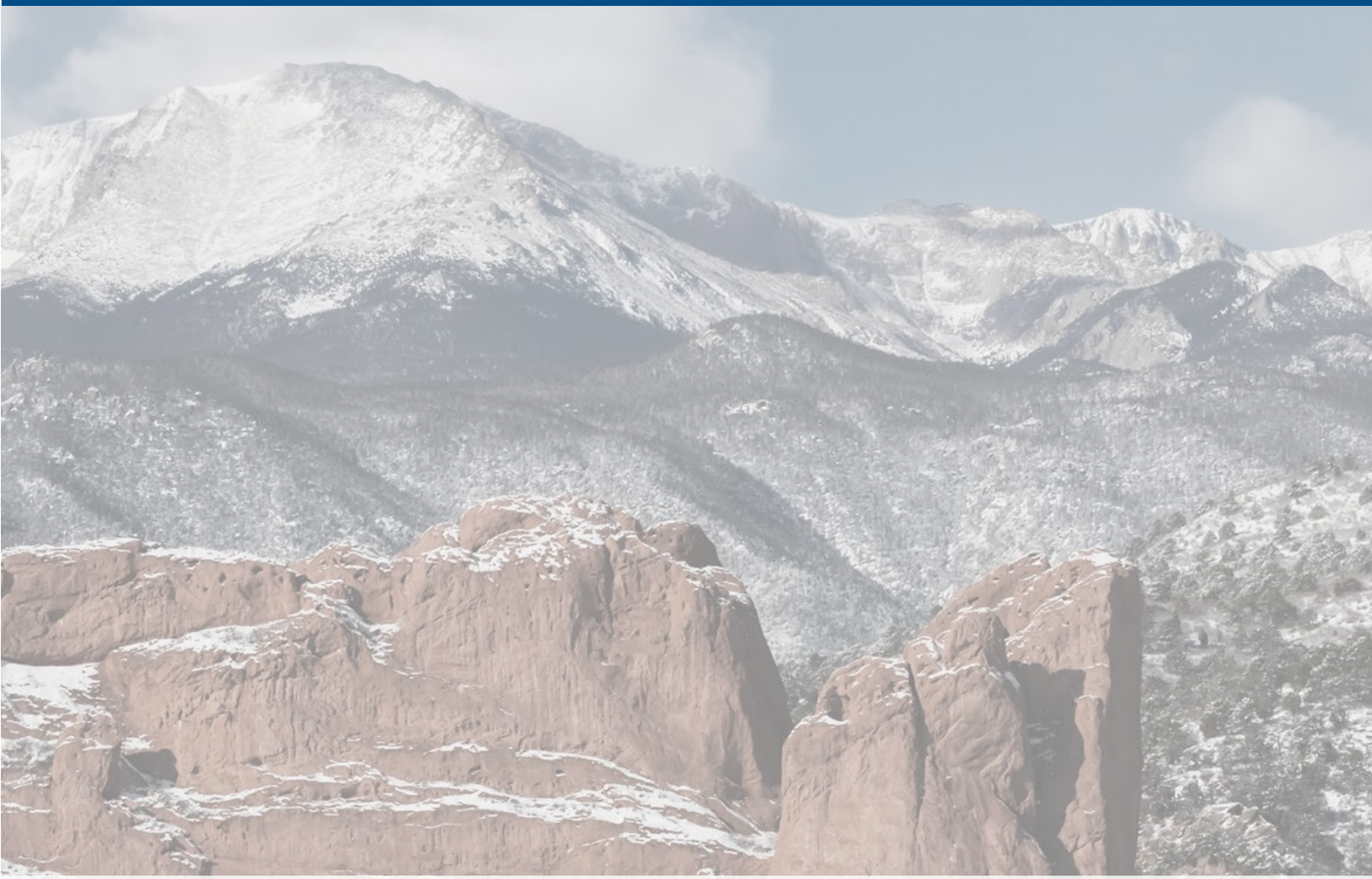
PIKES PEAK REGIONAL MULTI-HAZARD MITIGATION PLAN

Volume 1—Basic Plan

April 2026



PIKES PEAK REGIONAL EMERGENCY MANAGEMENT

TETRA TECH

Pikes Peak Regional Multi-Hazard Mitigation Plan

VOLUME 1—BASIC PLAN

APRIL 2026

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EXECUTIVE SUMMARY

Hazard Mitigation Overview

Hazard mitigation is the use of long-term and short-term policies, programs, projects, and other activities to minimize the loss of life, injury, and property damage that can result from a disaster. Communities, residents, and businesses across the United States have been faced with continually increasing costs associated with natural and human-caused hazards. Hazard mitigation is the first step in reducing risk and is the most effective way to reduce costs associated with hazards.

The Pikes Peak Regional Office of Emergency Management (PPROEM) has developed a regional multi-hazard mitigation plan (HMP) to reduce risks from disasters to the people, property, economy, and environment within El Paso County. Developed by the County and eight participating local jurisdictions (the Planning Partners), this HMP updates the 2020 Pikes Peak HMP. It includes regional assessment of hazards, risk, and capabilities. The plan complies with federal and state hazard mitigation planning requirements to establish the Planning Partners' eligibility for funding under Federal Emergency Management Agency (FEMA) grant programs.

The following are the jurisdictions in the Pikes Peak Region that participated as Planning Partners:

- El Paso County
- City of Colorado Springs
- City of Fountain
- City of Manitou Springs
- Town of Calhan
- Town of Green Mountain Falls
- Town of Monument
- Town of Palmer Lake
- Town of Ramah

The Planning Process

OVERALL APPROACH

To support the planning process, the Planning Partners accomplished the following:

- Developed a Hazard Mitigation Planning Team consisting of key stakeholders and a countywide Planning Partnership
- Reviewed the 2020 Pikes Peak Hazard Mitigation Plan
- Identified hazards of concern to the County to be included in the update
- Profiled the hazards of concern
- Estimated the inventory at risk and potential losses associated with these hazards
- Reviewed and updated the mitigation goals and objectives
- Reviewed the mitigation strategy and actions outlined in the 2020 HMP to indicate progress

- Developed new mitigation actions to reduce the vulnerability of assets from hazards of concern
- Involved a wide range of stakeholders and the public in the plan update process
- Developed mitigation plan maintenance procedures to be executed after obtaining approval of the plan from the Colorado Department of Homeland Security and Emergency Management (DHSEM) and FEMA

MULTIPLE AGENCY SUPPORT FOR HAZARD MITIGATION

Primary responsibility for hazard mitigation lies with local governments. Partners at the state and federal levels are available to assist local communities with their mitigation strategies. FEMA provides grants, tools, guidance, and training to support mitigation planning. In Colorado, DHSEM is the lead agency providing hazard mitigation planning assistance to local jurisdictions.

The participating jurisdictions provided significant input into the preparation of this HMP, in particular the preparation of jurisdiction-specific annexes included in Volume 2. They fully coordinated with and solicited participation from county and local governments, relevant organizations and groups, state and federal agencies, and the general public. This coordination ensured that stakeholders had established communication channels and relationships to support mitigation planning and mitigation actions included in the plan.

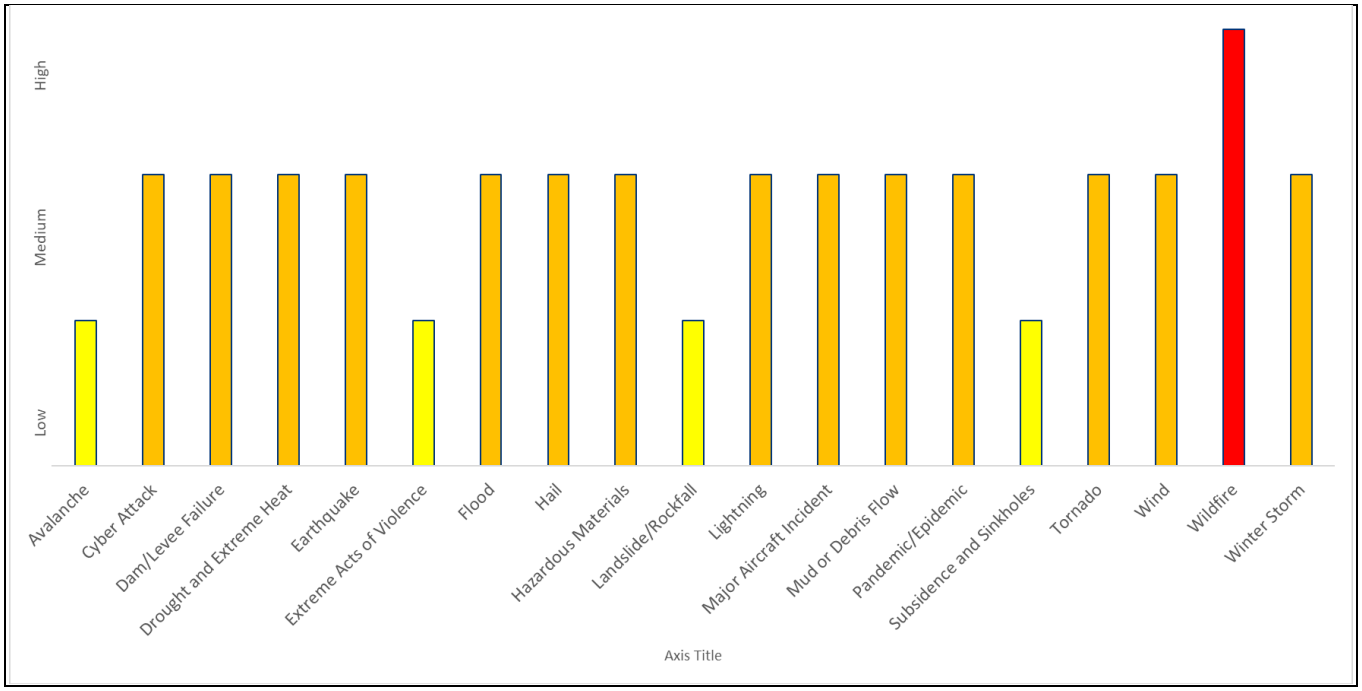
Under the project management of PPROEM, the Hazard Mitigation Planning Team provided oversight for the preparation of this plan. The Planning Team includes representatives from the following:

- Pikes Peak Regional Office of Emergency Management
- Pikes Peak Regional Building Department
- El Paso County Communications
- El Paso County Economic Development
- El Paso County Geographic Information System (GIS)
- El Paso County Planning and Community Development
- El Paso County Public Health
- El Paso County Public Works and Engineering
- El Paso County Sherriff's Office
- El Paso County Stormwater/Floodplain
- Dam Safety Branch of the Colorado Department of Natural Resources

Risk Assessment for Local Hazards of Concern

The Planning Partners evaluated each jurisdiction's risk and vulnerability due to each of the hazards of concern, based on past events, past and predicted future losses, and the expected probability of future occurrence. From these evaluations, hazards were ranked as high, medium, low, or negligible risk to each jurisdiction. The hazard rankings were used to focus and prioritize individual jurisdictional mitigation strategies. Summary overall hazard rankings for all of the Pikes Peak Region are as shown in Figure ES-1.

Figure ES-1. Summary of Overall Hazard Rankings for Pikes Peak Region



Capability Assessment and Plan Integration into Other Local Mechanisms

Effective mitigation is achieved when hazard awareness and risk management become integral parts of public activities and decision-making. The Pikes Peak Region has many plans and programs that support hazard risk management. This HMP integrates, complements, and references those plans and programs to the extent practical in order for it to be a comprehensive resource for hazard mitigation.

The HMP includes a capability assessment to review relevant local mechanisms for each participating jurisdiction. This assessment identifies where each jurisdiction is currently able to implement hazard mitigation measures and where each would benefit from improved capabilities for such measures. The capability assessment also provides a summary and description of the existing plans, programs, and regulatory mechanisms at all levels of government (federal, state, county and local) that support hazard mitigation in the County. In the jurisdictional annexes, each participating jurisdiction identifies how it has integrated hazard risk management into its existing planning, regulatory and operational/administrative framework, and how it intends to continue to promote this integration.

Mitigation Strategy

HAZARD MITIGATION PLAN GOALS AND OBJECTIVES

The HMP includes mitigation goals for reducing or avoiding long-term vulnerabilities to the identified hazards of concern. The planning process included a review and update of previous mitigation goals and objectives developed to guide the selection of mitigation actions. The goals and objectives were updated based on the updated risk assessment, discussions, research, and input from plan participants and stakeholders. The goal development process considered the goals expressed in the Colorado State Hazard Mitigation Plan, as well as other relevant county and local planning documents. The following are the selected 2026 Pikes Peak Regional HMP goals:

- Goal 1—Reduce Loss of Life and Injury
  - **Objective 1.1:** Expand existing emergency notification systems to ensure reliable, diverse and redundant public communication of potential hazards
  - **Objective 1.2:** Review and assess region, county and local plans for current best practices, standards, and appropriate integration of risk reduction elements resulting in a more resilient community
  - **Objective 1.3:** Assess and improve hazard-specific mapping and alert and warning systems to provide accurate and accessible information to ensure that residents and visitors can respond appropriately
- Goal 2—Reduce Property and Economic Loss
  - **Objective 2.1:** Proactively protect and reduce vulnerability of critical facilities, infrastructure, community lifelines, the environment, and other key community assets from hazards
  - **Objective 2.2:** Explore tools and strategies that make public and private properties more resilient and support economic development in the region
  - **Objective 2.3:** Identify and address proposed Federal, State and local legislation that could impact emergency services
- Goal 3—Promote Risk and Threat Awareness within the Pikes Peak Region
  - **Objective 3.1:** Promote risk awareness and mitigation strategies through effective community preparedness outreach programs
  - **Objective 3.2:** Ensure that businesses and residents are informed about resources specifically available before, during, and after a disaster
- Goal 4—Incorporate Hazard Mitigation into Future Plans and Policies
  - **Objective 4.1:** Evaluate and integrate mitigation priorities supporting watersheds, storm water management and natural resources to protect life, property and the environment
  - **Objective 4.2:** Expand coordination with federal, state, local governments, and regional stakeholders to identify and leverage mitigation opportunities
- Goal 5—Continuity of Governance

- **Objective 5.1:** Identify needs and leverage available funding streams to improve public safety, response, and recovery programs
- **Objective 5.2:** Expand the Pikes Peak Regional partnerships with local businesses, Chambers of Commerce, and Non-Governmental Organizations (NGOs) to provide critical support and services to residents

IMPLEMENTATION OF THE 2020 PLAN

The status of the mitigation projects identified in the 2020 HMP was reviewed for this HMP. Numerous projects and programs have been implemented that have reduced hazard vulnerability to assets in the planning area. Uncompleted projects have been re-evaluated, modified as necessary, and incorporated into this plan. The Planning Partners' annexes describe these mitigation activities in more detail, and plan maintenance procedures have been developed to encourage thorough integration with local decisions and processes and regular review of implementation progress.

2026 MITIGATION STRATEGY

The Planning Partners continued to focus on the hazards which could affect their respective jurisdictions. Through the collaborative efforts of PPROEM, the partners developed 107 mitigation action items. To maintain its Emergency Management Accreditation Program (EMAP) standing, PPROEM ensured compliance with EMAP guidance. The HMP update encompassed nineteen hazards of concern that were both natural and human caused.

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APPENDICES

Appendix A. Planning Partner Hazard Mitigation Plan (HMP) Adoption resolutions
Appendix B. Definition of Terms and Acronyms
Appendix C. Public and Stakeholder Outreach Documentation
Appendix D. Meeting Documentation
Appendix E. Survey Results

1. INTRODUCTION

The Pikes Peak Regional Office of Emergency Management (PPROEM) has developed a hazard mitigation plan (HMP) to reduce risks from disasters to the people, property, economy, and environment within the County. Developed by the County and eight participating local jurisdictions (the Planning Partners), this HMP updates the 2020 Pikes Peak Regional HMP. The updated 2026 HMP includes countywide analysis and assessment of hazards, risk, and capabilities.

1.1 OVERVIEW TO HAZARD MITIGATION PLANNING

1.1.1 WHAT IS HAZARD MITIGATION?

Hazard mitigation is any sustained action taken to reduce or eliminate the long-term risk and effects that can result from hazards. The Federal Emergency Management Agency (FEMA) defines a hazard mitigation plan (HMP) as the documentation of a state or local government's evaluation of hazards and strategies to mitigate them.

Effective mitigation planning helps people, organizations, and government agencies to better prepare for and respond when disasters occur. It also allows local governments to remain eligible for FEMA grant funding for mitigation projects that will reduce the impact of future disaster events. The long-term benefits of mitigation planning and implementation include the following:

- An increased understanding of hazards faced by local communities
- A more sustainable and disaster-resistant community
- Financial savings through partnerships that support planning and mitigation efforts
- Focused use of limited resources on hazards that have the biggest impact on the community
- Reduced long-term impacts and damage to human health and structures
- Reduced costs associated with response and recovery efforts, including repairs

1.1.2 REGULATORY FRAMEWORK

In recent decades, federal policy regarding disasters has encouraged communities to assess their vulnerability to hazards before disaster strikes and then take actions to reduce potential risks. A disaster-resistant community can rebound more quickly and cost-effectively from a natural disaster, with less human injury or loss of property. This minimizes other losses associated with disasters, such as the time lost from productive activity by businesses and industries.

The federal Disaster Mitigation Act of 2000 (DMA) encourages hazard mitigation planning by states, tribes, and local governments. Under the DMA, communities seeking certain hazard-related federal funding must identify potential hazards to the community's health, safety, and well-being, and identify and prioritize actions that can be taken by the community to mitigate those hazards before disaster strikes.

Regulations implementing the DMA are included in Title 44 of the Code of Federal Regulations, Section 201 (44 CFR 201). To be eligible for hazard mitigation assistance from the federal government, communities must have an HMP to prepare for and reduce the potential impacts of hazards. The federal regulations require that states and local governments update HMPs on a 5-year basis.

One goal of the federal regulations is to facilitate cooperation between state and local authorities, prompting them to work together. This enhanced planning process enables local and state governments to better articulate accurate needs for mitigation, resulting in faster allocation of funding and more effective risk reduction projects. In Colorado, responsibility for fulfilling the requirements of the DMA and 44 CFR 201 has been delegated to the Colorado Department of Homeland Security and Emergency Management (DHSEM).

Table 1-1 summarizes the 44 CFR 201 requirements and where each is addressed in this hazard mitigation plan.

Table 1-1. FEMA Local Mitigation Plan Review Crosswalk

Plan Criteria	Primary Location in Plan
Prerequisites	
Adoption by the Local Governing Body: §201.6(c)(5)	Section 2.7; Appendix A
Planning Process	
Documentation of the Planning Process: §201.6(b) and §201.6(c)(1)	Chapter 2
Risk Assessment	
Identifying Hazards: §201.6(c)(2)(i)	Chapter 5
Profiling Hazards: §201.6(c)(2)(i)	Chapters 6 – 24
Assessing Vulnerability: Overview: §201.6(c)(2)(ii)	Section 4.3; Volume 2
Assessing Vulnerability: Identifying Structures: §201.6(c)(2)(ii)(A)	Section 4.2; Volume 2
Assessing Vulnerability: Estimating Potential Losses: §201.6(c)(2)(ii)(B)	Section 4.3; Volume 2
Assessing Vulnerability: Analyzing Development Trends: §201.6(c)(2)(ii)(C)	Section 4.2.5; Volume 2
Mitigation Strategy	
Local Hazard Mitigation Goals: §201.6(c)(3)(i)	Section 28.2
Identification and Analysis of Mitigation Actions: §201.6(c)(3)(ii)	Chapter 28
Implementation of Mitigation Actions: §201.6(c)(3)(iii)	Section 28.3
Multi-Jurisdictional Mitigation Actions: §201.6(c)(3)(iv)	Volume 2
Plan Maintenance Process	
Monitoring, Evaluating, and Updating the Plan: §201.6(c)(4)(i)	Chapter 29
Incorporation into Existing Planning Mechanisms: §201.6(c)(4)(ii)	Section 29.2.2; Volume 2
Continued Public Involvement: §201.6(c)(4)(iii)	Section 29.2.6; Volume 2

1.1.3 SPECIALIZED TERMS AND CONCEPTS

Like any technical field, hazard mitigation has developed over the years its own set of terms and concepts with particular meanings within the hazard mitigation practice. A full glossary and list of acronyms is provided in Appendix B. The list below provides a quick reference for specialized terms whose use is especially prominent in this hazard mitigation plan:

- **Adaptive capacity**—the ability of a human or natural system to adjust to climate change by moderating potential damage, taking advantage of opportunities, or coping with the consequences (EPA 2023)
- **Asset**—anything that is important to the character and function of a community (e.g., people, structures, community lifelines, the economy, and natural, historic, and cultural resources) (FEMA 2023)
- **Capability assessment**—an evaluation of which authorities, policies, programs, funding and resources a participant has to accomplish hazard mitigation (FEMA 2023)
- **Cascading hazards**—a primary event, such as heavy rainfall, seismic activity, or rapid snowmelt, followed by a chain of consequences that may range from modest (lesser than the original event) to substantial (National Academies of Sciences, Engineering, and Medicine 2022)
- **Community lifelines**—the most fundamental services in a community that, when stabilized, enable all other aspects of society to function (FEMA 2023)
- **Extent**—the range of anticipated intensities of the identified hazards within a community, most commonly expressed using various scientific scales (FEMA 2022)
- **Hazard profile**—a description of a hazard's location, extent, previous occurrences and probability of future events within a community (FEMA 2023)
- **Hazard ranking**—the process of identifying the hazards that pose the greatest risk to a community, based on how likely the hazard is to occur, the potential consequences if the hazard does occur, and other relevant local factors
- **Impact**—the consequences or effects of a hazard on a community's assets identified in the vulnerability assessment. (FEMA 2023)
- **Integration**—the inclusion of hazard mitigation principles, vulnerability information and mitigation actions into other existing community planning to leverage activities that have co-benefits, reduce risk and increase resilience (FEMA 2022)
- **Mitigation action**—measures, projects, plans or activities proposed to reduce the current and future vulnerabilities identified in the risk assessment (FEMA 2023)
- **Mitigation strategy**— the long-term blueprint for reducing the potential hazard-related losses identified in the risk assessment; the strategy consists of mitigation goals, mitigation actions, and a plan for implementing the actions (FEMA 2023)
- **Natural hazard**—a source of harm or difficulty created by a meteorological, environmental or geological event (FEMA 2023)
- **Plan maintenance**—monitoring and updating a hazard mitigation plan as warranted by changing conditions, availability of new information, and progress on the proposed mitigation actions (FEMA 2023)

- **Planning process**—the procedures used to develop a hazard mitigation plan with broad acceptance across the community
- **Risk**—the potential for damage or loss when hazards interact with people or assets (FEMA 2023)
- **Risk assessment**—a data-driven analysis to find where a local jurisdiction is vulnerable to hazards (FEMA 2023)
- **Social vulnerability**—the potential for loss within an individual or social group, as affected by traits that influence an individual's or group's resilience, which is their ability to prepare, respond, cope or recover from an event (FEMA 2023)
- **Stakeholder**—individuals or groups that a mitigation action or policy affects, including businesses, private organizations and residents (FEMA 2023)
- **Vulnerability**—a description of which assets within locations identified to be hazard prone are at risk from the effects of the hazard (FEMA 2023)

1.2 HISTORY OF HAZARD MITIGATION PLANNING IN THE PIKES PEAK REGION

1.2.1 PREVIOUS PIKES PEAK REGION HAZARD MITIGATION PLANS

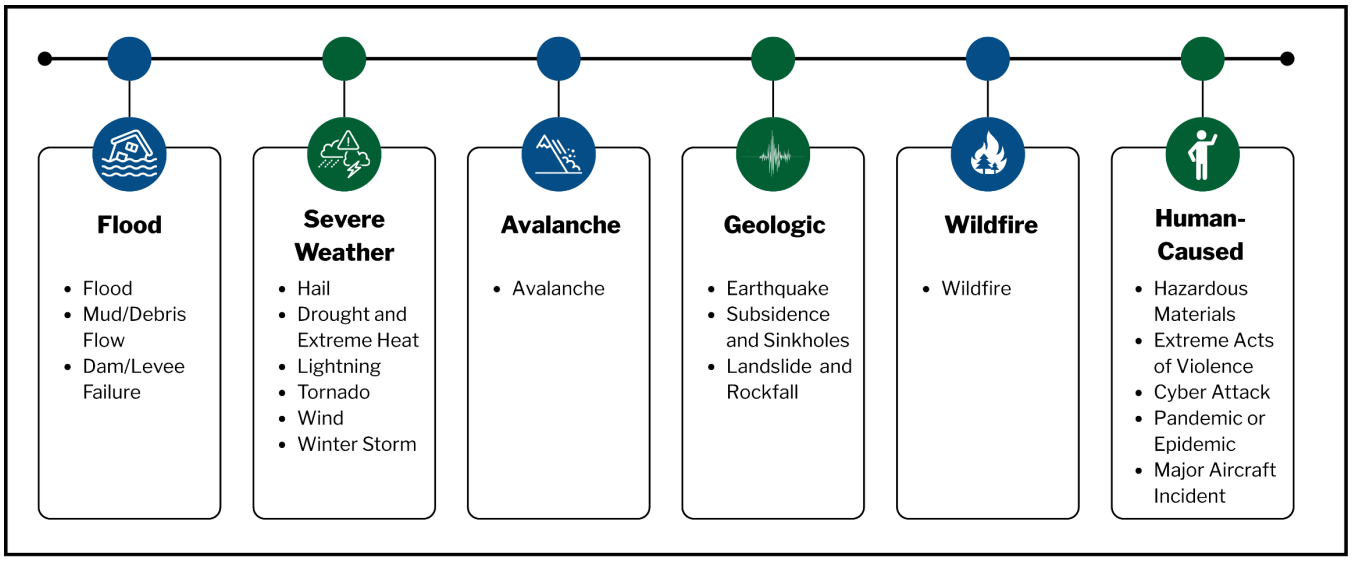
The Pikes Peak Region has been included in 20 federal disaster declarations (major disaster, fire management, and emergency) since 1954. Following the adoption of Disaster Mitigation Act (DMA) 2000 and the new national focus on mitigating hazards through advance planning, the County prepared and adopted its first hazard mitigation plan in October of 2004 (Colorado DHS EM 2004). The plan has been regularly updated since then, with updates adopted in 2009, 2014, 2019, and 2024 (PPROEM 2025). The most recent update identified the hazards listed in Figure 1-1 as the greatest hazards of concern in the Pikes Peak Region.

1.2.2 KEY CHANGES IN THE CURRENT UPDATE

The following are the most significant changes made between the previous County HMP (2020) and the current (2026) update:

- The plan structure was revised to separate county-wide elements and jurisdictional annexes. Volume 1 contains the essential elements of a hazard mitigation plan, including the planning process, risk assessment, capability assessment, and plan maintenance procedures. The jurisdictional annexes in Volume 2 contain information specific to El Paso County and the eight participating municipalities, including their individual mitigation strategies.
- The structure of the plan was reorganized to meet the requirements of the April 2025 FEMA Local Mitigation Planning Policy Guide and to improve readability.

Figure 1-1. Greatest Hazards of Concern



- The Hazard Mitigation Planning Team streamlined the plan goals and objectives to make them more distinct and to reflect current regional priorities. The updated goals and objectives are stated in Chapter 28.
- The consideration of hazard impacts on critical facilities was aligned with FEMA's definition of community lifelines. The complete list of community lifeline facilities considered in the risk assessment is available in Chapter 3.

1.3 PLAN ORGANIZATION

The plan provides a detailed review and analysis of each hazard of concern, resources, and relevant statistical information for the Planning Partners. The plan is organized into two volumes: Volume 1 includes all information that applies to the entire planning area (the Pikes Peak Region); and Volume 2 includes specific information for each participating jurisdiction.

Volume 1 is a resource for ongoing mitigation analysis. It includes a description of the County and its jurisdictions as well as information on mitigation planning and how the risk assessment and capability assessment were performed. Volume 1 of the plan includes the following chapters:

- Part 1: The Planning Process and Planning Area
  - Chapter 1: Introduction
  - Chapter 2: Planning Process: A description of the plan methodology and development process, committee and stakeholder roles and activities, and how the plan will be incorporated into existing programs. Information regarding the adoption of the plan by each participating jurisdiction.
  - Chapter 3: County Profile: An overview of the Pikes Peak Region, including: general information and physical conditions, land use patterns and trends, population and

demographics, economy, general building stock inventory, community lifelines, and natural, historic, and cultural resources

- Part 2: Risk Assessment
  - Chapter 4: Methodology: Description of the methodology used to assess hazard risk and the status of local data.
  - Chapter 5: Hazards of Concern Identification: Documentation of the process of identifying the hazards of concern for further profiling and evaluation.
  - Chapters 6 – 6.1 through 6.10: Hazard profiles and findings of the risk assessment (estimates of the impact of hazard events on life, safety, and health; general building stock; critical facilities; the economy, and natural, historic, and cultural resources).
  - Chapter 7: Hazard Ranking: Description and summary of the hazard ranking process.
- Part 3: Capability Assessment
  - Chapter 8: Capability Assessment: A summary and description of the existing plans, programs, and regulatory mechanisms at all levels of government (federal, state, county, local) that support hazard mitigation within the County.
- Part 4: Mitigation Strategy
  - Chapter 28: Mitigation Strategy: Information regarding the mitigation goals and objectives identified by the Steering Committee in response to priority hazards of concern, and the process by which County and local mitigation strategies have been developed or updated.
- Part 5: Plan Maintenance
  - Chapter 29: Plan Maintenance Procedures: A system to continue to monitor, evaluate, maintain, and update the plan.

Volume 2 consists of annexes for each participating jurisdiction. Each annex summarizes the jurisdiction's planning, regulatory, and fiscal capabilities; evaluates vulnerabilities to hazards; describes the status of past mitigation actions; and provides a specific mitigation strategy. The annexes provide each jurisdiction with an expedient resource for implementing mitigation projects and maximizing future grant opportunities.

Appendices include the following:

- Appendix A: Planning Partner HMP Adoption Resolutions: Documentation that supports the plan approval signatures included in Chapter 2 of this plan.
- Appendix B: Definition of Terms and Acronyms: Documentation that defines all terminology and acronyms that are used throughout this plan.
- Appendix C: Public and Stakeholder Outreach Documentation: Documentation of the public and stakeholder outreach effort including webpages, informational materials, public and stakeholder meetings and presentations, surveys, and other methods used to receive and incorporate public and stakeholder comment and input to the plan update process.

- Appendix D: Meeting Documentation: Agendas, attendance sheets, minutes, and other documentation (as available and applicable) of planning meetings convened during the development of the plan.
- Appendix E: Survey Results: Complete results of public and stakeholder surveys deployed to inform the development of the mitigation strategies.

2. PLANNING PROCESS

This chapter describes the planning process used to update the Pikes Peak Regional HMP, including how it was prepared, who was involved in the process, and how the public was involved. The planning approach aimed to achieve the following results:

- The plan will be multi-jurisdictional, including all municipalities in the County. PPROEM invited all jurisdictions in the Region to join in the planning process. All eight local municipal governments in the County participated in the 2026 plan update process:
  - El Paso County
  - City of Colorado Springs
  - City of Fountain
  - City of Manitou Springs
  - Town of Calhan
  - Town of Green Mountain Falls
  - Town of Monument
  - Town of Palmer Lake
  - Town of Ramah
- The format of this plan is such that other entities can easily join at a later date as part of the regulatory 5-year plan update process.
- The plan considers all hazards that pose a risk to the area, as required by 44 CFR 201. Non-natural hazards that pose significant risk were considered as well.
- The plan was developed following FEMA regulations and prevailing FEMA and state guidance. This ensures that all the requirements are met and supports plan review. In addition, this plan will meet criteria for the National Flood Insurance Program (NFIP) Community Rating System (CRS) and the Flood Mitigation Assistance (FMA) programs.

PPROEM applied for and was awarded a multi-jurisdictional planning grant under the Building Resilient Infrastructure and Communities grant program (#23BRIC25-PASO), which has supported the development of this HMP. Grant administration was the responsibility of PPROEM.

2.1 GENERAL MITIGATION PLANNING APPROACH

Federal Emergency Management Agency (FEMA) provides hazard mitigation planning support to local communities through guidance, resources, and plan reviews. This hazard mitigation plan was prepared in accordance with the following regulations and guidance:

- FEMA Mitigation Planning How-to Series (FEMA 386-1 through 4, 2002)
- FEMA How-To Guide for Using Hazus for Risk Assessment FEMA Document No. 433, February 2004.
- FEMA Local Mitigation Plan Review Guide, October 1, 2011.
- FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards, January 2013.

- FEMA Integrating Hazard Mitigation into Local Planning, March 1, 2013.
- FEMA Plan Integration: Linking Local Planning Efforts, July 2015.
- FEMA Local Mitigation Planning Policy Guide, April 19, 2022.
- FEMA Local Mitigation Planning Handbook, May 2023.
- Disaster Mitigation Assistance (DMA) 2000 (Public Law 106-390, October 30, 2000).
- 44 CFR 201 and 206 (including: Feb. 26, 2002, Oct. 1, 2002, Oct. 28, 2003, and Sept. 13, 2004, Interim Final Rules).
- DHSEM Enhanced State Hazard Mitigation Plan 2023

2.2 ORGANIZATION OF PLANNING PROCESS

2.2.1 PLANNING PROCESS PARTICIPANTS

Project Management and Planning Consultant (Core Planning Team)

Project management was the responsibility of PPROEM. A contract planning consultant (Tetra Tech) was tasked with the following:

- Assisting with the organization of the Hazard Mitigation Planning Team and the Planning Partnership
- Assisting with the development and implementation of a public and stakeholder outreach program
- Data collection
- Facilitation and attendance at meetings
- Review and update of the hazards of concern, and hazard profiling and risk assessment
- Assistance with the review and update of mitigation planning goals and objectives
- Assistance with the review of past mitigation strategy progress
- Assistance with the screening of mitigation actions and the identification of appropriate actions
- Assistance with the prioritization of mitigation actions
- Authoring of the draft and final plan documents

Planning Partnership

In April 2025, PPROEM notified all municipalities in the County of the pending planning process and invited them to formally participate. Jurisdictions were asked to formally notify the County of their intent to participate via a letter of intent and to identify planning points of contact to facilitate their participation and represent the interests of their communities. All participating jurisdictions, including the County, are recognized as Planning Partners and belong to the Planning Partnership for this HMP. The Planning Partnership was charged with the following:

- Representing their jurisdiction throughout the planning process
- Ensuring participation of all departments and functions within their jurisdiction that have a stake in mitigation (e.g., planning, engineering, code enforcement, police and emergency services, public works)

- Assisting in gathering information for inclusion in the HMP update, including the use of previously developed reports and data
- Supporting and promoting the public involvement process
- Reporting on progress of mitigation actions identified in prior or existing HMPs, as applicable
- Identifying, developing, and prioritizing appropriate mitigation actions
- Reporting on progress of integration of prior or existing HMPs into other planning processes and municipal operations
- Supporting and developing a jurisdictional annex
- Reviewing, amending, and approving all sections of the plan update
- Adopting, implementing, and maintaining the plan update

Table 2-1 shows the current members of the Planning Partnership as of the time of publication of this plan update.

Table 2-1. Hazard Mitigation Planning Partnership Members

Jurisdiction	Primary Point of Contact	Title	Alternate Point of Contact	Title
El Paso County	Meredith Nichols	PPROEM Deputy Director	Amanda Meldrum	PPROEM Emergency Management Specialist
City of Colorado Springs	Meredith Nichols	PPROEM Deputy Director	Amanda Meldrum	PPROEM Emergency Management Specialist
City of Fountain	John Trylch	Assistant City Manager	Todd Evans	Deputy City Manager
City of Manitou Springs	Frederick Rollenhagen	Planning Director	Denise Howel	City Administrator
Town of Calhan	Cindy Tompkins	Town Clerk	Megan McReynolds	Court Clerk
Town of Green Mountain Falls	Caleb Patterson	Town Manager	Sean Goings	Marshal
Town of Monument	Andrew Archuleta	Assistant Director of Public Works	Tom Tharnish	Director of Public Works
Town of Palmer Lake	Glen Smith	Interim Town Manager	Erica Romero	Town Clerk
Town of Ramah	Cindy Tompkins	Town Clerk	James Osborne	Mayor

The various jurisdictions in the Pikes Peak Region have differing levels of capabilities and resources available to apply to the plan update process, as well as differing levels of vulnerability to and impacts from the hazards being considered in this plan. It was PPROEM's intent to encourage participation by all jurisdictions, and to accommodate their specific needs and limitations while still meeting the intent and purpose of plan update participation. Such accommodations have included establishing a Hazard Mitigation Planning Team, engaging a contract consultant to assume certain

elements of the plan update process on behalf of the jurisdictions, and providing alternative mechanisms for planning participation.

Ultimately, jurisdictional participation is evidenced by a completed annex of the HMP, wherein jurisdictions individually identify their planning points of contact, evaluate their risk from the hazards of concern, identify their capabilities to effect mitigation in their community, identify and prioritize a suite of actions to mitigate their hazard risk, and adopt the updated plan via resolution. Annexes are included in Volume 2 of this HMP.

It is noted that five municipalities including the County actively participate in the National Flood Insurance Program and have a designated NFIP floodplain administrator. This includes City of Colorado Springs, City of Fountain, City of Manitou Springs, and Town of Monument. All floodplain administrators have been informed of the planning process, reviewed the plan documents, and provided direct input to the plan update. Local floodplain administrators are identified as part of each jurisdiction's hazard mitigation planning team, as presented in the jurisdictional annexes in Volume 2.

After completion of the plan, implementation and ongoing maintenance will become a function of the Planning Partnership as described in Chapter 29 (Plan Maintenance). The Planning Partnership was responsible for reviewing the draft plan and soliciting public comment as part of an annual review and as part of the five-year mitigation plan updates.

Hazard Mitigation Planning Team

PPROEM developed a Hazard Mitigation Planning Team (HMPT) to provide guidance and direction to the HMP update effort, and to ensure that the resulting document will be embraced by local government leaders as well as all who live and work within the planning area. Steering Committee members were charged with the following:

- Providing guidance and oversight of the planning process on behalf of the general planning partnership
- Attending and participating in Steering Committee meetings
- Assisting with the development and completion of certain planning elements, including:
  - Reviewing and updating the hazards of concern
  - Developing a public and stakeholder outreach program
  - Ensuring that the data and information used in the plan update process is the best available
  - Reviewing and updating the hazard mitigation goals
  - Identifying and screening appropriate mitigation strategies and activities
- Reviewing and commenting on plan documents prior to submission to DHSEM and FEMA

The Hazard Mitigation Planning Team provided guidance, leadership, and oversight of the planning process and acted as the point of contact for all participating jurisdictions and various interest groups in the planning area. Table 2-2 lists the members of the Planning Team.

Table 2-2. Hazard Mitigation Planning Team Members

Affiliation	Name	Title	Alternate Name	Alternate Title
El Paso County Administration	Sunny Bryant	Deputy County Administrator		
El Paso County Board of County Commissioners	Bill Wysong	County Commissioner		
El Paso County Communications	Scott Anderson	Communications and Public Relations Manager		
El Paso County Planning and Community Development	Meggan Herington	Director	Roland Peterson	Fire Safety and Wildfire Mitigation Program Manager
El Paso County Economic Development (includes Housing)	Sara Lobato	Economic Development Analyst	Natasha North	Project Manager
El Paso County Public Health	Jocelyn Rosado	Emergency Manager		
El Paso County Public Works	Jack Ladley	Director	Jeffrey Manchester	
El Paso County Public Works – Engineering	Matthew Johnson			
El Paso County Stormwater/ Floodplain	Erica Rylander	Stormwater Permit Specialist		
Pikes Peak Regional Building Department	Keith Curtis	Floodplain Administrator		
Pikes Peak Regional Office of Emergency Management	Meredith Nichols	Deputy Director	Amanda Meldrum	Emergency Management Specialist
Town of Calhan	Cindy Tompkins	Town Clerk	Chester Barlow	Board of Trustees
City of Colorado Springs	Caroline Schmitz	Stormwater Manager	Ashley Whitworth	Wildfire Mitigation Program Administrator
City of Fountain	John Trylch	Administrative Services Director		
Town of Green Mountain Falls	Caleb Patterson	Town Manager		

Affiliation	Name	Title	Alternate Name	Alternate Title
City of Manitou Springs	Denise Howell	City Manager	Frederick Rollenhagen	Planning Director
Town of Monument	Madeline VanDenHoek	Interim Town Manager	Andrew Archuleta	Assistant Director of Public Works
Town of Palmer Lake	John Vincent	Fire Chief	Glen Smith	Interim Town Manager
Town of Ramah	Cindy Tompkins	Town Clerk	Jim Osborne	Mayor
PPROEM	Meredith Nichols	Deputy Director	Amanda Meldrum	EM Specialist
PPROEM	Andrew Notbohm	Director	Tobi Blanchard	Deputy Director
American Red Cross	Bill Barnett			
CommonSpirit Hospitals	Sara Baird	Emergency Preparedness Manager		
Lyda Hill Institute for Human Resilience	Nicole Weis	Director of Healing and Community Programs	Charles Benight	Executive Director
Mountain View Electric Association	Devin Camacho	Government Affairs Liaison	Kim Mally	Member Relations
Pikes Peak Area Council of Government	Paul Rochette	Planning Manager		
Pikes Peak CERT	Chuck Wood	CERT Volunteer	John Dewsnap	CERT Volunteer
University of Colorado at Colorado Springs	Cynthia Norton	Environmental Health and Safety Manager		
University of Colorado Health	Trevor Russell	Emergency Manager	Cindy Corsano	
US Army Corps of Engineers	Ryan Brooks			
US Space Force	Cory Matthews	Emergency Management Specialist	Darren Pemberton	

2.2.2 PLANNING ACTIVITIES

Members of the Planning Partnership (individually and as a whole), as well as key stakeholders, met and communicated as needed to share information. This included workshops to identify hazards, assess risks, update inventories of critical facilities, and assist in updating mitigation goals and strategies. All members of the Planning Partnership had the opportunity to review the draft plan, supported interaction with other stakeholders, and assisted with public involvement efforts.

These activities provided continuity through the process to ensure that hazard vulnerability information and appropriate mitigation strategies were incorporated.

Table 2-3 summarizes meetings and other planning activities conducted during the development of the plan. It also identifies which 44 Code of Federal Regulations (CFR) 201 requirements each activity satisfies. Documentation of meetings (agendas, sign-in sheets, minutes, etc.) may be found in Appendix C. In addition to the activities listed in the table, there was a great deal of communication between Planning Partnership members and the consultant through individual local meetings, phone, and email.

Table 2-3. Summary of Mitigation Planning Activities

Date	44 CFR 201 Requirement[a]	Description of Activity	Participants
September 2024	2	All municipalities invited to participate in the planning process.	PPROEM, Municipalities
March 25, 2025	2	Project Start Up Meeting: Discuss proposed planning process and scope of work including documenting participation, schedule, and public and stakeholder outreach and involvement.	PPROEM, Tetra Tech
April 9, 2025	2, 3c	Geographic Information System (GIS) data collection meeting	PPROEM, El Paso County Geographic Information System (GIS), City of Colorado Springs Geographic Information System (GIS), Tetra Tech
Bi-Weekly	-	Weekly project status meeting to discuss action items in support of the expedited planning process	PPROEM, Tetra Tech
April 2, 2025	1b	Presented HMP update process to regional floodplain managers and requested input and support. Encouraged floodplain representatives to participate in planning process.	PPROEM, El Paso County Floodplain, Colorado Springs Floodplain, Manitou Springs Floodplain, Tetra Tech
April 2025	2	Public project website developed: https://www.PPROEM.com/HMPUpdate	PPROEM
April 2025	2	Online Public Hazard Preparedness and Mitigation survey developed and deployed	PPROEM, Tetra Tech
April 2025	2	Online Stakeholder Hazard Mitigation survey developed and deployed	PPROEM, Tetra Tech
April 23, 2025	2	Hazard Mitigation Planning Team Meeting: project kickoff and schedule	Hazard Mitigation Planning Team
May 14, 2025	2	Hazard Mitigation Planning Team Meeting: County and stakeholder capabilities were assessed.	Hazard Mitigation Planning Team

Date	44 CFR 201 Requirement[a]	Description of Activity	Participants
May 22, 2025	1b	Public meeting at PPROEM facility to provide information about the HMP planning process to the public and stakeholders.	Public and Stakeholders
June 11, 2025	2	Hazard Mitigation Planning Team Meeting: survey summaries were presented.	Hazard Mitigation Planning Team
October 20, 2025	2	Draft Plan posted to public project website	Public and Stakeholders
October 21, 2025	1b, 2, 3, 4, 5	Hazard Mitigation Planning Team Meeting: Plan Maintenance, Draft Plan Review	Hazard Mitigation Planning Team
October 21, 2025	1b	Public meeting at PPROEM facility. Information on the HMP planning process was made available to attendees. Attendees were encouraged to review the Draft Plan.	Public and Stakeholders
November 4, 2025	1b, 2	Public and stakeholder comments to Draft Plan received and incorporated into Final Plan.	Public and Stakeholders
November 10, 2025	All requirements	Final plan submitted to DHSEM and FEMA Region 8	DHSEM, FEMA Region 8
Upon plan approval by FEMA	1a	Plan adoption by resolution by the governing bodies of all participating municipalities	All plan participants

a. Numbers in column 2 identify specific requirements of 44 CFR 201.6, as follows:
1a – Prerequisite – Adoption by the Local Governing Body (201.6.a.1)
1b – Public Participation (201.6.b)
2 – Planning Process – Documentation of the Planning Process (201.6.c.1)
3a – Risk Assessment – Identifying Hazards (201.6.c.2.i)
3b – Risk Assessment – Profiling Hazard Events (201.6.c.2.i)
3c – Risk Assessment – Assessing Vulnerability: Identifying Assets (201.6.c.2.ii.A)
3d – Risk Assessment – Assessing Vulnerability: Estimating Potential Losses (201.6.c.2.ii.B)
3e – Risk Assessment – Assessing Vulnerability: Analyzing Development Trends (201.6.c.2.ii.C)
4a – Mitigation Strategy – Local Hazard Mitigation Goals (201.6.c.3.i)
4b – Mitigation Strategy – Identification and Analysis of Mitigation Measures (201.6.c.3.ii)
4c – Mitigation Strategy – Implementation of Mitigation Measures (201.6.c.3.iii)
5a – Plan Maintenance Procedures – Monitoring, Evaluating, and Updating the Plan (201.6.c.4.i)
5b – Plan Maintenance Procedures – Implementation through Existing Programs (201.6.c.4.ii)
5c – Plan Maintenance Procedures – Continued Public Involvement (201.6.c.4.iii)

2.3 STAKEHOLDER OUTREACH AND INVOLVEMENT

The plan update was written using the best available information obtained from a wide variety of sources. Throughout the HMP update process, a concerted effort was made to gather information from municipal and regional agencies and staff as well as stakeholders, federal and state agencies,

and the residents of the County. The Hazard Mitigation Planning Team solicited information from local agencies and individuals with specific knowledge of certain hazards and past historical events. In addition, the Hazard Mitigation Planning Team and Planning Partnership took into consideration planning and zoning codes, ordinances, and recent land use planning decisions.

This section details the outreach to, and involvement of, the many agencies, departments, organizations, non-profits, districts, authorities, and other entities that have a stake in managing hazard risk and mitigation, commonly referred to as stakeholders.

Diligent efforts were made to ensure broad regional, county, and local representation in this planning process. A comprehensive list of stakeholders was developed with the support of the Hazard Mitigation Planning Team and Planning Partnership. Stakeholder outreach was performed early and throughout the planning process, including mass media notification efforts. Identified stakeholders were invited to attend the Planning Partnership risk assessment meeting, and key stakeholders were requested to participate on the Hazard Mitigation Planning Team and/or Planning Partnership. Information and input provided by these stakeholders has been included throughout this plan.

The following sections list the stakeholders who were invited to participate in the development of this plan and describe how they contributed to the plan. This summary information demonstrates the scope and breadth of the stakeholder outreach efforts during the planning process. Beyond those described here, many stakeholders were aware of and/or contributed to this plan through formal and informal outreach efforts by the Planning Partners involved in the plan update.

2.3.1 FEDERAL AND STATE AGENCIES

The federal and state agencies listed in Table 2-4 were contacted during the planning process. The table describes how each participated.

2.3.2 COUNTY AND REGIONAL AGENCIES

The county and regional agencies listed in Table 2-5 were invited to participate during the planning process. The table describes how each participated.

Community Lifeline Representatives

FEMA defines community lifelines as fundamental services in a community that, when stabilized, enable all other aspects of society. Following a disaster event, intervention is required to stabilize community lifelines. PPROEM asked County agencies associated with community lifeline categories to complete a stakeholder survey. Table 2-6 lists other stakeholders involved with community lifelines who were invited to participate in the planning process by attending Hazard Mitigation Planning Team meetings, contributing subject-matter expertise, completing a stakeholder survey, or reviewing the draft plan.

Table 2-4. Participation of Federal and State Agencies

Agency	Participation
FEMA Region 8	Provided updated planning guidance; provided summary and detailed NFIP data for planning area; conducted plan review.
National Centers for Environmental Information (NCEI) National Hurricane Center (NHC) National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS) Storm Prediction Center (SPC) U.S. Army Corps of Engineers (USACE) U.S. Census Bureau U.S. Geological Survey (USGS)	Information regarding hazard identification and the risk assessment for this HMP update was requested and received or incorporated by reference
Colorado Department of Homeland Security and Emergency Management	Administered planning grant and facilitated FEMA review; provided updated planning guidance; attended meetings; conducted plan review.
Colorado Avalanche Information Center Colorado Geological Survey Colorado Wildfire Risk Assessment	Information regarding hazard identification and the risk assessment for this HMP update was requested and received or incorporated by reference

Table 2-5. County and Regional Agencies

Department	Attended HMPT Meetings	Completed Stakeholder Survey	Reviewed Draft Plan	Updated 2020 Mitigation Strategy
Pikes Peak Regional Office of Emergency Management	☒	☒	☒	☒
Pikes Peak Regional Building Department	☒	☒	☒	☐
El Paso County Communications	☒	☐	☒	☒
El Paso County Economic Development	☒	☒	☒	☐
El Paso County Geographic Information System (GIS)	☒	☐	☒	☐
El Paso County Department of Human Services	☐	☐	☒	☒
El Paso County Planning and Community Development	☒	☒	☒	☒
El Paso County Public Health	☒	☐	☒	☒
El Paso County Public Works and Engineering	☒	☒	☒	☒
El Paso County Sheriff's Office	☒	☒	☒	☐
El Paso County Stormwater/Floodplain	☒	☐	☒	☐
Fountain Creek Watershed District	☒	☐	☒	☒

Table 2-6. Stakeholders by Community Lifeline

Community Lifeline Category	Stakeholders Contacted
Safety and Security	Cascade Volunteer Fire Department, Colorado Springs Fire Department, Colorado State Forest Service, El Paso County Sheriffs Office, Fremont County Emergency Management, Town of Palmer Lake Fire Department, Pueblo County Sheriffs Office, Schriever Space Force Base, Tri-County Fire Protection District
Food, Hydration, Shelter	El Paso County Planning, Big Sandy School District, Calhand Board of Trustees, Cheyenne Mountain School District, Fountain-Fort Carson School District, El Paso County Department of Public Works, Ellicott School District, The Myron Stratton Home, American Red Cross.
Health and Medical	Children's Hospital Colorado, Lyda Hill Institute for Human Resilience, UCHealth, Common Spirit Hospitals.
Energy	Colorado Springs Utilities, Mountain View Electric Association
Communications	Colorado Springs Utilities, Peak Alliance for a Sustainable Future, Town of Calhan, Town of Monument Public Works, Town of Ramah, El Paso County Economic Development, Pikes Peak Regional Building Department,
Transportation	Colorado Springs Airport, Schriever Space Force Base
Hazardous Materials	Cascade Volunteer Fire Department, Colorado Springs Fire Department, Fremont County Emergency Management, Town of Palmer Lake Fire Department, Pueblo County Sheriffs Office, Tri-County Fire Protection District, El Paso County HAZMAT.
Water Systems	Colorado Springs Utilities, Forest View Acres Water District, Park Forest Water District, Colorado State Forest Service, Fountain Creek Watershed District.

Dam Owners

In order to address High Hazard Potential Dams, outreach was conducted to dam owners and the Dam Safety Branch of the Colorado Department of Natural Resources. PPROEM maintains a list of all dam owners within El Paso County. For security reasons, that list does not appear in this plan. The following information was requested from all dam owners via email early in the process:

- Information, data, or resources regarding the risk to dam failure as a result of deficiencies or exposure to hazards such as flooding, geologic impacts, and severe storms
- Concerns with dam safety due to changing climate conditions
- Concerns with emergency action plan deficiencies including warning time, evacuation needs, etc.
- Completed or in progress repairs/improvements to dams
- Potential new mitigation actions that should be considered for inclusion in the HMP mitigation strategy
- In addition to the above request, dam owners were invited to attend HMPT meetings, complete the stakeholder survey, and review the draft plan.

Additional Stakeholder Groups

The following additional groups were invited to attend HMPT meetings, contribute subject-matter expertise, complete a stakeholder or business survey, and review the draft plan:

- Businesses, Academia, and Other Private Organizations
- Organizations Working with Socially Vulnerable Groups and Underserved Communities

2.3.3 ADJACENT JURISDICTIONS

The County kept surrounding jurisdictions apprised of the project, invited them to complete a neighboring community survey, and requested their review of the draft plan. The following adjoining county and jurisdictional representatives were contacted in April 2025 to inform them about the availability of the project website, draft plan documents, and surveys and to invite them to provide input to the planning process:

- Chaffee County
- Douglas County
- Fremont County
- Jefferson County
- Lake County
- Park County
- Teller County

2.3.4 FLOODPLAIN COORDINATION WITH COMMUNITIES AND OTHER AGENCIES

The agencies and organizations listed in Table 2-7 were contacted to determine if they had studies, plans, data, or information pertinent to the County's floodplain management efforts; to determine if their programs or initiatives may affect the community's program; and to see if they could support the HMP efforts by attending a meeting of the Hazard Mitigation Planning Team or commenting on the draft plan (copies of the draft plan review meeting are included in Appendix D).

Table 2-7. Other Agency Participation

Contacts	Agency	Participation
Jessica Mcintire Craig Milroy Caroline Schmitz Pam Farmer Tim Stickel Bootsy Jones Ashley Whitworth Kris Cooper Steve Wilch Ashley Franco Timothy Biolchini	City of Colorado Springs Fire Department, City Utilities, and Community Public Health	Participated in the HMPT Kick-Off meeting. Participated in the HMPT capabilities meeting and provided information on Worksheet B for regional and agency capabilities. Participated in the HMPT survey meeting and reviewed the public survey results as well as the finalized Goals and Objectives for the plan. Reviewed and provided feedback where applicable on the mitigation action worksheet. Participated in the HMP risk assessment meeting to review the risk rankings for each hazard of concern. Provided feedback, where applicable, on the risks perceived in their area. Coordinated with ongoing stormwater CIP.
Darren Adame	Stratmoor Hills Water	Participated in the HMPT Kick-Off meeting.

Contacts	Agency	Participation
Charles "Chip" Benight **Kris Parsons** **Cynthia Norton** **Nicole Weis**	UCCS Lydia Hill Institute for Human Resilience	Participated in the HMPT Kick-Off meeting. Participated in the HMPT capabilities meeting and provided information on Worksheet B for regional and agency capabilities. Participated in the HMPT survey meeting and reviewed the public survey results as well as the finalized Goals and Objectives for the plan. Reviewed and provided feedback where applicable on the mitigation action worksheet.
Keith Curtis	PPRBD	Participated in the HMPT Kick-Off meeting. Reviewed and provided feedback where applicable on the mitigation action worksheet.
Devin Camacho **Kim Mally**	Mountain View Electric Association Cooperative (MVEA COOP)	Participated in the HMPT Kick-Off meeting.
Trevor Russell **Cindy Corsaro**	UC Health	Participated in the HMPT Kick-Off meeting.
Derek Strickler	Navigators	Participated in the HMPT Kick-Off meeting.
Scott Bartlett	The Independence Center	Participated in the HMPT Kick-Off meeting.
Jonathan Bradley **Scott Ridings**	Town of Monument Fire Department	Participated in the HMPT Kick-Off meeting. Participated in the HMPT capabilities meeting and provided information on Worksheet B for regional and agency capabilities.
Tim Johnson **Andrew Archuleta**	Town of Monument	Participated in the HMPT Kick-Off meeting. Participated in the HMPT capabilities meeting and provided information on Worksheet B for regional and agency capabilities.
Chester Barlow	Surmount Solutions	Participated in the HMPT Kick-Off meeting.
Fredrick Rollenhagen **Carlos Sandoval** **Janie Anderson**	City of Manitou Springs District 12	Participated in the HMPT Kick-Off meeting. Participated in the HMPT capabilities meeting and provided information on Worksheet B for regional and agency capabilities. Participated in the HMPT survey meeting and reviewed the public survey results as well as the finalized Goals and Objectives for the plan. Reviewed and provided feedback where applicable on the mitigation action worksheet.
Samuel Stump **John Trylch**	City of Fountain	Participated in the HMPT Kick-Off meeting. Participated in the HMPT capabilities meeting and provided information on Worksheet B for regional and agency capabilities. Participated in the HMPT survey meeting and reviewed the public survey results as well as the finalized Goals and Objectives for the plan. Reviewed and provided feedback where applicable on the mitigation action worksheet.
John Vincent	Town of Palmer Lake	Participated in the HMPT Kick-Off meeting. Reviewed and provided feedback where applicable on the mitigation action worksheet.

Contacts	Agency	Participation
Michael Garman	Broadmoor Fire Rescue	Participated in the HMPT capabilities meeting and provided information on Worksheet B for regional and agency capabilities.
Sara Baird	CommonSpirit Hospitals	Participated in the HMPT capabilities meeting and provided information on Worksheet B for regional and agency capabilities.
Matthew Johnson **Meggan Herington**	EPC DPW Engineering and Planning Department	Participated in the HMPT capabilities meeting and provided information on Worksheet B for regional and agency capabilities. Provided feedback, where applicable, on the risks perceived in their area.
Cindy Tompkins	Town of Calhan and Town of Ramah	Participated in the HMPT capabilities meeting and provided information on Worksheet B for regional and agency capabilities. Participated in the HMPT survey meeting and reviewed the public survey results as well as the finalized Goals and Objectives for the plan. Reviewed and provided feedback where applicable on the mitigation action worksheet.
Caleb Patterson	Town of Green Mountain Falls	Participated in the HMPT capabilities meeting and provided information on Worksheet B for regional and agency capabilities. Participated in the HMPT survey meeting and reviewed the public survey results as well as the finalized Goals and Objectives for the plan. Reviewed and provided feedback where applicable on the mitigation action worksheet. Participated in the HMP risk assessment meeting to review the risk rankings for each hazard of concern. Provided feedback, where applicable, on the risks perceived in their area.
Andrew Archuleta **Andy Kovacs**	Town of Monument Fire Department	Participated in the HMPT capabilities meeting and provided information on Worksheet B for regional and agency capabilities. Participated in the HMPT survey meeting and reviewed the public survey results as well as the finalized Goals and Objectives for the plan. Reviewed and provided feedback where applicable on the mitigation action worksheet.
Cory Matthews	Cheyenne Mountain SFB	Participated in the HMPT survey meeting and reviewed the public survey results as well as the finalized Goals and Objectives for the plan. Reviewed and provided feedback where applicable on the mitigation action worksheet.
Bill Barnett	American Red Cross	Participated in the HMPT survey meeting and reviewed the public survey results as well as the finalized Goals and Objectives for the plan. Reviewed and provided feedback where applicable on the mitigation action worksheet. Participated in the HMPT survey meeting and reviewed the public survey results as well as the finalized Goals and Objectives for the plan. Reviewed and provided feedback where applicable on the mitigation action worksheet.

Contacts	Agency	Participation
Ariane Carrillo	El Paso School District 8 – Fountain-Fort Carson School District	Participated in the HMPT survey meeting and reviewed the public survey results as well as the finalized Goals and Objectives for the plan. Reviewed and provided feedback where applicable on the mitigation action worksheet.
Lizz Floro	EPSO	Participated in the HMPT survey meeting and reviewed the public survey results as well as the finalized Goals and Objectives for the plan. Reviewed and provided feedback where applicable on the mitigation action worksheet.
Jocelyn Rosado	El Paso County Public Health	Participated in the HMPT survey meeting and reviewed the public survey results as well as the finalized Goals and Objectives for the plan. Reviewed and provided feedback where applicable on the mitigation action worksheet.
Darren Pemberton	Schriever SFB Emergency Management	Participated in the HMPT survey meeting and reviewed the public survey results as well as the finalized Goals and Objectives for the plan. Reviewed and provided feedback where applicable on the mitigation action worksheet.
Tobi Blanchard	Pikes Peak Regional Office of Emergency Management	Participated in the HMPT survey meeting and reviewed the public survey results as well as the finalized Goals and Objectives for the plan. Reviewed and provided feedback where applicable on the mitigation action worksheet.
Catherine Buckley	Colorado College	Participated in the HMPT survey meeting and reviewed the public survey results as well as the finalized Goals and Objectives for the plan. Reviewed and provided feedback where applicable on the mitigation action worksheet.
Jason Humble	DHSEM Mitigation	Participated in the HMPT survey meeting and reviewed the public survey results as well as the finalized Goals and Objectives for the plan. Reviewed and provided feedback where applicable on the mitigation action worksheet.
Sara Muirheid	Mountain View Electric Association, Inc.	Participated in the HMPT survey meeting and reviewed the public survey results as well as the finalized Goals and Objectives for the plan. Reviewed and provided feedback where applicable on the mitigation action worksheet.
Matthew Johnson	EPC DPW Engineering	Participated in the HMPT survey meeting and reviewed the public survey results as well as the finalized Goals and Objectives for the plan. Reviewed and provided feedback where applicable on the mitigation action worksheet.
Mike Till	CSFS WPFO	Participated in the HMPT survey meeting and reviewed the public survey results as well as the finalized Goals and Objectives for the plan. Reviewed and provided feedback where applicable on the mitigation action worksheet.
Clessie Anderson	DHS	Participated in the HMPT survey meeting and reviewed the public survey results as well as the finalized Goals and Objectives for the plan. Reviewed and provided feedback where applicable on the mitigation action worksheet.

Contacts	Agency	Participation
Buck Franks	US Army Garison, Ft. Carson	Participated in the HMPT survey meeting and reviewed the public survey results as well as the finalized Goals and Objectives for the plan. Reviewed and provided feedback where applicable on the mitigation action worksheet.
Alli Schuch	Fountain Creek Watershed District	Participated in the HMP risk assessment meeting to review the risk rankings for each hazard of concern. Provided feedback, where applicable, on the risks perceived in their area.

2.3.5 STAKEHOLDER SURVEY SUMMARY

This section summarizes the results and feedback received by those who completed the stakeholder and neighboring community surveys. Feedback was reviewed by the HMPT and integrated where appropriate in the plan. Refer to Table 2-7 to see other agencies involved in reviewing and analyzing the stakeholder and community surveys.

The stakeholder survey was designed to identify general needs for hazard mitigation and resiliency within the Pikes Peak Region from the perspective of stakeholders, as well as to identify specific projects that may be included in the mitigation plan. It was distributed to identified stakeholders, including county and municipal departments and agencies. The following stakeholder agencies participated in the stakeholder survey:

- Big Sandy School District
- Calhan Board of Trustees
- Cascade Volunteer Fire Department
- Cheyenne Mountain School Dist. 12
- Children's Hospital Colorado
- City of Colorado Springs
- Colorado Springs Airport
- Colorado Springs Fire Department / PPROEM
- Colorado Springs Utilities
- Colorado State Forest Service
- El Paso County Economic Development
- El Paso County Planning
- El Paso County School District #8 (Fountain-Fort Carson School)
- El Paso County Sheriff's Office
- El Paso County, Department of Public Works
- Ellicott School District 22
- Forest View Acres Water District
- Fremont County Emergency Management
- Lyda Hill Institute for Human Resilience
- Mountain View Electric Association
- Park Forest Water District
- Peak Alliance for a Sustainable Future
- Pikes Peak Regional Building Dept.
- Pueblo County Sheriff's Office
- Schriever Space Force Base
- The Myron Stratton Home
- Town of Calhan
- Town of Monument Public Works
- Town of Palmer Lake Fire Department
- Town of Ramah, Municipality
- Tri-County Fire Protection District
- UC Health

Hazard and Damage Identification

Survey respondents identified the following as the top 5 hazards of concern which their organization has a special interest or expertise in:

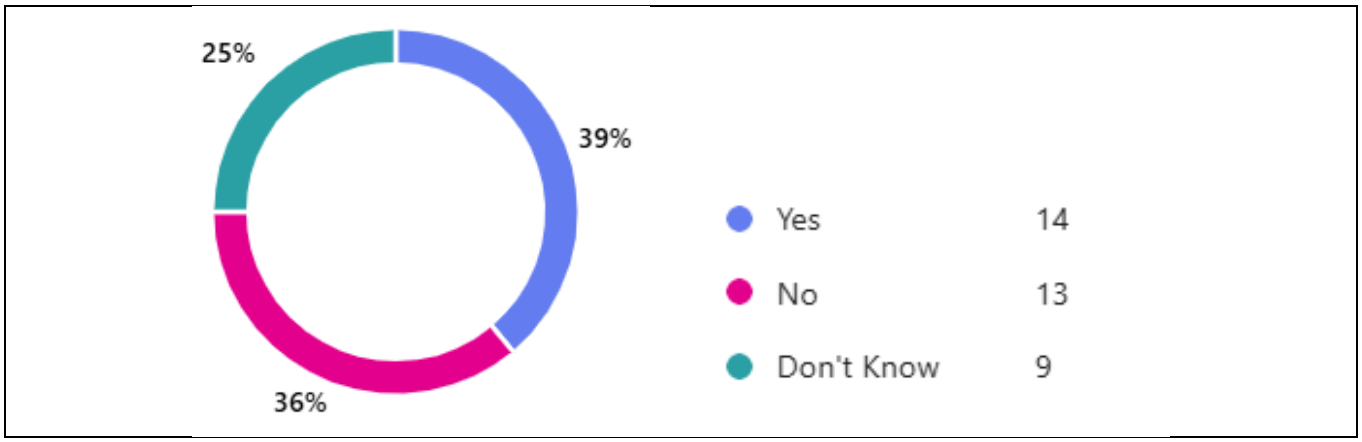
- Wildfire – 26 responses
- Severe winter storms – blizzard, heavy snow, ice (22 responses)
- Flood – 20 responses
- Damaging Wind – 15 responses

Respondents were asked what challenges or barriers exist when reducing vulnerability to hazards within the Pikes Peak Region. The vast majority of respondents selected funding and lack of resources as the main challenge.

Community Preparedness

Respondents were asked if any of their critical facilities were located in a hazard area, such as floodplain, wildland-urban interface, coastal erosion zones, and more. Figure 2-1 illustrates that 39% of respondents submitted that their critical facilities were located in a hazard area. Additionally, 36% submitted that their critical facilities were not located in a hazard area, and 25% were unsure. For those located in a hazard area, the majority of respondents indicated that the hazard area where their critical facility was located was in a wildland-urban interface area.

Figure 2-1. Stakeholder Survey Response for Critical Facilities Located in Hazard Area



Respondents were asked what plans are accessible to their agency; the top five are as follows:

- Emergency Operations Plan – 22 responses
- Strategic Plan – 17 responses
- Continuity of Operations Plan – 16 responses
- Crisis Communications Plan – 13 responses
- Business Continuity Plan – 5 responses

Respondents were asked if their agency works with or supports people with access and functional needs or other whole community members. The majority of respondents answered yes (54%). Equal number of responders (23% each) answered yes or don't know.

Project Identification

Respondents identified some of the following as desired projects to implement to reduce vulnerability to hazards:

- More wildland fire mitigation and community preparedness measures.
- Countywide storm water conveyance system assessment and replacement program to address aging and undersized infrastructure in flood-prone areas.
- Rural road hardening and wildfire resident/population movement road improvements for Wildland-Urban Interface (WUI) communities.
- Drainageway rehabilitation in high-risk areas to mitigate flash flooding and erosion.
- Developing a hazard mitigation geospatial dashboard to enhance risk-informed planning and infrastructure decision-making.
- Installation of three strategically placed 30,000-gallon underground water tanks in non-hydrated areas.
- Make the Town of Palmer Lake a fire adapted community to minimize the effects of catastrophic wildfire.
- Address post-fire flooding and debris flow mitigation for the city's watershed.
- Conduct mitigation inspections for plans submitted for new developments in the County.
- Stormwater infrastructure, tornado storm shelters, backup power at a town facility or the fairgrounds where the public can stay in extended power outage times.
- Update the sustainability framework for the Pikes Peak Region.
- Any and all forest fuels reduction project to protect the Pike Region against impacts of pre and post wildfire disturbances.

2.4 PUBLIC OUTREACH

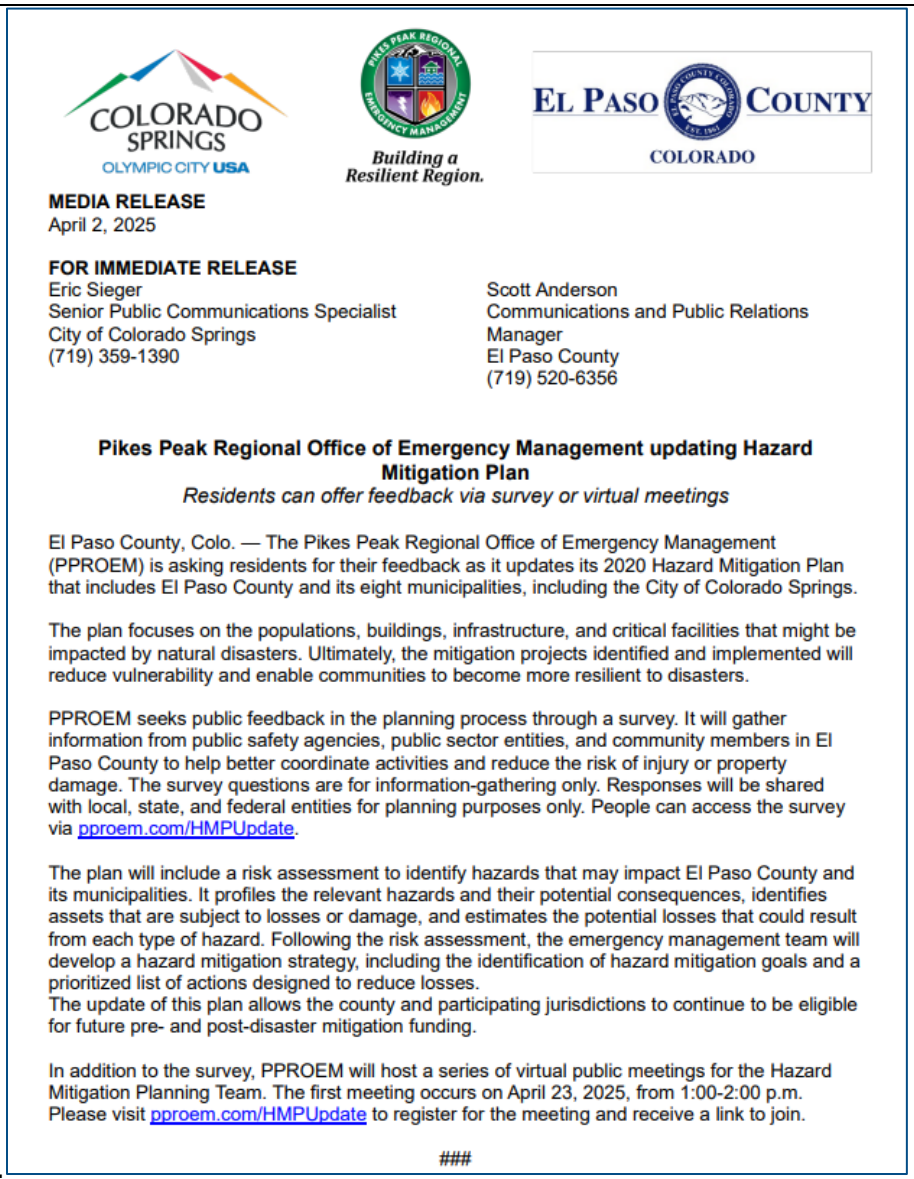
Public outreach and engagement was a pillar of the HMP update and was prioritized throughout the planning process. Due to the difference in planning partner size and capabilities, a wide variety of outreach methods were employed. Jurisdiction-specific activities and public feedback integration into the planning process are described in Volume 2.

2.4.1 PUBLIC INFORMATION ACTIVITIES

The Hazard Mitigation Planning Team (HMPT) and Pikes Peak regional stakeholders employed virtual, in-person, and printed outreach methods to inform the public about the plan, advertise the public survey, invite the public to attend meetings, and promote the public comment period. Copies of outreach activities and announcements may be found in Appendix C. The following public engagement activities were conducted by the HMPT:

- On April 2, 2025, a joint media release from PPROEM, El Paso County, and City of Colorado Springs was distributed through official channels. The release solicited feedback from the public by promoting the public survey link, the project website, and the date, time, and location of the April 23 HMPT meeting. A copy of the release is shown in Figure 2-2.

Figure 2-2. HMP Update Announcements



COLORADO SPRINGS
OLYMPIC CITY USA

Building a Resilient Region.

EL PASO COUNTY
COLORADO

MEDIA RELEASE
April 2, 2025

FOR IMMEDIATE RELEASE

Eric Sieger
Senior Public Communications Specialist
City of Colorado Springs
(719) 359-1390

Scott Anderson
Communications and Public Relations Manager
El Paso County
(719) 520-6356

Pikes Peak Regional Office of Emergency Management updating Hazard Mitigation Plan

Residents can offer feedback via survey or virtual meetings

El Paso County, Colo. — The Pikes Peak Regional Office of Emergency Management (PPROEM) is asking residents for their feedback as it updates its 2020 Hazard Mitigation Plan that includes El Paso County and its eight municipalities, including the City of Colorado Springs.

The plan focuses on the populations, buildings, infrastructure, and critical facilities that might be impacted by natural disasters. Ultimately, the mitigation projects identified and implemented will reduce vulnerability and enable communities to become more resilient to disasters.

PPROEM seeks public feedback in the planning process through a survey. It will gather information from public safety agencies, public sector entities, and community members in El Paso County to help better coordinate activities and reduce the risk of injury or property damage. The survey questions are for information-gathering only. Responses will be shared with local, state, and federal entities for planning purposes only. People can access the survey via pproem.com/HMPUpdate.

The plan will include a risk assessment to identify hazards that may impact El Paso County and its municipalities. It profiles the relevant hazards and their potential consequences, identifies assets that are subject to losses or damage, and estimates the potential losses that could result from each type of hazard. Following the risk assessment, the emergency management team will develop a hazard mitigation strategy, including the identification of hazard mitigation goals and a prioritized list of actions designed to reduce losses.
The update of this plan allows the county and participating jurisdictions to continue to be eligible for future pre- and post-disaster mitigation funding.

In addition to the survey, PPROEM will host a series of virtual public meetings for the Hazard Mitigation Planning Team. The first meeting occurs on April 23, 2025, from 1:00-2:00 p.m.
Please visit pproem.com/HMPUpdate to register for the meeting and receive a link to join.

###

- On April 7, 2025, local news station KRDO ran a news segment about the HMP update and interviewed PPROEM Deputy Director Meredith Nichols about the planning process and ways the public could contribute to the plan. A screenshot of the news segment and website article is shown in Figure 2-3.
- A public webpage was established to facilitate communication between the Hazard Mitigation Planning Team, planning partnership, public, and stakeholders (www.PPROEM.com/HMPUpdate). The public webpage contains a project overview, project contact information, access to the public survey and the draft HMP for public comment. In addition, PPROEM maintained a link to a news announcement on the homepage of their website about the HMP update throughout the planning process. Screenshots of the HMP webpage and the HMP news announcement are shown in Figure 2-4.

Figure 2-3. News Report on HMP Update

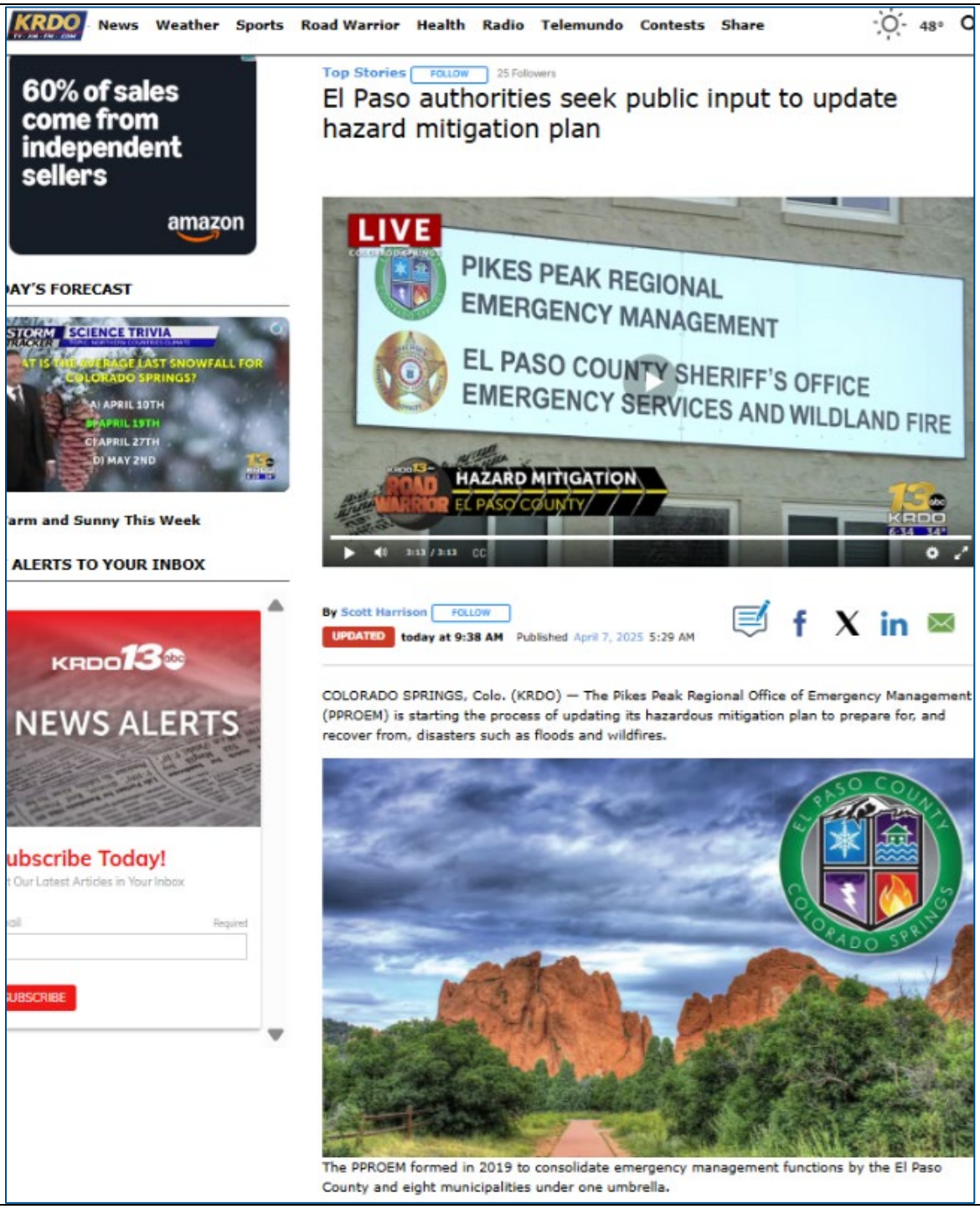
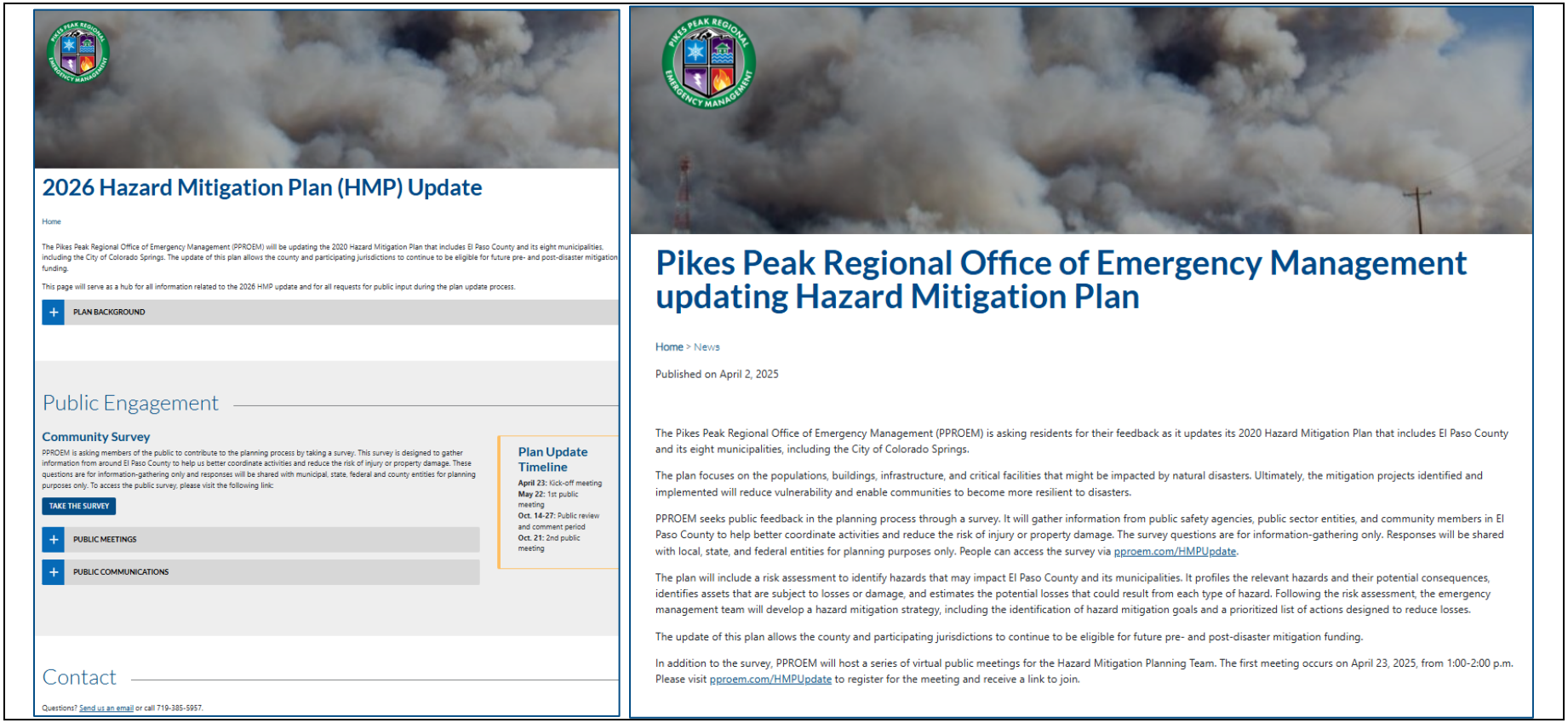


Figure 2-4. HMP Webpage and PPROEM Website



2026 Hazard Mitigation Plan (HMP) Update

Home

The Pikes Peak Regional Office of Emergency Management (PPROEM) will be updating the 2020 Hazard Mitigation Plan that includes El Paso County and its eight municipalities, including the City of Colorado Springs. The update of this plan allows the county and participating jurisdictions to continue to be eligible for future pre- and post-disaster mitigation funding.

This page will serve as a hub for all information related to the 2026 HMP update and for all requests for public input during the plan update process.

+ PLAN BACKGROUND

Public Engagement

Community Survey

PPROEM is asking members of the public to contribute to the planning process by taking a survey. This survey is designed to gather information from around El Paso County to help us better coordinate activities and reduce the risk of injury or property damage. These questions are for information-gathering only and responses will be shared with municipal, state, federal and county entities for planning purposes only. To access the public survey, please visit the following link:

TAKE THE SURVEY

+ PUBLIC MEETINGS

+ PUBLIC COMMUNICATIONS

Plan Update Timeline

April 23: Kick-off meeting
May 22: 1st public meeting
Oct. 14-27: Public review and comment period
Oct. 21: 2nd public meeting

Contact

Questions? Send us an email or call 719-385-5957.

Pikes Peak Regional Office of Emergency Management updating Hazard Mitigation Plan

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The Pikes Peak Regional Office of Emergency Management (PPROEM) is asking residents for their feedback as it updates its 2020 Hazard Mitigation Plan that includes El Paso County and its eight municipalities, including the City of Colorado Springs.

The plan focuses on the populations, buildings, infrastructure, and critical facilities that might be impacted by natural disasters. Ultimately, the mitigation projects identified and implemented will reduce vulnerability and enable communities to become more resilient to disasters.

PPROEM seeks public feedback in the planning process through a survey. It will gather information from public safety agencies, public sector entities, and community members in El Paso County to help better coordinate activities and reduce the risk of injury or property damage. The survey questions are for information-gathering only. Responses will be shared with local, state, and federal entities for planning purposes only. People can access the survey via pproem.com/HMPUpdate.

The plan will include a risk assessment to identify hazards that may impact El Paso County and its municipalities. It profiles the relevant hazards and their potential consequences, identifies assets that are subject to losses or damage, and estimates the potential losses that could result from each type of hazard. Following the risk assessment, the emergency management team will develop a hazard mitigation strategy, including the identification of hazard mitigation goals and a prioritized list of actions designed to reduce losses.

The update of this plan allows the county and participating jurisdictions to continue to be eligible for future pre- and post-disaster mitigation funding.

In addition to the survey, PPROEM will host a series of virtual public meetings for the Hazard Mitigation Planning Team. The first meeting occurs on April 23, 2025, from 1:00-2:00 p.m. Please visit pproem.com/HMPUpdate to register for the meeting and receive a link to join.

An online disaster preparedness and mitigation survey was developed to gauge household preparedness that may impact the Pikes Peak Region and to assess the level of knowledge of tools and techniques to assist in reducing risk to those hazards. The questionnaire asked quantifiable questions about resident perception of risk, knowledge of mitigation, and support of community programs. The questionnaire also asks several demographic questions to help analyze trends. A summary of the survey is available in Section 2.4.3 and the full results are available in Appendix E. The survey was promoted in the joint press release, news segment, social media posts, and at public events. Example of survey outreach are shown in the jurisdictional annexes in Volume 2.

Once submitted to DHSEM and FEMA, the final plan will be available for public review and comment in the same manner and format as the Draft Plan, as well as in hard-copy format at the following as identified in Chapter 28.

In order to involve the public in the planning process, the Plan Update will be available to the public through a variety of venues. A printed version of the Plan will be maintained at the Office of Emergency Management, and Department of Planning.

2.4.2 PUBLIC MEETINGS

On May 22, 2025, PPROEM hosted an in-person public meeting at the PPROEM headquarters in the City of Colorado Springs. The purpose of the meeting was to provide an overview of the planning process and describe how the public can provide input on hazard problems and potential solutions. The meeting presented an opportunity for the community to learn about the Region's efforts to prepare for natural disasters and participate in creating a resilient community. The meeting was announced via press release and advertised on social media and the event was live-streamed on the County's Facebook page for anyone unable to attend in person.

On October 21, 2025, PPROEM hosted an in-person public meeting at the PPROEM headquarters in the City of Colorado Springs. The purpose of the meeting was to review the various chapters in the plan, highlight key findings for the public, and describe the public comment procedures. The meeting presented an opportunity for the public to provide feedback and ask questions. Although the meeting was advertised by the County of El Paso and all participating jurisdiction, no members of the public attended the meeting.

2.4.3 PUBLIC SURVEY SUMMARY

A public survey was developed by the HMPT to determine household level of preparedness for hazards and to gather input about mitigation projects and community priorities. The questionnaire was posted on the County website in April 2025 and was available through June 10 for public input. All participating jurisdictions advertised the survey via local homepage links, and other available public announcement methods (e.g., Facebook, Twitter, email blasts, etc.). Roughly 81 responses were collected. The full results are provided in Appendix E.

The public survey was developed to assess the level of knowledge of tools and techniques to assist in reducing risk and loss associated with hazards. It asked quantifiable questions about resident perception of risk, knowledge of mitigation, and support of community programs. The County

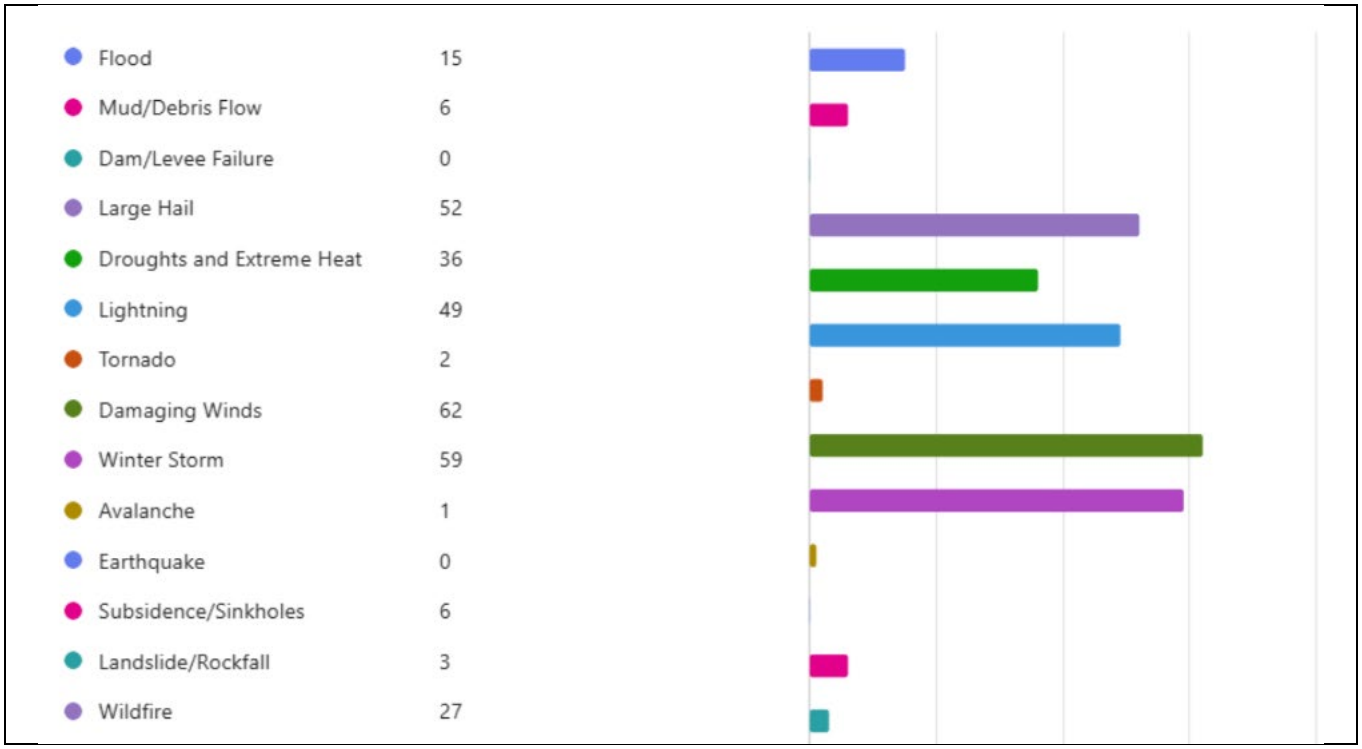
advertised the survey on their website and social media accounts. As of June 2025, the survey received 81 responses.

Demographically, the most common (46 responses) age of respondents was over the age of 60. The majority (72 responses) of residents owned their home or place of residence. Over half (72 responses) of residents resided in single-family detached homes.

Survey respondents identified the following as the top 5 most frequently occurring hazard events within El Paso County in the past five years, as shown in Figure 2-5:

- Damaging Winds – 62 responses
- Severe winter storms – blizzard, heavy snow, ice (59 responses)
- Large Hail – 52 responses
- Lightning – 49 responses

Figure 2-5. Most Frequently Experienced Hazard Events



Respondents identified the following as desired projects to implement to reduce the damages due to hazards:

- Public accessible hazard risk maps and additional public outreach for hazards present in neighborhoods.
- Emergency procedures for County buildings across the region.
- Additional fire safety mitigation and outreach to educate residents on fire risk and what can be done at home to prevent future fire occurrences.

Respondents were then given the opportunity to provide information on the type of hazards that have damaged their homes. The majority of respondents (28%) selected hail damage as the most frequent hazard to damage their homes. Damage to roofs and fences due to downed trees, heavy winds, and fires were also selected.

Respondents were asked what their first choice is for receiving hazard information. The majority of respondents selected Mass Notification System (Peak Alert). The second choice was through televised warnings (TV).

Respondents were also asked how concerned they were about the following hazards below. The choice selections were "not concerned," "somewhat concerned," "concerned," "very concerned," and "extremely concerned." The majority selected for each hazard is listed below:

- Flood – Somewhat concerned
- Mud/Debris Flow – *Somewhat concerned*
- Dam/Levee Failure – *Not concerned*
- Large Hail – Extremely concerned
- Drought and Extreme Heat – *Extremely concerned*
- Lightning – Very concerned
- Tornado – Somewhat concerned
- Damaging Winds – *Very concerned*
- Winter Storm – *Very concerned*
- Avalanche – *Not concerned*
- Earthquake – *Not concerned*
- Subsidence/Sinkholes – *Not concerned*
- Landslide/Rockfall – *Not concerned*
- Wildfire – Extremely concerned
- Hazardous Materials Incident – *Not concerned*
- Extreme Acts of Violence – *Extremely concerned*
- Cyber Attack – Somewhat concerned
- Pandemic/Epidemic – *Somewhat concerned*
- Major Aircraft Incidents – *Not concerned*

2.4.4 PUBLIC COMMENT PERIOD

The Draft Plan was posted to the PPROEM website on October 20, 2025, for public review and comment. All public comments were directed to PPROEM for collection and review by the Hazard Mitigation Planning Team. All public comments received were forwarded to the appropriate jurisdiction and/or agency and incorporated into the final plan as appropriate.

2.5 INCORPORATION OF EXISTING PLANS, STUDIES, REPORTS AND TECHNICAL INFORMATION

The plan uses the best available information to support hazard profiling, risk assessment, review and evaluation of mitigation capabilities, and the development and prioritization of County and local

mitigation strategies. Plans, reports, and other technical information were identified and accessed online through independent research by the planning consultant or provided directly by PPROEM, participating jurisdictions, and stakeholders involved in the planning effort. Detailed sources of technical data and information used are listed in the References section.

The asset inventory data used for the risk assessment is presented in the Regional Profile (Chapter 3). Details of the source of this data, along with technical information on how the data was used to develop the risk assessment, are presented in Chapter 4, as well as throughout the hazard profiles in this HMP. PPROEM and participating jurisdictions provided relevant jurisdiction-specific planning and regulatory documents, which were reviewed to identify:

- Existing jurisdictional capabilities
- Needs and opportunities to develop or enhance capabilities, which may be identified in the County or local mitigation strategies
- Mitigation-related goals or objectives, considered in the review and update of the overall Goals and Objectives (see Section 27.2)
- Proposed, in-progress, or potential mitigation actions to be incorporated into the updated County and local mitigation strategies

The following regulations, codes, ordinances, and plans were reviewed to develop mitigation planning goals and objectives and mitigation strategies that are consistent across local and regional planning and regulatory mechanisms:

- El Paso County Master Plan
- 2023 Pikes Peak Regional Building Code
- Community Wildfire Protection Plan, 2011
- Land Development Code El Paso County
- Flood insurance rate maps
- NFIP flood damage prevention ordinances
- Pikes Peak Regional Office of Emergency Management Debris Management Plan
- Emergency management and response plans
- Land use and open space plans
- Community rating system
- 2023 Colorado Enhanced State Hazard Mitigation Plan (E-SHMP)
- 2023 Colorado Emergency Preparedness Assessment
- 2020 Pikes Peak Regional Hazard Mitigation Plan
- Jurisdictional plans and codes

PPROEM and participating jurisdictions were tasked with updating the assessment of their planning and regulatory capabilities (see capability assessment section of each jurisdictional annex in Volume 2). They reviewed relevant plans contributing to the capability of the County and each jurisdiction to integrate effective mitigation efforts into their daily activities. This review is reflected in the capability assessment table in each of the municipal annexes. These tables list plan types, names, and dates, as well as a summary of how each plan supports mitigation and resilience.

2.6 INTEGRATION WITH EXISTING PLANNING MECHANISMS AND PROGRAMS

Effective mitigation is achieved when hazard awareness and risk management approaches and strategies become an integral part of public activities and decision-making. Many existing plans and programs support hazard mitigation in the County. It is critical that this HMP integrate, coordinate with, and complement, those existing plans and programs.

The capability assessment presented in Chapter 26 provides a summary and description of the existing plans, programs, and regulatory mechanisms at all levels of government (federal, state, county and local) that support hazard mitigation in the Region. In the jurisdictional annexes in Volume 2, each participating jurisdiction identifies how it has already integrated hazard mitigation into its planning, regulatory and administrative framework ("integration capabilities") and how it intends to promote this integration ("integration actions").

2.7 PLAN ADOPTION

Adoption by the local governing bodies of each participating jurisdiction demonstrates the commitment of the Planning Partners to fulfill the mitigation goals and strategies outlined in this HMP. Adoption via a municipal resolution legitimizes the HMP and authorizes responsible agencies to execute their responsibilities.

In addition to being required by DMA 2000, adoption of the HMP is necessary because:

- It lends authority to the plan to serve as a guiding document for all local and state government officials.
- It gives legal status to the plan in the event it is challenged in court.
- It certifies to program and grant administrators that the plan's recommendations have been properly considered and approved by the jurisdictions' governing authority and residents.
- It helps to ensure the continuity of mitigation programs and policies over time because elected officials, staff, and other community decision-makers can refer to the official document when making decisions about the community's future.

All participating jurisdictions will proceed with formal adoption proceedings. Each jurisdiction must submit a copy of its formal adoption resolution or other legal instrument to the HMP Coordinator at PPROEM. PPROEM will forward the executed resolutions to DHSEM, after which they will be forwarded to FEMA for the record. FEMA allows two options for submitting adoption resolutions:

- Submittal of adoption resolutions with plan—All participating jurisdictions provide documentation of plan adoption when the plan is initially submitted to the state for review. After receiving the draft plan from the state, FEMA conducts its review and will approve the plan if it meets all requirements.
- Approvable pending adoption—A draft HMP is submitted to the state and FEMA for approval prior to adoption by the jurisdictions. When FEMA determines that the plan as a whole and each participating jurisdiction have met all the requirements except adoption, FEMA will

inform the state that the plan is "approvable pending adoption" (APA). After that, once FEMA receives documentation of adoption resolutions from at least one jurisdiction, the status is changed from APA to approved for the entire plan and for that jurisdiction. Other jurisdictions that participated in the planning process then receive approval once they pass their own adoption resolutions. A jurisdiction with a plan in APA status does not meet the requirement for an approved mitigation plan to apply for and receive funding assistance.

FEMA will transmit acknowledgement of verification of formal plan adoption and the official approval of the plan to the PPROEM HMP Coordinator. The plan approval date begins the five-year approval period and sets the expiration date for the plan. All participating jurisdictions will have the same expiration date regardless of their own jurisdiction's adoption date. The date indicated on FEMA's approval letter is the official approval date.

The resolutions issued by each jurisdiction to support adoption of this HMP are included in Appendix A.

3. REGIONAL PROFILE

The planning area for this HMP is comprised of the entirety of the Pikes Peak Region. This chapter presents general information about the land, people, and assets of the Pikes Peak Region. This information provides a baseline for understanding the economic, structural, and population assets at risk from the hazards addressed in this HMP.

3.1 LOCATION

El Paso County is located in the central part of Colorado, bordered by Douglas County to the north, Teller County to the west, Elbert County to the northeast, Lincoln County to the east, and Pueblo County to the south. The county encompasses a total area of approximately 2,158 square miles, with the city of Colorado Springs serving as the county seat and the largest municipality. The county's strategic location along Interstate 25 makes it a vital transportation hub within the state. Figure 3-1 shows the planning area considered for this HMP update.

3.2 JURISDICTIONS WITHIN THE COUNTY

El Paso County is composed of several municipalities and unincorporated communities. Major jurisdictions include the cities of Colorado Springs, City of Fountain, and City of Manitou Springs, as well as the town of Monument. Each jurisdiction has its own governance structure and may implement local regulations that influence land use, emergency management, and hazard mitigation efforts. All jurisdictions participated in this HMP update and created a jurisdictional annex, which can be found in Volume 2.

- Cities
  - Colorado Springs
  - Fountain
  - Manitou Springs
- Towns
  - Calhan
  - Green Mountain Falls
  - Monument
  - Palmer Lake
  - Ramah

Table 3-1 shows the total area of each participating jurisdiction.

Figure 3-1. Pikes Peak Region Multi-Hazard Mitigation Plan Area

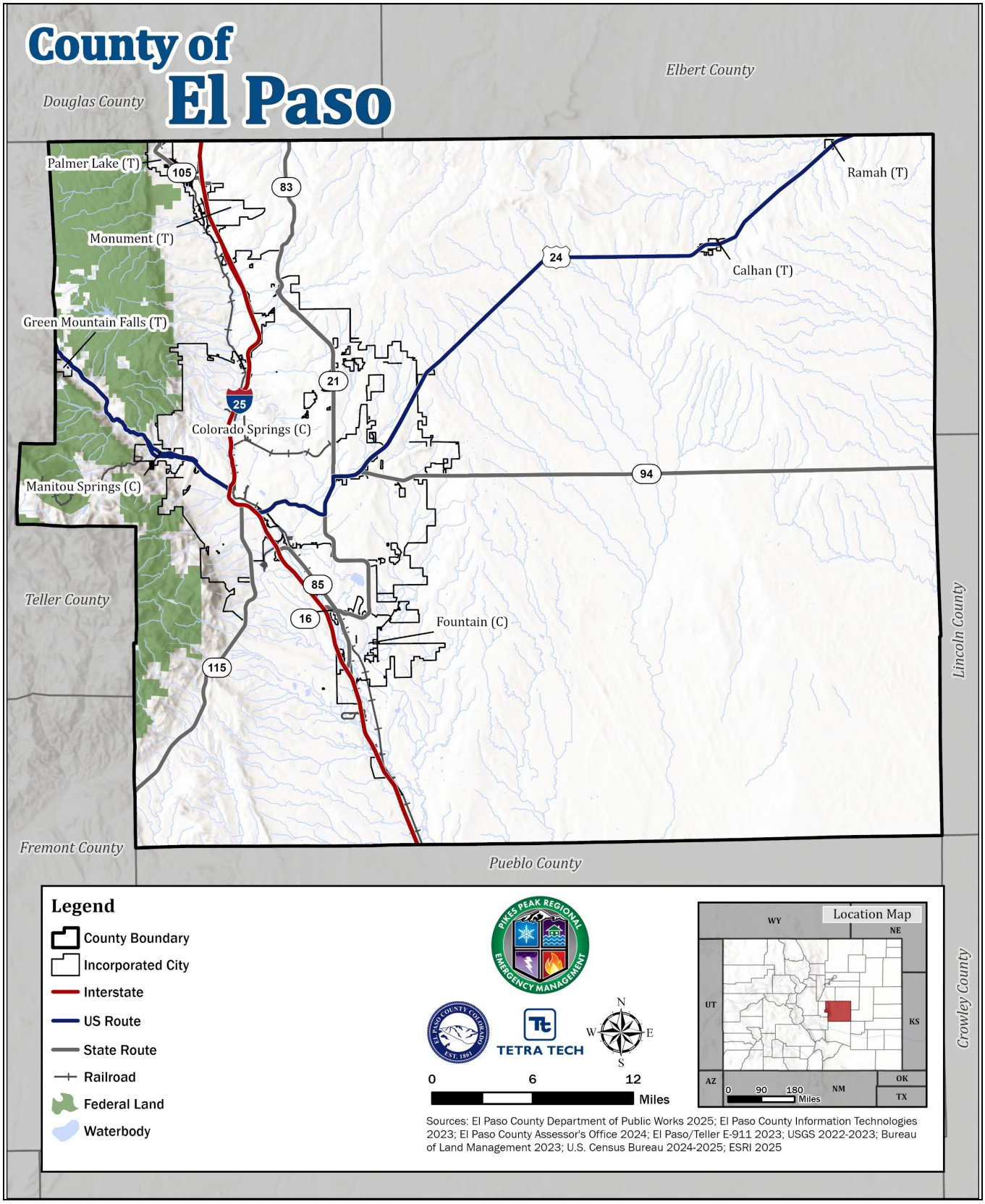


Table 3-1. Jurisdiction Areas

Jurisdiction	Acres	Square Miles
Town of Calhan	529.6	0.8
City of Colorado Springs	129,010.4	201.6
City of Fountain	14,068.0	22.0
Town of Green Mountain Falls	494.3	0.8
City of Manitou Springs	1,988.2	3.1
Town of Monument	4,427.4	6.9
Town of Palmer Lake	1,970.7	3.1
Town of Ramah	162.2	0.3
Unincorporated County	1,205,073.3	1,882.9
El Paso County (Total)	**1,357,724.1**	**2,121.4**

3.3 HISTORY

3.3.1 COMMUNITY HISTORY

The following is summarized from an on-line article in Colorado Encyclopedia (History Colorado and Colorado Encylopedia n.d.)

The Pikes Peak area's long history of human habitation began almost 12,000 years ago. Paleo-Indians and Archaic peoples mined the colored clay deposits near present-day Calhan to make pottery and bricks. Ute Indians occupied the Pikes Peak region by about AD 1500. By the middle of the seventeenth century the Utes had obtained horses from the Spanish, and some began hunting buffalo on the plains. Other groups of Plains Indians—including the Cheyenne, Kiowa, and Lakota—also frequented the eastern El Paso County area in the nineteenth century.

The El Paso County area came under the jurisdiction of the United States as part of the Louisiana Purchase in 1803. In 1806 an expedition led by Lieutenant Zebulon Pike explored the southwestern part of the new territory. In the decades after Pike's expedition, the Rocky Mountains became a haven for beaver trappers, and the Pikes Peak area was no exception.

The discovery of gold in 1858 set off the Colorado Gold Rush of 1858–59. American emigrants arrived by the thousands. The town of Colorado City was established at the present site of City of Colorado Springs on August 13, 1859. The gold rush prompted the US government to organize the Colorado Territory in 1861. El Paso became one of the territory's first 17 counties, with Colorado City as county seat.

In 1870, William Jackson Palmer and partner William Bell founded the Denver & Rio Grande Railroad, a branch of which would run south from Denver to the Colorado City area. After acquiring land near Colorado City along the railroad's right-of-way, Palmer advertised real estate for his new Fountain Colony all over the United States and Britain. The town was quickly renamed City of

Colorado Springs. City of Colorado Springs grew to a population of 1,500 by the end of 1872, and in 1873 the city took over the role of county seat.

The town of Calhan developed in 1888 along an expanding line of the Rock Island Railroad, some 35 miles northeast of City of Colorado Springs. By 1900 the town remained a tiny plains outpost with a population of just 40, but by 1910 it had 400 residents and 45 businesses. Town of Calhan was incorporated in 1919.

The U.S. Army established Camp Carson south of City of Colorado Springs in 1942. During World War II the camp held some 9,000 prisoners of war, mostly Italians and Germans. The camp was expanded and redesignated as Fort Carson in 1954. That same year the U.S. Air Force chose to build its academy in City of Colorado Springs. In 1957 the North American Aerospace Defense Command (NORAD) was established at Ent Air Force Base in City of Colorado Springs. The headquarters for NORAD was moved underneath Cheyenne Mountain, west of the city, in 1961. In 1983 the military broke ground on Falcon Air Force Base (later renamed Schriever Air Force Base), which currently monitors and controls more than 150 navigation, communication, and early-warning satellites.

In 2009 Outside magazine ranked City of Colorado Springs number 1 on its list of “America’s Best Cities”; in 2014 TripAdvisor rated Garden of the Gods as the top-ranking U.S. park, and in 2015 the website Wallet Hub ranked the city as the nation’s third-best large city to live in. El Paso County today also features a robust agricultural economy. As of 2012 the county ranks third in the state in the raising of horses, goats, and chickens. It is also the number-1 producer of plant nursery stock and harvests the second-highest acreage of sod in Colorado.

3.3.2 HISTORY OF MAJOR HAZARD EVENTS

The President of the United States has the authority to issue disaster declarations for hazard events that cause more damage than state and local governments can manage without assistance from the federal government. The declaration triggers funding for emergency and recovery efforts led by FEMA. The first federal disaster declaration was issued in 1953. Initially, declarations applied to entire states. Beginning in 1969, the process was refined to specify the individual counties affected by each declaration. Federally disaster declarations are classified as major disaster (DR), emergency declaration (EM), or fire management assistance (FM). Table 3-2 lists the 20 federal disaster declarations that have included El Paso County.

3.4 PHYSICAL SETTING

The physical setting of El Paso County is diverse, featuring a mix of urban, suburban, and rural landscapes. The county's elevation ranges from approximately 6,000 feet in the plains to over 14,000 feet in the Rocky Mountains, including the iconic Pikes Peak. This varied topography contributes to a range of ecosystems and natural resources, with significant areas designated as parks and open spaces, such as Garden of the Gods and Cheyenne Mountain State Park.

Table 3-2. FEMA Disaster Declarations for the Pikes Peak Region

FEMA Declaration Date	Declaration Number	Description
June 19, 1965	DR-200	Tornadoes, Severe Storms, Flooding
May 19, 1969	DR-261	Severe Storms, Flooding
May 23, 1973	DR-385	Heavy Rains, Snowmelt, Flooding
August 2, 1976	DR-517	Severe Storms, Flash Flooding
January 29, 1977	EM-3025	Drought
May 17, 1999	DR-1276	Severe Storms, Flooding, Mudslides, and Landslides
June 19, 2002	DR-1421	Wildfires
April 9, 2003	EM-3185	Snowstorm
September 5, 2005	EM-3224	Hurricane Katrina Coastal Storm
January 7, 2007	EM-3270	Snowstorm
June 24, 2012	FM-2984	Waldo Canyon fire
June 28, 2012	DR-4067	High Park and Waldo Canyon Wildfires
June 11, 2013	FM-5027	Black Forest Wildfire
July 26, 2013	DR-4134	Black Forest Wildfire
September 12, 2013	EM-3365	Severe Storms, Flooding, Landslides, and Mudslides
September 14, 2013	DR-4145	Severe Storms, Flooding, Landslides, and Mudslides
July 16, 2015	DR-4229	Severe Storms, Tornadoes, Flooding, Landslides, and Mudslides
March 13, 2020	EM-3436	Covid-19 Pandemic
March 28, 2020	DR-4498	Covid-19 Pandemic
August 25, 2023	DR-4731	Severe Storms, Flooding, and Tornadoes

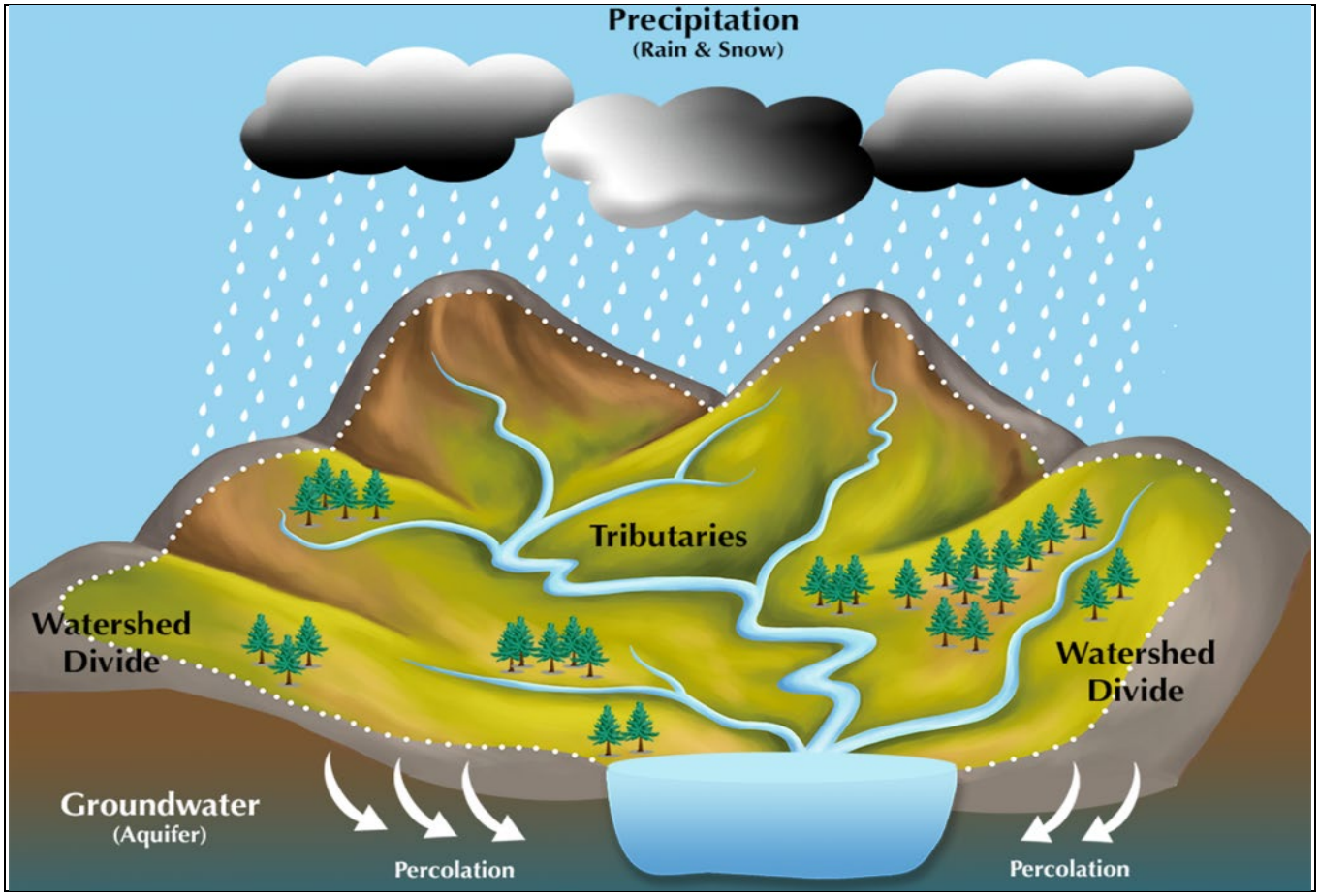
Source: (FEMA n.d.)

3.4.1 WATER RESOURCES

A watershed is an area of land that is bounded by ridges or hills (watershed divide) that create a basin in which water drains to a common point (river, lake, ocean, etc.); typical features are shown on Figure 3-2.

El Paso County is situated within multiple watersheds that play a crucial role in the region's hydrology. The primary watersheds include the Fountain Creek watershed, which flows southward into Pueblo Reservoir, and the Cherry Creek watershed. These watersheds are vital for managing water resources, supporting agriculture, and providing recreational opportunities. The health of these watersheds is essential for flood management and ecological sustainability, as they are susceptible to both flooding and drought conditions

Figure 3-2. Hydrographic Features of a Typical Watershed



Source: (Seacoast Science Center n.d.)

3.4.2 TOPOGRAPHY AND GEOLOGY

The topography of El Paso County is diverse, ranging from the flat plains in the east to the rugged mountains in the west. The county's elevation varies significantly, with lower elevations around 6,000 feet in the plains and rising to over 14,000 feet at the summit of Pikes Peak. This elevation gradient creates distinct ecological zones and influences local weather patterns. The foothills of the Rocky Mountains provide scenic vistas and recreational opportunities, while the plains support agricultural activities.

El Paso County's geology is primarily characterized by sedimentary rock formations, including sandstone, limestone, and shale, which date back to the Paleozoic and Mesozoic eras. The region is known for its geological features, including the Front Range of the Rocky Mountains, which is composed of granite and metamorphic rocks. The county also contains significant geological formations such as the Fountain Formation and the Laramie Formation, which contribute to the area's natural beauty and provide resources for construction and landscaping.

3.4.3 CLIMATE

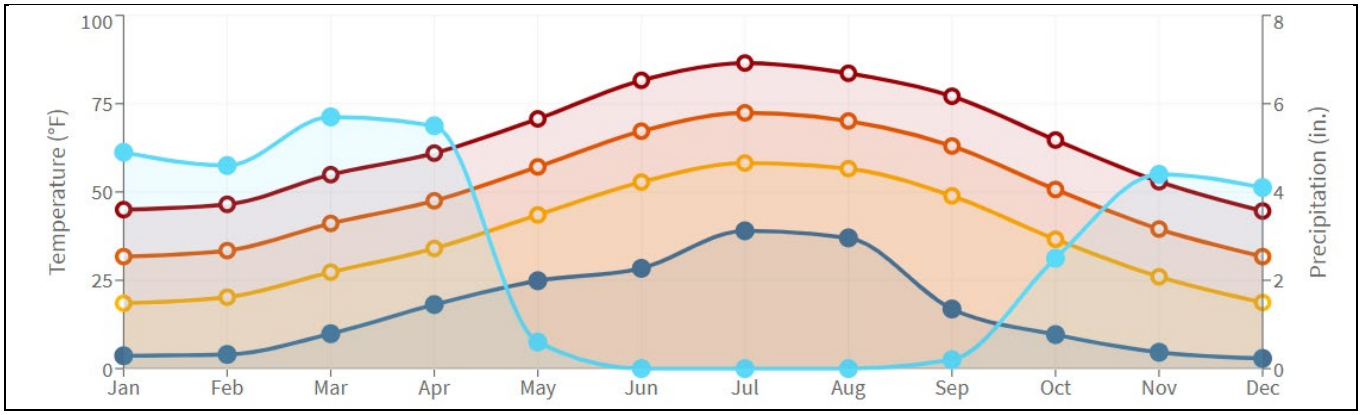
El Paso County experiences a semi-arid climate, characterized by warm summers and cold winters. The county's elevation contributes to temperature variations, with lower elevations experiencing warmer temperatures compared to higher altitudes. Average monthly precipitation varies from 3.12 inches in July to 0.23 inches in December. Snowfall is common in winter, particularly in the mountainous areas, and can lead to hazardous conditions. Average monthly snow varies from 0 inches in the summer months to 5.7 inches in March. Understanding the climate is crucial for planning and preparing for hazards such as wildfires, floods, and winter storms. Table 3-3 summarizes the average monthly precipitation, snow, and temperatures for the City of Colorado Springs Airport from 1991 to 2020; Figure 3-3 shows the same information in a graph format.

Table 3-3. City of Colorado Springs Airport Average Temperature, Precipitation, and Snow

DATE	Precipitation (inches)	Snow (inches)	Average Temperature (°F)	Maximum Temperature (°F)	Minimum Temperature (°F)
Jan	0.29	4.9	31.7	45	18.5
Feb	0.32	4.6	33.4	46.5	20.2
Mar	0.79	5.7	41.1	54.9	27.3
Apr	1.45	5.5	47.5	61	34
May	1.99	0.6	57.1	70.7	43.5
Jun	2.27	0	67.2	81.6	52.8
Jul	3.12	0	72.4	86.5	58.2
Aug	2.96	0	70.1	83.6	56.6
Sep	1.35	0.2	63	77.1	48.9
Oct	0.77	2.5	50.7	64.7	36.6
Nov	0.37	4.4	39.5	52.9	26
Dec	0.23	4.1	31.7	44.6	18.7

Source: (NOAA n.d.)

Figure 3-3. City of Colorado Springs Airport Average Temperature and Precipitation, and Snow



Source: (NOAA n.d.)

3.4.4 LAND COVER

Land cover in El Paso County is diverse, reflecting the varying topography and land use patterns. The county includes urban areas, agricultural land, forests, grasslands, and open spaces. Urban development is concentrated in and around City of Colorado Springs, while agricultural land primarily exists in the eastern plains. Forested areas are prevalent in the foothills and mountainous regions, providing critical habitats and recreational opportunities. Open spaces and parks, such as Garden of the Gods and Cheyenne Mountain State Park, contribute to the county's natural beauty and serve as vital resources for residents and visitors alike. Table 3-4 shows the total land cover for El Paso County and Figure 3-4 shows the information on a map.

Table 3-4. Land Cover

Land Cover Category	Acreage	% of County
Agriculture	5,524	0.4%
Barren Land	2,410	0.2%
Forest	152,194	11.2%
Rangeland	1,014,324	74.4%
Urban Area	169,450	12.4%
Water	1,799	0.1%
Wetland	16,914	1.2%
El Paso County (Total)	**1,362,614**	**100.0%**

Source: El Paso County Information Technologies 2023; NLCD; USGS 2023

3.5 LAND USE

Land use in El Paso County is characterized by a combination of residential, commercial, industrial, and agricultural areas. The county has experienced significant growth in recent years, leading to increased urbanization, particularly in and around City of Colorado Springs. The land use planning process is guided by the El Paso County Master Plan, which aims to balance development with the preservation of natural resources and open spaces. Figure 3-5 shows the County's current land use from the 2021 El Paso County Master Plan.

The Rural landscape covers most of the eastern portion of the County and just over fifty percent of the total County land area. The character of these areas is generally rural, remote, or distant from high activity and higher density areas. Rural El Paso County exists in the mountainous or hilly areas to the west, southwest, and south, surrounded by forested federal land or state-owned parks or preserves, and in the rolling plains to the east, with irrigated crop lands, or grazing lands used for agricultural production. Rural areas also provide farm homesteads and large single-family estates on substantially sized parcels. Residential parcels in Rural areas average approximately 34 acres.

Figure 3-4. Land Cover

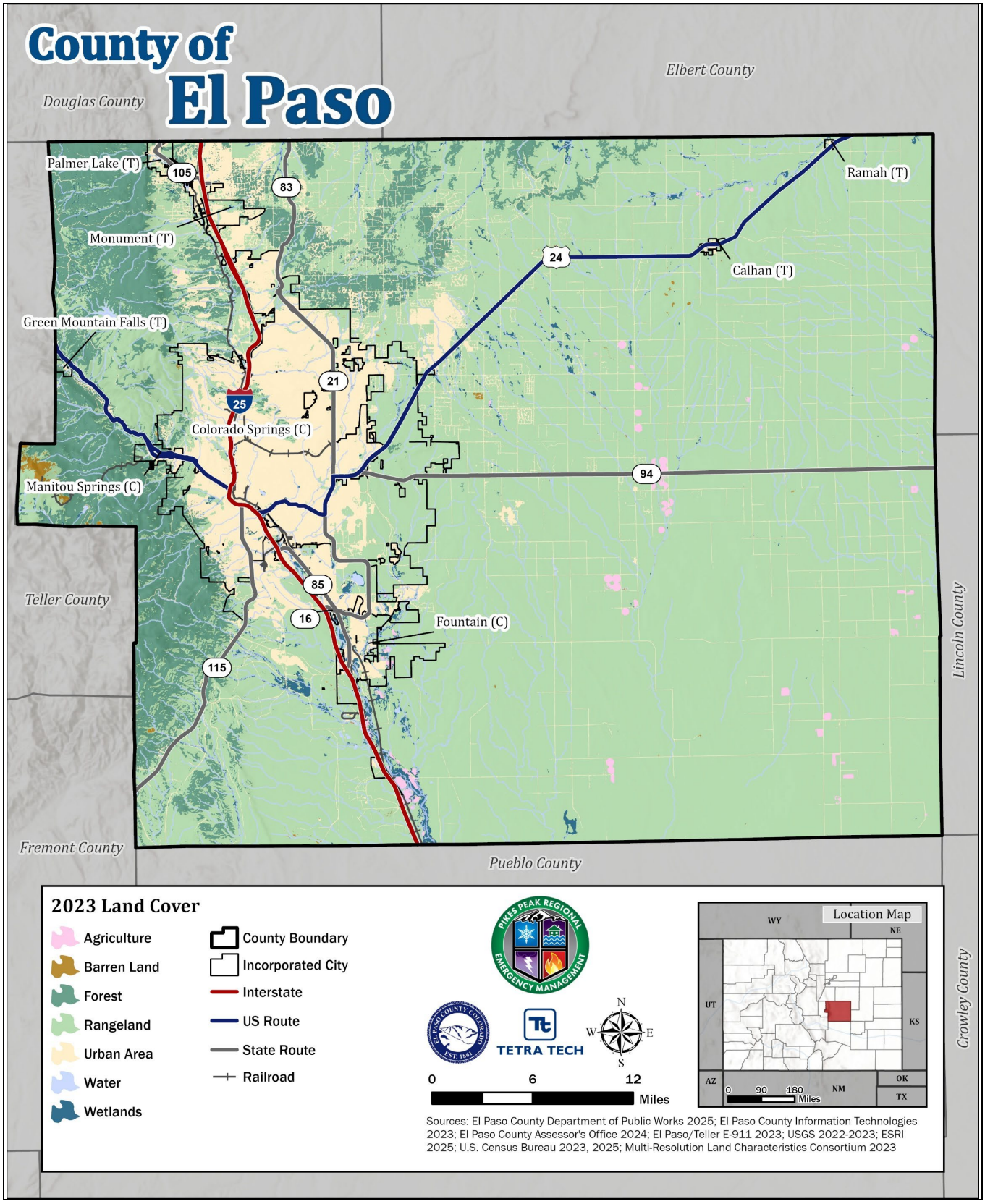
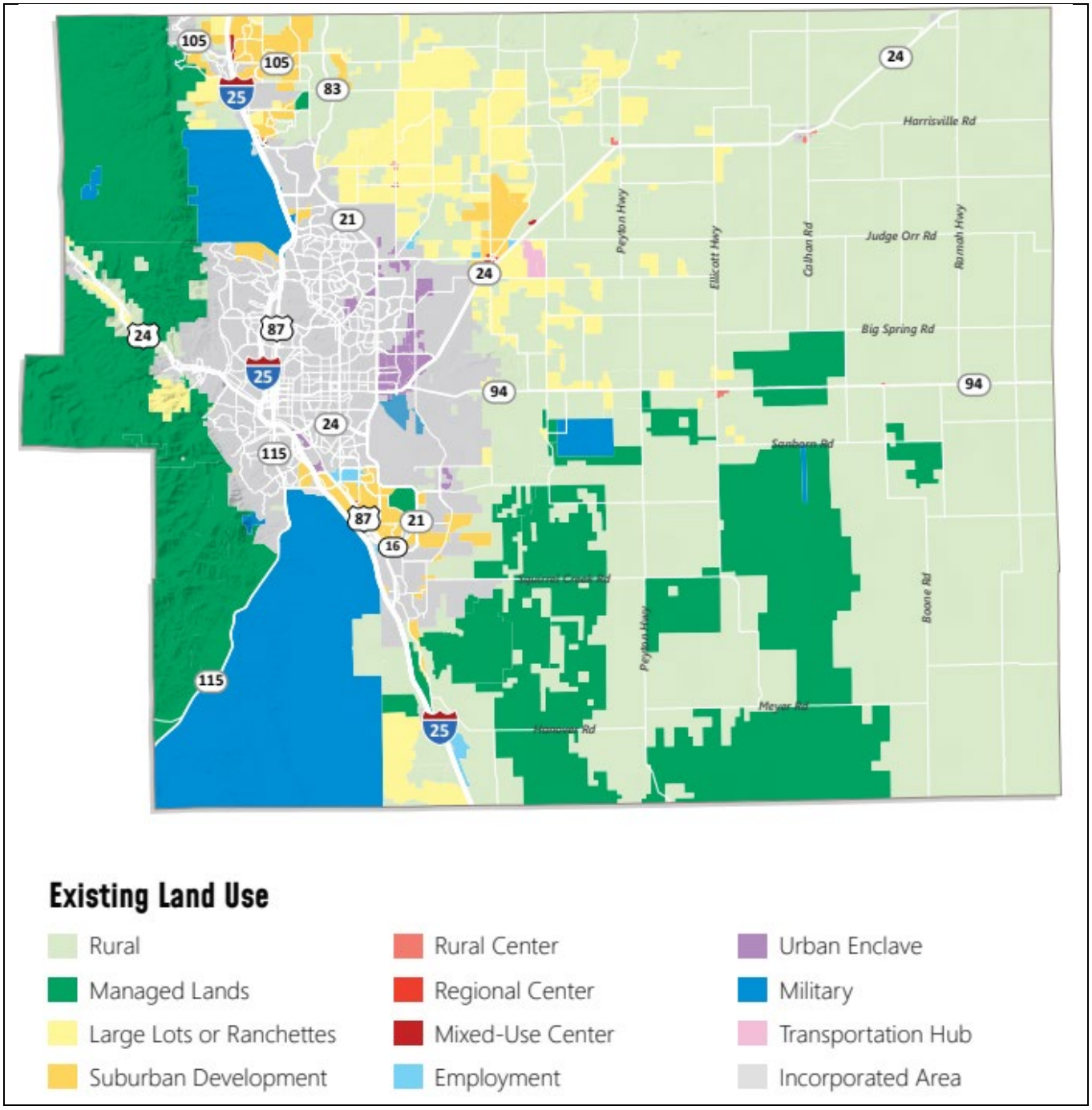


Figure 3-5. Land Use Classification



Source: El Paso County Master Plan, 2021

A Rural Center contains a mix of residential and limited commercial development along main streets and include opportunities for uses such as convenience stores, coffee shops, and restaurants. Rural Centers are surrounded by Rural areas or Large-Lot or Ranchette Development and include places like Black Forest (along Black Forest Road), Peyton, Calhan, Ellicott, Yoder, and Rush.

Managed Lands are federal, state, or local government-owned properties that cover large areas. These areas as shown do not represent all government holdings in the County, however they include the most prominent, expansive areas, including military installations, like Fort Carson and the U.S. Air Force Academy, other large rural tracts, park lands, and conservation areas.

Large Lot or Ranchette Development, sometimes called Rural Suburban Development, covers almost three times the land area in El Paso County in comparison to the smaller-lot Suburban Development. They are typically located between suburban and rural areas and vary in character based on geography and landscape. These areas have a median lot size of approximately 5 acres. Many large-lot development areas rely on wells and septic systems.

Suburban Development covers more than 28,000 acres (45 square miles) of land in El Paso County. These areas are located close to City of Colorado Springs, Town of Monument, Town of Palmer Lake, or City of Fountain, and include development in places like Falcon, Gleneagle, Woodmoor, Security-Widefield, and Stratmoor. The character of Suburban Development is predominantly residential in the form of subdivisions with smaller lots and curvilinear streets, with some County areas being difficult to distinguish from suburban development within city limits.

Employment areas are comprised of land for industrial or other business uses. They are primarily located near I-25 or other highway or arterial road corridors. An example of an Employment Area is Meadow Lake Airport, a private airport located east of Falcon, and other adjacent properties.

Mixed-Use Centers are focused along main points of access to I-25 in the northern areas. These include centers at Gleneagle (Exit 156) and Woodmoor (Exit 161). The mix of uses contained in these high-activity areas include commercial services, restaurants, banks, gas stations, park-and-rides, apartments and townhomes, and institutional uses, like high schools and libraries.

A Regional Center is located in the heart of Falcon and features a unique mix of uses for the County. Falcon's Regional Center is a major commercial destination for residents in the Falcon-Peyton region, and communities farther to the east. The area differs from other communities' Mixed-Use or Rural Centers by providing a level of goods and services that attracts people from across the rural region such as restaurants, entertainment, retail, commercial services, grocery stores, libraries, and post offices.

Within the County's Incorporated Areas, there are enclaves of developed and undeveloped land that remain unincorporated, although they are surrounded on all sides by the City of Colorado Springs and give the sense that it is part of the City. These unincorporated pockets include the area of Cimarron Hills, Northeast City of Colorado Springs, and Southeast City of Colorado Springs near Stratmoor. These enclaves are primarily residential but also feature a mix of uses including residential, commercial, institutional, or industrial.

Incorporated Areas are the lands within the boundaries of the eight incorporated cities and towns in El Paso County, the largest of which is the City of Colorado Springs, and the smallest of which is the town of Ramah in the northeast corner of the County.

3.6 POPULATION AND DEMOGRAPHICS

3.6.1 CURRENT POPULATION

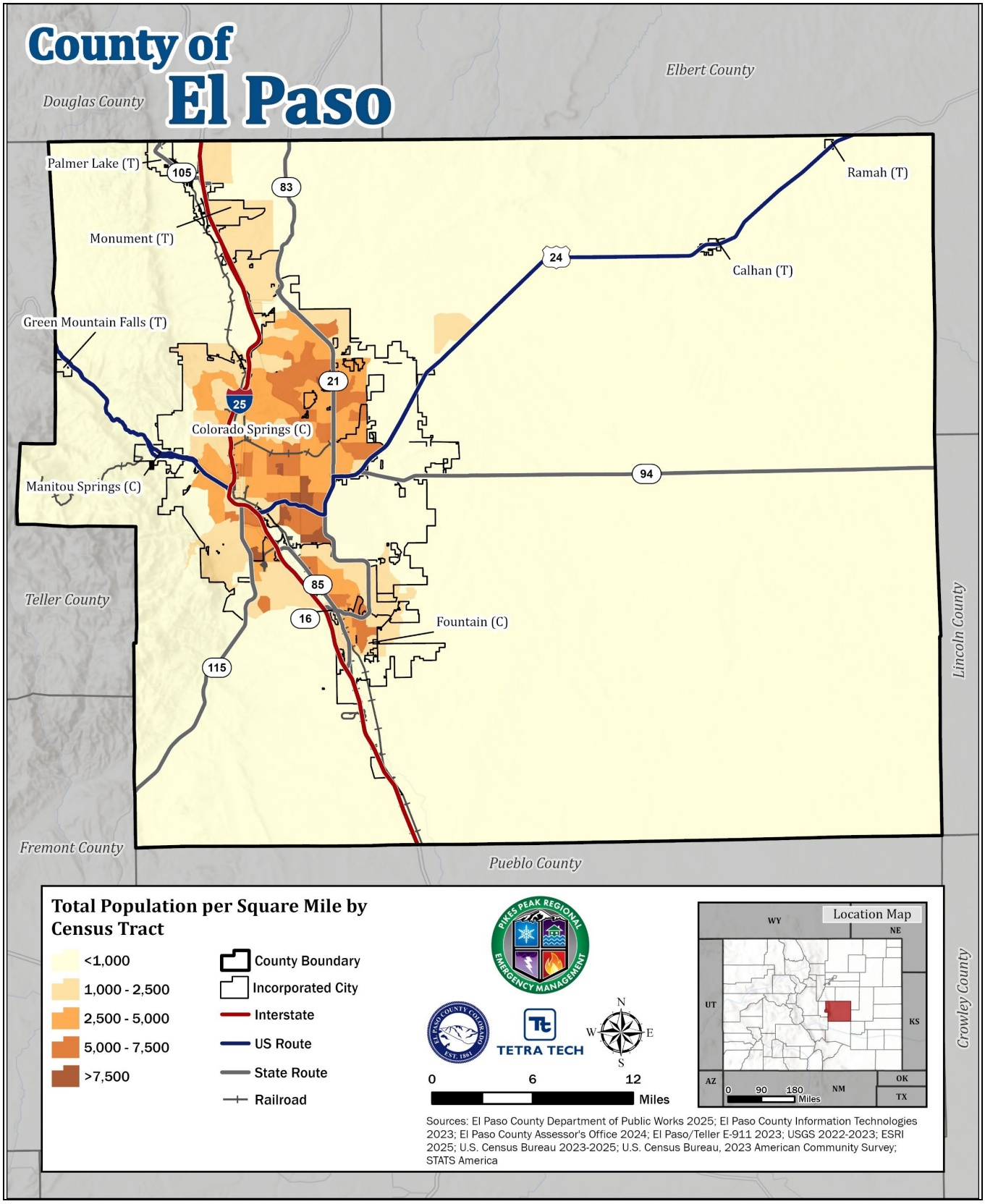
As of the 2020 Census, El Paso County has a population of approximately 730,395 residents, making it the most populous county in Colorado. The county's population continued to climb and as of 2023, the American Community Survey (ACS) estimates that the population was 736,008. The demographic profile is diverse, with a growing Hispanic population and a significant number of military personnel and veterans due to the presence of military installations. Table 3-5 summarizes population estimates for the county and municipalities and Figure 3-6 shows the county-wide population by census tract.

Table 3-5. El Paso County Population

Jurisdiction	2020 Census Population	2020 Census Population as % of County Total	2023 ACS 5-Year Estimate Population	2023 ACS 5-Year Estimate Population as % of County Total
Town of Calhan	762	0.1%	510	0.1%
City of Colorado Springs	406,361	55.6%	405,307	55.1%
City of Fountain	91,369	12.5%	92,873	12.6%
Town of Green Mountain Falls	622	0.1%	690	0.1%
City of Manitou Springs	4,858	0.7%	4,796	0.7%
Town of Monument	10,399	1.4%	11,035	1.5%
Town of Palmer Lake	2,636	0.4%	2,635	0.4%
Town of Ramah	111	0.0%	130	0.0%
Unincorporated County	213,277	29.2%	218,032	29.6%
El Paso County (Total)	**730,395**	**100.0%**	**736,008**	**100.0%**

Source: U.S. Census Bureau 2020 Decennial Total Population; U.S. Census Bureau 2023, American Community Survey
Note: The town of Green Mountain Falls is located in El Paso County and Teller County. Town of Green Mountain Falls is 96.3% within El Paso County; this multiplier was used to extract only the population within El Paso County.

Figure 3-6. Population by Census Tract



3.6.2 SOCIALLY VULNERABLE POPULATIONS

El Paso County is characterized by a diverse and rapidly growing population, reflecting various demographic trends and social dynamics. Understanding the population characteristics is essential for effective planning and resource allocation, particularly in the context of hazard mitigation and community resilience. As the population grows and diversifies, it is essential to recognize and address the needs of socially vulnerable populations within El Paso County. Social vulnerability refers to the susceptibility of certain groups to adverse impacts from hazards, such as natural disasters, economic downturns, or public health emergencies. Key aspects of socially vulnerable populations in El Paso County include:

- Low-Income Households: A significant portion of the population lives below the poverty line, particularly in certain neighborhoods of City of Colorado Springs and surrounding areas. These households may have limited access to resources, making them more vulnerable during emergencies.
- Elderly Population: The county has a growing elderly population, which can be particularly vulnerable to health risks, isolation, and mobility challenges during emergencies. Programs that support seniors are essential for ensuring their safety and well-being.
- Minority Communities: El Paso County is home to a diverse array of ethnic and racial groups, including a growing Hispanic population. These communities may face barriers to accessing services, information, and resources, particularly during crisis situations.
- Individuals with Disabilities: People with disabilities may experience challenges in accessing resources and support during emergencies. Ensuring that emergency plans are inclusive and consider the needs of these individuals is crucial for effective hazard mitigation.

Addressing the needs of socially vulnerable populations is a critical component of El Paso County's hazard mitigation planning. By understanding the demographics and vulnerabilities of its residents, the county can develop targeted strategies to enhance resilience and ensure equitable access to resources and support during emergencies.

These populations can be more susceptible to hazard events based on a number of factors including their physical and financial ability to react or respond during a hazard, and the location and construction quality of their housing. This HMP considers several socially vulnerable population groups: the elderly (persons over the age of 65), the young (persons under the age of 5), non-English speaking households, those with disabilities, and those living below the poverty level (as defined by the U.S. Census Bureau). Figure 3-7 shows vulnerable population concentrations by census tract in El Paso County. Table 3-6 summarizes socially vulnerable populations in each participating jurisdiction.

3.6.3 POPULATION TRENDS

Population trend information was evaluated to estimate future shifts that could significantly change the character of the area. Population trends can provide a basis for making decisions on the type of mitigation approaches to consider and the locations in which these approaches should be applied. This information can also be used to support planning decisions regarding future development in vulnerable areas.

Figure 3-7. Vulnerable Populations by Census Tract

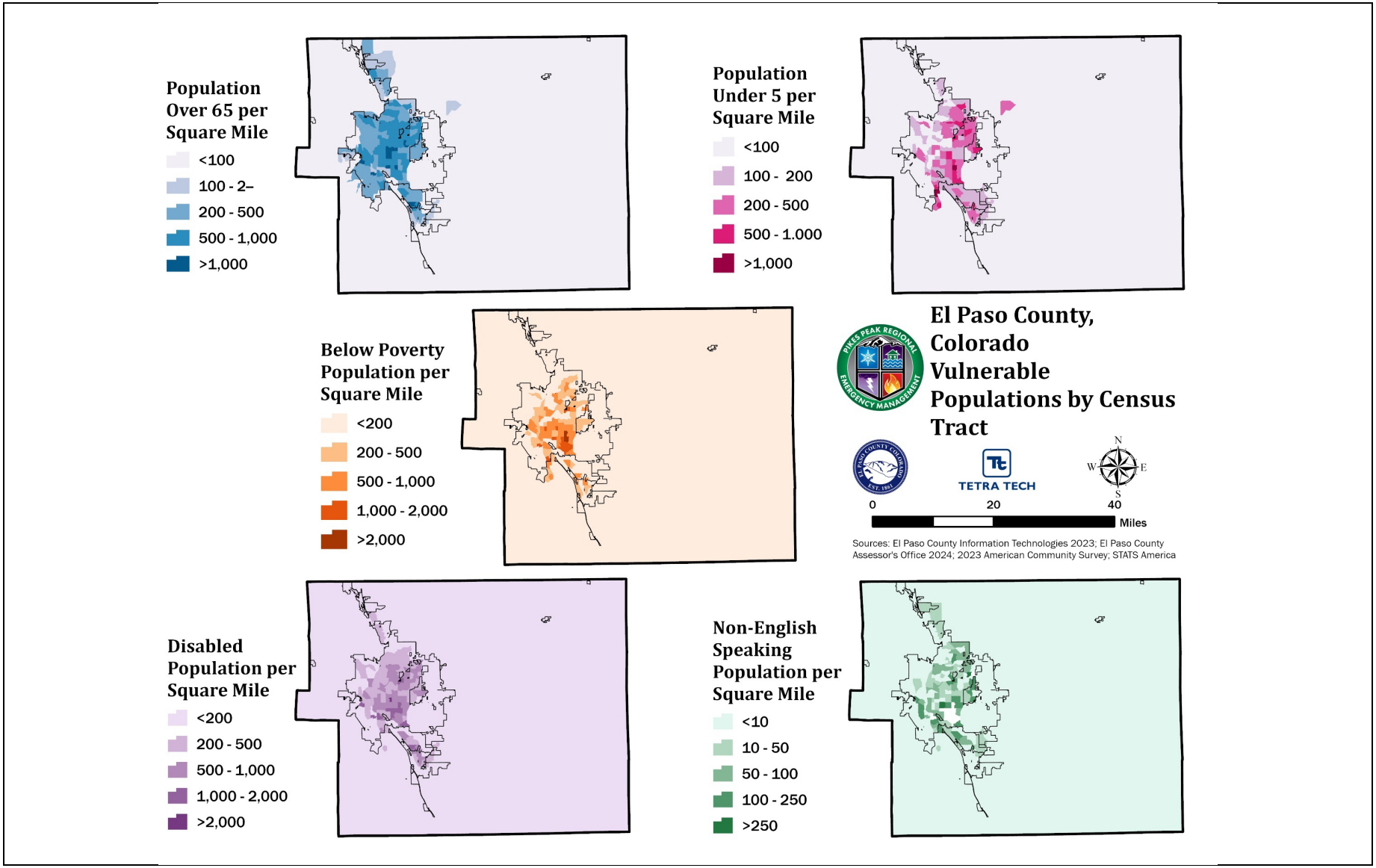


Table 3-6. El Paso County Socially Vulnerable Populations

Jurisdiction	Population Over 65	Population Over 65 as % of Total Jurisdiction Population	Population Under 5	Population Under 5 as % of Total Jurisdiction Population	Non-English Speaking Population	Non-English Speaking Population as % of Total Jurisdiction Population	Population with Disability	Population with Disability as % of Total Jurisdiction Population	Population Below Poverty Level	Population Below Poverty Level as % of Total Jurisdiction Population
Town of Calhan	114	22.4%	23	4.5%	0	0.0%	78	15.3%	48	9.4%
City of Colorado Springs	61,906	15.3%	23,342	5.8%	7,968	2.0%	54,736	13.5%	41,928	10.3%
City of Fountain	7,778	8.4%	7,463	8.0%	962	1.0%	9,530	10.3%	7,734	8.3%
Town of Green Mountain Falls	92	13.3%	14	2.0%	0	0.0%	130	18.8%	28	4.1%
City of Manitou Springs	860	17.9%	63	1.3%	22	0.5%	643	13.4%	471	9.8%
Town of Monument	1,475	13.4%	608	5.5%	123	1.1%	493	4.5%	607	5.5%
Town of Palmer Lake	531	20.2%	74	2.8%	0	0.0%	352	13.4%	89	3.4%
Town of Ramah	57	43.8%	7	5.4%	0	0.0%	49	37.7%	3	2.3%
Unincorporated County	27,829	12.8%	14,351	6.6%	1,924	0.9%	21,179	9.7%	10,069	4.6%
El Paso County (Total)	**100,642**	**13.7%**	**45,945**	**6.2%**	**10,999**	**1.5%**	**87,190**	**11.8%**	**60,977**	**8.3%**

Note: The town of Green Mountain Falls is located in El Paso County and Teller County. Town of Green Mountain Falls is 96.3% within El Paso County; this multiplier was used to extract only the population within El Paso County.

Source: U.S. Census Bureau 2023, American Community Survey

El Paso County has experienced significant population growth over the past two decades. The population increased by nearly 15% from 2010 to 2020, driven by factors such as economic opportunities, quality of life, and the presence of military installations. This growth trend is expected to continue, with projections indicating that the population could reach over 900,000 by 2040. Table 3-7 summarizes recent and projected future changes in county population.

Table 3-7. El Paso County Population Change

July 2010	July 2015	July 2020	July 2025	July 2030	July 2035	July 2040	July 2045	July 2050
627,232	677,969	732,366	758,150	810,949	867,406	920,112	965,080	1,001,087

Source: (DOLA n.d.)

Key factors contributing to this growth include:

- Economic Development: The county's diverse economy, including defense, technology, and tourism sectors, attracts new residents seeking employment and a high quality of life.
- Military Presence: The presence of major military installations, such as Fort Carson and the U.S. Air Force Academy, contributes to population growth through the influx of military personnel and their families.
- Quality of Life: El Paso County offers a range of amenities, including outdoor recreational opportunities, cultural attractions, and a relatively low cost of living compared to other metropolitan areas in Colorado.

3.7 ECONOMY

El Paso County has the third largest gross domestic product in Colorado, second only to Denver and Arapahoe Counties (BEA 2024).

3.7.1 MAJOR INSTITUTIONS

El Paso County's economy is diverse and robust, with key industries including defense, healthcare, education, and tourism. The presence of several military installations, including Fort Carson and the U.S. Air Force Academy, significantly contributes to the local economy. The county has also seen growth in technology and manufacturing sectors, supported by a skilled workforce and educational institutions such as the University of Colorado at City of Colorado Springs

El Paso County is home to several major employers that significantly contribute to the local economy. Key sectors include:

- Defense and Military: The presence of military installations, including Fort Carson, the U.S. Air Force Academy, and Peterson Space Force Base, makes defense one of the largest employment sectors in the county. Together, these installations employ thousands of military personnel and civilians, contributing to the local economy through direct employment and associated spending.

- Healthcare: The healthcare sector is another major employer in El Paso County, with institutions such as Penrose-St. Francis Health Services and UCHealth Memorial Hospital providing jobs for a significant number of residents. The demand for healthcare services continues to grow, driven by population increases and an aging demographic.
- Education: Educational institutions, including the University of Colorado, City of Colorado Springs and Pikes Peak Community College, are vital to the local economy. These institutions not only provide jobs but also contribute to workforce development and research initiatives.
- Technology and Manufacturing: The technology sector has seen substantial growth in recent years, with companies specializing in software development, cybersecurity, and advanced manufacturing establishing a presence in the county. This sector is supported by a skilled workforce and collaborations with local educational institutions.

3.7.2 EMPLOYMENT

El Paso County has experienced positive employment trends over the past decade, with job growth outpacing the national average. As of 2024, the county had a labor force of 382,933 (BLS n.d.). Key trends include:

- Diversification of Industries: Defense has historically been a dominant sector, but the county's economy has diversified, with growth in technology, healthcare, and tourism. This diversification helps to stabilize the economy and reduce reliance on any single sector.
- Unemployment Rates: The unemployment rate in El Paso County has generally remained lower than the national average, reflecting a strong job market. As of 2024, the unemployment rate was approximately 4.3%. Figure 3-8 shows the unemployment rate in El Paso County from 2019 to 2024.
- Remote Work and Flexible Employment: The COVID-19 pandemic accelerated trends toward remote work and flexible employment arrangements. Many companies in the county have adopted hybrid work models, allowing employees to work from home part-time, which has implications for local commercial real estate and transportation patterns.

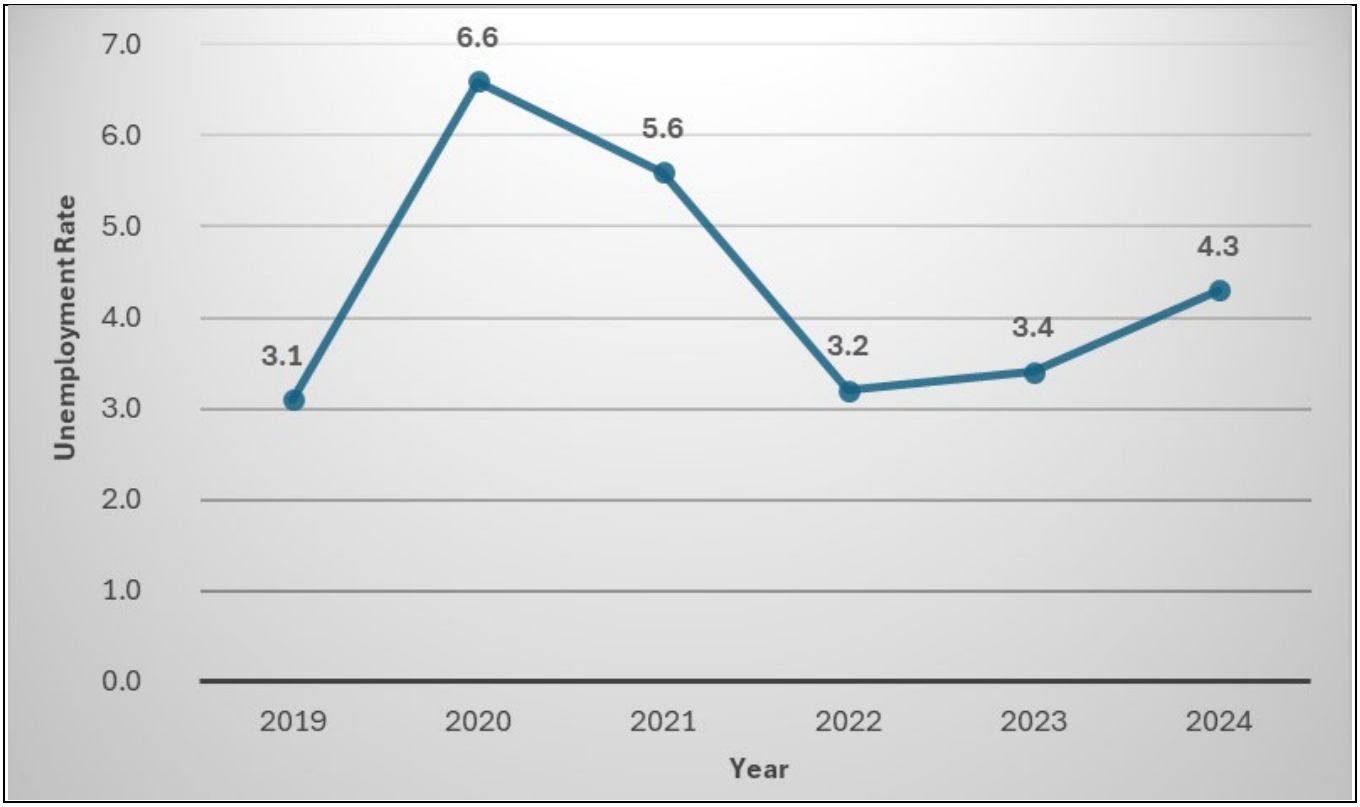
3.7.3 INCOME

Income levels in El Paso County reflect the diverse economic landscape. The median household income is over $87,000, which is higher than the national median but lower than the state median. Income disparities exist across different neighborhoods and demographic groups. Key points include:

- Income Inequality: While many residents enjoy higher incomes, certain areas, particularly those with high concentrations of low-income households, experience economic challenges. Addressing income inequality is essential for fostering a more equitable community.
- Cost of Living: The cost of living in El Paso County is relatively moderate compared to other metropolitan areas in Colorado, making it an attractive location for families and individuals seeking affordable housing and quality of life.

Table 3-8 summarizes income in El Paso County, the State of Colorado, and the United States.

Figure 3-8. El Paso County Unemployment Rate



Source: (BLS n.d.)

Table 3-8. Household Income

Household Income	El Paso County	Colorado	United States
Less than $10,000	3.5%	3.9%	4.9%
$10,000 to $14,999	2.2%	2.6%	3.6%
$15,000 to $24,999	4.8%	5.0%	6.6%
$25,000 to $34,999	5.6%	5.3%	6.8%
$35,000 to $49,999	9.7%	8.9%	10.4%
$50,000 to $74,999	16.8%	15.0%	15.7%
$75,000 to $99,999	13.8%	13.0%	12.7%
$100,000 to $149,999	20.2%	19.3%	17.4%
$150,000 to $199,999	10.8%	11.3%	9.3%
$200,000 or more	12.7%	15.8%	12.6%
Median Household Income	87,470	92,470	78,538
Mean Household Income	113,043	124,231	110,491

Source: ACS 5-Year Estimates, 2023

3.7.4 ECONOMIC TRENDS

Several economic trends are shaping the future of El Paso County, including:

- Population Growth and Housing Demand: The county's rapid population growth is driving demand for housing, commercial spaces, and infrastructure development. This growth presents both opportunities and challenges for local planners and developers.
- Sustainability and Resilience: There is a growing emphasis on sustainability and resilience in economic development, with initiatives aimed at promoting green technologies, renewable energy, and environmentally friendly practices in various industries.
- Tourism and Recreation: The county's natural beauty and recreational opportunities, including Pikes Peak and Garden of the Gods, drive tourism-related economic activities. Efforts to enhance tourism infrastructure and promote local attractions are ongoing.
- Workforce Development: As the economy evolves, workforce development initiatives are critical to ensuring that residents have the skills needed for emerging industries. Collaborations between educational institutions and local businesses are essential for preparing the workforce for future job opportunities.

3.8 GENERAL BUILDING STOCK

The general building stock in El Paso County includes a mix of residential, commercial, and public buildings. As of 2021, there are approximately 250,000 housing units in the county, with a significant portion being single-family homes. The construction and building codes are regulated at both the county and municipal levels to ensure safety and resilience against hazards (El Paso County Building Department, 2021).

The general building stock in El Paso County plays a critical role in defining the community's character, safety, and resilience to hazards. This section provides an overview of existing development patterns, the history of development in the county, and information about new and planned development.

3.8.1 EXISTING DEVELOPMENT

For the purposes of this plan, approximately 252,492 structures were identified by the tax data and spatial data available. These structures account for a replacement cost value of approximately $152 billion. Estimated content value was calculated by using 50 percent of the residential replacement cost value, and 100 percent of the non-residential replacement values. Using this methodology, approximately $63 billion in contents exist within these properties. Approximately 91.5 percent of the total buildings in the County are residential, which make up 56.9 percent of the total building stock value. Table 3-9 summarizes the number and value of all general buildings in the planning area. Table 3-10 presents building stock statistics by occupancy class.

Table 3-9. Number and RCV of Buildings of All Buildings in the Planning Area

	Number of Buildings	Replacement Cost Value—Structure	Replacement Cost Value—Contents	Replacement Cost Value—Total
Town of Calhan	424	$206,314,950	$176,768,431	$383,083,382
City of Colorado Springs	166,064	$61,036,857,529	$44,871,390,297	$105,908,247,826
City of Fountain	9,810	$3,002,880,420	$2,033,759,398	$5,036,639,818
Town of Green Mountain Falls	556	$105,432,367	$64,858,463	$170,290,831
City of Manitou Springs	2,412	$761,949,948	$499,355,284	$1,261,305,232
Town of Monument	3,594	$1,427,753,293	$1,013,968,044	$2,441,721,337
Town of Palmer Lake	1,304	$416,927,248	$289,636,793	$706,564,041
Town of Ramah	83	$15,942,779	$9,739,880	$25,682,659
Unincorporated County	68,245	$22,325,010,718	$14,205,229,921	$36,530,240,639
El Paso County (Total)	**252,492**	**$89,299,069,252**	**$63,164,706,512**	**$152,463,775,764**

Source: U.S. Army Corps of Engineers, National Structure Inventory 2022; RSMeans 2024

Table 3-10. Building Stock Count and Replacement Cost Value (RCV) by Occupancy Class

Jurisdiction	Residential Building Count	Residential RCV	Commercial Building Count	Commercial RCV	Industrial Building Count	Industrial RCV	Other Building Count	Other RCV
Town of Calhan	340	$113,248,619	66	$174,744,252	1	$985,953	17	$94,104,558
City of Colorado Springs	150,213	$55,297,544,482	12,059	$33,703,311,004	2,147	$6,755,263,603	1,645	$10,152,128,737
City of Fountain	9,303	$3,039,603,521	379	$1,271,274,940	56	$134,426,389	72	$591,334,968
Town of Green Mountain Falls	520	$126,099,601	23	$15,095,838	6	$10,506,791	7	$18,588,601
City of Manitou Springs	2,116	$815,836,394	236	$276,024,100	26	$13,894,553	34	$155,550,185
Town of Monument	3,245	$1,365,371,740	275	$662,782,358	45	$160,196,304	29	$253,370,934
Town of Palmer Lake	1,154	$406,081,575	99	$168,257,595	18	$31,652,120	33	$100,572,750
Town of Ramah	79	$18,608,698	2	$1,502,322	0	$0	2	$5,571,639
Unincorporated County	64,297	$25,587,532,317	2,539	$5,937,316,025	799	$1,740,653,867	610	$3,264,738,430
El Paso County (Total)	**231,267**	**$86,769,926,946**	**15,678**	**$42,210,308,435**	**3,098**	**$8,847,579,580**	**2,449**	**$14,635,960,803**

Source: U.S. Army Corps of Engineers, National Structure Inventory 2022; RSMeans 2024
Note: Other = Government, Religion, Agricultural, and Education

A household includes all the people who occupy a housing unit as their usual residence. According to the 2023 ACS, 283,174 households are located in the Pikes Peak Region. A housing unit is a house, apartment, mobile home or trailer, a group of rooms, or a single room occupied as separate living quarters (or if vacant, intended for occupancy as separate living quarters). The 2023 ACS identified 296,753 housing units in the county and 13,579 are vacant.

The 2023 Economic Surveys Business Patterns data identified 18,852 business establishments employing approximately 267,012 people in the Pikes Peak Region. The professional, scientific, and technical services industry has the greatest number of establishments in the County, with 2,662. This is followed by the health care and social assistance industry with 2,405 establishments, and the construction industry with 1,997 establishments. Table 3-11 shows the industries that employ more than 1,000 employees in El Paso County.

Table 3-11. Major Industries and Employers

Industry	Number of Establishments	Number of Employees
Professional, scientific, and technical services	2,662	31,827
Health care and social assistance	2,405	44,725
Construction	1,997	15,370
Retail trade	1,993	33,999
Other services (except public administration)	1,916	23,777
Accommodation and food services	1,637	34,237
Real estate and rental and leasing	1,606	4,602
Finance and insurance	1,140	13,153
Administrative, support, waste management, and remediation services	989	12,695
Wholesale trade	537	7,105
Manufacturing	438	11,485
Transportation and warehousing	372	10,698
Educational services	352	9,304
Arts, entertainment, and recreation	341	4,712
Information	334	6,989
Management of companies and enterprises	79	1,710

Source: 2023 Economic Surveys County Business Patterns

Figure 3-9 through Figure 3-12 show the distribution and value density of residential, commercial, industrial, and other buildings. Value density is the dollar value of structures per unit area, including building content value. The densities are shown in units of $1,000 ($K) per square mile. Value density maps can assist communities in visualizing areas of high loss potential and in evaluating aspects of the study area in relation to the specific hazard risks.

Figure 3-9. Distribution of Residential Value Density in El Paso County

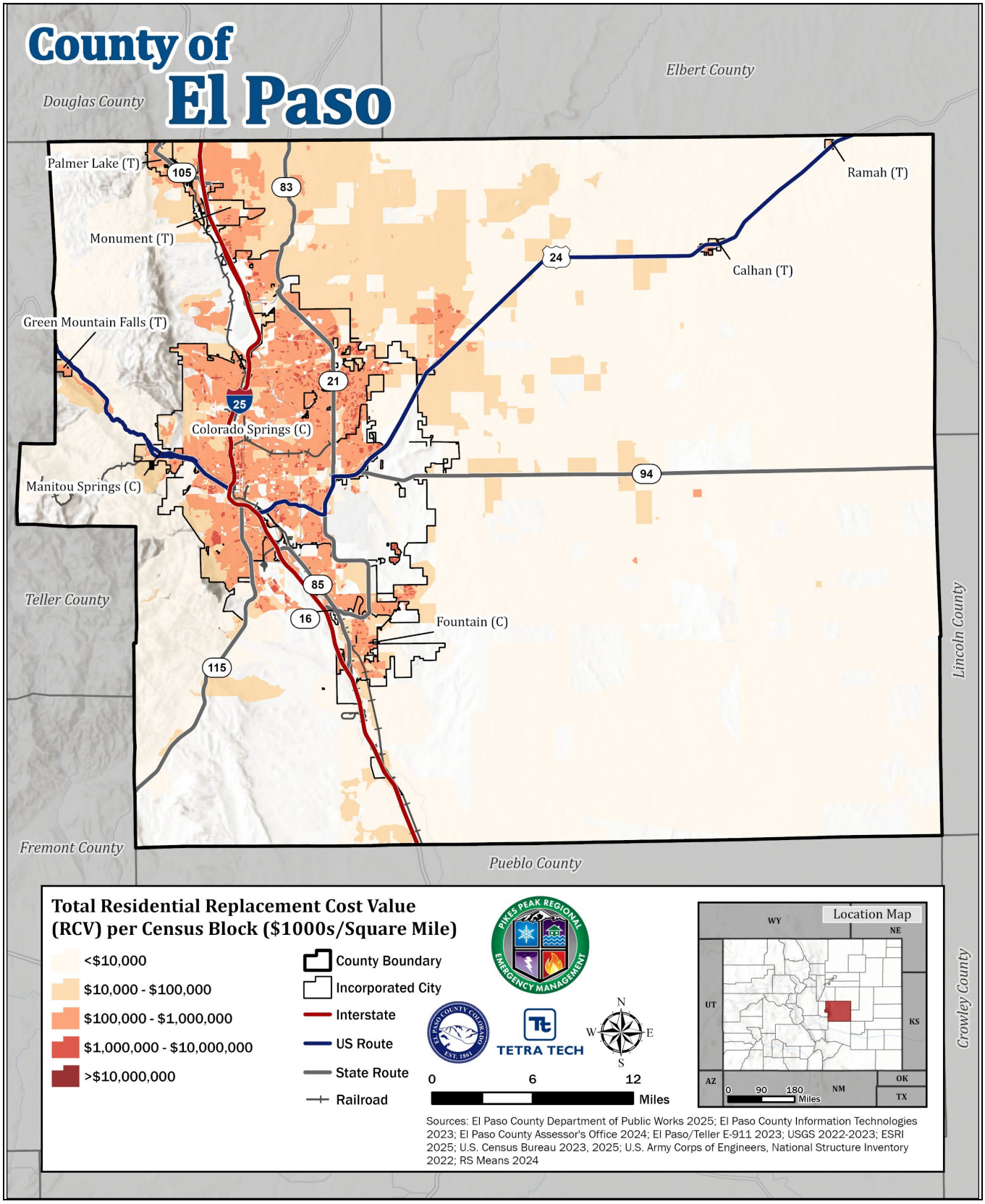


Figure 3-10. Distribution of Commercial Value Density in El Paso County

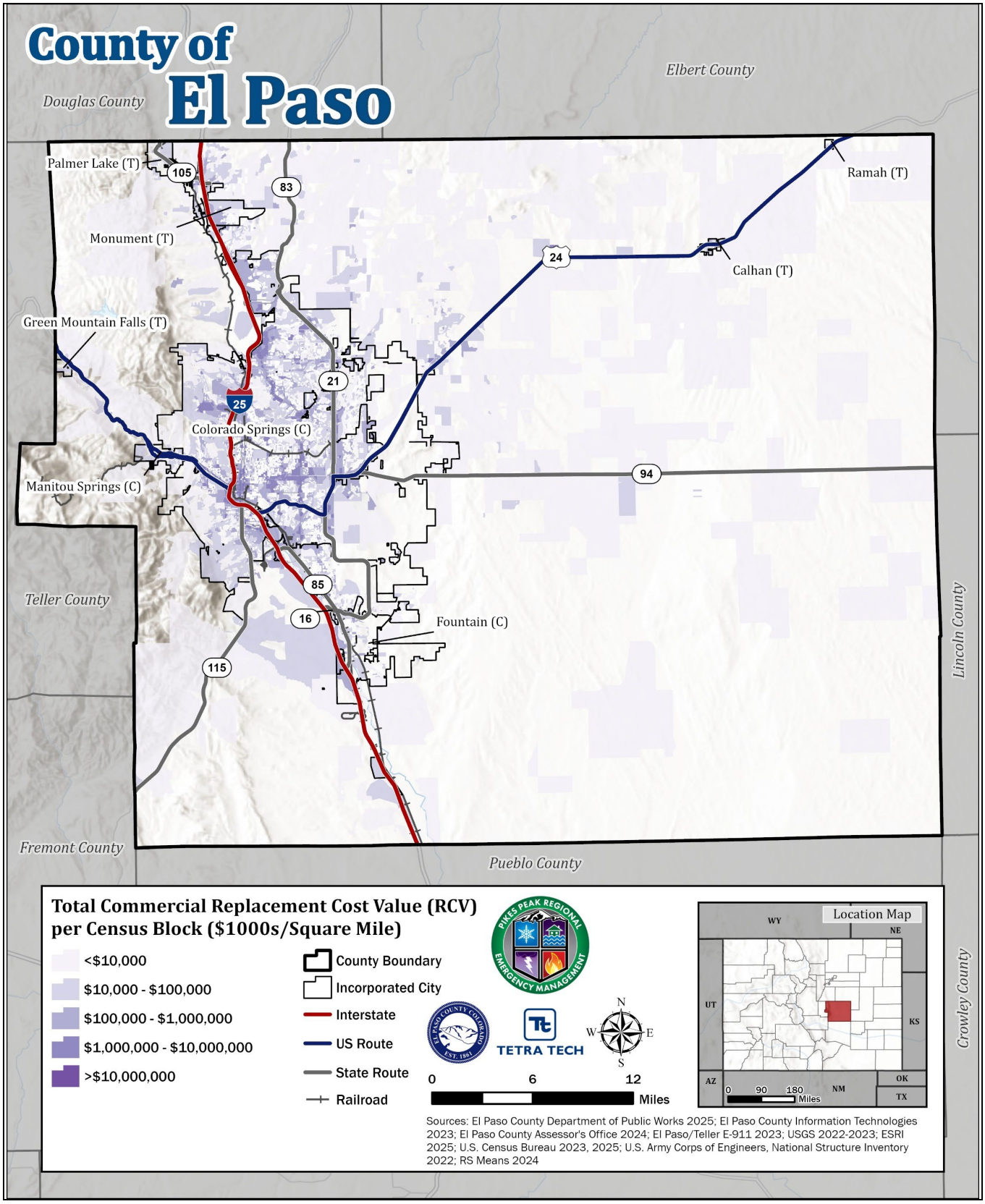


Figure 3-11. Distribution of Industrial Building Stock and Value Density in El Paso County

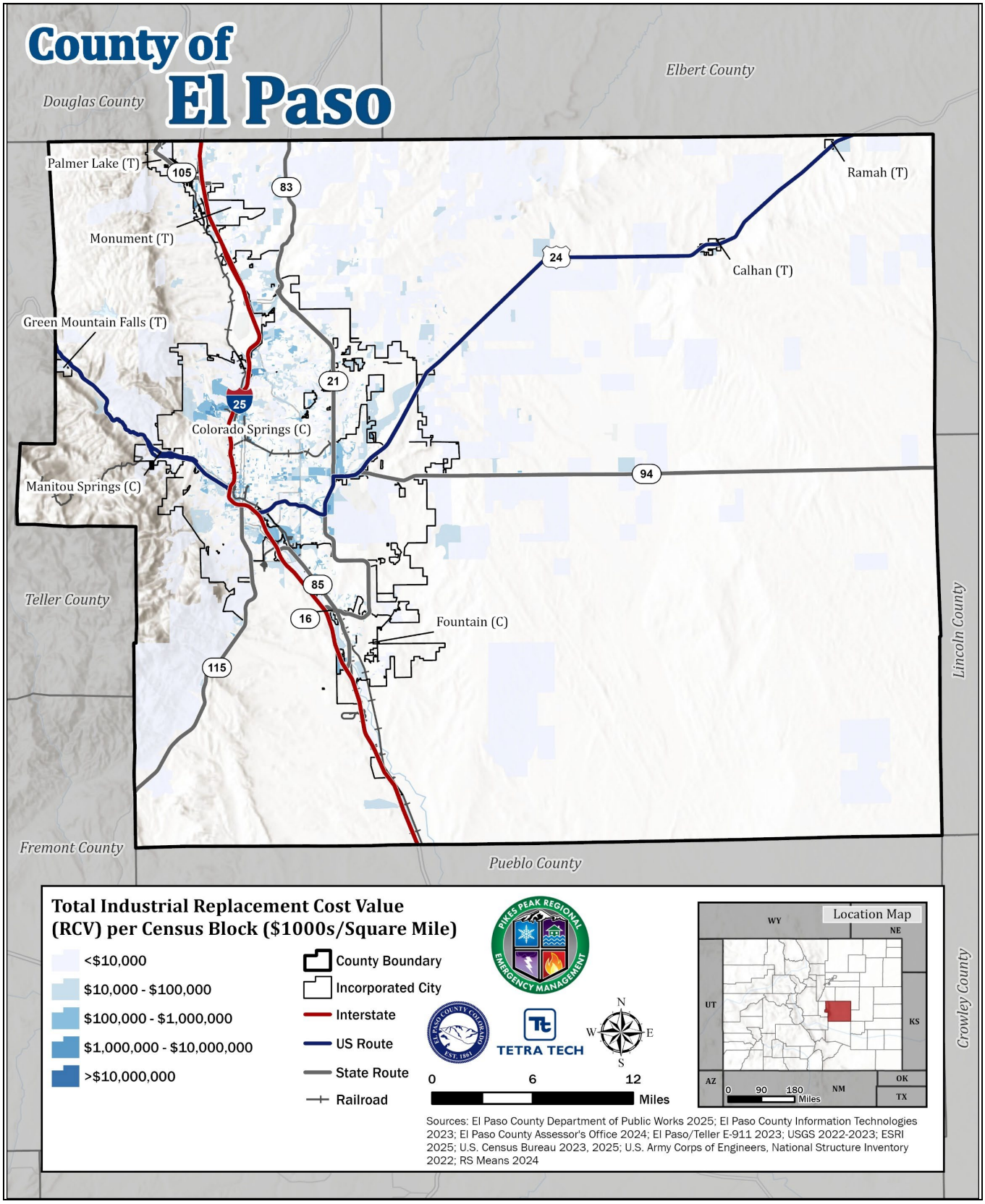
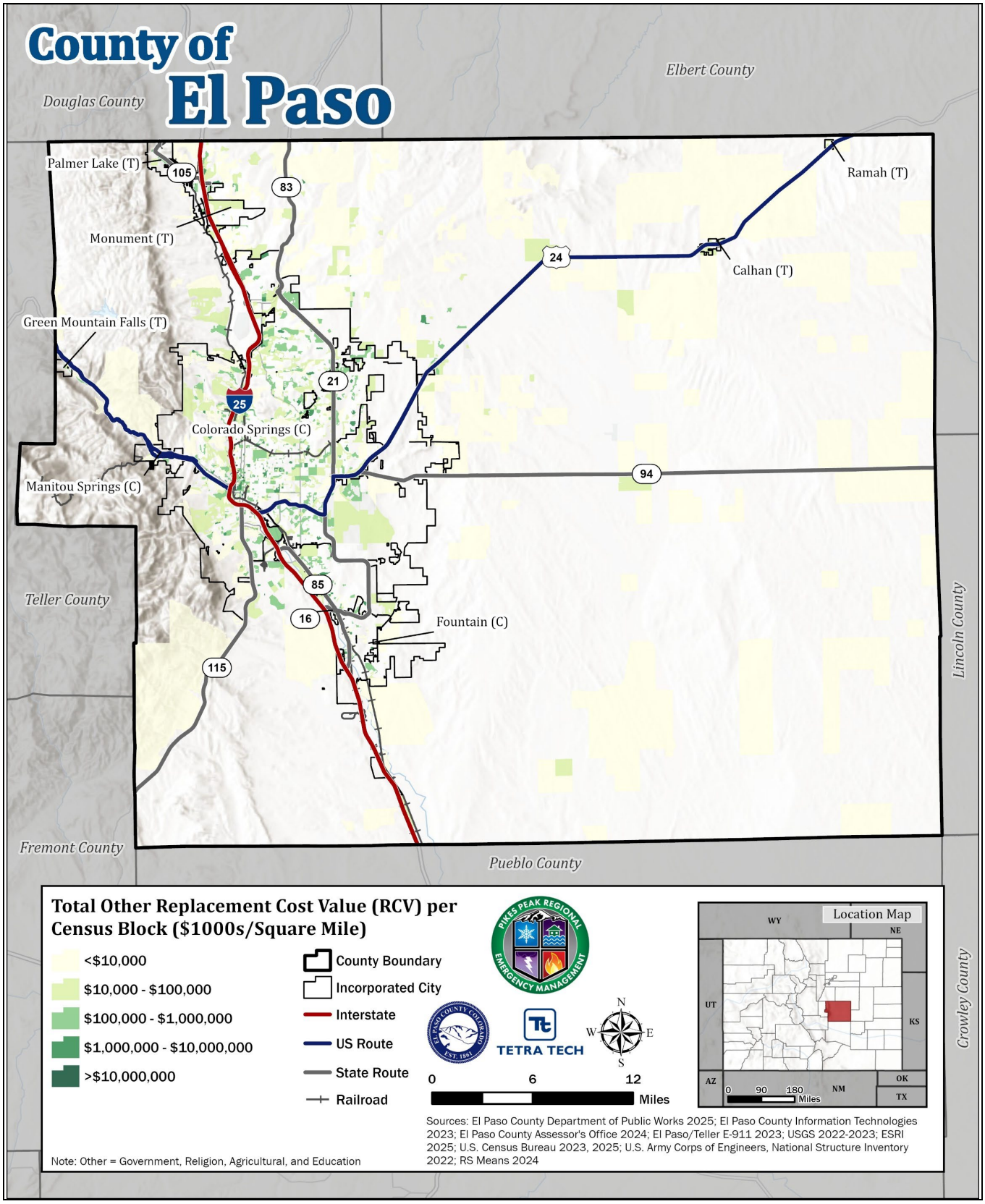


Figure 3-12. Distribution of Other Building Stock and Value Density in El Paso County



3.8.2 NEW DEVELOPMENT

The County uses best available data to avoid potential exposure of new development to hazard events. The County discourages development in vulnerable areas, areas with high population density, and the special flood hazard area, and encourages high local-level regulatory standards.

El Paso County's existing development patterns reflect a mix of urban, suburban, and rural land uses that have evolved over time. Key characteristics of the current development patterns include:

- Urban Development: The most densely populated areas are located in and around City of Colorado Springs, where urban development is characterized by a mix of residential, commercial, and institutional uses. High-density housing, such as apartments and townhomes, is common in urban neighborhoods, providing options for a diverse population.
- Suburban Growth: Suburban areas have expanded outward from City of Colorado Springs, with new residential developments emerging in communities such as City of Fountain, Town of Monument, and Town of Palmer Lake. These areas typically feature single-family homes with larger lots, parks, and amenities that cater to families seeking a suburban lifestyle.
- Rural Areas: Eastern and western parts of the county maintain more rural characteristics, with agricultural land, open spaces, and fewer residential developments. These areas support farming and ranching activities, contributing to the county's agricultural economy.
- Mixed-Use Developments: Recent trends have seen an increase in developments that combine residential, commercial, and recreational spaces. These developments promote walkability and community interaction, aligning with contemporary urban planning principles.

El Paso County is actively planning for future growth and development, with several new and planned projects aimed at accommodating the increasing population and enhancing community infrastructure. Key aspects include:

- Residential Developments: Numerous residential projects are underway, including single-family homes, townhomes, and apartment complexes. These developments are concentrated in suburban areas and are designed to meet the demands of a growing population while incorporating amenities such as parks and community spaces.
- Commercial and Mixed-Use Projects: Several commercial developments are planned along major transportation corridors, focusing on local businesses and services to residents. Mixed-use developments that integrate residential, commercial, and recreational spaces are also being prioritized to promote walkability and community interaction.
- Infrastructure Improvements: Investments in infrastructure, including transportation, utilities, and public services, are essential to support new development. Planned improvements to roads, public transit, and water management systems will enhance connectivity and resilience.
- Sustainability Initiatives: New developments are increasingly incorporating sustainable design practices, such as energy-efficient building materials, green spaces, and water conservation measures. These initiatives align with the county's goals for environmental stewardship and resilience to climate change.

New development is further discussed in the jurisdictional annexes in Volume 2, where each participating jurisdiction identifies new and upcoming development within their borders.

3.9 COMMUNITY LIFELINES

Facilities that are essential to the health and welfare of the population and that maintain essential and emergency functions are designated as critical facilities. These typically include police and fire stations, schools, emergency operations centers, and infrastructure such as roads, bridges and utilities that provide water, electricity, and communications. Facilities that use or store hazardous materials are designated as critical facilities as well. All of these facilities are especially important after any hazard event (FEMA 1997).

FEMA defines some critical facilities, as well as public services, as "community lifelines." Community lifelines provide the fundamental services in a community that, when stabilized, enable all other aspects of society. Following a disaster event, intervention is required to stabilize lifelines. FEMA defines eight categories of community lifelines as summarized in Table 3-12.

Table 3-12. FEMA-Defined Categories of Community Lifelines

Community Lifeline Category	Types of Facilities and Services Included
Safety and security	Law enforcement/security, fire service, search and rescue, government service, community safety
Food, hydration, shelter	Food, hydration, shelter, agriculture
Health and medical	Medical care, public health, patient movement, medical supply chain, fatality management
Energy	Power grid, fuel
Communications	Infrastructure, responder communications, alerts warnings and messages, finance, 911 and dispatch
Transportation	Highway/roadway/motor vehicle, mass transit, railway, aviation, maritime
Hazardous materials	Facilities, hazmat, pollutants, contaminants
Water systems	Potable water infrastructure, wastewater management

Source: FEMA 2023

A comprehensive inventory of community lifelines in the Pikes Peak Region was developed from various sources, including input from the Hazard Mitigation Planning Team and Planning Partnership. The following sections describe the inventory of community lifelines that was used for the risk assessment in this HMP. Although many lifeline facilities could fall within numerous categories, each lifeline facility identified for this planning effort was categorized according to its primary function.

3.9.1 SAFETY AND SECURITY

Key facilities and services considered for the inventory under the safety and security category include:

- County facilities
- Dams
- Emergency Communications Centers
- Fire Stations
- Military Installations
- Police Stations
- Public Works Facilities
- Schools

Figure 3-13 shows the location of safety and security facilities included in the lifelines inventory for this HMP. The inventory included 651 safety and security facilities.

3.9.2 FOOD, HYDRATION, SHELTER

Food, hydration, and shelter facilities were not included in the lifelines inventory. Categories considered for this lifeline include shelters, agriculture facilities, lodging providers, and food distribution. In the case of shelters, these facilities were represented in another lifeline. For agriculture, lodging, and food distribution, mapping data was not available to PPROEM. An area for future HMP improvement may be the identification or collection of food, hydration, and shelter facilities that are considered critical.

3.9.3 HEALTH AND MEDICAL

Key facilities and services considered for the inventory under the health and medical category include:

- EMS/Ambulance
- Hospital
- Medical Care

Figure 3-14 shows the location of health and medical facilities included in the lifelines inventory for this HMP. The inventory included 528 health and medical facilities.

Figure 3-13. Safety and Security Facilities

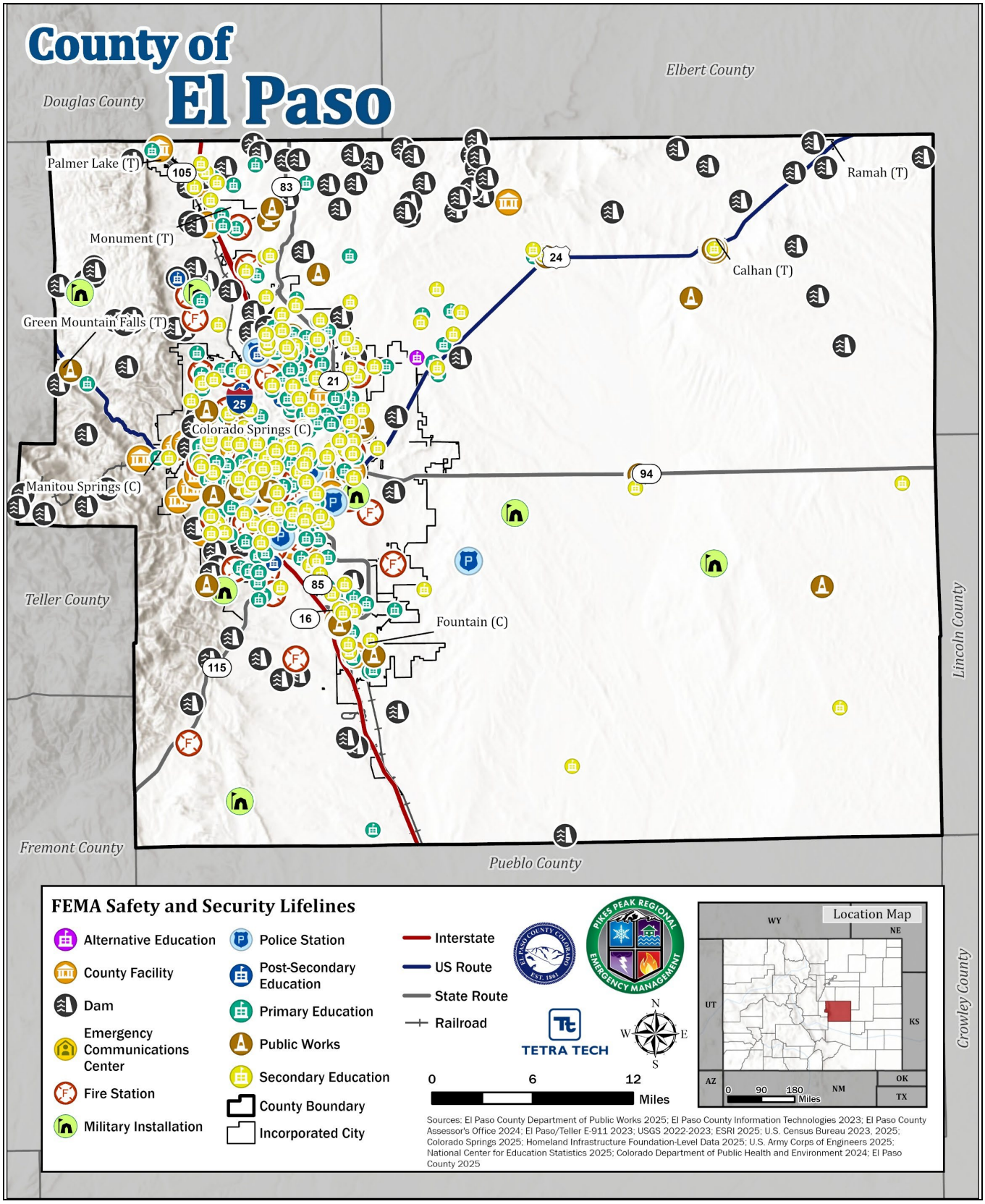
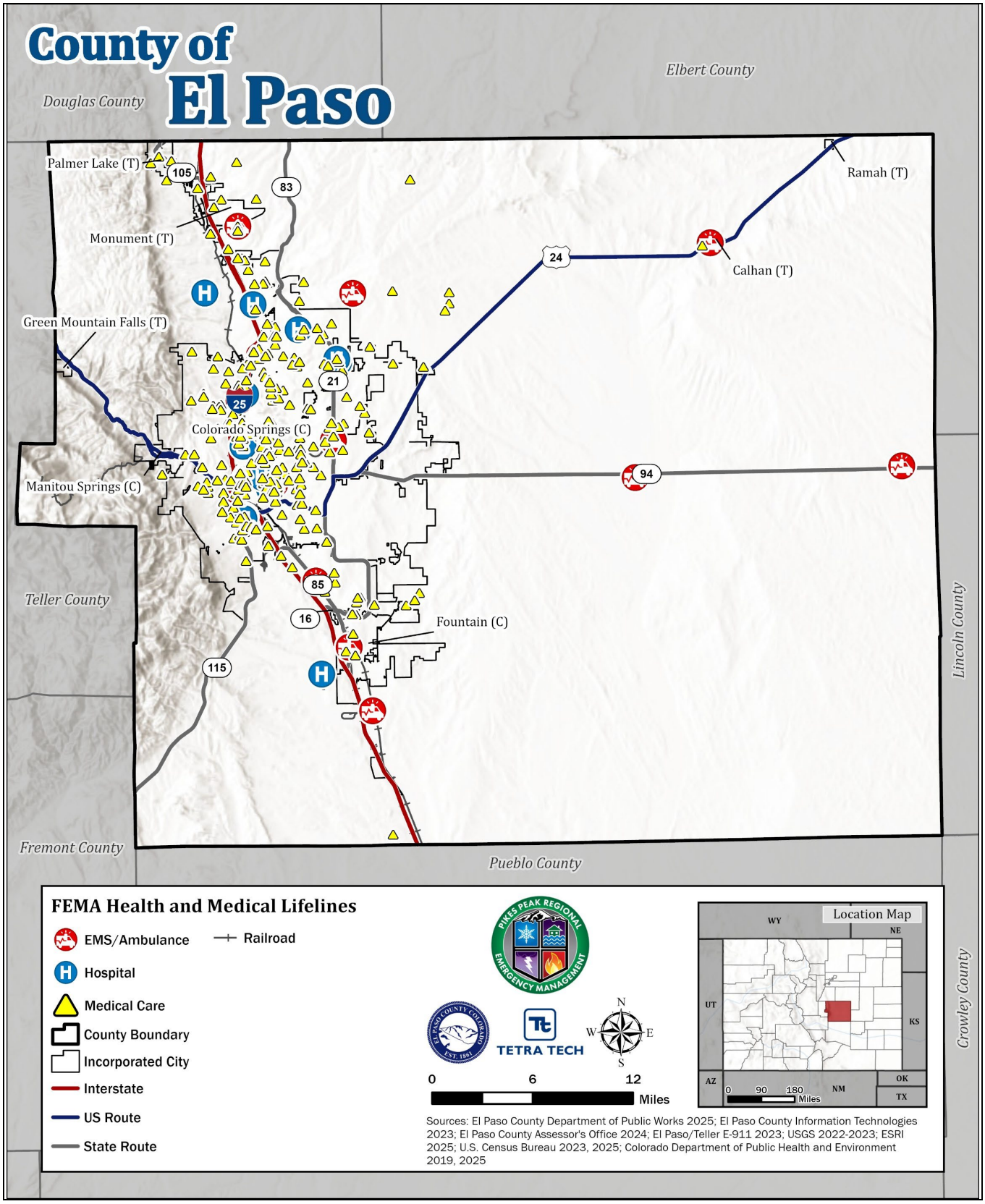


Figure 3-14. Health and Medical Facilities



3.9.4 ENERGY

Key facilities and services considered for the inventory under the energy category include:

- Generators
- Substations

The inventory included 70 energy facilities. All or which are considered sensitive information. While these assets were included in the vulnerability analysis for the hazards of concern, the detailed information of these assets and mapped locations will not appear in this HMP.

3.9.5 COMMUNICATIONS

Key facilities and services considered for the inventory under the communications category include:

- Cellular Towers

Figure 3-15 shows the location of communications facilities included in the lifelines inventory for this HMP. The inventory included 18 cellular towers.

3.9.6 TRANSPORTATION

Key facilities and services considered for the inventory under the transportation category include:

- Colorado Springs Airport

Figure 3-16 shows the location of transportation facilities included in the lifelines inventory for this HMP. The inventory included 1 transportation facility.

3.9.7 HAZARDOUS MATERIALS

Key facilities and services considered for the inventory under the hazardous materials category include:

- Tier II Sites

Figure 3-17 shows the location of hazardous materials facilities included in the lifelines inventory for this HMP. The inventory included 238 hazardous materials facilities.

3.9.8 WATER SYSTEMS

Key facilities and services considered for the inventory under the water systems category include:

- Lift Stations
- Treatment Plants
- Water Pumps
- Water Stations

The inventory included 185 water system facilities, all of which are considered sensitive information. While these assets were included in the vulnerability analysis for the hazards of concern, detailed information of these assets and mapped locations will not appear in this HMP.

Figure 3-15. Communications Facilities

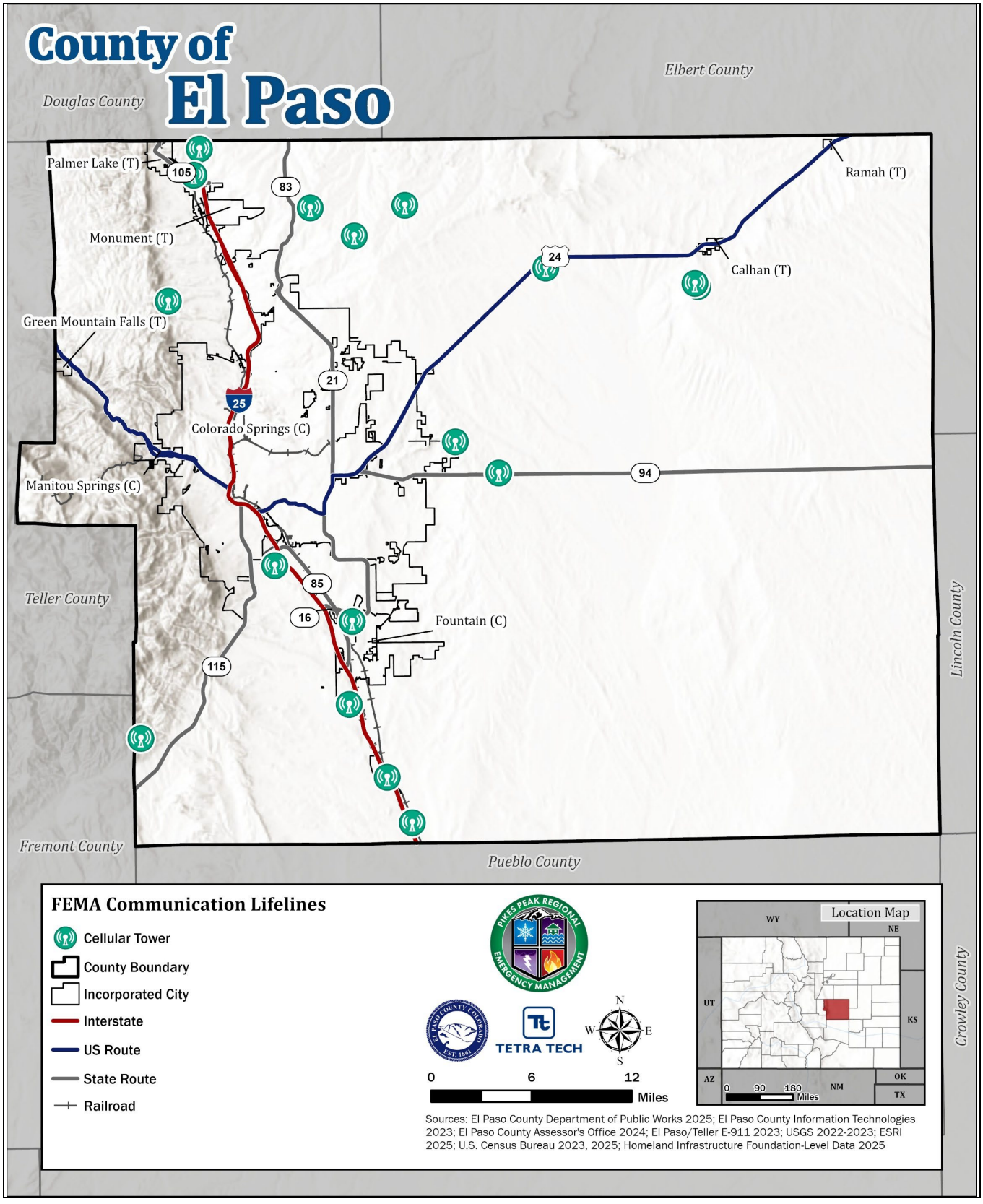


Figure 3-16. Transportation Facilities

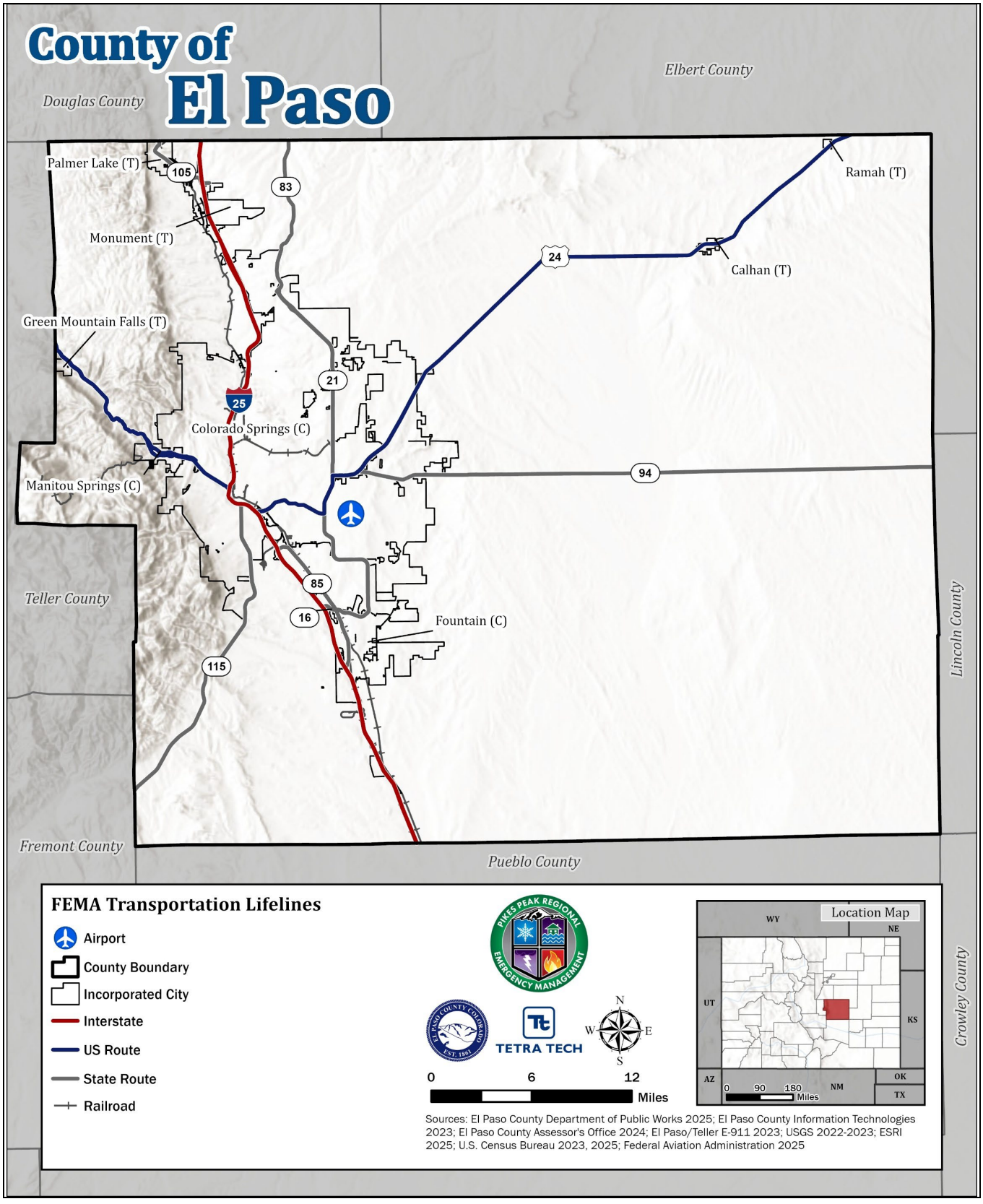
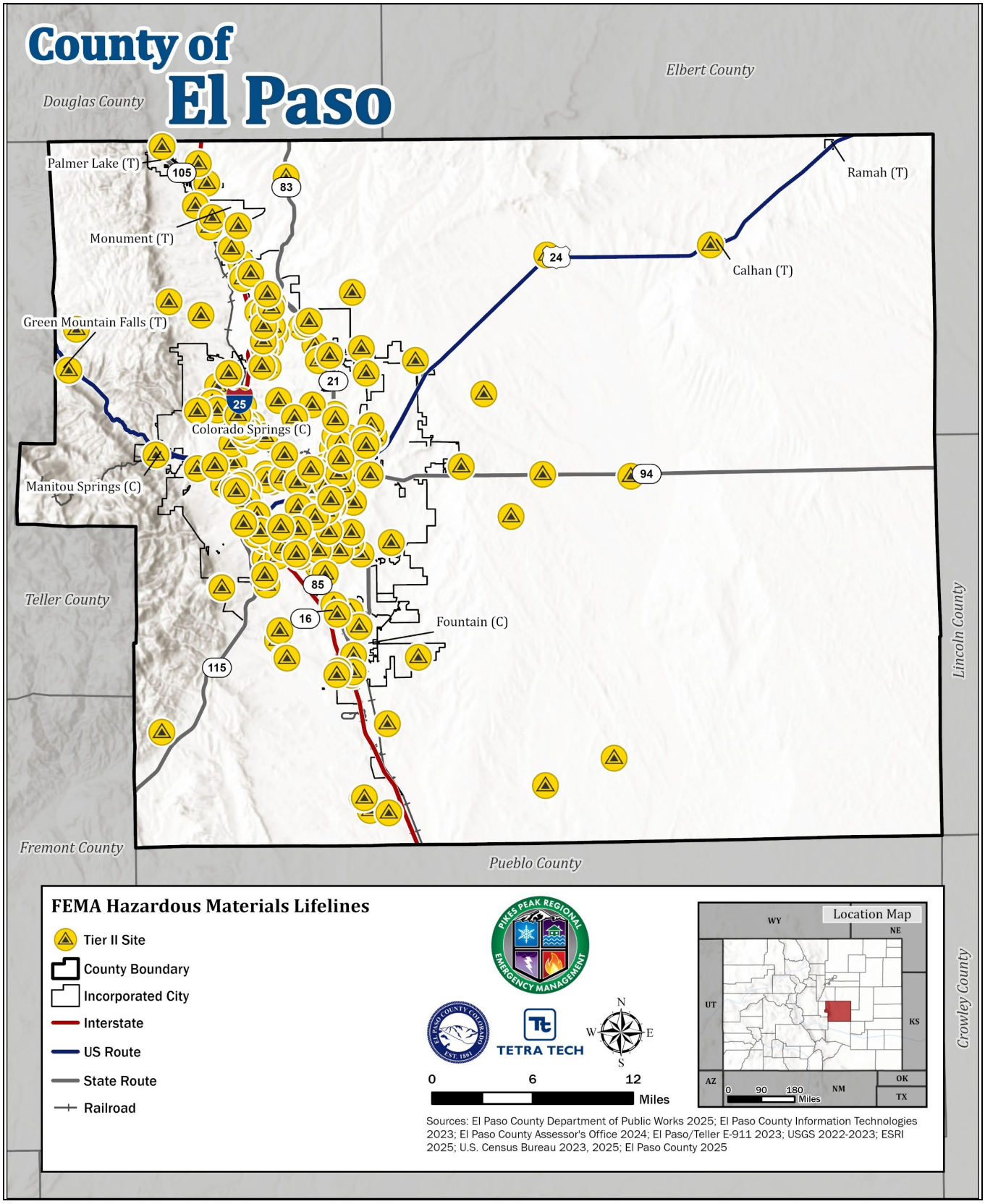


Figure 3-17.Hazardous Material Lifelines



3.9.9 OTHER CRITICAL FACILITIES

Some facilities that are identified as critical for hazard mitigation do not fit in any of FEMA's community lifeline categories. Key facilities and services considered for the inventory that are considered other critical facilities include:

- Libraries
- Park Facilities
- Polling Centers

Figure 3-18 shows the location of other facilities included in the lifelines inventory for this HMP. The inventory included 71 other facilities.

3.10 NATURAL, HISTORIC AND CULTURAL RESOURCES

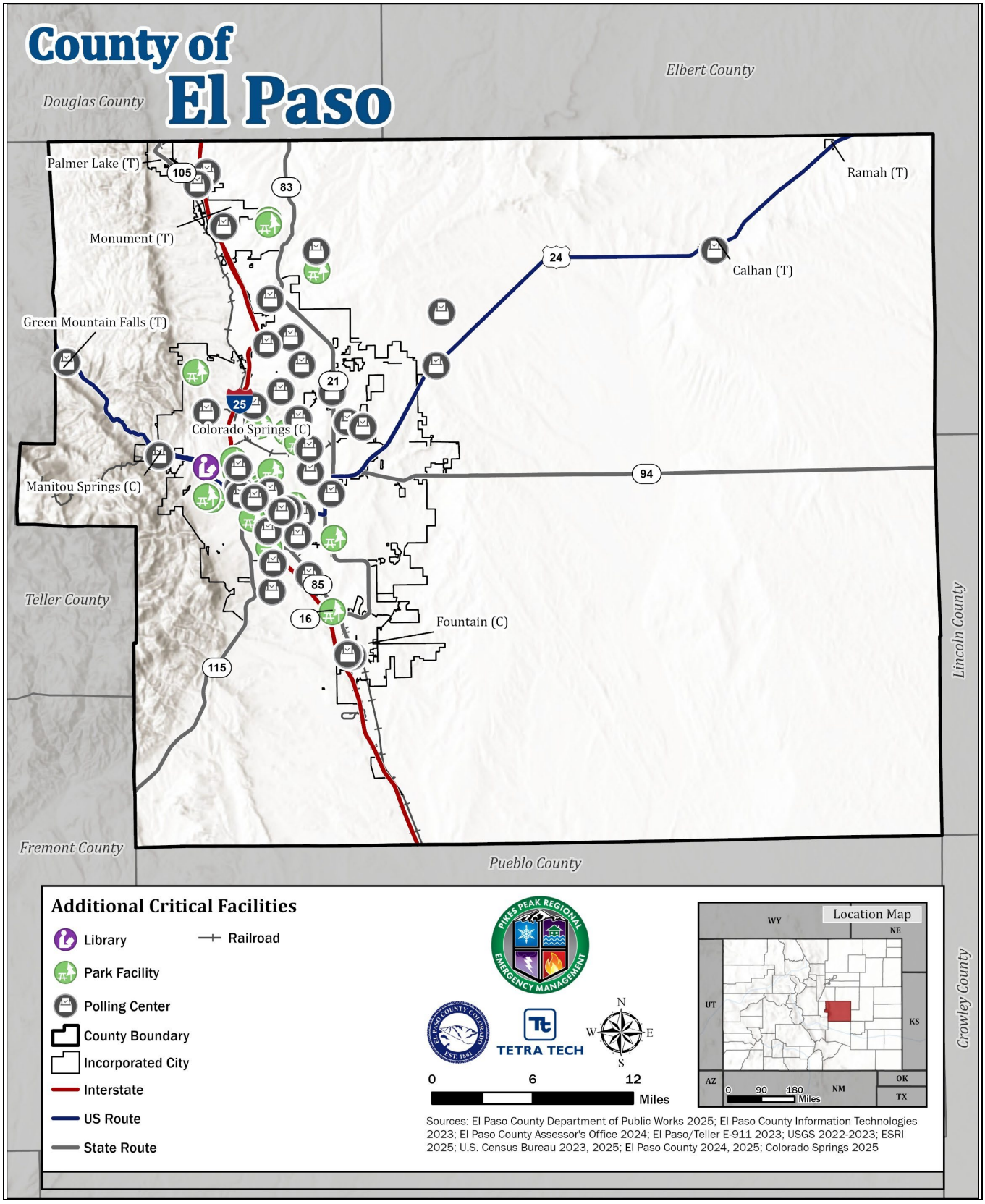
El Paso County is rich in natural, historic, and cultural resources. Natural resources include parks, open spaces, and scenic areas that provide recreational opportunities and habitat for wildlife. Historic resources include landmarks such as the Manitou Cliff Dwellings and the City of Colorado Springs Pioneers Museum. The county's cultural resources are reflected in its diverse communities and events that celebrate its heritage (El Paso County Cultural Services, 2021).

3.10.1 NATURAL RESOURCES

El Paso County is home to a variety of natural resources that contribute to its ecological diversity and recreational opportunities:

- Pikes Peak: One of Colorado's most famous mountains, Pikes Peak stands at 14,115 feet and is part of the Rocky Mountain range. It is a popular destination for hiking, sightseeing, and outdoor recreation, drawing thousands of visitors each year.
- Garden of the Gods: This public park features stunning red rock formations and offers a range of recreational activities, including hiking, rock climbing, and biking. It is recognized as a National Natural Landmark and is a significant tourist attraction.
- Cheyenne Mountain State Park: This park encompasses over 2,700 acres of diverse ecosystems, including forests, grasslands, and wildlife habitats. It offers hiking trails, camping, and opportunities for wildlife viewing.
- Fountain Creek: This watershed is a critical natural resource that supports local ecosystems and provides water for agricultural and urban uses. The creek is also prone to flooding, which can impact surrounding areas.

Figure 3-18. Other Critical Facilities



3.10.2 HISTORIC RESOURCES

El Paso County's history is reflected in its numerous historic sites and landmarks:

- Manitou Cliff Dwellings: These ancient dwellings, built by the Ancestral Puebloans, are a significant archaeological site that provides insight into the region's Native American history. The site is preserved as a museum and cultural center.
- City of Colorado Springs Pioneers Museum: Housed in a historic courthouse, this museum showcases the history of El Paso County and the Pikes Peak region, featuring exhibits on local culture, heritage, and historical artifacts.
- Old Colorado City: Once the capital of the Colorado Territory, Old Colorado City is now a historic district with preserved buildings, shops, and galleries that reflect the area's 19th-century architecture and history.
- The Broadmoor Hotel: This historic luxury hotel, opened in 1918, is known for its stunning architecture and beautiful gardens. It has hosted numerous dignitaries and events, making it a significant cultural landmark.

3.10.3 CULTURAL RESOURCES

El Paso County's cultural resources reflect its diverse population and rich traditions:

- Cultural Festivals: Events such as the City of Colorado Springs Labor Day Lift Off and the Pikes Peak International Hill Climb celebrate local culture and community spirit through art, music, and food.
- Art and Music Venues: The City of Colorado Springs Fine Arts Center, Ford Amphitheater, and the Pikes Peak Center for the Performing Arts host a variety of artistic performances and exhibitions, enriching the cultural landscape of the county.
- Military Heritage: The presence of military installations contributes to the county's culture, with events and programs that honor veterans and active-duty service members, such as the annual Armed Forces Day Parade.

4. RISK ASSESSMENT METHODOLOGY AND TOOLS

A risk assessment is the process of evaluating the potential loss of life, personal injury, and economic and property damage that could result from identified hazards. Identifying potential hazards and vulnerable assets allows planning personnel to address and reduce hazard impacts and allows emergency management personnel to establish early response priorities. Results of the risk assessment are used in subsequent mitigation planning processes, including determining and prioritizing mitigation actions that reduce each jurisdiction's risk from each hazard. Past, present, and future conditions must be evaluated to assess risk most accurately for the county and participating jurisdictions. The process focuses on the following elements:

- Identify Hazards of Concern—Use all available information to determine what types of hazards may affect a jurisdiction.
- Profile Each Hazard—Understand each hazard in terms of:
  - Extent—The potential severity of each hazard
  - Location—Geographic area most likely to be affected by the hazard
  - Previous occurrences and losses
  - Impacts of Climate Change
  - Probability of future hazard events
- Assess Vulnerability and Impacts—Use all available information to estimate to what extent populations and assets may be adversely affected by a hazard now and in the future:
  - Determine vulnerability—Estimate the total number of assets in the jurisdiction that are likely to experience a hazard event if it occurs by overlaying hazard maps with the asset inventories.
  - Estimate potential impacts/losses—Assess the impact of hazard events on the people, property, economy, and lands of the region, including estimates of the losses associated with potential damage or cost that can be avoided by mitigation.
  - Evaluate future changes that may affect vulnerability and impacts—Analyze how demographic changes, projected development, and climate change impacts can alter current vulnerability and potential impacts.

The Pikes Peak Regional risk assessment was updated using the following best-available information:

- A new building stock inventory was generated using U.S. Army Corps of Engineers, National Structure Inventory 2022; and 2024 RSMeans cost adjustment values.
- 2020 Decennial Census Population data and 2019-2023 American Community Survey 5-year Population Estimates were utilized.
- Critical facilities were updated and reviewed by the Planning Partnership.

- Lifelines were identified in the critical facility inventory to align with FEMA's community lifeline definition.
- FEMA's Hazus program was used to estimate potential impacts from the flood, wind, and seismic hazards.
- Best-available hazard data were used, as described in this section.

4.1 PREVIOUS EVENTS AND PROBABILITY OF OCCURRENCE

Based on records of previous hazard events and consideration of potential future changes that could affect the frequency of future events, a rating has been assigned to each hazard of concern in this HMP for the future probability of occurrence of that hazard. The following were the primary sources for identifying previous occurrences:

- **FEMA disaster declarations**—FEMA records hazard events that have been declared by the president to be disasters, as described in Section 3.3.2.
- **Colorado governor's emergency proclamations**—The governor of Colorado is authorized to proclaim an emergency statewide or at local levels. Such proclamations trigger emergency powers and assistance programs. The governor can issue an emergency proclamation when a state of emergency exists, defined in state code as conditions of disaster or extreme peril to people and property that are of a magnitude to be beyond the control of individual local governments. Emergency proclamations are a prerequisite when requesting a federal disaster declaration.
- **U.S. Department of Agriculture disaster declarations**—The U.S. Secretary of Agriculture is authorized to designate counties as disaster areas to make emergency loans to producers suffering losses in those counties and in contiguous counties.
- **Hazard-specific databases**—Sources that provide records of specific types of hazard events include the National Centers for Environmental Information's Storm Events Database, the National Integrated Drought Information System's U.S. Drought Monitor, and the U.S. Geological Survey's Earthquake Catalog.
- **News reports and previously published planning documents** such as the Colorado State Hazard Mitigation Plan and the previous Pikes Peak Regional Multi-Hazard Mitigation Plan.

Probability of future hazard events means the likelihood of the hazard occurring or reoccurring. The probability of occurrence ratings were assigned as outlined in Table 4-1.

Table 4-1. Probability Ratings for Future Hazard Event Occurrence

Probability of Annual Occurrence	Percent Chance of Annual Occurrence
Unlikely	≤ 1%
Rare	>1% - 10%
Occasional	>10% - 100%
Frequent	>100% (hazard event is likely to occur multiple times per year)

4.2 ASSET INVENTORIES

Planning area assets were identified to assess vulnerability and potential impacts from the hazards of concern. This HMP assesses the following types of assets: population, buildings, critical facilities, community lifelines, and the environment. Each asset type is described below. To protect individual privacy and the security of critical facilities, information on properties assessed is presented in aggregate, without details about specific individual properties.

4.2.1 POPULATION

Statistics from the 2020 Decennial Census Population estimate and 2019-2023 American Community Survey (ACS) 5-year estimate were used to estimate the vulnerability of and potential impacts on the County's population. Socially vulnerable populations included in the risk assessment are people under 5 years old or over 65 years old, people living below the poverty level, non-English speaking individuals, and people with a disability.

To determine the population statistics for the town of Green Mountain Falls, StatsAmerica was used to calculate the percentage of the town's population only within El Paso County since this town is divided between El Paso County and Teller County. Population counts at the jurisdictional level were averaged among the residential structures in the county to estimate the population at the structure level. This estimate provides a more precise distribution of population across the county compared to only using the Census block or Census tract boundaries.

FEMA's Hazus program was used to estimate potential impacts on people from flood and seismic hazards. The Hazus model estimates sheltering requirements and potential deaths and injuries.

Vulnerable populations included in the risk assessment are children, elderly, population below the poverty level, non-English speaking individuals, and persons institutionalized with a disability.

4.2.2 BUILDINGS

A custom general building stock inventory was created for this HMP. The general building stock was updated countywide using the National Structure Inventory database (NSI, 2022) as designed and made available by the U.S. Army Corps of Engineers (USACE). The National Structure Inventory (NSI) is a system of databases containing structure inventories of varying quality and spatial coverage. In 2018 and 2019 the NSI team created the data using the following inputs from numerous input data sources. The two main sources of data are CoreLogic parcel files for residential structures and ESRI business layer for non-residential structures. Each data file used contains data on the type of development that exists at a given location. Attributes provided in the associated files were used to further define each structure, such as year built, number of stories, occupancy class, and square footage. The centroid of each building footprint was used to estimate the building location.

Structural and content replacement cost values (RCV) were calculated for each building using the available assessor data, the building footprint, and RSMeans 2024 values. RCV is the current cost of returning a destroyed asset to its pre-damaged condition using present-day cost of labor and materials. Total RCV consists of both the structural cost to replace a building and the estimate

value of contents of a building. Content value was estimated as 50 percent of the structure value for residential buildings, and 100 percent of the structure value for non-residential buildings.

A regional location factor for the project area was applied based on the individual building stock's zip code locations. Only the first three digits of the zip code are used, location factors are designated based upon a city or a larger rural area. Table 4-2 shows the regional location factor applied for this HMP.

Table 4-2. RCV Regional Location Factor

Zip Code Area	Residential	Non-Residential
800xx – 802xx (Denver)	0.90	0.92
808xx – 809xx (City of Colorado Springs)	0.85	0.88
810xx (Pueblo)	0.86	0.89

RCV is the current cost of returning an asset to its pre-damaged condition using present-day cost of labor and materials. Total RCV consists of both the structural cost to replace a building and the estimate value of contents of a building. The occupancy classes available in Hazus were condensed into the categories of residential, commercial, industrial, agricultural, religious, governmental, and educational to facilitate analysis and presentation of results. Residential loss estimates addressed both multi-family and single-family dwellings.

4.2.3 CRITICAL FACILITIES AND COMMUNITY LIFELINES

A critical facility inventory, which includes government facilities, utilities, transportation assets and other facilities, was developed using the following sources: Colorado Department of Public Health and Environment (2018-2019, 2023-2025); El Paso County (2025); Homeland Infrastructure Foundation-Level Data (2024-2025); National Center for Education Statistics (2025); U.S. Army Corps of Engineers (2025); City of Colorado Springs (2025); Colorado Springs Utilities (2025); Federal Aviation Administration (2025). The development involved a review for accuracy, additions, or deletions of new or moved critical assets, identification of backup power for each asset (if known) and whether the critical facility is considered a lifeline in accordance with FEMA's definition.

4.2.4 ENVIRONMENT AND LAND COVER

National land cover data created by the U.S. Geological Survey (USGS) in 2023 was converted from a raster to a vector polygon, which informed spatial areas of built and natural areas. The built land use areas were defined as urban areas and include developed open space, low, medium, and high intensity locations. Non-urban areas were extracted into agricultural, barren land, forest, rangeland, water, and wetlands land cover categories.

4.2.5 NEW DEVELOPMENT

New Development was not analyzed as part of this hazard mitigation plan update.

4.3 VULNERABILITY AND IMPACT ASSESSMENT METHODOLOGY

El Paso County used standardized tools, combined with local, state, and federal data and expertise to assess potential vulnerability and losses associated with hazards of concern. Three levels of analysis were used, depending upon the data available for each hazard:

- **Qualitative Review**—This analysis includes an examination of historical impacts to understand potential impacts of future events of similar size. Potential impacts and losses are discussed qualitatively using best-available data and professional judgment.
- **Vulnerability Analysis**—This analysis involves overlaying available spatial hazard layers, for hazards with defined locations, on asset mapping in Geographic Information System (GIS) to determine which assets are located in the hazard area.
- **Loss Estimation**—The FEMA Hazus modeling software was used to estimate impact in terms of potential losses for the following hazards: flood and earthquake.

Table 4-3 summarizes the type of analysis conducted by hazard of concern.

Table 4-3. Summary of Risk Assessment Analyses

Hazard	Population	General Building Stock	Critical Facilities	New Development
Avalanche	V	V	V	Q
Cyber Attack	Q	Q	Q	Q
Dam/Levee Failure	Q	Q	Q	Q
Drought and Extreme Heat	Q	Q	Q	Q
Earthquake	L	L	L	Q
Epidemic-Pandemic	Q	Q	Q	Q
Extreme Acts of Violence	Q	Q	Q	Q
Flood	V, L	V, L	V, L	Q
Hail	Q	Q	Q	Q
Hazardous Materials	Q	Q	Q	Q
Landslide and Rockfall	V	V	V	Q
Lightning	Q	Q	Q	Q
Major Aircraft Incident	Q	Q	Q	Q
Mud and Debris Flow	V	V	V	Q
Subsidence and Sinkholes	V	V	V	Q
Tornado	Q	Q	Q	Q
Wildfire	V	V	V	Q
Wind	Q	Q	Q	Q
Winter Storm	Q	Q	Q	Q

Note: V = vulnerability analysis; L = loss estimation; Q = qualitative review

4.3.1 HAZUS

Hazus is a Geographic Information System (GIS)-based software tool developed by FEMA that uses engineering and scientific risk calculations to estimate damage and loss. Its use is accepted by FEMA and provides a consistent framework for assessing risk across a variety of hazards. Hazus uses GIS technology to produce detailed maps and analytical reports that estimate direct physical damage to building stock, critical facilities, transportation systems and utility systems. To generate this information, Hazus provides default data for inventory, vulnerability, and hazards; this default data can be supplemented with local data to provide a more refined analysis. Analyses that use the default Hazus data are called basic analyses, and those that update the Hazus default with current local data are called advanced analyses.

Hazus damage reports can include induced damage (inundation, fire, threats posed by hazardous materials and debris) and direct economic and social losses (casualties, shelter requirements, and economic impact) depending on the hazard and available local data. Hazus' open data architecture can be used to manage community GIS data in a central location. The use of this software also promotes consistency of data output now and in the future and standardization of data collection and storage.

For this HMP, losses were estimated in Hazus using depth grids for the flood analysis and probabilistic (mean return period) analyses and seismic hazards. The probabilistic model generates estimated damage and losses for specified return periods (e.g., 100- and 500-year).

4.3.2 HAZARD-SPECIFIC METHODOLOGIES

Avalanche

There is no mapped avalanche risk zone information available for the Pikes Peak Region; however, a slope analysis was performed in order to identify areas that may potentially be at risk for an avalanche event.

A vulnerability analysis was conducted using a 1-meter digital elevation model from the U.S. Geological Survey (USGS) to determine areas where slopes are between 30-50 degrees and where elevations are greater than 8,000-feet. The slope angle for avalanche was obtained from: Avalanche.org » Slope Angle. *The website explains that: Most slab avalanches initiate on slopes where the steepest slope angle is between 30° and 50°*. Therefore, this parameter was used when conducting the slope analysis.

The county's assets (population, buildings, and critical facilities) were examined to determine if they are built in areas of the avalanche hazard area. Assets with their centroid located in the hazard area were totaled to estimate the totals and values at risk from the impacts of an avalanche.

Cyber Attack

All of El Paso County is at risk from the impacts of drought and extreme heat events. A qualitative analysis was conducted to assess the county's vulnerability to this hazard of concern.

Dam/Levee Failure

All of El Paso County is at risk from the impacts of dam/levee failure events. A qualitative analysis was conducted to assess the county's vulnerability to this hazard of concern.

Drought and Extreme Heat

All of El Paso County is at risk from the impacts of drought and extreme heat events. A qualitative analysis was conducted to assess the county's vulnerability to this hazard of concern.

Earthquake

A probabilistic assessment was conducted for the 500-year mean return period earthquake events through an advanced analysis in Hazus. The probabilistic method uses information from historical earthquakes and inferred faults, locations, and magnitudes to compute probable ground shaking levels, by Census tract, for a seismic event of a selected a recurrence period. Hazus' potential loss estimates are acceptable for the planning-level purposes of this HMP.

Groundwater was set at a depth of 5 feet (default setting). The default assumption is a magnitude 7.0 earthquake for all return periods. Although damages are estimated at the census tract level, results were presented at the municipal level. Because there are multiple Census tracts that contain more than one jurisdiction, an area analysis was used to extract the percent of each tract that falls within individual jurisdictions. The percentage was multiplied against the results calculated for each tract and summed for each jurisdiction.

Damage estimates were calculated for losses to buildings (structural and non-structural) and contents. Structural losses include load carrying components of the structure. Non-structural losses include those to architectural, mechanical, and electrical components of the structure, such as nonbearing walls, veneer and finishes, HVAC systems, boilers, etc.

Extreme Acts of Violence

All of El Paso County is at risk from the impacts of extreme acts of violence events. A qualitative analysis was conducted to assess the county's vulnerability to this hazard of concern.

Flood

The 1- and 0.2-percent annual chance flood events were examined to evaluate the county's risk from the flood hazard. These flood events are generally those considered by planners and evaluated under federal programs such as NFIP. The following data were used to evaluate vulnerability and determine potential future losses for this plan update:

- The El Paso County FEMA Effective Digital Flood Insurance Rate Map (DFIRM) dated December 07, 2018 with the latest LOMR date of May 12, 2025.
- A riverine depth grid was created by use of the effective County DFIRM data and a 1-meter Digital Elevation Model provided by USGS (2020-2023).

The effective El Paso County FEMA DFIRM published in 2018/2025 was used to evaluate vulnerability and determine potential future losses. The depth grid generated using the DFIRM and 1-meter DEM was integrated into the Hazus riverine flood model and used to estimate potential losses for the 1-percent annual chance flood event.

Vulnerability Analysis

To estimate vulnerability to the 1-percent- and 0.2-percent annual chance flood events, the DFIRM flood boundaries were overlaid on the centroids of updated assets (population, building stock, and critical facilities). Centroids that intersected the flood boundaries were totaled to estimate the building RCV and population vulnerable to the flood inundation areas.

Loss Estimation

The Hazus riverine flood model was run to estimate potential losses in El Paso County for the 1-percent annual chance flood event. An advanced analysis was performed for the building stock and critical facilities. Buildings located within the floodplain were imported as user-defined facilities to estimate potential losses at the structural level. Hazus calculated the estimated potential losses to the population (default 2020 U.S. Census data), potential damage to the general building stock, and potential damage to critical facilities based on the depth grids generated and the default Hazus damage functions in the flood model.

Hail

All of El Paso County is at risk from the impacts of hail. A qualitative analysis was conducted to assess the county's vulnerability to this hazard of concern.

Hazardous Materials

All of El Paso County is at risk from the impacts of hazardous materials. A qualitative analysis was conducted to assess the county's vulnerability to this hazard of concern.

Landslide & Rockfall

A vulnerability analysis was conducted using areas susceptible to landslide and rockfall, developed by the Colorado Geological Survey. The landslide inventory was compiled by digitizing landslide deposits visible on 1-m resolution lidar datasets and high-resolution imagery and joining it with previously cataloged landslide inventories from various published data sets and mapping projects.

The county's assets (population, buildings, and critical facilities) were examined to determine if they are built in areas susceptible to landslide and/or rockfall. Assets with their centroid located in the hazard area were totaled to estimate the totals and values at risk from the impacts of landslides & rockfall.

Lightning

All of El Paso County is at risk from the impacts of lightning. A qualitative analysis was conducted to assess the county's vulnerability to this hazard of concern.

Major Aircraft Incident

All of El Paso County is at risk from the impacts of a major aircraft incident. A qualitative analysis was conducted to assess the county's vulnerability to this hazard of concern.

Mud and Debris Flow

A vulnerability analysis was conducted using the Colorado Geological Survey (2018) polygons represent areas that may be susceptible to debris flows, especially during extreme precipitation events. The spatial data sourced by the geological survey depict generalized areas that may be susceptible to debris flows based on available Geographic Information System (GIS) data and limited field observations in easily accessible areas.

The county's assets (population, buildings, and critical facilities) were examined to determine if they are built in areas susceptible to debris flow. Assets with their centroid located in the hazard area were totaled to estimate the totals and values at risk from the impacts of debris flow.

The geological survey has stated the following limitations of the spatial data: These polygons depict generalized areas that may be susceptible to debris flows based on available GIS data and limited field observations in easily accessible areas. The polygons were generated at a scale of approximately 1:24,000 (1 inch = approx. 0.4 mi.) and are not valid if enlarged to scales greater than 1:24,000.The degree of susceptibility to a particular geologic hazard, in any given area, is related to ever-changing natural and human-induced conditions, and any alteration in the natural landscape may increase or decrease susceptibility to a particular hazard. The polygons are not intended to assign risk, or indicate the degree, severity, recurrence interval, or exact boundary of individual debris flows or debris-flow susceptible areas. Because of limitations associated with the mapping scale and the scope of this project, some areas that may be susceptible to potentially damaging but localized debris flows near the mouths of small gullies or at the base of steep slopes may not be included. Additionally, some higher-order streams in larger mountain valleys that have been mapped as debris flow susceptibility areas may be more likely to produce water floods than debris flows depending on local rainfall-runoff conditions and availability of erodible sediment and debris in the basin. Inclusion of existing structures and infrastructure within a mapped susceptibility area does not necessarily indicate that debris-flow impacts will occur, in only indicates that these features may be more exposed to debris-flow events than similar features located in other areas.

Pandemic/Epidemic

All of El Paso County is at risk from the impacts of a pandemic/epidemic. A qualitative analysis was conducted to assess the county's vulnerability to this hazard of concern.

Subsidence & Sinkhole

A vulnerability analysis was conducted using areas susceptible to collapsible soils, evaporite bedrock and subsidence areas developed by the Colorado Geological Survey. Specifically, the Colorado Geologic Survey's subsidence hazards areas, collapsible soil areas, and evaporite bedrock layers were combined to form a hazard layer.

The county's assets (population, buildings, and critical facilities) were examined to determine if they are built in areas susceptible to subsidence and sinkholes. Assets with their centroid located in the hazard area were totaled to estimate the totals and values at risk from the impacts of subsidence and sinkholes.

Tornado

All of El Paso County is at risk from the impacts of a tornado. A qualitative analysis was conducted to assess the county's vulnerability to this hazard of concern.

Wildfire

A vulnerability analysis was conducted using the Wildland Urban Interface Risk areas developed by the Colorado Wildfire Risk Assessment (CO-WRA). The Wildland-Urban Interface (WUI) Risk Index layer is a rating of the potential impact of a wildfire on people and their homes. The WUI Risk Index has been calculated consistently for all areas in Colorado, which allows for comparison and ordination of areas across the entire state. Data is modeled at a 20-meter cell resolution, which is consistent with other CO-WRA layers. The risks analyzed were the moderate, high and highest risks.

The county's assets (population, buildings, and critical facilities) were examined to determine if they are built in areas susceptible to wildfire. Assets with their centroid located in the hazard area were totaled to estimate the totals and values at risk from the impacts of wildfire.

Wind

All of El Paso County is at risk from the impacts of an extreme wind event. A qualitative analysis was conducted to assess the county's vulnerability to this hazard of concern.

Winter Storm

All of El Paso County is exposed and vulnerable to the winter storm hazard. In general, structural impacts include damage to roofs and building frames, rather than building content. Current modeling tools are not available to estimate specific losses for this hazard. A qualitative analysis was conducted to assess the county's vulnerability to this hazard of concern.

4.4 CONSEQUENCE ANALYSIS METHODOLOGY

This HMP includes a consequence analysis for each of the hazards identified in Chapter 5 to 24 to consider the impact on the following:

- Public
- Responders
- Continuity of operations, including continued delivery of services
- Property, facilities, and infrastructure
- Environment
- The economic condition of the jurisdiction
- Public confidence in the jurisdiction's governance

The analysis for each hazard presents answers to the following questions:

- Describe the methodology utilized to conduct the consequence analysis.
- Describe how the consequences on the public have been analyzed for the identified hazards.
- Provide how the program defines the public and provide a description of who it is.

- Describe how the consequences on responders have been analyzed for the identified hazards.
- Provide how the program defines responders and provide a description of who it is.
- Describe how the consequences on the continuity of operations, including continued delivery of services, have been analyzed for the identified hazards.
- Provide how the program defines continuity of operations and provide a description of what it is.
- Provide a description of the delivery of services and what it includes.
- Describe how the consequences on property, facilities, and infrastructure have been analyzed for the identified hazards.
- Provide how the program defines the property and provide a description of what it is.
- Provide how the program defines facilities and provide a description of what it is.
- Provide how the program defines the infrastructure and provide a description of what it is.
- Describe how the consequences on the environment have been analyzed for the identified hazards.
- Provide how the program defines the environment and provide a description of what it is.
- Describe how the consequences on the economic condition of the jurisdiction have been analyzed for the identified hazards.
- Provide how the program has determined the economic condition of the program and provide a description of what it is.
- Describe how the consequences on the public's confidence in the jurisdiction's governance have been analyzed for the identified hazards.
- Provide how the program has determined public confidence in the jurisdiction's governance and provide a description of what it is.

4.5 DATA SOURCE SUMMARY

Table 4-4 summarizes the data sources used for the risk assessment for this plan.

4.6 LIMITATIONS

Loss estimates, vulnerability analyses, and hazard-specific impact evaluations rely on the best-available data and methodologies. Uncertainties are inherent in any loss estimation methodology and arise in part from incomplete scientific knowledge concerning hazards and their effects on the built environment. Uncertainties also result from the following:

- Approximations and simplifications necessary to conduct such a study
- Incomplete or dated inventory, demographic, or economic parameter data
- The unique nature, geographic extent, and severity of each hazard
- Mitigation measures already employed by the participating jurisdictions
- The amount of advance notice residents have to prepare for a specific hazard event
- Uncertainty of climate change projections

Table 4-4. Risk Assessment Data Documentation

Data	Source	Date	Format
Population data	U.S. Census Bureau; American Community Survey 5-Year Estimates	2020; 2023	Comma-Separated Values
Building Inventory	U.S. Army Corps of Engineers, National Structure Inventory; RSMeans	2022; 2024	Digital (GIS)
Critical Facilities	[1]Colorado Department of Public Health and Environment; [2]El Paso County; [3]Homeland Infrastructure Foundation-Level Data; [4]National Center for Education Statistics; [5]U.S. Army Corps of Engineers; [6]City of Colorado Springs; [7]Federal Aviation Administration; [8]Colorado Springs Utilities	[1]2018-2019, 2023-2025; [2]2025; [3]2024, 2025; [4]2025; [5]2025; [6]2025; [7]2025; [8]2025	Digital (GIS)
Land Cover	National Land Cover Database; U.S. Geological Survey	2023	Digital (GIS)
Effective Digital Flood Insurance Rate Map (DFIRM) Data	FEMA	2018/2025	Digital (GIS)
Digital Elevation Model (1-meter)	U.S. Geological Survey	2020-2023	Digital (GIS)
Avalanche	Tetra Tech; U.S. Geological Survey	2025; 2020-2023	Digital (GIS)
Debris Flow	Colorado Geological Survey	2018	Digital (GIS)
Landslide and Rockfall	Colorado Geological Survey	undated	Digital (GIS)
Subsidence and Sinkhole	Colorado Geological Survey	undated	Digital (GIS)
Wildfire	Colorado Wildfire Risk Assessment	2022	Digital (GIS)

These factors can result in a range of uncertainty in loss estimates, possibly by a factor of two or more. Therefore, potential vulnerability and loss estimates are approximate. These results do not predict precise results and should be used to understand relative risk. Over the long term, El Paso County will collect additional data and update and refine existing inventories to assist in estimating potential losses.

Potential economic loss is based on the present value of the general building stock using best-available data. The county acknowledges significant impacts may occur to critical facilities and infrastructure as a result of these hazard events causing great economic loss. However, monetized damage estimates to critical facilities and infrastructure, and economic impacts were not quantified and require more detailed loss analyses. In addition, economic impacts to industry such as tourism and the real-estate market were not analyzed.

4.7 CONSIDERATIONS FOR MITIGATION AND NEXT STEPS

The following items are to be discussed for considerations for the next plan update to enhance the risk assessment:

- All Hazards
  - Create an updated user-defined general building stock dataset using up-to-date parcels, footprints, and RSMeans values.
  - Utilize updated and current demographic data.
- Avalanche
  - Create a mapped avalanche risk zone for the Pikes Peak Region. Remote sensing technologies like LiDAR and aerial surveys can provide valuable data on snowpack conditions, aiding in avalanche forecasting and mitigation efforts.
- Cyber Attack
  - Incorporate the most current available data from the American Census Survey (ACS) to analyze the impact of cyber-attack on the overall population and socially vulnerable population.
- Dam/Levee Failure
  - Obtain the most current dam inundation hazard areas in order to support vulnerability and loss estimation analyses.
- Drought and Extreme Heat
  - Track drought and extreme heat data for injuries, deaths, shelter needs, agricultural losses, and other impacts to determine distributions of most at-risk areas.
- Earthquake
  - Identify unreinforced masonry in critical facilities and privately-owned buildings (i.e., residences) by accessing local knowledge, tax assessor information, and/or pictometry/orthophotos. These buildings may not withstand earthquakes of certain magnitudes and plans to provide emergency response or recovery efforts at these properties can be developed.
  - Analyze an exposure analysis on National Earthquake Hazard Reduction Program (NEHRP) D&E Soils where applicable within the County
- Extreme Acts of Violence
  - Assess terrorist activity on the overall life, health, and safety of the entire population and critical lifelines in place.
- Flood
  - The general building stock inventory can be updated to include attributes regarding first floor elevation and foundation type (basement, slab on grade, etc.) to enhance loss estimates.

  - Conduct a Hazus loss analysis for more frequent flood events (e.g., 10- and 50-year flood events).
  - Conduct a repetitive loss area analysis.
  - Continue to expand and update urban flood areas to further inform mitigation.
  - As more current FEMA floodplain data become available (i.e., Digital Flood Insurance Rate Map (DFIRMs)), update the vulnerability analysis and generate a more detailed flood depth grid that can be integrated into the current Hazus version.
- Hail
  - Obtain the most updated building stock data to understand the vulnerability to critical lifelines to hailstorm events.
  - Assess the impacts to socially vulnerable populations, such as the elderly and disabled, to hailstorms pre- and post-events.
- Hazardous Materials
  - Assess the overall population that is within one mile of major roadways and transpiration hubs to identify those most at risk to hazardous material spills.
- Landslide and Rockfall
  - Should the county determine the need for a more detailed assessment of risk, it could determine steep slope by other percentage categorizations.
- Lightning
  - Mapping and assessment of lightning hazards are constantly evolving. As new data and science become available, assessments of risk should be reevaluated.
- Major Aircraft Incident
  - Assessment of location and function for all aircraft facilities to detail the vulnerability and impacts to overall population, environment, and critical facilities nearby.
- Mud and Debris Flow
  - Mapping and assessment of mud and debris flow hazards are constantly evolving. As new data and science become available, assessments of risk should be reevaluated.
  - If available, general building stock inventory could be updated to include attributes such as codes and standards the structures were constructed to.
- Pandemic/Epidemic
  - Utilize the most updated data and advisories from the Colorado Department of Public Safety for impact to the overall population and socially vulnerable people.
- Subsidence and Sinkholes
  - Utilize historical records of subsidence, groundwater extraction, rainfall, and other relevant factors to understand past subsidence events and identify patterns.
- Tornado

  - Mapping and assessment of tornado hazards are constantly evolving. As new data and science become available, assessments of risk should be reevaluated.

- Wildfire
  - General building stock inventory can be updated to include attributes such as roofing material, fire detection equipment, or distance to fuels as another measure of vulnerability.

- Wind
  - The general building stock inventory can be updated to include attributes regarding protection against strong winds, such as hurricane straps, to enhance loss estimates.
  - Integrate resident/population movement road data that is currently being developed.

- Winter Storm
  - If available for the region, obtain average snowfall distributions to determine if various areas in the county have historically received higher snowfalls and might continue to be more susceptible to higher snowfalls and snow loads on the building stock and critical facilities and infrastructure.

5. IDENTIFICATION OF HAZARDS OF CONCERN

5.1 REVIEW OF POTENTIAL HAZARDS

To provide a strong foundation for mitigation actions in this plan, PPROEM considered a full range of hazards that could impact the area. The final hazards of concern were identified based on the results of the 2023 Colorado Emergency Preparedness Assessment (CEPA), which is a hazard identification and risk assessment. The assessment identified the following hazards as posing the most risk to the Pikes Peak Region:

- Cyber attack
- Infrastructure failure
- Wildfire
- Severe winter weather
- Landslides, mud/debris flows, and rockfalls
- Flood
- Hail

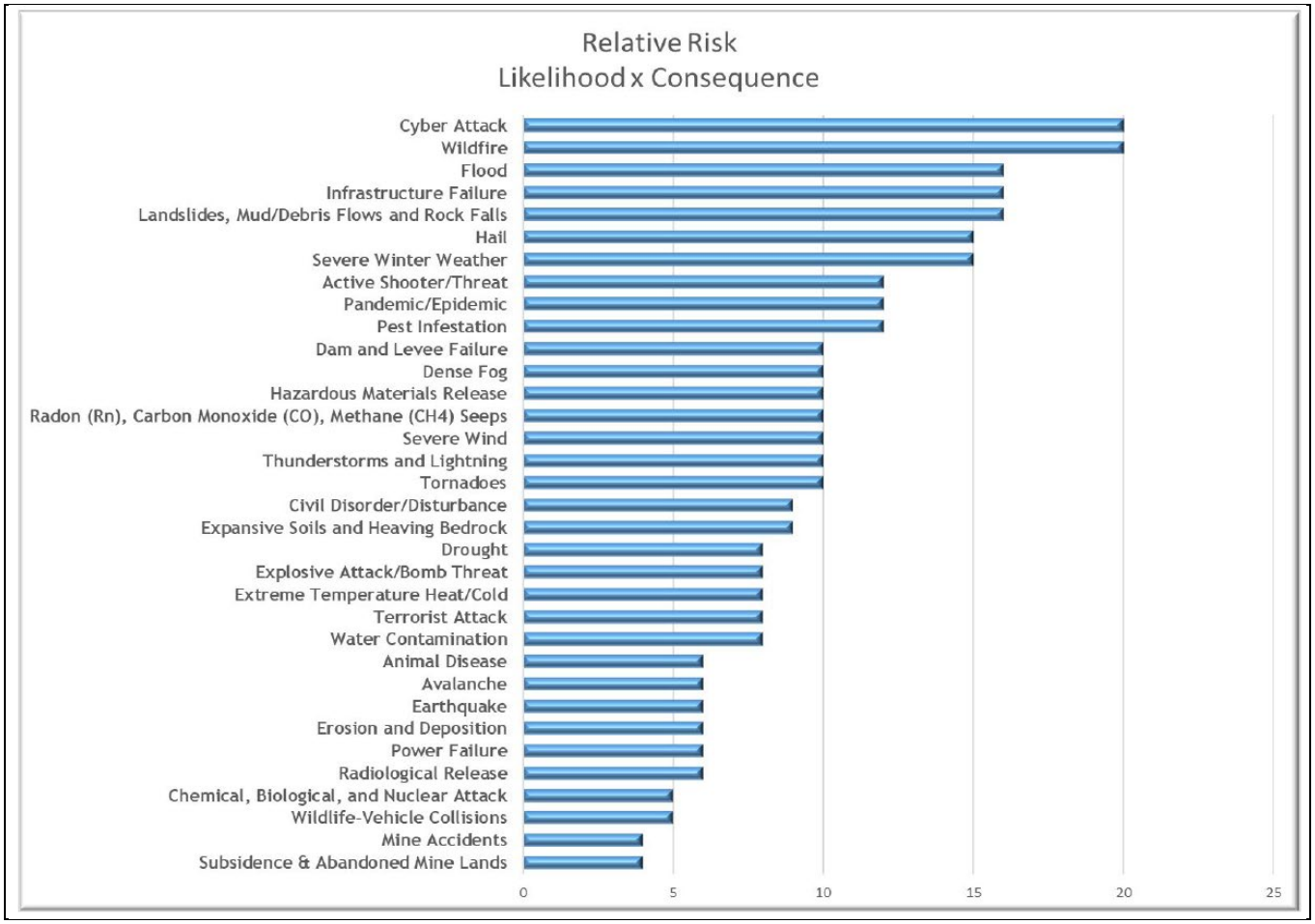
Figure 5-1 shows the results of the CEPA relative risk results for El Paso County. In addition to the CEPA report, information about hazards was collected from the following:

- Input from all Planning Partners
- Review of the 2023-2028 Colorado Enhanced State Hazard Mitigation Plan (E-SHMP)
- Review of the 2020 Pikes Peak Regional Hazard Mitigation Plan
- Research on the frequency, magnitude, and costs associated with hazards that have previously or could feasibly impact the region
- Qualitative information regarding natural (not human-caused) hazards and the perceived vulnerability of the study area's assets to them

Based on the review of potential hazards of concern, 19 hazards of concern were identified as significant hazards affecting the entire County, to be addressed at the County level in this plan (shown here):

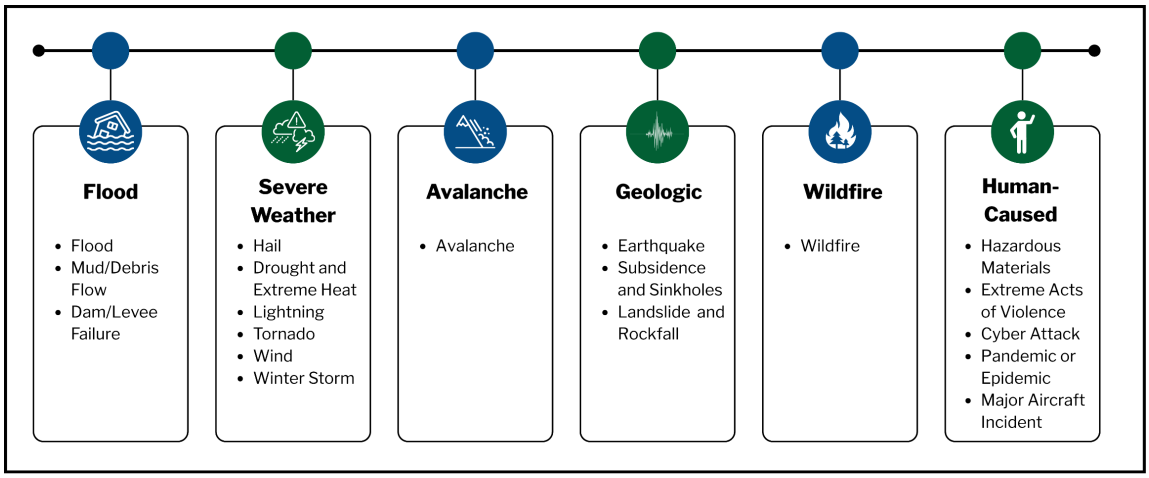
- Flood
- Mud and debris flow
- Dam/levee failure
- Hail
- Drought and extreme heat
- Lightning
- Tornado
- Wind
- Winter storm
- Avalanche
- Earthquake
- Subsidence and sinkholes
- Landfall and rockfall
- Wildfire
- Hazardous materials
- Extreme acts of violence
- Cyber attack
- Pandemic/epidemic
- Major aircraft incident

Figure 5-1. CEPA Risk Assessment



These hazards are the same as the hazards profiled in the 2020 Pikes Peak Regional HMP and the grouping of hazards, as shown on Figure 5-2, was carried forward as well.

Figure 5-2. Hazard Groupings



Other natural and human-caused hazards of concern have occurred within the Pikes Peak Region, but have a low potential to occur, are addressed by other planning mechanisms, and/or do not result in significant impacts within the County. Therefore, these hazards are not addressed in this update. If deemed necessary by the County, these hazards may be considered in future plan updates.

5.2 HAZARD DEFINITIONS AND GROUPINGS

The Hazard Mitigation Planning Team approved use of the following hazard event definitions and groupings:

- A flood is a general and temporary condition of partial or complete inundation of normally dry land areas from:
  - the overflow of stream banks,
  - the unusual and rapid accumulation of runoff of surface waters from any source, or
  - mudflows or the sudden collapse of shoreline land.
- Dam failure occurs when the retention function of the dam is compromised, either in part or in its entirety. A levee breach occurs when part of a levee gives way, creating an opening through which floodwaters
  may pass.
- A mud flow is a mass of water and fine-grained earth that flows down a stream, ravine, canyon, arroyo, or gulch.
- Hail is precipitation that is formed when updrafts in severe storms carry raindrops upward into extremely cold areas of the atmosphere.
- Drought is a shortage of water associated with a deficiency of precipitation due to prolonged climate patterns and occurs when a normal amount of moisture is unavailable to satisfy an area's usual water consumption. Extreme heat events are defined by the U.S. Environmental Protection Agency (EPA) as "summertime weather that is substantially hotter and/or more humid than average for a location at that time of year" (EPA, 2006).
- Lightning is an electrical discharge between positive and negative regions of a thunderstorm.
- Tornadoes are violently rotating columns of air, formed by a combination of atmospheric instability and wind shear.
- Windstorms are a storm featuring violent winds. Windstorms tend to damage ridgelines that face into the winds.
- Winter storms can include heavy snow, ice, and blizzard conditions.
- According to the US National Weather Service, an avalanche is a rapid flow of snow down a hill or mountainside
- An earthquake is caused by a sudden slip on a fault. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and cause the shaking that is felt during an earthquake.

- Subsidence is defined by the Colorado Geological Survey as the sinking of the land over man-made or natural underground voids. Subsidence can occur gradually over a prolonged period of time, or abruptly in the form of sinkholes.
- Landfall (landslides) include a wide range of ground movements from rock fall to slope failure and are primarily attributed to gravity acting on steep slopes. A rockfall is the falling of a newly detached mass of rock from a cliff or down a very steep slope.
- Wildfires result in uncontrolled destruction of forests, brush, field crops, grasslands, and real and personal property in non-urban areas. Because of their distance from firefighting resources, they can be difficult to contain and can cause a great deal of destruction.
- FEMA defines Hazardous Materials as chemical substances that, if released or misused, can pose a threat to the environment or health. Hazardous Materials is a human-caused hazard that results in hazardous material spills.
- Extreme acts of violence is a human-caused hazard which includes terrorism and targeted violence intended to inflict mass injury, destruction, or death and/or is potentially destructive of critical infrastructure or key resources.
- Cyber-attacks are human-caused hazards that include deliberate attacks on information technology (IT) information systems (IS) and/or data in an attempt to gain illegal access or purposely cause damage.
- Epidemics occur when an infectious disease spreads beyond a local population, reaching people in a wider geographical area. When that disease reaches global proportions, it is called a pandemic.
- A major aircraft accident is associated with the operation of an aircraft, which takes place between the time any person boards the aircraft with the intention of flight and all such persons have disembarked, and in which any person suffers death or serious injury, or in which the aircraft receives substantial damage. A major aircraft incident is an occurrence other than an accident with the operation of an aircraft, which affects or could affect the safety of operations.

These groupings are the same as those provided by FEMA (FEMA 386-2 Understanding Your Risks, Identifying Hazards and Estimating Losses; Multi-Hazard Identification and Risk Assessment – The Cornerstone of the National Mitigation Strategy; Local Mitigation Planning Handbook).

6. WILDFIRE

6.1 HAZARD PROFILE

6.1.1 HAZARD DESCRIPTION

The Colorado Wildfire Mitigation Plan defines wildland fire as an unplanned, unwanted wildland fire including unauthorized human-caused fires, escaped wildland fire use events, escaped prescribed fire projects, and all other wildland fires where the objective is to put the fire out.

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

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

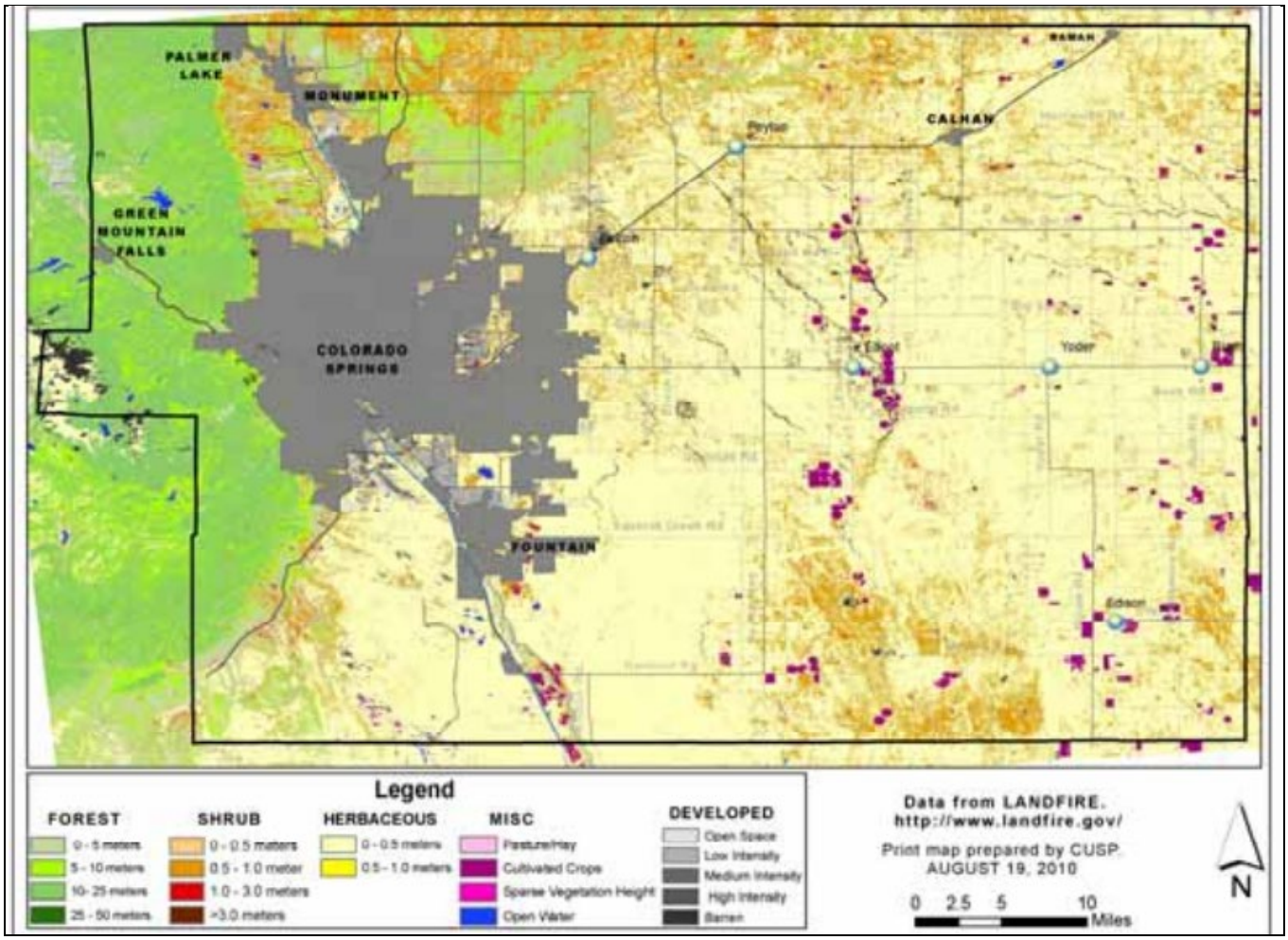
Fire conditions arise from a combination of hot weather, an accumulation of vegetation, and low moisture content in air and fuel. These conditions, especially when combined with high winds and years of drought, increase the potential for wildfire to occur. There are three major factors that sustain wildfires and predict a given area's potential to burn. These factors are fuel, topography, and weather.

Fuel is the material that feeds a fire and is a key factor in wildfire behavior. Fuel is generally classified by type and by volume. Fuel sources are diverse and include everything from dead tree needles and leaves, twigs, and branches to dead standing trees, live trees, brush, and cured grasses. Manmade structures, such as homes and associated combustibles, are also considered a fuel source. The type of prevalent fuel directly influences the behavior of wildfire. Light fuels such as grasses burn quickly and serve as a catalyst for the spread of fire. In addition, "ladder fuels" can

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

As shown in the El Paso County Community Wildfire Protection Plan (CWPP) Vegetation Types Map, Figure 6-1, El Paso County has two primary types of fuel hazards: grasslands and forests. The County's fuel types follow its topography: in the eastern half, with its relatively flat terrain, mostly grasses and shrubs predominate. In the western portion, where foothills rise steeply, thick coniferous forests are typical. The CWPP describes the dense forests of the western County as providing heavy fuel loads that can sustain intense fires, and to complicate matters, thousands of homes are located in these forests, often on steep slopes, accessed by narrow roads.

Figure 6-1. El Paso County CWPP Vegetation Types



Source: El Paso County's Sheriff's Office n.d.

Topography, or an area's terrain and land slope, affects its susceptibility to wildfire spread. Due to the tendency of heat from a fire to rise via convection, both fire intensity and rate of spread increases as slope increases. The arrangement of vegetation throughout a hillside can also contribute to increased fire activity on slopes.

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. Wind is the most treacherous weather factor. The greater the wind, the faster a fire will spread and the more intense it will be. In addition to wind speed, wind shifts can occur suddenly due to temperature changes or the interaction of wind with topographical features such as slopes or steep hillsides. Lightning also ignites wildfires; often in terrain that is difficult for firefighters to reach. Drought conditions contribute to concerns about wildfire vulnerability. During periods of drought, the threat of wildfire increases.

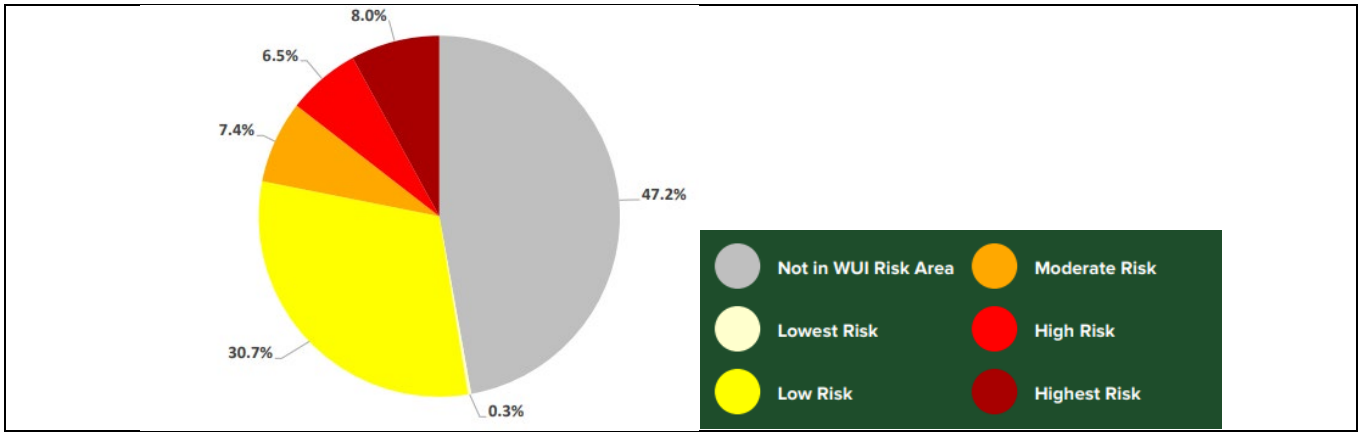
According to the El Paso County CWPP, local fire season generally runs from spring to autumn. However, wildfires can and do occur during winter months, especially during mild, dry winters. Even during winters with normal precipitation, Chinook winds can reduce snow cover, dry fuels and create higher fire danger (El Paso County's Sheriff's Office n.d.).

The Colorado State Hazard Mitigation Plan describes protecting the Wildland-Urban Interface (WUI) as the nation's fastest-growing firefighting expense. In 2015, the U.S. Department of Agriculture (USDA) projected that fighting wildfires will account for 67 percent of the Forest Service's annual budget by 2025. Protecting life and property in these areas is costly because fire managers must take an aggressive stand on the ground and from the air (Colorado - Climate Action 2018).

6.1.2 LOCATION

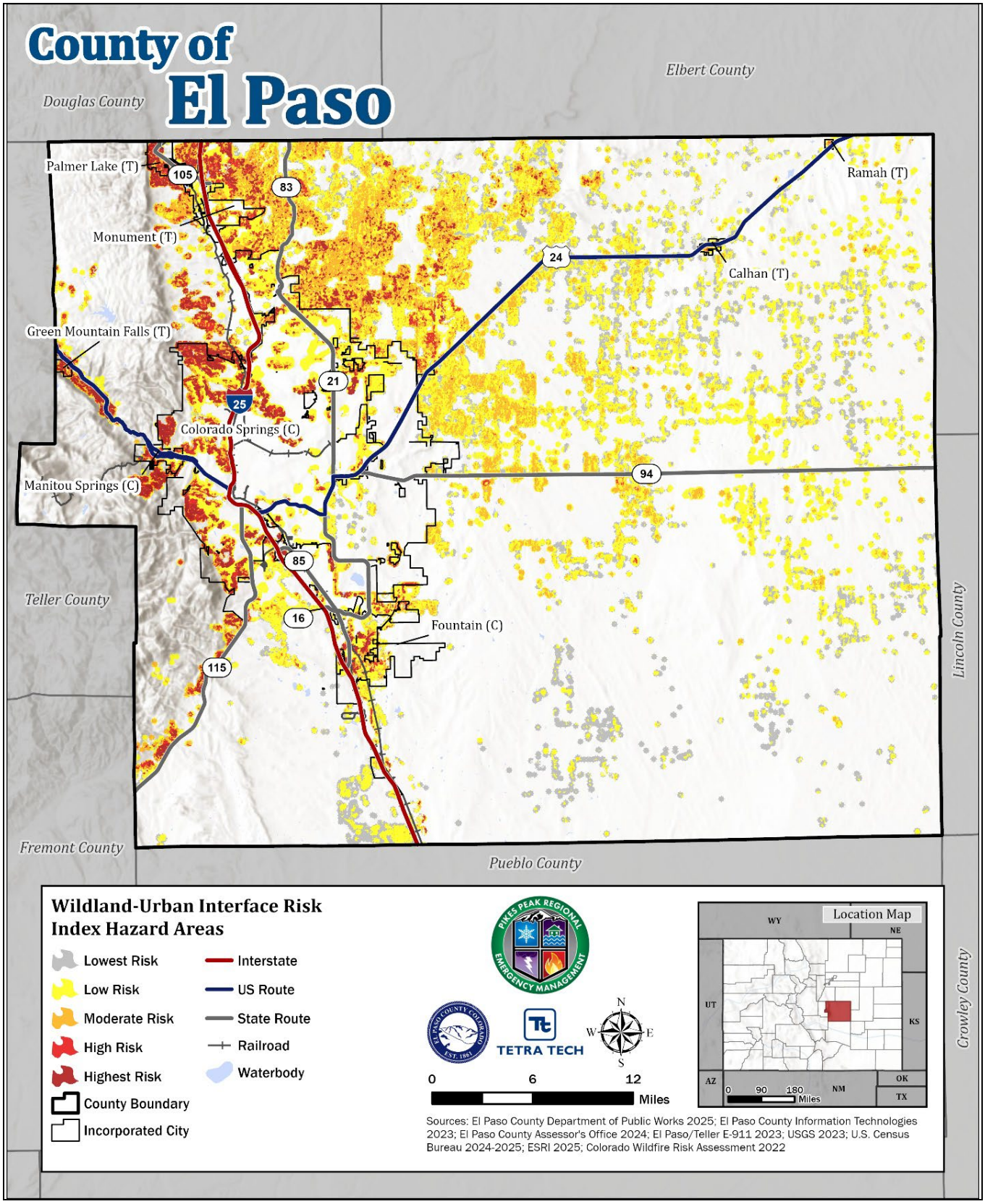
El Paso County continues to lead the state in population growth, and much of this growth is occurring in the Wildland-Urban Interface (WUI) area, where structures and other human improvements meet and mix with undeveloped wildland or vegetative fuels. Population growth within the WUI substantially increases the risk from wildfires. For El Paso County, the Colorado – Wildfire Risk Assessment Portal (CO-WRAP) estimates that 58 percent of the County population lives within the WUI and is at risk from wildfire (Colorado Parks Service 2025). As of 2022, over 2.5 million residents of the state live in the WUI risk area (Colorado Parks Service 2025). Both Figure 6-2 and Figure 6-3 display the WUI risk for El Paso County.

Figure 6-2. Wildland-Urban Interface (WUI) Risk for El Paso County



Source: Colorado Parks Servide n.d.

Figure 6-3. Wildland-Urban Interface (WUI) Risk Index Hazard Areas



The CO-WRAP report for El Paso County maps the Wildland-Urban Interface Risk Index, which is a rating of the potential impact of wildfire on people and their homes. The key input reflects housing density. The CO-WRAP report states that the location of people living in the WUI and rural areas is essential for defining potential wildfire impacts to people and homes.

In the CO-WRAP report, wildfire risk is the possibility of loss or harm occurring from wildfire. Wildfire Risk is a composite risk map created by combining the Values at Risk Rating and the Burn Probability layers. It identifies areas with the greatest potential impacts from a wildfire. Wildfire risk is comprised of several individual risk layers including Wildland Urban Interface (housing density), Forest Assets, Riparian Assets and Drinking Water Importance Areas risk outputs. The WUI component is a key element of the composite risk since it represents where people live in the wildland and urban fringe areas that are susceptible to wildfires and damages. The four individual risk layers are weighted to derive the Values at Risk Rating layer (Colorado Parks Service n.d.).

According to the FEMA National Risk Index (NRI), El Paso County has a relatively high risk of wildfire overall (Figure 6-4), ranging from “No Rating” to “Very High” across the County (Figure 6-5).

6.1.3 EXTENT

The wildfire hazard in the county is considered critical, with potential impacts including isolated fatalities or multiple injuries and illnesses, significant or long-term property damage that may compromise structural stability, and disruptions to essential facilities and services lasting between 24 and 72 hours. A wildfire event in El Paso County has the potential to be catastrophic, resulting in mass casualties, widespread damage, and severe disruption to the population, infrastructure, environment, economy, and government operations. First responders are exposed to the dangers from the initial incident and after-effects from smoke inhalation and heat stroke. Such an event could overwhelm local and state response capabilities, requiring substantial out-of-state and federal assistance. The City of Colorado Springs, with a population of over 400,000 and a high density of structures, would be particularly vulnerable to extensive damage.

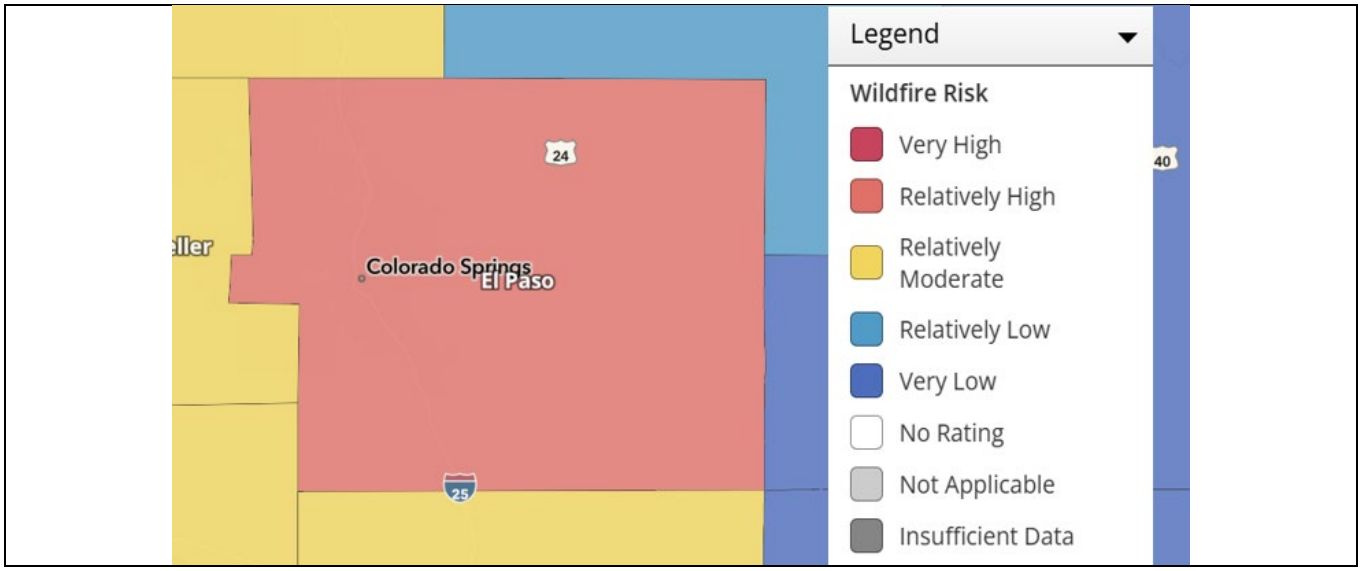
Warning Time

Wildfire events typically offer significant warning time, often between 12 to 24 hours, though this can vary depending on conditions. While wildfires are frequently human caused, either accidentally or intentionally, their exact timing is unpredictable. Fireworks, especially around the Fourth of July, are a common ignition source, requiring heightened vigilance during that period.

Dry seasons, drought conditions, and dry lightning significantly increase wildfire risk. Although lightning-related weather can often be forecast 24 to 48 hours in advance by the National Weather Service, wind-driven grass fires can spread so rapidly that they leave little or no time for public warnings or orderly evacuations. In contrast, forest fires tend to spread more slowly, though under the right conditions, they too can move quickly and unpredictably.

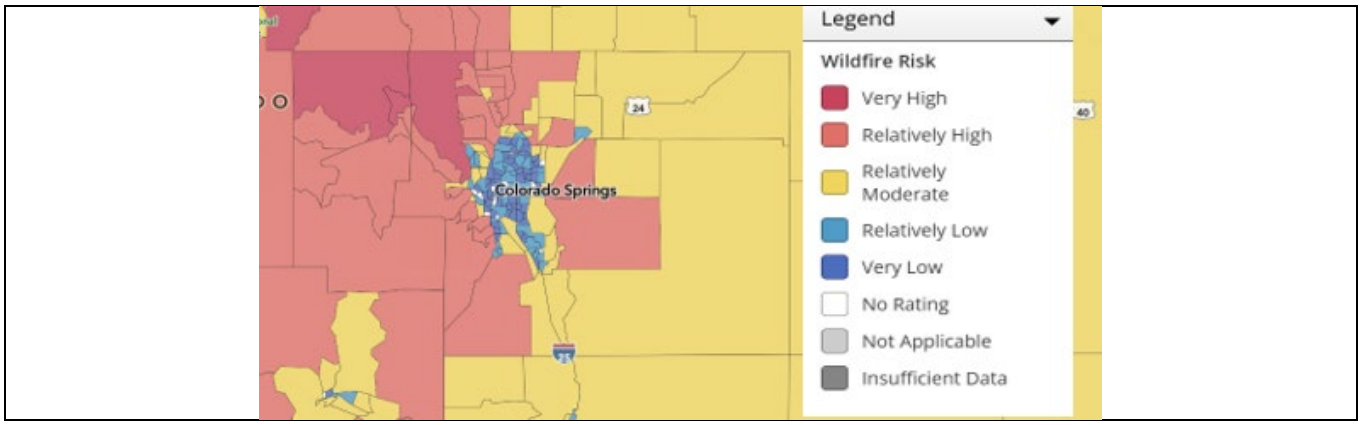
If a wildfire ignites and spreads rapidly, evacuation may be necessary within hours or even days. Fires typically reach peak intensity between 1 p.m. and 6 p.m. Fortunately, fire alerts are generally issued quickly once a fire is detected, and the widespread use of cellular and two-way radio communications has significantly improved the speed and effectiveness of public warnings.

Figure 6-4. FEMA National Risk Index Map for Wildfire Hazards in El Paso County by County View



Source: FEMA NRI, 2025.

Figure 6-5. FEMA National Risk Index Map for Wildfire Hazards in El Paso County by Census Tract View



Source: FEMA NRI, 2025

6.1.4 PREVIOUS OCCURRENCES

FEMA Disaster Declarations

Table 6-1 lists all wildfire-related major disasters declarations that have included the Pikes Peak Region since 1953.

State Emergency Proclamations

Between 2020 and 2024, the Pikes Peak Region was not included in any state emergency proclamation for a wildfire-related event.

Table 6-1. FEMA Disaster Declarations for Wildfire Events in the Pikes Peak Region

FEMA Declaration Date	Declaration Number	Description
June 19, 2002	DR-1421	Wildfires
June 24, 2012	FM-2984	Waldo Canyon fire
June 28, 2012	DR-4067	High Park and Waldo Canyon Wildfires
June 11, 2013	FM-5027	Black Forest Wildfire
July 26, 2013	DR-4134	Black Forest Wildfire

Source: FEMA n.d.

U.S. Department of Agriculture (USDA) Declarations

Between 2020 and 2024, the Pikes Peak Region was included in ten USDA drought-related agricultural disaster declarations, summarized in Table 6-2. Drought has the potential to increase the severity and frequency of wildfire events.

Table 6-2. U.S. Department of Agriculture (USDA) Declarations for Drought Events in Pikes Peak Region Since Previous HMP

Disaster Begin Date	USDA Declaration Number	Description
May 5, 2020	S4680	Drought-FAST TRACK
May 12, 2020	S4687	Drought-FAST TRACK
April 14, 2020	S4692	Drought-FAST TRACK
June 16, 2020	S4703	Drought-FAST TRACK
May 12, 2020	S4722	Drought-FAST TRACK
July 21, 2020	S4798	Drought-FAST TRACK
August 25, 2020	S4848	Drought-FAST TRACK
November 1, 2020	S4917	Drought-FAST TRACK
November 1, 2021	S5147	Drought-FAST TRACK
November 1, 2022	S5372	Drought-FAST TRACK

Source: (USDA n.d.)

All Recent Events

Table 6-3 lists major recorded wildfire-related events that impacted Pikes Peak Region since the previous HMP was developed. For earlier events, refer to the previous HMP.

Table 6-3. Wildfire Events in Pikes Peak Region (2020 to 2024)

Date	Hazard	Event Narrative
April 10, 2022	Wildfire	Fire crews across the region are very busy with multiple fires reported amid Red Flag conditions bringing dangerous winds to areas of Colorado in need of moisture. Mandatory evacuation orders for El Paso County: East of Curtis Road, West of Peyton Highway, South of Falcon Highway, North of Highway 94.
May 12, 2022	Wildfire	Multiple grass fires in Colorado Springs, including one near the airport.
October 10 – 11, 2023	Wildfire	Small fires along Highway 94 in eastern El Paso County. Pre-evacuation notices were sent to property owners living to the north of the intersection at Highway 94 and Peyton Highway.
March 13 - 15, 2025	Wildfire	Meridian Fire: A fast-moving wildfire burned across 2,515 acres east of City of Colorado Springs, forcing mandatory evacuations and destroying three outbuildings before firefighters gained 80% containment. The fire was 100% contained on March 15.

Source: (The Denver Post 2025); (KOAA 2023); (KOAA 5 2022); (Next 9News 2022)

6.1.5 PROBABILITY OF FUTURE OCCURRENCES

Information on previous wildfire occurrences in the County was used to calculate the probability of future occurrence of such events. Table 6-4 lists the number of events from various sources over the 40-year period from 1985 to 2025, which is the most complete period of record for all sources reviewed. Based on these records and input from the Steering Committee, the probability of occurrence for wildfire in the County is considered “occasional.”

Table 6-4. Probability of Future Wildfire Events in Pikes Peak Region

Hazard Type	Number of Occurrences Between 1985 and 2025	% Chance of Occurring in Any Given Year
Wildfire	22	53.7%

Source: NOAA-NCEI, 2025

6.1.6 CASCADING IMPACTS ON OTHER HAZARDS

Wildfires can generate a range of secondary effects, which in some cases may cause more widespread and prolonged damage than the fire itself. Fires can cause direct economic losses in the reduction of harvestable timber and indirect economic losses in reduced tourism. Wildfires cause the contamination of reservoirs, destroy transmission lines, and contribute to flooding. Wildfires strip slopes of vegetation, exposing them to greater amounts of runoff. This, in turn, can weaken soils and cause failures on slopes. Major landslides can occur several years after a wildfire. Most wildfires burn hot and for long durations that can bake soils, especially those high in clay content, thus increasing the imperviousness of the ground. This increases the runoff generated by storm events, thus increasing the chance of flooding. Large amount of ash, topsoil, and debris can then wash into streams and rivers.

6.2 VULNERABILITY AND IMPACT ASSESSMENT

The wildfire vulnerability analysis used methodology described in Section 4.3, with moderate, high and highest hazard areas based on WUI risk areas from the Colorado Wildfire Risk Assessment.

6.2.1 LIFE, HEALTH, AND SAFETY

Overall Population

The entire population of the County has some risk of wildfire impacts; those residing in the WUI hazard areas have a higher risk. Table 6-5 presents the number of people located in the moderate, high, and highest WUI hazard areas, with 173,854 total people in the County vulnerable to all WUI risk. That is over 23 percent of the County total population. The City of Colorado Springs has the highest number of people located in the WUI hazard area (56,610).

There are 63,591 people, or 8.6 percent of the County population, living in the moderate WUI risk hazard area. The unincorporated portions of the County (37,850) and City of Fountain (11,849) have the largest number of people located in this moderate risk zone. There is a total of 54,041 people, or 7.3 percent of the County population, which is in the high WUI risk hazard area. The unincorporated portions of the County (21,163) have the largest number of people located in this high-risk zone. There is a total of 56,222 people, or 7.6 percent of the County population, which is in the highest WUI risk hazard area. The City of Colorado Springs (27,724) has the largest number of people located in this highest-risk zone.

Socially Vulnerable Population

Smoke and air pollution from wildfires can be a severe health hazard, especially for sensitive populations, including children, the elderly, and those with respiratory and cardiovascular diseases. Smoke generated by wildfire contains particulate matter (soot, tar, water vapor, and minerals), gases (carbon monoxide, carbon dioxide, and nitrogen oxides), and toxic substances (formaldehyde, benzene, and others), depending 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 wildfires include difficulty in breathing, odor, and reduction in visibility.

Table 6-6, shows the number of vulnerable persons located in moderate risk, high risk, and highest WUI risk hazard areas. There are 7,986 people over the age of 65, 4,186 people under the age of 5, 685 non-English speakers, 6,646 disabled persons, and 4,025 people below the poverty line residing in the moderate WUI risk zone. There are 7,024 people over the age of 65, 3,445 people under the age of 5, 677 non-English speakers, 6,022 disabled persons, and 4,003 people below the poverty line residing in the high WUI risk zone. There are 7,616 people over the age of 65, 3,483 people under the age of 5, 794 non-English speakers, 6,628 disabled persons, and 4,551 people below the poverty line residing in the highest WUI risk zone.

Table 6-5. Population in All Wildland Urban Interface Hazard Areas

	2023 ACS Total Jurisdiction Population	Moderate Risk WUI: Population in Hazard Area	Moderate Risk WUI: Population in Hazard Area as % of Total in Jurisdiction	High Risk WUI: Population in Hazard Area	High Risk WUI: Population in Hazard Area as % of Total in Jurisdiction	Highest Risk WUI: Population in Hazard Area	Highest Risk WUI: Population in Hazard Area as % of Total in Jurisdiction	Combined WUI: Population in Hazard Area	Combined WUI: Population in Hazard Area as % of Total in Jurisdiction
Town of Calhan	510	244	47.8%	93	18.2%	4	0.8%	341	66.9%
City of Colorado Springs	405,307	10,663	2.6%	18,223	4.5%	27,724	6.8%	56,610	14.0%
City of Fountain	92,873	11,849	12.8%	10,961	11.8%	8,815	9.5%	31,625	34.1%
Town of Green Mountain Falls	690	181	26.2%	130	18.8%	319	46.2%	630	91.3%
City of Manitou Springs	4,796	505	10.5%	1,106	23.1%	1,035	21.6%	2,646	55.2%
Town of Monument	11,035	1,628	14.8%	1,421	12.9%	652	5.9%	3,701	33.5%
Town of Palmer Lake	2,635	607	23.0%	913	34.6%	1,000	38.0%	2,520	95.6%
Town of Ramah	130	64	49.2%	31	23.8%	3	2.3%	98	75.4%
Unincorporated County	218,032	37,850	17.4%	21,163	9.7%	16,670	7.6%	75,683	34.7%
El Paso County (Total)	**736,008**	**63,591**	**8.6%**	**54,041**	**7.3%**	**56,222**	**7.6%**	**173,854**	**23.6%**

Source: U.S. Census Bureau 2023, American Community Survey; U.S. Army Corps of Engineers, National Structure Inventory 2022; Colorado Wildfire Risk Assessment 2022

Table 6-6. Estimated Number of Vulnerable Persons Located in the Wildland Urban Interface Risk Hazard Areas

	Moderate Risk WUI: Vulnerable Population in Hazard Area	Moderate Risk WUI: Vulnerable Population in Hazard Area as % of Total in Jurisdiction	High Risk WUI: Vulnerable Population in Hazard Area	High Risk WUI: Vulnerable Population in Hazard Area as % of Total in Jurisdiction	Highest Risk WUI: Vulnerable Population in Hazard Area	Highest Risk WUI: Vulnerable Population in Hazard Area as % of Total in Jurisdiction
People Over 65						
Town of Calhan	54	47.4%	20	17.5%	1	0.9%
City of Colorado Springs	1,628	2.6%	2,783	4.5%	4,234	6.8%
City of Fountain	992	12.8%	918	11.8%	738	9.5%
Town of Green Mountain Falls	24	26.1%	17	18.5%	42	45.7%
City of Manitou Springs	90	10.5%	198	23.0%	185	21.5%
Town of Monument	217	14.7%	190	12.9%	87	5.9%
Town of Palmer Lake	122	23.0%	184	34.7%	201	37.9%
Town of Ramah	28	49.1%	13	22.8%	1	1.8%
Unincorporated County	4,831	17.4%	2,701	9.7%	2,127	7.6%
El Paso County (Total)	**7,986**	**7.9%**	**7,024**	**7.0%**	**7,616**	**7.6%**
People Under 5						
Town of Calhan	11	47.8%	4	17.4%	0	0.0%
City of Colorado Springs	614	2.6%	1,049	4.5%	1,596	6.8%
City of Fountain	952	12.8%	880	11.8%	708	9.5%
Town of Green Mountain Falls	3	21.4%	2	14.3%	6	42.9%
City of Manitou Springs	6	9.5%	14	22.2%	13	20.6%
Town of Monument	89	14.6%	78	12.8%	35	5.8%
Town of Palmer Lake	17	23.0%	25	33.8%	28	37.8%

	Moderate Risk WUI: Vulnerable Population in Hazard Area	Moderate Risk WUI: Vulnerable Population in Hazard Area as % of Total in Jurisdiction	High Risk WUI: Vulnerable Population in Hazard Area	High Risk WUI: Vulnerable Population in Hazard Area as % of Total in Jurisdiction	Highest Risk WUI: Vulnerable Population in Hazard Area	Highest Risk WUI: Vulnerable Population in Hazard Area as % of Total in Jurisdiction
Town of Ramah	3	42.9%	1	14.3%	0	0.0%
Unincorporated County	2,491	17.4%	1,392	9.7%	1,097	7.6%
El Paso County (Total)	**4,186**	**9.1%**	**3,445**	**7.5%**	**3,483**	**7.6%**
Non-English Speaking People						
Town of Calhan	0	0.0%	0	0.0%	0	0.0%
City of Colorado Springs	209	2.6%	358	4.5%	545	6.8%
City of Fountain	122	12.7%	113	11.7%	91	9.5%
Town of Green Mountain Falls	0	0.0%	0	0.0%	0	0.0%
City of Manitou Springs	2	9.1%	5	22.7%	4	18.2%
Town of Monument	18	14.6%	15	12.2%	7	5.7%
Town of Palmer Lake	0	0.0%	0	0.0%	0	0.0%
Town of Ramah	0	0.0%	0	0.0%	0	0.0%
Unincorporated County	334	17.4%	186	9.7%	147	7.6%
El Paso County (Total)	**685**	**6.2%**	**677**	**6.2%**	**794**	**7.2%**
People with Disability						
Town of Calhan	37	47.4%	14	17.9%	0	0.0%
City of Colorado Springs	1,440	2.6%	2,461	4.5%	3,744	6.8%
City of Fountain	1,215	12.7%	1,124	11.8%	904	9.5%
Town of Green Mountain Falls	34	26.2%	24	18.5%	60	46.2%
City of Manitou Springs	67	10.4%	148	23.0%	138	21.5%

	Moderate Risk WUI: Vulnerable Population in Hazard Area	Moderate Risk WUI: Vulnerable Population in Hazard Area as % of Total in Jurisdiction	High Risk WUI: Vulnerable Population in Hazard Area	High Risk WUI: Vulnerable Population in Hazard Area as % of Total in Jurisdiction	Highest Risk WUI: Vulnerable Population in Hazard Area	Highest Risk WUI: Vulnerable Population in Hazard Area as % of Total in Jurisdiction
Town of Monument	72	14.6%	63	12.8%	29	5.9%
Town of Palmer Lake	81	23.0%	122	34.7%	133	37.8%
Town of Ramah	24	49.0%	11	22.4%	1	2.0%
Unincorporated County	3,676	17.4%	2,055	9.7%	1,619	7.6%
El Paso County (Total)	**6,646**	**7.6%**	**6,022**	**6.9%**	**6,628**	**7.6%**
People Below Poverty Level						
Town of Calhan	23	47.9%	8	16.7%	0	0.0%
City of Colorado Springs	1,103	2.6%	1,885	4.5%	2,867	6.8%
City of Fountain	986	12.7%	912	11.8%	734	9.5%
Town of Green Mountain Falls	7	25.0%	5	17.9%	12	42.9%
City of Manitou Springs	49	10.4%	108	22.9%	101	21.4%
Town of Monument	89	14.7%	78	12.9%	35	5.8%
Town of Palmer Lake	20	22.5%	30	33.7%	33	37.1%
Town of Ramah	1	33.3%	0	0.0%	0	0.0%
Unincorporated County	1,747	17.4%	977	9.7%	769	7.6%
El Paso County (Total)	**4,025**	**6.6%**	**4,003**	**6.6%**	**4,551**	**7.5%**

Source: U.S. Census Bureau 2023, American Community Survey; U.S. Army Corps of Engineers, National Structure Inventory 2022; Colorado Wildfire Risk Assessment 2022

6.2.2 GENERAL BUILDING STOCK

Property damage from wildfires can be severe and can significantly alter entire communities. Loss estimations for the wildfire hazard are not based on damage functions, because no such damage functions have been generated. Instead, loss estimates were developed representing 10 percent, 30 percent, 50 percent and 100 percent of the assessed value of exposed structures. This allows emergency managers to select a range of economic impact based on an estimate of the percent of damage to the general building stock. More than 50 percent damage is substantial by most building codes and typically requires total reconstruction of the structure.

Table 6-7 provides the total number of buildings in the all-risk WUI hazard areas. There are a total of 53,469 buildings with a replacement cost value of over $27 billion located in all risk WUI hazard areas for the County. The unincorporated portions of the County (23,567) and City of Colorado Springs (22,110) have the highest number of buildings with replacement cost values of over $11 billion.

Table 6-8, Table 6-9, and Table 6-10 provide the number of buildings located in moderate risk, high risk, and highest risk WUI hazard areas. There is a total of 18,906 buildings, accounting for 7.5 percent of the County total buildings located in the moderate WUI risk hazard area. This is estimated at being over $10 billion in RCV. For the high WUI risk hazard area, there is a total of 16,288 buildings, which is 6.5 percent of the total buildings in the County. The RCV for these buildings is estimated at over $8 billion. For the highest WUI risk hazard area and most vulnerable to wildfire risks, there is a total of 18,275 buildings, which is 7.2 percent of the total buildings in the County. The RCV for these buildings is estimated at over $8.8 billion.

Additionally, Table 6-11, Table 6-12, and Table 6-13 present the number of buildings by occupancy class located within the moderate, high, and highest WUI risk areas in El Paso County.

- In the moderate WUI risk area, there are 17,806 residential, 849 commercial, 244 industrial, and 205 other buildings.
- In the high-risk area, the totals include 15,578 residential, 516 commercial, 112 industrial, and 82 other buildings.
- In the highest-risk area, there are 17,407 residential, 626 commercial, 138 industrial, and 104 other buildings.

Table 6-7. Buildings in All WUI Hazard Areas Combined

Jurisdiction	Jurisdiction Total Buildings	Jurisdiction Total Replacement Cost Value	Number of Buildings in Hazard Area	Buildings in Hazard Area as % of Jurisdiction Total	Replacement Cost Value in Hazard Area	Replacement Cost Value in Hazard Area as % of Jurisdiction Total
Town of Calhan	424	$383,083,382	268	63.2%	$192,006,670	50.1%
City of Colorado Springs	166,064	$105,908,247,826	22,110	13.3%	$11,617,544,324	11.0%
City of Fountain	9,810	$5,036,639,818	3,279	33.4%	$1,415,764,702	28.1%
Town of Green Mountain Falls	556	$170,290,831	502	90.3%	$143,174,994	84.1%
City of Manitou Springs	2,412	$1,261,305,232	1,326	55.0%	$580,195,720	46.0%
Town of Monument	3,594	$2,441,721,337	1,132	31.5%	$578,659,395	23.7%
Town of Palmer Lake	1,304	$706,564,041	1,222	93.7%	$612,027,747	86.6%
Town of Ramah	83	$25,682,659	63	75.9%	$18,261,213	71.1%
Unincorporated County	68,245	$36,530,240,639	23,567	34.5%	$12,309,088,329	33.7%
El Paso County (Total)	**252,492**	**$152,463,775,764**	**53,469**	**21.2%**	**$27,466,723,094**	**18.0%**

Source: U.S. Army Corps of Engineers, National Structure Inventory 2022; RSMeans 2024; Colorado Wildfire Risk Assessment 2022

Table 6-8. Buildings in the Moderate Risk WUI Hazard Area

Jurisdiction	Jurisdiction Total Buildings	Jurisdiction Total Replacement Cost Value	Number of Buildings in Hazard Area	Buildings in Hazard Area as % of Jurisdiction Total	Replacement Cost Value in Hazard Area	Replacement Cost Value in Hazard Area as % of Jurisdiction Total
Town of Calhan	424	$383,083,382	193	45.5%	$151,976,387	39.7%
City of Colorado Springs	166,064	$105,908,247,826	4,275	2.6%	$2,694,613,295	2.5%
City of Fountain	9,810	$5,036,639,818	1,242	12.7%	$572,923,234	11.4%
Town of Green Mountain Falls	556	$170,290,831	151	27.2%	$50,054,420	29.4%
City of Manitou Springs	2,412	$1,261,305,232	245	10.2%	$102,538,846	8.1%
Town of Monument	3,594	$2,441,721,337	511	14.2%	$309,125,610	12.7%
Town of Palmer Lake	1,304	$706,564,041	333	25.5%	$237,606,631	33.6%
Town of Ramah	83	$25,682,659	42	50.6%	$13,971,842	54.4%
Unincorporated County	68,245	$36,530,240,639	11,914	17.5%	$6,423,535,157	17.6%
El Paso County (Total)	**252,492**	**$152,463,775,764**	**18,906**	**7.5%**	**$10,556,345,422**	**6.9%**

Source: U.S. Army Corps of Engineers, National Structure Inventory 2022; RSMeans 2024; Colorado Wildfire Risk Assessment 2022

Table 6-9. Buildings in the High Risk WUI Hazard Area

Jurisdiction	Jurisdiction Total Buildings	Jurisdiction Total Replacement Cost Value	Number of Buildings in Hazard Area	Buildings in Hazard Area as % of Jurisdiction Total	Replacement Cost Value in Hazard Area	Replacement Cost Value in Hazard Area as % of Jurisdiction Total
Town of Calhan	424	$383,083,382	71	16.7%	$38,000,298	9.9%
City of Colorado Springs	166,064	$105,908,247,826	7,095	4.3%	$3,614,105,085	3.4%
City of Fountain	9,810	$5,036,639,818	1,122	11.4%	$453,667,341	9.0%
Town of Green Mountain Falls	556	$170,290,831	104	18.7%	$34,161,032	20.1%
City of Manitou Springs	2,412	$1,261,305,232	552	22.9%	$230,265,299	18.3%
Town of Monument	3,594	$2,441,721,337	424	11.8%	$184,496,948	7.6%
Town of Palmer Lake	1,304	$706,564,041	438	33.6%	$221,819,023	31.4%
Town of Ramah	83	$25,682,659	19	22.9%	$3,910,891	15.2%
Unincorporated County	68,245	$36,530,240,639	6,463	9.5%	$3,256,133,831	8.9%
El Paso County (Total)	**252,492**	**$152,463,775,764**	**16,288**	**6.5%**	**$8,036,559,748**	**5.3%**

Source: U.S. Army Corps of Engineers, National Structure Inventory 2022; RSMeans 2024; Colorado Wildfire Risk Assessment 2022

Table 6-10. Buildings in the Highest Risk WUI Hazard Area

Jurisdiction	Jurisdiction Total Buildings	Jurisdiction Total Replacement Cost Value	Number of Buildings in Hazard Area	Buildings in Hazard Area as % of Jurisdiction Total	Replacement Cost Value in Hazard Area	Replacement Cost Value in Hazard Area as % of Jurisdiction Total
Town of Calhan	424	$383,083,382	4	0.9%	$2,029,985	0.5%
City of Colorado Springs	166,064	$105,908,247,826	10,740	6.5%	$5,308,825,944	5.0%
City of Fountain	9,810	$5,036,639,818	915	9.3%	$389,174,127	7.7%
Town of Green Mountain Falls	556	$170,290,831	247	44.4%	$58,959,542	34.6%
City of Manitou Springs	2,412	$1,261,305,232	529	21.9%	$247,391,575	19.6%
Town of Monument	3,594	$2,441,721,337	197	5.5%	$85,036,837	3.5%
Town of Palmer Lake	1,304	$706,564,041	451	34.6%	$152,602,093	21.6%
Town of Ramah	83	$25,682,659	2	2.4%	$378,480	1.5%
Unincorporated County	68,245	$36,530,240,639	5,190	7.6%	$2,629,419,341	7.2%
El Paso County (Total)	**252,492**	**$152,463,775,764**	**18,275**	**7.2%**	**$8,873,817,924**	**5.8%**

Source: U.S. Army Corps of Engineers, National Structure Inventory 2022; RSMeans 2024; Colorado Wildfire Risk Assessment 2022

Table 6-11. Building Types in the Moderate Risk WUI Hazard Area by General Occupancy Class

Jurisdiction	Residential	Commercial	Industrial	Other
Town of Calhan	163	27	1	2
City of Colorado Springs	3,952	233	45	45
City of Fountain	1,187	37	7	11
Town of Green Mountain Falls	137	7	4	3
City of Manitou Springs	223	17	4	1
Town of Monument	479	24	6	2
Town of Palmer Lake	266	40	5	22
Town of Ramah	39	2	0	1
Unincorporated County	11,162	462	172	118
El Paso County (Total)	**17,608**	**849**	**244**	**205**

Source: U.S. Army Corps of Engineers, National Structure Inventory 2022; Colorado Wildfire Risk Assessment 2022
Note: Other = Government, Religion, Agricultural, and Education

Table 6-12. Building Types in the High Risk WUI Hazard Area by General Occupancy Class

Jurisdiction	Residential	Commercial	Industrial	Other
Town of Calhan	62	7	0	2
City of Colorado Springs	6,754	256	54	31
City of Fountain	1,098	16	5	3
Town of Green Mountain Falls	98	3	0	3
City of Manitou Springs	488	56	2	6
Town of Monument	418	5	1	0
Town of Palmer Lake	400	30	5	3
Town of Ramah	19	0	0	0
Unincorporated County	6,241	143	45	34
El Paso County (Total)	**15,578**	**516**	**112**	**82**

Source: U.S. Army Corps of Engineers, National Structure Inventory 2022; Colorado Wildfire Risk Assessment 2022
Note: Other = Government, Religion, Agricultural, and Education

Table 6-13. Building Types in the Highest Risk WUI Hazard Area by General Occupancy Class

Jurisdiction	Residential	Commercial	Industrial	Other
Town of Calhan	3	1	0	0
City of Colorado Springs	10,275	342	63	60
City of Fountain	883	22	6	4
Town of Green Mountain Falls	241	5	1	0
City of Manitou Springs	457	52	10	10
Town of Monument	192	3	2	0
Town of Palmer Lake	438	7	3	3
Town of Ramah	2	0	0	0
Unincorporated County	4,916	194	53	27
El Paso County (Total)	**17,407**	**626**	**138**	**104**

Source: U.S. Army Corps of Engineers, National Structure Inventory 2022; Colorado Wildfire Risk Assessment 2022
Note: Other = Government, Religion, Agricultural, and Education

6.2.3 COMMUNITY LIFELINES AND OTHER CRITICAL FACILITIES

In the event of wildfire, there would likely be little damage to the majority of infrastructure. Most roads and railroads would be without damage except in the worst scenarios. Power lines are the most at risk to wildfire because most are made of wood and susceptible to burning. Also susceptible are communication infrastructure such as telephone cabling and antenna towers. In the event of a wildfire, natural gas pipelines could provide a source of fuel and lead to a catastrophic explosion.

Fires can create conditions that block or prevent access and can isolate residents and emergency service providers. A wildfire typically does not have a major direct impact on bridges, but it can create conditions in which bridges are obstructed. Many bridges in areas of high to moderate fire risk are important because they provide the only ingress and egress to large areas and in some cases to isolated neighborhoods.

Tables Table 6-14 through Table 6-16 present the number of facilities in El Paso County categorized by lifeline categories within areas designated as moderate, high, and highest WUI risk hazard zones.

- In the moderate risk hazard area, there are 112 total facilities. The Safety and Security sector has the highest count with 54 facilities, followed by Health and Medical with 22.
- In the high-risk hazard area, there are 66 facilities. The Health and Medical sector leads with 25 facilities, followed by Safety and Security with 17.
- In the highest risk hazard area, the County has 90 facilities. Both the Health and Medical and Safety and Security sectors have the highest number, with 31 facilities each.

Table 6-14. Number of Facilities in the Moderate Risk WUI Hazard Area

Jurisdiction	Communica-tions	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transpor-tation	Water Systems	Other Critical Facilities	Total	Facilities in Hazard Area as % of Jurisdiction Total
Town of Calhan	0	0	0	0	1	0	0	0	0	**1**	16.7%
City of Colorado Springs	0	1	0	3	13	18	0	9	2	**46**	3.7%
City of Fountain	0	0	0	0	0	2	0	0	0	**2**	4.9%
Town of Green Mountain Falls	0	0	0	1	0	0	0	0	0	**1**	16.7%
City of Manitou Springs	0	2	0	0	0	0	0	0	0	**2**	22.2%
Town of Monument	0	0	0	0	0	1	0	0	0	**1**	5.3%
Town of Palmer Lake	0	0	0	0	1	1	0	0	0	**2**	25.0%
Town of Ramah	0	0	0	0	0	0	0	0	0	**0**	0.0%
Unincorporated County	3	4	0	4	7	32	0	6	1	**57**	13.7%
El Paso County (Total)	**3**	**7**	**0**	**8**	**22**	**54**	**0**	**15**	**3**	**112**	**6.4%**

Source: Colorado Department of Public Health and Environment 2019, 2024-2025; Colorado Springs 2025; Colorado Springs Utilities 2025; El Paso County 2024-2025; Federal Aviation Administration 2025; Homeland Infrastructure Foundation-Level Data 2025; National Center for Education Statistics 2025; U.S. Army Corps of Engineers 2025; Colorado Wildfire Risk Assessment 2022

Table 6-15. Number of Facilities in the High Risk WUI Hazard Area

Jurisdiction	Communica-tions	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transpor-tation	Water Systems	Other Critical Facilities	Total	Facilities in Hazard Area as % of Jurisdiction Total
Town of Calhan	0	0	0	0	0	0	0	0	0	**0**	0.0%
City of Colorado Springs	0	3	0	0	15	9	0	12	0	**39**	3.1%
City of Fountain	0	0	0	1	1	1	0	0	0	**3**	7.3%
Town of Green Mountain Falls	0	0	0	0	0	0	0	1	0	**1**	16.7%
City of Manitou Springs	0	0	0	0	0	1	0	0	0	**1**	11.1%
Town of Monument	0	0	0	0	0	0	0	0	0	**0**	0.0%
Town of Palmer Lake	0	0	0	0	0	1	0	0	0	**1**	12.5%
Town of Ramah	0	0	0	0	0	0	0	0	0	**0**	0.0%
Unincorporated County	1	1	0	1	9	5	0	2	2	**21**	5.0%
El Paso County (Total)	**1**	**4**	**0**	**2**	**25**	**17**	**0**	**15**	**2**	**66**	**3.7%**

Source: Colorado Department of Public Health and Environment 2019, 2024-2025; Colorado Springs 2025; Colorado Springs Utilities 2025; El Paso County 2024-2025; Federal Aviation Administration 2025; Homeland Infrastructure Foundation-Level Data 2025; National Center for Education Statistics 2025; U.S. Army Corps of Engineers 2025; Colorado Wildfire Risk Assessment 2022

Table 6-16. Number of Facilities in the Highest Risk WUI Hazard Area

Jurisdiction	Communica-tions	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transpor-tation	Water Systems	Other Critical Facilities	Total	Facilities in Hazard Area as % of Jurisdiction Total
Town of Calhan	0	0	0	0	0	0	0	0	0	**0**	0.0%
City of Colorado Springs	0	1	0	3	23	16	0	19	1	**63**	5.0%
City of Fountain	0	0	0	0	1	2	0	0	0	**3**	7.3%
Town of Green Mountain Falls	0	0	0	0	0	3	0	0	0	**3**	50.0%
City of Manitou Springs	0	0	0	1	0	0	0	0	0	**1**	11.1%
Town of Monument	1	0	0	0	0	0	0	0	0	**1**	5.3%
Town of Palmer Lake	0	0	0	0	2	0	0	0	0	**2**	25.0%
Town of Ramah	0	0	0	0	0	0	0	0	0	**0**	0.0%
Unincorporated County	0	0	0	2	5	10	0	0	0	**17**	4.1%
El Paso County (Total)	**1**	**1**	**0**	**6**	**31**	**31**	**0**	**19**	**1**	**90**	**5.1%**

Source: Colorado Department of Public Health and Environment 2019, 2024-2025; Colorado Springs 2025; Colorado Springs Utilities 2025; El Paso County 2024-2025; Federal Aviation Administration 2025; Homeland Infrastructure Foundation-Level Data 2025; National Center for Education Statistics 2025; U.S. Army Corps of Engineers 2025; Colorado Wildfire Risk Assessment 2022

6.2.4 ECONOMY

Wildfires have a negative economic impact on El Paso County, especially following major events like the Waldo Canyon Fire (2012) and the Black Forest Fire (2013). These natural disasters have caused widespread damage to homes, businesses, and critical infrastructure. The Black Forest Fire alone destroyed over 500 homes and resulted in hundreds of millions of dollars in damage. According to a 2014 Economic Development Assessment Team (EDAT) report, the cumulative impacts of wildfires and cascading impacts of flooding damaged or destroyed nearly 1,000 commercial structures in the County (Economic Development Administration 2014). Wildfires also disrupt local economies by displacing residents, reducing tourism, and straining emergency response and recovery funds and efforts. The long-term economic impacts also include increased insurance premiums and reduced property values in high-risk and highest risk areas.

6.2.5 ENVIRONMENT

Fire is a natural and critical ecosystem process in most terrestrial ecosystems, dictating in part the types, structure, and spatial extent of native vegetation. However, wildfires can cause severe environmental impacts:

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

Many ecosystems are adapted to historical patterns of fire occurrence. These patterns, called “fire regimes,” include temporal attributes (e.g., frequency and seasonality), spatial attributes (e.g., size and spatial complexity), and magnitude attributes (e.g., intensity and severity), each of which have ranges of natural variability. Ecosystem stability is threatened when any of the attributes for a given fire regime diverges from its range of natural variability.

6.2.6 HISTORIC AND CULTURAL RESOURCES

Wildfires can threaten the historic and cultural resources of El Paso County which include landmarks such as Old Colorado City, the City of Colorado Springs Pioneers Museum, and other historic housing, neighborhoods, and cultural sites. For example, the Black Forest Fire incident of 2013 was one of the most damaging in state history. This event highlighted the vulnerability of these cultural resources because it destroyed almost 500 homes and nearby historic properties (DHS 2015). Many cultural landmarks are in forested or WUI areas which make them susceptible to future fire damage. Wildfires can also lead to the loss of archive materials, irreplaceable artifacts, and architectural structures that are important to the community. The economic and cultural loss from such events can be detrimental and can also impact tourism and historical identity.

6.3 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

6.3.1 LAND USE AND DEVELOPMENT

The County has experienced significant growth over the last decade and is expected to continue this trend, projecting 58 percent growth between 2010 and 2030. Exposure and risk to wildfire is expected to increase as development and population growth continue.

According to the El Paso County Wildfire Protection Plan, the El Paso County Land Development Code regulates new development in unincorporated areas that are forested or have been otherwise identified as being at risk of wildland fire, according to the Colorado Vegetation Classification Project. The County maintains a map to identify the forested areas where the wildland fire standards of the code apply. Before a permit is issued for building in these areas, a builder must commit to take actions to reduce the ignitability of new structures and to support wildfire suppression activities (El Paso County Land Development Code 2017). Additionally, some fire protection districts in the County have adopted the International Fire Code with local amendments, which requires certain building features and vegetation mitigation for new construction in WUI areas defined by each local jurisdiction (El Paso County Land Development Code 2017).

City of Colorado Springs requires new construction in its hillside neighborhoods to comply with its Hillside Development Manual. Along with best practices for safe and aesthetic development of steep terrain, the manual mandates three types of actions to reduce wildfire risk: management of fuels and defensible space, fire detection and protection systems, and Class A roofing materials (El Paso County Land Development Code 2017).

There continues to be growth and development on private lands in the WUI and it is expected that development in high-risk areas will continue. By identifying areas with significant potential for population growth and/or future development in high-risk areas, communities can identify areas of mitigation interest and reduce hazard risks associated with increased exposure.

6.3.2 PROJECTED CHANGES IN POPULATION PATTERNS

The County population is projected to increase by over 32 percent by 2050. Table 3-7 summarizes recent and projected future changes in county population. Between 2010 and 2025 alone, the County population rose by nearly 21 percent. With this increase in population, the risk to wildfire has also increased. More people residing and living in the County and wildfire hazard area directly increases the exposure to this hazard in the event it may occur. Additionally, an increase in projected populations in the future will also indicate an increase in wildfire risk. It is critically important that the County plans for and mitigates against wildfire hazards for the current population and the projected new population in the future.

6.3.3 CLIMATE CHANGE

Fire in western ecosystems is affected by climate variability, local topography, and human intervention. Climate change has the potential to affect multiple elements of the wildfire system: fire behavior, ignitions, fire management, and vegetation fuels. Hot dry spells create the highest fire risk. Increased temperatures may intensify wildfire danger by warming and drying out vegetation. When climate alters fuel loads and fuel moisture, forest susceptibility to wildfires changes. Climate change also may increase winds that spread fires. Faster fires are harder to contain and thus are more likely to expand into residential neighborhoods. Climate scenarios project summer temperature increases between 2 degrees Celsius (°C) and 5°C and precipitation decreases of up to 15 percent. Such conditions would exacerbate summer drought and further promote high-elevation wildfires.

6.3.4 OTHER IDENTIFIED CONDITIONS

The major issues regarding wildfire are the following:

- Public education and outreach to people living in or near the fire hazard zones should include information about and assistance with mitigation activities such as defensible space, and advance identification of roadway routes and safe zones.
- Wildfires could cause landslides, and debris flows as a secondary hazard. Climate change could affect the wildfire hazard.
- Future growth into wildland-urban interface areas should continue to be managed.
- Area fire districts and local governments need to continue to exercise and train on WUI events and emergency evacuation.
- Vegetation management activities would include enhancement through expansion of the target areas as well as additional resources.
- Regional consistency of higher building code standards such as residential sprinkler requirements and prohibitive combustible roof standards.
- Fire department water supply in high-risk wildfire areas.
- Expand certifications and qualifications for fire department personnel. Ensure that all firefighters are trained in basic wildfire behavior, basic fire weather, and that all company officers and chief level officers are trained in the wildland command and strike team leader level.

- Evaluate and designate emergency ingress / egress routes in WUI areas and in new land development.
- Tools such as land use planning, zoning ordinances, building code, and subdivision regulations should be considered to mitigate risk.

6.4 CONSEQUENCE ANALYSIS

Table 6-17 presents the results of the consequence analysis for the wildfire hazard.

Table 6-17. Wildfire Consequence Analysis

Category	Narrative
Hazard Description	Fire conditions result from a combination of hot weather, an accumulation of vegetation, and low moisture content in both the air and fuel sources. When these conditions are compounded by high winds and prolonged drought, the likelihood of a wildfire occurring significantly increases. There are three major factors that sustain wildfires and help predict the potential for an area to burn: fuel, topography, and weather.
Impact on Property, Facilities, and Infrastructure	Major or long-term property damage can threaten the structural stability of buildings and infrastructure. Approximately 58% of the region's population resides within the Wildland-Urban Interface (WUI). Within this area, 21,483 structures are located in zones classified as having moderate to very high wildfire risk. Wildfires contribute to air pollution and can directly or indirectly affect roads, bridges, schools, and hospitals, making access significantly more difficult. Detours and road closures further increase the overall cost of a wildfire event. Additionally, transportation, communications, and the general operation of governmental services may be disrupted during a wildfire incident. In most reported fire events, roads and bridges have been identified as the primary infrastructure elements impacted.
Impact on the Environment	Wildfires can cause significant environmental impacts, including the loss of forests and grasslands, degradation of water quality, increased erosion, and sedimentation that may affect critical infrastructure and natural waterways. Dead or damaged trees pose a risk of falling, while the loss of ground vegetation can lead to landslides, mudslides, or other forms of geologic movement. This was notably observed in areas downstream of the Waldo Canyon burn scar. Additional hazards include potential damage to hazardous materials (HAZMAT) facilities, disruptions to transportation systems, the ignition of urban fires, and interruptions to utility services. Habitat destruction also has a profound effect on the environment, threatening biodiversity and ecosystem stability.

Category	Narrative
Impact on Responders	Incident responders face the same threats as the general public, but at a more significant and probable level. In addition to these risks, responders may be injured while accessing fires in areas with rough or steep terrain. The likelihood of injury, illness, or even death is considerably high for those on the front lines. Other threats include physical exhaustion, which is common during large fires that persist over extended periods, as well as long-term health effects from exposure to environmental hazards. The physical and psychological strain placed on first responders, along with concerns about the impact on their families, can further increase the risks they face. Ambulance services may also be affected due to blocked roadways, limiting their ability to reach those in need.
Impact on Continuity of Operations, Continuity of Government, and Delivery of Services	Wildfire incidents can lead to the interruption of essential facilities and services for periods ranging from 12 to 24 hours. Power outages are likely, especially in areas that are not adequately equipped with backup generators. These disruptions can affect critical infrastructure and hinder emergency response efforts, public safety, and community operations. PPROEM maintains the Continuity of Operations Plan and the Continuity of Government Plan for the County of El Paso and the City of Colorado Springs; other jurisdictions in the Pikes Peak Region are in the process of developing continuity plans and procedures.
Impact on the Public	Wildfires can result in isolated deaths as well as multiple injuries and illnesses. Potential losses from wildfire events include human life, damage to structures and other improvements, destruction of natural and cultural resources, and negative impacts on both the quality and quantity of the water supply. Additionally, range and croplands may be affected, leading to economic losses in sectors such as tourism and firefighting expenditures. Smoke and air pollution generated by wildfires also pose serious health hazards to the public.
Impact on the Economic Condition of the County	Potential losses from wildfires include human life, damage to structures and other improvements, destruction of natural and cultural resources, and negative impacts on the quality and quantity of the water supply. Wildfires can also affect range and croplands, leading to economic losses in areas such as tourism and firefighting expenditures. Smoke and air pollution from wildfires pose serious health hazards and may contribute to a decline in tourism. Depending on the characteristics of the affected area, many home-based businesses may be disrupted due to evacuation orders, loss of utility services, or direct property damage. Secondary impacts can include future flooding and erosion during heavy rainfall events. Additionally, the loss of businesses and temporary unemployment caused by wildfire incidents can have a significant effect on the local economy.
Impact on the Public Confidence in Government	Public confidence is closely tied to the perception of how effectively response and recovery efforts are managed during and after a wildfire event. A response that demonstrates the County's preparedness and attentiveness to public needs—along with a recovery process that restores services and repairs damage in a timely manner—can help maintain or even enhance the County's reputation. Clear and consistent public communication regarding the County's response efforts is essential to maintaining trust in local government.

7. FLOOD

7.1 HAZARD PROFILE

7.1.1 HAZARD DESCRIPTION

A flood is an overflow of water from oceans, rivers, groundwater, or rainfall that submerges areas that are usually dry. This natural phenomenon can be exacerbated by features of the built environment.

Flood is a hazard that can occur during any season. Flooding typically occurs during prolonged rainfalls over several days, intense rainfalls over a short period of time, or when an ice or debris jam causes a river or stream to overflow onto the surrounding area. The most common cause of flooding is rain or snowmelt which accumulates faster than soils can absorb it, or rivers can carry it away. Flooding can also result from the failure of a water control structure (NWS 2019).

Flooding events are a common occurrence in El Paso County and are the most frequently occurring hazard in the United States (DHS 2022). A variety of flood types, such as riverine, flash flooding, stormwater, urban, and ice jam flooding can cause widespread damage throughout rural and urban areas, causing loss of life, injury, and severe water damage to residential and commercial buildings, bridge and road closures, transit services, electrical and communication networks, and agriculture.

Floodplains

Floods are one of the most frequent and costly hazards in terms of human hardship and economic loss, particularly to communities in the floodplains of a major water source. A floodplain is a flat land adjacent to a river, creek, or stream that is subject to periodic inundation when floodwater exceeds the capacity of the main channel, or water escapes the channel through bank erosion. It is an integral part of a stream system that collects fresh water from the land and carries it to the ocean. Floodplains moderate flooding, maintain water quality, recharge groundwater, reduce erosion, redistribute sand and sediment, and support fish and wildlife habitats.

The floodplain is affected by adjustments the system makes to its sediment load and variable flow. During inundation, silt is deposited by retreating floodwater and trapped by vegetation, building up the floodplain. The buildup is greatest near the stream, forming natural levees in areas of stable banks. Floodplain deposits, which are coarsest near the stream, may show vertical size-graded stratification (sorting). Floodplain deposits and floodplain development affect a larger natural structure than might first be appreciated (National Geographic 2022).

The boundaries of floodplains are affected by land use, impervious surface, placement of obstructing structures in floodways, changes in precipitation and runoff patterns, improvements in technology for measuring topographic features, and utilization of different hydrologic modeling techniques. One measurement of a floodplain is the area inundated by the “100-year” flood, or a flood that has a 1 percent chance in any given year of being equaled or exceeded.

7.1.2 LOCATION

Areas subject to flooding include the following (National Geographic 2022) (FEMA 2022):

- Locations that experience greater than the 1-percent annual chance of flood
- Those subject to less extensive, more frequent, or repetitive flooding
- Sites that experience shallow flooding, stormwater flooding, or drainage problems that do not meet National Flood Insurance Program (NFIP) mapping criteria (20 percent of flood insurance claims are from properties in these areas)
- Places affected by flood-related hazards such as riverine erosion

Table 7-1 and Table 7-2 list the area in each jurisdiction within the 1-percent and 0.2 percent annual chance flood hazard areas, respectively. Figure 7-1 shows the 1-percent and 0.2-percent special flood hazard areas across the County.

The Digital Flood Insurance Rate Map (DFIRM) data provided by FEMA for El Paso County shows the following flood hazard areas:

- 1-Percent Annual Chance Flood Hazard (Table 7-1)—Areas subject to inundation by the 1-percent annual-chance flood event. This includes Zone A, Zone AE, and Zone AO. Mandatory flood insurance requirements and floodplain management standards apply. Base flood elevations are provided in Zone AE. Zone AO has associated flood depths derived from detailed hydraulic analyses. Zone A has no determined flood depths.
- 0.2-Percent Annual Chance Flood Hazard (Table 7-2)—Area of minimal flood hazard, usually depicted on Flood Insurance Rate Map (FIRMs) as the 500-year flood level or Shaded X Zone.

Figure 7-2 and Figure 7-3 show the Riverine Flooding Risk Index for El Paso County on the county and census tract scales, respectively. This index indicates the susceptibility of the County to riverine flooding. According to the National Risk Index, on the county scale, the County has a relatively moderate risk of riverine flooding; on the census tract scale, although portions of the County have no rating, most census tracks range from a very low risk to relatively high risk (FEMA 2019).

7.1.3 EXTENT

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

Table 7-1. Land Area in the 1-Percent Annual Chance Flood Hazard Area

Jurisdiction	Total Land Area (acres; excludes water bodies)	Area Within Hazard Area (acres)	% of Jurisdiction Total
Town of Calhan	530	25	4.7%
City of Colorado Springs	129,010	3,505	2.7%
City of Fountain	14,068	1,437	10.2%
Town of Green Mountain Falls	494	46	9.3%
City of Manitou Springs	1,988	122	6.1%
Town of Monument	4,427	189	4.3%
Town of Palmer Lake	1,971	62	3.1%
Town of Ramah	162	27	16.7%
Unincorporated County	1,205,073	60,444	5.0%
El Paso County (Total)	**1,357,724**	**65,857**	**4.9%**

Source: El Paso County Information Technologies 2023; USGS 2023; FEMA 2018/2025

Table 7-2. Land Area in the 0.2-Percent Annual Chance Flood Hazard Area

Jurisdiction	Total Land Area (acres; excludes water bodies)	Area Within Hazard Area (acres)	% of Jurisdiction Total
Town of Calhan	530	29	5.5%
City of Colorado Springs	129,010	4,537	3.5%
City of Fountain	14,068	1,849	13.1%
Town of Green Mountain Falls	494	53	10.7%
City of Manitou Springs	1,988	143	7.2%
Town of Monument	4,427	203	4.6%
Town of Palmer Lake	1,971	97	4.9%
Town of Ramah	162	27	16.7%
Unincorporated County	1,205,073	61,705	5.1%
El Paso County (Total)	**1,357,724**	**68,643**	**5.1%**

Source: El Paso County Information Technologies 2023; USGS 2023; FEMA 2018/2025

Figure 7-1. Special Flood Hazard Areas

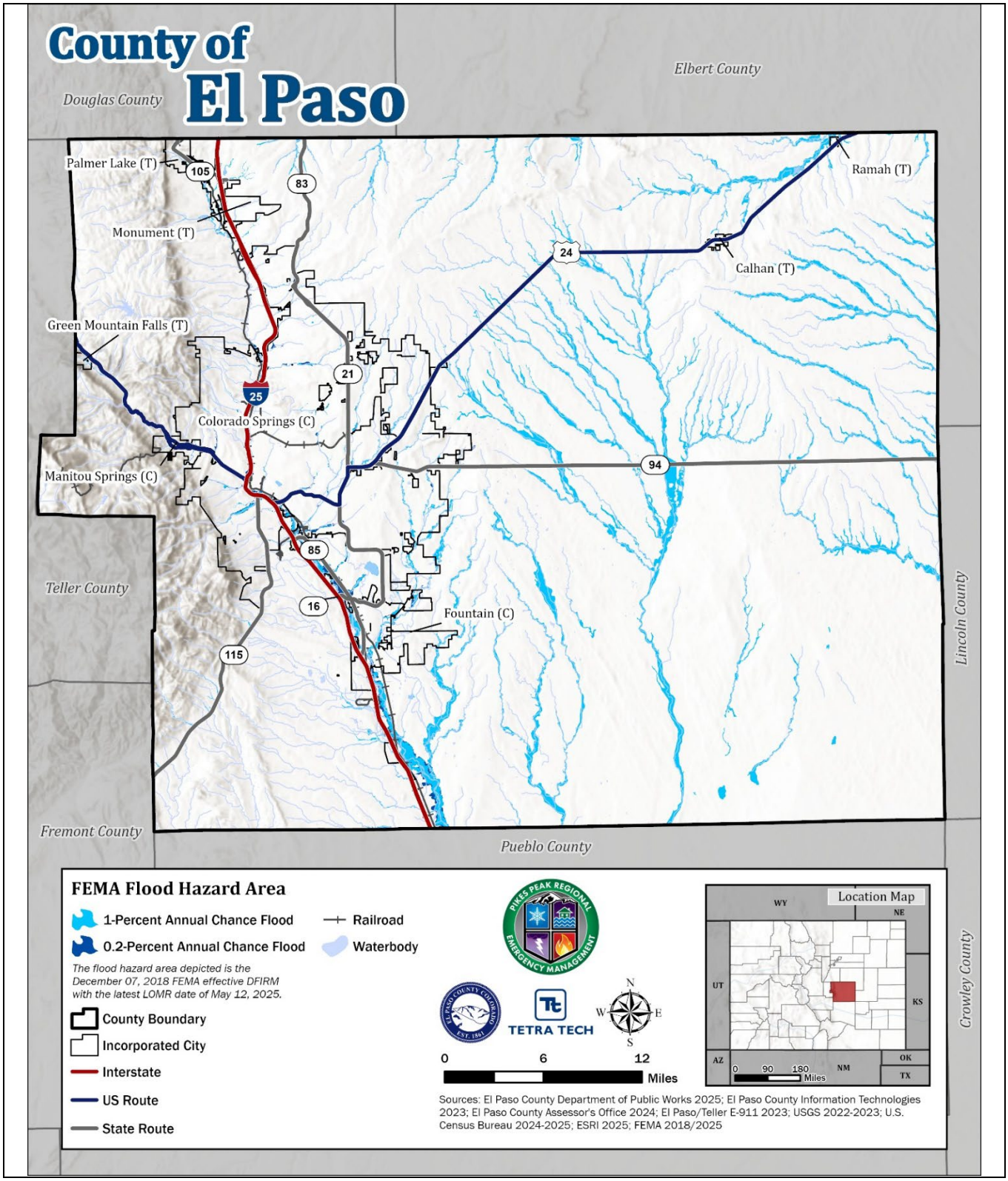
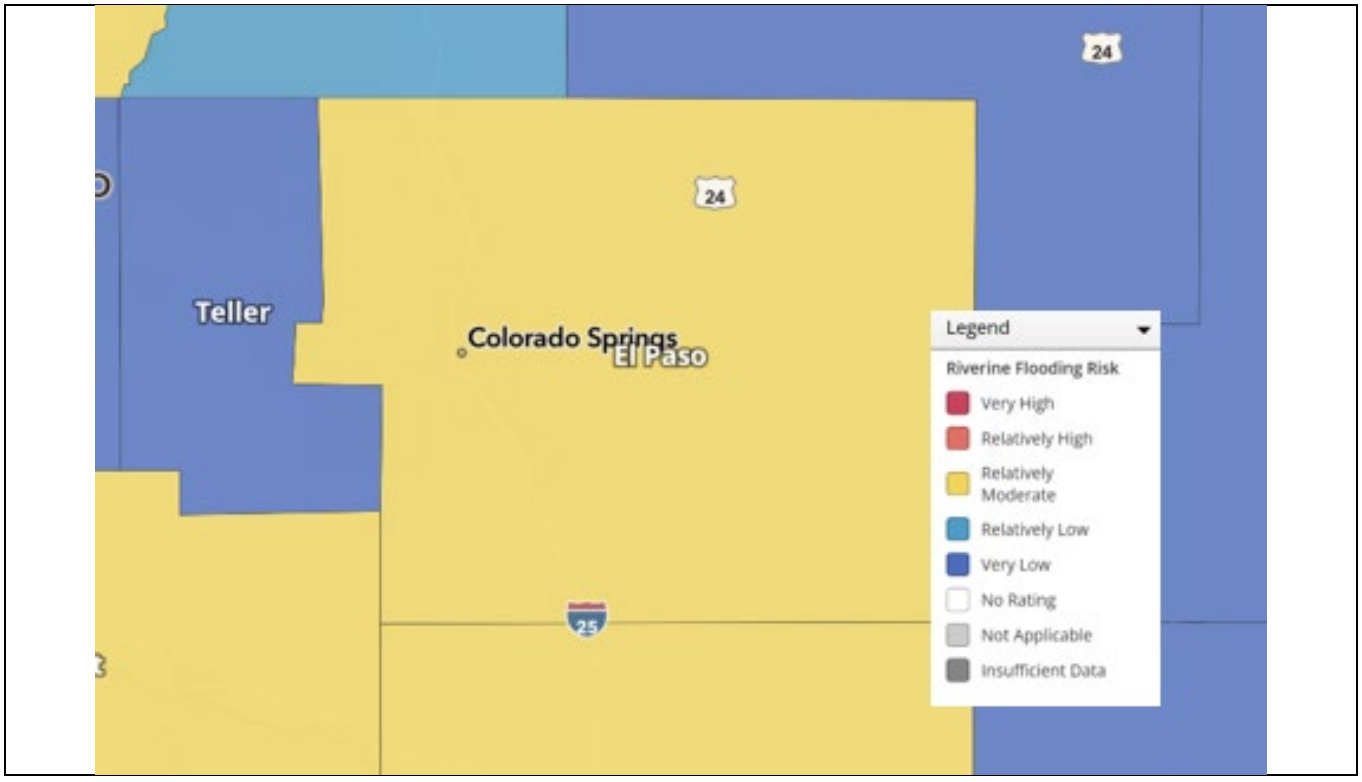
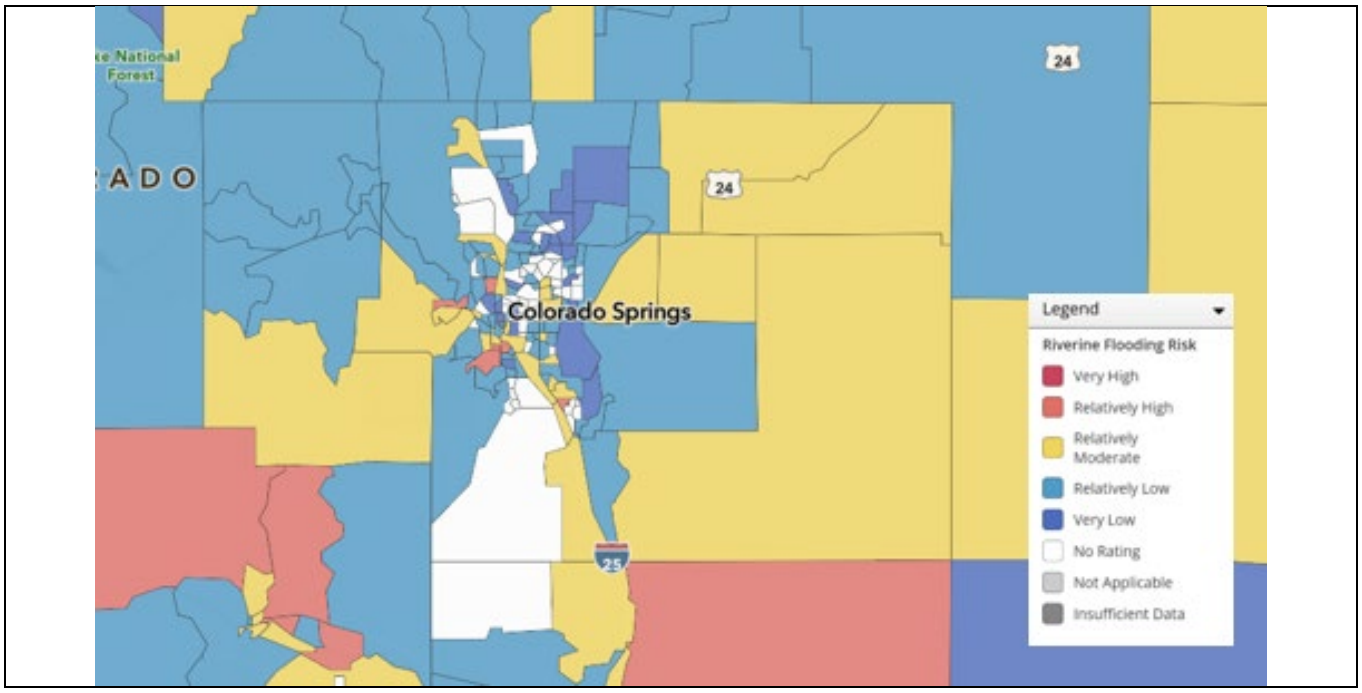


Figure 7-2. Riverine Flooding National Risk Index Score Using the County Scale



Source: FEMA 2025

Figure 7-3. Riverine Flooding National Risk Index Score Using the Census Tract Scale



Source: FEMA 2025

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

Warning Time

Because of the sequential pattern of meteorological conditions needed to cause serious flooding, it is unusual for a flood to occur without warning. Warning times for floods can be between 24 and 48 hours. Flash flooding can be less predictable, but potential hazard areas can be warned in advanced of potential flash flooding danger. A flash flood monitoring system, developed by Pikes Peak Regional Building Department's Floodplain Administration, continuously transmits rain and stream data to Emergency Management agencies. Flood warnings are also issued by radio and television media, National Oceanic and Atmospheric Administration (NOAA) weather radio, public address systems, emergency sirens or emergency personnel. Police and fire officials may be on hand to direct evacuation.

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

- If 1 inch or more of rain falls in an urban or mountain area in 1 hour, a flood statement should be issued. In mountain areas, a flash flood warning may be necessary.
- If 2 or more inches of rain falls in an urban or mountain area in 1 hour, a flash flood warning should be issued.
- In rural areas on the plains, if rainfall reaches 2 inches in 1 hour, a flood statement should be issued and if rainfall reaches 3 inches in 1 hour a flash flood warning should be issued.
- If precipitable water values exceed 150 percent of normal, this is a good indicator that flash flood producing rains will develop if precipitation occurs.

National Flood Insurance

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 study presents water surface elevations for floods of various magnitudes, including the 1-percent annual chance flood and the 0.2-percent annual chance flood (the 500-year flood). Base flood elevations and the boundaries of the 100- and 500-year floodplains are shown on Flood Insurance Rate Maps (FIRMs), which are the principal tools for identifying the extent and location of the flood hazard. FIRMs are the most detailed and consistent data source available, and for many communities they represent the minimum area of oversight under their floodplain management program.

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

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

El Paso County and its incorporated communities participate in the NFIP program. Structures permitted or built in the County before the program began are called "pre-FIRM" structures, and structures built afterwards are called "post-FIRM." The insurance rate is different for the two types of structures. The effective date for the current countywide Flood Insurance Rate Map (FIRM) is December 7, 2018. At the time of this update the County and jurisdictions saw a decrease in the mapped flood risk. This is attributed to additional infrastructure and mitigation measures put into place between the 1997 and 1999 effective maps and this update. The County and participating communities are currently in good standing with the provisions of the NFIP. Compliance is monitored by FEMA regional staff. Maintaining compliance under the NFIP is an important component of flood risk reduction.

Community Rating System

The Community Rating System (CRS) is a voluntary program within the NFIP that encourages floodplain management activities that exceed the minimum NFIP requirements. Flood insurance premiums are discounted to reflect the reduced flood risk resulting from community actions meeting the following three goals of the CRS:

- Reduce flood losses.
- Facilitate accurate insurance rating.
- Promote awareness of flood insurance

For participating communities, flood insurance premium rates are discounted in increments of 5 percent. For example, a Class 1 community would receive a 45 percent premium discount, and a Class 9 community would receive a 5 percent discount. (Class 10 communities are those that do not participate in the CRS; they receive no discount.) The CRS classes for local communities are based on 18 creditable activities in the following categories:

- Public Information
- Mapping and regulations
- Flood damage reduction
- Flood preparedness

CRS activities can save lives and reduce property damage. Communities participating in the CRS represent a significant portion of the nation's flood risk; over 66 percent of the NFIP's policy base is in these communities. Communities receive premium discounts through the CRS range from small to large and represent a broad mixture of flood risks. Table 7-3 summarizes CRS participation.

Table 7-3. CRS Participating Communities

Community	Original Effective Date	CRS Class	% Discount
El Paso County	1992	10	Not Participating
City of Colorado Springs	1992	7	15
City of Manitou Springs	1992	9	5

Source: (FEMA 2025)

Repetitive Loss Properties

The Open FEMA National Flood Insurance Program (NFIP) Multiple Loss Properties dataset was analyzed to gain an understanding of repetitive flood loss in the County. The dataset provides information on structures that have had multiple NFIP claims across the history of the program. Table 7-4 summarizes the repetitive loss and severe repetitive loss properties in the County.

Table 7-4. Repetitive Loss Summary

Type of Repetitive Loss	Residential	Non-Residential
Repetitive Loss Properties (NFIP definition)	19	5
Repetitive Loss Properties (FMA definition)	1	0
Severe Repetitive Loss Properties (NFIP definition)	1	0
Severe Repetitive Loss Properties (FMA definition)	2	0

Source: (FEMA 2024)

National Flood Insurance Program (NFIP) Definition of Repetitive Loss: The NFIP defines a repetitive loss property as any insurable building for which two or more claims of more than $1,000 were paid by the NFIP within any rolling 10-year period since 1978.

Flood Mitigation Assistance Grant Program (FMA) Definition of Repetitive Loss: FEMA's Flood Mitigation Assistance (FMA) program defines a repetitive loss property as any insurable building that has incurred flood-related damage on two occasions, in which the cost of the repair, on average, equaled or exceeded 25 percent of the market value of the structure at the time of each such flood event.

National Flood Insurance Program (NFIP) Definition of Severe Repetitive Loss: A residential property covered under an NFIP flood insurance policy and: (a) That has at least four NFIP claim payments over $5,000 each, and the cumulative amount of such claims payments exceeds $20,000; or (b) For which at least two separate claims payments have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building. In both instances, at least two of the claims must be within 10 years of each other, and claims made within 10 days of each other will be counted as one claim.

Flood Mitigation Assistance Grant Program (FMA) Definition of Severe Repetitive Loss: An NFIP-Insured structure that has incurred flood-related damage for which four or more separate claims payments have been made, with the amount of each claim (including building and contents payments) exceeding $5,000, and with the cumulative amount of such claims payments exceeding $20,000; or for which at least two separate claims payments (building payments only) have been made under such coverage, with the cumulative amount of such claims exceeding the market value of the building.

7.1.4 PREVIOUS OCCURRENCES

FEMA Disaster Declarations

Table 7-5 lists flood-related presidentially declared disasters that have included Pikes Peak Region.

Table 7-5. FEMA Disaster Declarations for Flood Events in Pikes Peak Region

FEMA Declaration Date	Declaration Number	Description
June 19, 1965	DR-200	Tornadoes, Severe Storms, Flooding
May 19, 1969	DR-261	Severe Storms, Flooding
May 23, 1973	DR-385	Heavy Rains, Snowmelt, Flooding
August 2, 1976	DR-517	Severe Storms, Flash Flooding
May 17, 1999	DR-1276	Severe Storms, Flooding, Mudslides, and Landslides
September 12, 2013	EM-3365	Severe Storms, Flooding, Landslides, and Mudslides
September 14, 2013	DR-4145	Severe Storms, Flooding, Landslides, and Mudslides
July 16, 2015	DR-4229	Severe Storms, Tornadoes, Flooding, Landslides, and Mudslides
August 25, 2023	DR-4731	Severe Storms, Flooding, and Tornadoes

Source: (FEMA n.d.)

State Emergency Proclamations

Table 7-6 lists all flood-related state emergency proclamations that included the Pikes Peak Region from 2020 to 2024.

Table 7-6. State Emergency Proclamations for Flood Events in Pikes Peak Region

State Proclamation Date	State Proclamation Number	Description
July 21, 2023	D-2023-011	Severe Weather and Flooding

Source: Colorado Governor n.d.

U.S. Department of Agriculture (USDA) Declarations

Between 2020 and 2024, the Pikes Peak Region was not included in any USDA flood-related agricultural disaster declarations.

All Recent Events

Table 7-7 lists flood-related events that impacted Pikes Peak Region since the previous HMP was developed. For earlier events, refer to the previous HMP.

Table 7-7. Flood Events in Pikes Peak Region (2020 to 2024)

Date	Hazard	Event Narrative
May 24, 2020	Heavy Rain	As strong thunderstorms moved through parts of El Paso County during the afternoon and evening hours on May 24th, several reports of nearly 1 of rain were reported. Most of the rain fell within 45-60 minutes as the storms moved through. No reports of flooding.
May 30, 2020	Heavy Rain	More thunderstorms with very heavy rain were experienced across parts of El Paso, Pueblo, and Custer Counties during the afternoon and evening hours on May 30th. Several reports of over 0.75 inches in 30 minutes with urban flash flooding reported. Road was washed out in Midway Ranches due to heavy rain from thunderstorms.
June 26, 2020	Heavy Rain	Scattered thunderstorms developed across the higher terrain early in the afternoon and then spread east across the I-25 Corridor during the mid-to-late afternoon and then continued to the far southeast plains by late evening. Hail was the main hazard, with several significant hail reports observed across El Paso county. Stalled cars in water on Voyager Parkway. Heavy rain, 1.42 inches. U.S. Geological Survey (USGS) station at U.S. Air Force Academy.
July 4, 2020	Heavy Rain	Scattered thunderstorms developed over the mountains by midday and then spread east across the plains in the afternoon and evening. Heavy rainfall and flash flooding were concerns this day, though isolated high thunderstorm wind gusts also occurred. Heavy rainfall of 0.72 inches occurred, falling in 40 minutes.
July 15, 2020	Heavy Rain	Storms developed over the mountains early in the afternoon and then spread east to the I-25 corridor through the afternoon hours, with reports of large hail and heavy rainfall with flash flooding noted in this location. Several vehicles underwater and stranded in security. Water was not swift moving. Reports of several shattered glass windows, and windshield damage. One inch hail. Heavy rainfall of 2.25 inches accumulated in under an hour.
July 27, 2020	Heavy Rain	Another day of showers and thunderstorms occurred over a good portion of southern Colorado. Flash flooding remained heightened on this day for the Spring burn scar, as well as parts of the eastern San Juan mountains where focus for persistent storm development and heavy rain occurred. Heavy rainfall of 0.5 inches fell in 20 minutes.
August 5, 2020	Heavy Rain	Isolated showers and storms developed over the mountains and high valleys during the day. Thunderstorm development then shifted to the I-25 corridor in the afternoon, specifically the Pikes Peak region, where multiple storms produced large hail. Heavy rainfall with localized flooding also occurred on this day. Water flowing over curb at Fontaine and Dartmouth. Extensive street flooding reported by broadcast media. Cars stalling in flood waters across roadway. Several boulders were washed onto Highway 24 due to heavy rainfall. Trained spotter reported large hail, 1.75 inches. Woman was hit in the wrist at 7 Falls and was injured. Time estimated at 4 PM. Reported at 10th and Colorado Ave., City of Colorado Springs, CO. National Weather Service employee reported large hail, 1.75 inches. Heavy rainfall of 1.51 inches.

Date	Hazard	Event Narrative
August 6, 2020	Heavy Rain	Thunderstorm development was once again focused across the Pikes Peak region on this day, with strong to severe thunderstorm development occurring. While large hail did occur, several reports of heavy rainfall were noted. Public reported large hail, 1 inch. Heavy rainfall of 2.13 inches.
August 16, 2020	Heavy Rain	Isolated thunderstorms developed over the higher terrain early in the afternoon and then moved east into the plains in the late afternoon and evening producing pockets of severe weather with heavy rainfall. Heavy rainfall of 1 inch fell in the past 35 to 40 minutes.
August 20, 2020	Thunderstorm Wind	Another day of afternoon and evening thunderstorm development occurred across both the higher terrain and plains. A few strong to severe storms occurred on this day. Street flooding greater than 6 inches deep at Austin Bluffs and Academy. Storm chaser reports large hail, 1 inch. Heavy rainfall of 2 inches. Local broadcasters shared pictures of thunderstorm wind damage in Ellicott, CO from the severe storms. Based on archived radar information it appears that a microburst descended right on top of the damaged location leading to the outbuilding and metal fencing damage.
May 17, 2021	Heavy Rain	A large upper-level system moved across the region during this time, providing widespread precipitation to much of southern Colorado. While a few severe reports consisting of large hail were observed, the main hazards were heavy rainfall with flash flooding. With the arrival of colder air, snow was also observed over and near the mountains. Heavy rain of 1.49 inches, City of Manitou Springs. Heavy rain of 1.89 inches, 2 miles northwest City of Manitou Springs. Heavy rain of 1.95 inches, 2 miles south southwest City of Manitou Springs.
July 31, 2021	Heavy Rain	The combination of the monsoon plume and moist low level upslope flow allowed for thunderstorms with heavy rainfall and flash flooding to occur on this day across the region. The highest concern for flash flooding was over the mountains and I-25 corridor region, but later in the evening, additional flash flooding occurred along and south of Highway 50. Streets were flooded, and vehicles were stranded. Heavy rainfall of 3.22 inches.
August 1, 2021	Heavy Rain	Widespread moderate to heavy rainfall occurred across much of the eastern mountains and adjacent locations along the I-25 corridor on this day. Rainfall as high as 2 to 5 inches was observed in many locations, with flash flooding occurring across parts of Pueblo county. Heavy rainfall of 3.49 inches.
September 3, 2021	Heavy Rain	Isolated to scattered showers and thunderstorms occurred across the central mountains and into the Pikes Peak region during this period, with rainfall amounts generally staying on the lighter side. A few higher amounts above one inch were observed across the Pikes Peak region though. Heavy rainfall of 1.33 inches.
July 6 – 7, 2022	Heavy Rain	Thunderstorms developed in the afternoon over and near the higher terrain, with an initial risk of strong to severe storms in the Pikes Peak region. This risk then spread into the eastern plains along the Highway 50 corridor later in the evening, where large hail damaging wind gusts up to around 75 mph, localized flash flooding, and even a tornado occurred. Heavy rainfall of 1.17 inches.

Date	Hazard	Event Narrative
July 25, 2022	Flood	Thunderstorms occurred once again on this day, though coverage was lower. Large hail was observed, however, heavy rain with localized flooding were the main hazards. Minor flooding of roads reported in the Security and Widefield area.
July 29, 2022	Heavy Rain	Isolated strong thunderstorms developed late in the day and into the evening across parts of northern El Paso County. Heavy rain with localized flooding were the main hazards, especially on the east side of City of Colorado Springs and near the Palmer Divide. Peyton Highway flooded five miles north of Peyton. Intersection of Meridian and Londonderry flooded 6-8 inches deep. Wooten Road flooded just north of Platte Avenue. Heavy rainfall of 2.50 inches.
August 6, 2022	Heavy Rain	Late afternoon thunderstorm activity pushed off the Palmer Divide moving east-southeast across the Colorado plains. Numerous flash flooding events, severe thunderstorm winds and some damages were reported across the region. Heavy rain was reported, 3 inches.
August 15, 2022	Heavy Rain	A few strong to severe storms developed right along the Palmer Divide in northern El Paso County during the afternoon of August 15th. As the storms slowly drifted east-southeast, they became severe, producing large damaging hail and pockets of flash flooding. Flash flooding with water flowing over the road at the intersection of Sweet Road and Peyton Hwy. Trained spotter called in to report flash flooding 3 miles west of Town of Calhan with approximately 1.5 to 2 inches fallen in the past hour. Recorded 1.7 inches of rain in an hour.
March 31, 2023	High Wind	Another day of windy conditions across southern Colorado, especially over the eastern plains where winds gusting to 70 mph were observed.
June 12, 2023	Heavy Rain	A closed low pressure center formed over southern California advecting Pacific based moisture towards southern Colorado. There was a record 2-day amount of rain that fell at the City of Colorado Springs Airport. There was also a single day amount over 5 inches reported in El Paso County. Reports of flash flooding burdened El Paso, Pueblo, and Fremont Counties. Poor drainage caused flash flooding. Reported by trained spotter. Law enforcement reported on B street in City of Colorado Springs. Water rescues are located on Hiawatha Drive in City of Colorado Springs. There was 3.93 inches of rain reported.
June 16, 2023	Heavy Rain	The continued deluge of heavy rain, severe thunderstorms, flash flooding, and tornadoes continue over southern Colorado by yet another closed low located over southern California. The largest hail stone was 4 inches as reported by law enforcement and emergency management located in Baca County. Heavy rains continue over the I-25 corridor, with multiple reports of additional flooding in El Paso and Pueblo Counties.
July 7, 2023	Heavy Rain	Residual moisture from an anomalously wet June moistened the lower levels aiding in ample amounts of instability. The northwest flow pattern created a lot of shear, which led to prolonged 3-day severe weather events over adjacent and eastern plains of southern Colorado.

Date	Hazard	Event Narrative
July 20, 2023	Heavy Rain	An upper-level high pressure center was located over central Arizona and central New Mexico which resulted in a favorable pattern for efficient diurnal wind fluctuations including upslope-oriented winds towards WFO Pueblo's eastern mountains. Weak waves embedded in the upper-level northwesterly flow enhanced the lift and the pattern enhanced the deep shear. The result was a very rare mountainous tornado that was observed at around 9,000 feet.
July 31, 2023	Heavy Rain	Surface flow from the east advected amply amounts of low-level moisture which created another event where heavy rains, hail, and gusty winds were observed. Weak perturbations in the upper flow sparked thunderstorms across the region.
September 11, 2023	Heavy Rain	Heavy rain primarily impacted the I-25 corridor in southern Colorado. No reports of flash flooding.
July 20 – 21, 2024	Flash Flood	Heavy rainfall and flash flooding on July 20 and 21 in El Paso and Pueblo Counties. Video shared on social from a social media partner of flash flooding/rushing water across roadway on Wooten Road near E Platte Ave in City of Colorado Springs.
August 9, 2024	Heavy Rain	An upper-level pattern which allowed for a sufficient mid-level monsoonal moisture plume to be established over the region aided in the development of storms, which produced heavy rainfall and lead to some heavy amounts of rain and minor flash flooding from the 7th thru 10th of August. A severe storm which developed over Teller County also allowed for a rare tornado to occur over high terrain, just NNE of Cripple Creek, on the 9th of August. Public Report from mPING: Street/road flooding; Street/road closed; Vehicles stranded. A trained spotter reported 0.63 inches of rain from a thunderstorm in a short period of time.
August 12, 2024	Heavy Rain	With a mid-level monsoonal moisture plume already in place, and a passing shortwave trough in the upper levels, a few strong to severe storms developed over portions of the plains from the 12th thru 13th of August and also resulted in some heavy amounts of rain over El Paso County. A wet microburst from a thunderstorm also produced wind damage around the city of Pueblo due to brief gusty winds being greater than hurricane force. A public source reported heavy rain with a total amount of 1.5 inches in a short period of time due to a strong storm.

Source: NOAA-NCEI, 2024

7.1.5 PROBABILITY OF FUTURE OCCURRENCES

Information on previous flood occurrences in the County was used to calculate the probability of future occurrence of such events. Table 7-8 lists the number of events from various sources over the 71-year period from 1954 to 2025, which is the most complete period of record for all sources reviewed. However, it is important to note that this information is approximate and does not mean that other flood events have not occurred, but simply that records were not present. Based on these records and input from the Steering Committee, the probability of occurrence for flood in the County is considered “frequent.”

Table 7-8. Probability of Future Flood Events in Pikes Peak Region

Hazard Type	Number of Occurrences Between 1954 and 2025	% Chance of Occurring in Any Given Year
Flash Flood	110	100%
Flood	13	54%
Heavy Rain (which may result in flooding)	43	17%
Total	166	100%

Source: NOAA-NCEI, 2025

Note: 100% probability indicates that it is statistically likely for an event to occur every year. It does not indicate that the occurrence of an event is a certainty in any given year.

7.1.6 CASCADING IMPACTS ON OTHER HAZARDS

The impacts of wildfire events on flood severity in the County are significant. Post-fire conditions in El Paso County will result in higher flows, more debris, and the potential for water to overflow channels and embankments causing significant additional damage (USGS 2018). Damage to bridges and utility crossings from the increased flows may result in power outages, hazardous conditions, and contamination to waters and the surrounding areas. Given these considerations, the flood hazard in communities recently impacted by wildfire is critical: isolated deaths and/or multiple injuries and illnesses; major or long-term property damage that threatens structural stability; and/or interruption of essential facilities and services for 24 to 72 hours.

Secondary effects, such as blocking or destroying roads, destroying homes and businesses, impacting on critical facilities and disrupting supply chains and access are prevalent with riverine flooding in El Paso County. Bridge, water infrastructure, riparian ecosystems and flood control devices can also be substantially damaged and impact a community's ability to function.

7.2 VULNERABILITY AND IMPACT ASSESSMENT

The 1- and 0.2-percent annual chance flood events were examined to evaluate the county's risk from the flood hazard, using the methodology described in Section 4.3.

7.2.1 LIFE, HEALTH, AND SAFETY

Overall Population

Table 7-9 summarizes estimated population exposure to the 1 percent and 0.2 percent annual chance flood events. An estimated 4,753 residents live in the 1-percent annual chance floodplain, or 0.6 percent of the County's total population. Unincorporated El Paso County has the greatest number of residents living in the 1 percent annual chance floodplain, at 2,075 residents. Based on the same analysis, there are an estimated 13,384 residents living in the 0.2 percent annual chance floodplain, or 1.8 percent of the County's total population. The City of Colorado Springs has the greatest number of residents living in the floodplain, at 4,400 residents.

Table 7-9. Population in the Riverine Flood Hazard Areas

	2023 ACS Total Jurisdiction Population	1% Annual Chance Flood: Population in Hazard Area	1% Annual Chance Flood: Population in Hazard Area as % of Total in Jurisdiction	0.2% Annual Chance Flood: Population in Hazard Area	0.2% Annual Chance Flood: Population in Hazard Area as % of Total in Jurisdiction
Town of Calhan	510	4	0.8%	6	1.2%
City of Colorado Springs	405,307	1,837	0.5%	4,400	1.1%
City of Fountain	92,873	399	0.4%	4,093	4.4%
Town of Green Mountain Falls	690	62	9.0%	74	10.7%
City of Manitou Springs	4,796	344	7.2%	432	9.0%
Town of Monument	11,035	6	0.1%	6	0.1%
Town of Palmer Lake	2,635	25	0.9%	52	2.0%
Town of Ramah	130	1	0.8%	1	0.8%
Unincorporated County	218,032	2,075	1.0%	4,320	2.0%
El Paso County (Total)	**736,008**	**4,753**	**0.6%**	**13,384**	**1.8%**

Source: U.S. Census Bureau 2023, American Community Survey; U.S. Army Corps of Engineers, National Structure Inventory 2022; FEMA 2018/2025

The Hazus analysis for flood estimated displacements of the population as listed in Table 7-10. In El Paso County, a 1-percent annual chance flood could result in approximately 6,339 displaced individuals, with 1,928 seeking short-term shelter. The City of Colorado Springs would be the most affected, with an estimated 3,622 displaced people and 1,212 requiring short-term sheltering.

Socially Vulnerable Population

Research has shown that some populations, while they may not have more hazard exposure, may experience exacerbated impacts and prolonged recovery if/when impacted. This is due to many factors, including their physical and financial ability to react or respond during a hazard. Of the population exposed, the most vulnerable include the economically disadvantaged and the population over 65. Economically disadvantaged populations may be more vulnerable because they are likely to make decisions to evacuate based on net economic impacts on their families. The population over age 65 is also more vulnerable because they are more likely to seek or need medical attention that may not be available due to isolation during a flood event, and they may have more difficulty evacuating.

Table 7-10. 1-Percent Annual Chance Flood Impacts on People

Jurisdiction	Total Population 2023 ACS	Population Displaced by 1% Annual Chance Flood	Persons Seeking Short-Term Shelter Due to 1% Annual Chance Flood
Town of Calhan	510	10	8
City of Colorado Springs	405,307	3,622	1,212
City of Fountain	92,873	110	50
Town of Green Mountain Falls	690	81	15
City of Manitou Springs	4,796	445	106
Town of Monument	11,035	23	4
Town of Palmer Lake	2,635	39	14
Town of Ramah	130	7	0
Unincorporated County	218,032	2,002	519
El Paso County (Total)	**736,008**	**6,339**	**1,928**

Source: U.S. Census Bureau 2023, American Community Survey; Hazus v6.1; U.S. Geological Survey 2020-2023; FEMA 2018/2025

Table 7-11 presents the estimated socially vulnerable populations in the 1 percent and 0.2 percent annual chance flood hazard areas. Of the 4,753 persons located in the 1 percent annual chance floodplain, there are 652 persons over the age of 65, 278 persons under the age of 5, 59 non-English speakers, 549 persons with a disability, and 353 living in poverty. Of the 13,384 persons located in the 0.2 percent annual chance floodplain, there are 1,662 persons over the age of 65, 872 persons under the age of 5, 167 non-English speakers, 1,512 persons with a disability, and 1,040 living in poverty.

7.2.2 GENERAL BUILDING STOCK

Exposure to the flood hazard includes buildings located in the mapped flood zone or downstream in other flood inundation areas. The potential damage is the modeled loss that could occur to the exposed inventory measured by the structural and content replacement cost value. There are an estimated 1,859 buildings exposed to the 1 percent annual flood chance event, representing 0.7 percent of the County's total general building stock inventory with a replacement cost value of $1,248,137,796. The City of Colorado Springs has the greatest number of its buildings in the 1 percent annual chance floodplain (798 buildings or 0.5 percent of its total building stock). There are an estimated 4,411 buildings in the 0.2 percent annual chance floodplain, representing 1.7 percent of the County's total general building stock inventory with a replacement cost value of $3,175,220,416. The City of Colorado Springs has the greatest number of buildings located in the 0.2 percent annual chance floodplain (2,046 buildings or 1.2 percent of its total building stock).

Table 7-11. Estimated Number of Vulnerable Persons Living in the Riverine Flood Hazard Areas

	1% Annual Chance Flood: Vulnerable Population in Hazard Area	**1% Annual Chance Flood:** Vulnerable Population in Hazard Area as % of Total in Jurisdiction	**0.2% Annual Chance Flood:** Vulnerable Population in Hazard Area	**0.2% Annual Chance Flood:** Vulnerable Population in Hazard Area as % of Total in Jurisdiction
People Over 65				
Town of Calhan	1	0.9%	1	0.9%
City of Colorado Springs	280	0.5%	672	1.1%
City of Fountain	33	0.4%	342	4.4%
Town of Green Mountain Falls	8	8.7%	9	9.8%
City of Manitou Springs	61	7.1%	77	9.0%
Town of Monument	0	0.0%	0	0.0%
Town of Palmer Lake	5	0.9%	10	1.9%
Town of Ramah	0	0.0%	0	0.0%
Unincorporated County	264	0.9%	551	2.0%
El Paso County (Total)	**652**	**0.6%**	**1,662**	**1.7%**
People Under 5				
Town of Calhan	0	0.0%	0	0.0%
City of Colorado Springs	105	0.4%	253	1.1%
City of Fountain	32	0.4%	328	4.4%
Town of Green Mountain Falls	1	7.1%	1	7.1%
City of Manitou Springs	4	6.3%	5	7.9%
Town of Monument	0	0.0%	0	0.0%
Town of Palmer Lake	0	0.0%	1	1.4%
Town of Ramah	0	0.0%	0	0.0%
Unincorporated County	136	0.9%	284	2.0%
El Paso County (Total)	**278**	**0.6%**	**872**	**1.9%**
Non-English Speaking People				
Town of Calhan	0	0.0%	0	0.0%
City of Colorado Springs	36	0.5%	86	1.1%
City of Fountain	4	0.4%	42	4.4%
Town of Green Mountain Falls	0	0.0%	0	0.0%
City of Manitou Springs	1	4.5%	1	4.5%

	1% Annual Chance Flood: Vulnerable Population in Hazard Area	1% Annual Chance Flood: Vulnerable Population in Hazard Area as % of Total in Jurisdiction	0.2% Annual Chance Flood: Vulnerable Population in Hazard Area	0.2% Annual Chance Flood: Vulnerable Population in Hazard Area as % of Total in Jurisdiction
Town of Monument	0	0.0%	0	0.0%
Town of Palmer Lake	0	0.0%	0	0.0%
Town of Ramah	0	0.0%	0	0.0%
Unincorporated County	18	0.9%	38	2.0%
El Paso County (Total)	**59**	**0.5%**	**167**	**1.5%**
People with Disability				
Town of Calhan	0	0.0%	0	0.0%
City of Colorado Springs	248	0.5%	594	1.1%
City of Fountain	40	0.4%	420	4.4%
Town of Green Mountain Falls	11	8.5%	14	10.8%
City of Manitou Springs	46	7.2%	58	9.0%
Town of Monument	0	0.0%	0	0.0%
Town of Palmer Lake	3	0.9%	7	2.0%
Town of Ramah	0	0.0%	0	0.0%
Unincorporated County	201	0.9%	419	2.0%
El Paso County (Total)	**549**	**0.6%**	**1,512**	**1.7%**
People Below Poverty Level				
Town of Calhan	0	0.0%	0	0.0%
City of Colorado Springs	190	0.5%	455	1.1%
City of Fountain	33	0.4%	340	4.4%
Town of Green Mountain Falls	2	7.1%	3	10.7%
City of Manitou Springs	33	7.0%	42	8.9%
Town of Monument	0	0.0%	0	0.0%
Town of Palmer Lake	0	0.0%	1	1.1%
Town of Ramah	0	0.0%	0	0.0%
Unincorporated County	95	0.9%	199	2.0%
El Paso County (Total)	**353**	**0.6%**	**1,040**	**1.7%**

Source: U.S. Census Bureau 2023, American Community Survey; U.S. Army Corps of Engineers, National Structure Inventory 2022; FEMA 2018/2025

Table 7-12 and Table 7-13 for the estimated exposure of buildings during 1- and 0.2 percent annual chance flood events by jurisdiction. Table 7-14 and Table 7-15 provide a summary of buildings in the 1- and 0.2 percent annual chance flood events by occupancy class.

Estimated Damage to Buildings

Table 7-16 summarizes estimated building losses due to the 1 percent annual chance flood event. Roughly $156 million in damage is estimated for all occupancies, with the City of Colorado Springs estimated to see the majority of damage ($66 million).

Estimated Debris Generated by Flooding

Debris management may be a large expense after a flood event. Hazus breaks down flood debris into three categories: finishes (dry wall, insulation, etc.); structural (wood, brick, etc.) and foundations (concrete slab and block, rebar, etc.). The distinction is made because of the different types of equipment needed to handle the debris.

Table 7-17 summarizes the countywide debris estimates for the 1 percent annual chance flood events. The table only estimates structural debris generated by flooding and does not include non-structural debris or debris generated by wind that may be associated with a storm that causes flooding. Overall, Hazus estimates that there will be 6,657.3 tons of debris generated during the 1 percent annual chance flood event in El Paso County.

7.2.3 COMMUNITY LIFELINES AND OTHER CRITICAL FACILITIES

Many miles of road and rail infrastructure are exposed to the 100-year floodplain in the planning area. Roads or railroads that are blocked or damaged can isolate residents and can prevent access throughout the County, including for emergency service providers needing to get to vulnerable populations or to make repairs. Bridges washed out or blocked by floods or debris also can cause isolation. Water and sewer systems can be flooded or backed up, causing health problems. Underground utilities can be damaged. Dikes can fail or be overtopped, inundating the land that they protect. The following sections describe specific types of critical infrastructure.

The major roads in the planning area that pass through the 100-year floodplain and thus are exposed to flooding include:

- US Interstate 25
- State Highway 83
- State Highway 115
- State Highway 16
- State Highway 94
- US Highway 24
- State Highway 21
- State Highway 105
- US Highway 85

Table 7-12. Buildings in the 1-Percent Annual Chance Flood Hazard Area

Jurisdiction	Jurisdiction Total Buildings	Jurisdiction Total Replacement Cost Value	Number of Buildings in Hazard Area	Buildings in Hazard Area as % of Jurisdiction Total	Replacement Cost Value in Hazard Area	Replacement Cost Value in Hazard Area as % of Jurisdiction Total
Town of Calhan	424	$383,083,382	5	1.2%	$2,347,355	0.6%
City of Colorado Springs	166,064	$105,908,247,826	798	0.5%	$562,139,436	0.5%
City of Fountain	9,810	$5,036,639,818	41	0.4%	$16,448,282	0.3%
Town of Green Mountain Falls	556	$170,290,831	56	10.1%	$22,814,984	13.4%
City of Manitou Springs	2,412	$1,261,305,232	240	10.0%	$210,260,822	16.7%
Town of Monument	3,594	$2,441,721,337	2	0.1%	$1,184,958	<0.1%
Town of Palmer Lake	1,304	$706,564,041	13	1.0%	$5,663,830	0.8%
Town of Ramah	83	$25,682,659	1	1.2%	$179,156	0.7%
Unincorporated County	68,245	$36,530,240,639	703	1.0%	$427,098,974	1.2%
El Paso County (Total)	**252,492**	**$152,463,775,764**	**1,859**	**0.7%**	**$1,248,137,796**	**0.8%**

Source: U.S. Army Corps of Engineers, National Structure Inventory 2022; RSMeans 2024; FEMA 2018/2025

Table 7-13. Buildings in the 0.2-Percent Annual Chance Flood Hazard Area

Jurisdiction	Jurisdiction Total Buildings	Jurisdiction Total Replacement Cost Value	Number of Buildings in Hazard Area	Buildings in Hazard Area as % of Jurisdiction Total	Replacement Cost Value in Hazard Area	Replacement Cost Value in Hazard Area as % of Jurisdiction Total
Town of Calhan	424	$383,083,382	6	1.4%	$2,824,224	0.7%
City of Colorado Springs	166,064	$105,908,247,826	2,046	1.2%	$1,682,584,611	1.6%
City of Fountain	9,810	$5,036,639,818	541	5.5%	$489,578,252	9.7%
Town of Green Mountain Falls	556	$170,290,831	70	12.6%	$28,941,403	17.0%
City of Manitou Springs	2,412	$1,261,305,232	298	12.4%	$246,093,153	19.5%
Town of Monument	3,594	$2,441,721,337	2	0.1%	$1,184,958	<0.1%
Town of Palmer Lake	1,304	$706,564,041	37	2.8%	$36,084,640	5.1%
Town of Ramah	83	$25,682,659	1	1.2%	$179,156	0.7%
Unincorporated County	68,245	$36,530,240,639	1,410	2.1%	$687,750,019	1.9%
El Paso County (Total)	**252,492**	**$152,463,775,764**	**4,411**	**1.7%**	**$3,175,220,416**	**2.1%**

Source: U.S. Army Corps of Engineers, National Structure Inventory 2022; RSMeans 2024; FEMA 2018/2025

Table 7-14. Buildings in the 1-Percent Annual Chance Flood Hazard Area by General Occupancy Class

Jurisdiction	Residential Buildings in the Landslide Hazard Area	Commercial Buildings in the Landslide Hazard Area	Industrial Buildings in the Landslide Hazard Area	Other Buildings in the Landslide Hazard Area
Town of Calhan	3	2	0	0
City of Colorado Springs	681	106	8	3
City of Fountain	40	1	0	0
Town of Green Mountain Falls	47	7	0	2
City of Manitou Springs	152	75	7	6
Town of Monument	2	0	0	0
Town of Palmer Lake	11	1	0	1
Town of Ramah	1	0	0	0
Unincorporated County	612	63	15	13
El Paso County (Total)	**1,549**	**255**	**30**	**25**

Source: U.S. Army Corps of Engineers, National Structure Inventory 2022; FEMA 2018/2025
Note: Other = Government, Religion, Agricultural, and Education

Table 7-15. Buildings in the 0.2-Percent Annual Chance Flood Hazard Area by General Occupancy Class

Jurisdiction	Residential Buildings in the Landslide Hazard Area	Commercial Buildings in the Landslide Hazard Area	Industrial Buildings in the Landslide Hazard Area	Other Buildings in the Landslide Hazard Area
Town of Calhan	4	2	0	0
City of Colorado Springs	1,631	350	34	31
City of Fountain	410	104	11	16
Town of Green Mountain Falls	56	12	0	2
City of Manitou Springs	191	90	8	9
Town of Monument	2	0	0	0
Town of Palmer Lake	23	3	0	11
Town of Ramah	1	0	0	0
Unincorporated County	1,274	97	22	17
El Paso County (Total)	**3,592**	**658**	**75**	**86**

Source: U.S. Army Corps of Engineers, National Structure Inventory 2022; FEMA 2018/2025
Note: Other = Government, Religion, Agricultural, and Education

Table 7-16. 1-Percent Annual Chance Flood Impacts on Buildings

Jurisdiction	Total Replacement Cost Value (RCV)	Estimated Loss for All Occupancies	Estimated Loss as % of Total RCV	Estimated Loss for Residential Properties	Estimated Loss for Commercial Properties	Estimated Loss for Industrial Properties	Estimated Loss for All Other Occupancies
Town of Calhan	$383,083,382	$138,935	<0.1%	$138,935	$0	$0	$0
City of Colorado Springs	$105,908,247,826	$65,901,313	0.1%	$50,017,756	$12,507,905	$3,370,511	$5,141
City of Fountain	$5,036,639,818	$2,203,263	<0.1%	$2,122,491	$80,772	$0	$0
Town of Green Mountain Falls	$170,290,831	$2,433,256	1.4%	$1,739,478	$303,098	$0	$390,680
City of Manitou Springs	$1,261,305,232	$51,553,231	4.1%	$14,118,278	$30,516,928	$936,375	$5,981,650
Town of Monument	$2,441,721,337	$25,269	<0.1%	$25,269	$0	$0	$0
Town of Palmer Lake	$706,564,041	$403,693	0.1%	$395,032	$0	$0	$8,661
Town of Ramah	$25,682,659	$61,097	0.2%	$61,097	$0	$0	$0
Unincorporated County	$36,530,240,639	$33,260,666	0.1%	$21,282,103	$4,003,340	$4,135,766	$3,839,457
El Paso County (Total)	**$152,463,775,764**	**$155,980,723**	**0.1%**	**$89,900,439**	**$47,412,043**	**$8,442,652**	**$10,225,589**

Source: Hazus v6.1; U.S. Army Corps of Engineers, National Structure Inventory 2022; RSMeans 2024; U.S. Geological Survey 2020-2023; FEMA 2018/2025
Note: Other = Government, Religion, Agricultural, and Education

Table 7-17. Estimated Debris Created During 1-Percent Annual Chance Flood Event

Jurisdiction	Total (tons)	Finish (tons)	Structure (tons)	Foundation (tons)
Town of Calhan	5.4	4.5	0.4	0.5
City of Colorado Springs	3,166.5	2,493.7	394.1	278.7
City of Fountain	55.0	31.4	9.6	14.0
Town of Green Mountain Falls	203.4	141.9	33.2	28.3
City of Manitou Springs	2,421.4	977.1	805.0	639.3
Town of Monument	3.0	2.6	0.3	0.2
Town of Palmer Lake	5.8	5.4	0.1	0.3
Town of Ramah	8.4	4.4	1.4	2.6
Unincorporated County	788.5	592.1	80.8	115.5
El Paso County (Total)	**6,657.3**	**4,253.1**	**1,324.8**	**1,079.4**

Source: Hazus v6.1; U.S. Army Corps of Engineers, National Structure Inventory 2022; U.S. Geological Survey 2020-2023; FEMA 2018/2025

Flooding events can significantly impact road bridges. These are important because often they provide the only ingress and egress to some neighborhoods. An analysis showed that there are over 200 bridges that are in or cross over the 100-year floodplain.

Water and sewer systems can be affected by flooding. Floodwater can back up drainage systems, causing localized flooding. Culverts can be blocked by debris from flooding events, also causing localized urban flooding. Floodwater can get into drinking water supplies, causing contamination. Sewer systems can be backed up, causing wastewater to spill into homes, neighborhoods, rivers, and streams. Two wastewater facilities are identified in the 100-year floodplain.

Erosion and deposition along riverways can also impact on critical facilities and infrastructure as erosion removes the buffer between facilities and infrastructure and deposition changes riverine flooding behaviors. Ensuring the rivers and riparian environments are healthy and maintained, particularly following a flood event, can help mitigate these impacts.

Levees have historically been used to control flooding in portions of the planning area. The U.S. Army Corps of Engineers lists three levees in the National Levee Database, all within the City of Colorado Springs. It is possible that there are additional levees within the County that are not listed within this database. Additional levees may be located on smaller rivers, streams, and creeks that protect small areas of land. They may have been built under earlier flood management goals. Many older levees are exposed to scouring and failure due to old age and construction methods.

Table 7-18 and Table 7-19 list the number of facilities in the 1-percent and 0.2-percent annual chance flood hazard areas. There are 49 facilities in the 1-percent annual chance flood hazard area. Of these, 31 fall under the Safety and Security sector, followed by 8 facilities in the Water Systems sector. Within the 0.2-percent annual chance flood hazard area, there are 72 facilities. Of these, 40 are in the Safety and Security sector, and 13 are in the Water Systems sector.

Table 7-18. Number of Facilities in the 1-Percent Annual Chance Flood Hazard Area

Jurisdiction	Communica-tions	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transpor-tation	Water Systems	Other Critical Facilities	Total	Facilities in Hazard Area as % of Jurisdiction Total
Town of Calhan	0	0	0	0	0	3	0	0	0	**3**	50.0%
City of Colorado Springs	0	0	0	1	1	6	0	6	1	**15**	1.2%
City of Fountain	0	0	0	0	0	0	0	0	0	**0**	0.0%
Town of Green Mountain Falls	0	0	0	1	0	0	0	0	0	**1**	16.7%
City of Manitou Springs	0	0	0	0	0	0	0	0	1	**1**	11.1%
Town of Monument	0	0	0	0	0	1	0	0	0	**1**	5.3%
Town of Palmer Lake	0	0	0	0	0	0	0	0	0	**0**	0.0%
Town of Ramah	0	0	0	0	0	0	0	0	0	**0**	0.0%
Unincorporated County	0	0	0	3	2	21	0	2	0	**28**	6.7%
El Paso County (Total)	**0**	**0**	**0**	**5**	**3**	**31**	**0**	**8**	**2**	**49**	**2.8%**

Source: Colorado Department of Public Health and Environment 2019, 2024-2025; Colorado Springs 2025; Colorado Springs Utilities 2025; El Paso County 2024-2025; Federal Aviation Administration 2025; Homeland Infrastructure Foundation-Level Data 2025; National Center for Education Statistics 2025; U.S. Army Corps of Engineers 2025; FEMA 2018/2025

Table 7-19. Number of Facilities in the 0.2-Percent Annual Chance Flood Hazard Area

Jurisdiction	Communica-tions	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transpor-tation	Water Systems	Other Critical Facilities	Total	Facilities in Hazard Area as % of Jurisdiction Total
Town of Calhan	0	0	0	0	0	3	0	0	0	**3**	50.0%
City of Colorado Springs	0	0	0	3	4	15	0	11	1	**34**	2.7%
City of Fountain	0	0	0	0	0	0	0	0	0	**0**	0.0%
Town of Green Mountain Falls	0	0	0	1	0	0	0	0	0	**1**	16.7%
City of Manitou Springs	0	0	0	1	0	0	0	0	1	**2**	22.2%
Town of Monument	0	0	0	0	0	1	0	0	0	**1**	5.3%
Town of Palmer Lake	0	0	0	0	0	0	0	0	0	**0**	0.0%
Town of Ramah	0	0	0	0	0	0	0	0	0	**0**	0.0%
Unincorporated County	0	1	0	4	2	21	0	2	1	**31**	7.5%
El Paso County (Total)	**0**	**1**	**0**	**9**	**6**	**40**	**0**	**13**	**3**	**72**	**4.1%**

Source: Colorado Department of Public Health and Environment 2019, 2024-2025; Colorado Springs 2025; Colorado Springs Utilities 2025; El Paso County 2024-2025; Federal Aviation Administration 2025; Homeland Infrastructure Foundation-Level Data 2025; National Center for Education Statistics 2025; U.S. Army Corps of Engineers 2025; FEMA 2018/2025

As shown in Table 7-20, during a 1 percent annual chance flood event, several lifeline sectors in the area are expected to experience varying levels of damage. The Safety and Security sector is the most affected, with 31 facilities impacted, 18 with less than 5 percent damage, 11 with 5 to 19 percent damage, 1 with 20 to 39 percent damage, and 1 with damage exceeding 50 percent.

Table 7-20. Number of Facilities Experiencing Damage Due to the 1-Percent Annual Chance Flood Event

Lifeline	<5% Damage	5 - 19% Damage	20 - 39% Damage	40 - 49% Damage	50% or Greater Damage
Communications	0	0	0	0	0
Energy	1	0	0	0	0
Food, Hydration, Shelter	0	0	0	0	0
Hazardous Materials	4	0	0	0	1
Health and Medical	2	0	1	0	0
Safety and Security	18	11	1	0	1
Transportation	0	0	0	0	0
Water Systems	7	2	0	0	0

Source: Hazus v6.1; Colorado Department of Public Health and Environment 2019, 2024-2025; Colorado Springs 2025; Colorado Springs Utilities 2025; El Paso County 2024-2025; Federal Aviation Administration 2025; Homeland Infrastructure Foundation-Level Data 2025; National Center for Education Statistics 2025; U.S. Army Corps of Engineers 2025; U.S. Geological Survey 2020-2023; FEMA 2018/2025

7.2.4 ECONOMY

Floods impacts on the local and regional economy include general building stock damage, associated tax loss, impacts on utilities and infrastructure, agricultural losses, business interruption, and effects on tourism. Flooding can result in standing water which blocks transportation corridors and public transit for days or causes damage that takes weeks to repair. Flooding may also prevent individuals from traveling to school, work, shopping centers, services, etc. Table 7-16 lists building-related economic losses due to the 1 percent annual chance and 2 percent annual chance of flood events. In areas that are directly flooded, renovations of commercial and industrial buildings may be necessary, disrupting associated services.

7.2.5 ENVIRONMENT

Flooding is a natural event, and floodplains provide many natural and beneficial functions. Nonetheless, with human development factored in, flooding can impact the environment in negative ways. Migrating fish can wash into roads or over dikes into flooded fields, with no possibility of escape. Pollution from roads, such as oil, and hazardous materials, can wash into rivers and streams. During floods, these can settle onto normally dry soils, polluting them for agricultural uses. Bridge abutments, levees, and logjams from timber harvesting can increase stream bank erosion, causing rivers and streams to migrate into non-natural courses.

7.2.6 HISTORIC AND CULTURAL RESOURCES

Flooding in El Paso County has had, and could continue to have, significant impacts on its historic and cultural resources. Areas such as City of Manitou Springs, which is rich in heritage and architectural landmarks, especially has experienced flood impacts to these resources. One notable example is the City of Manitou Springs Incline Trail and Hydro-Electric Plant Pipeline. This is a site listed on the National Register of Historic Places. During the severe flooding events of September 2013, the early 20th-century industrial archaeological site suffered extensive damage due to landslides and erosion. The floods compromised structures of the historic railway and associated water infrastructure which resulted in a multi-year restoration and mitigation effort supported by FEMA (FEMA 2024). As well, such events threaten the cultural identity of the region by disrupting access to historic trails, landmarks, and community gathering spaces. These impacts emphasize the vulnerability of heritage sites to natural disasters and the importance of integrating cultural resource protection into floodplain management and emergency planning.

7.3 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

7.3.1 LAND USE

Flooding has influenced land use planning and development in El Paso County. This has prompted shifts in the policy and infrastructure types to mitigate future risks. As the County continues to grow in urban centers like City of Colorado Springs, flood-prone areas such as along Fountain Creek and its tributaries, have required strong zoning regulations and stormwater management practices. The Colorado Hazard Mapping Program, supported by the Colorado Water Conservation Board, has provided updated flood hazard maps and risk assessments that guide local decision-making (Colorado Climate Action n.d.). Tools such as these help identify areas that are not suitable for development and help to inform the design of green infrastructure like detention basins and open space buffers that may help to reduce runoff and erosion. Also, floodplain development restrictions assist with protecting both property and natural ecosystems by ensuring new construction does not increase flood risks. These changes reflect resilience-focused land use planning in response to climate change and extreme weather events.

Changes in Floodplain Development and Demographics

Because they border water bodies, floodplains have historically been popular sites to establish settlements. But human activity in floodplains frequently interferes with the natural function of floodplains. It can affect the distribution and timing of drainage, thereby increasing flood problems. Human development can create local flooding problems by altering or confining drainage channels. This increases flood potential in two ways: it reduces the stream's capacity to contain flows, and it increases flow rates or velocities downstream during all stages of a flood event. Human activities

can interface effectively with a floodplain if steps are taken to mitigate the activities' adverse impacts on floodplain functions.

Growth and development in El Paso County and incorporated communities have a high potential to encroach on the floodplain and in flood prone areas, putting additional lives and investments at risk. Property owners may apply pressure to develop their land to the fullest and highest potential, even when development and property are in high-risk areas for flooding. The municipalities and County should put controls in place to ensure that they are reasonably protecting lives and investments in existing and future flood prone areas.

Drought and wildfire have both increased in frequency and magnitude in recent years. These will continue to adversely impact the vulnerabilities of flooding. It is anticipated that rain events may arrive with less consistency, yet also with increased frequency for events with greater amounts of precipitation. This scenario could exacerbate flooding events.

Changes in Watershed Development

El Paso County has experienced changes in watershed development driven by rapid population growth, urban expansion, and evolving land use policies. The County has been actively updating its Land Development Code to better manage the impacts of development on natural resources, including watersheds (El Paso County n.d.). The goal of these updates is to balance growth and environmental stewardship by incorporating more strict stormwater management practices, erosion control measures, and sustainable land use planning. Also, the County's Drainage Criteria Manual and Engineering Criteria Manual are technical guidance to ensure that new developments do not increase flooding or degrade water quality for the communities (El Paso County n.d.). Urban areas like City of Colorado Springs will continue to expand into undeveloped land, it is important to maintain the health of watersheds such as Fountain Creek. These efforts reflect the commitment to protecting water resources while accommodating the region's growth.

7.3.2 CLIMATE CHANGE

Annual precipitation amounts in the region are projected to increase, primarily in the form of heavy rainfall, which has the potential to increase the risk of flash flooding and riverine flooding and flood critical transportation corridors and infrastructure. Increases in precipitation may alter and expand the floodplain boundaries and runoff patterns, resulting in the exposure of populations, buildings, critical facilities, and infrastructure that were previously outside the floodplain. This increase in exposure would result in an increased risk to life and health, an increase in structural losses, a diversion of additional resources to response and recovery efforts, and an increase in business closures affected by future flooding events due to loss of service or access.

It is anticipated El Paso County will continue to experience direct and indirect impacts of flooding events annually that may induce secondary hazards such as infrastructure deterioration or failure, utility failures, power outages, water quality and supply concerns, and transportation delays, accidents, and inconveniences (FEMA n.d.).

7.3.3 OTHER IDENTIFIED CONDITIONS

The major issues for the flood hazard in the planning area are the following:

- Flash flooding that occurs with little or no warning will continue to impact the planning area.
- The duration and intensity of storms contributing to flooding issues may increase because of climate change.
- Flooding may be exacerbated by other hazards, such as wildfires, and may cause damage in areas not typically considered special flood hazard areas.
- Damages resulting from floods may impact tourism, which may have significant impacts on the local economy.
- The promotion of flood insurance as a means of protecting private property owners from the economic impacts of frequent flood events should continue.

7.4 CONSEQUENCE ANALYSIS

Table 7-21 presents the results of the consequence analysis for the flood hazard.

Table 7-21. Consequence Analysis for the Flood Hazard

Category	Narrative
Hazard Description	Most flooding events in the planning area have resulted in property damage, flooded roadways, and stalled vehicles. Typically, the damage is limited in magnitude, with brief service interruptions and few, if any, injuries. However, extreme flooding events—such as those in 1935, 2013, and 2015—can be devastating. Flash floods and slope failures during such events have the potential to cause multiple fatalities, destroy homes and businesses, and compromise essential services for extended periods.
Impact on Property, Facilities, and Infrastructure	There are 2,056 structures located within the 100-year special flood hazard area and 4,386 structures within the 500-year special flood hazard area. The combined market value of these parcels exceeds $481 million, representing approximately 0.6% of the total market value of all parcels in the planning area. Damage to private property is expected, particularly to vehicles caught in moving water and smaller structures such as sheds and outbuildings. Several areas within the county are exposed to infrastructure risks, which pose threats to roadway routes, the distribution of goods, and access to critical lifelines.
Impact on the Environment	Flooding and debris flows can damage or destroy flood-control structures that have been installed over the years. Riparian vegetation may be displaced in areas affected by erosion. Utility services located in or near inundated areas may also be damaged, causing further environmental harm. Standing water following a flood event can become a breeding ground for disease-carrying insects. Facilities housing hazardous materials are of particular concern, as floodwaters may carry these substances into riparian and riverine ecosystems. Additional environmental impacts may include displaced animals, habitat destruction, channel migration, hazardous materials contamination, displacement of homeless camps (leading to environmental contamination), and damage to utility systems such as sewage, sanitary sewer, and stormwater infrastructure.

Category	Narrative
Impact on Responders	Flooded roadways and stalled vehicles can severely hinder the ability of emergency responders to navigate affected areas. A high volume of response requests may quickly overwhelm local emergency services, necessitating assistance from neighboring jurisdictions. Specialized training in water rescue—particularly swift water rescue tactics and procedures—is essential for responding to incidents involving people trapped in moving water. Debris on roadways will further impede access and require heavy equipment, such as front-end loaders, to clear paths. Evacuation support, including door-to-door notifications and traffic management, may increase risks to responders. Widespread flooding can stretch first responder personnel thin, and disruptions to communication lines may affect the ability to coordinate effectively. Physical and psychological strain on responders, along with concerns about their families, can increase overall risk. Ambulance services may also be impacted by flooded roadways.
Impact on Continuity of Operations, Continuity of Government, and Delivery of Services	Flooding events have the potential to interrupt essential facilities and services for 24 to 72 hours. Damage to facilities or personnel in the incident area may necessitate the temporary relocation of operations to maintain continuity of services. PPROEM maintains the Continuity of Operations Plan and the Continuity of Government Plan for the County of El Paso and the City of Colorado Springs; other jurisdictions in the Pikes Peak Region are in the process of developing continuity plans and procedures.
Impact on the Public	Flooding can result in isolated deaths and multiple injuries or illnesses. Facilities housing hazardous materials are particularly vulnerable, as floodwaters may carry these substances into sensitive ecosystems. Damage to private property is expected, especially vehicles and structures inundated by water. Debris in floodwaters—including floating materials, household and industrial chemicals, and suspended sediment—can amplify the dangers posed to individuals caught in the flow. Multiple fatalities may occur if people are unable to escape moving water. The public's ability to receive timely information about response and recovery efforts may be limited. Impacts on individuals will vary depending on the nature of the event, such as flash floods in canyons versus river floods on plains. Residents without flood insurance may be disproportionately affected. Evacuations, property damage, and inaccessibility may displace residents. Individuals in flood zones may come into direct contact with hazardous materials, increasing the risk of drowning, injury, or disease exposure.

Category	Narrative
Impact on the Economic Condition of the County	Major flooding events are expected to disrupt the local economy. While building and infrastructure damage is significant, the most detrimental short-term impact is often the loss of electric power, which affects businesses, government operations, and residents. Without rapid restoration of services, small businesses may be forced to close. Major disasters can trigger a "domino effect" that harms the economy. For example, damage to residential properties may lead to population displacement, reducing the customer base for local businesses. Businesses may be destroyed or damaged to the extent that they cannot operate, either temporarily or permanently. Even without immediate population relocation, business closures can reduce available services and prompt residents to leave the area. The destruction or severe damage of public facilities such as schools, libraries, and government buildings may result in job losses and further displacement. A lack of flood insurance among businesses could have catastrophic effects on the local economy. In many cases, flooding can have a greater economic impact than other natural disasters.
Impact on Public Confidence in Government	The public's confidence in government response is closely tied to how effectively planning, response, and recovery efforts are executed. If these efforts are not timely or effective, the government's ability to provide aid may be questioned. Transparent communication with the public—such as explaining the nature of a power outage (e.g., equipment damage versus simple repair)—helps residents understand why restoration may take longer than expected. Keeping the public informed about the extent of damage, repair status, and realistic timelines can positively influence public confidence. Conversely, a lack of communication may be perceived as inaction, leading to frustration, anger, and unrest.

8. MUD OR DEBRIS FLOW

8.1 HAZARD PROFILE

8.1.1 HAZARD DESCRIPTION

According to the Colorado Geological Survey, a mud flow is a mass of water and fine-grained earth that flows down a stream, ravine, canyon, arroyo, or gulch (Colorado Geological Survey n.d.). If more than half of the solids in the mass are larger than sand grains-rocks, stones, boulders— the event is called a debris flow. The mud and debris flow problem can be exacerbated by wildfires that remove vegetation that serves to stabilize soil from erosion. Heavy rains on the denuded landscape can lead to rapid development of destructive mud flows.

Soil slumps or slides can liquefy during intense rainfall events, especially on already saturated soils. Multiple debris flows can funnel into channels as they flow down a hillside. These flows can accelerate to speeds as great as 35 miles per hour and travel long distances from their source (USGS 2016). Although flows originate on steep slopes, once started they can travel over gently sloping terrain. It is common for flows to begin in depressions at the top of small gullies, known as swales. Areas downslope from swales are particularly hazardous (USGS 2016). Additional areas susceptible to debris flows include roadcuts or other slope areas that have been altered and areas where surface runoff is channeled (USGS 2016). Flows in areas that have been modified, such as roadways, may occur during less intense rainfall situations than those required for undisturbed areas (USGS 2016). A debris fan is a conical landform produced by successive mud and debris flow deposits, and the likely spot for future events.

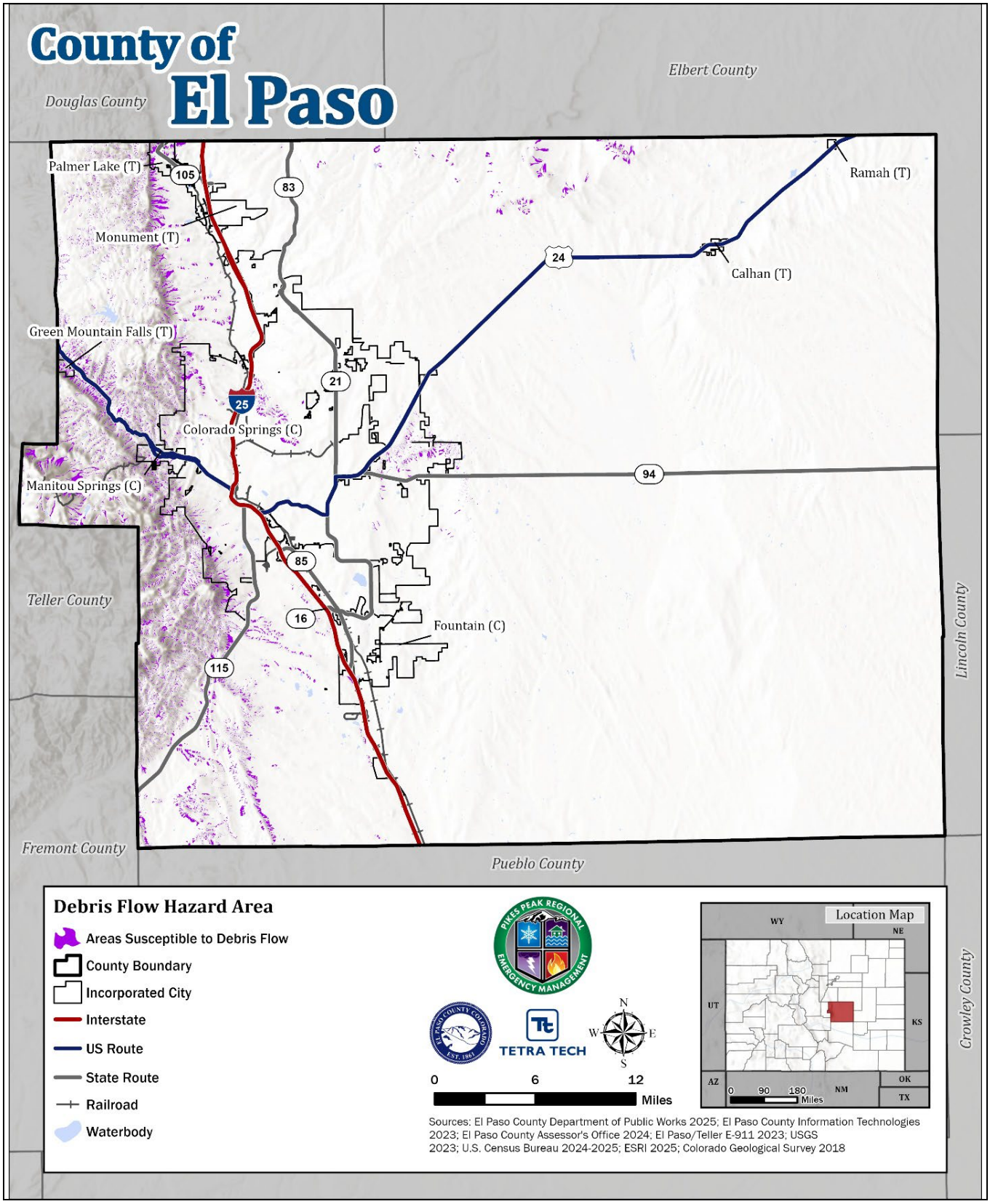
8.1.2 LOCATION

Mud and debris flows occur across Colorado on an on-going basis. Most flows occur on areas with steep slopes and generally occur more frequently in the more mountainous areas of the County (Figure 8-1). The best available predictor of where flows might occur is the location of past movements. The most hazardous areas for mud and debris flow events are canyon bottoms, stream channels, areas near the outlets of canyons, and slopes excavated for buildings and roads (USGS 2016). Wildfires greatly increase the threat of mud or debris flows, so areas downslope of recent burn scars are more likely to experience mud flow events.

8.1.3 EXTENT

Slope failures in the United States result in an average of 25 lives lost per year and an annual cost of about $1.5 billion. The severity of this hazard for jurisdictions with exposure to it includes isolated deaths, injuries and illnesses; major or long-term property damage; and interruption of essential facilities and services for 24 to 72 hours.

Figure 8-1. Debris Flow Hazard Area



Warning Time

The warning time for mud/debris flow is minimal with less than six hours. In general, there is usually little to no warning time for specific mud or debris flow events. However, such events usually occur concurrently with other hazards such as floods or severe storms. While individual events cannot be predicted, areas where such events are likely to occur are identifiable. Flood and severe storm warnings can be useful indicators to area residents of when mud or debris flow events may occur; however, it is important for residents to remember that wildfire burn scars are able to produce flows even with moderate levels of precipitation.

8.1.4 PREVIOUS OCCURRENCES

FEMA Disaster Declarations

Table 8-1 lists all mud/debris flow-related major disasters declarations that have included the Pikes Peak Region since 1953.

Table 8-1. FEMA Disaster Declarations for Mud/Debris Flow-Related Events in the Pikes Peak Region

FEMA Declaration Date	Declaration Number	Description
May 17, 1999	DR-1276	Severe storms, flooding, mudslides, and landslides
September 12, 2013	EM-3365	Severe storms, flooding, landslides, and mudslides
September 14, 2013	DR-4145	Severe storms, flooding, landslides, and mudslides
July 16, 2015	DR-4229	Severe storms, tornadoes, flooding, landslides, and mudslides

Source: FEMA n.d.

State Emergency Proclamations

The Pikes Peak Region was not included in any mud/debris flow-related state emergency proclamations from 2020 to 2024.

U.S. Department of Agriculture (USDA) Declarations

Between 2020 and 2024, the Pikes Peak Region was not included in any USDA drought-related agricultural disaster declarations.

All Recent Events

Table 8-2 lists major recorded mud/debris flow-related events that impacted Pikes Peak Region since the previous HMP was developed. For earlier events, refer to the previous HMP.

Table 8-2. Mud/Debris Flow-Related Events in Pikes Peak Region (2020 to 2024)

Date	Hazard	Event Narrative
August 5, 2020	Debris Flow	Isolated showers and storms developed over the mountains and high valleys during the day. Thunderstorm development then shifted to the I-25 corridor in the afternoon, specifically the Pikes Peak region, where multiple storms produced large hail. Heavy rainfall with localized flooding also occurred on this day. Several boulders washed onto Highway 24 due to heavy rainfall.
August 20, 2024	Mudslide	The Colorado Department of Transportation reported a mudslide closing part of US-24 eastbound, west of City of Colorado Springs.

Source: NOAA-NCEI 2025.

8.1.5 PROBABILITY OF FUTURE OCCURRENCES

Information on previous mud/debris flow occurrences in the County was used to calculate the probability of future occurrence of such events. Table 8-3 lists the number of events from various sources over the 25-year period from 1999 to 2024, which is the most complete period of record for all sources reviewed. Based on these records and input from the Steering Committee, the probability of occurrence for mud/debris flow in the County is considered “occasional.”

Table 8-3. Probability of Future Mud/Debris Flow Events in Pikes Peak Region

Hazard Type	Number of Occurrences Between 1999 and 2024	% Chance of Occurring in Any Given Year
Mud Flow	5	19.2%
Debris Flow	2	7.7%
Total	7	26.9%

Source: NOAA-NCEI 2025, FEMA n.d, PPR HMP 2020

8.1.6 CASCADING IMPACTS ON OTHER HAZARDS

Mud and debris flows can cause several types of secondary effects, such as blocking access to roads, which can isolate residents and businesses and delay commercial, public, and private transportation. This could result in economic losses for businesses. Other potential problems resulting from mud and debris flows are power and communication failures. Vegetation or poles on slopes can be knocked over, resulting in possible losses to power and communication lines. Flows also have the potential of destabilizing the foundation of structures, which may result in monetary loss for residents. They also can damage rivers or streams, potentially harming water quality, fisheries, and spawning habitat.

8.2 VULNERABILITY AND IMPACT ASSESSMENT

A vulnerability analysis was conducted using the Colorado Geological Survey (2018) mapping of areas that may be susceptible to debris flows, especially during extreme precipitation events. The analysis was performed as described in Section 4.3.

8.2.1 LIFE, HEALTH, AND SAFETY

Overall Population

People living or working near steep slopes are exposed to mud and debris flows hazards. Individuals travelling on roads that cut through mountainous terrain or recreating in such areas are also exposed. Residents living downslope of wildfire burn scars are also exposed to mud and debris flow hazards. Table 8-4 shows the number of people living in the debris flow hazard area. The City of Colorado Springs has the highest number of people in the susceptible debris flow hazard area with 2,744 people. The town of Green Mountain Falls has the highest percentage of population living in debris flow hazard areas (30 percent).

Table 8-4. Population in the Susceptible Debris Flow Hazard Area

Jurisdiction	Total Population 2023 ACS	Population in Hazard Area	Population in Hazard Area as % of Total in Jurisdiction
Town of Calhan	510	0	0.0%
City of Colorado Springs	405,307	2,744	0.7%
City of Fountain	92,873	0	0.0%
Town of Green Mountain Falls	690	210	30.4%
City of Manitou Springs	4,796	686	14.3%
Town of Monument	11,035	0	0.0%
Town of Palmer Lake	2,635	719	27.3%
Town of Ramah	130	0	0.0%
Unincorporated County	218,032	1,664	0.8%
El Paso County (Total)	**736,008**	**6,023**	**0.8%**

Source: U.S. Census Bureau 2023, American Community Survey; U.S. Army Corps of Engineers, National Structure Inventory 2022; Colorado Geological Survey 2018

Socially Vulnerable Population

Mud and debris flows can have significant impacts on socially vulnerable populations such as the elderly, people with disabilities, children under the age of 5 years, and those living in poverty. These groups often face greater challenges in evacuating or accessing emergency services and shelters during fast-moving disasters. For example, elderly or disabled individuals who may have limited mobility have increased difficulty to escape rapidly advancing flows reaching speeds of up to 35 miles per hour. Children under the age of 5 years lack the awareness or ability to respond

appropriately without adult assistance. People living in poverty are more likely to reside in debris flow high-risk areas, such as steep slopes or poor drainage zones. They also often reside in housing that lacks structural measures to withstand debris flows.

Table 8-5 shows the number of vulnerable people living in the debris flow hazard area. According to this table, there are a total of 926 people over the age of 65, 300 under the age of 5, 70 non-English speakers, 758 with disabilities, and 458 below the poverty level which are in the susceptible debris flow hazard area. The City of Colorado Springs has the highest population of people over the age of 64 (419), people under the age of 5 (158), non-English speakers (53), disabled persons (370), and people below the poverty level (283) which are in the susceptible debris flow hazard area.

8.2.2 GENERAL BUILDING STOCK

Property located near steep slopes or downslope from wildfire burn scars are exposed to mud and debris flow hazards. All property exposed to the mud and debris flow hazard is vulnerable. Structural damage can range from minor damage to destruction. More than 50 percent damage to structures is substantial by most building codes and typically requires total reconstruction.

Table 8-6 and Table 8-7 provide information on the number and type of buildings located in the debris flow hazard area. There are a total of 2,487 buildings located in the susceptible debris flow hazard area with a replacement cost value of over $1.2 million. The City of Colorado Springs has the highest number of buildings (1,069) located in the susceptible debris flow hazard area with a replacement cost value of over $573 million. There is a total of 2,285 residential buildings, 157 commercial buildings, 22 industrial buildings, and 23 other building types located in the susceptible debris flow hazard area. The City of Colorado Springs has the highest number of residential (1,017) and industrial (9) building types located in the susceptible debris flow hazard area. The City of Manitou Springs has the highest number of commercial (57) buildings located in the susceptible debris flow hazard area. Unincorporated El Paso County has the highest number of other building types (10) located in the susceptible debris flow hazard area.

Table 8-5. Estimated Number of Vulnerable Persons Located in the Susceptible Debris Flow Hazard Area

	Population Over 65 Living in Hazard Area	Population Over 65 in Hazard Area as % of Total In Jurisdiction	Population Under 5 Living in Hazard Area	Population Under 5 in Hazard Area as % of Total In Jurisdiction	Non-English Speaking Population Living in Hazard Area	Non-English Speaking Population in Hazard Area as % of Total In Jurisdiction	Population with Disability Living in Hazard Area	Population with Disability in Hazard Area as % of Total In Jurisdiction	Population Below Poverty Level Living in Hazard Area	Population Below Poverty Level in Hazard Area as % of Total In Jurisdiction
Town of Calhan	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
City of Colorado Springs	419	0.7%	158	0.7%	53	0.7%	370	0.7%	283	0.7%
City of Fountain	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Town of Green Mountain Falls	28	30.4%	4	28.6%	0	0.0%	39	30.0%	8	28.6%
City of Manitou Springs	123	14.3%	9	14.3%	3	13.6%	92	14.3%	67	14.2%
Town of Monument	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Town of Palmer Lake	144	27.1%	20	27.0%	0	0.0%	96	27.3%	24	27.0%
Town of Ramah	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Unincorporated County	212	0.8%	109	0.8%	14	0.7%	161	0.8%	76	0.8%
El Paso County (Total)	**926**	**0.9%**	**300**	**0.7%**	**70**	**0.6%**	**758**	**0.9%**	**458**	**0.8%**

Source: U.S. Census Bureau 2023, American Community Survey; U.S. Army Corps of Engineers, National Structure Inventory 2022; Colorado Geological Survey 2018

Table 8-6. Buildings in the Susceptible Debris Flow Hazard Area

	Jurisdiction Total Buildings	Jurisdiction Total Replacement Cost Value	Number of Buildings in Hazard Area	Buildings in Hazard Area as % of Jurisdiction Total	Replacement Cost Value in Hazard Area	Replacement Cost Value in Hazard Area as % of Jurisdiction Total
Town of Calhan	424	$383,083,382	0	0.0%	$0	0.0%
City of Colorado Springs	166,064	$105,908,247,826	1,069	0.6%	$573,898,175	0.5%
City of Fountain	9,810	$5,036,639,818	0	0.0%	$0	0.0%
Town of Green Mountain Falls	556	$170,290,831	169	30.4%	$45,271,934	26.6%
City of Manitou Springs	2,412	$1,261,305,232	369	15.3%	$211,540,700	16.8%
Town of Monument	3,594	$2,441,721,337	0	0.0%	$0	0.0%
Town of Palmer Lake	1,304	$706,564,041	335	25.7%	$155,249,561	22.0%
Town of Ramah	83	$25,682,659	0	0.0%	$0	0.0%
Unincorporated County	68,245	$36,530,240,639	545	0.8%	$244,232,830	0.7%
El Paso County (Total)	**252,492**	**$152,463,775,764**	**2,487**	**1.0%**	**$1,230,193,200**	**0.8%**

Source: U.S. Army Corps of Engineers, National Structure Inventory 2022; RSMeans 2024; Colorado Geological Survey 2018

Table 8-7. Buildings in the Susceptible Debris Flow Hazard Area by General Occupancy Class

	Residential Buildings in the Susceptible Debris Flow Hazard Area	Commercial Buildings in the Susceptible Debris Flow Hazard Area	Industrial Buildings in the Susceptible Debris Flow Hazard Area	Other Buildings in the Susceptible Debris Flow Hazard Area
Town of Calhan	0	0	0	0
City of Colorado Springs	1,017	39	9	4
City of Fountain	0	0	0	0
Town of Green Mountain Falls	159	9	1	0
City of Manitou Springs	303	57	5	4
Town of Monument	0	0	0	0
Town of Palmer Lake	315	14	1	5
Town of Ramah	0	0	0	0
Unincorporated County	491	38	6	10
El Paso County (Total)	**2,285**	**157**	**22**	**23**

Source: U.S. Army Corps of Engineers, National Structure Inventory 2022; Colorado Geological Survey 2018
Note: Other = Government, Religion, Agricultural, and Education

8.2.3 COMMUNITY LIFELINES AND OTHER CRITICAL FACILITIES

A significant number of critical facilities and infrastructure can be exposed to mud and debris flows:

- Roads—Flows can block egress and ingress on roads, causing isolation for neighborhoods, traffic problems and delays for public and private transportation. This can result in economic losses for businesses.
- Bridges—Flows can significantly impact road bridges. Mud and debris can knock out bridge abutments or significantly weaken the soil supporting them, making them hazardous for use.
- Power Lines—Power lines are generally elevated above steep slopes; the towers supporting them can be subject to mud or debris flows. A flow could trigger failure of the soil underneath a tower, causing it to collapse and ripping down the lines. Power and communication failures due to landslides can create problems for vulnerable populations and businesses.
- Water Supply and Distribution Systems—Large amounts of debris that wash into streams can clog reservoirs, pipelines, or treatment facilities

Several types of infrastructure are exposed to mass movements, including transportation, water and sewer and power infrastructure. Highly susceptible areas of the county include mountain roads and transportation infrastructure.

Table 8-8 indicates that there are 26 facilities in El Paso County located within the debris flow hazard area. Of these, 11 are in the Safety and Security sector, followed by 6 in the Energy sector.

Table 8-8. Number of Facilities in the Susceptible Debris Flow Hazard Area

Jurisdiction	Communica-tions	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transpor-tation	Water Systems	Other Critical Facilities	Total	Facilities in Hazard Area as % of Jurisdiction Total
Town of Calhan	0	0	0	0	0	0	0	0	0	**0**	0.0%
City of Colorado Springs	0	1	0	0	1	4	0	1	1	**8**	0.6%
City of Fountain	0	0	0	0	0	0	0	0	0	**0**	0.0%
Town of Green Mountain Falls	0	0	0	0	0	3	0	0	0	**3**	50.0%
City of Manitou Springs	0	2	0	0	0	1	0	0	0	**3**	33.3%
Town of Monument	0	0	0	0	0	0	0	0	0	**0**	0.0%
Town of Palmer Lake	0	0	0	0	2	1	0	0	0	**3**	37.5%
Town of Ramah	0	0	0	0	0	0	0	0	0	**0**	0.0%
Unincorporated County	0	3	0	2	0	2	0	2	0	**9**	2.2%
El Paso County (Total)	**0**	**6**	**0**	**2**	**3**	**11**	**0**	**3**	**1**	**26**	**1.5%**

Source: Colorado Department of Public Health and Environment 2019, 2024-2025; Colorado Springs 2025; Colorado Springs Utilities 2025; El Paso County 2024-2025; Federal Aviation Administration 2025; Homeland Infrastructure Foundation-Level Data 2025; National Center for Education Statistics 2025; U.S. Army Corps of Engineers 2025; Colorado Geological Survey 2018

8.2.4 ECONOMY

Mud and debris flows can have economic impacts on the County by disrupting infrastructure, damaging property, and putting strain on various public resources. These fast-moving flows can destroy critical facilities and lifelines such as roads, bridges, utilities, and buildings which leads to costly repairs and long-term service interruptions. Agricultural areas of the County may suffer significant crop losses due to soil erosion and damage. Tourism for the County can also experience declines due to damaged natural attractions and safety concerns for visitors. Businesses may also face closures or reduced operation times, especially if customer access is impacted. Also, the County often has the financial burden of emergency response, cleanup, and mitigation efforts following an event which can divert funds away from other essential services.

8.2.5 ENVIRONMENT

Environmental problems because of mud and debris flows can be numerous. Flows that fall into streams may significantly impact fish and wildlife habitat, as well as affecting water quality. Hillsides that provide wildlife habitat can be lost for prolonged periods of time due to mud or debris flows.

8.2.6 HISTORIC AND CULTURAL RESOURCES

Mud and debris flows can have severe impacts to the historic and cultural resources of El Paso County especially in areas with steep terrain and a previous history of intense rainfall events. According to the Colorado Geological Survey, large portions of the County, especially near the Front Range, are susceptible to debris flows that can damage or bury structures, roads, and archaeological sites (Colorado Geological Survey n.d.). Historic districts such as Old Colorado City and City of Manitou Springs as well as military heritage sites near Peterson Space Force Base are at higher risk due to the proximity to vulnerable slopes and drainages. Mud and debris flows can erode or inundate historic buildings, displace artifacts, and compromise cultural landscapes. Once damaged these resources are damaged it is often difficult or impossible to restore fully and can lead to permanent loss of heritage.

8.3 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

8.3.1 LAND USE AND DEVELOPMENT

The region is experiencing moderate growth, and this growth is expected to continue in the coming decades. More development may increase the number of people and structures exposed to mud and debris flow hazards. Land use planning and permit authorization conducted by the County and incorporated areas can be used to guide development away from flow-prone areas. The City of

Manitou Springs recently adopted new ordinances to strengthen hazard-related requirements, defining standards to reduce risk from flooding, geologic hazards, and wildfire. The City of Colorado Springs has established overlays to regulate hillside development in areas with unstable or potentially unstable slopes, areas with previous mining activity, or areas that exhibit other geologic hazards that could potentially compromise structures.

8.3.2 PROJECTED CHANGES IN POPULATION PATTERNS

The County population is projected to increase by over 32 percent by 2050. Table 3-7 summarizes recent and projected future changes in county population. Between 2010 and 2025 alone, the County population rose by nearly 21 percent. More people residing and living in the County and mud/debris flow areas directly increases the exposure to this hazard in the event it may occur. Additionally, an increase in projected populations in the future will also indicate an increase in mud/debris flow risk. It is critically important that the County plans for and mitigates against mud/debris flow hazards for the current population and the projected new population in the future.

8.3.3 CLIMATE CHANGE

Climate change may impact storm patterns, increasing the probability of more frequent, intense storms with varying duration. Increase in global temperature could affect the snowpack and its ability to hold and store water. Warming temperatures also could increase the occurrence and duration of droughts, which would increase the probability of wildfire, reducing the vegetation that helps to support steep slopes. All of these factors would increase the probability for mud and debris flow occurrences.

8.3.4 OTHER IDENTIFIED CONDITIONS

Important issues associated with mud and debris flow in the planning area include the following:

- It is likely that there are existing homes in mud and debris flow risk areas throughout the County. The degree of vulnerability of these structures depends on the codes and standards the structures were constructed. Information to this level of detail is not currently available.
- As incidents of wildfires increase, and hillsides are void of vegetation, rain-soaked hillsides are more likely to slide resulting in increased damage countywide.
- Future development could lead to more homes in mud and debris flow risk areas.
- Mapping and assessment of mud and debris flow hazards are constantly evolving. As new data and science become available, assessments of risk should be reevaluated.
- The impact of climate change is uncertain.
- Mud and debris flows may cause negative environmental consequences, including water quality degradation.
- The risk associated with the mud and debris flow hazard overlaps the risk associated with other hazards such as flood and wildfire. This provides an opportunity to seek mitigation alternatives with multiple objectives that can reduce risk for multiple hazards.

8.4 CONSEQUENCE ANALYSIS

Table 8-9 presents the results of the consequence analysis for the mud/debris flow hazard.

Table 8-9. Consequence Analysis for the Mud or Debris Flow Hazard

Category	Narrative
Hazard Description	Locations situated downhill and downstream from existing and future burn scars are highly susceptible to flash flooding and debris flows, particularly in areas with steep terrain. Rainstorms that develop over burn areas can produce flash flooding and debris flows almost as quickly as National Weather Service radar can detect the rainfall. Even brief periods of heavy rain can trigger flash flooding and debris flows, posing significant risks to life and property.
Impact on Property, Facilities, and Infrastructure	Major or long-term property damage resulting from flooding can threaten the structural stability of buildings and infrastructure. Although these events may cause widespread damage, the most detrimental short-term impact is often the loss of electric power, which affects businesses, government operations, and residents. Loss of roadway sections may force emergency response vehicles to take detours, delaying response times. Transportation infrastructure would also be impacted, further hindering emergency operations.
Impact on the Environment	Mud and debris flows can damage or destroy flood-control structures that have been installed over time. Riparian vegetation may be displaced in areas affected by erosion. Utility services located in or near inundated zones may be compromised, causing additional environmental damage. Standing water following a flood event can become a breeding ground for disease-carrying insects. Facilities housing hazardous materials are of particular concern, as floodwaters may carry these substances into riparian and riverine ecosystems. Additional environmental impacts may include displaced animals, habitat destruction, channel migration, hazardous materials contamination, displacement of homeless camps (resulting in environmental contamination), and damage to utility systems such as sewage, sanitary sewer, and stormwater infrastructure.
Impact on Responders	Flooded roadways and stalled vehicles can severely impede the ability of emergency responders to navigate affected areas. A high volume of response requests may quickly overwhelm local emergency services, requiring assistance from neighboring jurisdictions. Specialized training in water rescue—particularly swift water rescue tactics and procedures—is essential for responding to incidents involving individuals trapped in moving water. Debris on roadways will further hinder access and require heavy equipment, such as front-end loaders, to clear paths. Evacuation support, including door-to-door notifications and traffic management, may increase risks to responders. Widespread flooding can stretch first responder personnel thin, and disruptions to communication lines may affect coordination efforts. Physical and psychological strain on responders, along with concerns about their families, can increase overall risk. Ambulance services may also be impacted by flooded roadways.

Category	Narrative
Impact on Continuity of Operations, Continuity of Government, and Delivery of Services	Flooding events can interrupt essential facilities and services for 24 to 72 hours. PPROEM maintains the Continuity of Operations Plan and the Continuity of Government Plan for the County of El Paso and the City of Colorado Springs; other jurisdictions in the Pikes Peak Region are in the process of developing continuity plans and procedures.
Impact on the Public	Flooding can result in isolated deaths and multiple injuries or illnesses. Facilities housing hazardous materials are especially concerning, as floodwaters may carry these substances into sensitive ecosystems. Damage to private property is expected, particularly vehicles and structures inundated by water. Debris in floodwaters—including floating materials, household and industrial chemicals, and suspended sediment—can amplify the dangers posed to individuals caught in the flow. Multiple fatalities may occur if people are unable to escape moving water. The public's ability to receive timely information about response and recovery efforts may be limited. Residents may be displaced due to evacuation, property damage, or inaccessibility to their homes. Individuals in flood zones may come into direct contact with hazardous materials, increasing the risk of drowning, injury, or disease exposure.
Impact on the Economic Condition of the County	Major flooding events are expected to disrupt the local economy. While building and infrastructure damage is significant, the most detrimental short-term impact is often the loss of electric power, which affects businesses, government operations, and residents. Without rapid restoration of services, small businesses may be forced to close. Major disasters can trigger a "domino effect" that harms the economy. For example, damage to residential properties may lead to population displacement, reducing the customer base for local businesses. Businesses may be destroyed or damaged to the extent that they cannot operate, either temporarily or permanently. Even without immediate population relocation, business closures can reduce available services and prompt residents to leave the area. The destruction or severe damage of public facilities such as schools, libraries, and government buildings may result in job losses and further displacement. A lack of flood insurance among businesses could have catastrophic effects on the local economy.
Impact on the Public Confidence in Government	The public's confidence in government response is closely tied to how effectively planning, response, and recovery efforts are executed. If these efforts are not timely or effective, the government's ability to provide aid may be questioned. Transparent communication with the public—such as explaining the nature of a power outage (e.g., equipment damage versus simple repair)—helps residents understand why restoration may take longer than expected. Keeping the public informed about the extent of damage, repair status, and realistic timelines can positively influence public confidence. Conversely, a lack of communication may be perceived as inaction, leading to frustration, anger, and unrest.

9. DAM AND LEVEE FAILURE

9.1 HAZARD PROFILE

9.1.1 HAZARD DESCRIPTION

Dams

Dams are man-made structures built for a variety of uses, including flood protection, power, agriculture, water supply, and recreation. Dams are typically constructed of earth, rock, concrete, or mine tailings. Although dam failure, either completely or partially, is a very rare event, when they occur, they are a significant hazard for communities downstream. Two factors that influence the potential severity of a full or partial dam failure are 1) the amount of water impounded and the density, type, and value of development and 2) infrastructure located downstream.

Dam failure occurs when the retention function of the dam is compromised, either in part or in its entirety. Dam failure is not the only type of emergency associated with dams. Spillway discharges that are large enough to cause flooding in downstream areas or flooding upstream of dams due to backwater effects or high pool levels are both considered dam emergencies and may cause significant property damage and loss of life.

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

- Overtopping of the primary dam structure, which accounts for 34 percent 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 percent of all dam failures.
- Failure due to piping and seepage accounts for 20 percent 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 or valves, caused by the piping of embankment material into conduits through joints or cracks, constitutes 10 percent of all failures.

The remaining 6 percent 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.

Dam failures result in a unique source of flash flooding, when a large amount of previously detained water is suddenly released into a previously dry area due to a failure in some way of the dam. Dam failure is the uncontrolled release of impounded water resulting in downstream flooding, which can affect life and property.

Area planning agencies have established comprehensive policies regarding sound land use in identified flood hazard areas. While some of the areas vulnerable to the more severe impacts from dam failure intersect the mapped flood hazard areas, the inundation areas from a dam failure cover a much larger portion of the planning area. Flood-related policies in these comprehensive plans and in the local municipal code will help to reduce the risk associated with the dam failure hazard for development in the planning area but will be unlikely to help reduce risk to all structures within the dam inundation area.

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 hygrograph 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 or due to earlier seasonal snowmelt 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 are already seeing increases in stream flows from earlier releases from dams.

Dams are constructed with safety features known as "spillways." Spillways are put in place on dams as a safety measure in the event of the reservoir filling too quickly. Spillway overflow events, often referred to as "design failures," result in increased discharges downstream and increased flooding potential. Although climate change will not increase the probability of catastrophic dam failure, it may increase the probability of design failures.

Levees

Levees are natural or man-made embankments constructed along the banks of rivers, canals, and coastlines to protect adjacent lands from flooding by reinforcing the banks. 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 (FEMA 2020). Levees provide strong flood protection, but they are not failsafe. They are designed to protect against a specific flood level and could be overtop during severe weather events.

A levee breach occurs when part of a levee gives way, creating an opening through which floodwater may pass. A breach may occur gradually or suddenly. The most dangerous breaches happen quickly during periods of high water. The resulting torrent can quickly swamp a large area behind the failed levee with little or no warning.

Earthen levees can be damaged in several ways. For instance, strong river currents and waves can erode the surface. Debris and ice carried by floodwaters—and even large objects such as boats or barges—can collide with and gouge the levee. Trees growing on a levee can blow over, leaving a

hole where the root wad and soil used to be. Burrowing animals can create holes that enable water to pass through a levee. If severe enough, any of these situations can lead to a zone of weakness that could cause a levee breach. In seismically active areas, earthquakes and ground shaking can cause a loss of soil strength, weakening a levee and possibly resulting in failure. In the rare occurrence when a levee system fails or is overtopped, severe flooding can occur due to increased elevation differences associated with levees and the increased water velocity that is created.

9.1.2 LOCATION

Inundation maps should be included for each dam with an Emergency Action Plan (EAP). An EAP is a document that identifies potential emergency conditions at a dam and specifies actions to be followed to minimize property damage and loss of life. The EAP helps emergency management authorities identify the critical areas for action in case of an emergency. An inundation map illustrates which properties may be affected by floodwaters and shows the extent of flooding expected spatially within a geographic area. These maps will not be included in this Plan for security reasons but remain on file with the owners of the dam associated with the EAP. Many EAPs remain on file with the PPROEM.

Dams

PPROEM maintains a list of 168 dams within the Region. Dams are classified based on the potential loss of life and property to the downstream area resulting from failure or mis-operation of the dam or facilities, not from the condition or probability of the dam failing:

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

Based on these classifications, there are 30 high hazard, 12 significant hazard, 72 low hazard, and 54 undetermined hazard dams in El Paso County. All dams with either significant or high hazard potential are required to maintain an EAP. Table 9-1 lists the dams located in the County rated high or significant hazard. Should an emergency arise, the dam owner should refer to preplanned EAP procedures for issuing an early warning and notifying downstream emergency management authorities of the situation.

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

Table 9-1. Dams in El Paso County

Dam Name	River Or Stream Name	Year Completed	Hazard Potential Classification	Condition Assessment
Aspen Lake	South Beaver Creek	1956	Low	Satisfactory
Banning Lewis #1	East Fork Sand Creek	1888	Low	Not Rated
Banning Lewis #8	Jimmy Camp Creek	1943	Low	Not Rated
Big Horn	E Fk W Beaver Creek	1896	Low	Satisfactory
Big Sandy Creek Antelope	Antelope Creek	1960	Low	Satisfactory
Big Sandy Creek Watershed N-5	Big Sandy Creek-Tr	1960	Low	Not Rated
Big Sandy Creek Watershed S-1	Big Sandy Creek	1963	Low	Fair
Big Sandy Creek Watershed S-12	Big Sandy Creek-Tr	1959	Low	Fair
Big Sandy Creek Watershed S-17	Big Sandy Creek-Tr	1959	Low	Not Rated
Big Sandy Creek Watershed S-6	Big Sandy Creek-Tr	1960	Low	Fair
Big Tooth	South Ruxton Creek	1927	High	Satisfactory
Boehmer	Boehmer Creek	1893	Low	Not Rated
Bristlecone	Beaver Creek	1986	Significant	Satisfactory
Calahan	Fountain River-Tr	1963	Low	Unsatisfactory
Chapel Hills #1	Monument-Tr	1984	Low	Not Rated
Chapel Hills #2	Monument-Tr	1984	High	Satisfactory
Columbine	South Beaver Creek	1930	Low	Not Rated
Crystal Creek	Crystal Creek	1934	High	Fair
Curiton	Chico Creek-Tr	1903	Low	Not Rated
Curr	Fountain Creek-Tr	1971	Significant	Satisfactory
Drake Lake	Unavailable	Unavailable	Low	Fair
Fisher Canon	Fishers Canyon-Tr	1929	High	Fair
Fishers Canyon Debris Basin Dam	Fishers Canyon Channel	1999	High	Fair
Fountain Valley No 2	Fountain Creek-Tr	1910	High	Satisfactory
Franktown Parker Fpe-2	East Cherry Cr-Tr	1965	Low	Satisfactory
Franktown Parker Fpe-3	East Cherry Creek	1965	Low	Not Rated

Dam Name	River Or Stream Name	Year Completed	Hazard Potential Classification	Condition Assessment
Franktown Parker Fpe-4	East Cherry Cr-Tr	1965	Low	Satisfactory
Franktown Parker Fpe-5	East Cherry Cr-Tr	1965	Low	Unsatisfactory
Franktown Parker Fpe-6	East Cherry Cr-Tr	1964	Low	Not Rated
Garden of The Gods	Camp Creek	2020	High	Satisfactory
Glen Carin	Little Turkey Creek-Tr	1899	Low	Not Rated
Glen Eyrie #3	Camp Creek-Os	1901	High	Fair
Glen Lawson #1	N Fork Horse Creek	1971	Low	Not Rated
Gold Camp	North Cheyenne Creek-Os	1954	High	Satisfactory
Golding, Charles	Little Horse-Tr	1971	Low	Satisfactory
Hanna Ranch Supernatant	Fountain Creek-Tr	1996	Low	Not Rated
Haymes Storage	Rock Creek	1887	Low	Unsatisfactory
Highline	Monument Creek-Tr	1938	High	Satisfactory
Interquest South Pond A	Kettle Creek-Tr	1990	Low	Not Rated
John May #1	Rock Creek-Os	1967	Low	Not Rated
John Townsend	Spring Branch Pond	1885	Low	Poor
Keeton Lake	Little Fountain Creek	1936	Significant	Satisfactory
Kettle Creek Diversion Dam	Kettle Creek	1961	High	Not Available
Kettle Lake #2	Kettle Creek-Os	1967	Low	Not Available
Kettle Lake #3	Kettle Creek-Os	1967	Low	Not Available
Kiowa Crk Wtrshd 1-G-20	Kiowa Creek-Tr	1957	Low	Fair
Kiowa Crk Wtrshd 1-G-30	Kiowa Creek-Tr	1957	Low	Fair
Kiowa Crk Wtrshd 1-M-10	Kiowa Creek-Tr	1957	Low	Satisfactory
Kiowa Crk Wtrshd 1-N-10	Kiowa Creek-Tr	1957	Low	Not Rated
Kiowa Crk Wtrshd 1-P-10	Kiowa Creek	1958	Low	Fair
Kiowa Crk Wtrshd 1-P-20	Kiowa Creek-Tr	1957	Low	Fair
Kiowa Crk Wtrshd F-18	Kiowa Creek-Tr	1958	Low	Not Rated
Kiowa Crk Wtrshd H-21	Kiowa Creek-Tr	1956	Low	Not Rated
Kiowa Crk Wtrshd I-28	Kiowa Creek-Tr	1955	Low	Not Rated
Kiowa Crk Wtrshd J-33	Kiowa Creek-Tr	1956	Low	Satisfactory
Kiowa Crk Wtrshd K-38	Kiowa Creek-Tr	1956	Low	Satisfactory

Dam Name	River Or Stream Name	Year Completed	Hazard Potential Classification	Condition Assessment
Kiowa Crk Wtrshd K-41	Kiowa Creek-Tr	1955	Low	Fair
Kiowa Crk Wtrshd K-79	Kiowa Creek	1955	Low	Fair
Kiowa Crk Wtrshd W-71	Kiowa Creek-Tr	1957	Low	Satisfactory
Kiowa Crk Wtrshd Y-77	Kiowa Creek-Tr	1955	Low	Not Rated
Lake Moraine	Ruxton Creek	1891	High	Fair
Lemansany Detention No. 2	Big Sandy Creek-Tr	1973	Low	Fair
Leo Lake	South Beaver Creek-Tr	1930	Low	Not Rated
Manitou	North Fork French Creek	1971	High	Fair
Mccullough	West Monument Creek-Os	1990	Significant	Satisfactory
Minkler, Eldon Det. #1	Horse Creek-Tr	1970	Low	Fair
Monument Lake	Monument Creek	1893	Significant	Satisfactory
Nichols	West Monument Creek	1929	Low	Not Rated
Non Potable Reservoir Dam 1	Lehman Run	1961	Significant	Not Available
Non Potable Reservoir Dam 2	Tr-Monument Cr - Offstream	1961	High	Not Available
Non Potable Reservoir Dam 3	Tr-Monument Cr - Offstream	1961	High	Not Available
Non Potable Reservoir Dam 4	Goat Camp Creek	1958	Low	Not Available
Northfield	West Monument Creek	1955	Low	Satisfactory
Northfield Wtp Backwash Reservoir	West Monument-Tr	1974	Low	Not Rated
Northside	Rock Creek	1892	Low	Fair
Palmer Lake #2	N. Monument Ck	1904	High	Satisfactory
Palmer Lake #5	Camp Creek	1906	Significant	Satisfactory
Patty Jewett	Shooks Run-Os	1964	Low	Satisfactory
Penrose	Spring Run-Tr	1917	High	Unsatisfactory
Pikeview	Monument Creek-Os	1952	Low	Not Rated
Pinon	Beaver Creek	1986	Significant	Satisfactory

Dam Name	River Or Stream Name	Year Completed	Hazard Potential Classification	Condition Assessment
Prospect Lake	Fountain Creek-Os	1954	Significant	Satisfactory
R. D. Nixon	Fountain Creek-Tr	1979	Significant	Satisfactory
Rainbow	South Beaver Creek	1930	Low	Fair
Ramah Det. and Rec.	Big Sandy Creek	1964	Significant	Satisfactory
Rampart	West Monument Creek	1970	High	Satisfactory
Regulating Reservoir	West Monument Creek-Tr	1996	High	Satisfactory
Robinson	Black Squirrel Creek	1958	Low	Satisfactory
Sand Creek Detention Basin No. 2	Sand Creek	2009	Low	Unsatisfactory
Sand Creek Detention Basin No. 6	Sand Creek	2014	Significant	Satisfactory
South Lake	Fountain Creek-Tr	1973	High	Satisfactory
South Suburban	North Cheyenne Creek-Os	1932	High	Satisfactory
Spires Broadmoor North Debris Dam	Unavailable	2005	High	Fair
Spires Broadmoor South Debris Dam	Unavailable	2005	High	Fair
Spring Run #2	Spring Run	1970	High	Satisfactory
Valley No. 1	Camp Creek-Os	1901	High	Unsatisfactory
Valley No. 2	Camp Creek-Tr	1906	High	Unsatisfactory
W. Cherry Creek Det. #1	West Cherry Creek-Tr	1961	Low	Fair
W. Cherry Creek Det. #2	West Cherry Creek-Tr	1960	Low	Satisfactory
W. Cherry Creek Det. #4	West Cherry Creek-Tr	1961	Low	Fair
W. Cherry Creek Det. #5	West Cherry Creek-Tr	1960	Low	Satisfactory
W. Cherry Creek Det. #6	West Cherry Creek	1961	Low	Fair
Wilson	E Fk W Beaver Creek-Tr	1897	Significant	Satisfactory
Wolf Ranch Irrigation Reservoir	Cottonwood Creek	2018	Low	Fair
Woodland Park	Loy Gulch	1963	High	Fair
Woodmoor C. C. #4	Dirty Woman Creek	1965	Low	Satisfactory

Dam Name	River Or Stream Name	Year Completed	Hazard Potential Classification	Condition Assessment
Woodmoor Lake	Dirty Woman Creek-Tr	1973	High	Fair

Source: (USACE 2025)

High Hazard Potential Dams (HHPD) Requirements

High Hazard Potential Dams (HHPDs) in El Paso County pose critical risks due to the potential for life-threatening downstream flooding, damage to property, and disruption to essential infrastructure if a dam fails or releases large volumes of water during extreme weather events. As noted in Table 9-1, there are three dams in El Paso County listed as high hazard and unsatisfactory condition: Penrose, Valley No. 1 and Valley No. 2 (USACE 2025). Colorado's statewide analyses highlight that high-hazard dams can generate significant downstream impacts, even when functioning properly, as intense rainfall or rapid snowmelt can force large spillway releases that inundate populated areas, roadways, and critical services. El Paso County participates in ongoing Risk MAP and Hazard Mitigation Plan (HMP) updates, which identify dam-related risks among the region's key hazards and emphasize that dam or levee failure poses a cascading threat that can combine with other hazards such as debris flows, flash flooding, and geologic instability in steep canyons around Colorado Springs and Manitou Springs (Colorado Water Conservation Board n.d.). These vulnerabilities are compounded by the aging nature of Colorado's dam inventory: the state maintains over 400 high-hazard potential dams, many more than 50–60 years old, with some requiring structural rehabilitation or enhanced monitoring to meet modern safety standards (Colorado Department of Local Affairs 2026).

Dam safety limitations in the region often stem from aging infrastructure, spillway capacity constraints, limited inspection resources, and gaps in emergency preparedness and inundation mapping—issues reflected in state and national dam safety reports. Addressing these deficiencies requires a combination of improved engineering assessments, updated hydrologic studies, clear Emergency Action Plans (EAPs), and stronger coordination between dam owners, Colorado Dam Safety officials, and local jurisdictions. One project that illustrates these issues is the Glen Eyrie #3 Reservoir, a high-hazard, privately owned earth dam in Colorado Springs built in 1901, with a 205-acre-foot capacity and an uncontrolled spillway subject to significant hydrologic stress during major storm events. Although currently rated in *conditionally satisfactory* condition, the dam sits above developed areas along Camp Creek, making downstream populations vulnerable if extreme rainfall or structural deficiencies exceed the dam's capacity. Addressing such vulnerabilities may involve structural rehabilitation, spillway upgrades, sediment and vegetation management, continuous monitoring, and integration into the county's updated HMP to ensure compliance with state safety guidelines and to strengthen local readiness for both controlled and uncontrolled releases from HHPDs (Snoflo 2026).

Levees

The U.S. Army Corps of Engineers (USACE) National Levee Database lists three known levees in El Paso County, all located in City of Colorado Springs: Templeton Gap Floodway, North Levee,

Templeton Gap Floodway, South Levee and the Templeton Gap Floodway Levee 1. It is possible that there are additional levees located within the County that are not listed in this database. All levees were inspected in 2018 and the action items taken care of immediately following. Routine maintenance of the levees is performed by the City of Colorado Springs Operations & Maintenance Division on an annual basis to comply with the USACE inspection standards. The City is under contract to re-map the floodway to reflect current rainfall frequency and intensity data.

9.1.3 EXTENT

Warning Time

The warning time for dam and levee failure is minimal with less than six hours. Warning time for dam failure varies depending on the cause of the failure. In events of extreme precipitation or massive snowmelt, evacuations can be planned with sufficient time. In the event of a structural failure due to earthquake, there may be no warning time. A dam's structural type also affects warning time. Earthen dams do not tend to fail completely or instantaneously. Once a breach is initiated, discharging water erodes the breach until either the reservoir water is depleted, or the breach resists further erosion. Concrete gravity dams also tend to have a partial breach as one or more monolith sections are forced apart by escaping water. The time of breach formation ranges from a few minutes to a few hours (USACE n.d.).

El Paso County and its planning agencies have established protocols for flood warning and response to imminent dam failure in the flood warning portion of its adopted emergency operations plan. These protocols are tied to the emergency action plans created by the dam owners.

- Incorporation of Existing Plans, Studies, Reports, and Technical Information
- Colorado State Emergency Action Plan (CSEAP)

The Colorado State Emergency Action Plan (CSEAP) plays a crucial role in ensuring dam safety for the state and El Paso County by providing a framework for responding to potential dam failures or incidents. The CSEAP is administered through the Colorado Division of Water Resources and emphasizes emergency preparedness and reduction in incidents. It requires dam owners to develop Emergency Action Plans (EAPs) that outline specific procedures for identifying and responding to emergency conditions and include alerting local and state emergency officials (Colorado Division of Water Resources n.d.). These EAPs are essential for protecting lives, property, and critical infrastructure downstream of high hazard dams. CSEAP also promotes coordination between dam owners, engineers, and emergency managers. It includes regional EAP exercises to ensure readiness and effective communication during actual events. CSEAP significantly reduces the risks associated with dam failures and enhances public safety across Colorado by mandating these proactive measures.

9.1.4 PREVIOUS OCCURRENCES

Federal Emergency Management Agency (FEMA) Disaster Declarations

The Pikes Peak Region has never received a major disaster declaration for a dam or levee failure.

State Emergency Proclamations

Between 2020 and 2024, the Pikes Peak Region was not included in any state emergency proclamations for dam or levee failure.

U.S. Department of Agriculture (USDA) Declarations

Between 2020 and 2024, the Pikes Peak Region was not included in any USDA agricultural disaster declarations related to dam or levee failure.

All Recent Events

El Paso County has never experienced the breach of a large-scale, significant dam; however, in September of 1929 after dam failures on Ute Pass Fish Club, a 15-foot wall of water killed one victim and destroyed a mountain resort. According to ASDSO, two low hazard dams in El Paso County—Emerald Valley Lower Dam and Emerald Valley Upper Dam—did fail during a flooding event in September 2013 (ASDSO 2025b).

9.1.5 PROBABILITY OF FUTURE OCCURRENCES

Information on previous dam and levee failure occurrences in the County was used to calculate the probability of future occurrence of such events. Table 9-2 lists the number of events from various sources between 1929 and 2025 which is the most complete period of record for all sources reviewed. Based on these records and input from the Steering Committee, the probability of occurrence for dam and levee failure in the County is considered “rare.”

Table 9-2. Probability of Future Dam and Levee Failure Events in Pikes Peak Region

Hazard Type	Number of Occurrences Between 1929 and 2025	% Chance of Occurring in Any Given Year
Dam Failure	3	3.1%

Source: (ASDSO 2025b)

9.1.6 CASCADING IMPACTS ON OTHER HAZARDS

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, and destruction of downstream habitat.

9.2 VULNERABILITY AND IMPACT ASSESSMENT

The analysis of dam and levee failure risk in El Paso County was conducted using a qualitative approach.

9.2.1 LIFE, HEALTH, AND SAFETY

Overall Population

The entire population residing within a dam and/or levee failure inundation zone is considered exposed and potentially vulnerable to these hazard events. The potential for loss of life is affected by the warming time provided, and capacity and number of resident/population movement routes available to populations living within these areas. Those most at risk include the economically disadvantaged and the population over the age of 65 due to their limited capability to respond or mitigate against dam failures.

Socially Vulnerable Population

Vulnerable populations are all populations downstream from dam and levee failures that are incapable of escaping the area within the allowable time frame. This includes children, elders, and disabled people 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. Potential for loss of life is determined by the capacity and number of resident/population movement routes available for residents in the inundation zone, and ability to provide timely warning.

Table 3-6 lists the number of socially vulnerable populations within the County. The county's population includes 100,642 people over the age of 65, 10,999 non-English speakers, 45,945 children under the age of 5, 87,190 people with disabilities, and 60,977 people below the poverty level. These socially vulnerable populations are more susceptible to the impacts of dam and levee failures, with risk increasing based on their proximity to inundation areas. For planning purposes, it is reasonable to assume that percentages and distribution of socially vulnerable populations affected by a dam and levee failure will be similar to the countywide numbers.

9.2.2 GENERAL BUILDING STOCK

Vulnerable properties are those closest to the dam and levee inundation area. City of Colorado Springs Utilities does not have, nor maintain, data on the monetary value of property within an inundation zone. However, it is known that properties within the inundation area would experience the largest, most destructive surge of water. Low-lying areas are also vulnerable since they are where the dam waters would collect. Transportation routes are vulnerable to dam inundation and have the potential to be wiped out, creating isolation issues. This includes all roads, railroads and bridges in the path of the dam inundation. Those that are most vulnerable are those that are already in poor condition and would not be able to withstand a large water surge. Utilities such as overhead power lines, cable and phone lines could also be vulnerable. Loss of these utilities could create additional isolation issues for the inundation areas.

9.2.3 COMMUNITY LIFELINES AND OTHER CRITICAL FACILITIES

Critical infrastructure located within or close to the dam and levee inundation zone have the greatest potential to be impacted by the surge of water. Utilities such as overhead power lines, cables, and phone lines in the inundation zone are also vulnerable.

Inundation zones associated with the Rampart and North Catamount Dams, two large dams in the western county, primarily follow the path of Monument Creek and Fountain Creek. Critical resources and infrastructure that could be impacted by a breach of either dam, include the Pikes Peak Highway, Interstate 25 and US Highway 24, the Pikes Peak Regional Office of Emergency Management, several schools and a hospital, the U.S. Air Force Academy, and a wastewater treatment plant.

9.2.4 ECONOMY

A dam or levee failure can have devastating economic impacts on El Paso County. When these infrastructures fail, it can lead to widespread flooding that damages homes, businesses, transportation networks, and public utilities. The costs include emergency response, property damage, and business interruptions which can total millions to even billions of dollars depending on the scale of the failure. Longterm economic impacts include the suffering from reduced property values and loss of tourism. Agricultural losses can be particularly devastating in rural areas where flooding can destroy crops, livestock, and irrigation systems. Also, the cost of rebuilding infrastructure and implementing new safety measures can strain local government budgets and divert funds from other essential services.

9.2.5 ENVIRONMENT

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.

The environment would be vulnerable to several risks in the event of dam failure. The inundation could introduce many foreign elements into local waterways. This could result in destruction of downstream habitat and could have detrimental effects on many species of animals.

9.2.6 HISTORIC AND CULTURAL RESOURCES

Dam and levee failures in El Paso County pose threats to the entire region's historic and cultural resources. These types of failures can lead to catastrophic flooding which can damage or even destroy irreplaceable archaeological sites, historic buildings, and cultural landscapes that reflect the Indigenous, Hispanic, and pioneer heritage of the region. Many of these resources are located near waterways or in floodplains which make them especially vulnerable. For example, sudden inundation can erode ancient Native American sites and wash away historic structures; or disrupt cemeteries and sacred grounds. Also, the loss of these resources can impact community ties to the past and diminish cultural identity. Preservation efforts must include flood risk assessments and emergency planning that prioritize the protection of these culturally significant assets.

9.3 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

9.3.1 LAND USE AND DEVELOPMENT

As discussed in Chapter 3 (County Profile), areas targeted for future growth and development have been identified across the County. Any areas of growth could be potentially impacted by a dam and/or levee failure event if the structures are located within the flood protection area and mitigation measures are not considered. Therefore, it is the intention of the County and all participating jurisdictions to discourage development in vulnerable areas or to encourage higher regulatory standards at the local level. Due to the sensitive nature of dam locations and downstream inundation zones, an assessment to determine the proximity of these new development sites to potential dam inundation cannot be performed at this time.

9.3.2 PROJECTED CHANGES IN POPULATION PATTERNS

The County population is projected to increase by over 32 percent by 2050. Table 3-7 summarizes recent and projected future changes in county population. Between 2010 and 2025 alone, the County population rose by nearly 21 percent. With this increase in population, the increase in risk to dams and levee failure has also increased. More people residing and living in dam and levee failure hazard areas directly increases the exposure to this hazard in the event it may occur. Additionally, an increase in projected populations in the future will also indicate an increase in dam and levee failure risk. It is critically important that the County plans for and mitigates against these hazards for the current population and the projected new population in the future.

9.3.3 CLIMATE CHANGE

Studies indicate that the State of Colorado will experience an increase or decrease in average annual precipitation by about 7 percent based on emission outcomes (Colorado Water Conservation Board n.d.). If increased it will primarily be in the form of heavy rainfall, which could elevate the risk of dam failures. Increased precipitation may place additional stress on dam and levee structures. Existing flood control systems might struggle to manage the higher water flow from more frequent, intense rainfall events. This could lead to more frequent overtopping of dams and flooding of county assets in adjacent inundation areas. However, the probable maximum flood used in dam design may still accommodate these climate changes.

9.3.4 OTHER IDENTIFIED CONDITIONS

The most significant issue associated with dam failure involves the properties and populations in the inundation zones. Flooding because 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 hazard events such as earthquakes, landslides, or severe weather, which limits their predictability and compounds the hazard. Important issues associated with dam failure hazards include the following:

- Federally regulated dams have an adequate level of oversight and sophistication in the development of emergency action plans for public notification in the unlikely event of failure. However, the protocol for notification of downstream citizens of imminent failure needs to be tied to local emergency operations planning.
- Mapping for federally regulated dams is already required and available; however, mapping for non-federal-regulated dams that estimates inundation depths is needed to better assess the risk associated with dam failure from these facilities.
- Most dam failure mapping required at federal levels requires determination of the probable maximum flood. While the probable maximum flood represents a worst-case scenario, it is generally the event with the lowest probability of occurrence. For non-federal-regulated dams, mapping of dam failure scenarios that are less extreme than the probable maximum flood but have a higher probability of occurrence can be valuable to emergency managers and community officials downstream of these facilities. This type of mapping can illustrate areas potentially impacted by more frequent events to support emergency response and preparedness.
- The concept of residual risk associated with structural flood control projects should be considered in the design of capital projects and the application of land use regulations.
- Addressing security concerns and the need to inform the public of the risk associated with dam failure is a challenge for public officials.

9.4 CONSEQUENCE ANALYSIS

Table 9-3 presents the results of the consequence analysis for the dam and levee failure hazard.

Table 9-3. Consequence Analysis for the Dam and Levee Failure Hazard

Category	Narrative
Hazard Description	The consequences of dam or levee failure closely resemble those experienced during a severe flood event. Dams are classified based on the potential loss of life and property downstream in the event of failure, rather than the condition or likelihood of failure. The classifications are as follows: • **High Hazard Potential**: Probable loss of life (one or more). • **Significant Hazard Potential**: No probable loss of life, but potential for economic loss, environmental damage, disruption of lifeline facilities, or other significant impacts. These dams are often located in rural or agricultural areas but may also be found in populated regions with critical infrastructure. • **Low Hazard Potential**: No probable loss of life and minimal economic or environmental losses, typically limited to the dam owner's property. In El Paso County, 28 dams are classified as high hazard, 13 as significant hazard, and 60 as low hazard. Levees are designed to provide a specific level of flood protection; however, no levee system offers complete protection from all flood events. Some level of flood risk remains for people and structures located behind levees (FEMA, 2009). There are three levees in the Pikes Peak Region, all located within the City of Colorado Springs.
Impact on Property, Facilities, and Infrastructure	Flooding can result in the destruction or severe damage of property and the interruption of essential facilities and services for more than 72 hours. Damage to private property is expected, particularly vehicles caught in moving water and smaller structures such as sheds and outbuildings. Several essential facilities and infrastructure are located within inundation zones, including the Pikes Peak Highway, Interstate 25, U.S. Highway 24, the Pikes Peak Regional Office of Emergency Management, multiple schools, a hospital, the U.S. Air Force Academy, and a wastewater treatment plant. Loss of roadway sections would require emergency response vehicles to take detours, delaying response times and impacting transportation infrastructure.
Impact on the Environment	Flooding and debris flows can damage or destroy flood-control structures that have been installed over time. Riparian vegetation may be displaced in areas affected by erosion. Utility services located in or near inundated zones may be compromised, causing additional environmental damage. Standing water following a flood event can become a breeding ground for disease-carrying insects. Facilities housing hazardous materials are of particular concern, as floodwaters may carry these substances into riparian and riverine ecosystems. Additional sediment introduced by flooding may also affect the local water supply.

Category	Narrative
Impact on Responders	Flooded roadways and stalled vehicles can severely impede the ability of emergency responders to navigate affected areas. A high volume of response requests may quickly overwhelm local emergency services, requiring assistance from neighboring jurisdictions. Specialized training in water rescue—particularly swift water rescue tactics and procedures—is essential for responding to incidents involving individuals trapped in moving water. Evacuation support, including door-to-door notifications and traffic management, may increase risks to responders. Widespread flooding can stretch first responder personnel thin, and disruptions to communication lines may affect coordination efforts. The presence of hazardous materials in affected areas may expose responders to additional risks. Physical and psychological strain on responders, along with concerns about their families, can further increase vulnerability. Ambulance services may also be impacted by flooded roadways.
Impact on Continuity of Operations, Continuity of Government, and Delivery of Services	Flooding may result in the loss of facilities or infrastructure necessary for the provision of government services. First responders may face short-term accessibility issues while performing routine duties or reporting to work locations. Damage to facilities or personnel in the incident area may require the temporary relocation of operations to maintain continuity of services. PPROEM maintains the Continuity of Operations Plan and the Continuity of Government Plan for the County of El Paso and the City of Colorado Springs; other jurisdictions in the Pikes Peak Region are in the process of developing continuity plans and procedures.
Impact on the Public	Flooding can lead to multiple deaths and injuries. Damage to private property is expected, especially vehicles and structures inundated by water. Individuals caught in moving water face a high risk of fatality. Residents may be displaced due to evacuation, property damage, or inaccessibility to their homes. People within flood zones may come into direct contact with hazardous materials, increasing the risk of drowning, injury, or disease exposure.
Impact on the Economic Condition of the County	Major flooding events are expected to disrupt the local economy. While building and infrastructure damage is significant, the most detrimental short-term impact is often the loss of electric power, which affects businesses, government operations, and residents. Without rapid restoration of services, small businesses may be forced to close. Major disasters can trigger a “domino effect” that harms the economy. For example, damage to residential properties may lead to population displacement, reducing the customer base for local businesses. Businesses may be destroyed or damaged to the extent that they cannot operate, either temporarily or permanently. Even without immediate population relocation, business closures can reduce available services and prompt residents to leave the area. The destruction or severe damage of public facilities such as schools, libraries, and government buildings may result in job losses and further displacement.

Category	Narrative
Impact on Public Confidence in Government	The public's confidence in government response is closely tied to how effectively planning, response, and recovery efforts are executed. If these efforts are not timely or effective, the government's ability to provide aid may be questioned. Transparent communication with the public—such as explaining the nature of a power outage (e.g., equipment damage versus simple repair)—helps residents understand why restoration may take longer than expected. Keeping the public informed about the extent of damage, repair status, and realistic timelines can positively influence public confidence. Conversely, a lack of communication may be perceived as inaction, leading to frustration, anger, and unrest.

10. CYBER ATTACK

10.1 HAZARD PROFILE

10.1.1 HAZARD DESCRIPTION

Cyber-attacks are deliberate attacks on information technology (IT) information systems (IS) and/or data to gain illegal access or purposely cause damage. Cyber-attacks are difficult to recognize and typically use malicious code to alter computer data or steal information. The risk of cyber-attacks to IS's is a growing concern as people and institutions become more dependent upon technology that is in a constant state of change with numerous interconnects. The Federal Bureau of Investigation's (FBI) Cyber Division states that "cyber intrusions are becoming more commonplace, more dangerous, and more sophisticated," with implications for private- and public-sector networks.

The Colorado Governor's Office of Information Technology defines cyber-attacks as follows: "State of Colorado characterizes information system security or cyber incidents as any event violating State of Colorado security policy, standards, procedures, guidelines, processes or security best practice that may be detected as unexplained network or system behavior resulting in the loss of sensitive data or any instance where State of Colorado's reputation might suffer." This may include unauthorized disclosures of information, increased access to informational assets, corruption of information, denial of service, and theft of state information technology or telecommunications assets, services, or resources.

Cyber-attacks may be carried out by a variety of actors, which may be external, internal, and partners to the organization, agency, institution, or business. According to the Verizon Enterprise Solution's 2019 Data Breach Investigation Report (DBIR), the highest proportion of attacks are carried out by external actors. The DBIR also identified that many data breaches, 49 percent, involve small businesses, 18 percent involve public sector entities, 15 percent healthcare organizations, and 10 percent involve the financial industry. The report also found that 86 percent of breaches were financially motivated.

Cyber disruptions can be intentional or unintentional. Unintentional disruptions are more common and occur when a portion of a system fails, whether because of coding mistakes, physical failure of hardware, or even solar storm activity. Intentional disruptions are a directed attack and pose a serious threat to disrupt daily operations and capabilities.

10.1.2 LOCATION

Cyber-attacks are not bound by any geographic feature and can target any networked computer or system. CHIRRP notes that 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 outside Colorado may impact people, businesses, and institutions within the state.

All jurisdictions in the planning area are vulnerable on some level, directly or indirectly, to a cyber-attack. However, in general, City of Colorado Springs and El Paso County, may have higher vulnerabilities due to higher concentrations of local, state, and federal facilities. Larger cities like City of Colorado Springs are also more vulnerable to cyber-attacks because of the higher concentrations of people, businesses, and critical infrastructure.

10.1.3 EXTENT

Most cyberattacks have negligible or minor impacts; however, it is possible for a cyberattack to have substantial impacts if the data breach is significant enough or if critical, protected information gets into the hands of terrorist groups. One of the primary challenges of cyber-attacks for government and local government partners is the fact that government agencies may not fully understand their vulnerabilities. It also may be difficult to pinpoint when or how a cyberattack initially happens, which can lead to prolonged and extensive attacks in some situations.

Warning Time

Cyber-attacks are highly unpredictable and often occur without warning, which leaves minimal time for preparation. Typically, the warning time for such attacks is less than six hours, making it challenging for individuals and organizations to respond effectively and mitigate potential damage.

10.1.4 PREVIOUS OCCURRENCES

Federal Emergency Management Agency (FEMA) Disaster Declarations

The Pikes Peak Region has never received a major disaster declaration for a cyber-attack-related event.

State Emergency Proclamations

Between 2020 and 2024, the Pikes Peak Region was not included in any state emergency proclamation for a cyber-attack-related event.

U.S. Department of Agriculture (USDA) Declarations

Between 2020 and 2024, the Pikes Peak Region was not included in any USDA cyber-attack-related agricultural disaster declarations.

All Recent Events

Table 10-1 lists major recorded cyber-attack-related events that impacted Pikes Peak Region since the previous HMP was developed. For earlier events, refer to the previous HMP.

10.1.5 PROBABILITY OF FUTURE OCCURRENCES

Cyber-attacks occur daily, but most impacts are negligible or limited. However, it is possible that a cyber-attack could occur that could greatly disrupt operations.

Table 10-1. Cyber-Attack Events in Pikes Peak Region (2020 to 2025)

Date	Hazard	Event Narrative
October 1, 2020	Cyber Attack	FBI agents have warned small businesses of possible ransomware and cyber attack increases. The agents reported 8 incidents of companies falling victim to ransomware attacks in El Paso County between October and September of 2020. The losses ranged between $300,000 to up to $1.7 million. These attacks also leave the companies unable to continue with work on an average of 21 days.
October 10, 2022	Cyber Attack	Denver International and City of Colorado Springs airports were among several U.S. airports whose websites were targeted by cyberattacks. The websites were knocked offline after a pro-Russia hacker group called Killnet made a public call for coordinated denial-of-service cyberattacks on a list of specific targets published on the group's Telegram channel. Technicians had the website up and running by 9 a.m. with no interruption in normal airport operations.
December 28, 2024 – January 7, 2025	Cyber Attack	A nationwide data break which targeted a software called "PowerSchool" impacted City of Colorado Springs School District 11, City of Manitou Springs School District 14, and School District 49. These three school systems were alerted that an unauthorized user accessed certain information stored in their PowerSchool systems. PowerSchool alerted the school districts 10 days after the initial attack. The student information including names, addresses, lunch status, birthdates, medical information, ethnicity, gender, grade level, and cumulative GPA was taken by the cyber-attacker along with parent and emergency contact information.

Source: El Paso Times 2021; KOAA News5 2025; The Gazette 2022

Information on previous cyber-attack occurrences in the County was used to calculate the probability of future occurrence of such events. Table 10-2 lists the number of events from various sources between 2020 and 2025, which is the most complete period of record for all sources reviewed. Based on these records and input from the Steering Committee, the probability of occurrence for cyber-attack in the County is considered "frequent."

Table 10-2. Probability of Future Cyber-Attack Events in Pikes Peak Region

Hazard Type	Number of Occurrences Between 2020 and 2025	% Chance of Occurring in Any Given Year
Cyber Attacks	3	50%

Source: El Paso Times 2021; KOAA News5 2025; The Gazette 2022

10.1.6 CASCADING IMPACTS ON OTHER HAZARDS

Secondary hazards may include economic, structural or societal harm due to loss of operations, reputation, personal identifying information theft, critical facilities vulnerability and transportation operations impacts. Hackers tampering with election systems is also of concern. Secondary impacts have a high potential to extend beyond those identified due to the highly integrated nature of technology into a diverse range of community systems.

10.2 VULNERABILITY AND IMPACT ASSESSMENT

All El Paso County is at risk from the impacts of cyber-attacks. A qualitative analysis was conducted to assess the County's vulnerability to this hazard of concern.

10.2.1 LIFE, HEALTH, AND SAFETY

Overall Population

All individuals, businesses, and other institutions in the planning area are potential targets for cyber-attacks. According to the American Census Survey (ACS), that is a total of 736,008 people (Table 3-5). These threats can occur in various forms including identity theft, loss of sensitive information, disruption of services, and other malicious activities. The extensive threat of cyber-attacks means that no entity is entirely safe which makes it important for everyone to remain vigilant and proactive in their cybersecurity measures.

A cyber-attack that targets critical infrastructure could result in severe consequences including injury or even death. The disruption of essential emergency response systems such as healthcare and utilities can have a cascading effect increasing the impact of the initial attack. This emphasizes the importance of strong cybersecurity preparedness plans to protect against these unpredictable and potentially devastating hazard events. This ensures that all people are aware of the risks and equipped with the necessary tools to respond effectively to cyber-attacks in the County to maintain the safety and security of their community.

Socially Vulnerable Population

Cyber-attacks can have severe impacts for socially vulnerable populations such as the elderly, people with disabilities, non-English speakers, and children. These groups often face barriers to understanding and navigating digital systems which make them more susceptible to phishing scams, identity theft, and misinformation. For example, the elderly may lack digital literacy, and non-English speakers might struggle to recognize fraudulent messages in unfamiliar languages. People with disabilities may rely on assistance technologies that can be disrupted by malware. The impacts can range from financial loss and emotional distress to compromised safety and privacy. As a result, it can further increase the already existing social inequalities. Addressing these vulnerabilities requires inclusive cybersecurity education, accessible digital tools, and targeted protection to ensure that everyone is safe from cyber-attacks.

According to Table 3-6, 100,642 individuals over 65, 10,999 non-English speakers, 45,945 people under the age of 5, 87,190 peoples with disabilities, and 60,977 people below the poverty level are at risk to cyber-attacks within the County.

10.2.2 GENERAL BUILDING STOCK

Generally, cyber-attacks are not directed against the built environment; however, if water control or transportation devices are hacked, then secondary impacts to property could result.

10.2.3 COMMUNITY LIFELINES AND OTHER CRITICAL FACILITIES

Water, electricity, transportation, safety services and emergency response, among other critical systems, are all vulnerable to cyber-attack. Cyber-attacks continue to become more sophisticated and an increased threat to people, businesses, institutions, local governments, and state agencies to varying degrees. Large- scale cyber-attacks can destabilize local economies. Smaller jurisdictions may also be hindered by a lower capacity to respond and recover to such attacks.

Cyber-attacks targeted at Supervisory Control and Data Acquisition (SCADA) related utilities can cause severe disruptions to transportation, public safety, and utility services, all of which are critical infrastructure that are highly dependent on information technology.

10.2.4 ECONOMY

Cyber-attacks can significantly disrupt the Pike Peaks Region's economy by targeting critical infrastructure, local businesses, and governmental services. When cybercriminals breach systems like power grids, water treatment facilities, or transportation networks this can result in the halt of economic activity. It can also result in delays of services and weaken public morale. Small businesses often lack robust cybersecurity defenses and may suffer financial losses from ransomware attacks, data breaches, or shutdowns. These disruptions can lead to job losses and losses of revenue which can weaken the local economic hub for the County and region.

There is also long-term economic impacts due to cyber-attacks. The long-term economic impact of cyber-attacks includes increased costs for cybersecurity, additional insurance premiums, and legal fees. The County or region may need to divert public funds from essential services to recover from such attacks and to investigate breaches. In the region where digital software is a key driver for development, cyber-attacks can widen the divide and halt efforts to attract more innovation and investment to the area.

10.2.5 ENVIRONMENT

Generally, cyber-attacks will have no direct impact on the environment; however, the environment may be affected if a hazardous materials release occurred because of critical infrastructure failure because of an attack.

10.2.6 HISTORIC AND CULTURAL RESOURCES

El Paso County is home to many archives, museums, and heritage sites tied to military history, Native American culture, and early pioneer settlements. These institutions have started to digitize their collections and rely on online systems for preservation, access, and education. Therefore, they are more vulnerable to cyber-attacks. A cyber-attack could corrupt or erase irreplaceable digital archives, halt access to historical records, or even manipulate cultural narratives. Given the County's proximity to military installations like Peterson Space Force Base, the risk of targeted cyber incidents may be elevated. This makes it important for local cultural stewards to invest in cybersecurity measures to protect the County's unique historical archives and databases from digital harm.

10.3 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

10.3.1 LAND USE AND DEVELOPMENT

None of the land use and development in the planning area is exposed to the cyber-attack hazards discussed in this chapter.

10.3.2 PROJECTED CHANGES IN POPULATION PATTERNS

Digital data continues to be the predominant format of data and there are no indications that will change. Therefore, it will be important to closely monitor information systems and provide multi-level protection against potential threats as the technological capabilities expand. The increasing use and reliance on cloud computing and smart metering systems is introducing new security challenges that will require constant monitoring to safeguard user safety and privacy.

The County population is projected to increase by over 32 percent by 2050. Table 3-7 summarizes recent and projected future changes in county population. Between 2010 and 2025 alone, the County population rose by nearly 21 percent. As the population increases, so does the risk of cyber-attacks due to greater human activity in vulnerable areas. More people residing and living in the County and utilizing technological services directly increases the exposure to this hazard in the event it may occur. Additionally, an increase in projected populations in the future will also indicate an increase in cyber-attack risk. It is critically important that the County plans for and mitigates against cyber-attack hazards for the current population and the projected new population in the future.

10.3.3 CLIMATE CHANGE

Climate change is not anticipated to affect the risk or impacts associated with cyber-attacks.

10.3.4 OTHER IDENTIFIED ISSUES

Significant issues associated with cyber-attacks include but are not limited to:

- Attacks are not bounded my geographic features and can occur in any location.
- Malicious actors are difficult to identify and apprehend because they can be operating from anywhere in the world.
- Attacks can shut down and/or malfunction critical infrastructure and operations.
- The rapid expansion and utilization of new technologies such as smart metering systems is resulting in new security challenges.

10.4 CONSEQUENCE ANALYSIS

Table 10-3 presents the results of the consequence analysis for the cyber-attack hazard.

Table 10-3. Consequence Analysis for the Cyber Attack Hazard

Category	Narrative
Hazard Description	Cyber-attacks are deliberate attacks on information technology systems in an attempt to gain illegal access to a computer or purposely cause damage. Cyber- attacks differ by motive, attack type and vector, and perpetrator profile.
Impact on Property, Facilities, and Infrastructure	While some attacks affect only data, physical damage to hardware is possible. Sabotage of utilities and infrastructure could result in system failures that damage property on a scale equal with natural disasters. Facilities and infrastructure may become unusable because of a cyber-attack.
Impact on the Environment	While effects of cyber threats on the natural environment would be unlikely, they are conceivable. The effects on the natural environment may come from a system failure that, for example, causes the release of hazardous materials or improper disposal of waste.
Impact on Responders	Cyber-attacks have the potential to interfere with emergency-response communication and activities. Many agencies rely on technology to notify and route responders to the scene of the incident.
Impact on Continuity of Operations, Continuity of Government, and Delivery of Services	Agencies that rely on electronic backup of critical files are vulnerable. The delivery of services can be impacted since governments rely, to a great extent, upon electronic delivery of services. PPROEM maintains the Continuity of Operations Plan and the Continuity of Government Plan for the County of El Paso and the City of Colorado Springs; other jurisdictions in the Pikes Peak Region are in the process of developing continuity plans and procedures.
Impact on the Public	A cyber-attack could disable the vast majority of systems which control critical infrastructure, traffic control systems, and basic activities. It could also impact personal data and accounts.
Impact on the Economic Condition of the County	Could greatly affect the economy. In an electronic-based commerce society, any disruption to daily activities can have disastrous impacts to the economy. It is difficult to measure the true extent of the impact.
Impact on Public Confidence in Government	The government's inability to protect confidential personal data would impact confidence. An attack would raise questions regarding the security of using electronic systems for government services.

11. EPIDEMIC/PANDEMIC

11.1 HAZARD PROFILE

11.1.1 HAZARD DESCRIPTION

The U.S. Center for Disease Control (CDC) defines an outbreak as the occurrence of more cases of disease than normally expected within a specific place or group of people over a given period. An epidemic is a localized outbreak that spreads rapidly and affects many people or animals in a community. A pandemic is an epidemic that occurs worldwide or over a very large area and affects many people or animals. Because there is little to no pre-existing immunity against the new virus, it spreads worldwide. Generally, pandemic events cause sudden, pervasive illness in all age groups on a global scale. The exact size and extent of the infected population is dependent upon how easily the illness is spread, the mode of transmission, and the amount of contact between the infected and non-infected persons.

Fears of a pandemic have risen in recent years as the globalized economy and growing population fosters large scale international travel and trade. In the United States, the public health system works at the federal, state, and local levels to monitor diseases, plan and prepare for outbreaks, and prevent epidemics where possible. But, in the age of air travel and worldwide shipping, it is becoming increasingly difficult to contain localized outbreaks as infected or exposed people travel and work, sending the disease across the globe in a matter of hours.

According to the CDC, “pandemics can place extraordinary demands on public health and health care systems as well as on essential community services. Healthcare providers and hospitals may be overwhelmed, and there may not be enough medical supplies to meet demand.” including food systems (CDC 2024).

11.1.2 LOCATION

All areas within the planning region are susceptible to the human health hazards discussed in this chapter. Infectious diseases can be introduced into the County from outside its geographic boundaries, for example, El Paso County residents who travel extensively may be exposed to these hazards abroad and bring them back upon return. This dynamic makes it difficult to map the extent and location of these hazards, unlike more geographically defined hazards such as flooding, dam failure, or wildfire.

In general, jurisdictions that are more densely populated are more vulnerable to disease threats when the disease is directly spread from human to human, but every jurisdiction in the region has some vulnerability to pandemic and infectious disease threats.

11.1.3 EXTENT

The severity of human health hazards is dependent upon the percentage of the population exposed to these hazards of concern. As exposed populations reach epidemic proportions, the severity can significantly increase. The key to reducing the severity of an infection is capping the exposure so that the percentage of the population exposed does not continue to grow or spread to uninfected populations.

Jurisdictional losses in a pandemic or infectious disease outbreak stem from lost wages and productivity, not losses to buildings or land. Losses are difficult to estimate because the exact rates of absenteeism and cost of treating a widespread disease will depend on the virus or bacterium in question, the availability of vaccination or treatment, and the severity of symptoms.

Warning Time

There is maximum warning time for epidemic and pandemic events with more than 24 hours' notice. An outbreak of disease may occur quickly; however, for it to reach pandemic levels, the spread may take weeks or even months.

11.1.4 PREVIOUS OCCURRENCES

Pandemics have occurred throughout history, but it has only been in the last century that proper records have been kept regarding their cause and origins. The four most serious pandemics that the U.S. Center for Disease Control (CDC) has recorded are the result of influenza viruses. These occurred in 1918, 1957, 1968, and 2009 and, more recently, the Novel Coronavirus Disease, COVID 19, was declared a pandemic by the WHO on March 11, 2020.

Descriptions of the outbreaks are summarized in more detail below. The following descriptions, apart from the Novel Coronavirus, are transcribed from the 2023 Colorado State Hazard Mitigation Plan (Colorado DHSEM 2023).

1918 Spanish Flu: In 1918, a powerful strain of the flu, colloquially known as "Spanish Flu," spread throughout the world. The virus was extremely deadly, bringing on pneumonia that filled its victim's lungs with fluid. Worldwide, an estimated 21-50 million people died between 1918 and 1919 as a result of the flu. In Colorado, an estimated 8,000 people were killed by the flu and complications. The state had one of the highest mortality rates in the country, possibly because of the large population with compromised lung function, including miners and tubercular patients. It would not be uncommon for terminal patients to request their caretakers to end their life. The 1918 Spanish flu pandemic remains the worst-case pandemic event on record.

1957 Asian Flu: In February 1957, a new influenza A (H2N2) virus emerged in East Asia, triggering a pandemic ("Asian Flu"). This H2N2 virus was comprised of three different genes from an H2N2 virus that originated from an avian influenza A virus, including the H2 hemagglutinin and the N2 neuraminidase genes. It was first reported in Singapore in February 1957, Hong Kong in April 1957, and in coastal cities in the United States in summer 1957. The estimated number of deaths was 1.1 million worldwide and 116,000 in the United States.

1968 Flu: The 1968 pandemic was caused by an Influenza A (H3N2) virus comprised of two genes from an avian Influenza A virus, including a new H3 hemagglutinin, but also contained the N2 neuraminidase from the 1957 H2N2 virus. It was first noted in the United States in September 1968. The estimated number of deaths was one million worldwide and about 100,000 in the United States. Most excess deaths were in people 65 years and older. The H3N2 virus continues to circulate worldwide, as a seasonal Influenza A virus. Seasonal H3N2 viruses, which are associated with severe illness in older people, undergo regular antigenic drift.

2009 Swine Flu: In the spring of 2009, a new version of the H1N1 virus emerged. This version, due to its genetic lineage, became known as Swine Flu. By June, the Centers for Disease Control and Prevention (CDC) stopped counting cases and declared it a pandemic. The CDC estimated that there were 60.8 million cases, 274,304 hospitalizations, and 12,469 deaths throughout the United States. A vaccine was distributed in the U.S. in October 2009, and the pandemic was declared over on August 11, 2010.

In Colorado, there had been 2,041 hospitalizations across 54 counties by May of 2010. A total of 69 people died. Unlike most other pandemics, deaths were fairly spread out amongst all age groups, with younger generations taking more of the brunt. Approximately 17 percent of the total deaths were under 18 years of age. This is likely because older generations had been exposed to another version of H1N1 at some point in their lives, giving them some immunity, while those who were younger had no existing immunity. Of those who were hospitalized, the CDC estimated that about 70 percent of them belonged to a high-risk group, meaning they likely had existing complications that only compounded the illness.

2019 Novel Coronavirus (COVID-19): In December 2019, COVID-19 emerged in China and the first confirmed COVID-19 case in Colorado presented on March 5, 2020. As of writing this plan, WHO data counts fatalities in the US as over 1.1 million deaths and globally over 6.9 million. The COVID-19 pandemic has affected approximately 1.8 million people in Colorado, with over 15,200 deaths. Vaccines became available in December 2020 and over 72 percent of Coloradoans, roughly 4.1 million, have completed the primary series of vaccine doses based on Colorado Department of Public Health and Environment (CDPHE) data. On May 11, 2023, the COVID-19 public health emergency was declared over in US.

Federal Emergency Management Agency (FEMA) Disaster Declarations

Table 11-1 lists all pandemic/epidemic-related major disasters declarations that have included the Pikes Peak Region since 1953.

Table 11-1. FEMA Disaster Declarations for Pandemic/Epidemic Events in the Pikes Peak Region

FEMA Declaration Date	Declaration Number	Description
March 13, 2020	EM-3436	Covid-19 Pandemic
March 28, 2020	DR-4498	Covid-19 Pandemic

Source: FEMA n.d.

State Emergency Proclamations

Table 11-2 lists all pandemic/epidemic-related state emergency proclamations that included the Pikes Peak Region from 2020 to 2024.

Table 11-2. State Emergency Proclamations for Pandemic/Epidemic Events in the Pikes Peak Region (2020 to 2024)

State Proclamation Date	State Proclamation Number	Description
March 11, 2020	D-2020-003	Coronavirus Disease 2019

Source: Colorado Governor n.d.

U.S. Department of Agriculture (USDA) Declarations

Between 2020 and 2024, the Pikes Peak Region was not included in any USDA pandemic/epidemic-related agricultural disaster declarations.

All Recent Events

Table 11-3 lists major recorded pandemic/epidemic-related events that impacted Pikes Peak Region since the previous HMP was developed. For earlier events, refer to the previous HMP.

Table 11-3. Pandemic/Epidemic Events in Pikes Peak Region (2020 to 2024)

Date	Hazard	Event Narrative
March 5, 2020 – May 11, 2023	COVID-19 Pandemic	The first confirmed case of COVID-19 in Colorado was on March 5, 2020, most likely due to international travel. It was first identified in Summit and Douglas Counties. At the end of 2024, there were 1,769,981 confirmed COVID-19 cases and 14,522 deaths attributed to the pandemic in the state of Colorado. The federal COVID-19 Public and Health Emergency officially ended on May 11, 2023

Source: KDVR 2025

11.1.5 PROBABILITY OF FUTURE OCCURRENCES

The Colorado Department of Public Health and Environment (CDPHE) considers a pandemic to be inevitable. However, there is no definite way to predict when a pandemic might happen. Based on historical events, there have been five pandemics since 1918, which leads to a 4.7 percent chance of a pandemic occurring in any given year. Therefore, this hazard is being assigned a probability of "rare."

11.1.6 CASCADING IMPACTS ON OTHER HAZARDS

Human health hazards, such as pandemics or epidemics, are not like natural hazards that have measurable secondary impacts, such as earthquakes, floods, or fires. This is due primarily to the fact that human health hazards do not impact general building stock or critical facilities and infrastructure as other hazards do. The largest secondary impact caused by human health hazards

would be economic. Large outbreaks of any human health hazard could reduce the workforce significantly for long periods of time while the infected population recovers from the impacts of the disease and/or while non-essential workforce is in quarantine. Hospitals and health care providers could be overwhelmed because of a large influx of patients.

Additionally, secondary impacts could include civil disorder and violence exacerbated by the pandemic as an outcome of fear or because of the measures taken to contain or control the outbreak.

11.2 VULNERABILITY AND IMPACT ASSESSMENT

All El Paso County is at risk from the impacts of epidemics and pandemics. A qualitative analysis was conducted to assess the County's vulnerability to this hazard of concern.

11.2.1 LIFE, HEALTH, AND SAFETY

Overall Population

According to the Colorado State Hazard Mitigation Plan, a severe pandemic could result in absenteeism rates reaching up to 40 percent during peak weeks of a community outbreak. This absenteeism may be due to illness, caregiving responsibilities, or fear of infection. Public health measures, such as school closures, quarantines, and voluntary stay-at-home advisories ("snow days"), can further increase absenteeism and disrupt daily life and essential services (Colorado Department of Public Safety 2018).

All residents within the El Paso County planning area are potentially susceptible to the human health hazards associated with pandemics. The Colorado State Hazard Mitigation Plan notes that densely populated areas face a higher risk of disease transmission due to shared resources and close contact among individuals. With one of the highest base populations in the state, El Paso County is particularly vulnerable to widespread impacts during a pandemic (Colorado Department of Public Safety 2018).

A large-scale outbreak or epidemic of a communicable disease could have severe consequences for the population. While it is difficult to predict which groups will be most affected in any given pandemic, historical data suggest that infants, the elderly, individuals with chronic illnesses or compromised immune systems, and pregnant women are typically at higher risk for serious symptoms and complications.

Additionally, frontline workers, including healthcare professionals, public health staff, law enforcement, and firefighters, face elevated exposure risks. Their illness or absence during a pandemic can strain the overall response capacity, further compounding the impact on the community.

Socially Vulnerable Population

Pandemics and epidemics severely impact socially vulnerable populations due to pre-existing health conditions, limited access to resources, and other barriers. For example, the elderly

population often have chronic health conditions and weakened immune systems which make them more susceptible to severe illness and death during an outbreak. People with disabilities may face challenges accessing healthcare, transportation, or emergency information especially when services are disrupted. Non-English speakers frequently encounter language barriers that hinder their ability to receive accurate public health information. Children below the age of 5 years old, particularly those in low-income households, may suffer from food insecurity and reduced access to healthcare and mental health services.

These populations within El Paso County also experience heightened social and economic consequences during health crises. Elderly individuals in long-term care facilities may face isolation and increased mortality. Individuals with disabilities may lose access to caregivers or essential services. Non-English speakers may be excluded from relief programs or public health messaging. Children under the age of 5 years old may endure long-term developmental setbacks due to disrupted schooling and social situations.

11.2.2 GENERAL BUILDING STOCK

None of the health hazards addressed in this chapter are considered to have any measurable impact on the built environment in the planning area.

11.2.3 COMMUNITY LIFELINES AND OTHER CRITICAL FACILITIES

None of the health hazards addressed in this chapter are considered to have any measurable impact on critical facilities in the planning area. However, in the event of a large infectious disease outbreak, “critical facilities face particular challenges due to both the risk of unavailability of key staff through illness and quarantine, as well as other long-term impacts that might affect the ability of the operator to maintain continuous availability” (Uptime Intelligence Team 2020).

During the COVID-19 outbreak, 16 critical infrastructure sectors were identified by the Cybersecurity & Infrastructure Security Agency (CISA) whose assets, systems, and networks are considered so vital to the United States that their incapacitation or destruction would have a debilitating effect on security, national economic security, national public health or safety, or any combination thereof.

Healthcare facilities (and veterinary clinics) have been prepared for the health hazards. Emergency management planning incorporates all disciplines responding to an event, (fire agencies, law enforcement, first responder ground and air ambulance agencies, public health, mental and spiritual health). Planning includes identifying shelters, alternate treatment facilities, isolation capacity, and methods to immediately expand physical and human resources.

11.2.4 ECONOMY

The economic impact of a human health hazard could be localized to a single population or could be significant, depending on the number of cases and available resources to care for those affected. Other financial impacts are absorbed or managed by the organization affected (i.e., healthcare facilities and veterinary offices train their personnel at their own cost). The potential for human health hazards is not likely to slow the expected growth in the County.

11.2.5 ENVIRONMENT

None of the environment in the planning area is exposed to the human health hazards discussed in this chapter.

11.2.6 HISTORIC AND CULTURAL RESOURCES

Pandemics and epidemics can significantly impact historic and cultural resources in El Paso County by disrupting preservation efforts and limiting public access. During the COVID-19 pandemic many museums, cultural centers, and historic sites in the County were forced to close or reduce operations which lead to increased revenue losses. These closures not only impacted tourism and education but also delayed the conservation efforts of local heritage. For example, El Paso County Historical Society launched initiatives to collect personal stories and artifacts relating to the pandemic which recognizes the importance of preserving this historical moment in time for future generations.

11.3 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

11.3.1 LAND USE AND DEVELOPMENT

None of the land use and development in the planning area is exposed to the human health hazards discussed in this chapter.

11.3.2 PROJECTED CHANGES IN POPULATION PATTERNS

The County population is projected to increase by over 32 percent by 2050. Table 3-7 summarizes recent and projected future changes in county population. Between 2010 and 2025 alone, the County population rose by nearly 21 percent. This drastically increases the region's risk to pandemics, as there will be far more people who can potentially become ill and can also pass on the disease. Also, as population continues to grow and development expands further into wildland areas, it can mean more potential for transmission of infectious diseases through denser population and more interaction with wild animals.

11.3.3 CLIMATE CHANGE

Future climate scenarios are predicted to be warmer and dryer which could mean the introduction of diseases typically associated with warmer climates. However, ongoing efforts to reduce Colorado's greenhouse gas emissions and adapt to a changing climate, such as the Colorado Climate Plan, will help to reduce the impacts of climate change on pandemics.

11.3.4 OTHER IDENTIFIED CONDITIONS

Important issues associated with pandemic disease include but are not limited to the following:

- Prevention is the key to mitigation of the impacts of these hazards. Prevention through vaccination and abatement will help to reduce the exposure to these hazards.
- Adequately trained and supplied medical personnel must be available.
- Conduct outreach to inform the public about exposure to and prevention of human health hazards.
- Services may be delayed or suspended, and unemployment numbers may increase exponentially.
- Programs to improve overall health in the community to reduce the number of high- risk patients should be adopted.
- Having local medical resources available as federal and state resources may not be available.

11.4 CONSEQUENCE ANALYSIS

Table 11-4 presents the results of the consequence analysis for the epidemic/pandemic hazard.

Table 11-4. Consequence Analysis for the Epidemic/Pandemic Hazard

Category	Narrative
Hazard Description	Epidemics occur when an infectious disease spreads beyond a local population and affects people across a broader geographical area. When the disease reaches global proportions, it is classified as a pandemic. The size and extent of the infected population depend on how easily the illness spreads, the mode of transmission, and the level of contact between infected and non-infected individuals.
Impact on Property, Facilities, and Infrastructure	Property, facilities, and infrastructure are not typically directly affected by a pandemic. However, schools and hospitals are likely to bear the greatest burden. Schools may need to close temporarily to prevent further spread of the disease. Hospitals will be significantly overburdened due to the influx of patients. If illness becomes widespread, the operation of critical facilities may be compromised due to staffing shortages and increased demand.
Impact on the Environment	Pandemics are not expected to cause direct environmental effects. Unlike natural disasters, the impact is primarily on human health and societal systems.
Impact on Responders	Medical staff will be overwhelmed by hundreds of additional cases on top of their regular workload. Other emergency responders will be affected similarly to the general population, reducing the number of available personnel. Healthcare workers, public health professionals, and other responders may face a higher risk of exposure and illness, further straining the overall response effort.
Impact on Continuity of Operations, Continuity of Government, and Delivery of Services	A pandemic may result in a large portion of the workforce being absent, which could severely affect the continuity of government operations. The State of Colorado has Continuity of Operations Plans (COOPs) in place to address pandemics, aiming to minimize disruptions and maintain essential functions during such events. PPROEM maintains the Continuity of Operations Plan and the Continuity of Government Plan for the County of El Paso and the City of Colorado Springs; other jurisdictions in the Pikes Peak Region are in the process of developing continuity plans and procedures.
Impact on the Public	Pandemics can lead to unemployment, lost wages, illness, and death. In addition to physical health impacts, there may be significant emotional and psychological effects on individuals and communities.
Impact on the Economic Condition of the County	In the event of a pandemic, a substantial portion of the workforce may be unable to work due to illness or quarantine measures. Government guidance and public concern may reduce in-person commerce, and tourism is likely to decline. These factors will negatively impact the economy. Regulatory measures and public education efforts should aim to minimize economic disruption and support recovery.
Impact on the Public Confidence in Government	It is expected that the government will take action to end the pandemic by providing guidance, issuing directives, and facilitating the distribution of vaccines and antiviral medications. A measured response that aligns with the severity of the situation is essential to ending the pandemic and minimizing economic impacts. Ongoing public messaging and outreach are vital to maintaining public trust and ensuring compliance with health measures.

12. EXTREME ACTS OF VIOLENCE

12.1 HAZARD PROFILE

12.1.1 HAZARD DESCRIPTION

In September 2019, the Department of Homeland Security released its Strategic Framework for Countering Terrorism and Targeted Violence, which identifies three major threat actors, including Foreign Terrorist Organizations (FTOs), Domestic Terrorism, and Targeted Violence.

Foreign Terrorist Organizations (FTOs)

FTOs are foreign organizations that are designated by the Secretary of State in accordance with section 219 of the Immigration and Nationality Act as amended. The suspected terrorist group must meet three criteria to be designated an FTO, including: be a foreign organization, engage in or retain the capability and intent to engage in terrorism, and threaten the security of U.S. nationals or the national security (national defense, foreign relations, or the economic interest) of the United States. The Radical Islamist Terrorist Threat, including but not limited to ISIS, al-Qa'ida, and Hizballah are examples of Designated FTOs (DHS 2019).

Domestic Terrorism

Domestic terrorism, a phrase typically used to denote terrorists who are not directed or inspired by FTOs, have caused more deaths in the United States in recent years than have terrorists connected to FTOs. According to the U.S. Department of Justice, Federal Bureau of Investigation (FBI), Domestic terrorism is defined as "violent, criminal acts committed by individuals and/or groups to further ideological goals stemming from domestic influences, such as those of a political, religious, social, racial, or environmental nature." Domestic terrorist attacks and hate crimes sometimes overlap, as perpetrators of prominent domestic terrorist attacks have selected their targets based on factors such as race, ethnicity, national origin, religion, sexual orientation, gender, and gender identity.

According to the Department of Homeland Security "there is a growing threat from domestic actors, such as racially- and ethnically motivated violent extremists, including white supremacist violent extremists, anti-government and anti-authority violent extremists, and other ideological strains that drive terrorist violence. Lone attackers, as opposed to cells or organizations, generally perpetrate these kinds of attacks. But they are also part of a broader movement" (DHS 2019).

Examples of recent notable domestic terrorist attacks in the United States include: Florida State shooting (2025), Attempted assassination of Former President Donald Trump (2024), Uvalde school shooting (2022), El Paso Walmart shooting (2019), Pittsburg synagogue shooting (2018),

Orlando nightclub shooting (2016), Charleston church shooting (2015), and the Boston Marathon bombing (2013).

Targeted Violence

Unlike terrorism, targeted violence includes attacks otherwise lacking a clearly discernible political, ideological, or religious motivation, but that are of such severity and magnitude as to suggest a clear intent to inflict a degree of mass injury, destruction, or death commensurate with known terrorist tactics. Targeted violence may be a result of a perceived grievance, whether domestic, workplace, or of some other nature, and includes attacks within schools, places of worship, workplaces, large public gatherings, and other settings (DHS 2019).

Evidence-based research on individuals who carry out acts of targeted violence demonstrates that regardless of whether the attacks were acts of workplace violence, domestic violence, school-based violence, or terrorism, similar themes are evident among the perpetrators. A 2018 U.S. Secret Service National Threat Assessment Center (NTAC) review of mass attacks in public spaces found (USNTAC n.d.):

- Most of the attackers utilized firearms, and half departed the site on their own or committed suicide.
- Half were motivated by a grievance related to a domestic situation, workplace, or other personal issue.
- Two-thirds had histories of mental health symptoms, including depressive, suicidal, and psychotic symptoms.
- Nearly all had at least one significant stressor within the last five years, and over half had indications of financial instability in that timeframe.
- Nearly all made threatening or concerning communications and more than three-quarters elicited concern from others prior to carrying out their attacks.

Mass attacks are a persistent problem and a grave concern. According to the U.S. Secret Service, 27 mass attacks were carried out in public spaces in the United States in 2018, killing 91 people. In 2017, 28 mass attacks claimed 147 lives (USNTAC 2018). In the past ten years, the Nation witnessed the two deadliest mass attacks in its modern history, including a 2017 shooting at an outdoor concert in Las Vegas that killed 58 and injured 869. The impact of such attacks on the victims, their families, friends, local communities, and the Nation is immense.

Examples of recent notable targeted violence attacks in the United States include: Florida State shooting (2025), Virginia Beach City Building (2019), Stoneman Douglas High School, Parkland, Florida (2018), Borderline Bar & Grill, Thousand Oaks (2018), Las Vegas Concert (2017), San Bernardino (2015), Sandy Hook Elementary School (2012), Aurora Movie Theater (2012), and Virginia Tech (2007).

Soft targets and crowded places, such as shopping malls, schools, transportation systems, and sports venues, are particularly vulnerable to a terrorist or targeted violence attack. These locations are easily accessible to large numbers of people and have limited security or protective measures in place. Terrorists and other violent actors have plotted against or attacked such places using simple, low-cost methods with minimal identifiable indicators. As such, security awareness for soft

targets and crowded places is an urgent focus area. Also, of concern, violent extremist groups have often proven adept at exploiting the Internet's potential. Advances in technology have played a critical role in facilitating the spread, evolution, and interaction of violent ideologies and narratives of personal grievance and have resulted in subsequent security implications.

The 2019 Colorado State Emergency Operations Plan (SEOP) lists specific terrorist acts / operations; including, but not limited to, the following general categories (Colorado OEM 2019):

- Chemical events, to include weapons of mass destruction
- Biological events, including agri-terrorism (the direct, typically covert contamination of food supplies or the introduction of pests and/or disease agents to crops and livestock) and spread of disease
- Nuclear / radiological events
- Conventional events, to include bombings, arson, and armed assaults.
- Infrastructure - cyber events, to include actions involving, or affecting, Information Technology, data processing and storage or interference with critical infrastructure
- Delivery and employment of these items may entail use of mails, aircraft, watercraft, motor vehicles, or hand delivery to an intended target.
- Any combination of the above methods of attack.

12.1.2 LOCATION

The location of terrorist attacks is unpredictable, although certain critical facilities and venues for large public gatherings are usually considered to have more inherent vulnerability. The City of Colorado Springs, like most metropolitan communities, has the potential to be a target of a terrorist attack. The City and El Paso County have a number of iconic sites in its military bases (Fort Carson, Cheyenne Mountain, the U.S. Air Force Academy, etc.) that could be targeted, as well as critical facilities, communication systems, water and utilities, monuments, and areas where large groups congregate (e.g., stadiums, conventions, worship areas).

12.1.3 EXTENT

The potential scenarios of a terrorist attack vary widely depending on the number of terrorists/attackers involved, the level of weaponry, the sophistication of the strategy, the choice of target, and the response time to the event. The severity of violent crime is most often measured in its effect on lives. Most incidents of mass violence injure or kill a fairly low number of people. On the other hand, as in the experience of the New Life Church shooting, an event with few casualties can still create a huge community impact. It is difficult to quantify the psychological impact of an incident on a population.

Warning Time

There is minimal warning time for extreme acts of violence, with less than six hours' notice. It is rare that any actionable warning time is presented prior to the onset of an incident of this nature. On occasion there may be some time in a standoff or barricaded hostage situation in which mitigation actions can be executed.

12.1.4 PREVIOUS OCCURRENCES

Federal Emergency Management Agency (FEMA) Disaster Declarations

The Pikes Peak Region has never received a major disaster declaration for an extreme act of violence-related event.

State Emergency Proclamations

Between 2020 and 2024, the Pikes Peak Region was not included in any state emergency proclamation for an extreme act of violence-related event.

U.S. Department of Agriculture (USDA) Declarations

Between 2020 and 2024, the Pikes Peak Region was not included in any USDA extreme acts of violence-related agricultural disaster declarations.

All Recent Events

There has been no recent extreme violence events in the Pikes Peak Region. Incidences of extreme acts of violence have been infrequent in the region. Documented events are described below:

- **November 19-20, 2022**—A mass shooting at Club Q, a gay bar in City of Colorado Springs. Five people were killed and 25 others were injured.
- **November 27, 2015**—A gunman attacked a Planned Parenthood clinic in City of Colorado Springs resulting in a five-hour standoff and the deaths of a police officer and two civilians. Numerous emergency service agencies responded to the incident and provided aide. Office of Emergency Management (OEM) opened the Emergency Operations Center (EOC) and provided logistical support for the response and recovery operations.
- **December 9, 2007**—An active shooter situation at New Life Church resulted in three fatalities. The incident was linked to a shooting earlier in the day at a youth ministry complex in Aurora, Colorado, which resulted in a multi-jurisdictional event that included two cities. Colorado State Patrol, FBI and ATF were involved.
- **April 26, 1994—**A mail bomb killed a man and injured his wife in City of Colorado Springs.

12.1.5 PROBABILITY OF FUTURE OCCURRENCES

The probability of future terrorist attacks is partially monitored by the U.S. Department of Homeland Security through the Homeland Security Advisory System. In Colorado, potential terrorist activities are monitored by the City of Colorado Springs Police Department (CSPD) with assistance from the FBI Joint Terrorism Task Force and the state fusion center called the Colorado Information Analysis Center (CIAC). Fusion centers are set up across the United States as focal points within the state and local environment for the receipt, analysis, gathering, and sharing of threat-related information and have additional responsibilities related to the coordination of critical operational capabilities. These centers are the priority for the allocation of available federal resources, including the deployment of personnel and connectivity with federal data systems.

Information on previous extreme acts of violence occurrences in the County was used to calculate the probability of future occurrence of such events. Table 12-1 lists the number of events over the

31-year period from 1994 to 2025, which is the most complete period of record for all sources reviewed. Based on these records and input from the Steering Committee, the probability of occurrence for extreme acts of violence in the County is considered "rare."

Table 12-1. Probability of Future Extreme Acts of Violence Events in Pikes Peak Region

Hazard Type	Number of Occurrences Between 1994 and 2025	% Chance of Occurring in Any Given Year
Extreme Acts of Violence	3	9.7%

Source: PPROEM

12.1.6 CASCADING IMPACTS ON OTHER HAZARDS

The Colorado State Emergency Operations Plan (SEOP) states that there could be several secondary impacts to terrorism events including transportation and utility disruption, wildfire and urban fires, dam failure, HAZMAT incident, and infectious disease. The potential for secondary impacts emphasizes the need to contain the initial impacts including quick response and good coordination.

12.2 VULNERABILITY AND IMPACT ASSESSMENT

All El Paso County is at risk from the impacts of extreme acts of violence. A qualitative analysis was conducted to assess the County's vulnerability to this hazard of concern.

12.2.1 LIFE, HEALTH, AND SAFETY

Overall Population

It is difficult to estimate potential losses from terrorism attacks because of the tremendous range of potential impact. Losses typically involve injury and fatalities in an armed attack but could also be massive property damage along with human injury if an explosive device is involved. While cyber-attacks may not physically harm a person or damage a building, the violation of secure information can result in massive financial losses or crippling of a system needed to operate an important facility. Future growth in the area could contribute to a slightly higher risk of terrorism as the population grows and is more diverse. Terrorism is highly subjective to events and reactions to events all over the world and is extremely difficult to predict.

It can be assumed that the entire population in the planning area is exposed to some level of risk at any given time. This risk is greater when located in high population density areas. Vulnerable populations are at greater risk in any situation in which safety depends on prompt action and rapid movement.

Aside from the immediate injuries and loss of lives, the community impact of extreme violence takes many forms.

- Drain on emergency response resources: law enforcement, emergency medical services
- Business interruption
- Increased security expenses
- Business reduction due to negative public perception
- Behavioral and emotional health impacts to residents

Socially Vulnerable Population

Extreme acts of violence, such as mass shootings, have disproportionate impacts on socially vulnerable populations such as the elderly, individuals with disabilities, children under the age of 5 years old, and those living in poverty. These groups often face physical risks due to limited mobility, slower response times, or lack of access to safe resident/population movement routes. Psychologically, the trauma from these events can be more severe and long-lasting, especially for children and those with pre-existing mental health conditions. Also, economically disadvantaged individuals may lack access to adequate healthcare, mental counseling, or support services needed for such recovery. In the aftermath of an extreme act of violence, disparities can further marginalize these populations. Resources for recovery enhancements are often unequally distributed and as a result, such attacks not only inflict immediate harm but also deepen existing social and economic challenges.

12.2.2 GENERAL BUILDING STOCK

Property damage can range from almost negligible to millions of dollars depending on the type of incident and the location it is carried out. Local iconic landmarks may be destroyed, creating a psychological effect without significant injury or high dollar property loss. Property at risk is very difficult to determine due to the unpredictable nature of the threat and the wide variety of potential grievance targets. Incidents are typically localized in nature with limited property loss. The greatest impact may be economic due to loss of physical business assets, or loss of customer confidence.

12.2.3 COMMUNITY LIFELINES AND OTHER CRITICAL FACILITIES

Attacks directed at utility facilities and infrastructure may cause disruption in services or lead to potential cascading events that may proportionally impact local or regional populations more than physical damage.

The US Department of Homeland Security has identified sixteen Critical Infrastructure groups that may be potential targets for acts of terrorism at any level:

- Communications sector
- Critical manufacturing sector
- Defense industrial base sector (impacting the integrity of military operations)
- Emergency services sector
- Energy sector
- Financial services sector
- Food and agriculture sector
- Government facilities sector

- Healthcare and public health sector
- Information technology sector
- Nuclear facilities sector
- Dams sector
- Chemical sector
- Commercial facilities sector
- Transportation systems sector
- Water and waterways sector

Most critical infrastructure has some form of active or passive measures in place to minimize exposure to and mitigate effects of incidents of extreme violence. Systems are designed with redundancy to prevent long term loss of service, and facilities are "hardened" and/or access controlled. This limits the long-term exposure to incidents and allows for a rapid recovery.

12.2.4 ECONOMY

Extreme acts of violence such as mass shootings and terrorist attacks can have significant and lasting impacts on the economy of the County. In the immediate aftermath, local businesses may suffer from closures, reduced consumer access, and damage to infrastructure. Tourism, which is a major economic driver in portions of the County, can decline as safety becomes a concern. Additionally, property values may drop in impacted areas and insurance premiums could rise. These ripple effects can continue for years, especially in areas of the County that may have limited resources.

12.2.5 ENVIRONMENT

Acts of extreme violence tend to have a minimal impact on the environment except for a potential hazardous materials release or an Agri-terrorism attack. Agri-terrorism is defined as the "deliberate introduction of plant or animal pathogens, pests, or contaminants into the agricultural or food supply system with the intent to cause fear, economic disruption, or social instability" (Olson 2012).

12.2.6 HISTORIC AND CULTURAL RESOURCES

Extreme acts of violence can have a large and lasting impact on the historic and cultural resources of El Paso County. The County is home to historic landmarks, cultural institutions, and community traditions. An extreme act of violence such as a mass shooting could disrupt the preservation and appreciation of these resources. Public spaces that serve as cultural gathering points such as museums and parks may experience decreased public access due to fear and trauma. In term of long term impacts, such violence can alter the narrative of an area, which may overshadow the historical identity with tragedy and loss.

12.3 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

12.3.1 LAND USE AND DEVELOPMENT

Locally, the CSPD will work with state and federal officials to monitor potential threats. The underlying philosophy of the "See Something, Say Something" campaign where everyday citizens can help spot suspicious activity and report it is now widely accepted. Law enforcement officials in Colorado often rely on citizens to detect activity that is out of the ordinary. Of particular interest is recognition of suspicious behavior such as unauthorized individuals who request sensitive information or take photographs of critical infrastructure or sensitive areas without permission. In highly sensitive areas, cameras can be set up to help provide additional surveillance capability to security teams. Area schools maintain operation manuals for addressing attacks and responses.

Future trends in development will not have a significant impact on this hazard other than population density increases.

12.3.2 PROJECTED CHANGES IN POPULATION PATTERNS

The County population is projected to increase by over 32 percent by 2050. Table 3-7 summarizes recent and projected future changes in county population. Between 2010 and 2025 alone, the County population rose by nearly 21 percent. With this increase in population, the risk of extreme acts of violence has also increased. More people are residing and living in the County and utilizing public spaces and services directly increases exposure to this hazard in the event it may occur. Additionally, an increase in projected populations in the future will also indicate an increase in extreme acts of violence such as terrorist risk. It is critically important that the County plans for and mitigates against extreme acts of violence hazards for the current population and the projected new population in the future.

12.3.3 CLIMATE CHANGE

There are no impacts that extreme acts of violence may have on climate change. However, there could be potential for climate change to indirectly impact the severity and frequency of extreme acts of violence. With climate change, which is increasing physical stressors on the entire world, these negative impacts may increase public unrest and lead to additional disparities and inequality which may increase mental health impacts that can lead to acts of violence.

12.3.4 OTHER IDENTIFIED CONDITIONS

Important issues associated with an act of extreme violence in the planning area include the following:

- It is extremely difficult to predict the next incident location.

- The nature of these incidents is dynamic, often catastrophic, and complete within minutes. Increased security has an economic cost, as well as in personal freedom and way of life.
- Increased security measures may be unpopular, both politically and socially.
- It is important to understand and identify Positive and Potentially Malicious Uses of Technology (e.g., social media).
- Soft targets and crowded places are vulnerable to attack and warrant enhanced security. The cyber domain and critical infrastructure are significant targets to protect.
- The identification of critical infrastructures is an essential element of an effective anti – terrorism program and efforts must be taken to protect areas that could be exploited. Possible measures include security systems, improved communications and access restrictions.

12.4 CONSEQUENCE ANALYSIS

Table 12-2 presents the results of the consequence analysis for extreme acts of violence.

Table 12-2. Consequence Analysis for the Extreme Acts of Violence Hazard

Category	Narrative
Hazard Description	Terrorism involves acts of violence intended to inflict mass injury, destruction, or death, and may also target critical infrastructure or key resources. Three major threat actors have been identified: Foreign Terrorist Organizations (FTOs), domestic terrorism groups, and individuals engaging in targeted violence. The City of Colorado Springs and El Paso County contain several iconic and strategic sites that could be potential targets, including military installations such as Fort Carson, Cheyenne Mountain, and the U.S. Air Force Academy. Other vulnerable assets include critical facilities, communication systems, water and utility infrastructure, monuments, and locations where large groups gather—such as stadiums, convention centers, and places of worship.
Impact on Property, Facilities, and Infrastructure	Terrorist attacks may result in minimal property damage that does not threaten structural stability, or they may cause long-term damage that compromises structural integrity. The type and magnitude of the attack will determine the extent of damage to a jurisdiction's facilities. Buildings may be destroyed or rendered unsafe, and equipment—whether electronic or mechanical—may be ruined or rendered inaccessible due to damage or contamination. Explosions and fires can disable infrastructure such as roads, power lines, natural gas systems, fuel supplies, water pipelines, and sewage control facilities. Additionally, dams and other critical infrastructure could be significantly impacted depending on the nature and scale of the attack.

Category	Narrative
Impact on the Environment	While the environmental impacts of a terrorist attack are often minimal, they can be significant in cases involving hazardous materials releases or agri-terrorism. The destruction of urban infrastructure can lead to lingering contamination from pollutants, hazardous debris, and other toxic substances. Attacks on water supplies and food crops may have long-term consequences, rendering land or water sources unusable. Radiological damage can result in the closure of entire geographic areas for years. Wildlife may also be affected depending on the type and magnitude of the attack.
Impact on Responders	Emergency responders may experience similar impacts as civilians in the affected area, including medical issues and fatalities resulting from chemical exposure, explosions, or fire-related trauma. The physical and psychological strain on first responders, combined with concerns for their families, can increase their vulnerability. Ambulance services may also be disrupted depending on the nature and scale of the attack. Additionally, the possibility of secondary attacks poses further risks to response personnel.
Impact on Continuity of Operations, Continuity of Government, and Delivery of Services	Terrorist attacks may cause interruptions to essential facilities and services for periods ranging from less than 24 hours to as long as 72 hours. PPROEM maintains the Continuity of Operations Plan and the Continuity of Government Plan for the County of El Paso and the City of Colorado Springs; other jurisdictions in the Pikes Peak Region are in the process of developing continuity plans and procedures.
Impact on the Public	Terrorist attacks can result in isolated deaths or multiple injuries and fatalities. In addition to physical harm, such events often instill fear and helplessness in the general population. Terrorism can destroy property, disrupt lifelines, and damage the social fabric of communities. On a large scale, it can devastate major portions of a city's infrastructure, causing prolonged physical and economic hardship. Long-term psychological effects on affected populations are also possible.
Impact on the Economic Condition of the County	The economic viability of an area following a terrorist attack depends not only on the extent of the damage but also on how quickly infrastructure can be repaired. The preparedness of businesses to operate in a post-disaster environment, the readiness of citizens to respond to an attack, and the effectiveness of local governments and organizations in providing support, cleanup, and relocation services all play critical roles in recovery.
Impact on Public Confidence in Government	Public confidence is closely tied to perceptions of how well response and recovery efforts are managed during and after a terrorist event. A response that demonstrates preparedness and attentiveness to public needs—along with timely restoration of services and repair of damage—can help maintain or enhance trust in government. Clear and consistent public communication is essential. Keeping residents informed about the extent of damage, the status of repairs, and realistic expectations for recovery can positively influence public confidence. A lack of communication may be perceived as inaction, leading to frustration and diminished trust.

13. HAZARDOUS MATERIALS

13.1 HAZARD PROFILE

13.1.1 HAZARD DESCRIPTION

FEMA defines Hazardous Materials (HAZMAT) as chemical substances that, if released or misused, pose a threat to the environment or health. Incidents involving hazardous materials have the potential to be one of El Paso County's most catastrophic risks. There are currently over 380 chemicals that are listed on the Environmental Protection Agency's (EPA) Extremely Hazardous Substance List (EPA 2025). Federal Law (42 USC, Title III) places several requirements on local governments and businesses that apply to HAZMAT reporting and response. Title III has four primary requirements that: 1) establishes mandatory training requirements for first responders (29 CFR 1910.120) and the requirement to establish a Local (Chemical) Emergency Planning Committee (LEPC). These chemicals are used in industry, agriculture, medicine, research and consumer goods and come in the form of explosives, flammable and combustible substances, poisons and radioactive materials; 2) requires that any facility that maintains Extremely Hazardous Material at certain quantities must report them to the local LEPC. The reporting method is via the Tier II report established by Environmental Protection Agency (EPA); 3) makes the Tier II reports available to the public upon request; and 4) the local government LEPC must establish a method of emergency notification should a life-threatening HAZMAT spill occur. This emergency notification is outlined in PPROEM's HAZMAT plan which also explains the regional response capability, a DERA requirement. A Tier II Report is officially known as the Emergency and Hazardous Chemical Inventory Forms. This report is a form that organizations and businesses in the United States with hazardous chemicals above certain quantities are required to fill out by the EPA.

In essence, HAZMAT incidents consist of solid, liquid, and/or gaseous substances that are released from fixed or mobile containers, whether by accident or by design as with an intentional terrorist attack. A HAZMAT incident can last hours to days and some chemicals can be damaging for years. In addition to the primary release, explosions and/or fires can result from a release, and contaminants can be extended beyond the initial area by persons, vehicles, water, weather, and possibly wildlife.

Hazardous material incidents can include the spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment of a hazardous material, but exclude: (1) any release which results in exposure to poisons solely within the workplace with respect to claims which such persons may assert against the employer of such persons; (2) emissions from the engine exhaust of a motor vehicle, rolling stock, aircraft, vessel, or pipeline pumping station engine; (3) release of source, byproduct, or special nuclear material from a nuclear incident; and (4) the normal application of fertilizer. There are three recognized sources for HAZMAT incidents within the jurisdiction, including: delivery lines, fixed facilities storage and use locations, and identified transportation routes.

Personnel responsible for managing and mitigating future hazardous material incidents within a jurisdiction include:

- Local Emergency Planning Committee (LEPC): Committee that meets quarterly and consists of government, first responders, and local businesses that respond to or maintain Hazardous Materials.
- Designated Emergency Response Authority: responsible for planning and coordinating emergency response to HAZMAT spills within the County and maintain a HAZMAT response plan that is in accordance with 42 USC.

Delivery Lines

Natural gas and petroleum-based products are transported through the jurisdiction using transmission pipelines which are typically composed of high-strength steel or poly-vinyl chloride (PVC) of various sizes and pressures. These lines move large quantities of natural gas and petroleum-based products from the producing regions to local distribution companies, as well as to customers. The pressure in each section of line typically ranges from 200 pounds to 1,500 pounds per square inch depending on the type of area in which the pipeline is operating. As a safety measure, pipelines are designed to handle greater pressures than are actually delivered in a system. For example, pipelines in more populated areas operate at less than half of their design pressure level. Additionally, many major pipelines are "looped" allowing for two or more lines running parallel to each other in the same right of way. This provides maximum capacity during peak demand periods.

Fixed Facilities

El Paso County has numerous facilities and occupancies that contain hazardous materials for various industrial or commercial uses. For example, water and gas utilities are the largest users of common hazardous materials. Food processing, storage, and distribution companies use high quantities of refrigerants containing hazardous agents. Several industrial mining laboratories contain chemical inventories for testing and processing samples. Vehicle repair shops keep chemicals for welding and other shop repair services. These facilities are required to report to their respective county or City of Colorado Springs - LEPC and maintain detection and suppression systems to mitigate the increased risks. County HAZMAT personnel and/or City HAZMAT inspectors also inspect facilities containing hazardous materials and review emergency procedures to verify reporting compliance and preplan for emergencies.

Transportation Routes

Transportation of hazardous materials through the jurisdiction occurs by way of aircraft, freight train, and over-the-road commercial carriers. Over-the-road carriers account for the largest number of hazardous materials movements throughout the County; however, rail movements consist of larger quantities in a given movement. Data as to the number of vehicles as well as types and quantities of materials transiting the planning area is limited and it is impossible to know exactly what is on a section of a transportation route at any given time. Most over-the-road HAZMAT incidents involve passenger vehicles that leak 25 gallons or less of gasoline, which first arriving units mitigate without additional resources. Larger spills, however, typically require additional

resources, which includes the El Paso County and City of Colorado Springs Fire Department HAZMAT Team and/or other regional resources.

13.1.2 LOCATION

There are many sources of hazardous materials in the Pikes Peak Region. These sources include chemical manufacturers, service stations, healthcare facilities and hazardous materials disposal sites. Hazardous materials are also shipped daily on area highways and railroads, to include a major railroad that runs through the center of City of Colorado Springs.

A hazardous material incident can occur in a variety of locations and spatial extents. Some incidents (such as a fuel spill) can occur in a small location and impact a small spatial extent. Others, such as the release of toxic chemicals, may occur from a small location or source but can spread over large areas.

Delivery Lines

Numerous gas and petroleum-based pipelines traverse the jurisdiction and a full accounting of their locations and size of lines is not practical for display in this document. Most ruptures or delivery system malfunctions are isolated events with limited potential to become large-scale incidents. For most of these events, the primary hazard is the flammable/combustible nature of the gas compounds. Since a majority of these incidents occur outside of structures, the risk to the loss of life is isolated to the immediate area of origin or nearby structures where gases can accumulate. Utility providers can provide more detailed information of their infrastructure including location, pressure, line diameter, as well as the types of commodities and quantities that flow through specific lines.

Fixed Facility

The Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) requires facilities storing hazardous materials to report those substances annually to the State Emergency Response Commission, the Local Emergency Planning Committee (LEPC), and local fire departments. There are many such facilities located throughout the Pikes Peak Region, though many do not store substances or quantities of such that are considered extremely hazardous. Of greater concern to the emergency management community are those facilities that use or produce toxic chemicals above specific thresholds that pose major threats to human life and safety.

Transportation Routes

Aircraft transit the jurisdiction frequently with the majority of commercial traffic existing within City of Colorado Springs Municipal Airport's airspace and fixed facilities. There is also significant military air traffic. Although aircraft incidents/accidents occur throughout the jurisdiction, most HAZMAT related incidents occur within the airport grounds and are generally focused on fuel spills. Peterson Air Force Base responds to most incidents within airport secured areas.

Quantities of hazardous and nonhazardous materials are routinely transported by rail through El Paso County by Union Pacific (UP) and Burlington Northern & Santa Fe (BNSF) railroads. The railroad right of way runs through several jurisdictions from the northern county line to the southern

county line and generally parallels Interstate 25. Commodity flow studies based on 2018 data indicate that crude oil shipments through El Paso County have decreased in frequency over the last two years. According to the data, BNSF ships a majority of the hazardous loads passing through El Paso County. For BNSF, the three hazardous commodities with the highest number of loaded cars included: Class 2 (Petroleum gases, Liquefied), Class 9 (Elevated Temperature Materials), and Class 3 (Alcohols, NOS). There is a heightened sense of vulnerability to rail traffic due to the shipping of crude petroleum that has resulted in several catastrophic events when derailments have occurred within other jurisdictions.

Hazardous materials are routinely transported by carriers to destinations within El Paso County including federal, state, and county roads. Interstate 25, East and West Highway 24, and Highway 115 are designated by the State of Colorado as hazardous materials transportation routes. Although no other roadways are specifically designated for shipment of hazardous materials, local delivery of hazardous commodities is allowed on all roadways. Traffic Flow studies conducted by EPC OEM along hazmat routes within El Paso County were completed to obtain a snapshot of the type and frequency of commodities transported along the routes described above. The flow study found Interstate 25 to be by far the busiest hazardous materials route passing through El Paso County, with multiple loads of all hazard classes passing through this area on a regular basis.

13.1.3 EXTENT

The severity of a HAZMAT-related incident ranges from extremely limited and contained within a localized area, to catastrophic incidents affecting large areas and/or populations. Large releases are capable of harming individuals, the environment, and animals; as well as causing severe economic disruption. The severity of each source of potential HAZMAT release is dependent upon several variables: material involved, quantities released, location of the incident (e.g., proximity to densely populated areas, access to waterways, etc.), and weather conditions.

While HAZMAT-related incidents have the potential to be critical with isolated deaths and/or multiple injuries; major or long-term property damage that threatens structural stability; and/or interruption of essential facilities and services for 24 to 72 hours, within El Paso County the historic occurrence of critical hazmat incidents is extremely infrequent. Therefore, for this profile, the magnitude/severity is overall limited for all jurisdictions except for City of Colorado Springs, Town of Monument, and City of Fountain, which are considered critical due their high population density and location near major over-the-road and rail transportation routes.

Warning Time

The nature of hazardous materials accidents is often dynamic with little to no warning time. This makes understanding the most likely potential threat locations critical for a rapid initiation of protective measures for local populations and response actions.

13.1.4 PREVIOUS OCCURRENCES

Federal Emergency Management Agency (FEMA) Disaster Declarations

The Pikes Peak Region has never received a major disaster declaration for a hazardous material-related event.

State Emergency Proclamations

Between 2020 and 2024, the Pikes Peak Region was not included in any state emergency proclamation for a hazardous materials-related event.

U.S. Department of Agriculture (USDA) Declarations

Between 2020 and 2024, the Pikes Peak Region was not included in any USDA drought-related agricultural disaster declarations.

All Recent Events

Table 13-1. lists major recorded hazardous materials-related events that impacted Pikes Peak Region since the previous HMP was developed. For earlier events, refer to the previous HMP.

Table 13-1. Hazardous Materials Events in Pikes Peak Region (2020 to 2024)

Date	Hazard	Event Narrative
June 13, 2020	HAZMAT Transportation Spill	Semi-truck crashes, 4,000 gallons of hot tar spills on Highway 85 and South Academy. This resulted in the closer of Highway 85 for over 8 hours.
April 23, 2021	HAZMAT Transportation Spill	The El Paso County Hazardous Materials Response Team responded to a fuel spill involving a semi-truck on Highway 24 near Judge Orr Road. Battalion 303 arrived on scene just west of Judge Orr Road and confirmed an active fuel leak, prompting a request for hazmat support.
May 22, 2023	HAZMAT Transportation Spill	A hazardous material spill was reported just east of downtown City of Colorado Springs, according to the City of Colorado Springs Fire Department. The incident involved the release of over 50 gallons of various chemicals at 547 E. Cimarron Street.

Source: KRDO News 2020; The Gazette 2023

13.1.5 PROBABILITY OF FUTURE OCCURRENCES

Due to the continuous presence of hazardous materials being transported or stored in and around the Pikes Peak region, small HAZMAT incidents are considered “frequent” future events. However, based on historic events, the overall probability of a critical or catastrophic incident occurring is considered “occasional.” There have been no reported incidents at fixed facilities or high-pressure gas lines that have required hazmat intervention in the planning area within the last 15 years. Further, El Paso County has very little heavy industrial, the majority of facilities are light industrial.

13.1.6 CASCADING IMPACTS ON OTHER HAZARDS

The most likely secondary hazards associated with a HAZMAT incident would be secondary or expanding fires associated with the initial incident and environmental damage created through exposure to toxins. It is much more likely, however, that a hazardous materials incident will be secondary to another hazard such as a flood, wildland fire, and tornado, among others.

13.2 VULNERABILITY AND IMPACT ASSESSMENT

All El Paso County is at risk from the impacts of hazardous materials releases. A qualitative analysis was conducted to assess the County's vulnerability to this hazard of concern.

13.2.1 LIFE, HEALTH, AND SAFETY

Overall Population

Estimated potential losses are difficult to calculate because different hazardous materials have different impacts and other factors such as quantity or surrounding areas that may greatly influence the volatility of the released materials. While explosions involving hazardous materials are possible and would impact any nearby buildings and facilities, it is generally assumed that the greatest risk would be to human health and safety. The populations at greatest risk are those living and working within one mile of Interstate 25 and the railway or the population within a mile of a fixed facility.

Socially Vulnerable Population

Hazardous material spills can have severe impacts on socially vulnerable populations such as the elderly, individuals with disabilities, children under the age of 5 years, and those living in poverty. These groups often face greater challenges in responding to and recovering from incidents due to limited mobility, access to transportation, or communication barriers. For example, elderly or disabled individuals may be unable to evacuate quickly and may rely on medical equipment that could be compromised if exposed to certain chemicals. Children under the age of 5 years old are more susceptible to health impacts of toxic substances due to developing bodies and higher respiratory rates. People living in poverty may reside in poorly maintained housing structures which are closer to industrial zones or transportation corridors where spills typically occur. Those in poverty also tend to lack the financial resources to relocate or access healthcare. These unequal disparities express the need for inclusive emergency planning and targeted support to protect those who are most at-risk to hazardous material incidents.

13.2.2 GENERAL BUILDING STOCK

There is not a direct impact to the general building stock as a result of hazardous material spills. Indirect impacts could include closure of facilities and lack of access to these facilities. However, the structural impacts are usually small in comparison of other infrastructures such as roadways.

13.2.3 COMMUNITY LIFELINES AND OTHER CRITICAL FACILITIES

Many of the major delivery systems and the infrastructure surrounding them are considered critical infrastructure. An incident occurring on a transportation route, whether rail or ground, would potentially close traffic, creating cascading effects. There are several fixed sites, such as water treatment facilities, that may reduce service if an incident were to occur on premises, or when effected by a nearby facility or transportation incident requiring evacuations. Discussion on specific facilities will be withheld due to security concerns, but information for planners may be obtained through specific agencies.

Critical facilities within a half-mile buffer from delivery lines, fixed facilities storage and use locations, and identified transportation routes include two airports, two emergency centers, and several healthcare facilities. Additionally, over 100 schools are in potential exposure areas, as are several hazardous material storage facilities. Infrastructure facilities exposed to potential hazmat incidents include a handful of communication, water, wastewater, and power facilities, as well as many miles of highway and rail infrastructure.

13.2.4 ECONOMY

Hazardous material incidents can have economic impacts on the County impacting both short-term and long-term growth. Immediately following a spill or chemical release local governments may acquire large costs for emergency response, environmental cleanup, and public health assistance. Businesses located near an incident site may be forced to close temporarily, which can result in lost revenue and potential job losses. If the spill contaminates land or water resources, then agricultural operations and property values may go down which leads to reduced tax revenues and increased insurance claims. Additionally, the County may face legal liabilities or regulatory penalties, if applicable, which would impact public spending budgets.

13.2.5 ENVIRONMENT

Accidents involving chemicals or radioactive materials represent a significant threat to the environment, public health and safety, and community well-being. In an increasingly complex and interconnected world, no community is immune from the threat posed by environmental accidents and contamination. Even communities far removed from industrial production or storage facilities can still be at risk from accidents associated with the transport of hazardous materials. Major transportation accidents involving hazardous materials have been shown to produce profound economic, social, and psychological impacts in affected communities. These impacts can be both widespread and long lasting.

13.2.6 HISTORIC AND CULTURAL RESOURCES

Hazardous material spills can impact historic and cultural resources of El Paso County particularly in areas with rich heritage and cultural background such as City of Manitou Springs and City of Colorado Springs. These resources can range from historic buildings and archaeological sites to cultural landscapes and are often constructed from porous materials like wood, stone, and brick,

which can absorb toxic substances and suffer damages. For example, oil-based spills can penetrate historic masonry or timber which can lead to long-term deterioration and costly restoration. Another example in the County is the City of Manitou Springs Incline Trail and Hydro-Electric Plant Pipeline, both listed on the National Register of Historic Places, have previously been impacted by natural disasters. Hazardous material spills in these areas could further compromise their structural integrity and cultural value (FEMA n.d.).

Hazardous spills can also disrupt public access to cultural sites, delay or halt preservation projects, and reduce tourism which is an important economic driver for the County. Cleanup efforts in these areas must also comply with specific federal preservation laws, such as the National Historic Preservation Act, which can prolong recovery timelines (NPS 2023).

13.3 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

13.3.1 LAND USE AND DEVELOPMENT

It is anticipated that this region will continue to experience significant population growth and development, which will increase this population exposure to potential life loss, injuries, and environmental damage resulting from a hazardous materials release.

The Colorado Department of Transportation 2019 Colorado Freight Plan describes the impact of incompatible land uses developing in proximity to rail lines, stating “as areas surrounding current rail infrastructure are developed for residential, commercial, or other incompatible land uses, the ability of railroads to fully use or expand existing infrastructure and assets may be limited. Mixed-use development near existing rail assets may impose constraints on rail operations related to noise, safety, and hazardous materials. Improved zoning, regional freight land use planning, and continued coordination between local agencies and private railroads can mitigate incompatible development (such as schools, hospitals, dense residential developments, etc.) from occurring along or near rail lines” (Colorado Department of Transporation 2019).

Local planning and building departments and other agencies are taking steps to ensure proper storage, handling and maintenance of hazardous materials. For instance, the City of Colorado Springs Fire Department requires Hazardous Materials Permitting and Plan Review. Colorado State Patrol (CSP) is the primary DERA for state roads and EPC Hazmat responds as mutual aid to CSP and in the event CSP Hazmat is not available. Additionally, the CSP has a mutual aid agreement with the El Paso County and City of City of Colorado Springs HAZMAT Teams to respond to all spills on I-25.

13.3.2 PROJECTED CHANGES IN POPULATION PATTERNS

The County population is projected to increase by over 32 percent by 2050. Table 3-7 summarizes recent and projected future changes in county population. Between 2010 and 2025 alone, the County population rose by nearly 21 percent. With this increase in population, the risk to hazardous materials has also increased. More people residing and living in the County and hazardous material spillway directly increases the exposure to this hazard in the event it may occur. Additionally, an increase in projected populations in the future will also indicate an increase in hazardous material risk. It is critically important that the County plans for and mitigates against hazardous material events for the current population and the projected new population in the future.

13.3.3 CLIMATE CHANGE

There is no significant direct impact climate change has on hazardous material incidents. However, due to the impacts of climate change on the environment, a hazardous material spill may exacerbate environmental stressors and further alter the natural landscape and habitats.

13.3.4 OTHER IDENTIFIED CONDITIONS

Important issues associated with a hazardous materials release in the planning area include the following:

- It is extremely difficult to predict the next incident location.
- The self-reporting nature of Tier II facilities does not ensure all locations are identified.
- It is impossible to know where HAZMAT is being transported at any given time.
- Population density is increasing around potential hazardous material incident areas.
- Incompatible land uses developing in proximity to potential incident locations.

13.4 CONSEQUENCE ANALYSIS

Table 13-2 presents the results of the consequence analysis for hazardous materials.

Table 13-2. Consequence Analysis for Hazardous Materials

Category	Narrative
Hazard Description	Hazardous materials incidents involve the release of dangerous substances into the environment through actions such as spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing. However, certain releases are excluded from this definition, including: 1. Exposure to poisons solely within the workplace, with respect to claims made against the employer. 2. Emissions from the engine exhaust of motor vehicles, rolling stock, aircraft, vessels, or pipeline pumping station engines. 3. Release of source, byproduct, or special nuclear material from a nuclear incident. 4. The normal application of fertilizer.
Impact on Property, Facilities, and Infrastructure	Real property may become unusable due to contamination, depending on the nature of the hazardous materials event. Industrial and business sites may be rendered uninhabitable, either temporarily or permanently. Facilities located near the incident may also be affected, and public and private infrastructure could be shut down or destroyed. The type of infrastructure impacted will depend on the nature and extent of the event. Transportation methods—such as trucks, airplanes, and rail—may be severely disrupted during a hazardous materials incident and rendered unusable. Damage to facilities and infrastructure can be severe, especially in the case of explosions or fires. Any hazardous materials event may render facilities and infrastructure unusable until contamination is fully remediated.
Impact on the Environment	The environmental impact of a hazardous materials event depends on its location and the extent of contamination. Local wildlife and vegetation may be harmed, and groundwater and soil can become contaminated, making cleanup efforts extremely costly. Remediation may be required to restore environmental safety and functionality.
Impact on Responders	First responders may be unable to perform their duties effectively due to the nature of a hazardous materials event. Without proper precautions, training, and personal protective equipment (PPE), responders risk serious health consequences or death. Both short- and long-term exposure to certain chemicals can be hazardous. Physical and psychological strain on responders, along with concerns about their families, can increase overall risk. Ambulance services may be delayed or obstructed by blocked roadways. If the incident occurs at a critical transportation junction or covers a large area, the time required for cleanup could be significant.
Impact on Continuity of Operations, Continuity of Government, and Delivery of Services	Loss of facilities or transportation infrastructure can severely impact the ability to deliver goods and services efficiently. The Environmental Protection Agency's Hazardous Materials Plan outlines the roles and responsibilities of EPC Hazmat and supporting agencies to ensure a coordinated response and effective resource management during hazardous materials incidents within unincorporated areas and smaller municipalities. PPROEM maintains the Continuity of Operations Plan and the Continuity of Government Plan for the County of El Paso and the City of Colorado Springs; other jurisdictions in the Pikes Peak Region are in the process of developing continuity plans and procedures.

Category	Narrative
Impact on the Public	A serious hazardous materials event can have a significant impact on the surrounding population. The severity of the impact depends on the type of material involved, the level of exposure, and whether an explosion or fire occurs. Immediate public notification is essential to ensure safety and minimize exposure. Areas with high population density are at greater risk and require rapid communication and protective measures.
Impact on the Economic Condition of the County	Hazardous materials incidents can be particularly destructive to local economies. Such events may render entire regions uninhabitable, cause deaths and injuries, destroy facilities, and contaminate water and food supplies. Affected areas may become unattractive to tourists, further compounding economic losses. Long-term recovery may be hindered by the cost of cleanup and the stigma associated with contamination.
Impact on the Public Confidence in Government	The ability of government agencies to respond and recover effectively may be questioned if planning, response, and recovery efforts are not timely and well-coordinated. During a hazardous materials incident, clear and accurate communication with the public, partner agencies, and stakeholders is essential. Effective information flow helps maintain public safety, dispel rumors and misinformation, and reduce panic.

14. MAJOR AIRCRAFT INCIDENT

14.1 HAZARD PROFILE

14.1.1 HAZARD DESCRIPTION

An aircraft accident is an occurrence associated with the operation of an aircraft, which takes place between the time any person boards the aircraft with the intention of flight and all such persons have disembarked, and in which any person suffers death or serious injury, or in which the aircraft receives substantial damage. An aircraft incident is an occurrence other than an accident with the operation of an aircraft, which affects or could affect the safety of operations.

Periodic plane crashes are an unfortunate fact in mountain regions. Unpredictable, sometimes violent weather and rugged terrain often create a hazard for air travelers, especially those traveling in smaller aircraft. El Paso County's recent history reflects several aviation incidents, some fatal, and many of which are concentrated around the county's airports.

El Paso County, like many mountainous areas, demands the best of pilots. El Paso County has eight airports or small airfields. Four are U.S. Military airfields, three are active private airports, and one is a commercial airport. Commercial accidents are rare with the most notable occurring in March 1991 in which Flight 585 crashed while making its final approach to the City of Colorado Springs Airport, killing 25 people on board. This loss of life was kept to only those on the aircraft due to simple luck, as the plane came down in a park immediately adjacent to an apartment complex and subdivision.

Accident Potential Zones are rectangular zones extending outward from the ends of active runways that delineate those areas recognized as having the greatest risk of aircraft mishaps. Another specific zone for runways includes Part 77 Surfaces. Part 77 surfaces are a complex structure of imaginary surfaces in relation to each runway to prevent communities from allowing manmade objects, vegetation, or terrain to extend upward into the airspace used for takeoff, landing, or maneuvering. These two types of airspace were combined to create a zone surrounding each airport that represents the higher probability of aircraft accidents. The largest zone surrounds the runways shared by the City of Colorado Springs Municipal Airport and Peterson Air Force Base, both of which support large instrument-guided airliners, cargo planes, and military jets.

14.1.2 LOCATION

El Paso County contains eight airports or small airfields:

- City of Colorado Springs Municipal Airport, a regional commercial airport, is co-located with Peterson Air Force Base. Most of the County's air traffic, and the largest aircraft, fly in and out of these facilities (90 arrivals and departures per day at City of Colorado Springs Airport).

These facilities support large commercial passenger and cargo planes, and very large military aircraft.

- U.S. Air Force Academy: A small airport mostly used for training flights is located on the Academy grounds. The Academy's very small Bullseye airstrip is located in far eastern El Paso County. Aardvark Auxiliary Airfield is located on the Academy's main property. Aardvark Auxiliary Airfield was closed in 2008 and is no longer an active runway for flight operations. The runway is currently used for cadet training with remotely piloted aircraft.
- Fort Carson Butts Airfield: A small airport used for an increasing number of training flights.
- Small private airports: Meadowlake, Calhan, and Springs East.

Although all areas of the County are potentially at risk from airplane crashes. County dispatch records show that most airplane crashes occur on or near airports.

14.1.3 EXTENT

When considering community risk, airplane crashes are similar to earthquakes. In El Paso County, most airplane crashes are small; however, although a major aircraft accident is extremely rare, the potential for a crash must be considered. From 2008 to 2024, the NTSB recorded 40 aircraft accidents and incidents, including four deaths (NTSB n.d.).

The number of fatalities associated with light airplane crashes is low, compared to the 497 deaths from automobile crashes in the County between 2010 and 2018 (National Highway Traffic Safety Administration 2025). Thus, from the perspective of community risk, the severity of the County's "typical" airplane crash is limited with minor to significant injuries and minimal property damage that does not threaten structural stability; and/or interruption of essential facilities and services for more than 24 hours to critical with isolated deaths and/or multiple injuries, major long-term property damage that threatens structural stability, and interruption of essential facilities and services for 24 to 72 hours.

Warning Time

There is minimal warning time for major aircraft incidents, with less than six hours. Aircraft accidents often offer little to no warning prior to the onset of events as they take place during takeoff or landing. When there is a warning, it is possible to significantly change the outcome on most occasions by diverting flight paths to less populated areas or staging rescue equipment.

14.1.4 PREVIOUS OCCURRENCES

Federal Emergency Management Agency (FEMA) Disaster Declarations

The Pikes Peak Region has never received a major disaster declaration for a major aircraft incident-related event.

State Emergency Proclamations

Between 2020 and 2024, the Pikes Peak Region was not included in any state emergency proclamation for a major aircraft incident-related event.

U.S. Department of Agriculture (USDA) Declarations

Between 2020 and 2024, the Pikes Peak Region was not included in any USDA major aircraft incident-related agricultural disaster declarations.

All Recent Events

Table 14-1 lists major recorded major aircraft incident-related events that impacted Pikes Peak Region since the previous HMP was developed. For earlier events, refer to the previous HMP.

Table 14-1. Major Aircraft Incident Events in Pikes Peak Region (2020 to 2024)

Date	Hazard	Event Narrative
August 26, 2020	Plane Crash	One person dead after a plane crash on McCandlish Road. due to an improper landing.
June 27, 2021	Plane Crash	Two people were injured due to a small aircraft crash in the eastern part of the County. Only minor injuries were reported.
April 4, 2022	Plane Crash	Two adults and one child were injured due to a small aircraft crash at Meadow Lake Airport. The Falcon Fire Department responded to the crash and assisted the passengers of the plane. Only minor injuries were reported and treated by the hospital.
August 5, 2023	Plane Crash	A fatal plane crash occurred near Meadow Lake Airport.
January 6, 2025	Emergency Landing	A small plane made an emergency landing in a field near Town of Palmer Lake. No injuries as a result of the emergency landing were recorded. The plane was a single-engine Piper PA-12.

Source: KRDO 2020; KKTV11Alert 2021; The Denver Post 2022; KRDO 2023; Fox21 News 2025

14.1.5 PROBABILITY OF FUTURE OCCURRENCES

Information on previous major aircraft incident occurrences in the County was used to calculate the probability of future occurrence of such events. Table 14-2 lists the number of accidents and incidents reported from City of Colorado Springs from 2008 to 2024, which is the most complete period of record for all sources reviewed. Based on these records and input from the Steering Committee, the probability of occurrence for major aircraft incidents and accidents in the County is considered “occasional.”

Table 14-2. Probability of Future Aircraft Incident and Accident Events in Pikes Peak Region

Hazard Type	Number of Occurrences Between 2008 and 2024	% Chance of Occurring in Any Given Year
Aircraft Accident/Incident	40	100%

Source: (NTSB n.d.)

Note: 100% probability indicates that it is statistically likely for an event to occur every year. It does not indicate that the occurrence of an event is a certainty in any given year

14.1.6 CASCADING IMPACTS ON OTHER HAZARDS

The most significant secondary hazards associated with aircraft accidents are structure fire, wildfire, and hazardous materials releases.

14.2 VULNERABILITY AND IMPACT ASSESSMENT

All El Paso County is at risk from the impacts of major aircraft incidents. A qualitative analysis was conducted to assess the County's vulnerability to this hazard of concern.

14.2.1 LIFE, HEALTH, AND SAFETY

Overall Population

It can be reasonably assumed that the entire planning area is exposed to some extent to the potential for aircraft accidents. It is much more likely, however, that El Paso County will continue to see most incident occurrences near active airport facilities (See General Building Stock).

Socially Vulnerable Population

Aircraft accidents and incidents do not have major direct impacts on socially vulnerable populations. All residents and visitors in El Paso County face similar levels of risk and vulnerability to these events.

14.2.2 GENERAL BUILDING STOCK

Due to the relatively contained nature of a typical aircraft accident in El Paso County, significant property damage or loss is not likely. However, there are some major aerospace facilities that could incur significant economic loss. Active airport facilities in the County include:

- Public and General Aviation Facilities
  - City of Colorado Springs Airport (COS) – Main commercial airport serving the region.
  - Meadow Lake Airport – General aviation airport located in Peyton.
  - City of Colorado Springs East Airport – Located in Town of Calhan, primarily for general aviation.
  - Fat Chance Airport – Located in Peyton, used for private aviation.
- Military Airports
  - Peterson Air Force Base Airport – Military operations and support.
  - Schriever Air Force Base Airport – Military use, located east of City of Colorado Springs.
  - Butts Army Airfield (FCS) – Located at Fort Carson, used for military aviation.
- Private/Other Airports
  - Cherokee Trail Ranch Airport – Located in Elbert, private use.
  - Interspace Airport Advertising – Located in City of Colorado Springs, likely related to aviation

14.2.3 COMMUNITY LIFELINES AND OTHER CRITICAL FACILITIES

The most likely critical facilities exposed to aircraft accident risk are the eight airfields as this is the most likely area where an aircraft accident will occur. It is unlikely that an aircraft accident will have direct effect on most critical infrastructure within the planning area. The most common problem associated with this hazard are utility losses or potential transportation restrictions.

14.2.4 ECONOMY

A major airline crash or incident could result in economic impacts as these airlines are frequented by visitors to the County. If a major airline accident or incident occurs there may be a decrease in tourism which is a major economic driver for the County.

14.2.5 ENVIRONMENT

Secondary hazards associated with aircraft accidents that will likely have some of the most damaging effects on the environment are fire (structure or wildland) and hazardous materials releases. Hazardous materials releases and fire can significantly impact surrounding habitat.

14.2.6 HISTORIC AND CULTURAL RESOURCES

There are no direct impacts aircraft accidents and incidents have on the historic and cultural resources of El Paso County. If an aircraft accident occurs on a historic or cultural resource, then the impacts could result in irreversible damage. However, this is rare due to the airport's location standards.

14.3 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

14.3.1 LAND USE AND DEVELOPMENT

Aircraft accidents can influence land use and development planning in El Paso County, especially around active airports like City of Colorado Springs Airport and military installations such as Peterson and Schriever Air Force Bases. These incidents/accidents highlight the need for careful zoning and buffer zones to minimize risk to residential and commercial developments near flight paths. County planners must consider safety zones, noise contours, and emergency response access when approving new developments. Also, previous accident occurrences can prompt stronger building codes and influence the placement of certain critical facilities to reduce their vulnerability. The County's ongoing efforts to update the Land Development Code reflect the efforts to integrate safety and resilience with aviation operations in long-term planning

14.3.2 PROJECTED CHANGES IN POPULATION PATTERNS

The County population is projected to increase by over 32 percent by 2050. Table 3-7 summarizes recent and projected future changes in county population. Between 2010 and 2025 alone, the County population rose by nearly 21 percent. More people are residing and living in the County and utilizing aircraft services directly increases the exposure to this hazard in the event it may occur. Additionally, an increase in projected populations in the future will also indicate an increase in aircraft incidents and accident risk. It is critically important that the County plans for and mitigates aircraft hazards for the current population and the projected new population in the future.

14.3.3 CLIMATE CHANGE

There are no significant impacts climate change has on aircraft accidents or incidents, to date. Conversely, there is no data backed to prove that aircraft accidents/incidents have any effect on climate change processes as well.

14.3.4 OTHER IDENTIFIED CONDITIONS

Important issues associated with an aircraft accident in the planning area include the following:

- It is difficult to predict the next accident location.
- Military flights in the planning area will increase.
- Populations within the Accident Potential Zones and the Part 77 Areas will continue to grow.
- For land use and planning, considerations should be made about what is compatible land use near an airport.

14.4 CONSEQUENCE ANALYSIS

Table 14-3 presents the results of the consequence analysis for the aircraft incident hazard.

Table 14-3. Consequence Analysis for the Aircraft Incident Hazard

Category	Narrative
Hazard Description	El Paso County has experienced several aviation incidents in recent years, some of which have been fatal. Many of these incidents are concentrated around regional airports, highlighting the importance of aviation safety in these areas.
Impact on Property, Facilities, and Infrastructure	The most vulnerable properties, facilities, and infrastructure are those located closest to airports. The impact of an aviation incident can range from minimal—resulting in limited property damage and brief service interruptions of no more than 24 hours—to critical, involving long-term structural damage and service disruptions lasting 24 to 72 hours. While it is unlikely that an aircraft accident would directly affect most critical infrastructure within the planning area, common consequences include utility outages and transportation restrictions.
Impact on the Environment	Aircraft accidents can result in hazardous materials releases and fires, which may significantly affect surrounding habitats. These incidents can lead to contamination of soil, water, and air, posing risks to local ecosystems.
Impact on Responders	Personnel performing routine duties may be exposed to danger during an aviation incident. There is a high risk of injury or death from fires involving Class A, B, C, or D materials, toxic fumes from burning aircraft fuel, and explosive hazards. Proper training and protective equipment are essential to ensure responder safety.
Impact on Continuity of Operations, Continuity of Government, and Delivery of Services	Aviation incidents typically result in none or limited loss of facility functionality, infrastructure accessibility, or service delivery. However, depending on the severity and location of the incident, temporary disruptions may occur. PPROEM maintains the Continuity of Operations Plan and the Continuity of Government Plan for the County of El Paso and the City of Colorado Springs; other jurisdictions in the Pikes Peak Region are in the process of developing continuity plans and procedures.
Impact on the Public	The impact of an aviation incident can range from minor to significant injuries, and in critical cases, may result in isolated deaths and multiple injuries. The risk of direct impact increases within Accident Potential Zones and FAA Part 77 Areas due to higher aircraft activity in these regions.
Impact on the Economic Condition of the County	Most aviation incidents result in minimal economic impact. However, if an incident occurs in a densely populated area, the damage and economic consequences could be severe. Potential losses include property damage, business disruption, and reduced tourism.
Impact on the Public Confidence in Government	Public confidence in emergency response is closely tied to perceptions of how well response and recovery efforts are managed during and after an aviation incident. Effective communication is essential to maintaining public trust and minimizing social panic.

15. DROUGHT AND EXTREME HEAT

15.1 HAZARD PROFILE

15.1.1 HAZARD DESCRIPTION

Drought

Drought is a shortage of water associated with a deficiency of precipitation due to prolonged climate patterns and occurs when a normal amount of moisture is unavailable to satisfy an area's usual water consumption. Drought can be defined regionally based on its effects in the following categories:

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

Drought is a gradual phenomenon. Unlike rapid-onset disasters such as floods or wildfires, droughts develop slowly over multi-year periods, making it difficult to determine precisely when they begin or end.

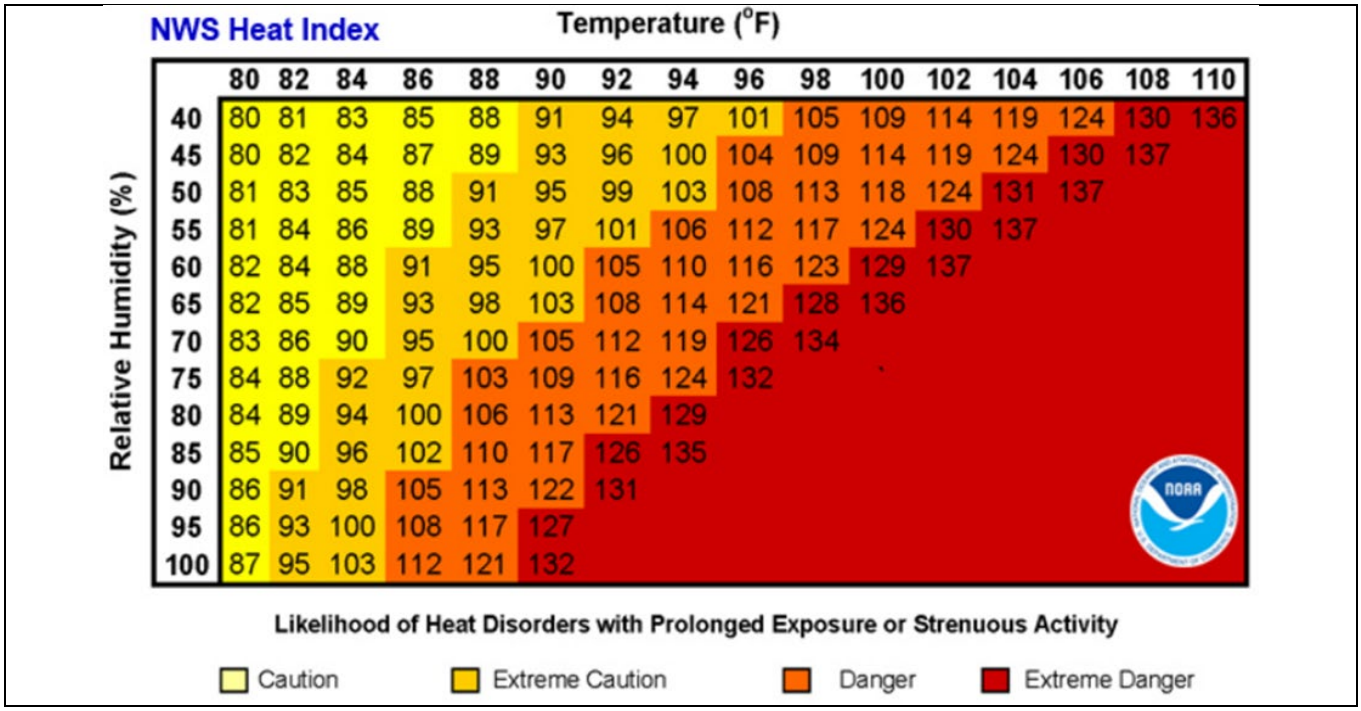
Defining the onset of drought depends on its impact on water users and the availability of local water supplies, including stored water in reservoirs or groundwater basins. Different local water agencies use varying criteria to define drought conditions and may issue drought watches or warnings. Regional or statewide drought determinations typically rely on a combination of hydrologic and water supply indicators.

Extreme Heat

Extreme heat events are defined by the U.S. Environmental Protect Agency (EPA) as "summertime weather that is substantially hotter and/or more humid than average for a location at that time of year" (EPA 2025). It is often also defined as a period of three or more consecutive days above 90 degrees Fahrenheit, but more generally a prolonged period of excessively hot weather, which may be accompanied by high humidity. Criteria that define an excessive heat event may differ among jurisdictions and in the same jurisdiction depending on the time of year.

Excessive heat events are often a result of more than just ambient air temperature. Heat index tables (see Figure 15-1) are commonly used to provide information about how hot it feels to the human body when relative humidity is factored into the actual air temperature. When relative humidity is high, the increased moisture content in the air decreases the evaporation of perspiration, thus making the body feel warmer. Since heat index values were devised for shady, light wind conditions, exposure to full sunshine can increase heat index values by up to 15 degrees Fahrenheit (°F). Also, strong winds, particularly with very hot, dry air, can be extremely hazardous.

Figure 15-1. National Weather Service (NWS) Heat Index



Source: NWS 2021

15.1.2 LOCATION

Drought and extreme heat are common across the United States especially in the western and southern regions. Areas in the Southwest including Arizona, New Mexico, and some parts of California and Texas frequently experience prolonged droughts due to low precipitation and high evaporation rates. These regions are also prone to extreme heat events where temperatures elevate above historical averages for extended periods of time. Climate change intensifies these hazards by increasing average temperatures and altering precipitation patterns which make droughts more frequent, severe, and longer-lasting. See Climate Change subsection for more information. These conditions not only strain water resources but also increase the risk of wildfires, reduce agricultural productivity, and pose serious public health threats.

In El Paso County, drought and extreme heat are growing concerns. According to the Colorado Health Institute's 2022 Health and Climate County Profile, El Paso County experiences an average

of 23 extreme heat days per year (defined as days at or above 90°F) compared to a regional average of just 5 days per year (Colorado Health Institute 2022).

Also, approximately 45 percent of the County's population lives in areas that have experienced severe, extreme, or exceptional drought conditions. These environmental stressors are combined by the County's demographic and health profile which includes a percentage of residents with chronic illnesses and socioeconomic vulnerabilities that increase sensitivity to these hazards. See Section 15.2 for detailed information on the vulnerability and impacts to County populations.

The U.S. Drought Monitor confirms that 100 percent of El Paso County's population is currently affected by drought with significant impacts on agriculture and water supply (NOAA 2025). Crops such as cotton, hay, and wheat, as well as livestock like cattle and sheep are all impacted due to drought conditions. These challenges are particularly important in rural and disadvantaged communities where resources for resilience may be limited.

15.1.3 EXTENT

El Paso County is a semi-arid region with annual average precipitation levels of 15.74 inches and an annual average of 39 inches of snow. Due to Colorado's semi-arid conditions, drought is a natural but unpredictable occurrence in the state. However, because of natural variations in climate and precipitation sources, it is rare for all of Colorado to be deficient in moisture at the same time. Single seasonal droughts over some portions of the state are quite common.

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

County residents receive water from a limited number of sources: primarily surface water (much of which is brought from outside of the region) and water districts that draw water from groundwater aquifers but also including individual homeowner wells into ground aquifers.

The 2018 El Paso County Water Master Plan looked extensively at water availability, sources and future demands. The expected water demands of the 2060 build-out scenario are nearly double that of the present day (El Paso County 2018).

Monitoring and Rating Drought

National Oceanic and Atmospheric Administration (NOAA) Drought Indices

The National Weather Service (NWS) has developed several indices to measure drought impacts and severity and to map their extent and locations (NWS 2024):

- The Palmer Crop Moisture Index measures short-term drought weekly to assess impacts on agriculture.
- The Palmer Z Index measures short-term drought on a monthly scale.
- The Palmer Drought Index is based on long-term weather patterns. The intensity of drought in a given month is dependent on current weather plus the cumulative patterns of previous

months. Weather patterns can change quickly, and the Palmer Drought Severity Index can respond fairly rapidly.

- The Palmer Hydrological Drought Index quantifies hydrological effects (reservoir levels, groundwater levels, etc.), which take longer to develop and last longer. This index responds more slowly to changing conditions than the Palmer Drought Index.
- The Standardized Precipitation Index considers only precipitation. A value of zero indicates the median precipitation amount; the index is negative for drought and positive for wet conditions. The Standardized Precipitation Index is computed for time scales ranging from one month to 24 months.

Maps of these indices show drought conditions nationwide at a given point in time. They are not necessarily indicators of any given area's long-term susceptibility to drought.

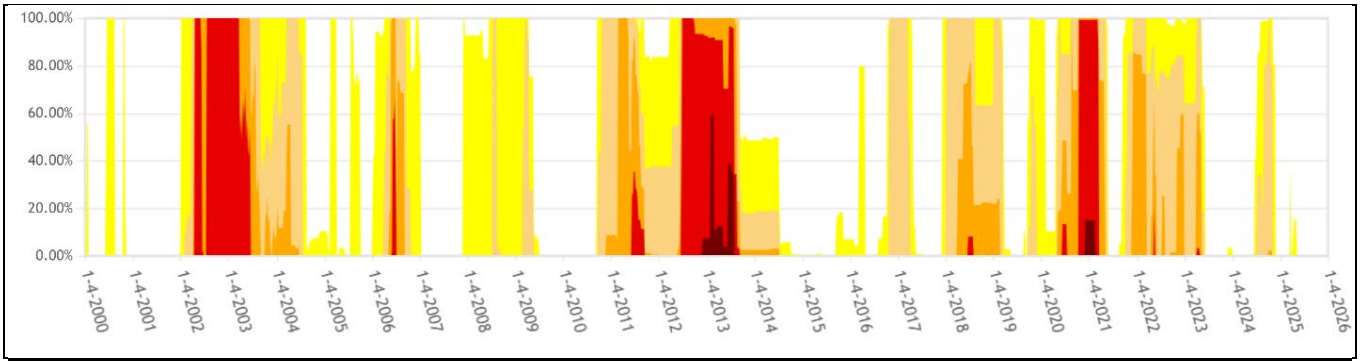
U.S. Drought Monitor

The U.S. Drought Monitor (USDM) is a map that has been updated weekly since 2000 to show the location and intensity of drought across the country, including El Paso County. The USDM measures variables including temperature, soil moisture, water levels in streams and lakes, snow cover, and meltwater runoff. Conditions are then categorized on a scale from abnormally dry to exceptional drought.

- D0—Abnormally Dry
  - Short-term dryness slowing planting, growth of crops
  - Some lingering water deficits
  - Pastures or crops not fully recovered
- D1—Moderate Drought
  - Some damage to crops, pastures
  - Some water shortages developing
  - Voluntary water-use restrictions requested
- D2—Severe Drought
  - Crop or pasture loss likely
  - Water shortages common
  - Water restrictions imposed
- D3—Extreme Drought
  - Major crop/pasture losses
  - Widespread water shortages or restrictions
- D4—Exceptional Drought
  - Exceptional and widespread crop/pasture losses
  - Shortages of water creating water emergencies

Figure 15-2 shows the weekly USDM ratings for El Paso County since 2000.

Figure 15-2. US Drought Monitor (2000 to 2025)



Drought Category	Description
Normal or wet conditions	None
Abnormally Dry	D1
Moderate Drought	D1
Severe Drought	D2
Extreme Drought	D3
Exceptional Drought	D4

Source: (USDM 2025)

The U.S. Department of Agriculture (USDA) uses the USDM to trigger disaster declarations and eligibility for low-interest loans. The Farm Service Agency uses it to help determine eligibility for their Livestock Forage Disaster Program, and the Internal Revenue Service uses it for tax deferral on forced livestock sales due to drought. State and local decision makers may use it to trigger drought responses or declare drought emergencies, along with other local indicators of drought within a jurisdiction.

Extreme Heat

The entire County is at risk of extreme heat events; however, these events may be exacerbated in urban areas, where reduced air flow, reduced vegetation, increased impermeable surfaces, and increased generation of waste heat can contribute to temperatures that are several degrees higher than in surrounding rural or less urbanized areas. This phenomenon is known as the urban heat island effect.

Warning Time

There is maximum warning time for drought events with more than 24 hours of advance warning. Droughts are climatic patterns that occur over long periods of time. Only generalized warnings can take place due to the numerous variables that scientists have not pieced together well enough to make accurate and precise predictions. Empirical studies conducted over the past century have shown that meteorological drought is never the result of a single cause. It is the result of many causes, often synergistic in nature.

Scientists currently do not know how to predict droughts more than a month in advance for most locations. Predicting drought depends on the ability to forecast precipitation and temperature. Anomalies of precipitation and temperature may last from several months to several decades. How long they last depends on interactions between the atmosphere and the oceans, soil moisture and land surface processes, topography, internal dynamics, and the accumulated influence of weather systems on the global scale.

Based on the criteria for heat stress forecasts developed by the National Weather Service (NWS), watches or warnings are issued when thresholds of daytime high and nighttime low heat index values are exceeded for at least two consecutive days.

15.1.4 PREVIOUS OCCURRENCES

Federal Emergency Management Agency (FEMA) Disaster Declarations

Table 15-1 lists all drought-related major disasters declarations that have included the Pikes Peak Region since 1953. There were no declarations for the County for extreme heat-related events.

Table 15-1. FEMA Disaster Declarations for Drought Events in the Pikes Peak Region

FEMA Declaration Date	Declaration Number	Description
January 29, 1977	EM-3025	Drought

Source: FEMA n.d.

State Emergency Proclamations

Between 2020 and 2024, the Pikes Peak Region was not included in any state emergency proclamation for drought-related or extreme heat-related events.

U.S. Department of Agriculture (USDA) Declarations

Between 2020 and 2024, the Pikes Peak Region was included in ten USDA drought-related agricultural disaster declarations, summarized in Table 15-2. There were no declarations for the County for extreme heat-related events.

All Recent Events

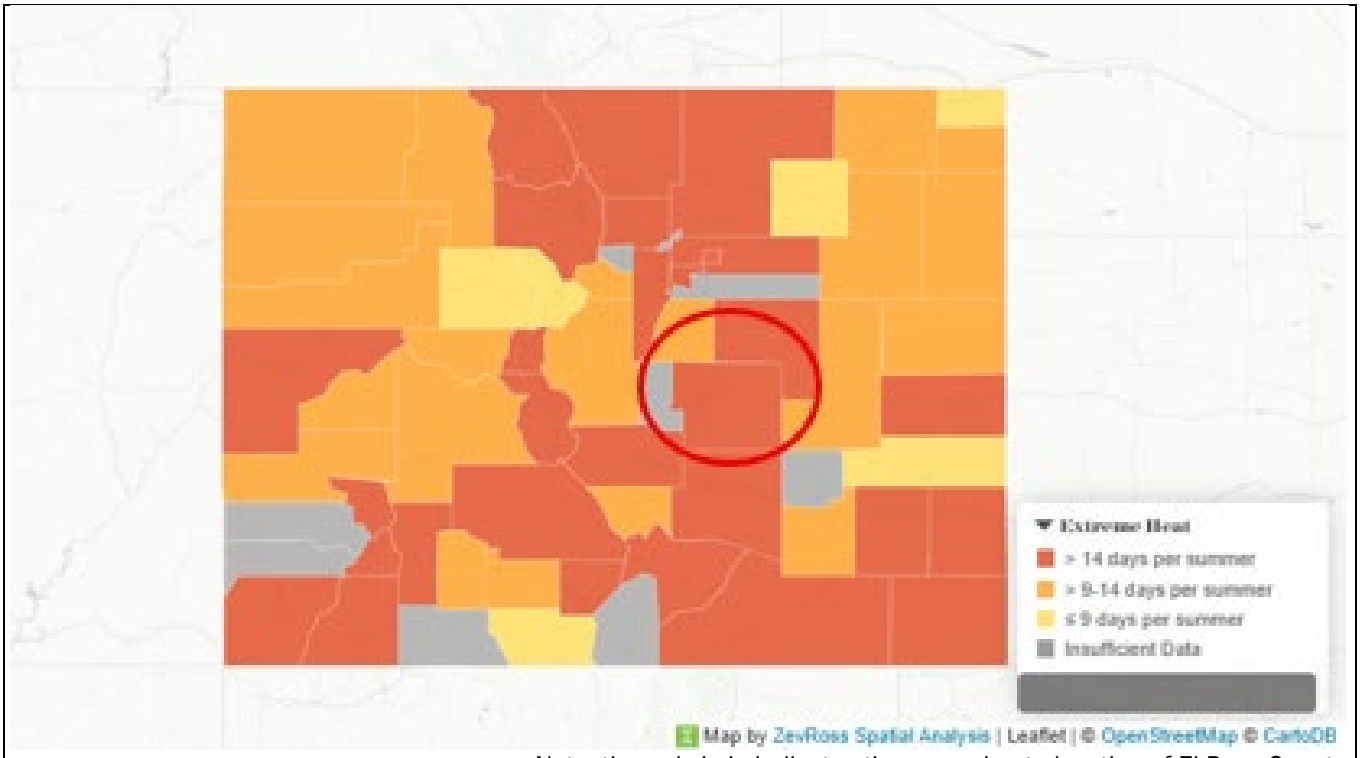
There is no known database that records incidences of extreme heat events, however, extreme heat events typically occur when temperatures are approximately 10 degrees above normal for the time of year for that location or when high temperatures are sustained for long periods of time. Figure 15-3, developed by the National Resource Defense Council (NRDC), shows the average number of extreme heat days per county from 2007 to 2016. In this analysis, extreme heat days are defined as days with daily maximum temperatures above the 90th percentile June-July-August temperature relative to a 1961-1990 reference period. According to this analysis, El Paso County experienced, on average, more than 14 days per year of extreme heat days than would be expected from the reference period. Based on historical records, areas with more than 9 days of extreme heat are living with more days of extreme heat than they did in the past.

Table 15-2. U.S. Department of Agriculture (USDA) Declarations for Drought Events in Pikes Peak Region Since Previous HMP

Disaster Begin Date	USDA Declaration Number	Description
May 5, 2020	S4680	Drought-FAST TRACK
May 12, 2020	S4687	Drought-FAST TRACK
April 14, 2020	S4692	Drought-FAST TRACK
June 16, 2020	S4703	Drought-FAST TRACK
May 12, 2020	S4722	Drought-FAST TRACK
July 21, 2020	S4798	Drought-FAST TRACK
August 25, 2020	S4848	Drought-FAST TRACK
November 1, 2020	S4917	Drought-FAST TRACK
November 1, 2021	S5147	Drought-FAST TRACK
November 1, 2022	S5372	Drought-FAST TRACK

Source:(USDA n.d.

Figure 15-3. Average Number of Extreme Heat Days per County from 2007 to 2016



Note: the red circle indicates the approximate location of El Paso County.

Source: NRDC n.d.

15.1.5 PROBABILITY OF FUTURE OCCURRENCES

Information on previous drought and extreme heat-related occurrences in the County was used to calculate the probability of future occurrences of such events. Table 15-3 lists the number of USDA drought declarations over the 12-year period from 2012 to 2024 and the number of days with National Weather Service (NWS) heat advisories issued from 2022 to 2024. These sources represent the most complete period of record for all sources reviewed. Based on these records and input from the Steering Committee, the probability of occurrence for drought and extreme heat in the County is considered "frequent."

Table 15-3. Probability of Future Drought and Extreme Heat Events in Pikes Peak Region

Hazard Type	Number of Occurrences 2012 to 2024	% Chance of Occurring in Any Given Year
Drought (2012 to 2024)	22	100%
Excessive Heat (2022 to 2024)	17	100%

Source: (USDA n.d.) (Iowa State University 2025)
Note: 100% probability indicates that it is statistically likely for an event to occur every year. It does not indicate that the occurrence of an event is a certainty in any given year.

15.1.6 CASCADING IMPACTS ON OTHER HAZARDS

The secondary hazard most associated with drought is wildfire. A prolonged lack of precipitation dries out vegetation, which becomes increasingly susceptible to ignition as the duration of the drought extends.

Air quality is susceptible to impacts of extreme heat events. The daily air quality index (AQI) indicates how clean or polluted the air is and what associated health effects might be a concern. Ground-level ozone and airborne particles are the two pollutants that pose the greatest threat to human health in this country and typically trigger air quality alerts during periods of extreme heat. Excessive heat events can also cause failure of motorized systems such as ventilation systems used to control temperatures inside buildings.

Drought can also have a severe impact on agriculture production, which has both economic and food supply impacts for the county and region.

15.2 VULNERABILITY AND IMPACT ASSESSMENT

All of El Paso County is vulnerable to drought and extreme heat events. The following subsections provide a qualitative discussion of the County's vulnerability to the drought and extreme heat hazards.

15.2.1 LIFE, HEALTH, AND SAFETY

Overall Population

The entire population of El Paso County (736,008) is exposed to both the drought and extreme heat hazard.

Drought

Drought can affect people's health and safety and can lower the quantity and quality of potable water for human consumption. A decrease in available water may also impact power generation and availability to residents. Short-term or long-term health effects from drought include heat-related illnesses, waterborne illnesses, recreational risks, limited food availability, and reduced air quality or sanitation.

Extreme Heat

Extreme heat events have potential health impacts including injury and death. The following health hazards are related to extreme heat (CDC 2022):

- *Heat exhaustion* is the body's response to an excessive loss of water and salt, usually through excessive sweating. Symptoms can include headache, cramping, dizziness, and weakness.
- *Heat stroke* is the most serious heat-related illness. It occurs when the body can no longer control its temperature: the body's temperature rises rapidly, the sweating mechanism fails, and the body is unable to cool down. When heat stroke occurs, the body temperature can rise to 106 °F or higher within 10 to 15 minutes. Heat stroke can cause permanent disability or death if the person does not receive emergency treatment

Table 15-4 summarizes the effects of prolonged exposure to direct sunlight on the human body during extreme heat events. Adhering to extreme temperature warnings and conducting appropriate mitigation and preparation measures can significantly reduce the risk of temperature-related deaths.

Heat waves cause more fatalities in the U.S. than the total of all other meteorological events combined. From 2004-2018, excessive heat exposure caused more than 10,500 deaths in the United States, approximately 90 percent of these deaths occurring during May to September (CDC 2020). Every year, on average, there are 702 deaths from extreme heat events (CDC 2020). Those susceptible to extreme heat may suffer from dehydration, heat exhaustion, heat cramps, heat strokes or even death. Air-conditioning is the number one protective factor against heat-related illness and death.

Overall impact to population is considered Critical: isolated deaths and/or multiple injuries and illness. However, the impact on property and critical facilities is considered Minor: little or no property damage and no or brief interruption of essential facilities and services.

Table 15-4. Adverse Effects of Prolonged Exposure to Direct Sunlight

Category	Heat Index	Effects on the Body
Caution	80°F - 90°F	Fatigue is possible with prolonged exposure and/or physical activity
Extreme Caution	90°F - 103°F	Heat stroke, heat cramps, or heat exhaustion is possible with prolonged exposure and/or physical activity
Danger	103°F - 124°F	Heat cramps or heat exhaustion is likely, and heat stroke is possible with prolonged exposure and/or physical activity
Extreme Danger	125°F or higher	Heat stroke is highly likely

Source: NWS 2021

Socially Vulnerable Population

Drought

Drought has a severe negative impact on socially vulnerable populations, including the elderly, people with disabilities, non-English speakers, and children. These groups often face challenges when accessing information, resources, and support that are critical during prolonged dry periods. For example, older adults and individuals with disabilities may have limited mobility or health conditions that make it difficult to cope with water shortages or extreme heat that often accompanies drought. Children are especially vulnerable to dehydration and heat-related illnesses, and disruptions to food programs can increase their risk of malnutrition. Non-English speakers may not receive emergency alerts or public health information which in return leaves them at greater risk during drought-related hazard events. According to the National Drought Mitigation Center, drought impacts disproportionately affect these vulnerable groups, increasing risks such as malnutrition, dehydration, and exposure to unsafe water sources (Case-Buskirk 2025).

Extreme Heat

Populations most at risk to extreme heat events include the elderly, who are less able to withstand temperatures extremes due to their age, health conditions, and limited mobility to access shelters; infants and children up to 4 years of age; individuals with chronic medical conditions (e.g., heart disease, high blood pressure); and low-income persons that cannot afford adequate cooling; (CDC 2022a, CDC 2005).

Meteorologists can accurately forecast extreme temperature event development and the severity of the associated conditions with several days lead time. These forecasts provide an opportunity for public health and other officials to notify vulnerable populations, implement short-term emergency response actions, and focus on surveillance and relief efforts on those at greatest risk. Designating and developing emergency cooling facilities can enhance the resilience and safety of communities.

15.2.2 GENERAL BUILDING STOCK

No structures will be directly affected by drought conditions, though some structures may become vulnerable to wildfires, which are more likely to follow 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.

Extreme or prolonged heat exposure may affect older, poorly built, or uninsulated buildings. Newer built structures generally are not impacted; however, elevated summer temperatures increase the energy demand for cooling. Losses can be associated with the overheating of heating, ventilation, and air conditioning (HVAC) systems.

15.2.3 COMMUNITY LIFELINES AND OTHER CRITICAL FACILITIES

Drought typically does not damage structures, and critical facilities, as defined in this plan, are expected to remain operational during such events. While water and sewer infrastructure may be affected, most other critical facilities are generally not impacted by drought conditions. However, prolonged drought can strain water resources, which may indirectly affect facility operations.

All critical facilities in El Paso County are exposed to the hazard of extreme heat. It is essential that these facilities remain operational during hazard events. Extreme heat can lead to increased electricity demand, potentially causing short-term utility failures such as brownouts. Additionally, power lines may sag under high temperatures, and the electrical grid may experience significant strain.

Impacts on transportation infrastructure from extreme heat include softening or buckling of road pavement and deterioration of concrete structures, compromising the integrity of roadways or reducing their useful lifetimes. Similarly, bridge joints and other structural elements expand and contract during periods of extreme heat and cold, requiring maintenance and reducing their useful lifetimes (OPR, CNRA, CEC 2018).

15.2.4 ECONOMY

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

Impacts of extreme heat events on the economy include loss of business function and damage to and loss of inventory. Business-owners can be faced with increased financial burdens due to unexpected repairs caused to the building, higher than normal utility bills, or business interruption due to power failure (i.e., loss of electricity, telecommunications).

The Colorado Natural Hazard Mitigation Plan notes that unincorporated El Paso County has $31,747,752,419 in crop insurance-based loss estimates (3-72) (Colorado Division of Homeland Security and Emergency Management 2018). While this number is significant, the 2018 state drought plan also notes that El Paso County has a relatively low socio-economic vulnerability impact to drought.

15.2.5 ENVIRONMENT

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.

15.2.6 HISTORIC AND CULTURAL RESOURCES

Drought can pose a threat to the historic and cultural resources of El Paso County. The County is home to many heritage sites including Native American landmarks, pioneer-era structures, and military history installations. Prolonged dry conditions can increase the deterioration of historic buildings made from certain materials such as adobe, wood, and other natural materials that are sensitive to loss of moisture. Also, drought increases the risk of wildfires which can directly damage or destroy irreplaceable cultural resources such as historic trails, archaeological sites, and museums.

15.3 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

15.3.1 LAND USE AND DEVELOPMENT

Local planning documents, such as comprehensive and water master plans, provide capacity at the local municipal level to protect future development from the impacts of drought. To combat the effects of urban heat island effect, communities can implement design standards and urban planning principles that reduce the impacts of excessive heat events.

15.3.2 PROJECTED CHANGES IN POPULATION PATTERNS

The County population is projected to increase by over 32 percent by 2050. Table 3-7 summarizes recent and projected future changes in county population. Between 2010 and 2025 alone, the County population rose by nearly 21 percent.

Vulnerability to drought will increase as population growth increases, putting more demands on existing water supplies. Future water use planning should consider an increase in population as well as potential impacts of climate change.

City of Colorado Springs Utilities (CSU) indicates that the region currently has three years' worth of water stored up in reservoirs, irrespective of a drought or no-drought state. Considering regional population growth and expected drought conditions, they anticipate having water supply shortfalls in about 20 years.

One of the most significant impacts of drought is the decreased supply of water for the region's inhabitants. As growth continues, so does the vulnerability for residents and business owners to drought impacts. Careful monitoring of the region's water supply will help drive conservation efforts and potential land use regulations aimed at minimizing drought impacts among other growth-related impacts. CSU has developed numerous programs aimed at conservation of water. The Xeriscape Education program on the CSU website is one example of how it helps with public outreach regarding water conservation efforts.

15.3.3 CLIMATE CHANGE

Seventy-six percent of El Paso County falls within the Koeppen Climate Zone of cold semi-arid. National Oceanic and Atmospheric Administration (NOAA) projects that by 2100, temperatures in this climate zone are expected to increase to between 6 and 14 degrees above historic levels. There may be as many as 120 extreme heat days annually in parts of the climate zone by 2100. The cold semi-arid climate zone is the driest area of the state. Precipitation levels are generally expected to remain unchanged, although a few areas may see minor increases or decreases by 2100.

With a warmer climate, droughts could become more frequent, more severe, and longer lasting. In 2024 alone, losses from drought in the U.S. totaled $182.7 billion (NOAA 2025). More frequent extreme events such as droughts could end up being more cause for concern than the long-term change in temperature and precipitation averages.

The best advice to water resource managers regarding climate change is to start addressing current stresses on water supplies and build flexibility and robustness into any system. Flexibility helps to ensure a quick response to changing conditions, and robustness helps people prepare for and survive the worst conditions. With this approach to planning, water system managers will be better able to adapt to the impacts of climate change.

According to the U.S. EPA, since 1901, the average surface temperature across the contiguous 48 states has risen at an average rate of 0.14 degrees Fahrenheit (°F) per decade (EPA 2024). NOAA routinely tracks the status of the average global temperature and, through their research, identified a warming trend since the mid-1970s. The warmest years globally have all occurred since 1998, with the top ten being 2016, 2019, 2015, 2017, 2018, 2014, 2010, 2013 and 2005 (tied), and 1998, respectively. This increase in average surface temperatures can also lead to more intense heat waves that can be exacerbated in urbanized areas by what is known as urban heat island effect, where temperatures can be 2 to 10 °F warmer than the surrounding rural countryside (EPA 2025). Additionally, as temperatures rise, so do the number of heat-related illnesses, emergency room visits, and deaths.

15.3.4 OTHER IDENTIFIED CONDITIONS

The planning team has identified the following drought and extreme heat related issues:

- Identification and development of alternative water supplies.
- Utilization of groundwater recharge techniques to stabilize the groundwater supply. The probability of increased drought frequencies and durations due to climate change.
- Exacerbated community and regional water supply problems due to lack of planning for long-term sustainability and by inefficient allocation of water property rights.
- Deficient wise-water management policies, protective regulations and conservation activities even during non-drought conditions.
- Potential for increased extreme heat events due to climate change. Ineffective development strategies to reduce "heat islands."

15.4 CONSEQUENCE ANALYSIS

Table 15-5 presents the results of the consequence analysis for the drought and extreme heat hazard.

Table 15-5. Consequence Analysis for the Drought and Extreme Heat Hazard

	Narrative
Hazard Description	Drought is a prolonged shortage of water resulting from a deficiency in precipitation due to extended climate patterns. It occurs when the normal amount of moisture is unavailable to meet an area's typical water consumption needs. Droughts develop slowly over multiple years, and it is often difficult to determine precisely when they begin or end. Extreme heat refers to summertime weather that is significantly hotter and/or more humid than average for a given location and time of year. Drought is often accompanied by extreme heat. When temperatures reach 90°F or higher, people are at increased risk for sunstroke, heat cramps, and heat exhaustion. Pets, livestock, and crops are also vulnerable to heat-related injuries and damage.
Impact on Property, Facilities, and Infrastructure	Although drought and extreme heat typically cause minimal direct property damage, the loss of farmland and a diminishing domestic water supply can have devastating effects on local economies. Extreme heat can place major strain on the electrical grid, causing power lines to sag and increasing the likelihood of brownouts or blackouts. The increased risk of wildfires during drought conditions can lead to catastrophic loss of buildings. Critical infrastructure—such as dams, transmountain ditches, and irrigation systems—may be damaged by excessively dry, expansive soil as it contracts. Structural damage may also occur due to decreased pore water pressure, high sediment loads from reservoir drawdowns, and debris flows or flooding following wildfires.
Impact on the Environment	Extended periods of drought and extreme heat can stress plant and animal species, disrupt local habitats, and increase human-wildlife interactions. Overgrazing during drought can degrade land quality, and water quality may decline to the point of causing localized fish kills. Low stream flows negatively affect riparian habitats and aquatic species. Drought can also trigger secondary hazards, particularly wildfires and potentially land subsidence. Severe wildfires are a major concern during periods of exceptional drought. The loss of farmland and reduced water availability can severely impact both local economies and natural ecosystems.
Impact on Responders	Drought is not typically considered an incident requiring emergency response, so it poses minimal direct threat to responders. However, extreme heat increases risks for firefighters, law enforcement officers, EMTs, and paramedics. It is essential that first responders and their departments are trained to recognize symptoms of heat-related illnesses and implement appropriate prevention measures.

	Narrative
Impact on Continuity of Operations, Continuity of Government, and Delivery of Services	Drought is unlikely to cause immediate disruption to essential services due to its slow onset. However, it may moderately impact water utilities, and in extreme cases, municipal water delivery could be interrupted. Recreational services may also be affected at the local level. Extreme heat may result in the loss of facility functionality, reduced accessibility, and impaired service delivery. Power outages are likely in areas without adequate backup generation. Food supply and distribution may be disrupted, potentially leading to increased food prices. PPROEM maintains the Continuity of Operations Plan and the Continuity of Government Plan for the County of El Paso and the City of Colorado Springs; other jurisdictions in the Pikes Peak Region are in the process of developing continuity plans and procedures.
Impact on the Public	The greatest risk to people during drought is the availability of drinking water, whether through municipal systems or individual wells. According to Colorado Springs Utilities' Water Conservation Plan (2008–2012), the water supply is projected to meet demand through 2046. However, reduced air quality from blowing dust can have harmful health effects. As regional growth continues, so does vulnerability to drought impacts. Careful monitoring of water supplies is essential to guide conservation efforts and inform land use regulations. Public communication about water preservation practices—such as limiting lawn and vegetation watering—and awareness of wildfire-prone areas is critical. Extreme heat affects human health by causing discomfort, respiratory issues, heat cramps, exhaustion, non-fatal heat stroke, and heat-related mortality. Vulnerable populations include individuals without air conditioning, senior citizens, young children, people with mental illness or chronic diseases, and those engaged in strenuous outdoor activities.
Impact on the Economic Condition of the County	According to the National Drought Monitoring Center (NDMC), the most prominent impacts of drought are agricultural, followed by fire-related and social consequences. Social impacts include effects on public health, recreation and tourism, loss of human life due to heat stress, and diminished aesthetic and cultural values.
Impact on Public Confidence in Government	The public's confidence in government response may be challenged if planning, response, and recovery efforts related to drought and extreme heat are not timely or effective. The public holds high expectations for government capabilities in issuing warnings, providing information, and coordinating response efforts. Clear and consistent communication is essential to maintain public trust and ensure safety during drought and extreme heat events.

16. HAIL

16.1 HAZARD PROFILE

16.1.1 HAZARD DESCRIPTION

Hail is precipitation that is formed when updrafts in severe storms carry raindrops upward into extremely cold areas of the atmosphere. The super cooled raindrops grow into balls of ice, which pose a hazard to property, people, livestock, and crops when they fall back to 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. Usually hailstones are less than 2" in diameter but have been reported much larger and may fall at speeds of up to 120 mph. Hailstorms occur throughout the spring, summer, and fall in the region, but are more frequent in late spring and early summer. These events are often associated with thunderstorms that may also cause high winds and tornadoes. Hail causes nearly $1 billion in damage to crops and property each year in the United States. Hail is also one of the requirements which the National Weather Service uses to classify thunderstorms as severe. If hailstones of more than one inch in diameter are produced in a thunderstorm, the storm qualifies as severe.

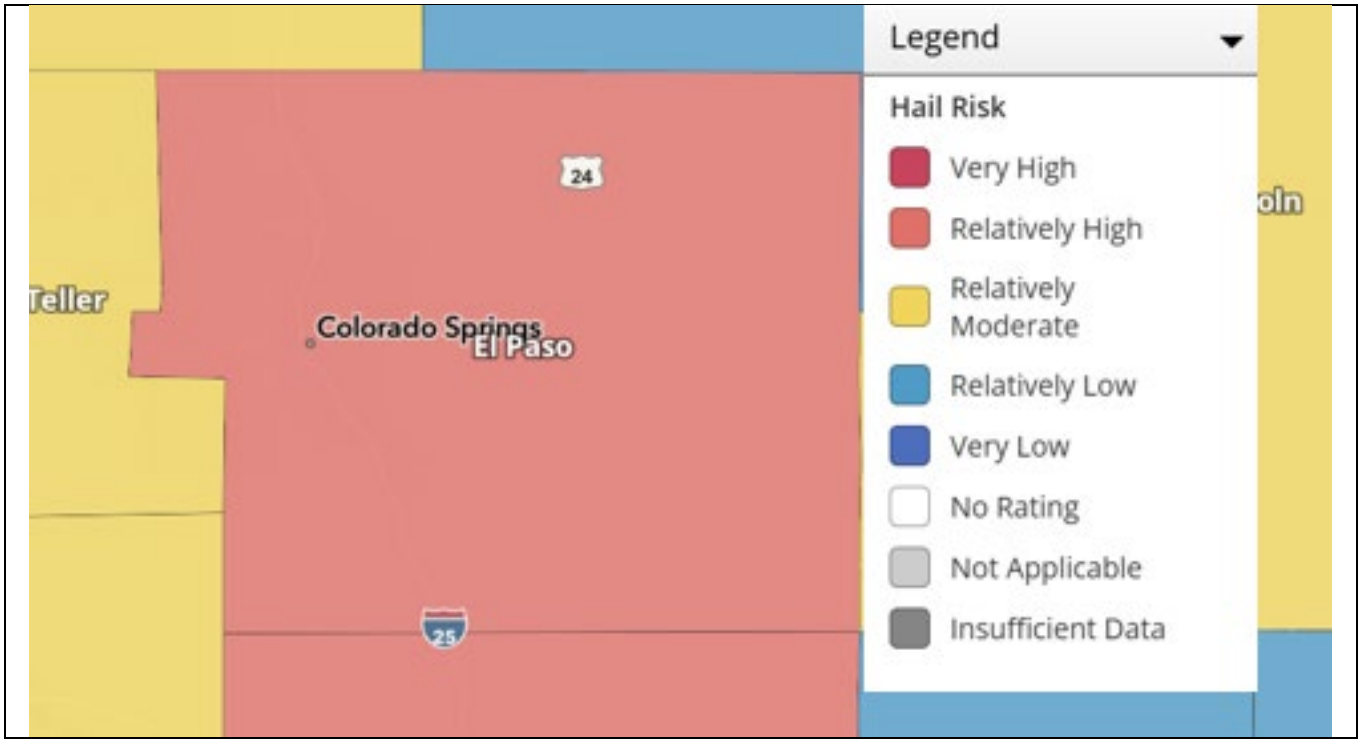
Large hailstones are capable of damaging structures, automobiles, and harming individuals and livestock.

16.1.2 LOCATION

Severe weather events have the potential to happen anywhere in the planning area. The entire extent of Pikes Peak Region is exposed to the hailstorm hazard. Hailstorms occur during severe storms, which are regional in nature. However, just as the amount of precipitation in the form of snow or rain may vary significantly within a single storm, so may the amount, size, and duration of hail within a severe storm. This can have a wide range of impacts.

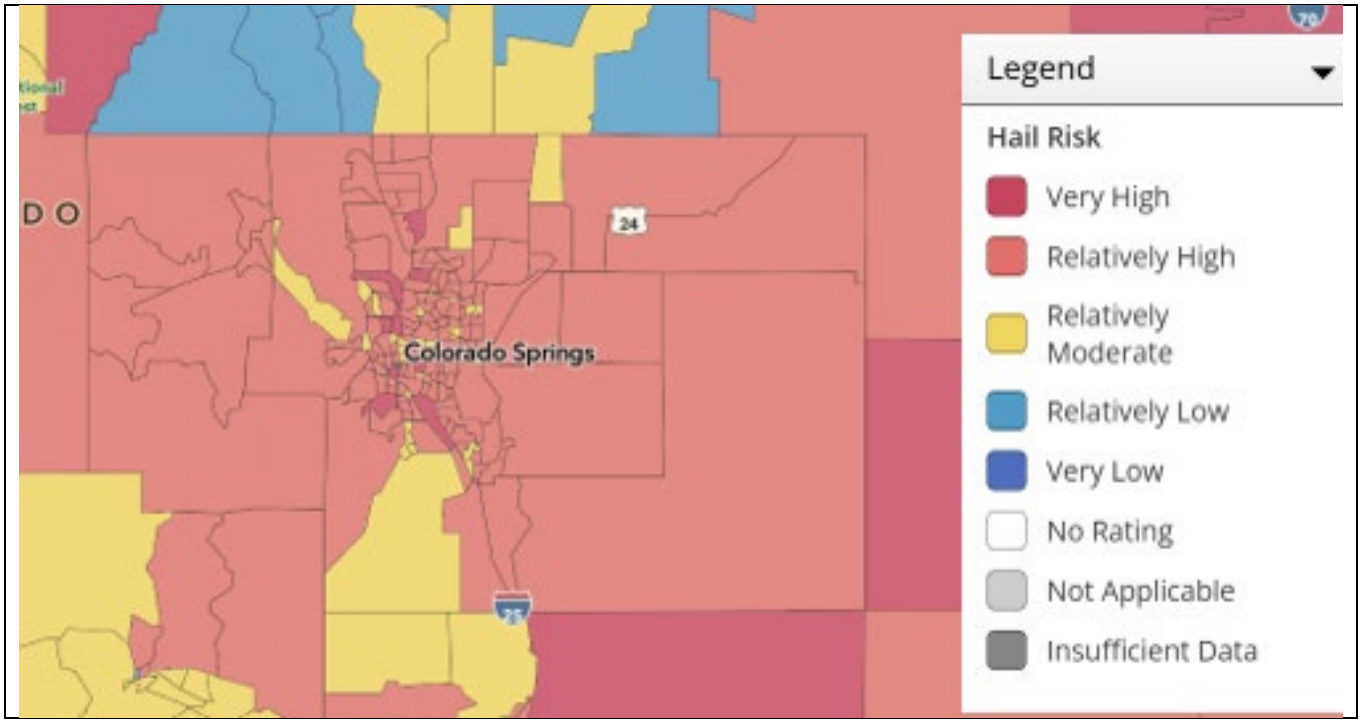
According to the FEMA National Risk Index Map (NRI) El Paso County has a relatively high hail risk. Figure 16-1 illustrates the NRI hail risk map by County view. Figure 16-2 illustrates the NRI hail risk map by census tract and ranges from relatively moderate to very high risk for hail risk in the County (FEMA n.d.).

Figure 16-1. FEMA National Risk Index for El Paso County by County View



Source: FEMA n.d.

Figure 16-2. FEMA National Risk Index for El Paso County by Census Tract

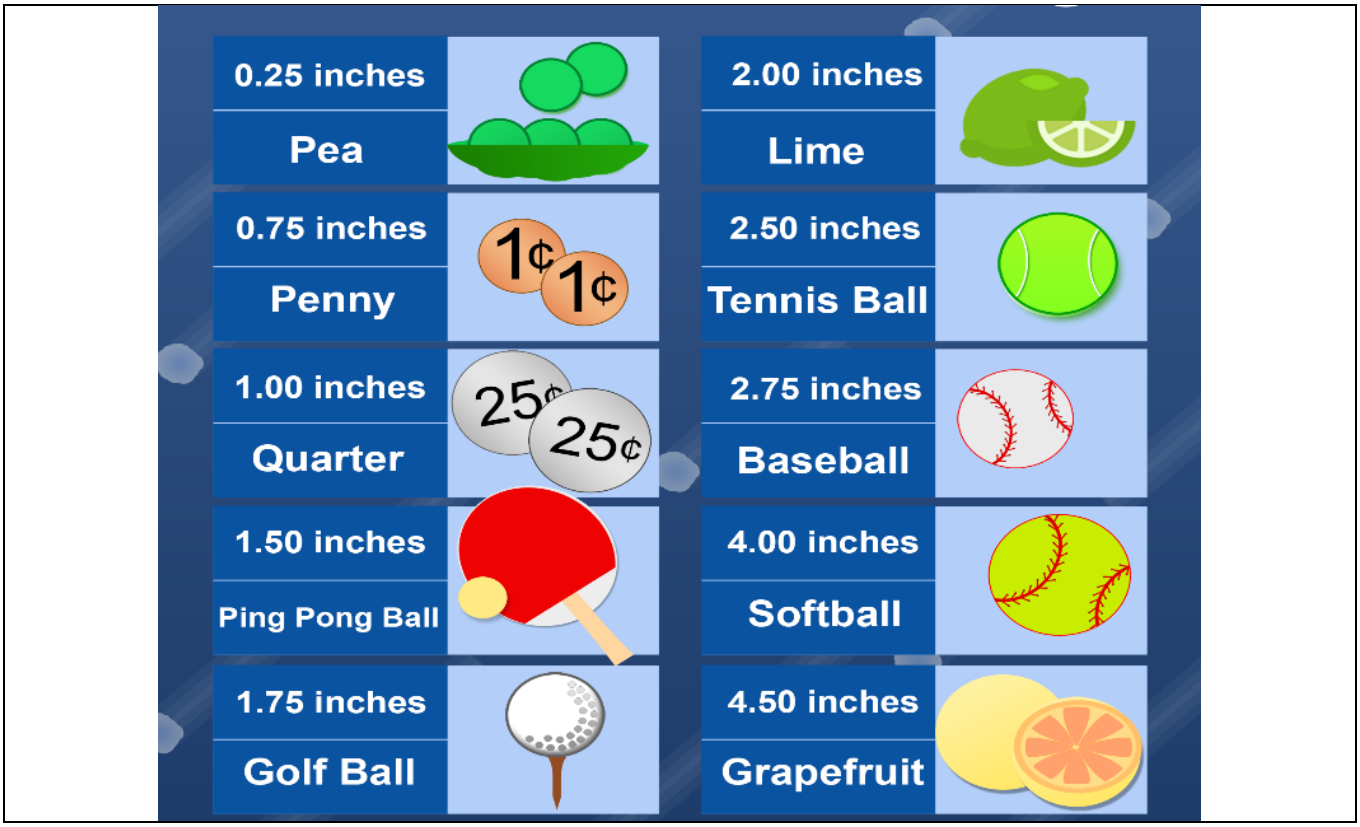


Source: FEMA n.d.

16.1.3 EXTENT

The severity of hail is measured by duration, hail size, and geographic extent. Hail can exhibit a variety of sizes, often estimated by comparing the hail to a known object (Figure 16-3). Most hailstorms are made up of a mix of different sizes, and only the very largest hail stones pose serious risk to people caught in the open (NSSL 2021). The Tornado and Storm Research Organization defines hail size through the TORRO Hailstorm Intensity Scale (H0-H10) which helps to explain the hail size to damage ratio.

Figure 16-3. Hail Size Reference Chart



Source: NWS 2023

Table 16-1 outlines the TORRO Hailstorm Intensity Scale. It shows that the most extreme (H10) events are called super hailstorms and can cause extensive damage to buildings and severe to maybe even fatal injuries to people. The size for super hailstorms can be over 100 mm or the size of a melon fruit.

Warning Time

The warning time for hail events is moderate, with 6 to 12 hours advance notice. Meteorologists can often predict the likelihood of a severe storm. This can give several days of warning time. However, meteorologists cannot predict the exact time of onset or severity of the storm. Some storms may come on more quickly and have only a few hours of warning time.

Table 16-1. The TORRO Hailstorm Intensity Scale

Scale	Intensity category	Typical hail diameter (mm)	Description	Typical damage impacts
H0	Hard hail	5	Pea	No damage
H1	Potentially damaging	5-15	Mothball	Slight general damage to plants, crops
H2	Significant	10-20	Marble, grape	Significant damage to fruit, crops, vegetation
H3	Severe	20-30	Walnut	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Severe	25-40	Pigeon's egg	Widespread glass damage, vehicle bodywork damage
H5	Destructive	30-50	Golf ball	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
H6	Destructive	40-60	Hen's egg	Bodywork of grounded aircraft dented; brick walls pitted
H7	Destructive	50-75	Tennis ball	Severe roof damage, risk of serious injuries
H8	Destructive	60-90	Large orange	(Severest recorded in the British Isles) Severe damage to aircraft bodywork
H9	Super Hailstorms	75-100	Grapefruit	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
H10	Super Hailstorms	>100	Melon	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

Source: The Tornado and Storm Research Organization n.d.

16.1.4 PREVIOUS OCCURRENCES

Federal Emergency Management Agency (FEMA) Disaster Declarations

Table 16-2 lists all hail-related major disasters declarations that have included the Pikes Peak Region since 1953.

State Emergency Proclamations

Table 16-3 lists all hail-related state emergency proclamations that included the Pikes Peak Region from 2020 to 2024.

U.S. Department of Agriculture (USDA) Declarations

Between 2020 and 2024, the Pikes Peak Region was not included in any USDA hail-related agricultural disaster declarations.

All Recent Events

Table 16-4 lists major recorded hail-related events that impacted Pikes Peak Region since the previous HMP was developed. For earlier events, refer to the previous HMP.

Table 16-2. FEMA Disaster Declarations for Hail-Related Events in the Pikes Peak Region

FEMA Declaration Date	Declaration Number	Description
June 19, 1965	DR-200	Tornadoes, severe storms, flooding
May 19, 1969	DR-261	Severe storms, flooding
May 23, 1973	DR-385	Heavy rains, snowmelt, flooding
August 2, 1976	DR-517	Severe storms, flash flooding
April 9, 2003	EM-3185	Snowstorm
January 7, 2007	EM-3270	Snowstorm
September 12, 2013	EM-3365	Severe storms, flooding, landslides, and mudslides
September 14, 2013	DR-4145	Severe storms, flooding, landslides, and mudslides
July 16, 2015	DR-4229	Severe storms, tornadoes, flooding, landslides, and mudslides
August 25, 2023	DR-4731	Severe storms, flooding, and tornadoes

Source: FEMA n.d.

Table 16-3. State Emergency Proclamations for Hail-Related Events in the Pikes Peak Region (2020 to 2024)

State Proclamation Date	State Proclamation Number	Description
March 12, 2021	D-2021-064	Severe Winter Weather
July 21, 2023	D-2023-011	Severe Weather and Flooding
February 9, 2024	D-2024-002	Extreme Cold Temperatures and Winter Weather

Source: Colorado Governor n.d.

Table 16-4. Hail Events in Pikes Peak Region (2020 to 2024)

Date	Hazard	Event Narrative
June 26, 2020	Heavy Rain	Scattered thunderstorms developed across the higher terrain early in the afternoon and then spread east across the I-25 Corridor during the mid to late afternoon and then continued to the far southeast plains by late evening. Hail was the main hazard, with several significant hail reports observed across El Paso county. Stalled cars in water on Voyager Parkway. Heavy rain, 1.42 inches. USGS station at U.S. Air Force Academy.
July 3, 2020	Hail	Scattered thunderstorms occurred across much of southern Colorado, as deeper upslope flow and high amounts of moisture were in place. Moderate amounts of rainfall did occur in some locations, as well as a few reports of large hail.

Date	Hazard	Event Narrative
July 12, 2020	Hail	Large amounts of moisture and instability supported scattered severe thunderstorms across southern Colorado during the afternoon and evening hours. While large hail was observed across mainly the Pikes Peak region, there were some isolated reports over the far eastern plains.
July 15, 2020	Heavy Rain	Storms developed over the mountains early in the afternoon and then spread east to the I-25 corridor through the afternoon hours, with reports of large hail and heavy rainfall with flash flooding noted in this location. Several vehicles underwater and stranded in security. Water was not swift moving. Reports of several shattered glass windows, and windshield damage. One inch hail. Heavy rainfall of 2.25 inches accumulated in under an hour.
July 21, 2020	Hail	Thunderstorms occurred in the afternoon and evening across the higher terrain and parts of the plains, especially the Pikes Peak region and I-25 corridor. Strong to severe storms occurred from around midafternoon through mid-evening, once again, with the highest risk across the Pikes Peak region.
August 5, 2020	Heavy Rain	Isolated showers and storms developed over the mountains and high valleys during the day. Thunderstorm development then shifted to the I-25 corridor in the afternoon, specifically the Pikes Peak region, where multiple storms produced large hail. Heavy rainfall with localized flooding also occurred on this day. Water flowing over curb at Fontaine and Dartmouth. Extensive street flooding reported by broadcast media. Cars stalling in flood waters across roadway. Several boulders were washed onto Highway 24 due to heavy rainfall. Trained spotter reported large hail, 1.75 inches. Woman was hit in the wrist at 7 Falls and was injured. Time estimated at 4 PM. Reported at 10th and Colorado Ave., City of Colorado Springs, CO. National Weather Service employee reported large hail, 1.75 inches. Heavy rainfall of 1.51 inches.
August 6, 2020	Heavy Rain	Thunderstorm development was once again focused across the Pikes Peak region on this day, with strong to severe thunderstorm development occurring. While large hail did occur, several reports of heavy rainfall were noted. Public reported large hail, 1 inch. Heavy rainfall of 2.13 inches.
August 15, 2020	Hail	Scattered thunderstorms developed during the late afternoon and early evening time frame on this day, primarily affecting locations along the I-25 corridor. Hail was the main hazard observed this day, though burn scar flash flooding also occurred. Trained spotter reported large hail, 1.5 inches.
August 20, 2020	Thunderstorm Wind	Another day of afternoon and evening thunderstorm development occurred across both the higher terrain and plains. A few strong to severe storms occurred on this day. Street flooding greater than 6 inches deep at Austin Bluffs and Academy. Storm chaser reports large hail, 1 inch. Heavy rainfall of 2 inches. Local broadcasters shared pictures of thunderstorm wind damage in Ellicott, CO from the severe storms. Based on archived radar information it appears that a microburst descended right on top of the damaged location leading to the outbuilding and metal fencing damage.

Date	Hazard	Event Narrative
July 14, 2020	Hail	During the afternoon hours of July 14th, scattered thunderstorms, including a few supercells, developed across eastern El Paso County. As this activity shifted eastward, they began to intensify and grow upscale into a larger thunderstorm complex. A series of supercells moved through Bent, Prowers, and Baca Counties producing a large non-damaging tornado, large hail, and damaging wind gusts.
May 2, 2021	Hail	Isolated to scattered thunderstorms developed over portions of the I-25 corridor in El Paso and Pueblo Counties during the afternoon and then spread eastward to southeastward across the Highway 50 corridor through the evening. Some of the thunderstorms were strong to severe, with the more intense storms producing large hail of 1-2 inches in diameter and damaging wind gusts of 60-70 mph. Additionally, a tornado and wind gusts up to around 90 mph were observed across the eastern plains on this day.
May 14, 2021	Hail	An upper-level disturbance moving across the region along with increasing moisture at the surface allowed thunderstorms to develop across the plains on this day. Severe storms did occur, primarily across the eastern plains, with large hail up to two inches being observed.
May 17, 2021	Heavy Rain	A large upper-level system moved across the region during this time, providing widespread precipitation to much of southern Colorado. While a few severe reports consisting of large hail were observed, the main hazards were heavy rainfall with flash flooding. With the arrival of colder air, snow was also observed over and near the mountains. Heavy rain of 1.49 inches, City of Manitou Springs. Heavy rain of 1.89 inches, 2 miles northwest City of Manitou Springs. Heavy rain of 1.95 inches, 2 miles south southwest City of Manitou Springs.
May 28, 2021	Hail	Isolated thunderstorms occurred on this day, mainly staying confined to the higher terrain. However, a few storms moved away and into adjacent locations, and with a stronger storm producing one inch hail across the Pikes Peak Region.
May 29, 2021	Hail	Thunderstorms developed across the Pikes Peak region and plains on this day along a surface low and boundary extending from around Teller County southeast through Las Animas County. This served as a focus for severe thunderstorms, with large hail up to one and a half inches noted across the Pikes Peak region, and a tornado observed across Las Animas County.
June 19, 2021	Hail	Increases in moisture and instability led to a higher coverage of strong to severe storms across the plains on this day. Winds and hail were the main thunderstorm risks as storms moved off the mountains and into the plains during the afternoon and evening hours.
June 24, 2021	Thunderstorm Wind	An embedded mid-level disturbance helped to develop showers and storms across the region through the early evening on this day, with strong to severe storms occurring across El Paso County through the far southeast plains. In this location high instability and strong forcing provided a setup for large hail and damaging winds to occur. The largest hail of 4 inches occurred across Kiowa county.

Date	Hazard	Event Narrative
July 1, 2021	Hail	The setup on this day supported another summer day with possible flash flooding over and near the mountains, though the setup did also support severe thunderstorm development as the activity pushed off the mountains into a more unstable air over the plains. This indeed did occur, with flash flooding and severe storms being observed from the Upper Arkansas River Valley down along the Highway 50 corridor and into the Pueblo area.
July 3, 2021	Hail	Isolated showers and storms occurred along the I-25 corridor during the afternoon on this day, especially around and north of Pueblo. There was additional development across the eastern plains, but both areas really only observed isolated severe storms.
August 12, 2021	Hail	Isolated to scattered thunderstorms occurred across the lower elevations of southern Colorado on this day, with a few large hail reports noted with the stronger storms.
September 14, 2021	Hail	Scattered thunderstorms, some strong to severe, occurred over the plains. The strongest storms developed around midafternoon through mid-evening and produced hail up to 1 to 1.25 inches and wind gusts of 60 to 70 mph. Winds of 50 mph or greater were also observed.
June 6, 2022	Hail	Strong to severe storms developed along the foothills and Palmer Divide in eastern Colorado and moved south-southeast out across the plains. Storms quickly became severe, moving off the higher terrain onto the warm and moist plains producing intense rainfall rates, flash flooding, and large damaging hail through the late evening hours.
June 7, 2022	Hail	A more significant and widespread day of severe weather occurred across much of southeastern Colorado during the afternoon and evening of June 7th. Numerous reports of large damaging hail, funnel clouds, and tornadoes occurred across the region. Cocorahs spotter measured 1.63-inch hail with earlier severe storm.
July 6 – 7, 2022	Heavy Rain	Thunderstorms developed in the afternoon over and near the higher terrain, with an initial risk of strong to severe storms in the Pikes Peak region. This risk then spread into the eastern plains along the Highway 50 corridor later in the evening, where large hail damaging wind gusts up to around 75 mph, localized flash flooding, and even a tornado occurred. Heavy rainfall of 1.17 inches.
August 15, 2022	Heavy Rain	A few strong to severe storms developed right along the Palmer Divide in northern El Paso County during the afternoon of August 15th. As the storms slowly drifted east-southeast, they became severe producing large damaging hail and pockets of flash flooding. Flash flooding with water flowing over the road at the intersection of Sweet Road. and Peyton Hwy. Trained spotter called in to report flash flooding 3 miles west of Town of Calhan with approximately 1.5 to 2 inches fallen in the past hour. Recorded 1.7 inches of rain in an hour.

Date	Hazard	Event Narrative
May 12, 2023	Heavy Snow	A closed low propagated from SW CONUS and rapidly intensified over the southeast Colorado plains. A combination of strong lift due to the rapidly intensifying cyclone and orographic lift created heavy snow over the mountains. Since this was a late spring system with origins from the Pacific, the lower elevations were warm enough for heavy rainfall that ended up causing some flooding issues along the Fountain Creek in El Paso County and Pueblo County. There was 1 foot of standing water as reported via video from law enforcement and social media. COOP observer reported 1 inch hail. There was 4 inches of snow. There was 6.39 inches of rain that fell. There was 12 inches of snow that fell.
June 16, 2023	Heavy Rain	The continued deluge of heavy rain, severe thunderstorms, flash flooding, and tornadoes continue over southern Colorado by yet another closed low located over southern California. The largest hail stone was 4 inches as reported by law enforcement and emergency management located in Baca County. Heavy rains continue over the I-25 corridor, with multiple reports of additional flooding in El Paso and Pueblo Counties.
July 15, 2023	Hail	The continuations of hail, wind, and tornadoes continue through mid-July as northwesterly upper-level flow develops once again over southern Colorado. Anomalous amounts of low-level moisture remain over the region due to record breaking precipitation in June and an active early July. Enhanced wind shears due from the upper-level northwesterly flow created an environment conducive to severe thunderstorms.
July 31, 2023	Heavy Rain	Surface flow from the east advected amply amounts of low-level moisture which created another event where heavy rains, hail, and gusty winds were observed. Weak perturbations in the upper flow sparked thunderstorms across the region.
May 15, 2024	Hail	A boundary pushing through southeast Colorado produced a few high based thunderstorms late in the day. Some of these storms became strong to severe, resulting in hail up to an inch in diameter and even one report of a funnel cloud. Picture of 1 inch diameter hail from social media.
May 20, 2024	Hail	A broad trough moving over southeast Colorado, with enough synoptic forcing, produced some stronger to severe thunderstorms along portions of the I-25 corridor and mainly over El Paso County. A trained spotter reported hail of 1.5 inches in diameter.
May 31, 2024	Hail	A very dynamic pattern within a longwave trough allowed for a series of major shortwave troughs to propagate over Colorado. This allowed for several days of severe thunderstorms. Severe thunderstorms were fueled by the conditionally unstable environment with sufficient forcing, high amounts of mid-level moisture, high levels of buoyancy (CAPE), steep lapse rates, and effective bulk shear. This resulted in reports of large hail (more than 2 inches), severe wind gusts of greater than 50 kts, and even a few land spouts/funnel clouds. A source via amateur radio reported hail of 1.25 inches in diameter.
July 3, 2024	Hail	Westerly flow-initiated thunderstorms over region bring severe wind and hail to the eastern plains. Picture of hail measuring 1.65 inches in diameter via social media.

Date	Hazard	Event Narrative
July 7, 2024	Hail	Northwest flows blossoms hailstorms. Hail measured to 1 inch fell southeast of Peterson AFB.
August 1, 2024	Hail	An upper-level trough transitioning over Colorado on the 1st of August provided enough instability for there to be the development of scattered strong to severe storms over Teller/El Paso counties by late in the afternoon and through the evening, resulting in several cases of severe hail reported. Members from other Federal Agency reported hail of 1.5 inches in diameter.
August 19, 2024	Thunderstorm Wind	An active upper-level pattern with a series of shortwave troughs moving over the region throughout the course of the week produced several days of strong to severe thunderstorms over the region. A trained spotter reported hail of 2 inches in diameter via social media with picture. A public source reported 1.50 inches of rain, which fell in a short period of time, and was produced by a strong thunderstorm.
September 7, 2024	Hail	Northwest flow over the area allowed for strong to severe storms to materialize, some of which produced large hail.

Source: NOAA-NCEI, 2024

16.1.5 PROBABILITY OF FUTURE OCCURRENCES

Information on previous hail occurrences in the County was used to calculate the probability of future occurrences of such events. Table 16-5 lists the number of events from various sources over the 71-year period from 1954 to 2025, which is the most complete period of record for all sources reviewed. Based on these records and input from the Steering Committee, the probability of occurrence for hail in the County is considered “frequent.”

Table 16-5. Probability of Future Hail Events in Pikes Peak Region

Hazard Type	Number of Occurrences Between 1954 and 2025	% Chance of Occurring in Any Given Year
Hail	250	100%

Source: NOAA_NCEI, 2025

Note: 100% probability indicates that it is statistically likely for an event to occur every year. It does not indicate that the occurrence of an event is a certainty in any given year.

16.1.6 CASCADING IMPACTS ON OTHER HAZARDS

The most significant secondary hazards associated with hailstorms are floods resulting from storm drains that have been clogged with hail.

16.2 VULNERABILITY AND IMPACT ASSESSMENT

All El Paso County is at risk from the impacts of hail. A qualitative analysis was conducted to assess the County's vulnerability to this hazard of concern.

16.2.1 LIFE, HEALTH, AND SAFETY

Overall Population

The entire population of El Paso County (736,008) is potentially exposed to hail events, though death or injury from hailstorms is rare. Hail can cause widespread property damage, disrupt transportation, and lead to power outages. These disruptions can affect access to essential services and infrastructure, especially in remote areas. While the physical threat from hail is generally low, the broader impacts can still be significant for the community as a whole.

Socially Vulnerable Population

Hailstorms disproportionately affect socially vulnerable groups such as the elderly, individuals with disabilities, children under the age of 5, and those living in poverty. These populations face greater physical risks due to limited mobility, lack of safe shelter, or reliance on specialized transportation and emergency services. For example, elderly individuals or people with disabilities may struggle to find cover quickly, and young children in outdoor settings are especially at risk.

Hail can also damage critical infrastructure like power lines and transportation systems, further endangering these groups. Economically, hailstorms can be devastating for low-income households lacking insurance or resources to repair damaged property. Mobile homes and older housing, more common among low-income residents, are particularly susceptible. The financial burden of repairs can lead to prolonged exposure to unsafe conditions. These cascading impacts underscore the need for targeted preparedness and recovery efforts focused on socially vulnerable populations.

16.2.2 GENERAL BUILDING STOCK

El Paso County is vulnerable to significant hailstorms in the future. Although weather forecasting provides warning for upcoming events, knowing exactly where and how large an impact to people and property is nearly impossible to predict. Hail-producing thunderstorms are a regular occurrence in the Region, and it is reasonable to expect future damage to automobiles, structures, and potentially individuals. All of the buildings and structures are vulnerable to hailstorm impacts. That means a total of 252,492 buildings in the County with a total replacement cost value of over $152 billion are vulnerable to possible hailstorms. The City of Colorado Springs has the highest number of buildings (166,064), with over $105 billion in replacement cost value. Table 3-9 summarizes the number and value of all general buildings in the planning area.

16.2.3 COMMUNITY LIFELINES AND OTHER CRITICAL FACILITIES

All critical facilities are exposed to risks associated with hail. Significant damage to critical facility and infrastructure that would result in a loss of function is uncommon. However, hail events may

occur simultaneously with other hazards, such as thunderstorms, that may result in damage or loss of function to facilities and infrastructure.

Incapacity and loss of roads are the primary transportation failures resulting from thunderstorms, wind and hail, mostly associated with secondary hazards. Landslides caused by heavy prolonged rains can block roads. High winds can cause significant damage to trees and power lines, blocking roads with debris, incapacitating transportation, isolating population, and disrupting ingress and egress. Of particular concern are roads providing access to isolated areas and to the elderly. Prolonged obstruction of major routes due to landslides, debris or floodwaters can disrupt the shipment of goods and other commerce. Large, prolonged storms can have negative economic impacts for an entire region. Severe windstorms and downed trees can create serious impacts on power and above-ground communication lines. Loss of electricity and phone connection can leave certain populations isolated because residents are unable to call for assistance.

16.2.4 ECONOMY

Hailstorms can have an economic impact on the County affecting both public and private sectors. The direct impacts are often related to property damage as hail can destroy roofs, vehicles, crops, and infrastructure, which can lead to billions of dollars in insurance claims and repair expenses. Businesses may also suffer from temporary closures due to damage or power outages which reduce productivity and sales. Local governments often have the economic burden of emergency response, debris cleanup, and infrastructure repair which can put pressure on municipal budgets. Over time, repeated events can lead to increased insurance premiums and reduced property values which can slow economic growth. These impacts express the need for and importance of resilience planning and investment in infrastructure that can mitigate future hailstorm losses.

16.2.5 ENVIRONMENT

The environment is highly exposed to thunderstorms, high winds, and hail. Natural habitats such as streams and trees risk major damage and destruction. Prolonged rains can saturate soils and lead to slope failure. Flooding events can produce river channel migration or damage riparian habitat. Hailstorms can also cause crop damage ranging from moderate to total loss. The impact of hail on a plant tissue depends on the size of the hailstones, duration of the storm, and the growth stage of the plants.

16.2.6 HISTORIC AND CULTURAL RESOURCES

Hailstorms can severely impact the historic and cultural resources of El Paso County. City of Manitou Springs and City of Colorado Springs are home to heritage sites and landmarks which are vulnerable to hailstorms. Large hail, exceeding two inches in diameter, has caused significant damage to historic buildings such as broken windows, damaged roofs, and damage to architectural features (Pachot 2025). Another example is the Cheyenne Mountain Zoo which is a cultural and educational institution in City of Colorado Springs. The zoo suffered extensive damage during the 2018 hailstorm which dropped nearly three inches in diameter. The hailstorm injured visitors and animals as well as shattering skylights and damaging historic exhibits (KOAA News 2020).

16.3 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

16.3.1 LAND USE AND DEVELOPMENT

All future developments will be affected by hail. The ability to withstand impacts lies in sound land use practices and consistent enforcement of codes and regulations for new constructions. The area planning departments are governed by the International Building Code. This code is equipped to deal with the impacts of severe weather events, including hail. Land use policies identified in general plans within the planning area also address many of the secondary impacts (flood) of the hail hazard.

16.3.2 PROJECTED CHANGES IN POPULATION PATTERNS

The County population is projected to increase by over 32 percent by 2050. Table 3-7 summarizes recent and projected future changes in county population. Between 2010 and 2025 alone, the County population rose by nearly 21 percent. With this increase in population, the risk of hail has also increased. More people are residing and living in the County, and this directly increases the exposure to hail hazard areas in the event it may occur. Additionally, an increase in projected populations in the future will also indicate an increase in hail risk. It is critically important that the County plans for and mitigates against hail hazards for the current population and the projected new population in the future.

16.3.3 CLIMATE CHANGE

Climate change presents a significant challenge for risk management associated with severe weather, especially hailstorms. The frequency of severe weather events has increased steadily over the last century. The changing hydrograph caused by climate change could have a significant impact on the intensity, duration and frequency of storm events. All these impacts could have significant economic consequences.

16.3.4 OTHER IDENTIFIED CONDITIONS

Important issues associated with a hail event in the planning area include the following:

- Older building stock in the planning area is built to low code standards or none at all. These
- structures could be highly vulnerable to damage from large diameter hail events. Hail may clog storm water infrastructure and exacerbate flooding within the area.
- Hail may result in crop damage and loss.

16.4 CONSEQUENCE ANALYSIS

Table 16-6 presents the results of the consequence analysis for the hail hazard.

Table 16-6. Consequence Analysis for the Hail Hazard

Category	Narrative
Hazard Description	Large hailstones are capable of causing significant damage to structures, vehicles, and crops. They also pose a risk of injury to individuals and livestock.
Impact on Property, Facilities, and Infrastructure	Hail affects the entire planning area, including all above-ground structures and utilities. While all buildings and equipment are exposed to hailstorms, the damage typically does not result in widespread disruption or debilitating structural failure. However, even small amounts of damage across many properties can result in high total property losses, especially to structures and vehicles. Large hailstorms may also lead to localized flooding when hailstones clog stormwater drainage systems. These secondary effects are difficult to predict or prevent but can cause significant damage. Hail-producing thunderstorms are common in the Pikes Peak Region, and future damage to automobiles, buildings, and individuals is likely.
Impact on the Environment	Tornadoes, high winds, and hail can negatively impact the environment by spreading debris and pollutants, damaging sewer and wastewater treatment facilities, disturbing wildlife and natural habitats, and destroying crops.
Impact on Responders	Firefighters, police, and emergency responders are typically deployed to impacted areas to close roads, assist the injured, and manage traffic. The American Red Cross may be called upon to provide shelter and aid to affected individuals, while the Humane Society of the Pikes Peak Region may assist with sheltering displaced animals. Voluntary Organizations Active in Disasters (VOAD) may also be requested to support recovery efforts. Responders performing routine duties may be exposed to hazards during hail events. Although most storm-related duties occur post-event, unsafe structural or environmental conditions may persist during the response period. Extreme hail events can damage emergency vehicles and delay response times.
Impact on Continuity of Operations, Continuity of Government, and Delivery of Services	Hail events typically result in limited or no loss of facility or infrastructure functionality. Any interruption of essential services is usually brief, lasting less than 24 hours. PPROEM maintains the Continuity of Operations Plan and the Continuity of Government Plan for the County of El Paso and the City of Colorado Springs; other jurisdictions in the Pikes Peak Region are in the process of developing continuity plans and procedures.
Impact on the Public	Hailstorms may cause minor injuries and illnesses. Motorists, outdoor workers, and individuals engaged in outdoor recreation are at risk from direct hail impacts or deteriorated road conditions caused by precipitation.

Category	Narrative
Impact on the Economic Condition of the County	Hail damage is generally covered under most insurance policies. Initial impacts may include temporary closures of businesses, such as grocery stores, due to structural damage. However, repairs and recovery typically occur quickly, restoring essential services. Insurance claims from large hailstorms tend to be small on a per-property basis but high in volume, resulting in substantial aggregate losses. Crop damage and financial loss to farmers can be significant. Between 2001 and 2019, El Paso County recorded over 500 significant hailstorms. One particularly severe storm caused nearly $100 million in damage across Colorado Springs and Pueblo Counties, affecting more than 5,000 homes and 11,000 vehicles.
Impact on the Public Confidence in Government	Public confidence is closely tied to perceptions of how well response and recovery efforts are managed during and after a hail event. A response that demonstrates the County's preparedness and attentiveness to public needs—and that restores services and repairs damage in a timely manner—can maintain or enhance the County's reputation. Effective communication, especially with vulnerable populations, is essential to ensure safety and maintain trust.

17. LIGHTNING

17.1 HAZARD PROFILE

17.1.1 HAZARD DESCRIPTION

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

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

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

Lightning is one of the more dangerous weather hazards in the United States and in Colorado. Each year, lightning is responsible for deaths, injuries, and millions of dollars in property damage, including damage to buildings, communications systems, power lines, and electrical systems. Lightning also causes forest and brush fires and deaths and injuries to livestock and other animals.

According to the National Lightning Safety Institute, lightning causes more than 26,000 fires in the United States each year. The institute estimates property damage, increased operating costs, production delays, and lost revenue from lightning and secondary effects to be in excess of $6 billion per year. Impacts can be direct or indirect. People or objects can be directly struck, or damage can occur indirectly when the current passes through or near it.

Intra-cloud lightning is the most common type of discharge. This occurs between oppositely charged centers within the same cloud. Usually, it takes place inside the cloud and looks from the outside of the cloud like a diffuse brightening that flickers. However, the flash may exit the boundary of the cloud, and a bright channel can be visible for many miles.

Although not as common, cloud-to-ground lightning is the most damaging and dangerous form of lightning. Most flashes originate near the lower-negative charge center and deliver negative charge to earth. However, a large minority of flashes carry positive charge to earth. These positive flashes often occur during the dissipating stage of a thunderstorm's life. Positive flashes are also more common as a percentage of total ground strikes during the winter months. This type of lightning is particularly dangerous for several reasons. It frequently strikes away from the rain core, either ahead or behind the thunderstorm. It can strike as far as five or ten miles from the storm in areas that most people do not consider to be a threat. Positive lightning also has a longer duration, so fires are more easily ignited. And, when positive lightning strikes, it usually carries a high peak electrical current, potentially resulting in greater damage.

The ratio of cloud-to-ground and intra-cloud lightning can vary significantly from storm to storm. Depending upon cloud height above ground and changes in electric field strength between cloud and earth, the discharge stays within the cloud or makes direct contact with the earth. If the field strength is highest in the lower regions of the cloud, a downward flash may occur from cloud to earth. Using a network of lightning detection systems, the United States monitors an average of 25 million strokes of lightning from the cloud-to-ground every year.

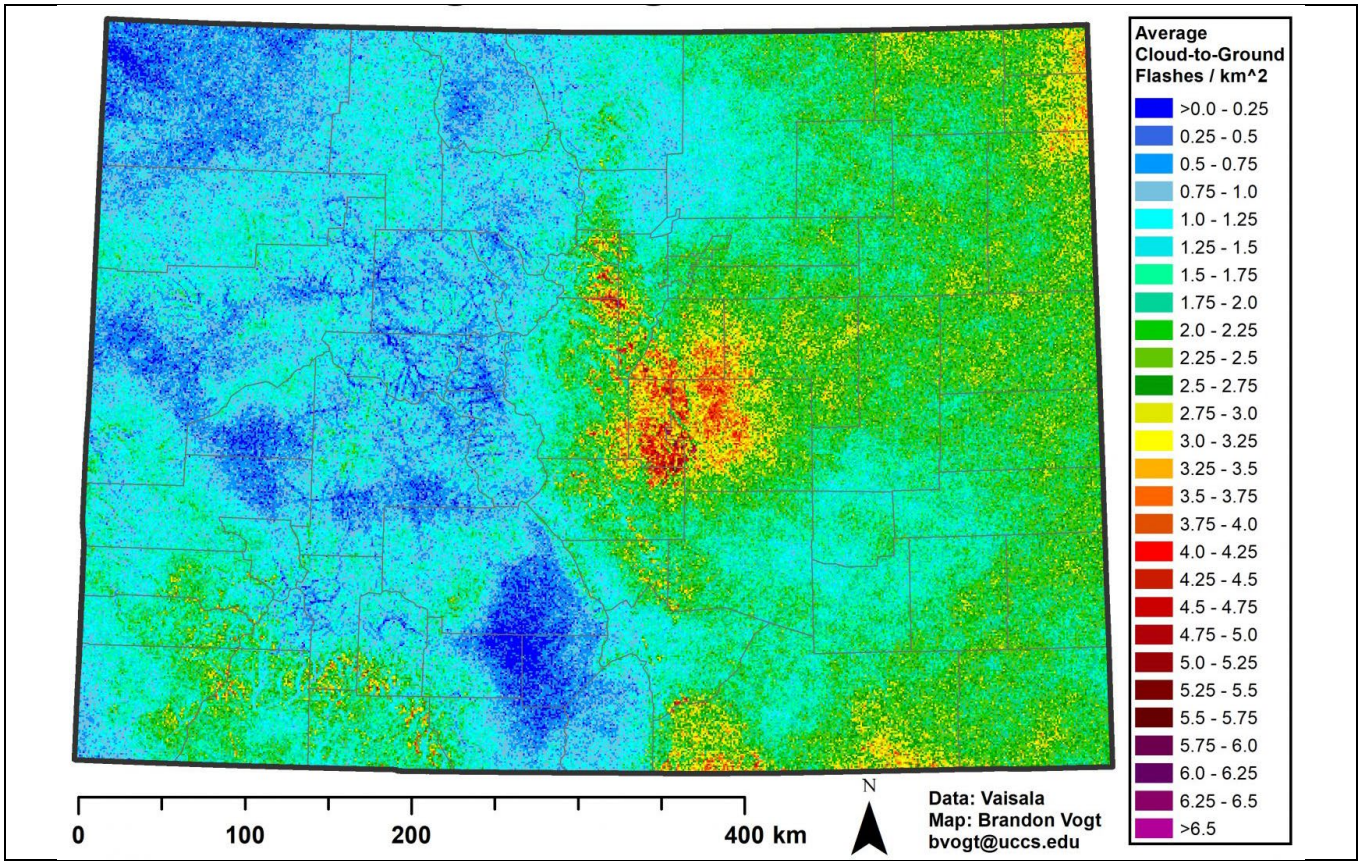
U.S. lightning statistics compiled by the National Oceanic and Atmospheric Administration between 1959 and 1994 indicate that most lightning incidents occur during the summer months of June, July, and August and during the afternoon hours from between 2 and 6 p.m.

17.1.2 LOCATION

Data from the National Weather Service ranks Colorado 19th in the Nation with respect to the number of cloud-to-ground lightning flashes (2009-2018) with an average number of more than 500,000 cloud-to- ground lightning strikes per year. El Paso County has an average of two to five lightning flashes per square kilometer per year, with higher lightning frequency in the northwestern part of the county, as shown by the flash density map in Figure 17-1.

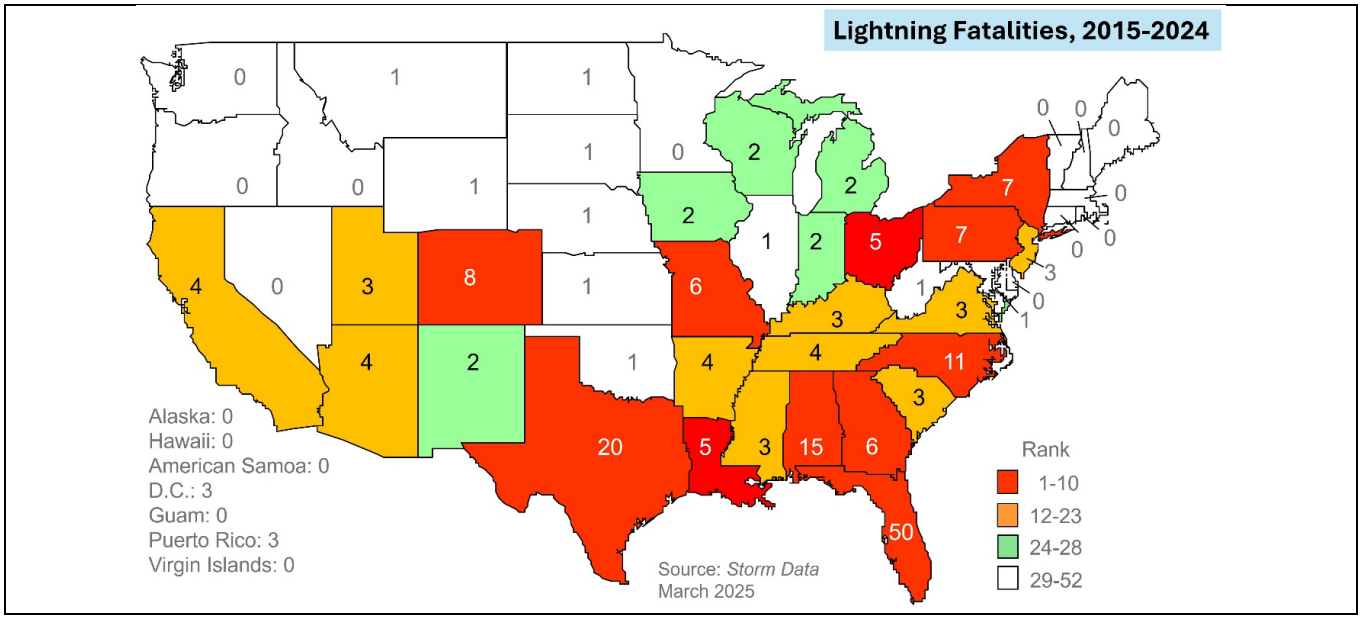
Figure 17-2 illustrates the number of lightning related fatalities by state from 2015 to 2024. Among all states, Colorado had the fifth highest number of lightning fatalities with eight fatalities, following Florida (50), Texas (20), Alabama (15), and North Carolina (11). El Paso County is the most dangerous County in the state for lightning strikes. Since 1980, lightning has killed 10 people and injured 84 in El Paso County (NWS 2023).

Figure 17-1. Annual Colorado Lighting 1996-2023



Source: (NWS n.d.)

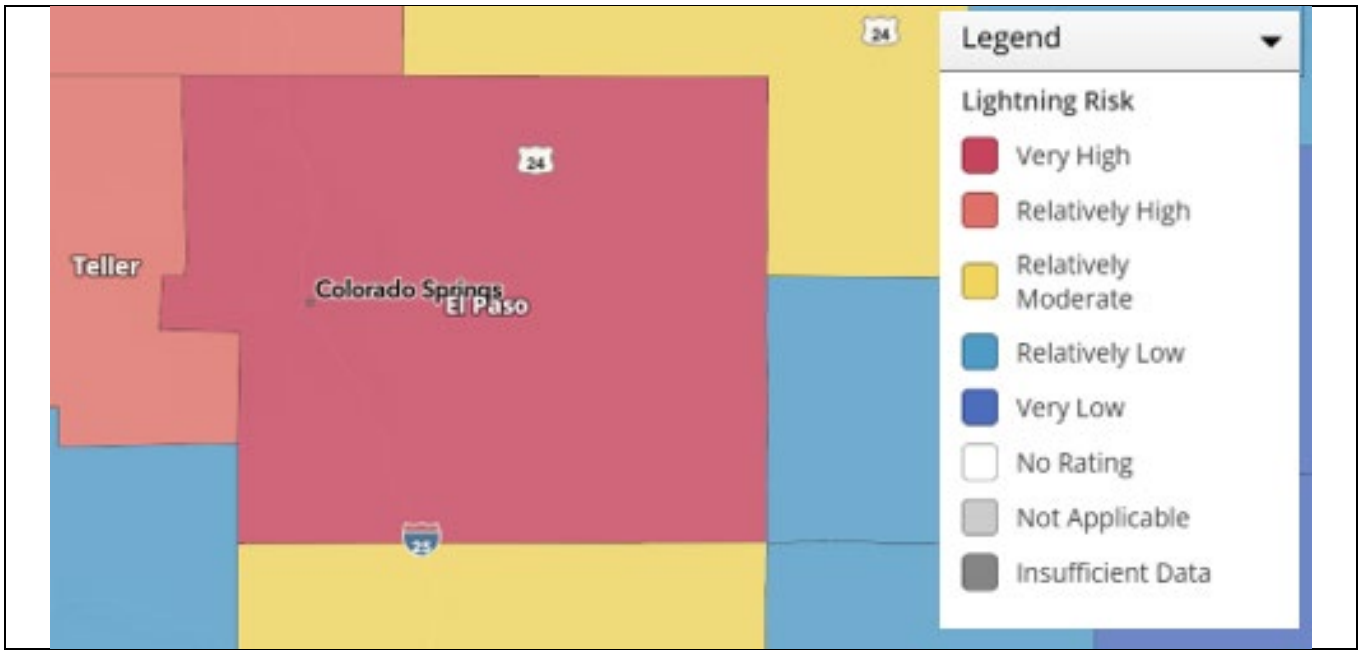
Figure 17-2. Number of Lightning Related Fatalities by State



Source: (NLSC n.d.)

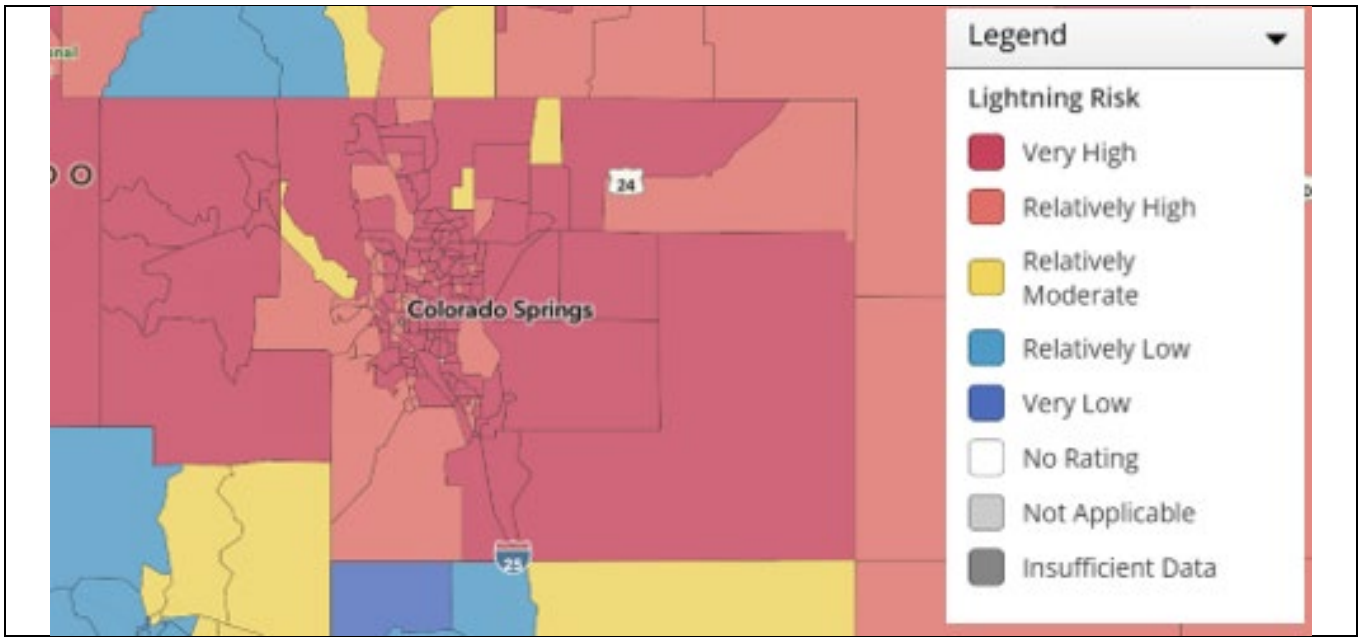
According to the FEMA National Risk Index (NRI) database (refer to Figure 17-3 and Figure 17-4), El Paso County has a relatively high risk to lightning hazards. Figure 17-4 illustrates the NRI map by census tract view and indicates a risk range of relatively moderate to very high for lightning risk throughout the County.

Figure 17-3. FEMA National Risk Index Map for Lightning Hazard in El Paso County by County View



Source: FEMA NRI, 2025.

Figure 17-4. FEMA National Risk Index Map for Lightning Hazard in El Paso County by Census Tract View



Source: FEMA NRI, 2025.

17.1.3 EXTENT

Lightning magnitude can be measured in voltage. Voltage is equivalent to the work done by an electric current as it flows through a given cross-sectional area in one second. The voltage of lightning varies with certain altitudes and thickness of the bolt. These fluctuating values are caused by the fact that clouds and earth act as capacitors. A capacitor is a device used to store charge. When the spacing between them increases, the voltage needed to produce lightning increases. So, for a given cloud-to-ground lightning strike voltage can be assumed to increase as the height of the cloud base increases. A comparison of approximated lightning voltage to other common/average voltages demonstrates lightnings massive energy potential.

Warning Time

Meteorologists can often predict the likelihood of a severe storm that produces lightning. This can give several days of warning time. However, meteorologists cannot predict the exact time of onset or severity of the storm. Some storms may come on more quickly and have only a few hours of warning time.

17.1.4 PREVIOUS OCCURRENCES

Federal Emergency Management Agency (FEMA) Disaster Declarations

Lightning is not a stand-alone category for disaster declarations; however, it is usually a feature of severe storms. Therefore, Table 17-1 lists all severe storm major disasters declarations that have included the Pikes Peak Region since 1953.

Table 17-1. Federal Emergency Management Agency (FEMA) Disaster Declarations for Lightning-Related Events in the Pikes Peak Region

FEMA Declaration Date	Declaration Number	Description
June 19, 1965	DR-200	Tornadoes, Severe Storms, Flooding
May 19, 1969	DR-261	Severe Storms, Flooding
May 23, 1973	DR-385	Heavy Rains, Snowmelt, Flooding
August 2, 1976	DR-517	Severe Storms, Flash Flooding
May 17, 1999	DR-1276	Severe Storms, Flooding, Mudslides, and Landslides
September 5, 2005	EM-3224	Hurricane Katrina Coastal Storm
September 12, 2013	EM-3365	Severe Storms, Flooding, Landslides, and Mudslides
September 14, 2013	DR-4145	Severe Storms, Flooding, Landslides, and Mudslides
July 16, 2015	DR-4229	Severe Storms, Tornadoes, Flooding, Landslides, and Mudslides
August 25, 2023	DR-4731	Severe Storms, Flooding, and Tornadoes

Source: FEMA n.d.

State Emergency Proclamations

Table 17-2 lists all severe weather-related state emergency proclamations that included the Pikes Peak Region from 2020 to 2024.

Table 17-2. State Emergency Proclamations for Lightning Related Events in the Pikes Peak Region (2020 to 2024)

State Proclamation Date	State Proclamation Number	Description
July 21, 2023	D-2023-011	Severe Weather and Flooding

Source: Colorado Governor n.d.

U.S. Department of Agriculture (USDA) Declarations

Between 2020 and 2024, the Pikes Peak Region was not included in any USDA drought-related agricultural disaster declarations.

All Recent Events

Table 17-3. lists major recorded lightning-related events that impacted Pikes Peak Region since the previous HMP was developed. For earlier events, refer to the previous HMP.

Table 17-3. Lightning-Related Events in Pikes Peak Region (2020 to 2024)

Date	Hazard	Event Narrative
May 24, 2020	Heavy Rain	As strong thunderstorms moved through parts of El Paso County during the afternoon and evening hours on May 24th, several reports of near 1 of rain were reported. Most of the rain fell within 45-60 minutes as the storms moved through. No reports of flooding.
May 30, 2020	Heavy Rain	More thunderstorms with very heavy rain were experienced across parts of El Paso, Pueblo, and Custer Counties during the afternoon and evening hours on May 30th. Several reports of over 0.75 inches in 30 minutes with urban flash flooding reported. Road was washed out in Midway Ranches due to heavy rain from thunderstorms.
June 6, 2020	Thunderstorm Wind	A powerful upper-level disturbance moving through the Rockies sparked the development of a line of thunderstorms that brought widespread damaging winds across southern Colorado. Given the scope and intensity of the damaging winds, the storm system was classified as derecho. Large barn and tack house knocked over intersection of highway 94 and antelope drive. Doppler estimated winds of 60-65 mph. Automated Surface Observing System KCOS City of Colorado Springs Airport. Roof peeled off a trailer home near the El Paso County fairgrounds. Time estimated per Doppler radar signatures. Doppler radar estimates 70-75 mph winds.
June 26, 2020	Heavy Rain	Scattered thunderstorms developed across the higher terrain early in the afternoon and then spread east across the I-25 Corridor during the mid to late afternoon and then continued to the far southeast plains by late evening. Hail was the main hazard, with several significant hail reports observed across El Paso county. Stalled cars in water on Voyager Parkway. Heavy rain, 1.42 inches. USGS station at U.S. Air Force Academy.

Date	Hazard	Event Narrative
July 3, 2020	Hail	Scattered thunderstorms occurred across much of southern Colorado, as deeper upslope flow and high amounts of moisture were in place. Moderate amounts of rainfall did occur in some locations, as well as a few reports of large hail.
July 4, 2020	Heavy Rain	Scattered thunderstorms developed over the mountains by midday and then spread east across the plains in the afternoon and evening. Heavy rainfall and flash flooding were concerns this day, though isolated high thunderstorm wind gusts also occurred. Heavy rainfall of 0.72 inches occurred, falling in 40 minutes.
July 12, 2020	Hail	Large amounts of moisture and instability supported scattered severe thunderstorms across southern Colorado during the afternoon and evening hours. While large hail was observed across mainly the Pikes Peak region, there were some isolated reports over the far eastern plains.
July 15, 2020	Heavy Rain	Storms developed over the mountains early in the afternoon and then spread east to the I-25 corridor through the afternoon hours, with reports of large hail and heavy rainfall with flash flooding noted in this location. Several vehicles underwater and stranded in security. Water was not swift moving. Reports of several shattered glass windows, and windshield damage. One inch hail. Heavy rainfall of 2.25 inches accumulated in under an hour.
July 21, 2020	Hail	Thunderstorms occurred in the afternoon and evening across the higher terrain and parts of the plains, especially the Pikes Peak region and I-25 corridor. Strong to severe storms occurred from around midafternoon through mid-evening, once again, with the highest risk across the Pikes Peak region.
July 27, 2020	Heavy Rain	Another day of showers and thunderstorms occurred over a good portion of southern Colorado. Flash flooding remained heightened on this day for the Spring burn scar, as well as parts of the eastern San Juan mountains where focus for persistent storm development and heavy rain occurred. Heavy rainfall of 0.5 inches fell in 20 minutes.
August 5, 2020	Heavy Rain	Isolated showers and storms developed over the mountains and high valleys during the day. Thunderstorm development then shifted to the I-25 corridor in the afternoon, specifically the Pikes Peak region, where multiple storms produced large hail. Heavy rainfall with localized flooding also occurred on this day. Water flowing over curb at Fontaine and Dartmouth. Extensive street flooding reported by broadcast media. Cars stalling in flood waters across roadway. Several boulders were washed onto Highway 24 due to heavy rainfall. Trained spotter reported large hail, 1.75 inches. Woman was hit in the wrist at 7 Falls and was injured. Time estimated at 4 PM. Reported at 10th and Colorado Ave., City of Colorado Springs, CO. National Weather Service employee reported large hail, 1.75 inches. Heavy rainfall of 1.51 inches.
August 6, 2020	Heavy Rain	Thunderstorm development was once again focused across the Pikes Peak region on this day, with strong to severe thunderstorm development occurring. While large hail did occur, several reports of heavy rainfall were noted. Public reported large hail, 1 inch. Heavy rainfall of 2.13 inches.

Date	Hazard	Event Narrative
August 15, 2020	Hail	Scattered thunderstorms developed during the late afternoon and early evening time frame on this day, primarily affecting locations along the I-25 corridor. Hail was the main hazard observed this day, though burn scar flash flooding also occurred. Trained spotter reported large hail, 1.5 inches.
August 16, 2020	Heavy Rain	Isolated thunderstorms developed over the higher terrain early in the afternoon and then moved east into the plains in the late afternoon and evening producing pockets of severe weather with heavy rainfall. Heavy rainfall of 1 inch fell in the past 35 to 40 minutes.
August 20, 2020	Thunderstorm Wind	Another day of afternoon and evening thunderstorm development occurred across both the higher terrain and plains. A few strong to severe storms occurred on this day. Street flooding greater than 6 inches deep at Austin Bluffs and Academy. Storm chaser reports large hail, 1 inch. Heavy rainfall of 2 inches. Local broadcasters shared pictures of thunderstorm wind damage in Ellicott, CO from the severe storms. Based on archived radar information it appears that a microburst descended right on top of the damaged location leading to the outbuilding and metal fencing damage.
October 11, 2020	High Wind	A cold front moved south across the region during the late afternoon and evening, providing a period of high northerly winds to southern Colorado. Multiple wind gust reports more than 60 mph were noted, that helped develop a dust storm, or haboob. As this dust storm moved through portions of the plains, visibility was reduced to near zero at times.
November 8, 2020	High Wind	An upper-level system moved across southern Colorado and brought increased snow chances and damaging winds to the eastern mountains and adjacent lower elevations during the early morning hours on the 8th. The main concerns for this day were the damaging winds, with gusts as high as 65 to 75 mph being reported. Very large pine trees snapped and uprooted. Mobile home rolled on side. Power outages from downed trees.
November 14, 2020	High Wind	A strong and quick upper-level system moved across the region during this period, providing light snow with strong winds and blowing snow to the central mountains, and high winds to the Pikes Peak region and parts of the plains. The highest and most widespread reports of high winds occurred over the Pikes Peak region.
November 15, 2020	High Wind	Windy conditions occurred for the third day in a row across southern Colorado during mid-November. However, the strongest winds were isolated on this day and confined mainly to the Pikes Peak region.
December 22, 2020	High Wind	A quick moving upper-level system crossed the Rockies on this day, bringing very strong winds to all the higher terrain and parts of the I-25 corridor. This system also brought a quick blast of snow to the mountains. The higher wind gusts and this snow helped provide a setup for snow squalls, which were observed over parts of Chaffee county.
March 10, 2021	High Wind	Strong southwest flow aloft continued this day, with another day of high winds occurring across parts of southern Colorado. On this day, winds really strengthened and were the strongest of the past few days with gusts up to 60 to 70 mph observed across the eastern plains.

Date	Hazard	Event Narrative
March 29, 2021	High Wind	As flow aloft increased out ahead of an approaching system, strong downslope winds developed lee of the eastern mountains, especially lee of the Sangre de Cristo and Wet mountains. Further north across Pikes Peak and Rampart Range, strong winds slid down the lee slopes into extreme western El Paso county. Strongest winds during this period were in the 70 to 80 mph range.
July 14, 2020	Hail	During the afternoon hours of July 14th, scattered thunderstorms, including a few supercells, developed across eastern El Paso County. As this activity shifted eastward, they began to intensify and grow upscale into a larger thunderstorm complex. A series of supercells moved through Bent, Prowers, and Baca Counties producing a large non-damaging tornado, large hail, and damaging wind gusts.
May 2, 2021	Hail	Isolated to scattered thunderstorms developed over portions of the I-25 corridor in El Paso and Pueblo Counties during the afternoon and then spread eastward to southeastward across the Highway 50 corridor through the evening. Some of the thunderstorms were strong to severe, with the more intense storms producing large hail of 1-2 inches in diameter and damaging wind gusts of 60-70 mph. Additionally, a tornado and wind gusts up to around 90 mph were observed across the eastern plains on this day.
May 14, 2021	Hail	An upper-level disturbance moving across the region along with increasing moisture at the surface allowed thunderstorms to develop across the plains on this day. Severe storms did occur, primarily across the eastern plains, with large hail up to two inches being observed.
May 17, 2021	Heavy Rain	A large upper-level system moved across the region during this time, providing widespread precipitation to much of southern Colorado. While a few severe reports consisting of large hail were observed, the main hazards were heavy rainfall with flash flooding. With the arrival of colder air, snow was also observed over and near the mountains. Heavy rain of 1.49 inches, City of Manitou Springs. Heavy rain of 1.89 inches, 2 miles northwest City of Manitou Springs. Heavy rain of 1.95 inches, 2 miles south southwest City of Manitou Springs.
May 28, 2021	Hail	Isolated thunderstorms occurred on this day, mainly staying confined to the higher terrain. However, a few storms moved away and into adjacent locations, and with a stronger storm producing one inch hail across the Pikes Peak Region.
May 29, 2021	Hail	Thunderstorms developed across the Pikes Peak region and plains on this day along a surface low and boundary extending from around Teller County southeast through Las Animas County. This served as a focus for severe thunderstorms, with large hail up to one and a half inches noted across the Pikes Peak region, and a tornado observed across Las Animas County.
June 19, 2021	Hail	Increases in moisture and instability led to a higher coverage of strong to severe storms across the plains on this day. Winds and hail were the main thunderstorm risks as storms moved off the mountains and into the plains during the afternoon and evening hours.

Date	Hazard	Event Narrative
June 24, 2021	Thunderstorm Wind	An embedded mid-level disturbance helped to develop showers and storms across the region through the early evening on this day, with strong to severe storms occurring across El Paso County through the far southeast plains. In this location high instability and strong forcing provided a setup for large hail and damaging winds to occur. The largest hail of 4 inches occurred across Kiowa county.
July 1, 2021	Hail	The setup on this day supported another summer day with possible flash flooding over and near the mountains, though the setup did also support severe thunderstorm development as the activity pushed off the mountains into a more unstable air over the plains. This indeed did occur, with flash flooding and severe storms being observed from the Upper Arkansas River Valley down along the Highway 50 corridor and into the Pueblo area.
July 3, 2021	Hail	Isolated showers and storms occurred along the I-25 corridor during the afternoon on this day, especially around and north of Pueblo. There was additional development across the eastern plains, but both areas only observed isolated severe storms.
July 31, 2021	Heavy Rain	The combination of the monsoon plume and moist low level upslope flow allowed for thunderstorms with heavy rainfall and flash flooding to occur on this day across the region. The highest concern for flash flooding was over the mountains and I-25 corridor region, but later in the evening, additional flash flooding occurred along and south of Highway 50. Streets were flooded, and vehicles were stranded. Heavy rainfall of 3.22 inches.
August 1, 2021	Heavy Rain	Widespread moderate to heavy rainfall occurred across much of the eastern mountains and adjacent locations along the I-25 corridor on this day. Rainfall as high as 2 to 5 inches was observed in many locations, with flash flooding occurring across parts of Pueblo county. Heavy rainfall of 3.49 inches.
August 12, 2021	Hail	Isolated to scattered thunderstorms occurred across the lower elevations of southern Colorado on this day, with a few large hail reports noted with the stronger storms.
September 3, 2021	Heavy Rain	Isolated to scattered showers and thunderstorms occurred across the central mountains and into the Pikes Peak region during this period, with rainfall amounts generally staying on the lighter side. A few higher amounts above one inch were observed across the Pikes Peak region though. Heavy rainfall of 1.33 inches.
September 12, 2021	Funnel Cloud	Scattered storms were possible over and near the mountains, northern El Paso county, and far eastern plains on this day. Widespread severe weather was not expected; however, a few stronger storms did develop and one storm across El Paso County did produce a funnel cloud. Pilot reported funnel cloud on their way into City of Colorado Springs airport but could not be seen from the ground.
September 14, 2021	Hail	Scattered thunderstorms, some strong to severe, occurred over the plains. The strongest storms developed around midafternoon through mid-evening and produced hail up to 1.25 inches and wind gusts of 60 to 70 mph. Winds of 50 mph or greater were also observed.

Date	Hazard	Event Narrative
October 13, 2021	High Wind	Snow, heavy at times, occurred across the central and southwest mountains on this day while damaging winds along with high fire danger was noted across much of the plains and San Luis Valley. Highest wind gusts were up to around 60 mph. A few thunderstorms also occurred, mainly over the far eastern plains, though there was not any damage observed from these storms.
October 19, 2021	High Wind	An upper-level system moved across the region and provided snow and high winds across southern Colorado. The strongest winds on this day were primarily observed over and near the mountains, especially the southern mountains.
December 15, 2021	High Wind	A potent upper-level system and surface low approached the region late in the day on the 14th and then lifted across Colorado during the day on the 15th. As the system moved overhead a strong upper-level jet of 120-knot moved from southwest to northeast across the region, from the San Luis Valley eastward into the eastern Colorado plains. This setup favored heavy mountain snow across the Continental Divide, primarily the eastern San Juan mountain. Meanwhile, lighter amounts of snow were observed across the central and eastern mountains. As this system pivoted across the region, the strength of this system and some weak instability supported the development of snow squalls from the Continental Divide east into parts of the I-25 corridor. The strong jet moving across the region as well as mountain wave action produced widespread extreme winds over much of southern Colorado. The very dry/drought conditions in place and the extreme winds then produced widespread blowing dust over much of the plains.||High/Extreme fire danger was also noted given the strength of the wind field and falling RH values, falling well into the teens, when combined with gusts over 70 MPH. Numerous grass and prairie fires occurred caused by falling power lines. Report of 7 car windows parked at Garden of the Gods that have been blown out. Trained spotter el28 called to report wind damage, and antenna tower was blown down at site. Three-inch tree limbs broken with power poles broken.
December 26, 2021	High Wind	A very active pattern continued across southern Colorado during this period, with multiple upper-level disturbances moving across the region. This supported another long period of damaging winds and heavy snow. Highest wind gusts were in the 70 to 90 mph range, with a 101-mph wind gust observed near Monarch Pass. The heavy snow was not too widespread, though Wolf Creek Pass did observe a total storm of 40 inches.
December 30, 2021	High Wind	An upper-level system approaching from the west supported a period of mountain snow, especially over the San Juan Mountains and Continental Divide. Additionally, the increasing wind field provided isolated damaging winds across the Pikes Peak region. Highest gusts in this location were in the 60 to around 70 mph range.
January 4, 2022	High Wind	Low pressure swept across eastern Colorado on January 4th producing strong westerly winds in its wake. Several 60+ MPH wind gusts were reported across the region.

Date	Hazard	Event Narrative
March 23, 2022	High Wind	A strong upper-level system moved across the region and supported high winds over much of the planes during this period. Strongest gusts up to 70 mph were observed across the Pikes Peak region, with winds gusting to 60 to 65 mph elsewhere across the plains.
April 5, 2022	High Wind	A strong upper-level system once again moved across the region during this time, providing a set up for very strong winds to develop. Highest winds were observed across the higher terrain; however, high winds were also noted near the I-25 corridor.
April 29, 2022	High Wind	A strong system once again moved across the region and provided high winds across southern Colorado. Highest winds up to 70 mph over the plains did produce blowing dust, with near zero visibility observed at times. Extremely critical fire weather conditions were also observed on this day, with the most dangerous conditions observed across the Interstate 25 corridor and the southeast plains.
May 9, 2022	High Wind	A very active period in terms of well above normal temperatures with high fire danger, and damaging winds with blowing dust occurred across much of southern Colorado during this time frame. Multiple days with high winds up to 80 90 mph were observed.
May 12, 2022	High Wind	A strong system moving across the region assisted with a short window of localized southwest to west winds gusting to around 60 to 65 mph during the morning hours. Tree snapped at base, 12 inches in diameter.
May 16, 2022	Thunderstorm Wind	Isolated strong to severe thunderstorms occurred across the southeast plains in the evening, with strong winds to 65 mph the main risk on this day.
May 27, 2022	Thunderstorm Wind	Isolated thunderstorms were observed on this day, mainly over the mountains and I-25 corridor. A few of these thunderstorms across the Pikes Peak region and I-25 corridor did produce wind gusts up to 60 to 70 mph.
April 12, 2022	High Wind	A strong system moving across the region brought high winds to much of southern Colorado. While it was windy everywhere on this day, the strongest winds of 80 to 90 mph occurred over the southern I-25 corridor from just south of Pueblo down to the New Mexico border.
April 23, 2022	High Wind	Another strong system moved across the region, providing a long period of high winds over much of southern Colorado during this period. While high winds up to around 80 mph were the main concern, several hazards ranging from high winds and extreme fire danger to a localized severe thunderstorm risk across the southeast plains, to snow and blowing snow across the central mountains were observed.
June 6, 2022	Hail	Strong to severe storms developed along the foothills and Palmer Divide in eastern Colorado and moved south-southeast out across the plains. Storms quickly became severe, moving off the higher terrain onto the warm and moist plains producing intense rainfall rates, flash flooding, and large damaging hail through the late evening hours.

Date	Hazard	Event Narrative
June 7, 2022	Hail	A more significant and widespread day of severe weather occurred across much of southeastern Colorado during the afternoon and evening of June 7th. Numerous reports of large damaging hail, funnel clouds, and tornadoes occurred across the region. Cocorahs spotter measured 1.63-inch hail with earlier severe storm.
July 6 – 7, 2022	Heavy Rain	Thunderstorms developed in the afternoon over and near the higher terrain, with an initial risk of strong to severe storms in the Pikes Peak region. This risk then spread into the eastern plains along the Highway 50 corridor later in the evening, where large hail damaging wind gusts up to around 75 mph, localized flash flooding, and even a tornado occurred. Heavy rainfall of 1.17 inches.
July 10, 2022	Thunderstorm Wind	Isolated showers and thunderstorms across the higher terrain pushed into the I-25 corridor in Pueblo and El Paso Counties through early in the evening. A stronger storm did occur in El Paso County, and produced wind gusts up to around 65 mph.
July 14, 2022	Thunderstorm Wind	Isolated thunderstorms developed across the Pikes Peak region on this day and then moved into the I-25 corridor in the evening. While most storms were sub severe, an isolated wind gust to 58 mph was observed near the U.S. Air Force Academy.
July 19, 2022	High Wind	Showers and thunderstorms initially developed over the higher terrain and as they moved into the I-25 corridor, some increase in intensity was observed. This was evident across El Paso county, where an isolated severe wind gust to 70 mph occurred. Wind gust from a collapsing shower moving across the City of Colorado Springs airport.
July 20, 2022	Thunderstorm Wind	Showers and thunderstorms occurred over and near the higher terrain as well as into the I-25 corridor during the afternoon and evening. An isolated wind gust to 58 mph occurred across southern El Paso county, along with a localized heavy rainfall report near the Wet Mountains.
July 25, 2022	Flood	Thunderstorms occurred once again on this day, though coverage was lower. Large hail was observed, however, heavy rain with localized flooding were the main hazards. Minor flooding of roads reported in the Security and Widefield area.
July 26, 2022	Thunderstorm Wind	Showers and thunderstorms, some strong, occurred over the higher terrain and adjacent plains during the evening time frame. Most storms were focused along the I-25 corridor, where heavy rain caused flash flooding in several locations in El Paso and Pueblo Counties. Cars stuck in the road at South Academy and Astrozone. Roads flooded near Don Juan Street and Platte Avenue. Significant flooding. A creek normally three feet wide and four inches deep is running forty plus feet wide and at least three feet deep. A road washed out between Town of Calhan and Town of Ramah. Heavy rainfall of 2.50 inches. Storm total so far in the last hour. Street and curbside flooding in the area. Two barn structures were destroyed.

Date	Hazard	Event Narrative
July 29, 2022	Heavy Rain	Isolated strong thunderstorms developed late in the day and into the evening across parts of northern El Paso County. Heavy rain with localized flooding were the main hazards, especially on the east side of City of Colorado Springs and near the Palmer Divide. Peyton Highway flooded five miles north of Peyton. Intersection of Meridian and Londonderry flooded 6-8 inches deep. Wooten Road flooded just north of Platte Avenue. Heavy rainfall of 2.50 inches.
August 6, 2022	Heavy Rain	Late afternoon thunderstorm activity pushed off the Palmer Divide moving east-southeast across the Colorado plains. Numerous flash flooding events, severe thunderstorms, winds and some damages were reported across the region. Heavy rain was reported, 3 inches.
August 15, 2022	Heavy Rain	A few strong to severe storms developed right along the Palmer Divide in northern El Paso County during the afternoon of August 15th. As the storms slowly drifted east-southeast, they became severe, producing large damaging hail and pockets of flash flooding. Flash flooding with water flowing over the road at the intersection of Sweet Road. and Peyton Hwy. Trained spotter called in to report flash flooding 3 miles west of Town of Calhan with approximately 1.5 to 2 inches fallen in the past hour. Recorded 1.7 inches of rain in an hour.
October 23, 2022	High Wind	An extended period of high winds were observed across much of southern Colorado during this time frame. The first part of this period was due to a mountain wave over the foothills of the eastern mountains, with a more widespread high wind event then occurring over the southern San Luis Valley and the eastern plains.
December 2, 2022	High Wind	A dangerous wind event occurred during this period, affecting much south central and southeast Colorado. While most of the higher terrain was impacted, these stronger winds did impact much of the southern I-25 corridor and plains. Highest wind gusts during this period were in the 80 to 100 mph range, with a report of 105 mph observed across Cheyenne Mountain. Concrete shingles blown off of the house and scattered across the lawn. Large tree on home in Broadmoor area. Semi blown over on I-25, in the vicinity of the U.S. Air Force Academy overlook.
January 11, 2023	High Wind	High winds occurred across the southeast mountains during this period, with gusty winds observed over much of southern Colorado. Isolated stronger wind gusts, ranging from 60 mph to 75 mph, were observed over portions of the I-25 corridor.
March 31, 2023	High Wind	Another day of windy conditions across southern Colorado, especially over the eastern plains where winds gusting to 70 mph were observed.
May 26, 2023	Tornado	Ample low-level moisture aided in creating an incredibly unstable environment with enough wind shear to create severe thunderstorms and some landspout tornadoes.

Date	Hazard	Event Narrative
June 12, 2023	Heavy Rain	Yet another closed low pressure center formed over southern California advecting Pacific based moisture towards southern Colorado. There was a record 2-day amount of rain that fell at the City of Colorado Springs Airport. There was also a single day amount over 5 inches reported in El Paso County. Reports of flash flooding burdened El Paso, Pueblo, and Fremont Counties. Poor drainage caused flash flooding. Reported by trained spotter. Law enforcement reported on B street in City of Colorado Springs. Water rescues are located on Hiawatha Drive in City of Colorado Springs. There was 3.93 inches of rain reported.
June 16, 2023	Heavy Rain	The continued deluge of heavy rain, severe thunderstorms, flash flooding, and tornadoes continue over southern Colorado by, yet another closed low located over southern California. The largest hail stone was 4 inches as reported by law enforcement and emergency management located in Baca County. Heavy rains continue over the I-25 corridor, with multiple reports of additional flooding in El Paso and Pueblo Counties.
June 22, 2023	Tornado	Exceptionally severe weather continues over southern Colorado with the continued deluge of moist air coming from the Pacific and remnant moisture from previous moisture from widespread heavy rainfall. The most notable weather feature was an EF3 tornado that hit a farm located in Prowers County. This was only the 3rd EF3 tornado recorded since National Weather Service (NWS) modernization in 1995. There was at least a foot of water reported over the road by a trained spotter. There was 1.98 inches of rain that fell within two hours. A brief cone tornado formed for around 2 minutes. The tornado hit a small fall located in northeastern El Paso County. Picture reveal minimal damage on weak structures. WCM called the farm to discuss damage with them and conducted a virtual damage survey revealing EF0 damage.
July 7, 2023	Heavy Rain	Residual moisture from an incredibly anomalously wet June continues to moisten the lower levels aiding in ample amounts of instability. The northwest flow pattern created a lot of shears, which led to prolonged 3 day severe weather event over adjacent and eastern plains of southern Colorado.
July 15, 2023	Hail	The continuations of hail, wind, and tornadoes continue through mid-July as northwesterly upper-level flow develops once again over southern Colorado. Anomalous amounts of low-level moisture remain over the region due to record breaking precipitation in June and an active early July. Enhanced wind shear due to the upper-level northwesterly flow created an environment conducive to severe thunderstorms.
July 20, 2023	Heavy Rain	An upper-level high pressure center was located over central Arizona and central New Mexico which resulted in a favorable pattern for efficient diurnal wind fluctuations including upslope-oriented winds towards WFO Pueblo's eastern mountains. Weak waves embedded in the upper-level northwesterly flow enhanced the lift and the pattern enhanced the deep shear. The result was a very rare mountainous tornado that was observed at around 9,000 feet.

Date	Hazard	Event Narrative
July 31, 2023	Heavy Rain	Surface flow from the east advected amply amounts of low-level moisture which created another event where heavy rains, hail, and gusty winds were observed. Weak perturbations in the upper flow sparked thunderstorms across the region.
August 2, 2023	Thunderstorm Wind	Monsoon-like conditions existed over the western half of the US with some of the thunderstorms that developed over Pueblo's mountains developing into a better environment for severe weather.
August 5, 2023	Tornado	The one and only time this year was when there was a proper monsoonal tap over southern Colorado. In this case, there was weak northwesterly flow aloft, and southeasterly flow at the surface, which resulted in an unstable and high shear environment. There was almost a tornado that touched down; however, no reports of debris or damage were reported. Spotter reported a funnel cloud to the west beginning to appear, just to the north of Town of Monument. Trained spotter saw the tornado on the ground around 3 to 4 miles north of his location.
September 11, 2023	Heavy Rain	Heavy rain primarily impacted the I-25 corridor in southern Colorado. No reports of flash flooding.
October 2, 2023	Thunderstorm Wind	A few high based thunderstorms developed over southern Colorado during the first two days of October and produced severe wind gusts.
December 2, 2023	High Wind	A prolonged period with a long wave trough developed over Colorado at the beginning of December. At the beginning of the events and enhanced jet streak oriented from the SW to the NE formed over southern Colorado, which produced High Wind Warning Criteria winds. The lower elevations did not see much for snow, at most 5 inches, but the mountains produced magnitudes of around 1 foot and more. There was 4 inches of snow that fell.
January 8, 2024	High Wind	The closed low dug down in a deep trough across the Rocky Mountains and SE Colorado. This brough more widespread heavy snow and strong winds to the forecast area. There was 6.2 inches of snow that fell.
February 11, 2024	Heavy Snow	An upper trough moved into the area and combined with a good tap of moisture from the southwest to cause snowfall across the area. There was 13.5 inches of snow measured.
February 26, 2024	High Wind	Strong winds mixed down to the surface from a maximum within the subtropical jet. This resulted in strong, gusty winds across the forecast area. Shortly after, an upper-level trough moved down from the Pacific Northwest. The two systems merged and led to strong wind and snow over and near higher terrain. There was 6.0 inches of snow measured. The gust of 66 mph was measured at the City of Colorado Springs Airport ASOS (COS).
April 6 – 7, 2024	High Wind	A strong low-pressure system oriented the upper-level jet streak to be from the southwest to northeast with magnitudes around 130 knots. This meteorological set-up is commonly associated with strong winds at the surface.

Date	Hazard	Event Narrative
May 15, 2024	Hail	A boundary pushing through southeast Colorado produced a few high based thunderstorms late in the day. Some of these storms became strong to severe, resulting in hail up to an inch in diameter and even one report of a funnel cloud. Picture of 1 inch diameter hail from social media.
May 20, 2024	Hail	A broad trough moving over southeast Colorado, with enough synoptic forcing, produced some stronger to severe thunderstorms along portions of the I-25 corridor and mainly over El Paso County. A trained spotter reported hail of 1.5 inches in diameter.
May 31, 2024	Hail	A very dynamic pattern within a longwave trough allowed for a series of major shortwave troughs to propagate over Colorado. This allowed for several days of severe thunderstorms. Severe thunderstorms were fueled by the conditionally unstable environment with sufficient forcing, high amounts of mid-level moisture, high levels of buoyancy (CAPE), steep lapse rates, and effective bulk shear. This resulted in reports of large hail (more than 2 inches), severe wind gusts of greater than 50 kts, and even a few land spouts/funnel clouds. A source via amateur radio reported hail of 1.25 inches in diameter.
July 20 – 21, 2024	Flash Flood	Heavy rainfall and flash flooding on July 20 and 21 in El Paso and Pueblo Counties. Video shared on social from a social media partner of flash flooding/rushing water across roadway on Wooten Road near E Platte Ave in City of Colorado Springs.
July 3, 2024	Hail	Westerly flow-initiated thunderstorms over region bring severe wind and hail to the eastern plains. Picture of hail measuring 1.65 inches in diameter via social media.
July 7, 2024	Hail	Northwest flows blossom hailstorms. Hail measured to 1 inch fell southeast of Peterson AFB.
July 16, 2024	Thunderstorm Wind	Scattered thunderstorms developed within northwesterly flow, causing strong outflow winds and wind damage. Asos station KCOS City of Colorado Springs airport measured 59mph wind gust.
August 1, 2024	Hail	An upper-level trough transitioning over Colorado on the 1st of August provided enough instability for there to be the development of scattered strong to severe storms over Teller/El Paso counties by late in the afternoon and through the evening, resulting in several cases of severe hail reported. Members from other Federal Agency reported hail of 1.5 inches in diameter.
August 9, 2024	Heavy Rain	An upper-level pattern which allowed for a sufficient mid-level monsoonal moisture plume to be established over the region aided in the development of storms, which produced heavy rainfall and lead to some heavy amounts of rain and minor flash flooding from the 7th thru 10th of August. A severe storm which developed over Teller County also allowed for a rare tornado to occur over high terrain, just NNE of Cripple Creek, on the 9th of August. Public Report from mPING: Street/road flooding; Street/road closed; Vehicles stranded. A trained spotter reported 0.63 inches of rain from a thunderstorm in a short period of time.

Date	Hazard	Event Narrative
August 12, 2024	Heavy Rain	With a mid-level monsoonal moisture plume already in place, and a passing shortwave trough in the upper levels, a few strong to severe storms developed over portions of the plains from the 12th thru 13th of August and also resulted in some heavy amounts of rain over El Paso County. A wet microburst from a thunderstorm also produced wind damage around the city of Pueblo due to brief gusty winds being greater than hurricane force. A public source reported heavy rain with a total amount of 1.5 inches in a short period of time due to a strong storm.
August 19, 2024	Thunderstorm Wind	An active upper-level pattern with a series of shortwave troughs moving over the region throughout the course of the week produced several days of strong to severe thunderstorms over the region. A trained spotter reported hail of 2 inches in diameter via social media with picture. A public source reported 1.50 inches of rain, which fell in a short period of time, and was produced by a strong thunderstorm.
September 7, 2024	Hail	Northwest flow over the area allowed for strong to severe storms to materialize, some of which produced large hail.
September 17, 2024	Thunderstorm Wind	A closed low ejecting to the northeast brought a line of storms that produced widespread severe wind gusts across the plains along and east of the I-25 corridor. There was a 65-knot wind gust reported at location.
December 18, 2024	High Wind	A fast-moving upper trough passed through Colorado, and with strong northwest flow aloft came a few gusty surface wind reports. A wind gust of 67 MPH was measured at a station 3 miles SSW of Air Force Academy.
December 29 – 30, 2024	High Wind	A broad upper trough passed through the region in the last several days of December, bringing a jet maximum overhead. These strong winds were felt across parts of the area, while minor snow accumulations were noted over the higher terrain. A wind gust of 69 MPH was measured.

Source: FEMA, 2025

17.1.5 PROBABILITY OF FUTURE OCCURRENCES

Information on previous lightning occurrences in the County was used to calculate the probability of future occurrence of such events. Table 17-4 lists the number of events from various sources over the 71-year period from 1954 to 2025, which is the most complete period of record for all sources reviewed. Based on these records and input from the Steering Committee, the probability of occurrence for lightning in the County is considered “frequent.”

17.1.6 CASCADING IMPACTS ON OTHER HAZARDS

The most significant secondary hazards associated with lightning strikes are wildfire and power outages.

Table 17-4. Probability of Future Lightning Events in Pikes Peak Region

Hazard Type	Number of Occurrences Between 1954 and 2025	% Chance of Occurring in Any Given Year
Lightning	50	100%

Source: NOAA-NCEI, 2025

Note: 100% probability indicates that it is statistically likely for an event to occur every year. It does not indicate that the occurrence of an event is a certainty in any given year.

17.2 VULNERABILITY AND IMPACT ASSESSMENT

All El Paso County is at risk from the impacts of lightning. A qualitative analysis was conducted to assess the County's vulnerability to this hazard of concern.

17.2.1 LIFE, HEALTH, AND SAFETY

Overall Population

It can be assumed that the entire planning area is exposed to some extent to lightning strikes. Certain areas are more exposed due to geographic location and local weather patterns, such as the northwestern portion of the County. All populations are vulnerable to lightning strikes; however, those working or recreating outdoors are more vulnerable.

The entire extent of El Paso County is exposed to some degree of lightning hazard, though exposed points of high elevation have significantly higher frequency of occurrence. Lightning has the potential to injure or kill people and damage structures either directly or by subsequent wildfire. Communications systems are also at risk. The Pikes Peak Region is certainly vulnerable to future lightning strikes judging by historical evidence. As a gateway into National Forest Land, the vast recreation opportunities in and around region place hikers, bikers, campers, among others at risk during major electrical storms.

Although the frequency of lightning events is relatively high, the magnitude is limited. Generally, damage is limited to single buildings and in most cases, personal hazard insurance covers any losses. Lightning can cause deaths, injuries, and property damage; including damage to buildings, communications systems, power lines, and electrical systems. However, the number of reported casualties and infrastructure losses from lightning is likely to be limited. The relationship of lightning to wildfire ignitions in the County increases the significance of this hazard.

Socially Vulnerable Population

Lightning often poses overlooked impacts on socially vulnerable populations including the elderly, people with disabilities, children under the age of 5 years, and those living in poverty. These groups may face heightened exposure due to limited access to safe shelter, inadequate housing, or reduced mobility during storms. For example, elderly individuals or those with disabilities may struggle to seek immediate shelter. Children under the age of 5 years may be more exposed during outdoor activities. People living in poverty often reside in inadequate housing that lacks proper

grounding or lightning protection systems which can increase the risk of injury or property damage. Also, limited access to emergency services and public awareness campaigns can delay timely responses and recovery efforts. In return this may intensify the long-term impacts of lightning-related hazards on these communities

17.2.2 GENERAL BUILDING STOCK

Lightning can have severe impacts on the general building stock of the County, particularly in areas that experience frequent thunderstorms. When lightning strikes a building it can cause fires, structural damage, and power surges that destroy electrical systems and utilities. Additionally, older buildings may lack proper lightning protection systems, such as grounding rods or surge protectors, and are especially vulnerable to lightning hazards. In densely populated areas a single lightning-induced fire can spread rapidly which can increase the risk of widespread property loss. Repeated lightning exposure can also degrade roofing materials and other structural components over time which can lead to higher maintenance costs and insurance costs.

17.2.3 COMMUNITY LIFELINES AND OTHER CRITICAL FACILITIES

Limited interruption of essential facilities and services for less than 24 hours. All critical facilities are likely exposed to risks associated with lightning strikes. The most common problem associated with lightning is loss of power. Phone, water, and sewer systems may not function. Loss of electricity and phone connection would leave certain populations isolated because residents would be unable to call for assistance

17.2.4 ECONOMY

There is no major direct impact that lightning has on the economy. However, secondary impacts could occur. If a severe lightning event causes fire, there is a possibility for property loss and increased costs to restore the areas impacted.

17.2.5 ENVIRONMENT

The environment is highly exposed to lightning strikes. Most lightning strikes will damage limited areas. However, lightning strikes commonly spark wildfires; thus, greatly expanding the area impacted.

17.2.6 HISTORIC AND CULTURAL RESOURCES

Lightning can impact the historic and cultural resources of El Paso County especially due to the region's high frequency of lightning strikes, with an average of over 50 events annually (HazardDB 2024). Many of the historic structures within the County, such as those located in Old Colorado City and City of Manitou Springs, are constructed from older materials that may lack lightning protection systems. This makes it especially vulnerable to fire and structural damage. Other cultural landmarks such as historic churches, museums, and military heritage sites like those near Peterson and Falcon Air Force Bases also face risks from electrical surges and fires caused by

lightning (Anderson 1991). The loss or damage of such irreplaceable assets can negatively impact on the County's cultural identity and impact tourism and community heritage. As climate change shifts and lightning activity increases, proactive measures to preserve and mitigate will be essential to protect these valuable resources.

17.3 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

17.3.1 LAND USE AND DEVELOPMENT

All future developments will be affected by lightning; however, impacts are likely to be highly localized. Most structures built to International Building Code are able to withstand the impact of lightning; however, lightning strikes are capable of sparking structure and wildfires. Lightning rod/grounding systems can improve the performance of a building during such an event. Fire codes in place result in less structure damage caused by lightning-sparked fires. Increasing population growth and development increases vulnerability to lightning.

17.3.2 PROJECTED CHANGES IN POPULATION PATTERNS

The County population is projected to increase by over 32 percent by 2050. Table 3-7 summarizes recent and projected future changes in county population. Between 2010 and 2025 alone, the County population rose by nearly 21 percent. With this increase in population, the risk to lightning has also increased. More people residing and living in the County directly increases the exposure to lightning hazards in the event it may occur. Additionally, an increase in projected populations in the future will also indicate an increase in lightning risk. It is critically important that the County plans for and mitigates against lightning and other associated hazards for the current population and the projected new population in the future.

17.3.3 CLIMATE CHANGE

Climate change presents a significant challenge for risk management associated with severe weather. The frequency of severe weather events has increased steadily over the last century. Historical data shows that the probability of severe weather events increases in a warmer climate. The changing hydrograph caused by climate change could have a significant impact on the intensity, duration and frequency of storm events. All these impacts could have significant economic consequences. A study by Colin Price analyzed likely impacts of climate change on lightning strikes and concluded that Climate model studies show that in a future warmer climate there may be fewer, but more violent thunderstorms, "which may increase the amount of lightning by 10 percent for every one-degree global warming" (Price 2008).

17.3.4 OTHER IDENTIFIED CONDITIONS

Important issues associated with the lightning hazard in the planning area include the following:

- Effective public education lightning hazard campaigns to reduce injuries and fatalities.
- Lightning strikes are common in the Pikes Peak Region and cause limited property damage on a regular basis.

17.4 CONSEQUENCE ANALYSIS

Table 17-5 presents the results of the consequence analysis for the lightning hazard.

Table 17-5. Consequence Analysis for the Lightning Hazard

Category	Narrative
Hazard Description	Although lightning events occur relatively frequently, their overall magnitude is typically limited. Damage is generally confined to single buildings, and in most cases, personal hazard insurance covers any resulting losses. Lightning can cause fatalities, injuries, and property damage, including harm to buildings, communication systems, power lines, and electrical systems. It is also a known cause of forest and brush fires.
Impact on Property, Facilities, and Infrastructure	Lightning typically results in minimal property damage that does not threaten structural stability. However, it affects the entire planning area, including all above-ground structures and utilities. Assets located in areas with higher lightning flash counts are at greater risk. Property losses may occur when trees or rooftops are struck. Power outages can result from downed utility lines due to lightning or accompanying wind. Communication systems are also vulnerable. Damage to structures caused by lightning is usually covered by private insurance. Personal injuries may occur if individuals are outdoors during a lightning strike, and many injuries are the result of fires ignited by lightning.
Impact on the Environment	Lightning can negatively impact the environment by damaging sewer and wastewater treatment facilities. It can also ignite wildfires, which may displace wildlife and alter natural habitats.
Impact on Responders	Firefighters, police officers, and emergency responders are often called to areas affected by lightning to close roads, assist the injured, and manage traffic. Responders may be exposed to hazards while performing routine duties during a lightning event. Although most storm-related duties occur post-event, unsafe structural or environmental conditions may persist during the response period. Motorcycle officers are particularly vulnerable during lightning storms due to their exposure.

Category	Narrative
Impact on Continuity of Operations, Continuity of Government, and Delivery of Services	Lightning may cause interruptions to essential facilities and services for less than 24 hours. These disruptions may include limited loss of facility functionality, accessibility, or service delivery. Power outages are possible, especially in areas without adequate backup generation. PPROEM maintains the Continuity of Operations Plan and the Continuity of Government Plan for the County of El Paso and the City of Colorado Springs; other jurisdictions in the Pikes Peak Region are in the process of developing continuity plans and procedures.
Impact on the Public	Lightning can cause minor injuries and illnesses, and in severe cases, may result in fatalities. It can also damage structures directly or indirectly through wildfires. Communication systems are particularly at risk. Populations most vulnerable to lightning-related injuries include outdoor workers, recreationalists, and participants in outdoor sports. In the event of injuries or displacement, the American Red Cross may be called upon to provide shelters and medical assistance. The Humane Society of the Pikes Peak Region may provide shelter for animals, and members of Voluntary Organizations Active in Disasters (VOAD) may assist with recovery efforts.
Impact on the Economic Condition of the County	While lightning events are relatively frequent, their magnitude is generally limited. Damage is usually confined to individual buildings and is often covered by personal hazard insurance. However, extended power outages caused by lightning can delay work and disrupt business operations.
Impact on the Public Confidence in Government	Due to the rapid onset and short duration of lightning flashes, government response and recovery functions are typically limited beyond the initial actions taken by first responders. The nature of lightning events often restricts the scope of coordinated recovery efforts.

18. TORNADO

18.1 HAZARD PROFILE

18.1.1 HAZARD DESCRIPTION

Tornadoes are violently rotating columns of air, formed by a combination of atmospheric instability and wind shear. Instability occurs when warm, moist air is wedged under drier, cooler air aloft. This warm air rises, causing the intense updrafts and downdrafts seen in strong thunderstorms — the incubators of tornadoes. Wind shear refers to changes in wind direction and speed at different elevations in the atmosphere. The combination of instability and wind shear forms the rotating column of air that is associated with a tornado. Tornadoes that form over water are known as waterspouts. Tornadoes that do not reach the ground surface are simply referred to as funnel clouds.

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.

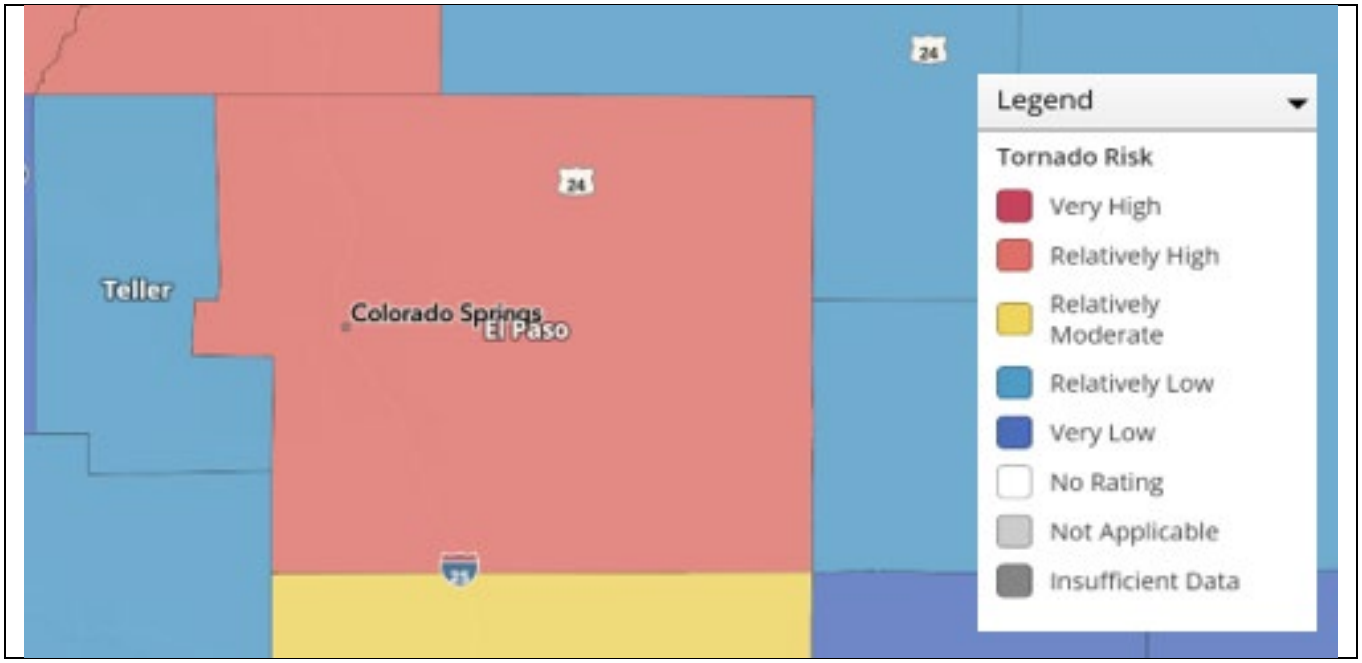
18.1.2 LOCATION

Tornadoes have been reported for nine months of the year in Colorado, with peak occurrences between mid- May through mid-August. June is the peak month for tornado activity in Colorado with May and July tied for second place. This is evident in the Pikes Peak region as well. Additionally, tornadoes in Colorado primarily occur between 11 AM and 11 PM with the main peak being between 2 PM and 7 PM (Colorado State - Colorado Climate Center 2024).

Figure 18-1 and Figure 18-2 illustrate the FEMA National Risk Index (NRI) maps for El Paso County for tornado hazard events. According to FEMA NRI, the entire County has a relatively high tornado risk. Figure 18-2 illustrates the NRI map by census tract view and shows a range of risk from relatively low to relatively high for portions of the County.

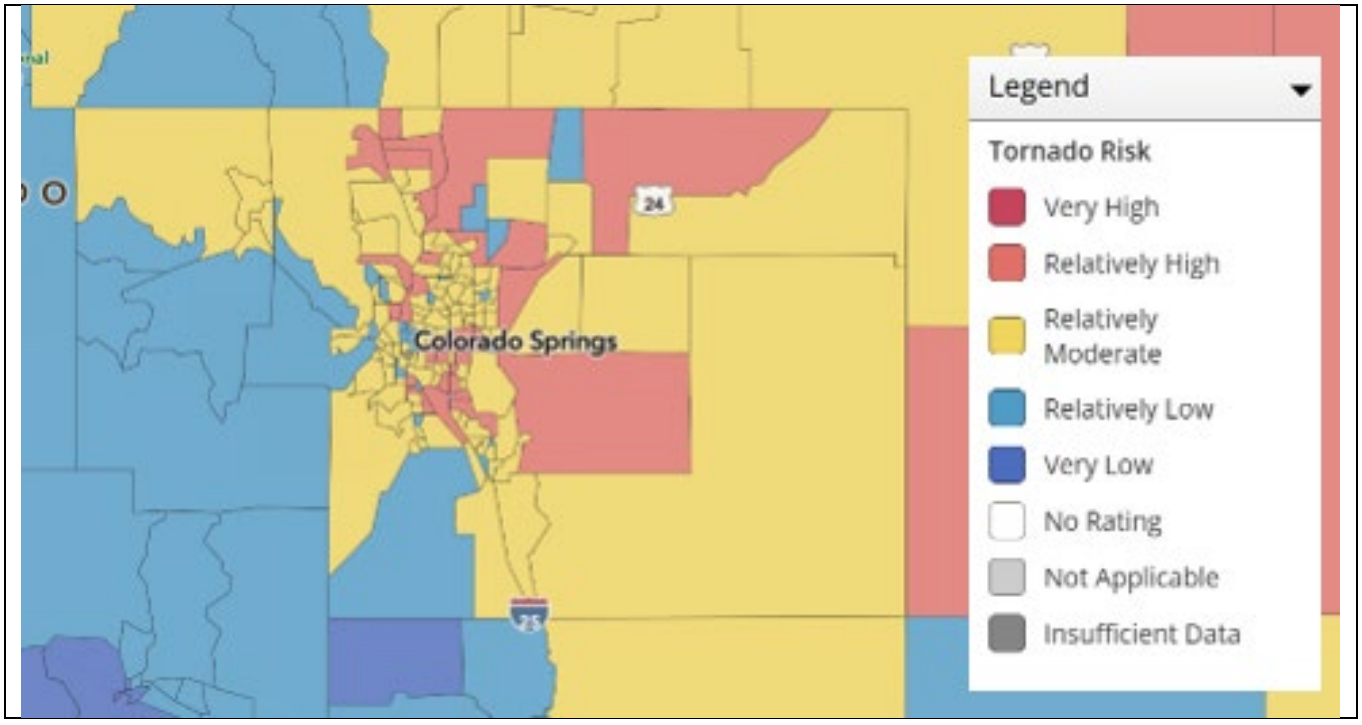
The topography of El Paso County limits the occurrence of most tornadoes to the central and eastern portion of the County. As an example, a tornado occurred on the western edge of the County in the mountains north of Town of Green Mountain Falls during the summer of 2007 (outside El Paso County in Teller County). Damage consisted of solely to forested areas. Most tornadoes occur to the east of City of Colorado Springs in the vicinity of Ellicott, Peyton, Town of Ramah, Town of Calhan, and Yoder.

Figure 18-1. FEMA National Risk Index Map for Tornado Hazard in El Paso County by County View



Source: FEMA NRI, 2025.

Figure 18-2. FEMA National Risk Index Map for Tornado Hazard in El Paso County by Census Tract View



Source: FEMA NRI, 2025.

18.1.3 EXTENT

Tornadoes are among the most dangerous types of local storms. Wind speeds can reach up to 300 mph, and they typically form within intense, rotating thunderstorms that may also produce large hail. Although they operate on a smaller scale than hurricanes, tornadoes can generate similar pressure differentials, making them extremely destructive. Fortunately, most tornadoes in Colorado are relatively weak, with wind speeds under 110 mph. Many occur in the rural areas of El Paso County. However, if a major tornado were to strike a populated area, the damage could be widespread—potentially resulting in business closures, fatalities, long-term displacement, and disruptions to essential services such as power and telecommunications.

Tornadoes were historically classified using the Fujita (F) Scale, which ranged from F0 to F6 and was based on observed damage to man-made structures. On February 1, 2007, the Enhanced Fujita (EF) Scale replaced the original system. The EF Scale offers a more accurate assessment of tornado strength by aligning wind speeds more closely with observed damage and modern building standards. It categorizes tornadoes into six intensity levels, providing a more reliable measure of surface wind speeds in severe events (see Table 18-1).

Table 18-1. Enhanced Fujita Scale

Enhanced Fujita Number	3-Second Gust (mph)
0	65-85
1	86-110
2	111-135
3	136-165
4	166-200
5	Over 200

Source: (NOAA 2007)

Warning Time

NOAA's storm prediction center issues tornado watches and warnings for El Paso County:

- Tornado Watch - Tornadoes are possible. Remain alert for approaching storms. Watch the sky and stay tuned to NOAA Weather Radio, commercial radio or television for information.
- Tornado Warning - A tornado has been sighted or indicated by weather radar. Take shelter immediately.

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

18.1.4 PREVIOUS OCCURRENCES

Federal Emergency Management Agency (FEMA) Disaster Declarations

Table 18-2 lists all tornado-related major disasters declarations that have included the Pikes Peak Region since 1953.

Table 18-2. Federal Emergency Management Agency (FEMA) Disaster Declarations for Tornado Events in the Pikes Peak Region

FEMA Declaration Date	Declaration Number	Description
June 19, 1965	DR-200	Tornadoes, Severe Storms, Flooding
August 25, 2023	DR-4731	Severe Storms, Flooding, and Tornadoes

Source: FEMA n.d.

State Emergency Proclamations

Between 2020 and 2024, the Pikes Peak Region was not included in any state emergency proclamation for a tornado-related event.

U.S. Department of Agriculture (USDA) Declarations

Between 2020 and 2024, the Pikes Peak Region was not included in any USDA drought-related agricultural disaster declarations.

All Recent Events

Table 18-3 lists major recorded tornado-related events that impacted Pikes Peak Region since the previous HMP was developed. For earlier events, refer to the previous HMP.

Table 18-3. Tornado Events in Pikes Peak Region (2020 to 2024)

Date	Hazard	Event Narrative
July 14, 2020	Hail	During the afternoon hours of July 14th, scattered thunderstorms, including a few supercells, developed across eastern El Paso County. As this activity shifted eastward they began to intensify and grow upscale into a larger thunderstorm complex. A series of supercells moved through Bent, Prowers, and Baca Counties producing a large non-damaging tornado, large hail, and damaging wind gusts.
May 2, 2021	Hail	Isolated to scattered thunderstorms developed over portions of the I-25 corridor in El Paso and Pueblo Counties during the afternoon and then spread eastward to southeastward across the Highway 50 corridor through the evening. Some of the thunderstorms were strong to severe, with the more intense storms producing large hail of 1-2 inches in diameter and damaging wind gusts of 60-70 mph. Additionally, a tornado and wind gusts up to around 90 mph were observed across the eastern plains on this day.
May 29, 2021	Hail	Thunderstorms developed across the Pikes Peak region and plains on this day along a surface low and boundary extending from around Teller County southeast through Las Animas County. This served as a focus for severe thunderstorms, with large hail up to one and a half inches noted across the Pikes Peak region, and a tornado observed across Las Animas County.

Date	Hazard	Event Narrative
June 7, 2022	Hail	A more significant and widespread day of severe weather occurred across much of southeastern Colorado during the afternoon and evening of June 7th. Numerous reports of large damaging hail, funnel clouds, and tornadoes occurred across the region. Cocorahs spotter measured 1.63-inch hail with earlier severe storm.
July 6 – 7, 2022	Heavy Rain	Thunderstorms developed in the afternoon over and near the higher terrain, with an initial risk of strong to severe storms in the Pikes Peak region. This risk then spread into the eastern plains along the Highway 50 corridor later in the evening, where large hail damaging wind gusts up to around 75 mph, localized flash flooding, and even a tornado occurred. Heavy rainfall of 1.17 inches.
May 26, 2023	Tornado	Ample low level moisture aided in creating an incredibly unstable environment with enough wind shear to create severe thunderstorms and some landspout tornadoes.
June 16, 2023	Heavy Rain	The continued deluge of heavy rain, severe thunderstorms, flash flooding, and tornadoes continue over southern Colorado by yet another closed low located over southern California. The largest hail stone was 4 inches as reported by law enforcement and emergency management located in Baca County. Heavy rains continue over the I-25 corridor, with multiple reports of additional flooding in El Paso and Pueblo Counties.
June 22, 2023	Tornado	Exceptionally severe weather continues over southern Colorado with the continued deluge of moist air coming from the Pacific and remnant moisture from previous moisture from widespread heavy rainfall. The most notable weather feature was an EF3 tornado that hit a farm located in Prowers County. This was only the 3rd EF3 tornado recorded since National Weather Service (NWS) modernization in 1995. There was at least a foot of water reported over the road by a trained spotter. There was 1.98 inches of rain that fell within two hours. A brief cone tornado formed for around 2 minutes. The tornado did hit a small area located in northeastern El Paso County. Picture reveal minimal damage on weak structures. WCM called the farm to discuss damage with them and performed a virtual damage survey revealing EF0 damage.
July 15, 2023	Hail	The continuations of hail, wind, and tornadoes continue through mid-July as northwesterly upper-level flow develops once again over southern Colorado. Anomalous amounts of low-level moisture remain over the region due to record breaking precipitation in June and an active early July. Enhanced wind shear due to the upper-level northwesterly flow created an environment conducive to severe thunderstorms.
July 20, 2023	Heavy Rain	An upper-level high pressure center was located over central Arizona and central New Mexico which resulted in a favorable pattern for efficient diurnal wind fluctuations including upslope-oriented winds towards WFO Pueblo's eastern mountains. Weak waves embedded in the upper-level northwesterly flow enhanced the lift and the pattern enhanced the deep shear. The result was a very rare mountainous tornado that was observed at around 9,000 feet.

Date	Hazard	Event Narrative
August 5, 2023	Tornado	The one and only time this year was when there was a proper monsoonal tap over southern Colorado. In this case, there was weak northwesterly flow aloft, and southeasterly flow at the surface, which resulted in an unstable and high shear environment. There was almost a tornado that touched down; however, no reports of debris or damage were reported. Spotter reported a funnel cloud to the west beginning to appear, just to the north of Town of Monument. Trained spotter saw the tornado on the ground around 3 to 4 miles north of his location.
March 24, 2024	Heavy Snow	During late March, yet another deep upper-level trough dug across the western US. This, along with a strong southwesterly flow from the subtropical jet, brought in sufficient moisture and synoptic/orographic lift for another round of snowfall for parts of SE Colorado. Additionally, the strong synoptic forcing and convective nature of parts of this system did allow for the formation of one landspout tornado on March 26th. There was 6.7 inches of snow measured.
August 9, 2024	Heavy Rain	An upper-level pattern which allowed for a sufficient mid-level monsoonal moisture plume to be established over the region aided in the development of storms, which produced heavy rainfall and lead to some heavy amounts of rain and minor flash flooding from the 7th thru 10th of August. A severe storm which developed over Teller County also allowed for a rare tornado to occur over high terrain, just NNE of Cripple Creek, on the 9th of August. Public Report from mPING: Street/road flooding; Street/road closed; Vehicles stranded. A trained spotter reported 0.63 inches of rain from a thunderstorm in a short period of time.

Source: NOAA-NCEI 2025.

18.1.5 PROBABILITY OF FUTURE OCCURRENCES

Information on previous tornado occurrences in the County was used to calculate the probability of future occurrence of such events. Table 18-4 lists the number of events from various sources over the 71-year period from 1954 to 2025, which is the most complete period of record for all sources reviewed. Based on these records and input from the Steering Committee, the probability of occurrence for tornado in the County is considered “frequent.”

Table 18-4. Probability of Future Tornado Events in Pikes Peak Region

Hazard Type	Number of Occurrences Between 1954 and 2025	% Chance of Occurring in Any Given Year
Tornado	60	100%

Source: NOAA-NCEI, 2025.

Note: 100% probability indicates that it is statistically likely for an event to occur every year. It does not indicate that the occurrence of an event is a certainty in any given year.

18.1.6 CASCADING IMPACTS ON OTHER HAZARDS

Tornadoes may cause loss of power if utility service is disrupted. Additionally, fires may result from damage to natural gas infrastructure. Hazardous materials may be released if a structure is damaged that houses such materials or if such materials are in transport.

18.2 VULNERABILITY AND IMPACT ASSESSMENT

All El Paso County is at risk from the impacts of tornadoes. A qualitative analysis was conducted to assess the County's vulnerability to this hazard of concern.

18.2.1 LIFE, HEALTH, AND SAFETY

Overall Population

It can be assumed that the entire planning area population, as listed in Table 3-5, is exposed to some extent to tornado events. Although, certain areas, such as the eastern portion of the County including the towns and communities of Town of Calhan (2023 population of 510) and Town of Ramah (2023 population of 130), are more exposed due to geographic location and local weather patterns.

Socially Vulnerable Population

Vulnerable populations such as the elderly, children below the age of 5 years, low income, disabled individuals, or linguistically isolated populations. These populations can face isolation and exposure after tornado events and could suffer more secondary effects of the hazard. Power outages because of tornadoes can be life threatening to those dependent on electricity for life support. Isolation of these populations is also a significant concern for emergency response efforts.

Additionally, socially vulnerable populations caught in the path of a tornado may be unable to seek appropriate shelter and are more at risk to loss of life and injury. This may include individuals who are out in the open, in cars, have mobility issues, or who do not have access to basements, cellars, or safe rooms.

18.2.2 GENERAL BUILDING STOCK

While all properties are at risk during tornado events, those that are already in poor condition or are in exposed or high-risk locations face the greatest potential for damage. Structural weaknesses and lack of proper maintenance, as well as proximity to open plains, can significantly increase the chances of complete destruction. As a result, these properties may require additional mitigation strategies and reinforcements to better withstand the impacts of tornado hazard events.

18.2.3 COMMUNITY LIFELINES AND OTHER CRITICAL FACILITIES

Tornadoes can cause significant damage to trees and power lines, blocking roads with debris, incapacitating transportation networks, isolating populations, and disrupting ingress and egress. Of

particular concern are roads providing access to isolated areas and to the elderly. Any facility that is in the path of a tornado is likely to sustain damage.

18.2.4 ECONOMY

Tornadoes have had an economic impact on El Paso County due to its location along the eastern plains where tornado activity is more frequent. Since 1950, the County has experienced 97 recorded tornadoes, resulting in approximately $9.7 million in property damage (Tornado Path 2025). The most financially damaging tornado was in 2001 when a tornado event caused $8.1 million in losses (Tornado Path 2025). While the frequency of tornadoes has decreased in the past decade, the economic impacts remain the same. Tornado hazard events not only damage homes and critical infrastructure but also disrupt local businesses, emergency services, and can exponentially slow economic growth of the County in impacted communities.

18.2.5 ENVIRONMENT

Environmental features are exposed to tornado risk, although damage is generally localized to the path of the tornado. If tornados impact facilities that store hazardous materials, areas impacted by material releases may be especially vulnerable.

18.2.6 HISTORIC AND CULTURAL RESOURCES

Tornadoes can threaten the historic and cultural resources of El Paso County which is home to many heritage sites including historic districts in City of Colorado Springs, military landmarks like Fort Carson, and other museums and cultural institutions. These resources are often built before modern building codes and are vulnerable to high winds and flying debris because of a tornado event. A direct tornado strike can also result in irreversible damage to architecture, artifacts, and archival materials which are irreplaceable. Even close-call events can cause cascading impacts such as water intrusion, roof damage, or structural weakening that disrupt the long-term preservation of these resources. The loss of such resources not only impacts the County's cultural identity but can also impact tourism and local economies that benefit financially from these resources.

18.3 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

18.3.1 LAND USE AND DEVELOPMENT

Continuing development pressures along the Front Range will likely increase the overall vulnerability to tornadoes. Building codes in place can reduce the overall impacts; however, significant tornadoes are unpredictable and are capable of destroying buildings with incredible

structural integrity. As the Region grows, development to the east, in lower elevations, will be particularly more vulnerable to tornadoes, as most of the tornados recorded in the County occurred farther away from the foothills.

18.3.2 PROJECTED CHANGES IN POPULATION PATTERNS

The County population is projected to increase by over 32 percent by 2050. Table 3-7 summarizes recent and projected future changes in county population. Between 2010 and 2025 alone, the County population rose by nearly 21 percent. With this increase in population, the risk to tornado has also increased. More people residing and living in the County and tornado areas directly increases the exposure to this hazard in the event it may occur. Additionally, an increase in projected populations in the future will also indicate an increase in tornado risk. It is critically important that the County plans for and mitigates against tornado hazards for the current population and the projected new population in the future.

18.3.3 CLIMATE CHANGE

Climate change impacts on the frequency and severity of tornadoes are unclear. According to the Center for Climate Change and Energy Solutions, "Researchers are working to better understand how the building blocks for tornadoes -- atmospheric instability and wind shear -- will respond to global warming. It is likely that a warmer, moister world would allow for more frequent instability. However, it is also likely that a warmer world would lessen chances for wind shear. Recent trends for these quantities in the Midwest during the spring are inconclusive. It is also possible that these changes could shift the timing of tornadoes or regions that are most likely to be hit" (Center for Climate and Energy Solutions n.d.).

18.3.4 OTHER IDENTIFIED CONDITIONS

Important issues associated with a tornado in the planning area include the following:

- Older building stock in the planning area is built to low code standards or none at all. These structures could be highly vulnerable to tornadoes. Redundancy of power supply must be evaluated.
- The capacity for backup power generation is limited.
- Roads and bridges blocked by debris or otherwise damaged might isolate populations.
- Warning time may not be adequate for residents to seek appropriate shelter or such shelter may not be widespread throughout the planning area.
- The impacts of climate change on the frequency and severity of tornadoes are not well understood.

18.4 CONSEQUENCE ANALYSIS

Table 18-5 presents the results of the consequence analysis for the tornado hazard.

Table 18-5. Consequence Analysis for the Tornado Hazard

Category	Narrative
Hazard Description	Most tornadoes in Colorado are relatively weak, with wind speeds below 110 miles per hour. Many of these tornadoes occur in rural areas of El Paso County. However, if a tornado were to touch down within city limits in a densely populated area, the resulting damage could be devastating.
Impact on Property, Facilities, and Infrastructure	Tornadoes can cause significant damage to structures, trees, utilities, crops, vehicles, and any unsecured property. They affect the entire planning area, including all above-ground structures and utilities. Due to their erratic movement, tornadoes often cause destruction in seemingly random patterns, making it difficult to identify specific hazard zones. With advance warning, individuals can evacuate to safe rooms or move to structurally sound areas within buildings. Basements are considered one of the safest places to shelter during a tornado. Tornadoes may also impact water treatment facilities, government buildings, public safety infrastructure, and healthcare services.
Impact on the Environment	Tornadoes can cause significant environmental damage, particularly through the destruction of trees and vegetation. This may lead to cascading water quality issues if water treatment facilities are affected. Debris from tornadoes can also displace animals and disrupt habitats. Local tornadoes are often less severe and may not follow a defined path, resulting in isolated damage that can be difficult to respond to and recover from.
Impact on Responders	Emergency personnel may be exposed to hazards while performing routine duties during a tornado event. Most storm-related duties occur post-event, but unsafe structural or environmental conditions may persist during the response period. Firefighters, police officers, and emergency responders are typically called to affected areas to close roads, assist the injured, and manage traffic. The American Red Cross may be asked to provide shelters and medical assistance, while the Humane Society of the Pikes Peak Region may provide shelter for displaced animals. Members of Voluntary Organizations Active in Disasters (VOAD) may assist with recovery efforts. First responders may face physical and psychological strain, and concerns about their families can increase overall risk. Ambulance services may be impacted by blocked or damaged roadways. Infrastructure personnel, due to their responsibilities, may also be considered responders and affected by tornado-related disruptions.
Impact on Continuity of Operations, Continuity of Government, and Delivery of Services	Tornadoes may result in the loss of facility functionality, reduced accessibility, and impaired service delivery. Power outages are likely, especially in areas without adequate backup generation. Essential facilities and services may be interrupted for 24 to 72 hours. PPROEM maintains the Continuity of Operations Plan and the Continuity of Government Plan for the County of El Paso and the City of Colorado Springs; other jurisdictions in the Pikes Peak Region are in the process of developing continuity plans and procedures.

Category	Narrative
Impact on the Public	Tornadoes can result in isolated deaths and multiple injuries. With advance warning, individuals can evacuate to safe rooms or structurally sound areas within buildings. Basements are among the safest places to shelter during a tornado. Those without adequate shelter during a tornado are at the greatest risk of injury or death.
Impact on the Economic Condition of the County	If a tornado were to strike a densely populated area, the damage and economic impact could be severe. Potential losses include the functionality and accessibility of facilities and infrastructure, as well as uninsured property damage. The transportation sector may be affected, disrupting the movement of goods and services.
Impact on the Public Confidence in Government	The public holds high expectations for government capabilities in issuing warnings, providing information, and coordinating response and recovery efforts related to tornadoes. There is also a strong expectation for the rapid restoration of critical lifelines and services following a tornado event.

19. WIND

19.1 HAZARD PROFILE

19.1.1 HAZARD DESCRIPTION

Windstorms represent the most common type of severe weather. Often accompanying severe thunderstorms (convective windstorms), they can cause significant property and crop damage, threaten public safety and disrupt utilities and communications. Straight-line winds are generally any wind not associated with rotation and in rare cases can exceed 100 miles per hour (mph). The National Weather Service defines high winds as sustained wind speeds of 40 mph or greater lasting for one hour or longer, or winds of 58 mph or greater for any duration. Windstorms are often produced by super-cell thunderstorms or a line of thunderstorms that typically develop on hot and humid days. There are seven types of damaging winds:

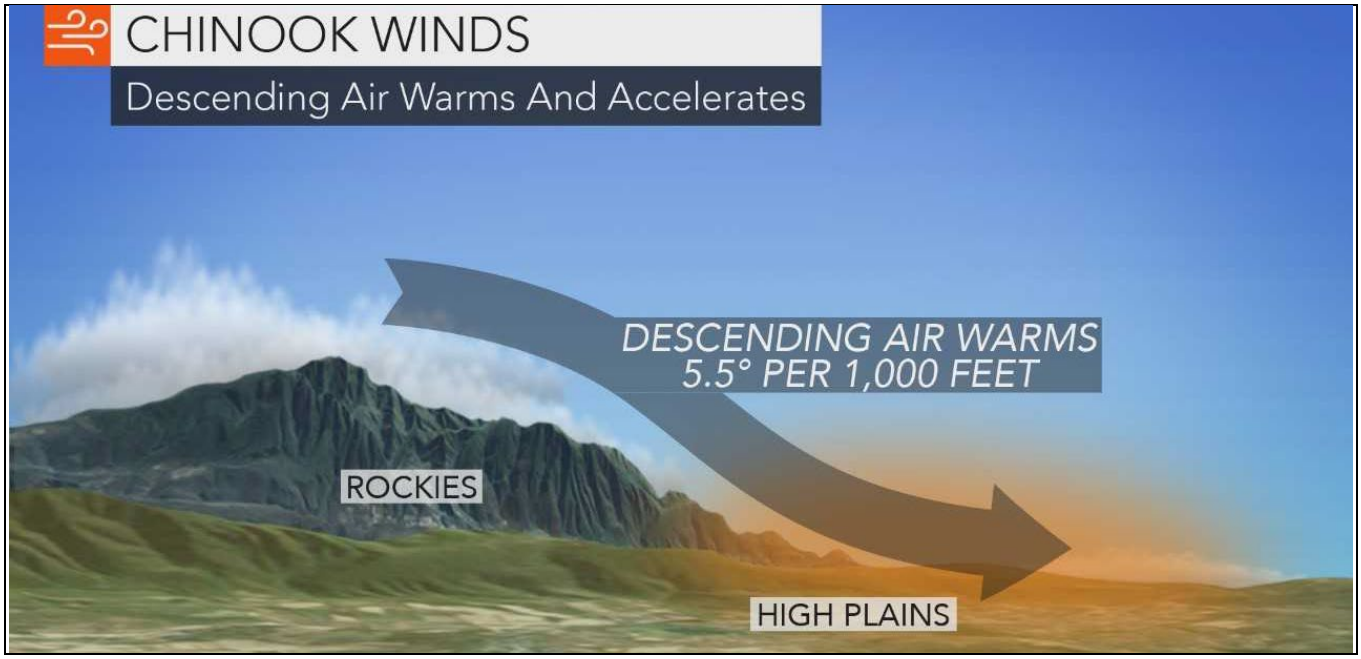
- Straight-line winds—Any thunderstorm wind that is not associated with rotation; this term is used mainly to differentiate from tornado winds. Most thunderstorms produce some straight- line winds as a result of outflow generated by the thunderstorm downdraft.
- Downdrafts—A small-scale column of air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

- Bow Echo—A bow echo is a linear wind front bent outward in a bow shape. Damaging straight- line winds often occur near the center of a bow echo. Bow echoes can be 200 miles long, last for several hours, and produce extensive wind damage at the ground.

There are two additional types of winds common in some parts of El Paso County called Bora and Chinook winds:

- Along the Colorado Front Range, the foothill areas are susceptible to Chinook winds, which are caused by the large temperature variations between the northern and southern United States during the winter. Chinook winds are dry, warm winds that rush down the slopes of the eastern mountains. These winds plow down the slopes of the Front Range at speeds ranging from 60 to 100 mph. Chinook winds can down power lines, overturn cars, produce flying debris, and reduce visibility. Refer to Figure 19-1 for a diagram on how chinook winds form.
- Bora winds are also common in some parts of El Paso County. A bora occurs when a strong low-pressure system coupled with a high-pressure system sends a cold wind through the western part of the State and down the slopes of the eastern mountains. High winds from the west or northwest into the adjacent plains can 100 miles per hour.

Figure 19-1. Chinook Wind Formation



Source: (Accuweather n.d.)

19.1.2 LOCATION

Windstorms could occur anywhere in El Paso County. Higher elevations could experience the most significant wind speeds, but these areas are generally not developed or populated. Wind events are most damaging to areas that are heavily wooded. According to the FEMA National Risk Index (NRI)

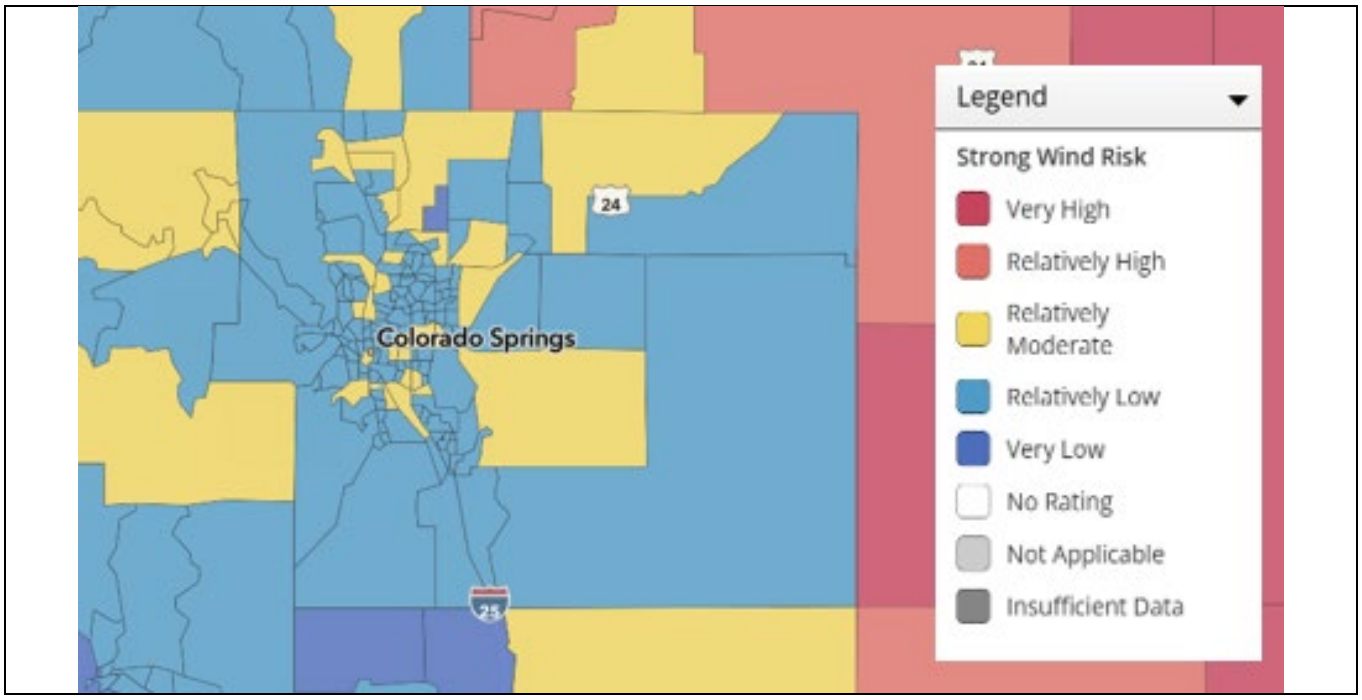
map, the entire County has a relatively moderate risk to strong winds. Refer to Figure 19-2 for the NRI County view map. According to Figure 19-3, which shows the FEMA NRI map by census tract view, El Paso County has a range from very low to relatively moderate risk to strong wind.

Figure 19-2. FEMA National Risk Index Map for Strong Winds in El Paso County by County View



Source: FEMA NRI 2025

Figure 19-3. FEMA National Risk Index Map for Strong Winds in El Paso County by Census Tract View

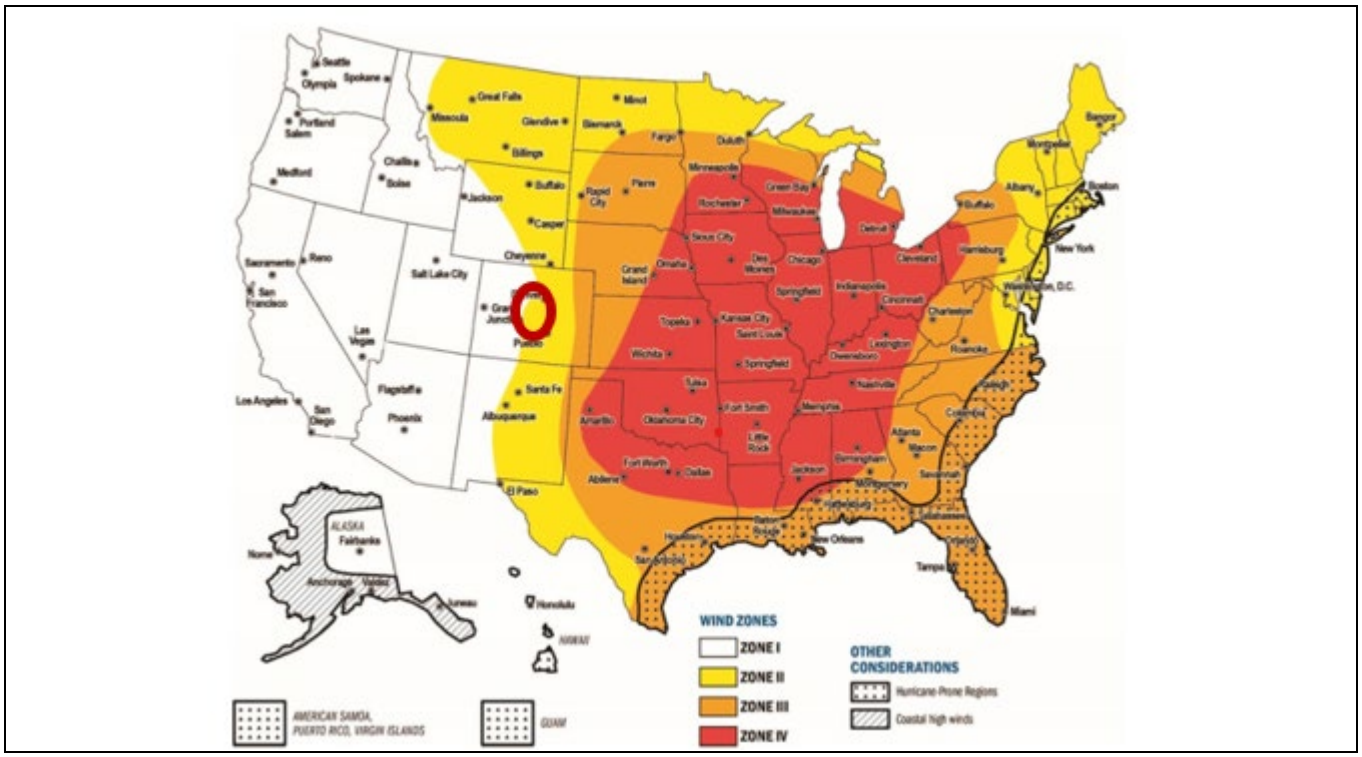


Source: FEMA NRI 2025

19.1.3 EXTENT

Windstorms in El Paso County are rarely life threatening but do disrupt daily activities. Any structures and above ground utilities are vulnerable to damage caused by major wind events. Major wind events can cause downed trees and power lines, damage to structures and fences, and send dangerous debris into the air leading to more damage, injuries, and potential deaths. They can also increase the potential for other hazards, such as wildfire. Winter winds can also cause damage, close highways (blowing snow), and induce avalanches. Winds can also cause trees to fall, particularly those killed by pine beetles or wildfire, creating a hazard to property or those outdoors. Due to the higher elevations of El Paso County, the wind is less dense, and thus less damaging than comparable winds at sea level. According to wind zone information provided by FEMA (Figure 19-4), El Paso County is located in wind Zone II (160 mile per hour maximum wind speeds). Portions of the County are also located in the Special Wind Region. These areas experience Chinook and Bora winds described above.

Figure 19-4. Wind Zones in the United States



Source: (FEMA 2024)

Warning Time

There is a maximum warning time for wind events with more than 24 hours. Meteorologists can often predict the likelihood of high wind events. These events often accompany severe storms. However, meteorologists cannot predict the exact time of onset or severity of high wind events. Some events may come on more quickly and have only a few hours of warning time. The National

Weather Service issues high wind advisories, high wind watches, and high wind warnings when hazardous conditions are expected.

19.1.4 PREVIOUS OCCURRENCES

Federal Emergency Management Agency (FEMA) Disaster Declarations

Table 19-1 lists all wind and high wind-related major disasters declarations that have included the Pikes Peak Region since 1953.

Table 19-1. Federal Emergency Management Agency (FEMA) Disaster Declarations for Wind-Related Events in the Pikes Peak Region

FEMA Declaration Date	Declaration Number	Description
June 19, 1965	DR-200	Tornadoes, Severe Storms, Flooding
May 19, 1969	DR-261	Severe Storms, Flooding
May 23, 1973	DR-385	Heavy Rains, Snowmelt, Flooding
August 2, 1976	DR-517	Severe Storms, Flash Flooding
May 17, 1999	DR-1276	Severe Storms, Flooding, Mudslides, and Landslides
April 9, 2003	EM-3185	Snowstorm
September 5, 2005	EM-3224	Hurricane Katrina Coastal Storm
January 7, 2007	EM-3270	Snowstorm
September 12, 2013	EM-3365	Severe Storms, Flooding, Landslides, and Mudslides
September 14, 2013	DR-4145	Severe Storms, Flooding, Landslides, and Mudslides
July 16, 2015	DR-4229	Severe Storms, Tornadoes, Flooding, Landslides, and Mudslides
August 25, 2023	DR-4731	Severe Storms, Flooding, and Tornadoes

Source: FEMA n.d.

State Emergency Proclamations

Table 19-2 lists all wind and high wind-related state emergency proclamations that included the Pikes Peak Region from 2020 to 2024.

Table 19-2. State Emergency Proclamations for Wind-Related Events in Pikes Peak Region (2020 to 2024)

State Proclamation Date	State Proclamation Number	Description
March 12, 2021	D-2021-064	Severe Winter Weather
July 21, 2023	D-2023-011	Severe Weather and Flooding
February 9, 2024	D-2024-002	Extreme Cold Temperatures and Winter Weather

Source: Colorado Governor n.d.

U.S. Department of Agriculture (USDA) Declarations

Between 2020 and 2024, the Pikes Peak Region was not included in any USDA wind-related agricultural disaster declarations.

All Recent Events

Table 19-3. lists major recorded wind and high wind-related events that impacted Pikes Peak Region since the previous HMP was developed. For earlier events, refer to the previous HMP.

Table 19-3. Wind-Related Events in Pikes Peak Region (2020 to 2024)

Date	Hazard	Event Narrative
January 17, 2020	High Wind	An intense storm system produced wind gusts nearing 80 mph at times over sections of southern Colorado. Some of the higher reported wind gusts with this event included 58 mph wind gusts near the Air Force Academy and Blende, 61 mph gusts near City of Manitou Springs and Walsenburg, a 63 mph gust near Peterson AFB, a 64 mph gust near Hoehne and an impressive 79 mph wind gust near La Veta.
February 25, 2020	High Wind	Strong winds impacted sections of El Paso, Las Animas and Baca counties on the 25th, with wind gusts of 58 to 60 mph reported near Hoehne, Campo, Truckton and Ellicott, respectively. A 62-mph wind gust was recorded near Springfield while a 64-mph gust was noted near Peterson Air Force Base.
June 6, 2020	Thunderstorm Wind	A powerful upper-level disturbance moving through the Rockies sparked the development of a line of thunderstorms that brought widespread damaging winds across southern Colorado. Given the scope and intensity of the damaging winds, the storm system was classified as derecho. Large barn and tack house knocked over intersection of highway 94 and antelope drive. Doppler estimated winds of 60-65 mph. Automated Surface Observing System KCOS City of Colorado Springs Airport. Roof peeled off a trailer home near the El Paso County fairgrounds. Time estimated per Doppler radar signatures. Doppler radar estimates 70-75 mph winds.
June 6, 2020	High Wind	A powerful upper-level disturbance moved through the Rockies on June 6, 2020, producing widespread damaging winds across southern Colorado. Cadet chapel reported 87 mph wind gusts within showers.
June 8, 2020	High Wind	A cold front surged south across the area during the late evening hours, with strong northerly winds accompanying this frontal passage. Wind gusts to around 60 mph were produced along and to the east of the I-25 corridor.
July 4, 2020	Heavy Rain	Scattered thunderstorms developed over the mountains by midday and then spread east across the plains in the afternoon and evening. Heavy rainfall and flash flooding were concerns this day, though isolated high thunderstorm wind gusts also occurred. Heavy rainfall of 0.72 inches occurred, falling in 40 minutes.

Date	Hazard	Event Narrative
August 20, 2020	Thunderstorm Wind	Another day of afternoon and evening thunderstorm development occurred across both the higher terrain and plains. A few strong to severe storms occurred on this day. Street flooding greater than 6 inches deep at Austin Bluffs and Academy. Storm chaser reports large hail, 1 inch. Heavy rainfall of 2 inches. Local broadcasters shared pictures of thunderstorm wind damage in Ellicott, CO from the severe storms. Based on archived radar information it appears that a microburst descended right on top of the damaged location leading to the outbuilding and metal fencing damage.
September 8 – 9, 2020	Winter Storm	A strong upper-level system impacted southern Colorado from September 8th through the 10th. This system brought an end to the above normal warmth and provided the region with winter like weather. 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. Snow amount of 9 inches. 4 NNE Black Forest.
October 11, 2020	High Wind	A cold front moved south across the region during the late afternoon and evening, providing a period of high northerly winds to southern Colorado. Multiple wind gust reports more than 60 mph were noted, that helped develop a dust storm, or haboob. As this dust storm moved through portions of the plains, visibility was reduced to near zero at times.
November 8, 2020	High Wind	An upper-level system moved across southern Colorado and brought increased snow chances and damaging winds to the eastern mountains and adjacent lower elevations during the early morning hours on the 8th. The main concerns for this day were the damaging winds, with gusts as high as 65 to 75 mph being reported. Very large pine trees snapped and uprooted. Mobile home rolled on side. Power outages from downed trees.
November 14, 2020	High Wind	A strong and quick upper-level system moved across the region during this period, providing light snow with strong winds and blowing snow to the central mountains, and high winds to the Pikes Peak region and parts of the plains. The highest and most widespread reports of high winds occurred over the Pikes Peak region.
November 15, 2020	High Wind	Windy conditions occurred for the third day in a row across southern Colorado during mid-November. However, the strongest winds were isolated on this day and confined mainly to the Pikes Peak region.
December 22, 2020	High Wind	A quick moving upper-level system crossed the Rockies on this day, bringing very strong winds to all the higher terrain and parts of the I-25 corridor. This system also brought a quick blast of snow to the mountains. The higher wind gusts and this snow helped provide a setup for snow squalls, which were observed over parts of Chaffee county.
March 10, 2021	High Wind	Strong southwest flow aloft continued this day, with another day of high winds occurring across parts of southern Colorado. On this day, winds really strengthened and were the strongest of the past few days with gusts up to 60 to 70 mph observed across the eastern plains.

Date	Hazard	Event Narrative
March 14 – 15, 2021	Winter Storm	A large upper-level system slowly moved across the region during this time frame, providing an extended period of moderate to heavy snow across the region. The widespread heavier snow did lessen in coverage towards the end of the period, however, continued to focus across the Palmer Divide. Moderate to heavy snow persisted in this location along with high winds, with blizzard conditions noted across far northern El Paso county. Highest snowfall amounts of around two feet were also observed in this location. Freezing rain, with 0.25 inches of icing on surfaces due to freezing drizzle and fog. Paved surfaces reported as icy. Heavy snow of 28.0 inches. Town of Palmer Lake. Heavy snow of 16.4 inches. 4 miles south of Air Force Academy. Heavy snow of 27.0 inches. Woodland Park.
March 29, 2021	High Wind	As flow aloft increased out ahead of an approaching system, strong downslope winds developed lee of the eastern mountains, especially lee of the Sangre de Cristo and Wet mountains. Further north across Pikes Peak and Rampart Range, strong winds slid down the lee slopes into extreme western El Paso county. Strongest winds during this period were in the 70 to 80 mph range.
July 14, 2020	Hail	During the afternoon hours of July 14th, scattered thunderstorms, including a few supercells, developed across eastern El Paso County. As this activity shifted eastward, they began to intensify and grow upscale into a larger thunderstorm complex. A series of supercells moved through Bent, Prowers, and Baca Counties producing a large non-damaging tornado, large hail, and damaging wind gusts.
May 2, 2021	Hail	Isolated to scattered thunderstorms developed over portions of the I-25 corridor in El Paso and Pueblo Counties during the afternoon and then spread eastward to southeastward across the Highway 50 corridor through the evening. Some of the thunderstorms were strong to severe, with the more intense storms producing large hail of 1-2 inches in diameter and damaging wind gusts of 60-70 mph. Additionally, a tornado and wind gusts up to around 90 mph were observed across the eastern plains on this day.
June 19, 2021	Hail	Increases in moisture and instability led to a higher coverage of strong to severe storms across the plains on this day. Winds and hail were the main thunderstorm risks as storms moved off the mountains and into the plains during the afternoon and evening hours.
June 24, 2021	Thunderstorm Wind	An embedded mid-level disturbance helped to develop showers and storms across the region through the early evening on this day, with strong to severe storms occurring across El Paso County through the far southeast plains. In this location high instability and strong forcing provided a setup for large hail and damaging winds to occur. The largest hail of 4 inches occurred across Kiowa county.

Date	Hazard	Event Narrative
September 12, 2021	Funnel Cloud	Scattered storms were possible over and near the mountains, northern El Paso county, and far eastern plains on this day. Widespread severe weather was not expected; however, a few stronger storms did develop and one storm across El Paso County did produce a funnel cloud. Pilot reported funnel clouds on their way into City of Colorado Springs airport but could not be seen from the ground.
September 14, 2021	Hail	Scattered thunderstorms, some strong to severe, occurred over the plains. The strongest storms developed around midafternoon through mid-evening and produced hail up to 1.25 inches and wind gusts of 60 to 70 mph. Winds of 50 mph or greater were also observed.
October 13, 2021	High Wind	Snow, heavy at times, occurred across the central and southwest mountains on this day while damaging winds along with high fire danger was noted across much of the plains and San Luis Valley. Highest wind gusts were up to around 60 mph. A few thunderstorms also occurred, mainly over the far eastern plains, though there was not any damage observed from these storms.
October 19, 2021	High Wind	An upper-level system moved across the region and provided snow and high winds across southern Colorado. The strongest winds on this day were primarily observed over and near the mountains, especially the southern mountains.
December 15, 2021	High Wind	A potent upper-level system and surface low approached the region late in the day on the 14th and then lifted across Colorado during the day on the 15th. As the system moved overhead a strong upper-level jet of 120 knots moved from southwest to northeast across the region, from the San Luis Valley eastward into the eastern Colorado plains. This setup favored heavy mountain snow across the Continental Divide, primarily the eastern San Juan mountain. Meanwhile, lighter amounts of snow were observed across the central and eastern mountains. As this system pivoted across the region, the strength of this system and some weak instability supported the development of snow squalls from the Continental Divide east into parts of the I-25 corridor. The strong jet moving across the region as well as mountain wave action produced widespread extreme winds over much of southern Colorado. The very dry/drought conditions in place and the extreme winds then produced widespread blowing dust over much of the plains.||High/Extreme fire danger was also noted given the strength of the wind field and falling RH values, falling well into the teens, when combined with gusts over 70 MPH. Numerous grass and prairie fires occurred caused by falling power lines. Report of 7 car windows parked at Garden of the Gods that have been blown out. Trained spotter el28 called to report wind damage, and antenna tower was blown down at site. Three-inch tree limbs broken with power poles broken.

Date	Hazard	Event Narrative
December 26, 2021	High Wind	A very active pattern continued across southern Colorado during this period, with multiple upper-level disturbances moving across the region. This supported another long period of damaging winds and heavy snow. Highest wind gusts were in the 70 to 90 mph range, with a 101-mph wind gust observed near Monarch Pass. The heavy snow was not too widespread, though Wolf Creek Pass did observe a total storm of 40 inches.
December 30, 2021	High Wind	An upper-level system approaching from the west supported a period of mountain snow, especially over the San Juan Mountains and Continental Divide. Additionally, the increasing wind field provided isolated damaging winds across the Pikes Peak region. Highest gusts in this location were in the 60 to around 70 mph range.
January 4, 2022	High Wind	Low pressure swept across eastern Colorado on January 4th producing strong westerly winds in its wake. Several 60+ MPH wind gusts were reported across the region.
March 23, 2022	High Wind	A strong upper-level system moved across the region and supported high winds over much of the planes during this period. Strongest gusts up to 70 mph were observed across the Pikes Peak region, with winds gusting to 60 to 65 mph elsewhere across the plains.
April 5, 2022	High Wind	A strong upper-level system once again moved across the region during this time, providing a set up for very strong winds to develop. Highest winds were observed across the higher terrain; however, high winds were also noted near the I-25 corridor.
April 29, 2022	High Wind	A strong system once again moved across the region and provided high winds across southern Colorado. Highest winds up to 70 mph over the plains did produce blowing dust, with near zero visibility observed at times. Extremely critical fire weather conditions were also observed on this day, with the most dangerous conditions observed across the Interstate 25 corridor and the southeast plains.
May 9, 2022	High Wind	A very active period in terms of well above normal temperatures with high fire danger, and damaging winds with blowing dust occurred across much of southern Colorado during this time frame. Multiple days with high winds up to 80 90 mph were observed.
May 12, 2022	High Wind	A strong system moving across the region assisted with a short window of localized southwest to west winds gusting to around 60 to 65 mph during the morning hours. Tree snapped at base, 12 inches in diameter.
May 16, 2022	Thunderstorm Wind	Isolated strong to severe thunderstorms occurred across the southeast plains in the evening, with strong winds to 65 mph the main risk on this day.
May 27, 2022	Thunderstorm Wind	Isolated thunderstorms were observed on this day, mainly over the mountains and I-25 corridor. A few of these thunderstorms across the Pikes Peak region and I-25 corridor did produce wind gusts up to 60 to 70 mph.

Date	Hazard	Event Narrative
April 12, 2022	High Wind	A strong system moving across the region brought high winds to much of southern Colorado. While it was windy everywhere on this day, the strongest winds of 80 to 90 mph occurred over the southern I-25 corridor from just south of Pueblo down to the New Mexico border.
April 23, 2022	High Wind	Another strong system moved across the region, providing a long period of high winds over much of southern Colorado during this period. While high winds up to around 80 mph were the main concern, several hazards ranging from high winds and extreme fire danger to a localized severe thunderstorm risk across the southeast plains, to snow and blowing snow across the central mountains were observed.
July 6, 2022	Heavy Rain	Thunderstorms developed in the afternoon over and near the higher terrain, with an initial risk of strong to severe storms in the Pikes Peak region. This risk then spread into the eastern plains along the Highway 50 corridor later in the evening, where large hail damaging wind gusts up to around 75 mph, localized flash flooding, and even a tornado occurred. Heavy rainfall of 1.17 inches.
July 10, 2022	Thunderstorm Wind	Isolated showers and thunderstorms across the higher terrain pushed into the I-25 corridor in Pueblo and El Paso Counties through early in the evening. A stronger storm did occur in El Paso County, and produced wind gusts up to around 65 mph.
July 14, 2022	Thunderstorm Wind	Isolated thunderstorms developed across the Pikes Peak region on this day and then moved into the I-25 corridor in the evening. While most storms were sub severe, an isolated wind gust to 58 mph was observed near the Air Force Academy.
July 19, 2022	High Wind	Showers and thunderstorms initially developed over the higher terrain and as they moved into the I-25 corridor, some increase in intensity was observed. This was evident across El Paso county, where an isolated severe wind gust to 70 mph occurred. Wind gust from a collapsing shower moving across the City of Colorado Springs airport.
July 20, 2022	Thunderstorm Wind	Showers and thunderstorms occurred over and near the higher terrain as well as into the I-25 corridor during the afternoon and evening. An isolated wind gust to 58 mph occurred across southern El Paso county, along with a localized heavy rainfall report near the Wet Mountains.
July 26, 2022	Thunderstorm Wind	Showers and thunderstorms, some strong, occurred over the higher terrain and adjacent plains during the evening time frame. Most storms were focused along the I-25 corridor, where heavy rain caused flash flooding in several locations in El Paso and Pueblo Counties. Cars stuck in the road at South Academy and Astro zone. Roads flooded near Don Juan Street and Platte Avenue. Significant flooding. A creek normally three feet wide and four inches deep is running forty plus feet wide and at least three feet deep. A road washed out between Town of Calhan and Town of Ramah. Heavy rainfall of 2.50 inches. Storm total so far in the last hour. Street and curbside flooding in the area. Two barn structures were destroyed.

Date	Hazard	Event Narrative
August 6, 2022	Heavy Rain	Late afternoon thunderstorm activity pushed off the Palmer Divide moving east-southeast across the Colorado plains. Numerous flash flooding events, severe thunderstorms, winds and some damages were reported across the region. Heavy rain was reported, 3 inches.
October 23, 2022	High Wind	An extended period of high winds were observed across much of southern Colorado during this time frame. The first part of this period was due to a mountain wave over the foothills of the eastern mountains, with a more widespread high wind event then occurring over the southern San Luis Valley and the eastern plains.
December 2, 2022	High Wind	A dangerous wind event occurred during this period, affecting much south central and southeast Colorado. While most of the higher terrain was impacted, these stronger winds did impact much of the southern I-25 corridor and plains. Highest wind gusts during this period were in the 80 to 100 mph range, with a report of 105 mph observed across Cheyenne Mountain. Concrete shingles blown off of the house and scattered across the lawn. Large tree on home in Broadmoor area. Semi blown over on I-25, in the vicinity of the Air Force Academy overlook.
December 22, 2022	Extreme Cold/Wind Chill	A strong cold front moved across the area during the evening hours, bringing with it a brief period of snowfall, gusty northerly winds, and frigid temperatures. Snowfall amounts generally stayed light, in the two-to-four-inch range. The main impacts during this period stemmed from the extreme cold, with many locations over the plains observing wind chill values of 25 below zero to 35 below zero. Some locations across El Paso county observed wind chill values of 40 below zero to 50 below zero. Wind chill value of 48 below zero.
January 11, 2023	High Wind	High winds occurred across the southeast mountains during this period, with gusty winds observed over much of southern Colorado. Isolated stronger wind gusts, ranging from 60 mph to 75 mph, were observed over portions of the I-25 corridor.
March 31, 2023	High Wind	Another day of windy conditions across southern Colorado, especially over the eastern plains where winds gusting to 70 mph were observed.
April 5, 2023	Winter Weather	Strong winds led to heavy snow as a closed low pressure center traveled over southern Colorado. Widespread light snow fell over the region, but the heaviest snow fell over northern El Paso County. There was 9 inches of snow reported 5 miles northeast of the Air Force Academy. There was 9 inches of snow reported 5 miles northeast of the Air Force Academy. There was 4 inches of snow reported 6 WSW of Falcon.
May 26, 2023	Tornado	Ample low-level moisture aided in creating an incredibly unstable environment with enough wind shear to create severe thunderstorms and some landspout tornadoes.

Date	Hazard	Event Narrative
June 22, 2023	Tornado	Exceptionally severe weather continues over southern Colorado with the continued deluge of moist air coming from the Pacific and remnant moisture from previous moisture from widespread heavy rainfall. The most notable weather feature was an EF3 tornado that hit a farm located in Prowers County. This was only the 3rd EF3 tornado recorded since National Weather Service (NWS) modernization in 1995. There was at least a foot of water reported over the road by a trained spotter. There was 1.98 inches of rain that fell within two hours. A brief cone tornado formed for around 2 minutes. The tornado hit a small fall located in northeastern El Paso County. Picture reveal minimal damage on weak structures. WCM called the farm to discuss damage with them and conducted a virtual damage survey revealing EF0 damage.
July 15, 2023	Hail	The continuations of hail, wind, and tornadoes continue through mid-July as northwesterly upper-level flow develops once again over southern Colorado. Anomalous amounts of low-level moisture remain over the region due to record breaking precipitation in June and an active early July. Enhanced wind shear due to the upper-level northwesterly flow created an environment conducive to severe thunderstorms.
July 20, 2023	Heavy Rain	An upper-level high pressure center was located over central Arizona and central New Mexico which resulted in a favorable pattern for efficient diurnal wind fluctuations including upslope-oriented winds towards WFO Pueblo's eastern mountains. Weak waves embedded in the upper-level northwesterly flow enhanced the lift and the pattern enhanced the deep shear. The result was a very rare mountainous tornado that was observed at around 9,000 feet.
July 31, 2023	Heavy Rain	Surface flow from the east advected amply amounts of low-level moisture which created another event where heavy rains, hail, and gusty winds were observed. Weak perturbations in the upper flow sparked thunderstorms across the region.
August 2, 2023	Thunderstorm Wind	Monsoon-like conditions existed over the western half of the US with some of the thunderstorms that developed over Pueblo's mountains developing into a better environment for severe weather.
August 5, 2023	Tornado	The one and only time this year was when there was a proper monsoonal tap over southern Colorado. In this case, there was weak northwesterly flow aloft, and southeasterly flow at the surface, which resulted in an unstable and high shear environment. There was almost a tornado that touched down; however, no reports of debris or damage were reported. Spotter reported a funnel cloud to the west beginning to appear, just to the north of Town of Monument. Trained spotter saw the tornado on the ground around 3 to 4 miles north of his location.
October 2, 2023	Thunderstorm Wind	A few high based thunderstorms developed over southern Colorado during the first two days of October and produced severe wind gusts.

Date	Hazard	Event Narrative
December 2, 2023	High Wind	A prolonged period with a long wave trough developed over Colorado at the beginning of December. At the beginning of the events and enhanced jet streak oriented from the SW to the NE formed over southern Colorado, which produced High Wind Warning Criteria winds. The lower elevations did not see much for snow, at most 5 inches, but the mountains produced magnitudes of around 1 foot and more. There was 4 inches of snow that fell.
January 8, 2024	High Wind	The closed low dug down in a deep trough across the Rocky Mountains and SE Colorado. This brough more widespread heavy snow and strong winds to the forecast area. There was 6.2 inches of snow that fell.
February 26, 2024	High Wind	Strong winds mixed down to the surface from a maximum within the subtropical jet. This resulted in strong, gusty winds across the forecast area. Shortly after, an upper-level trough moved down from the Pacific Northwest. The two systems merged and led to strong wind and snow over and near higher terrain. There was 6.0 inches of snow measured. The gust of 66 mph was measured at the City of Colorado Springs Airport ASOS (COS).
March 2, 2024	Heavy Snow	A broad upper-level trough moved in from the Pacific Northwest, bringing strong winds to the area along with orographically enhanced snowfall to some areas. There was 4.0 inches of snow measured.
March 24, 2024	Heavy Snow	During late March, yet another deep upper-level trough dug in across the western US. This, along with a strong southwesterly flow from the subtropical jet, brought in sufficient moisture and synoptic/orographic lift for another round of snowfall for parts of SE Colorado. Additionally, the strong synoptic forcing and convective nature of parts of this system did allow for the formation of one landspout tornado on March 26th. There was 6.7 inches of snow measured.
April 6, 2024	High Wind	A strong low-pressure system oriented the upper-level jet streak to be from the southwest to northeast with magnitudes around 130 knots. This meteorological set-up is commonly associated with strong winds at the surface.
May 15, 2024	Hail	A boundary pushing through southeast Colorado produced a few high based thunderstorms late in the day. Some of these storms became strong to severe, resulting in hail up to an inch in diameter and even one report of a funnel cloud. Picture of 1 inch diameter hail from social media.
May 31, 2024	Hail	A very dynamic pattern within a longwave trough allowed for a series of major shortwave troughs to propagate over Colorado. This allowed for several days of severe thunderstorms. Severe thunderstorms were fueled by the conditionally unstable environment with sufficient forcing, high amounts of mid-level moisture, high levels of buoyancy (CAPE), steep lapse rates, and effective bulk shear. This resulted in reports of large hail (in excess of 2 inches), severe wind gusts of greater than 50 kts, and even a few land spouts/funnel clouds. A source via amateur radio reported hail of 1.25 inches in diameter.

Date	Hazard	Event Narrative
July 3, 2024	Hail	Westerly flow-initiated thunderstorms over region bring severe wind and hail to the eastern plains. Picture of hail measuring 1.65 inches in diameter via social media.
July 16, 2024	Thunderstorm Wind	Scattered thunderstorms developed within northwesterly flow, causing strong outflow winds and wind damage. Asos station KCOS City of Colorado Springs airport measured 59mph wind gust.
August 9, 2024	Heavy Rain	An upper-level pattern which allowed for a sufficient mid-level monsoonal moisture plume to be established over the region aided in the development of storms, which produced heavy rainfall and lead to some heavy amounts of rain and minor flash flooding from the 7th thru 10th of August. A severe storm which developed over Teller County also allowed for a rare tornado to occur over high terrain, just NNE of Cripple Creek, on the 9th of August. Public Report from mPING: Street/road flooding; Street/road closed; Vehicles stranded. A trained spotter reported 0.63 inches of rain from a thunderstorm in a short period of time.
August 12, 2024	Heavy Rain	With a mid-level monsoonal moisture plume already in place, and a passing shortwave trough in the upper levels, a few strong to severe storms developed over portions of the plains from the 12th through 13th of August and also resulted in some heavy amounts of rain over El Paso County. A wet microburst from a thunderstorm also produced wind damage around the city of Pueblo due to brief gusty winds being greater than hurricane force. A public source reported heavy rain with a total amount of 1.5 inches in a short period of time due to a strong storm.
August 19, 2024	Thunderstorm Wind	An active upper-level pattern with a series of shortwave troughs moving over the region throughout the course of the week produced several days of strong to severe thunderstorms over the region. A trained spotter reported hail of 2 inches in diameter via social media with picture. A public source reported 1.50 inches of rain, which fell in a short period of time, and was produced by a strong thunderstorm.
September 17, 2024	Thunderstorm Wind	A closed low ejecting to the northeast brought a line of storms that produced widespread severe wind gusts across the plains along and east of the I-25 corridor. There was a 65-knot wind gust reported at location.
December 9, 2024	Heavy Snow	A quick-moving upper-level wave pushed through Colorado, bringing enough synoptic lift and moisture to bring snowfall to large portions of the area, along with a cold front passing over the eastern plains. This also came with breezy winds and cold temperatures across most of southeast Colorado. There was 6.3 inches of snow measured.
December 18, 2024	High Wind	A fast-moving upper trough passed through Colorado, and with strong northwest flow aloft came a few gusty surface wind reports. A wind gust of 67 MPH was measured at a station 3 miles SSW of Air Force Academy.

Date	Hazard	Event Narrative
December 29, 2024	High Wind	A broad upper trough passed through the region in the last several days of December, bringing a jet maximum overhead. These strong winds were felt across parts of the area, while minor snow accumulations were noted over the higher terrain. A wind gust of 69 MPH was measured.

Source: NOAA-NCEI 2025

19.1.5 PROBABILITY OF FUTURE OCCURRENCES

Information on previous wind and high wind occurrences in the County was used to calculate the probability of future occurrence of such events. Table 19-4 lists the number of events from various sources over the 71-year period from 1954 to 2025, which is the most complete period of record for all sources reviewed. Based on these records and input from the Steering Committee, the probability of occurrence for wind and high wind in the County is considered "frequent."

Table 19-4. Probability of Future Wind Events in Pikes Peak Region

Hazard Type	Number of Occurrences Between 1954 and 2025	% Chance of Occurring in Any Given Year
Thunderstorm Wind	117	100%
High Wind	157	100%
Funnel Cloud	22	31%
Cold/Wind Chill	6	8.5%
Extreme Cold/Wind Chill	1	1.4%
Total	303	100%

Source: NOAA-NCEI, 2025

Note: 100% probability indicates that it is statistically likely for an event to occur every year. It does not indicate that the occurrence of an event is a certainty in any given year."

19.1.6 CASCADING IMPACTS ON OTHER HAZARDS

The most significant secondary hazards associated with severe winds are falling and downed trees and downed power lines. Severe winds that cause power lines to fall can spark wildfires or can exacerbate and spread existing wildfires.

19.2 VULNERABILITY AND IMPACT ASSESSMENT

All of El Paso County is vulnerable to wind events. The following subsections discuss El Paso County's vulnerability, in a qualitative nature, to the wind hazard.

19.2.1 LIFE, HEALTH, AND SAFETY

Overall Population

It can be assumed that the entire planning area (736,008) is exposed to some extent to severe wind events. Certain areas are more exposed due to geographic location and local weather patterns. Populations living at higher elevations with large stands of trees or power lines may be more susceptible to wind damage and blackout. Residents may be exposed to danger from flying debris, collapsed structures, and overturned vehicles during severe wind events.

Socially Vulnerable Population

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

19.2.2 GENERAL BUILDING STOCK

All buildings in the planning area are exposed to severe wind hazards, but structures in poor condition or in particularly vulnerable locations (located on hilltops or exposed open areas) may risk the most damage. The frequency and degree of damage will depend on specific locations. Severe wind damage can include damage to siding, roof damage, and broken windows. Tractor-trailers may be overturned causing damage to their contents and other vehicles. Those structures that are located under or near overhead lines or near large trees may be damaged in the event of a collapse.

19.2.3 COMMUNITY LIFELINES AND OTHER CRITICAL FACILITIES

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

Incapacity and loss of roads are the primary transportation failures resulting from severe winds, mostly associated with secondary hazards. Winds can cause significant damage to trees and power lines, blocking roads with debris, incapacitating transportation, isolating population, and disrupting ingress and egress. Of particular concern are roads providing access to isolated areas and to the elderly. Prolonged windstorms can have negative economic impacts for an entire region. Severe windstorms and downed trees can create serious impacts on power and above-ground communication lines. Loss of electricity and phone connection would leave certain populations isolated because residents would be unable to call for assistance.

19.2.4 ECONOMY

The economy of the County is not directly impacted by wind and strong wind events. However, when strong winds cause downed trees which can result in damaged power lines or power outages, many small businesses or commercial structures can be without power for weeks. This cascading impact can cause business or restaurant shutdowns until the power is restored again. This results in loss of revenue and customer access for the days the facility must shut down due to power outages.

19.2.5 ENVIRONMENT

The environment is highly exposed to severe winds. Most damage results from falling trees or secondary hazards of severe winds, such as wildfires.

19.2.6 HISTORIC AND CULTURAL RESOURCES

There is not a direct impact wind or strong wind may have on the historical and cultural resources of the County. However, if strong winds toss around debris or down a tree, many of these historical structures or landmarks are not built with modern materials and may become damaged. Also, cultural spaces which are often publicly accessible may not be accessible if a down tree or debris blocks roadways to access these sites.

19.3 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

19.3.1 LAND USE AND DEVELOPMENT

All future developments will be affected by severe storms. The ability to withstand the impacts of severe winds lies in sound land use practices and consistent enforcement of codes and regulations for new constructions.

19.3.2 PROJECTED CHANGES IN POPULATION PATTERNS

The County population is projected to increase by over 32 percent by 2050. Table 3-7 summarizes recent and projected future changes in county population. Between 2010 and 2025 alone, the County population rose by nearly 21 percent. With this increase in population, the risk to wind and high winds has also increased. More people residing and living in the County and in high wind areas directly increases the exposure to this hazard in the event it may occur. Additionally, an increase in projected populations in the future will also indicate an increase in wind risk. It is critically important that the County plans for and mitigates against high wind hazards for the current population and the projected new population in the future.

19.3.3 CLIMATE CHANGE

FEMA Region VIII analyzed potential impacts to future conditions, including windstorms. Extent and magnitude are uncertain, but the frequency of summer events is likely to increase (FEMA 2025).

19.3.4 OTHER IDENTIFIED CONDITIONS

Important issues associated with severe wind events in the planning area include the following:

- Older building stock in the planning area is built to low code standards or none at all. These structures could be highly vulnerable to severe weather events such as windstorms.
- Redundancy of power supply must be evaluated.
- The capacity for backup power generation is limited. Isolated population centers.
- The impacts of climate change on severe weather events are unknown.
- Severe winds have the potential to spark or exacerbate wildfires.

19.4 CONSEQUENCE ANALYSIS

Table 19-5 presents the results of the consequence analysis for the wind hazard.

Table 19-5. Consequence Analysis for the Wind Hazard

Category	Narrative
Hazard Description	Windstorms are the most common type of severe weather and often accompany severe thunderstorms, known as convective windstorms. These events can cause significant property and crop damage, pose threats to public safety, and disrupt utilities and communication systems. Straight-line winds—defined as winds not associated with rotation—can occasionally exceed 100 miles per hour. The National Weather Service classifies high winds as sustained wind speeds of 40 mph or greater lasting for one hour or more, or winds of 58 mph or greater for any duration. Windstorms are frequently produced by supercell thunderstorms or lines of thunderstorms that typically form on hot and humid days.
Impact on Property, Facilities, and Infrastructure	Windstorms can cause minor to moderate property damage to structures and vehicles. All above-ground structures and utilities are vulnerable to damage during major wind events. High winds can down trees and power lines, damage buildings and fences, and send debris airborne, increasing the risk of further damage, injuries, and fatalities. Buildings, utility infrastructure, and communication systems may experience short-term impacts. Damage caused by downed trees may not be covered by insurance, depending on the circumstances.
Impact on the Environment	Windstorms may damage residential and commercial structures, potentially releasing hazardous materials or rupturing natural gas lines, which could lead to fires. Trees may be damaged or lost, and debris carried by wind can contaminate water sources. Crops are also vulnerable to wind damage, which can affect agricultural productivity and local ecosystems.

Category	Narrative
Impact on Responders	Firefighters, police officers, and emergency responders are typically deployed to affected areas to close roads, assist the injured, and manage traffic. The American Red Cross may be called upon to provide shelters and medical assistance, while the Humane Society of the Pikes Peak Region may offer shelter for displaced animals. Members of Voluntary Organizations Active in Disasters (VOAD) may assist with recovery efforts. Infrastructure personnel, due to their responsibilities, may also be considered responders and are likely to be impacted by high wind events.
Impact on Continuity of Operations, Continuity of Government, and Delivery of Services	Windstorms may result in limited loss of facility functionality, accessibility, or service delivery. Essential facilities and services may be interrupted for less than 24 hours. Power outages are possible, especially in areas without adequate backup generation. PPROEM maintains the Continuity of Operations Plan and the Continuity of Government Plan for the County of El Paso and the City of Colorado Springs; other jurisdictions in the Pikes Peak Region are in the process of developing continuity plans and procedures.
Impact on the Public	Windstorms can cause minor injuries and illnesses. One of the greatest dangers is falling trees or flying debris, which can destroy vehicles, damage structures, and cause serious injury or death. Motorists, air travelers, outdoor workers, and individuals engaged in outdoor recreation are among the populations most at risk. If a windstorm occurs during a drought, blowing dust and sand may reduce visibility and increase health risks. Flying debris poses a significant threat to life and safety.
Impact on the Economic Condition of the County	A severe windstorm in a densely populated area could result in extensive damage and have a devastating impact on the local economy. Loss of infrastructure functionality, disruption of transportation systems, and uninsured property damage could hinder economic activity and recovery efforts.
Impact on the Public Confidence in Government	Due to the rapid onset and short duration of windstorms, government response and recovery efforts are typically limited to first responders. Nonetheless, the public holds high expectations for the rapid restoration of critical lifelines and services following a windstorm event.

20. WINTER STORM

20.1 HAZARD PROFILE

20.1.1 HAZARD DESCRIPTION

A winter storm is a storm having significant snowfall, ice, and/or freezing rain; the quantity of precipitation varies by elevation. Winter storms can include heavy snow, ice, and blizzard conditions. Heavy snow can immobilize a region, stranding commuters, stopping the flow of supplies, and disrupting emergency and medical services. Accumulations of snow can collapse roofs, knock down trees, and power lines. In rural areas, homes and farms may be isolated for days, and unprotected livestock may be lost. The cost of snow removal, damage repair, and business losses can have a tremendous impact on cities and towns.

Heavy accumulations of ice can bring down trees, electrical wires, telephone poles and lines, and communication towers. Communications and power can be disrupted for days until damage can be repaired. Even small accumulations of ice may cause extreme hazards to motorists and pedestrians.

Severe local storms include small-scale atmospheric systems, including tornadoes, thunderstorms, windstorms, ice storms, and snowstorms. These storms may cause a great deal of destruction and even death, but their impact is generally confined to a small area. Typical impacts are on transportation infrastructure and utilities. Some winter storms are accompanied by strong winds, creating blizzard conditions with blinding wind-driven snow, severe drifting, and dangerous wind chills. Strong winds with these intense storms and cold fronts can knock down trees, utility poles, and power lines. Blowing snow can reduce visibilities to only a few feet in areas where there are no trees or buildings. Serious vehicle accidents can result with injuries and deaths.

Winter storms in El Paso County can include strong winds, blizzard conditions, freezing rain, and can result in property damage, localized power and telephone outages, and closures of streets, highways, schools, businesses, and nonessential government operations. Freezing rain is the result of rain occurring when the temperature is below the freezing point. The rain freezes on impact, resulting in a layer of glazing ice up to an inch thick. In a severe ice storm, an evergreen tree 60 feet high and 30 feet wide can be burdened with up to six tons of ice, creating a threat to power and telephone lines and transportation routes. A blizzard is an event produced by a combination of falling or blowing snow, and high winds, typically 35mph or more for a prolonged period. This combination can create potentially deadly travel conditions with impassable roads and restricted visibility.

People can also become isolated from essential services in their homes and vehicles. A winter storm can escalate, creating life-threatening situations when emergency response is limited by severe winter conditions. Other issues associated with severe winter weather include hypothermia and the threat of physical overexertion that may lead to heart attacks or strokes. Snow removal

costs can also impact budgets significantly. Heavy snowfall during winter can also lead to flooding or landslides during the spring if the area snowpack melts too quickly.

Extreme Cold

Extreme cold often accompanies a winter storm or is left in its wake. It is most likely to occur in the winter months of December, January, and February. Prolonged exposure to the cold can cause frostbite or hypothermia and can become life-threatening. Infants and the elderly are most susceptible. Pipes may freeze and burst in homes or buildings that are poorly insulated or without heat. Extreme cold can disrupt or impair communications facilities. Wind chill is the combination of wind and temperature that serves as an estimate of how cold it feels to be exposed to human skin. Wind chill values below -19 are considered dangerous.

20.1.2 LOCATION

The entire County is susceptible to severe winter storms. From 1948 to 2016, as recorded at the City of Colorado Springs MUNI AP weather station, the coldest month on average is January, with an average minimum temperature of 16.6 degrees Fahrenheit. The average annual snowfall is 38 to 57 inches depending on the elevation, and the number of days with a maximum temperature below 32 degrees Fahrenheit is 24 to 40 days. The highest annual snowfall was over 100 inches during the winter and depends on elevations. The coldest temperature on record was -27 degrees Fahrenheit on February 1, 1951 (NOAA n.d.).

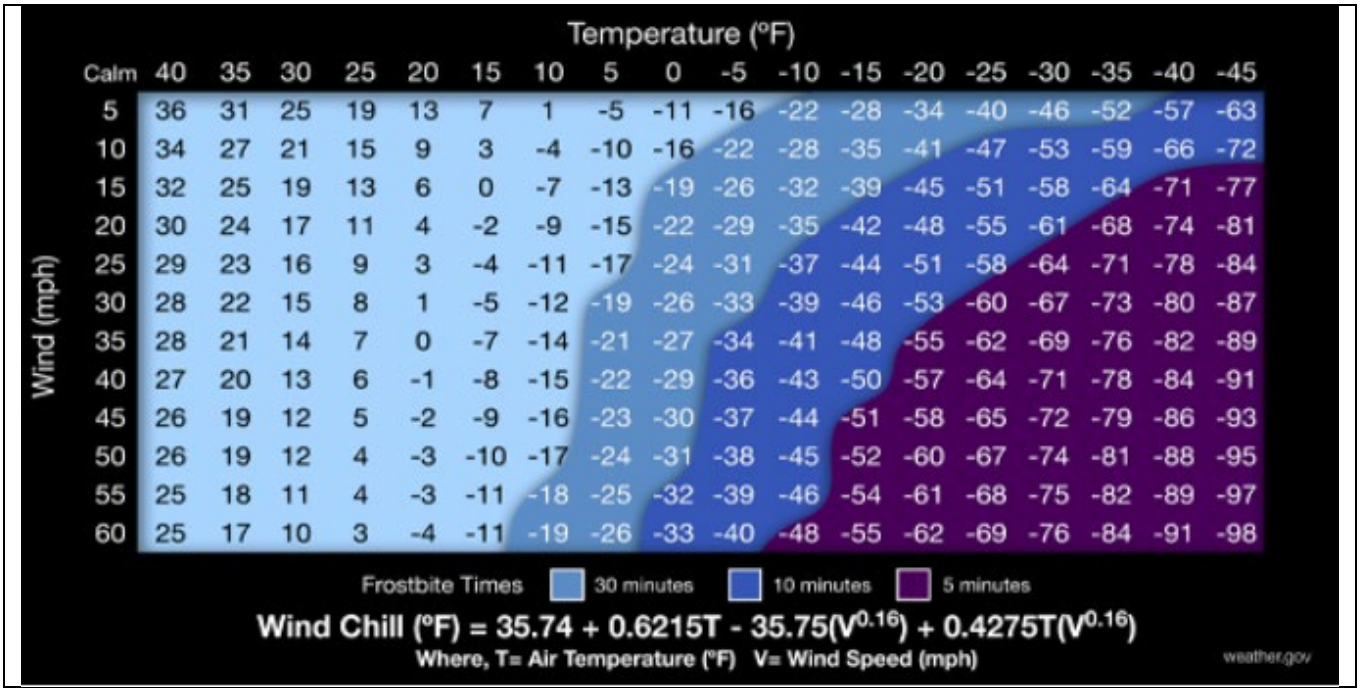
Seventy-six percent of El Paso County falls within the Koeppen Climate Zone of cold semi-arid. Although the probability of future occurrence of severe winter storms remains high, it is projected that the number of extreme cold events in the cold semi-arid climate zone will decline from approximately 185 to 95 days annually by the end of the 21st century, a difference of up to 60 days compared to historic levels.

20.1.3 EXTENT

In 2001, the National Weather Service (NWS) implemented an updated wind chill temperature index (Figure 20-1).This index describes the relative discomfort or danger resulting from the combination of wind and temperature. Wind chill is based on the rate of heat loss from exposed skin caused by wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature and eventually the internal body temperature.

A wind chill watch is issued by the NWS when wind chill warning criteria are possible in the next 12 to 36 hours. A wind chill warning is issued for wind chills of at least negative 25 degrees on the plains and minus 35 degrees in the mountains and foothills.

Figure 20-1. National Weather Service Wind Chill Chart



Source: NWS, 2025.

Warning Time

There is maximum warning time for winter storm events, with more than 24 hours. Meteorologists can often predict the likelihood of a severe winter storm. This can give several days of warning time. However, meteorologists cannot predict the exact time of onset or severity of the storm. Some storms may come on more quickly and have only a few hours of warning time.

20.1.4 PREVIOUS OCCURRENCES

Federal Emergency Management Agency (FEMA) Disaster Declarations

Table 20-1 lists all winter storm-related major disasters declarations that have included the Pikes Peak Region since 1953.

Table 20-1. Federal Emergency Management Agency (FEMA) Disaster Declarations for Winter Storm Events in the Pikes Peak Region

FEMA Declaration Date	Declaration Number	Description
April 9, 2003	EM-3185	Snowstorm
January 7, 2007	EM-3270	Snowstorm

Source: FEMA n.d.

State Emergency Proclamations

Table 20-2 lists all winter storm-related state emergency proclamations that included the Pikes Peak Region from 2020 to 2024.

Table 20-2. State Emergency Proclamations for Winter Storm Events in the Pikes Peak Region (2020 to 2024)

State Proclamation Date	State Proclamation Number	Description
March 12, 2021	D-2021-064	Severe Winter Weather
February 9, 2024	D-2024-002	Extreme Cold Temperatures and Winter Weather

Source: Colorado Governor n.d.

U.S. Department of Agriculture (USDA) Declarations

Between 2020 and 2024, the Pikes Peak Region was not included in any USDA winter storm-related agricultural disaster declarations.

All Recent Events

Table 20-3 lists major recorded winter storm-related events that impacted Pikes Peak Region since the previous HMP was developed. For earlier events, refer to the previous HMP.

Table 20-3. Winter Storm Events in Pikes Peak Region (2020 to 2024)

Date	Hazard	Event Narrative
February 7, 2020	Winter Storm	A Winter Storm produced six to eight inches of snow near Falcon, Florissant, City of Manitou Springs, Town of Monument, Pueblo West and Woodland Park, Nine to ten inches of snow was measured near the Air Force Academy, Black Forest, City of Colorado Springs, Town of Palmer Lake and Penrose. 11 to 12 inches of snow graced Monarch Pass, while 19 inches of snow impacted Leadville.
September 8, 2020	Winter Storm	A strong upper-level system impacted southern Colorado from September 8th through the 10th. This system brought an end to the above normal warmth and provided the region with winter like weather. 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. Snow amount of 9 inches. 4 NNE Black Forest.
October 25, 2020	Winter Storm	A potent winter storm affected the region on the 25th and 26th, bringing heavy snow to both the higher terrain and parts of the plains in southern Colorado. A brief period of freezing drizzle did occur prior to this snow, with a period of heavy snow occurring. The highest numbers were observed across the southwest mountains with this event. Additionally, a much colder air mass provided well below normal temperatures across the region. Snowfall of 8.9 inches. 4 South Air Force Academy.

Date	Hazard	Event Narrative
December 14 – 15, 2020	Heavy Snow	A strong upper-level system moved across the region during this time and provided another favorable setup for snow across southern Colorado. Only a few heavy snow reports were observed with this system. Heavy snow of 6.0 inches. 3 north northeast Town of Monument.
January 26, 2021	Heavy Snow	An active pattern and a favorable setup for persistent snow development occurred during this period, with both the higher terrain and lower elevations observing snow. Much of the snow during this time occurred over the eastern mountains and adjacent lower levels.
February 3 – 4, 2021	Heavy Snow	A quick moving upper-level system dropped southeast across Colorado during this period. Ahead of this system, westerly flow increased across the area and helped support a period of strong winds along parts of the higher terrain and the plains. Additionally, accumulating snow developed over the Continental Divide with this system, with an associated cold front helping to bring snow to much of the I-25 corridor. Heavy snow of 9.0 inches. Town of Palmer Lake.
February 17 – 18, 2021	Heavy Snow	A period of heavy snow was noted across southern Colorado during this time frame. Snow was observed across much of southern Colorado, especially the Wet and Sangre de Cristo mountains, and Pikes Peak region. The highest snowfall amounts were observed across the Pikes Peak region though, with many snowfalls reported more than six inches observed over Teller and El Paso counties. Heavy snow of 10.0 inches. 4 east northeast Town of Monument. Heavy snow of 6.5 inches. 3 east northeast City of Manitou Springs. Heavy snow of 8.0 inches. Cascade.
February 24 – 25, 2021	Heavy Snow	An upper-level system moved across the region during this time and helped assist with really focused snow development over El Paso County. Accumulating snow was noted outside of El Paso county, however, persistent heavier snow allowed amounts to approach ten to twelve inches in some spots. These higher amounts were observed across the western half of the county, around the I-25 corridor. Heavy snow of 12.0 inches. 2 southwest City of Colorado Springs.
March 4 – 5, 2021	Heavy Snow	An upper-level system moved across Colorado and brought isolated reports of heavy snow to parts of southern Colorado. Snow first spread across the eastern San Juan Mountains and then the Continental Divide, before moving into areas around the Palmer Divide. Snowfall from this system ranged from six to ten inches. Heavy snow of 10.0 inches. 1 west Woodland Park.
March 14 – 15, 2021	Winter Storm	Moderate to heavy snow persisted in this location along with high winds, with blizzard conditions noted across far northern El Paso county. Highest snowfall amounts of around two feet were also observed in this location. Freezing rain, with 0.25 inches of icing on surfaces due to freezing drizzle and fog. Paved surfaces reported as icy. Heavy snow of 28.0 inches. Town of Palmer Lake. Heavy snow of 16.4 inches. 4 miles south of Air Force Academy. Heavy snow of 27.0 inches. Woodland Park.

Date	Hazard	Event Narrative
March 21 – 22, 2021	Winter Storm	As an upper-level system approached from the west, a cold front dropped south through the region during this period. This assisted with a period of deep upslope flow focused across the Pikes Peak region, supporting the highest snowfall totals in this location. The highest totals were in the 8-to-10-inch range across the Pikes Peak region. Heavy snow of 9.0 inches. 5 miles northwest Cripple Creek. Heavy snow of 10.4 inches. 4 miles south of Air Force Academy. Heavy snow of 10.0 inches. 2 miles north of the Black Forest.
April 15 – 16, 2021	Heavy Snow	An upper-level system moved slowly across Colorado helping to provide an extended period of snow to both the higher and lower terrain of southern Colorado. While snow was observed across the mountains and mountain valleys, the highest snowfall totals of 6 to 9 inches were observed across El Paso and Pueblo Counties. Heavy snow of 8.5 inches. 5 miles west southwest Town of Calhan. Heavy snow of 6.0 inches. 6 miles south of the Air Force Academy.
April 19 – 20, 2021	Heavy Snow	A strong cold front moved across the region during this time frame, helping to support a period of moderate to heavy snow across the Pikes Peak Region and Palmer Divide. A few reports across these areas were in the 6-to-9-inch range, however, most of the snowfall during this event stayed below 6 inches. Heavy snow of 9.0 inches. 5 miles northwest Cripple Creek. Heavy snow of 7.5 inches. Town of Palmer Lake.
May 3, 2021	Heavy Snow	Moderate to heavy precipitation developed across the region during this time, and as snow levels fell, heavy snow occurred across mainly the higher terrain. However, this snow did move across adjacent locations, including the Pikes Peak region where six to seven inches of snow fell. Heavy snow of 5.5 inches 2 miles north northeast Town of Monument.
January 4, 2022	High Wind	Low pressure swept across eastern Colorado on January 4th producing strong westerly winds in its wake. Several 60+ MPH wind gusts were reported across the region.
March 16 – 17, 2022	Heavy Snow	An upper-level weather system brought widespread precipitation to the area during the period, with heavy and wet snow producing difficult travel conditions over the eastern mountains and Palmer Divide. The highest amounts were generally in the eight-to-ten-inch range, over and near the higher terrain. Heavy snow of 9.5 inches, 3 miles north northeast of Town of Monument.
April 24 – 25, 2022	Heavy Snow	An upper-level system tracked east across southern Colorado during this period. This led to snow from the Central Mountains, southeast into the Sangre de Cristo and Wet Mountains, and into the southern I-25 corridor. Amounts were generally low, though a couple of snowfall amounts around a foot and a half were observed over the Pikes Peak region and southern mountains. Heavy snow of 17 inches.

Date	Hazard	Event Narrative
May 20 – 21, 2022	Heavy Snow	A large upper-level system moved across the region through the period and brought very beneficial moisture to portions of south central and southeast Colorado in the form of rain and heavy snow. The heaviest snow, of one to two feet, fell over and near the Pikes Peak region and southern mountains. While the moisture was beneficial, this heavy wet snow did cause significant tree damage across the area. Heavy snow of 18.0 inches. 1 west southwest Woodland Park. Heavy snow of 19.0 inches. Town of Palmer Lake. Heavy snow of 13.5 inches. 6 south Air Force Academy.
October 27, 2022	Heavy Snow	An upper-level system brought snow to parts of the higher terrain and Pikes Peak region during this time frame. While amounts were generally light, isolated higher amounts of six to ten inches were observed. Heavy snowfall of 7.5 inches.
November 17 – 18, 2022	Heavy Snow	As a cold front moved through the area, snow continued to fill along the I-25 corridor throughout the evening and overnight hours. While snow was observed over both the I-25 and Highway 50 corridors, the highest snowfall totals of 6 to 7 inches occurred across El Paso county. Heavy snowfall of 7.1 inches two miles south southwest of City of Colorado Springs.
December 22 – 23, 2022	Extreme Cold/Wind Chill	A strong cold front moved across the area during the evening hours, bringing with it a brief period of snowfall, gusty northerly winds, and frigid temperatures. Snowfall generally stayed light, in the two-to-four-inch range. The main impacts during this period stemmed from the extreme cold, with many locations over the plains observing wind chill values of 25 below zero to 35 below zero. Some locations across El Paso county observed wind chill values of 40 below zero to 50 below zero. Wind chill value of 48 below zero.
December 28 – 29, 2022	Heavy Snow	An initial warmer start to the period resulted in a rain snow mix across the Pikes Peak region. With the arrival of much colder air, a transition to all snow occurred for the remainder of the event with heavy snow occurring in many places. Snowfall amounts were mainly in the six-to-ten-inch range, though a few reports up to around one foot were observed over far northern El Paso County. Heavy snow of 13.5 inches.
January 18 – 19, 2023	Heavy Snow	An active period was observed across south central Colorado during this time, with periods of heavy snow occurring over both the higher and lower terrain. The eastern San Juan Mountains observed the highest snowfall, with storm totals up to around four feet. The Pikes Peak region observed up to around seven inches, with lighter amounts observed elsewhere across the lower terrain. Storm total snowfall of 6.5 inches. 3-foot drifts.
January 20 – 21, 2023	Heavy Snow	An upper-level system moved across the region, bringing snow to much of south central and southeast Colorado. The snow was brief across the higher terrain, where lighter amounts were observed. Highest amounts ranging from 6 to 15 inches were observed across the eastern plains during this period. Heavy snowfall of 15 inches.

Date	Hazard	Event Narrative
February 15, 2023	Heavy Snow	Remnants of an AR combined with a strong cold front delivered heavy snow across the majority of Pueblo's CWA. Winter storm brough 6.3 inches of snow.
April 5 – 6, 2023	Winter Weather	Strong winds led to heavy snow as a closed low pressure center traveled over southern Colorado. Widespread light snow fell over the region, but the heaviest snow fell over northern El Paso County. There was 9 inches of snow reported 5 miles northeast of the Air Force Academy. There was 9 inches of snow reported 5 miles northeast of the Air Force Academy. There was 4 inches of snow reported 6 WSW of Falcon.
April 14 – 15, 2023	Heavy Snow	Another closed low propagated over southern Colorado and provided ample upslope flow for northern El Paso County to get another moderately heavy snow event on April 15th. There was 4 inches of snow reported 2 miles east of City of Manitou Springs. There was 6.5 inches of snow reported in Woodland Park. There was 7.4 inches of snow reported in Town of Palmer Lake with 0.59 inches of snow water equivalent.
April 21 – 22, 2023	Heavy Snow	The Spring system dropped snow, heavy over some places, from April 21st through April 23rd. The hardest hit area was the southern I-25 corridor. There was 3 inches of snow that fell 2 miles east of City of Manitou Springs. There was 4.5 inches of snow that fell in Woodland Park.
April 25, 2023	Heavy Snow	A later springs system developed over southern Colorado from April 24th through April 26th. Heavy snow was observed over the mountains and heavy rain was reported over the eastern plains of CO where temperatures were above freezing. There was 10 inches of snow that fell over Ruxton Park, CO. There was 5 inches of snow reported 1 mile west of Woodland Park.
April 27 – 28, 2023	Heavy Snow	The Wet Mountains and the southern I-25 corridor received much of the heavier snow during the final bigger snow event of April - April 28th. There was 4.3 inches of snow that fell 4.3 miles northeast of City of Colorado Springs.
May 12, 2023	Heavy Snow	A closed low propagated from SW CONUS and rapidly intensified over the southeast Colorado plains. A combination of strong lift due to the rapidly intensifying cyclone and orographic lift created heavy snow over the mountains. Since this was a late spring system with origins from the Pacific, the lower elevations were warm enough for heavy rainfall that ended up causing some flooding issues along the Fountain Creek in El Paso County and Pueblo County. There was 1 foot of standing water as reported via video from law enforcement and social media. COOP observer reported 1 inch hail. There was 4 inches of snow. There was 6.39 inches of rain that fell. There was 12 inches of snow that fell.
November 7 – 9, 2023	Winter Weather	A positively tilted shortwave trough propagated over Colorado from November 8th - November 9th. Snowfall amounts were relatively low, but there were spots located in Fremont County that got around 8 of snow. This was also the first snowstorm of the year for much of the lower elevations. 1 to 3 of snow fell over the City of Colorado Springs metropolitan area. There was 6 inches of snow that fell.

Date	Hazard	Event Narrative
November 20, 2023	Winter Weather	A closed low propagates over southern Colorado, tightening near the Colorado and Kansas border. The cold air aloft behind the cyclone created efficient conditions for snow across the Pikes Peak region, with the heaviest snowfall falling over Teller County and extreme northwestern El Paso County and lower amounts over the lower elevations of El Paso County. There was 6 inches of snow that fell 4 miles southwest of Town of Palmer Lake. There was 5 inches that fell over Woodland Park. There was 2.0 inches of snow 2 miles north of Black Forest.
November 24 – 25, 2023	Winter Weather	A broad and large closed low propagated over the northern portion of Colorado bringing lighter snow across portions of southern Colorado. There was 2.3 inches of snow that fell over Town of Monument, CO.
December 8 – 9, 2023	Heavy Snow	A long and sharp trough passed over the region that brought a strong cold front with very cold air behind it. The cold air created an efficient environment for efficient snow production, leading to heavy snowfall accumulations across the eastern mountains and the I-25 corridor from El Paso County down to the New Mexico border. There was 10.2 inches of snow that fell.
December 13 – 14, 2023	Winter Weather	A closed low pressure system propagated from the Pacific Northwest down through northern New Mexico providing an efficient flow regime for snowfall over the eastern mountains and over the plains. The propagation speed and the location of the cyclone wasn't the ideal location for snowfall, but I-25 corridor performed well. There was 4.9 inches of snow that fell.
December 23 – 24, 2023	Winter Weather	A weak wave train propagated over Colorado providing light to moderate snowfall over southern Colorado around Christmas time. There was 6 inches of snow that fell as observed by the COOP observer. Regional ASOS show 3 hours of 1/4 mile visibility and 30 mph wind gusts in conjunction with the snow.
January 6, 2024	Heavy Snow	A closed upper low moved through the Four Corners Region and into the forecast area, bringing widespread snow. There was 3.5 inches of snow that fell.
January 19, 2024	Winter Weather	Northwesterly flow set up over Colorado on January 19th. The northwesterly flow is an efficient orientation for upslope flow over the Sawatch Range of Lake and Chaffee Counties. Occasionally if there is a small amount of instability snow bands can develop over the I-25 corridor, which happened here. The amounts were quite small, however.
January 26, 2024	Heavy Snow	A relatively weak trough passed over southern Colorado from 1/25 to 1/26 producing moderate to heavy snowfall across the mountains, the mountain valleys, and portions of the I-25 Corridor. With the passing trough the vorticity advection sparked showers over the mountains the created snow bands over the mountains that spilled over the lower elevations. There was 7.5 inches of snow that fell.

Date	Hazard	Event Narrative
February 4, 2024	Heavy Snow	A closed low and associated upper-level trough moved from the Pacific Northwest into Colorado. At the same time, good moisture transport from the West Coast provided moisture and resulted in impactful snowfall for southeast Colorado. There was 14.0 inches of snow measured.
February 9, 2024	Heavy Snow	An upper-level low moved onshore in the Pacific Northwest and then slid eastward. This ramped up snow across the Rocky Mountains and adjacent areas. There was 4.0 inches of snow measured.
February 11, 2024	Heavy Snow	An upper trough moved into the area and combined with a good tap of moisture from the southwest to cause snowfall across the area. There was 13.5 inches of snow measured.
February 17, 2024	Heavy Snow	A fast-moving trough moved through the area. The trough brought lift and moisture to the mountains which resulted in light snowfall. There was 7.1 inches of snow measured.
March 2 – 3, 2024	Heavy Snow	A broad upper-level trough moved in from the Pacific Northwest, bringing strong winds to the area along with orographically enhanced snowfall to some areas. There was 4.0 inches of snow measured.
March 9, 2024	Heavy Snow	Another broad upper-level trough moved in from the northwest, along with a potent mid-level jet maximum that brought more snow to the area. There was 15.0 inches of snow measured.
March 15, 2024	Heavy Snow	An upper trough dug down through the Four Corners Region around the middle of March, bringing another winter storm system to southeast Colorado. This brought widespread heavy snow and rain to a large portion of the forecast area. There was 42.0 inches of snow measured.
March 16, 2024	Heavy Snow	The incoming upper low split into two parts: a broad trough that quickly moved east and a new lobe of energy that dove to the south, resulting in some lingering snow for the following several days. There was 20.0 inches of snow measured, as accumulation from the last 24 hours.
March 24, 2024	Heavy Snow	During late March, yet another deep upper-level trough dug in across the western US. This, along with a strong southwesterly flow from the subtropical jet, brought in sufficient moisture and synoptic/orographic lift for another round of snowfall for parts of SE Colorado. Additionally, the strong synoptic forcing and convective nature of parts of this system did allow for the formation of one landspout tornado on March 26th. There was 6.7 inches of snow measured.
April 2, 2024	Winter Weather	A weak wave aloft brough low snowfall amounts over the mountains, mountain valleys, and over the highest elevations plains. There was 1.3 inches of snow that fell.
April 27, 2024	Winter Weather	A large, closed low pressure system developed over the High Plains of the United States delivering moderate snowfall amounts over southern Colorado. There was 6.5 inches of snow that fell.
May 12, 2024	Heavy Snow	An upper-level trough moved through the area with a breezy southwest flow aloft. This setup resulted in heavy snow, heavy rain, and even some thunder. There was 16.0 inches of snow measured.

Date	Hazard	Event Narrative
October 18 – 19, 2024	Winter Weather	A closed low pressure center set up over the desert southwest. The seasonality of it created cold enough temperatures for heavy snow over the mountains, but the position of the low at this point of the year created a sufficient atmosphere for severe thunderstorms over the eastern plains.
October 29 – 30, 2024	Winter Weather	A trough associated with a strong jet streak developed over southern Colorado created strong winds over the I-25 corridor. There was 4 inches of snowfall was reported.
November 5 – 6, 2024	Heavy Snow	A deep upper trough and associated low, coupled with persistent upsloping, brought widespread precipitation to southeast Colorado. There was 7.0 inches of snow measured.
November 6 – 9, 2024	Heavy Snow	The broad upper trough continued to deepen over the Four Corners Region, with gusty winds and moist upslope flow continuing moderate to heavy snowfall across most of the forecast area. There was 27.9 inches of snow measured.
November 6 – 9, 2024	Heavy Snow	The upper low and associated trough finally pushed east of the forecast area as the weekend approached. Some upslope flow remained as things started to dry out, giving us another day or so of snowfall. There was 32.1 inches of snow measured.
November 25 – 28, 2024	Heavy Snow	As the upper jet progressed eastwards, shortwave energy moved across the area overhead, allowing for some enhanced precipitation formation, mostly over and near the higher terrain. There was 6.5 inches of snow measured.
December 9 – 10, 2024	Heavy Snow	A quick-moving upper-level wave pushed through Colorado, bringing enough synoptic lift and moisture to bring snowfall to large portions of the area, along with a cold front passing over the eastern plains. This also came with breezy winds and cold temperatures across most of southeast Colorado. There was 6.3 inches of snow measured.

Source: NOAA-NCEI, 2025.

20.1.5 PROBABILITY OF FUTURE OCCURRENCES

Information on previous winter storm occurrences in the County was used to calculate the probability of future occurrence of such events. Table 20-4 lists the number of events from various sources over the 71-year period from 1954 to 2025, which is the most complete period of record for all sources reviewed. Based on these records and input from the Steering Committee, the probability of occurrence for winter storms in the County is considered “frequent.”

Table 20-4. Probability of Future Winter Storm Events in Pikes Peak Region

Hazard Type	Number of Occurrences Between 1954 and 2025	% Chance of Occurring in Any Given Year
Blizzard	11	15.5%
Heavy Snow	96	100%
Winter Storm	100	100%
Winter Weather	32	45%
Total	239	100%

Source: NOAA-NCEI, 2025

Note: 100% probability indicates that it is statistically likely for an event to occur every year. It does not indicate that the occurrence of an event is a certainty in any given year.

20.1.6 CASCADING IMPACTS ON OTHER HAZARDS

Winter storms in the Pikes Peak Region can cause widespread impacts. The greatest threat is to public safety on major roads and highways. Power outages caused by snow, ice, and wind accompanied by cold temperatures create additional needs for shelter. Other issues caused by winter storms can be related to school closures, business closures, road closures, snow removal, and maintaining critical services like emergency services, food providers, and banks.

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

Heavy accumulations of ice and or strong winds can bring down trees, power lines, telephone poles and lines, and communication towers, causing communication disruptions that can last for days or weeks. Blowing snow can severely reduce visibility. Serious vehicle accidents can result with 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.

In rural parts of El Paso County, homes and ranches may be isolated for days, and unprotected livestock may be lost.

The most significant secondary hazards associated with severe local storms are falling and downed trees, landslides, and downed power lines. Rapidly melting snow combined with heavy rain can overwhelm both natural and man-made drainage systems, causing overflow and property destruction. Landslides can occur when the soil on slopes becomes oversaturated and fails.

20.2 VULNERABILITY AND IMPACT ASSESSMENT

All El Paso County is at risk from the impacts of winter storms. A qualitative analysis was conducted to assess the County's vulnerability to this hazard of concern.

20.2.1 LIFE, HEALTH, AND SAFETY

Overall Population

The entire planning area (736,008) is exposed to some extent to severe winter weather events. Certain areas are more exposed because of geographic location and local weather patterns.

Socially Vulnerable Population

Vulnerable populations are the elderly, children under the age of 5 years, low income, linguistically isolated populations, people with life- threatening illnesses, and residents living in areas that are isolated from major roads. Power outages can be life threatening to those dependent on electricity for life support. Isolation of these populations is a significant concern. These populations face isolation and exposure during severe winter weather events and could suffer more secondary effects of the hazard, or even death if not properly prepared.

20.2.2 GENERAL BUILDING STOCK

All buildings are exposed to severe winter weather, but structures in poor condition or in particularly vulnerable locations (located on hilltops or exposed open areas) may risk the most damage. Structures 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 frequency and degree of damage will depend on specific locations.

Estimates were developed for this HMP to show the potential loss to structures due to winter storms assuming damage equal to various percentages of area-wide replacement cost values (RCV). Results are shown in Table 20-5.

Table 20-5. Potential Damage to Structures from Winter Storms

Jurisdiction	Total Replacement Cost Value (Structure Only)	Damage Equal to 1% of Total RCV	Damage Equal to 5% of Total RCV	Damage Equal to 10% of Total RCV
Town of Calhan	$206,314,950	$2,063,150	$10,315,748	$20,631,495
City of Colorado Springs	$61,036,857,529	$610,368,575	$3,051,842,876	$6,103,685,753
City of Fountain	$3,002,880,420	$30,028,804	$150,144,021	$300,288,042
Town of Green Mountain Falls	$105,432,367	$1,054,324	$5,271,618	$10,543,237
City of Manitou Springs	$761,949,948	$7,619,499	$38,097,497	$76,194,995
Town of Monument	$1,427,753,293	$14,277,533	$71,387,665	$142,775,329
Town of Palmer Lake	$416,927,248	$4,169,272	$20,846,362	$41,692,725
Town of Ramah	$15,942,779	$159,428	$797,139	$1,594,278
Unincorporated County	$22,325,010,718	$223,250,107	$1,116,250,536	$2,232,501,072
El Paso County (Total)	**$89,299,069,252**	**$892,990,693**	**$4,464,953,463**	**$8,929,906,925**

Source: U.S. Army Corps of Engineers, National Structure Inventory 2022; RSMeans 2024

20.2.3 COMMUNITY LIFELINES AND OTHER CRITICAL FACILITIES

All critical facilities are likely exposed to severe winter weather. The most common problems associated with this hazard are utility losses. Downed power lines can cause blackouts, leaving large areas isolated. Telephone, water, and sewer systems may not function. Roads may become impassable because of ice or snow.

Incapacity and loss of roads are the primary transportation failures resulting from severe winter weather. 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 aboveground communication lines. Freezing power and communication lines can cause them to break, disrupting electricity and communication. Loss of electricity and telephone connection would leave certain populations isolated because residents would be unable to call for assistance.

20.2.4 ECONOMY

Winter storms can impact on the economy of the County and even an entire region depending on the scale of the event. When a winter storm strikes, often local businesses, schools, factories, and restaurants must shut down due to icy roadways, loss of utilities, and generally unsafe conditions all around. This can cause loss of revenue and customer access to businesses, as well as loss of school days for children to safely access their schools. Loss of revenue for a certain number of days can sometimes be detrimental to some local businesses, restaurants, and even factories.

20.2.5 ENVIRONMENT

The environment is highly exposed to severe weather events. Natural habitats such as streams and trees risk major damage and destruction. Flooding events caused by snowmelt can produce river channel migration or damage riparian habitat.

20.2.6 HISTORIC AND CULTURAL RESOURCES

Winter storms can have impacts on the historical and cultural resources of El Paso County. El Paso County is home to a rich array of historical landmarks, museums, and cultural spaces. Winter storms can degrade historical structures which may not be built to moder standards to withstand such events, further losing irreplaceable artifacts. Winter storms can also halt operations for educational resources such as museums and public outdoor landmarks. This can lead to loss of revenue that helps to fund restoration and maintenance efforts for these historical resources.

20.3 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

20.3.1 LAND USE AND DEVELOPMENT

All future developments will be affected by severe storms. The ability to withstand the impacts of winter storms lies in sound land use practices and consistent enforcement of codes and regulations for new constructions. Area planning departments have adopted the International Building Code. This code is equipped to deal with the impacts of severe weather events. Land use policies identified in general plans within the planning area also address many of the secondary impacts (flood and landslide) of the severe weather hazard.

20.3.2 PROJECTED CHANGES IN POPULATION PATTERNS

The County population is projected to increase by over 32 percent by 2050. Table 3-7 summarizes recent and projected future changes in county population. Between 2010 and 2025 alone, the County population rose by nearly 21 percent. With this increase in population, the risk to winter storms has also increased. More people residing and living in the County directly increases the exposure to this hazard in the event it may occur. Additionally, an increase in projected populations in the future will also indicate an increase in winter storm risk. It is critically important that the County plans for and mitigates against winter storm hazards for the current population and the projected new population in the future.

20.3.3 CLIMATE CHANGE

Climate change impacts and influences winter storms in the state by many evolving ways. While the overall trend seen in winter storm frequency remain uncertain, there is evidence that individual storm systems may become more intense due to increased atmospheric moisture and the warming temperatures. Warmer air holds more moisture which can lead to heavier snowfall during storms when temperatures are below freezing. Also, rising temperatures can mean that more winter precipitation may fall as rain rather than snow especially seen at lower elevations. This shift can reduce snowpack which is critical for Colorado's water supply and winter recreation economy. Additionally, climate change is contributing to more frequent dust-on-snow events which can accelerate this snowmelt and reduce snowpack longevity for the state (Colorado Climate Center n.d.). These changes in climate present significant challenges for state and local water management, agriculture, and tourism across the state.

20.3.4 OTHER IDENTIFIED CONDITIONS

Important issues associated with a winter storm in the planning area include the following:

- Older building stock in the planning area is built to low code standards or none at all. These structures could be highly vulnerable to severe weather events such as windstorms or snowstorms.
- Redundancy of power supply must be evaluated. The capacity for backup power generation is limited.
- The high altitudes and rugged terrain in the planning area exacerbates emergency situations caused by winter storm events.
- Future efforts should be made to identify populations at risk and determine special needs during winter storm events.

20.4 CONSEQUENCE ANALYSIS

Table 20-6 presents the results of the consequence analysis for the winter storm hazard.

Table 20-6. Consequence Analysis for the Winter Storm Hazard

Category	Narrative
Hazard Description	Heavy snowfall can immobilize a region by stranding commuters, halting the flow of supplies, and disrupting emergency and medical services. Accumulated snow can collapse roofs, damage trees, and bring down power lines. Power outages affect homes, businesses, and essential services such as water and sewer systems that rely on electric pumps. The financial impact of snow removal, damage repair, and business interruptions can be significant.
Impact on Property, Facilities, and Infrastructure	Winter storms affect the entire planning area, including all above-ground structures and infrastructure. While structural damage is typically minimal and covered by insurance, additional costs may arise from lost productivity, maintenance, and damage to contents within buildings. Heavy accumulations of ice, wet snow, or strong winds can bring down trees, power lines, telephone poles, and communication towers, resulting in communication disruptions that may last for days or weeks.
Impact on the Environment	Severe winter weather can damage vegetation and tree limbs due to heavy snow and ice accumulation. Rapid snowmelt following a storm may lead to flooding, which can cause further environmental degradation.
Impact on Responders	Heavy snow can immobilize a region, delaying emergency response and disrupting access to essential services such as food and fuel. Emergency personnel may be exposed to hazardous conditions while performing routine duties during a storm. Most storm-related duties occur post-event, but unsafe structural or environmental conditions may persist during the response period. First responders may face physical and psychological strain, and concerns about their families can increase overall risk. Ambulance services may be delayed due to blocked roadways.
Impact on Continuity of Operations, Continuity of Government, and Delivery of Services	Winter storms can interrupt essential facilities and services for 24 to 72 hours. PPROEM maintains the Continuity of Operations Plan and the Continuity of Government Plan for the County of El Paso and the City of Colorado Springs; other jurisdictions in the Pikes Peak Region are in the process of developing continuity plans and procedures.

Category	Narrative
Impact on the Public	Winter storms in the Pikes Peak region can cause widespread impacts, including isolated deaths and multiple injuries. The greatest threat to public safety occurs on major roads and highways, where snow and ice can lead to serious vehicle accidents. Road closures may delay emergency response and the delivery of medications or surgical equipment. Power outages caused by snow, ice, and wind—especially when accompanied by cold temperatures—create additional shelter needs. Blowing snow can severely reduce visibility, increasing the risk of accidents. Prolonged exposure to cold can result in frostbite or hypothermia, which may become life-threatening. Infants, the elderly, and stranded motorists are especially vulnerable until help arrives.
Impact on the Economic Condition of the County	Winter storms can lead to school closures, business shutdowns, road closures, and challenges in maintaining critical services such as emergency response, food supply, and banking operations. Snow removal and infrastructure maintenance are essential to restoring normal operations.
Impact on the Public Confidence in Government	Public confidence is closely tied to perceptions of how well response and recovery efforts are managed during and after a winter storm. A response that demonstrates the County's preparedness and attentiveness to public needs—and that restores services and repairs damage in a timely manner—can maintain or enhance the County's reputation. Effective public communication about response efforts is essential to maintaining trust in local government.

21. AVALANCHE

21.1 HAZARD PROFILE

21.1.1 HAZARD DESCRIPTION

According to the US National Weather Service, an avalanche is a rapid flow of snow down a hill or mountainside. Given the right conditions, avalanches can happen on any steep slope; however, certain times of the year and types of locations are naturally more dangerous.

An avalanche occurs when the stress (from gravity) trying to pull the snow downhill exceeds the strength (from bonds between snow grains) of the snow cover. There are four ingredients of an avalanche: steep slope, snow cover, weak layer in the snow cover, and a trigger. About 98 percent of all avalanches occur on slopes of 25 to 50 degrees. Earthquakes during the winter months could also trigger avalanches, potentially affecting even lower angled slopes and having widespread impacts depending on the level of ground shaking. Avalanches release most often on slopes above timberline that face away from prevailing winds (leeward slopes collect snow blowing from the windward sides of ridges.) Avalanches can run, however, on small slopes well below timberline, such as gullies, road cuts, and small openings in the trees. Very dense trees can anchor the snow to steep slopes and prevent avalanches from starting; however, avalanches can release and travel through a moderately dense forest.

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

Several weather and terrain factors determine avalanche severity and danger:

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

- Slope aspect—Leeward slopes are dangerous because windblown snow adds depth and creates dense slabs. South-facing slopes are more dangerous in the springtime.
- Slope steepness—Snow avalanches are most common on slopes of 30 to 45 degrees.

Avalanches occur regularly in the backcountry and are not a problem until human activities and land uses are affected adversely by the avalanches. Possible conflicting land uses between humans and avalanches include recreation, residential, transportation, and mining. Examples of this conflict include property damage, injury, deaths, and excessive maintenance costs (e.g., removal of debris from transportation corridors impacted by avalanches).

According to the Colorado Avalanche Information Center (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 (CAIC n.d.).

21.1.2 LOCATION

There is no mapped avalanche risk zone information available for the Pikes Peak Region; however, a slope analysis was performed to identify areas that may potentially be at risk for an avalanche event. Figure 21-1 shows slopes in the County that are between 30 and 50 degrees at over 8,000 feet elevation. The greatest potential impact from an avalanche is to those mountain communities of Town of Green Mountain Falls, Chipita Park, and Cascade, as well as, Highway 24, but avalanches are also a danger to snowmobilers, backcountry skiers and hikers.

21.1.3 EXTENT

Avalanches are extremely destructive due to the great impact of the rapidly moving snow and debris and the burial of areas in the runout zone. Avalanches can reach speeds of up to 200 miles an hour and can exert forces great enough to destroy structures and uproot or snap off large trees. Avalanche paths consist of a starting zone, a track, and a runout zone. The runout zone is often an attractive setting for development. Structures not specifically designed to withstand the impacts are generally destroyed.

Where avalanches cross highways, passing vehicles can be swept away and demolished, and their occupants killed. Snow avalanches also imperil cross-country skiers, downhill skiers, snowboarders, and snowmobilers. Several backcountry visitors perish each winter in Colorado. Residences planned or erected in avalanche run out zones may not qualify for financing or insurance. Damage associated with impact pressure are shown in Table 21-1.

Additionally, two distinct scales for measuring avalanche magnitude include the Relative Size Scale, or R-Scale, and the Destructive Size Scale, or D-Scale. These are both qualitative scales that are useful when communicating avalanche activity and reporting on events or analyzing historic events. While the scales provide some structure around reporting on avalanche magnitude, scoring along the scales are still subjective in nature and rely upon consistency between event observers to produce appropriate estimates of magnitude. R-Scale is a simple estimate of the size, based on volume, of an avalanche relative to the path within which it occurs. The R-Scale scoring and description are shown in Table 21-2.

Figure 21-1. Avalanche Hazard Area

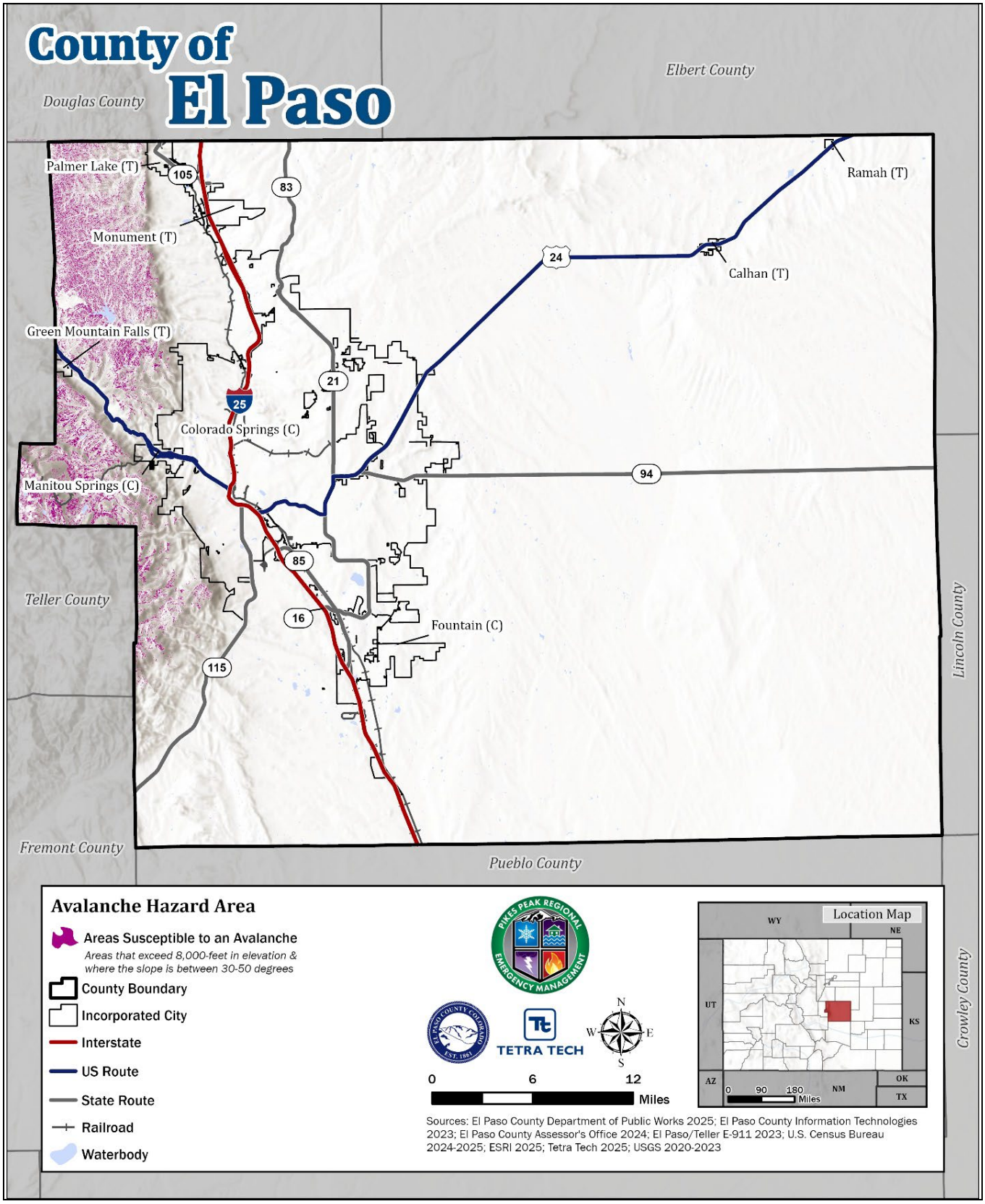


Table 21-1. Impact Pressure and Potential Damage

Impact Pressure (lbs/ft2)	Potential Damage
40-80	Break windows
60-100	Puch in doors, damage walls and roofs
200	Severely damage wood frame structures
400-600	Destroy wood frame structures, break trees
1000-2000	Destroy mature forests
>6000	Move large boulders

Source: (PPROEM 2020)

Table 21-2. R-Scale Scoring

Score	Description
R1	Very small, relative to path
R2	Small, relative to path
R3	Medium, relative to path
R4	Large, relative to path
R5	Major/Maximum, relative to path

Source: (Avalanche.Org 2025)

D-Scale is an assessment of the destructive potential of an avalanche. Half-sizes are sometimes reported within this scale, and the scale includes components for mass and path length associated with each score along the scale. D-Scale scoring is illustrated below in Table 21-3.

Table 21-3. D-Scale Scoring

Score	Description	Typical Mass	Typical Length
D1	Relatively harmless to people	<10 Tons	10 meters
D2	Could bury, injure, or kill a person	100 tons	100 meters
D3	Could bury and destroy a car, damage a truck, destroy a wood frame house, or break a few trees	1000 tons	1000 meters
D4	Could destroy a railway car, large truck, several buildings, or a substantial amount of forest	10,000 tons	2,000 meters
D5	Could gouge the landscape- largest snow avalanche known	100,000 tons	3,000 meters

Source: (Avalanche.Org 2025)

Warning Time

The warning time is considered minimal. Warning time is typically less than six hours. The time of an avalanche release depends on the condition of the snowpack, which can change rapidly during a

day and particularly during rainfall. Although forecasts can provide information regarding when avalanches are more likely to occur, an avalanche can occur with little or no warning time.

CAIC issues watches and warnings to communicate avalanche danger levels to those recreating in backcountry areas by zone. The North American Danger Scale, which ranges from low to extreme danger is shown in Figure 21-2. The danger is a combination of the expected likelihood, size, and distribution of avalanches.

Figure 21-2. North American Public Avalanche Danger Scale

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

Source: (Colorado Avalanche Information Center n.d.)

21.1.4 PREVIOUS OCCURRENCES

Although infrequent, avalanches do occur periodically in this region. Generally, avalanches in the County are relatively minor. There has only been one recorded death attributable to an avalanche in the County since 1950. The fatality occurred on the east face of Pike's Peak in April of 1995. In January 2007, City of Manitou Springs experienced an avalanche that spilled snow 15 feet deep onto a local highway leading to the top of Pikes Peak Mountain. The highway was closed for the winter months. There were no injuries or property damage caused by this avalanche. Other than these incidents, there has been no record of avalanches occurring in El Paso County according to the NOAA-NCEI Storm Event Database (NOAA-NCEI 2025).

FEMA Disaster Declarations

The Pikes Peak Region has never received a major disaster declaration for an avalanche-related event.

State Emergency Proclamations

Between 2020 and 2024, the Pikes Peak Region was not included in any state emergency proclamation for an avalanche-related event.

All Recent Events

There are no recorded avalanche-related events between 2020 and 2024. For earlier events, refer to the previous HMP.

21.1.5 PROBABILITY OF FUTURE OCCURRENCES

Information on previous avalanche occurrences in the County was used to calculate the probability of future occurrences of such events. As mentioned above, there are two recorded avalanche events in the Region's history. Table 21-4 lists the number of events from various sources over the 71-year period from 1954 to 2025, which is the most complete period of record for all sources reviewed. Based on these records and input from the Steering Committee, the probability of occurrence for avalanche in the County is considered "rare."

Table 21-4. Probability of Future Avalanche Events in Pikes Peak Region

Hazard Type	Number of Occurrences Between 1954 and 2025	% Chance of Occurring in Any Given Year
Avalanche	2	2.8%

Source: Pikes Peak Regional Office of Emergency Management

21.1.6 CASCADING IMPACTS ON OTHER HAZARDS

Avalanches can cause several types of secondary effects, such as blocking roads, which can isolate residents and businesses and delay commercial, public, and private transportation. This could result in economic losses for businesses. Other potential problems resulting from avalanches are power and communication failures. Avalanches also can damage rivers or streams, potentially harming water quality, fisheries, and spawning habitat.

21.2 VULNERABILITY AND IMPACT ASSESSMENT

A vulnerability analysis was conducted using the mapping of areas that may be at risk for an avalanche event (Figure 21-1). The analysis was performed as described in Section 4.3.

21.2.1 LIFE, HEALTH, AND SAFETY

Overall Population

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

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

Table 21-5 illustrates the population in the avalanche hazard area. Unincorporated El Paso County has the highest number of persons located in the avalanche hazard area at 406 people, 0.2 percent of the population. Town of Green Mountain Falls has 6 people located in the avalanche hazard area, which is 0.9 percent of the Township's population. The rest of the participating jurisdictions did not have people located in the avalanche hazard area.

Table 21-5. Population in the Avalanche Hazard Area

Jurisdiction	Total Population 2023 ACS	Population in Hazard Area	Population in Hazard Area as % of Total in Jurisdiction
Town of Calhan	510	0	0.0%
City of Colorado Springs	405,307	0	0.0%
City of Fountain	92,873	0	0.0%
Town of Green Mountain Falls	690	6	0.9%
City of Manitou Springs	4,796	0	0.0%
Town of Monument	11,035	0	0.0%
Town of Palmer Lake	2,635	0	0.0%
Town of Ramah	130	0	0.0%
Unincorporated County	218,032	406	0.2%
El Paso County (Total)	**736,008**	**412**	**0.1%**

Source: U.S. Census Bureau 2023, American Community Survey; Tetra Tech 2025; U.S. Army Corps of Engineers, National Structure Inventory 2022; U.S. Geological Survey 2020-2023

Socially Vulnerable Population

Avalanches can have significant risks to socially vulnerable populations, such as the elderly, disabled, non-English speaking individuals, and children. These groups often face unique challenges in both preparing for and responding to avalanche events. For example, the elderly and disabled may have limited mobility which make it difficult for them to evacuate quickly or access safe shelters. Additionally, non-English speaking individuals might struggle to understand the emergency warnings which are often disseminated in English. Additionally, recovery efforts may not always address the needs of these socially vulnerable groups which can lead to prolonged impacts and increased risks to future avalanche incidents.

Table 21-6 illustrates the number of vulnerable populations located in the avalanche hazard area. According to the 2023 American Community Survey (ACS), Unincorporated El Paso County has the largest number of persons over the age of 65 (51), under the age of 5 (26), non-English speakers (3), population with disability (39), and population below the poverty level (18) located in the avalanche hazard area.

21.2.2 GENERAL BUILDING STOCK

Avalanches can severely impact the general building stock of the County by causing extensive structural damage which may result in economic disruption. The force of an avalanche can demolish buildings especially those high-risk avalanche zones. This may lead to expensive repairs and perhaps even reconstruction. Residential, commercial, and other public buildings may be impacted from partial or complete destruction which not only impacts the lives of residents and workers but also disrupts local businesses and services. The economic burden of repairing and rebuilding damaged structures can strain local resources, impacting the overall economic stability of the County.

Table 21-7 shows the number of buildings in the avalanche hazard area. Unincorporated El Paso County has the largest number of buildings located in the avalanche hazard area, at 127, which is 0.2 percent of the buildings in this jurisdiction. The replacement cost value for these buildings located in the avalanche hazard area are $62,132,965. The Town of Green Mountain Falls has the second largest number of buildings located in the avalanche hazard area, at 5, which is 0.9 percent of the buildings in this jurisdiction. The replacement cost value for these buildings located in the avalanche hazard area are $1,101,526. City of Colorado Springs also has 1 building located in the avalanche hazard area with a replacement cost value of $4,900,896. The rest of the participating jurisdictions do not have any buildings located in the avalanche hazard area.

Table 21-8 shows buildings by general occupancy class located in the avalanche hazard area. There are a total of 125 residential buildings, 3 commercial buildings, 1 industrial building, and 4 other buildings located in the avalanche hazard area.

Table 21-6. Estimated Number of Vulnerable Persons Located in the Avalanche Hazard Area

	Population Over 65 Living in Hazard Area	Population Over 65 in Hazard Area as % of Total In Jurisdiction	Population Under 5 Living in Hazard Area	Population Under 5 in Hazard Area as % of Total In Jurisdiction	Non-English Speaking Population Living in Hazard Area	Non-English Speaking Population in Hazard Area as % of Total In Jurisdiction	Population with Disability Living in Hazard Area	Population with Disability in Hazard Area as % of Total In Jurisdiction	Population Below Poverty Level Living in Hazard Area	Population Below Poverty Level in Hazard Area as % of Total In Jurisdiction
Town of Calhan	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
City of Colorado Springs	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
City of Fountain	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Town of Green Mountain Falls	0	0.0%	0	0.0%	0	0.0%	1	0.8%	0	0.0%
City of Manitou Springs	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Town of Monument	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Town of Palmer Lake	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Town of Ramah	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Unincorporated County	51	0.2%	26	0.2%	3	0.2%	39	0.2%	18	0.2%
El Paso County (Total)	**51**	**0.1%**	**26**	**0.1%**	**3**	**<0.1%**	**40**	**<0.1%**	**18**	**<0.1%**

Source: U.S. Census Bureau 2023, American Community Survey; Tetra Tech 2025; U.S. Army Corps of Engineers, National Structure Inventory 2022; U.S. Geological Survey 2020-2023

Table 21-7. Buildings in the Avalanche Hazard Area

	Jurisdiction Total Buildings	Jurisdiction Total Replacement Cost Value	Number of Buildings in Hazard Area	Buildings in Hazard Area as % of Jurisdiction Total	Replacement Cost Value in Hazard Area	Replacement Cost Value in Hazard Area as % of Jurisdiction Total
Town of Calhan	424	$383,083,382	0	0.0%	$0	0.0%
City of Colorado Springs	166,064	$105,908,247,826	1	<0.1%	$4,900,896	<0.1%
City of Fountain	9,810	$5,036,639,818	0	0.0%	$0	0.0%
Town of Green Mountain Falls	556	$170,290,831	5	0.9%	$1,101,526	0.6%
City of Manitou Springs	2,412	$1,261,305,232	0	0.0%	$0	0.0%
Town of Monument	3,594	$2,441,721,337	0	0.0%	$0	0.0%
Town of Palmer Lake	1,304	$706,564,041	0	0.0%	$0	0.0%
Town of Ramah	83	$25,682,659	0	0.0%	$0	0.0%
Unincorporated County	68,245	$36,530,240,639	127	0.2%	$62,132,965	0.2%
El Paso County (Total)	**252,492**	**$152,463,775,764**	**133**	**0.1%**	**$68,135,387**	**<0.1%**

Source: U.S. Army Corps of Engineers, National Structure Inventory 2022; RSMeans 2024; Tetra Tech 2025; U.S. Geological Survey 2020-2023

Table 21-8. Buildings in the Avalanche Hazard Area by General Occupancy Class

	Residential	Commercial	Industrial	Other
Town of Calhan	0	0	0	0
City of Colorado Springs	0	1	0	0
City of Fountain	0	0	0	0
Town of Green Mountain Falls	5	0	0	0
City of Manitou Springs	0	0	0	0
Town of Monument	0	0	0	0
Town of Palmer Lake	0	0	0	0
Town of Ramah	0	0	0	0
Unincorporated County	120	2	1	4
El Paso County (Total)	**125**	**3**	**1**	**4**

Source: U.S. Army Corps of Engineers, National Structure Inventory 2022; Tetra Tech 2025; U.S. Geological Survey 2020-2023

Note: Other = Government, Religion, Agricultural, and Education

21.2.3 COMMUNITY LIFELINES AND OTHER CRITICAL FACILITIES

There is a small amount of infrastructure that could be blocked by avalanches, such as Highway 24 and the Pikes Peak Cog Railway. It should be noted that the Pikes Peak Cog Railway is a visitor attraction and economic asset and is not considered critical infrastructure. Yet, it is important to call out as several segments of the rail line are within identified avalanche hazard areas.

The significant issues of concern in the event of an avalanche are the threat to recreational users, property, and the possibility of disruption of transportation networks. When there is a high risk of avalanche danger, the Colorado Department of Transportation (CDOT) will close highways at the location of the avalanche path to conduct avalanche control. This may result in communities being cut off from their normal travel routes and from first responders.

According to CDOT, during the 2018-2019 winter season there were 1,707 hours of road closures due to avalanche control, resulting in a total of 44,378 feet of snow covering the centerline of the roadway. There is no effective way to keep the public out of avalanche-prone recreational areas, even during times of highest risk. A coordinated effort is needed among state, county and local law enforcement, fire departments, emergency management, public works agencies, and media outlets is essential to effectively communicate winter snowpack conditions and avalanche risks to the public.

Table 21-9 indicates that five facilities are located within the avalanche hazard area. Four of these belong to the Safety and Security sector, while the remaining one is part of the Health and Medical sector.

Table 21-9. Number of facilities in the Avalanche Hazard Area

Jurisdiction	Communica-tions	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transpor-tation	Water Systems	Other Critical Facilities	Total	Facilities in Hazard Area as % of Jurisdiction Total
Town of Calhan	0	0	0	0	0	0	0	0	0	**0**	0.0%
City of Colorado Springs	0	0	0	0	0	0	0	0	0	**0**	0.0%
City of Fountain	0	0	0	0	0	0	0	0	0	**0**	0.0%
Town of Green Mountain Falls	0	0	0	0	0	0	0	0	0	**0**	0.0%
City of Manitou Springs	0	0	0	0	0	0	0	0	0	**0**	0.0%
Town of Monument	0	0	0	0	0	0	0	0	0	**0**	0.0%
Town of Palmer Lake	0	0	0	0	0	0	0	0	0	**0**	0.0%
Town of Ramah	0	0	0	0	0	0	0	0	0	**0**	0.0%
Unincorporated County	0	0	0	0	1	4	0	0	0	**5**	1.2%
El Paso County (Total)	**0**	**0**	**0**	**0**	**1**	**4**	**0**	**0**	**0**	**5**	**0.3%**

Source: Colorado Department of Public Health and Environment 2019, 2024-2025; Colorado Springs 2025; Colorado Springs Utilities 2025; El Paso County 2024-2025; Federal Aviation Administration 2025; Homeland Infrastructure Foundation-Level Data 2025; National Center for Education Statistics 2025; U.S. Army Corps of Engineers 2025; U.S. Geological Survey 2020-2023; Tetra Tech 2025

21.2.4 ECONOMY

Avalanches can severely impact the economy of the County. The immediate destruction of critical infrastructure such as roads, bridges, and buildings requires extensive repair and reconstruction costs. This disruption may halt local businesses. Some local businesses which rely on tourism may be impacted as avalanches often deter visitors from winter sports and winter activities. Additionally, avalanches can damage agricultural land which can lead to crop failures and economic losses for farmers. The interruption of essential services like transportation and utilities also accentuates the economic strain on residents because recovery efforts often require lots of monetary investment and time. The economic impacts of avalanches extend beyond immediate damage and can impact the long-term economic stability and growth of the County.

21.2.5 ENVIRONMENT

Avalanches are a natural event, but they can negatively affect the environment. This includes trees located on steep slopes. A large avalanche can knock down many trees and kill the wildlife that lives in them. In spring, this loss of vegetation on the mountains may weaken the soil, causing landslides and mudflows. A large slab avalanche that releases from the ground may be more likely to carry a debris a farther distance in a burn scar. A burn scar would need to occur in a previously known avalanche path or at the prime angle for an avalanche to occur with this level of force. As with other avalanches, a weak base layer in the snowpack, followed by consolidated layers on top would need to occur.

21.2.6 HISTORIC AND CULTURAL RESOURCES

Avalanches can have a severe impact on the historic and cultural resources of El Paso County. The Pikes Peak Region is home to numerous historic sites and landmarks such as the City of Manitou Springs Historic District and the Pikes Peak Cog Railway which are vulnerable to damage from avalanches. The impact of an avalanche can destroy or severely damage these structures which can lead to the loss of cultural heritage and community significance. Additionally, the debris and snow from avalanches can obstruct access to these landmarks which may halt preservation efforts and reduce tourism, impacting the local economy.

21.3 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

21.3.1 LAND USE AND DEVELOPMENT

Avalanche conditions are predicted by the snowpack conditions and slope. Given these parameters, slope and elevation conditions should be considered for development to avoid avalanches. However, they must also be considered in upslope areas where when avalanche may crown and

flow into the development. It is common that areas that are avalanche prone are not prime for development given the geographic challenges (slope) and the unfavorable climate.

21.3.2 PROJECTED CHANGES IN POPULATION PATTERNS

The County population is projected to increase by over 32 percent by 2050. Table 3-7 summarizes recent and projected future changes in county population. Between 2010 and 2025 alone, the County population rose by nearly 21 percent. As the population increases, so does the risk of avalanches due to greater human activity in vulnerable areas. As more people reside in and visit areas prone to avalanches, the overall exposure to avalanche hazards increases significantly. Future population growth will further amplify this risk, making it critically important that the County plans for and mitigates against avalanche hazards for the current population and the projected new population in the future.

21.3.3 CLIMATE CHANGE

Some experts believe that an overall reduction in snowpack could lead to fewer avalanches in winter, but changing precipitation patterns could make avalanches more frequent in the springtime instead (Peitzsch 2021). Greater variability in weather patterns in the planning area may cause layers of rain to fall after light layers of snow, a sequence that can destabilize snowpack and increase the frequency and severity of avalanches (U.S. Forest Service 2019).

21.3.4 OTHER IDENTIFIED CONDITIONS

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

21.4 CONSEQUENCE ANALYSIS

Table 21-10 presents the results of the consequence analysis for the avalanche hazard.

Table 21-10. Consequence Analysis for the Avalanche Hazard

Category	Narrative
Hazard Description	Although avalanches are infrequent in this region, they do occur periodically. In El Paso County, avalanches are generally minor. Mountain communities are exposed to avalanche risk, but the greatest hazard is to individuals participating in outdoor recreation in backcountry areas. Transportation routes, such as Highway 24, are also vulnerable to avalanche activity.
Impact on Property, Facilities, and Infrastructure	Instances of personal property loss due to avalanches are rare but do occur occasionally. Known avalanche paths are typically undeveloped due to local land use regulations. Some events may impact private vehicles, and roadways can be blocked by avalanches, although they usually do not sustain significant damage. Communication and power infrastructure may experience short-term or minor disruptions as a result of avalanche activity.
Impact on the Environment	Avalanches can cause localized environmental damage, particularly in and around avalanche chutes. The removal or displacement of trees and rocks may lead to secondary hazards such as landslides or rockfalls due to compromised slope stability. There is also potential for short-term damming and sudden release of water if an avalanche intersects a waterway.
Impact on Responders	Some exposure exists for personnel performing routine duties on roadways and in areas prone to avalanches. Responders may face risks if entering avalanche-prone zones during or immediately after an event. However, most avalanche-related duties occur post-event, when the immediate risk has subsided.
Impact on Continuity of Operations, Continuity of Government, and Delivery of Services	Avalanches are not expected to cause the loss of facilities or infrastructure necessary for government services. However, short-term accessibility issues may arise for first responders performing routine duties or for personnel reporting to work locations. PPROEM maintains the Continuity of Operations Plan and the Continuity of Government Plan for the County of El Paso and the City of Colorado Springs; other jurisdictions in the Pikes Peak Region are in the process of developing continuity plans and procedures.
Impact on the Public	The greatest exposure to the avalanche hazard is to people participating in outdoor recreation in backcountry areas. Highway maintenance crews and motorists are also at risk of avalanches near or on roadways.
Impact on the Economic Condition of the County	The greatest exposure to avalanche hazards is among individuals engaged in outdoor recreation in backcountry areas. Highway maintenance crews and motorists traveling near or through avalanche-prone zones are also at risk.
Impact on Public Confidence in Government	The characteristics of avalanches—such as rapid onset and localized impact—result in limited government response and recovery functions beyond those performed by first responders. Monitoring programs help mitigate the risk of large-scale events, and road crews typically respond quickly to restore access to blocked roadways.

22. EARTHQUAKE

22.1 HAZARD PROFILE

22.1.1 HAZARD DESCRIPTION

An earthquake is caused by a sudden slip on a fault. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and cause the shaking that is felt during an earthquake. Earthquakes can affect hundreds of thousands of square miles, cause damage to property measured in tens of billions of dollars, result in loss of life and injury to hundreds of thousands of people and disrupt the social and economic functioning of the affected area. Most property damage and earthquake- related deaths are caused by the failure and collapse of structures due to ground shaking which is dependent upon amplitude and duration of the earthquake (FEMA 2023).

Often, the most dramatic evidence of an earthquake results from the vertical and/or horizontal displacement of the ground along a fault line. This displacement can sever transportation, energy, utility, and communications infrastructure potentially impacting numerous systems and people. These ground displacements can also result in severe and complete damage to structures situated on top of the ground fault. However, most damage from earthquake events is the result of shaking. Shaking also produces several phenomena that can generate additional damage:

- Additional ground displacement
- Landslides and avalanches
- Liquefaction and subsidence
- Seismic seiches

During minor earthquake events, objects often fall from shelves and dishes rattle. In major events, large structures may be torn apart by the forces of the seismic waves. Structural damage is generally limited to older structures that are poorly maintained, poorly constructed, or improperly (or not) designed for seismic events. Un-reinforced masonry buildings and wood frame homes not anchored to their foundations are typical victims of earthquake damage. Loose or poorly secured objects also pose a significant hazard when they are loosened or dropped by shaking. These "non-structural falling hazard" objects include bookcases, heavy wall hangings, and building facades. Home water heaters pose a special risk due to their tendency to start fires when they topple over and rupture gas lines. Crumbling chimneys may also be responsible for injuries and property damage. Dam and bridge failures are significant risks during stronger earthquake events, and due to the consequences of such failures, may result in considerable property damage and loss of life. In areas of severe seismic shaking hazard, shaking intensity levels of VII or higher can be experienced even on solid bedrock. In these areas, older buildings especially are at significant risk.

Ground displacement can also occur due to shaking, resulting in similar damages as mentioned previously. Even small earthquake events can cause landslides. Rock falls are common as unstable

material on steep slopes is shaken loose, but significant landslides or even debris flows can be generated if conditions are ripe. Roads may be blocked by landslide activity, hampering response and recovery operations. Avalanches are also possible when there is enough snowpack. Refer to section 6, to learn more about avalanches in the County.

Soils may liquefy and/or subside when impacted by the seismic waves. This is called liquefaction or subsidence. Fill and previously saturated soils are especially at risk. The failure of the soil has the potential to cause widespread structural damage. The oscillation and failure of the soils may result in increased water flow and/or failure of wells as the subsurface flows are disrupted and sometimes permanently altered. Increased flows may be dramatic, resulting in geyser-like waterspouts and/or flash floods. Similarly, septic systems may be damaged creating both inconvenience and health concerns. Refer to section 16, to learn more about subsidence in the County.

Seismic waves may rock an enclosed body of water (e.g., lake or reservoir), creating an oscillating wave referred to as a "seiche." Although not a common cause of damage, there is a potential for large, forceful waves like a tsunami ("tidal waves") to be generated on large reservoirs like Rampart Dam and Reservoir. These earthquake-generated waves could impact shoreline development and may have the potential to overtop, leading to downstream flash flooding.

22.1.2 LOCATION

According to the Colorado Geological Survey, Colorado is comprised of areas with low to moderate potential for damaging earthquakes (CGS 2019). There are about 90 potentially active faults that have been identified in Colorado with documented movement within the last 1.6 million years. Figure 22-1 shows potentially active faults in the Pikes Peak region and surrounding vicinity.

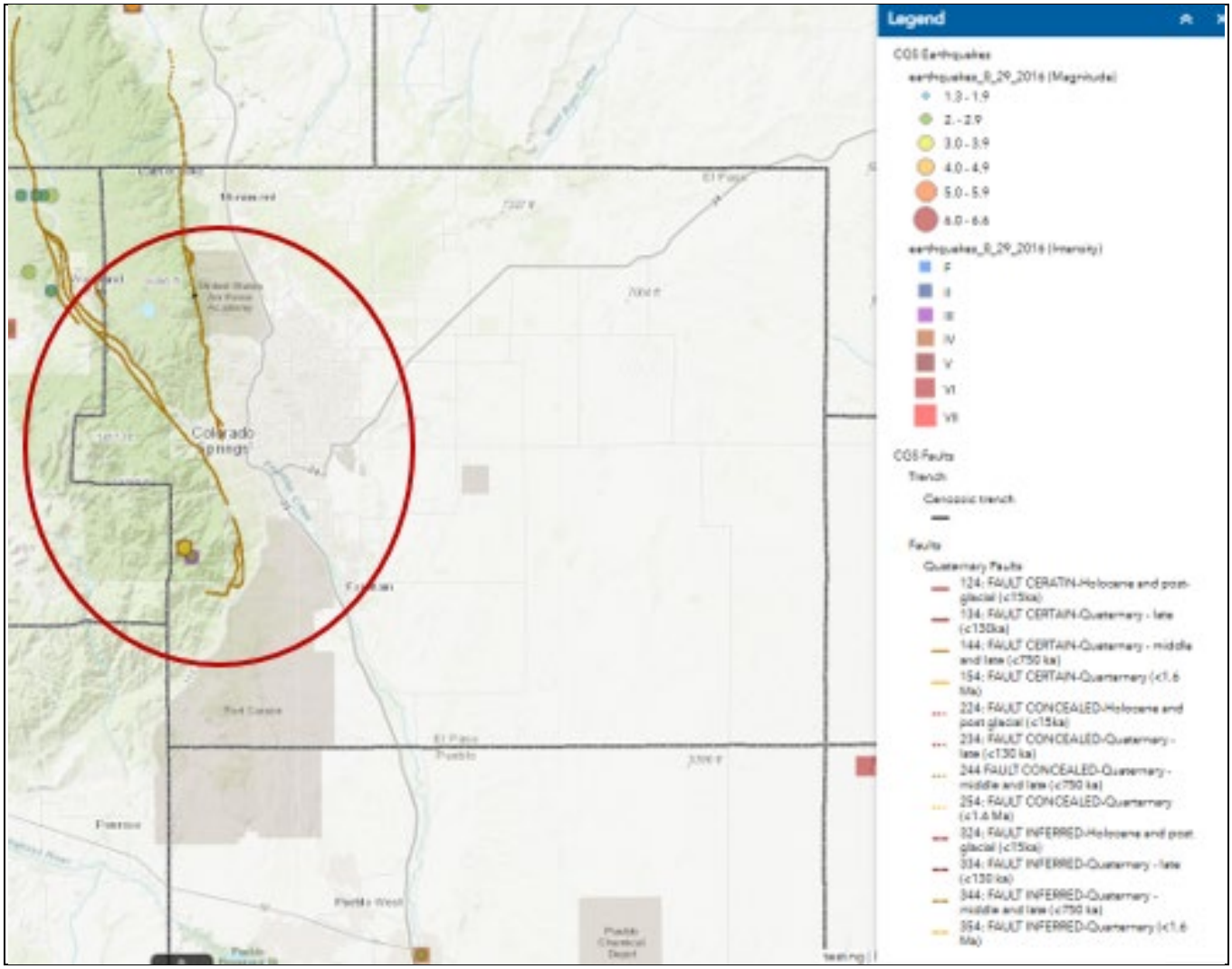
Earthquakes are a regional hazard that would affect all areas of the Pikes Peak region with varying magnitude and severity. The impact of an earthquake on this regional area would depend on several factors, including proximity to the epicenter, local geology, and the structural integrity of infrastructure. Urban centers may experience more significant damage due to higher population density and the concentration of critical infrastructure. While rural areas could face challenges related to emergency response and access.

The region's diverse topography which includes mountainous terrain and older historic structures could amplify the impacts of ground shaking and disrupt recovery efforts.

22.1.3 EXTENT

The amount of energy released during an earthquake is usually expressed as a Richter magnitude and is measured directly from the earthquake as recorded on seismographs. Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking, typically the greatest cause of losses to structures during earthquakes, at any given location on the surface as felt by humans and defined in the Modified Mercalli Intensity Scale (USGS - Earthquake Hazards Program n.d.). Table 22-1 describes the Modified Mercalli Intensity Scale according to USGS Earthquake Hazards Program.

Figure 22-1. Colorado Earthquake and Fault Map



Source: (CGS n.d.)

Table 22-1. Modified Mercalli Intensity Scale

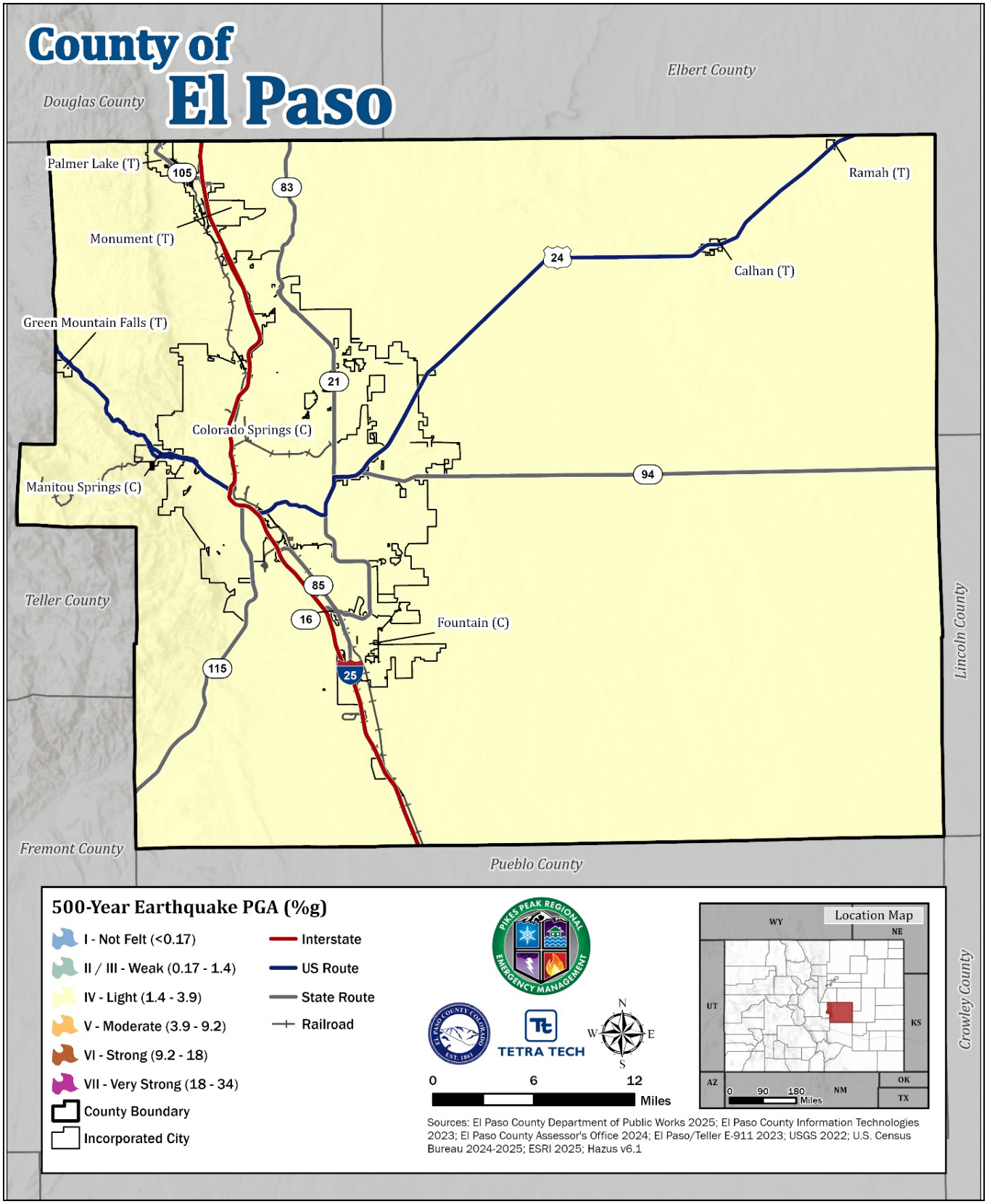
Intensity	Shaking	Damage
I	Not felt	Not felt except by a very few under especially favorable conditions.
II	Weak	Felt only by a few people at rest, especially on the upper floors of buildings.
III	Weak	Felt quite noticeably by people indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations like the passing of a truck. Duration estimated.
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Very Strong	Damage negligible in buildings of good design and construction; slightly moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage greatly in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Violent	Damage considerably in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings with partial collapse. Buildings shifted off foundations.
X	Extreme	Some well-built wooden structures were destroyed; most masonry and frame structures were destroyed with foundations. Rails bent.

Source: USGS - Earthquake Hazards Program n.d.

PGA is the effective peak ground acceleration during the earthquake. It is equal to the maximum ground acceleration that occurred during the earthquake shaking at a location. Figure 22-2 shows the 500-year PGA for El Paso County.

Earthquakes are extremely difficult to predict, and their occurrence rate is determined in one of two ways. If geologists can find evidence of distinct, datable earthquakes in the past, the number of these ruptures is used to define an occurrence rate. If evidence of ruptures is not available, geologists estimate fault slip rates from accumulated scarp heights and estimated date for the oldest movement on the scarp. Because a certain magnitude earthquake is likely to produce a displacement (slip) of a certain size, one can estimate the rate of occurrence of earthquakes of that magnitude.

Figure 22-2. 500-Year Earthquake Peak Ground Acceleration (PGA)



Recurrence rates are different for different assumed magnitudes thought to be "characteristic" of that fault type. Generally, a smaller magnitude quake will produce a faster recurrence rate, and for moderate levels of ground motion, a higher risk hazard. Future earthquakes are assumed to be likely to occur where earthquakes have produced faults in the recent past. Quaternary faults are faults that have slipped in the last 1.8 million years, and it is widely accepted that they are the most likely source of future large earthquakes. For this reason, quaternary faults are used to make fault sources for future earthquake models.

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 incidents.

Generally, the severity of an earthquake 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?

Warning Time

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

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

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

22.1.4 PREVIOUS OCCURRENCES

Colorado has a relatively short historical record of earthquakes. An earthquake and fault map developed by the Colorado Geological Survey shows the locations of historical epicenters and potentially active faults across the state. Figure 22-1 illustrates this mapping for El Paso County. The Ute Pass Fault Zone runs approximately along State Highways 67 and 24 to the western edge

of City of Colorado Springs. To the east of this zone lies the smaller Rampart Range Fault, which begins near Larkspur and extends south toward City of Colorado Springs, ending near Colorado Highway 24.

Both faults are classified as Quaternary. Any earthquake that is strong enough and occurs close enough to the County has the potential to cause impacts within El Paso County. The map also shows two recorded earthquake events in the City of Manitou Springs area: one on December 23, 1995 (Magnitude 3.5), and another on December 31, 1995 (Magnitude 2.8).

Federal Emergency Management Agency (FEMA) Disaster Declarations

The Pikes Peak Region has never received a major disaster declaration for an earthquake-related event.

State Emergency Proclamations

Between 2020 and 2024, the Pikes Peak Region was not included in any state emergency proclamation for an earthquake-related event.

U.S. Department of Agriculture (USDA) Declarations

Between 2020 and 2024, the Pikes Peak Region was not included in any USDA earthquake-related agricultural disaster declarations.

All Recent Events

There are no recorded major earthquake-related events that impacted Pikes Peak Region since the previous HMP was developed.

22.1.5 PROBABILITY OF FUTURE OCCURRENCES

The occurrence of earthquakes is relatively infrequent in Colorado, and the historical earthquake record is short (only about 130 years). Research based on Colorado's earthquake history suggests that an earthquake of 6.3 or larger has a one percent probability of occurring each year somewhere in Colorado (Colorado DHSEM 2023). According to the U.S. Geological Survey, the probability that a magnitude 5 or greater earthquake will occur in the next 50 years in El Paso County is 3 percent or less.

Information on previous earthquake occurrences in the County was used to calculate the probability of future occurrence of such events. Table 22-2 lists the number of events from various sources over the 71-year period from 1954 to 2025, which is the most complete period of record for all sources reviewed. Based on these records and input from the Steering Committee, the probability of occurrence for earthquake in the County is considered "rare."

Table 22-2. Probability of Future Earthquake Events in Pikes Peak Region

Hazard Type	Number of Occurrences Between 1954 and 2025	% Chance of Occurring in Any Given Year
Earthquake	2	2.8%

Source: CGS n.d.; PPROEM 2020

22.1.6 CASCADING IMPACTS ON OTHER HAZARDS

Earthquakes can cause large and sometimes disastrous landslides and mudslides. River valleys are vulnerable to slope failure, often because of loss of cohesion in clay-rich soils. Soil liquefaction occurs when water-saturated sands, silts or gravelly soils are shaken so violently that the individual grains lose contact with one another and float freely in the water, turning the ground into a pudding-like liquid. Building and road foundations lose load-bearing strength and may sink into what was previously solid ground. Unless properly secured, hazardous materials can be released, causing significant damage to the environment and people. Fires can be started by broken gas and power lines. Earthen dams and levees are highly susceptible to seismic events and the impacts of their eventual failures can be considered secondary risks for earthquakes. Seiches are like small tsunamis and can occur on lakes that are shaken by the earthquake. Seiches are usually only a few meters high but can still flood or knock down homes and trees.

22.2 VULNERABILITY AND IMPACT ASSESSMENT

A probabilistic assessment was conducted for the 500-year mean return period (MRP) earthquake events through an advanced analyses in Hazus, as described in Section 4.3.2.

22.2.1 LIFE, HEALTH, AND SAFETY

Overall Population

The entire population of El Paso County (736,008) is potentially exposed to direct and indirect impacts from earthquakes. 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. The Hazus analysis for the 500-year MRP earthquake event provides estimates of population displacement and of casualties, as shown in Table 22-3 and Table 22-4. For the estimates of casualties, the 2:00 AM estimate represents residential occupancy at a maximum, the 2:00 PM estimate represents educational, commercial and industrial sector loads at a maximum, and the 5:00 PM estimate represents peak commute time.

Table 22-3. Displaced and Short-Term Sheltering for the 500-Year MRP Earthquake Event

	Total Population 2023 ACS	Households Displaced by 500-Year MRP Earthquake Event	Persons Seeking Short-Term Shelter Due to 500-Year MRP Earthquake Event
Town of Calhan	510	0	0
City of Colorado Springs	405,307	8	4
City of Fountain	92,873	0	0
Town of Green Mountain Falls	690	0	0
City of Manitou Springs	4,796	0	0
Town of Monument	11,035	0	0
Town of Palmer Lake	2,635	0	0
Town of Ramah	130	0	0
Unincorporated County	218,032	2	1
El Paso County (Total)	**736,008**	**10**	**5**

Source: U.S. Census Bureau 2023, American Community Survey; Hazus v6.1
Note: Population results are rounded down.

Table 22-4. Estimated Casualties for the 500-Year MRP

	Number of Casualties for 500-Year MRP Earthquake Occurring at 2:00 AM	Number of Casualties for 500-Year MRP Earthquake Occurring at 2:00 PM	Number of Casualties for 500-Year MRP Earthquake Occurring at 5:00 PM
Non-hospitalized injuries	3	6	4
Hospitalizations	0	0	0
Fatalities	0	0	0

Source: Hazus v6.1

Socially Vulnerable Population

Socially vulnerable populations within the County face heightened risks during earthquakes due to physical, communication, and resource-related barriers. For example, the elderly and disabled may have limited mobility making it difficult to evacuate quickly or access emergency shelters. Non-English speakers may struggle to receive accurate emergency alerts or instructions which can delay critical protective measures. Children under the age of 5 may experience trauma and confusion and require specialized support during and after earthquake events. Additionally, these groups may reside in older or lower-quality housing that may be more susceptible to structural failure during seismic events. Without targeted preparedness and mitigation these populations are more likely to suffer disproportionate impacts and face longer recovery times following an earthquake.

Table 3-6 shows the number of socially vulnerable populations within the County. The county's population includes 100,642 people over the age of 65, 10,999 non-English speakers, 45,945 children under the age of 5, 87,190 people with disabilities, and 60,977 people below the poverty level. These socially vulnerable populations are more susceptible to the impacts of earthquakes. For planning purposes, it is reasonable to assume that percentages and distribution of socially vulnerable populations affected by an earthquake will be similar to the countywide numbers.

22.2.2 GENERAL BUILDING STOCK

Although all buildings in the planning area are potentially exposed, those that are in proximity to the two identified fault lines, Rampart and Ute Faults, are at greater risk for damage. Further, older structures that are not structurally sound may also be at greater risk of damage due to seismic events.

Additionally, building type matters when assessing potential damages resulting from earthquakes. For instance, the amount of damage to residential buildings will directly impact families and residents and may displace a large population of the County. Damages to industrial and commercial buildings may lead to severe impacts to businesses and the production of goods which in turn impact the County economy and supplies. The distribution of the planning area's general building stock by occupancy class is presented in Table 3-10.

Estimated Cost of Damage

Table 22-5 shows results from the Hazus analysis for the 500-year MRP earthquake event, indicating that the vast majority of buildings across all occupancy classes are expected to experience no damage. Residential buildings, which make up the largest share of structures, show 99.6 percent with no damage and only a small fraction experiencing slight (772), moderate (108), or extensive (9) damage. Commercial, industrial, and government-related buildings follow similar trends, with an estimated 99 percent in each category expected to remain undamaged.

Table 22-6 shows the Hazus estimated losses for the 500-year MRP earthquake event. Roughly $17 million in damage is estimated, with the City of Colorado Springs estimated to see the majority of damage ($11.7 million).

Estimated Debris Generated by Earthquake Event

Table 22-7 presents the estimated debris generated by a 500-year MRP earthquake in El Paso County, totaling 5,297 tons of brick/wood debris and 2,815 tons of concrete/steel debris.

Table 22-5. Severity of Expected Damage by Occupancy Class

Occupancy Class	Number of Buildings in Occupancy Class	Damage Level	Number of Buildings with This Level of Damage from 500-Year MRP Earthquake	Number of Buildings with This Level of Damage as % of Total in Occupancy Class
Residential Exposure (Single and Multi-Family Dwellings)	231,267	None	230,378	99.6%
		Slight	772	0.3%
		Moderate	108	<0.1%
		Extensive	9	<0.1%
		Complete	0	0.0%
Commercial Buildings	15,678	None	15,504	98.9%
		Slight	135	0.9%
		Moderate	36	0.2%
		Extensive	3	<0.1%
		Complete	0	0.0%
Industrial Buildings	3,098	None	3,066	99.0%
		Slight	25	0.8%
		Moderate	7	0.2%
		Extensive	1	<0.1%
		Complete	0	0.0%
Government, Religion, Agricultural, and Education Buildings	2,449	None	2,430	99.2%
		Slight	15	0.6%
		Moderate	3	0.1%
		Extensive	0	0.0%
		Complete	0	0.0%

Source: Hazus v6.1; U.S. Army Corps of Engineers, National Structure Inventory 2022

Table 22-6. 500-Year MRP Earthquake Event Impact on Buildings

Jurisdiction	Total Replacement Cost Value (RCV)	Estimated Loss for All Occupancies	Estimated Loss as % of Total RCV	Estimated Loss for Residential Properties	Estimated Loss for Commercial Properties	Estimated Loss for Industrial Properties	Estimated Loss for All Other Occupancies
Town of Calhan	$383,083,382	$22,228	<0.1%	$8,247	$11,696	$545	$1,740
City of Colorado Springs	$105,908,247,826	$11,700,822	<0.1%	$5,164,628	$4,721,914	$837,455	$976,824
City of Fountain	$5,036,639,818	$526,131	<0.1%	$300,549	$153,599	$24,724	$47,259
Town of Green Mountain Falls	$170,290,831	$22,077	<0.1%	$9,806	$9,227	$2,065	$979
City of Manitou Springs	$1,261,305,232	$101,462	<0.1%	$55,982	$33,111	$1,848	$10,521
Town of Monument	$2,441,721,337	$164,534	<0.1%	$84,728	$57,351	$9,943	$12,512
Town of Palmer Lake	$706,564,041	$89,336	<0.1%	$41,994	$30,227	$6,164	$10,951
Town of Ramah	$25,682,659	$2,265	<0.1%	$1,470	$516	$96	$183
Unincorporated County	$36,530,240,639	$4,315,063	<0.1%	$2,590,149	$1,138,033	$212,438	$374,444
El Paso County (Total)	**$152,463,775,764**	**$16,943,918**	**<0.1%**	**$8,257,554**	**$6,155,674**	**$1,095,278**	**$1,435,412**

Source: Hazus v6.1; U.S. Army Corps of Engineers, National Structure Inventory 2022; RSMeans 2024
Note: Other = Government, Religion, Agricultural, and Education

Table 22-7. Estimated Earthquake-Generated Debris

	Brick/Wood Debris Generated by 500-Year MRP (tons)	Concrete/Steel Debris Generated by 500-Year MRP (tons)
Town of Calhan	5.8	4.9
City of Colorado Springs	3,789.5	2,064.3
City of Fountain	132.1	74.1
Town of Green Mountain Falls	4.8	3.6
City of Manitou Springs	31.3	14.4
Town of Monument	33.3	23.9
Town of Palmer Lake	21.8	12.2
Town of Ramah	0.8	0.3
Unincorporated County	1,277.9	617.5
El Paso County (Total)	**5,297.4**	**2,815.3**

Source: Hazus v6.1; U.S. Army Corps of Engineers, National Structure Inventory 2022

22.2.3 COMMUNITY LIFELINES AND OTHER CRITICAL FACILITIES

All critical facilities in the planning area are exposed to earthquake hazards. Hazardous materials 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 hazardous materials 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.

For earthquake analysis, Hazus provides estimates of the likely level of damage to each community lifeline, as well as an assessment of how quickly damaged facilities can be returned to full functionality after an earthquake event. These results are shown in Table 22-8 and Table 22-9.

22.2.4 ECONOMY

Earthquakes can have severe impacts on the economy by disrupting both short-term operations and long-term development of goods and services. The immediate economic consequences may include damage to infrastructure such as roads, bridges, utilities, and public buildings which can stop transportation, communication, and essential services provided by the County and businesses. Small businesses may be impacted from property damage, inventory loss, and long-term closures which can lead to job losses. Since there are little capabilities and response preparation in place for El Paso County due to the low amount of earthquake occurrences in the past, these impacts can be especially severe and long-lasting.

Table 22-8. Average % Probability of Damage to Community Lifelines from 500-Year MRP Earthquake

	Average % Chance of No Damage	Average % Chance of Slight Damage	Average % Chance of Moderate Damage	Average % Chance of Extensive Damage	Average % Chance of Complete Damage
Communications	98.6%	1.0%	0.3%	<0.1%	0.0%
Energy	99.1%	0.6%	0.3%	<0.1%	0.0%
Food, Hydration, Shelter	0.0%	0.0%	0.0%	0.0%	0.0%
Hazardous Materials	98.5%	1.1%	0.3%	<0.1%	0.0%
Health and Medical	99.7%	0.3%	<0.1%	0.0%	0.0%
Safety and Security	99.1%	0.7%	0.2%	<0.1%	0.0%
Transportation	99.5%	0.5%	0.0%	0.0%	0.0%
Water Systems	99.1%	0.6%	0.3%	<0.1%	0.0%

Source: Hazus v6.1; Colorado Department of Public Health and Environment 2019, 2024-2025; Colorado Springs 2025; Colorado Springs Utilities 2025; El Paso County 2024-2025; Federal Aviation Administration 2025; Homeland Infrastructure Foundation-Level Data 2025; National Center for Education Statistics 2025; U.S. Army Corps of Engineers 2025

Table 22-9. Average Percent Functionality Following500-Year MRP Earthquake

	Average Percent Functionality on Day 1	Average Percent Functionality on Day 7	Average Percent Functionality on Day 30	Average Percent Functionality on Day 90
Communications	99.7%	99.9%	99.9%	99.9%
Energy	99.3%	99.9%	99.9%	99.9%
Food, Hydration, Shelter	0.0%	0.0%	0.0%	0.0%
Hazardous Materials	98.5%	99.6%	99.9%	99.9%
Health and Medical	99.7%	99.9%	99.9%	99.9%
Safety and Security	99.0%	99.7%	99.9%	99.9%
Transportation	99.9%	99.9%	99.9%	99.9%
Water Systems	99.3%	99.9%	99.9%	99.9%

Source: Hazus v6.1; Colorado Department of Public Health and Environment 2019, 2024-2025; Colorado Springs 2025; Colorado Springs Utilities 2025; El Paso County 2024-2025; Federal Aviation Administration 2025; Homeland Infrastructure Foundation-Level Data 2025; National Center for Education Statistics 2025; U.S. Army Corps of Engineers 2025

22.2.5 ENVIRONMENT

Environmental impacts of earthquakes can be numerous and widespread particularly when indirect effects are considered. One of the most immediate consequences is the triggering of secondary hazards such as landslides and flooding. Refer to sections 16 (landslides) and 13 (flood) for more information about these hazards. Earthquakes can destabilize slopes, especially in mountainous or hilly regions which lead to landslides that can destroy ecosystems and block riverways. Additionally, seismic activity can damage dams and levees which can result in sudden and severe flooding. Refer to section 8 (dam and levee failure) for more information on these hazards. These events not only pose direct threats to human life and property but also disrupt the natural habitat of the area and alter landscapes in ways that can take decades to recover.

Other common examples of earthquake impact to the environment are listed below:

- Poor water quality
- Damage to vegetation
- Breakage in sewage or toxic material containments

22.2.6 HISTORIC AND CULTURAL RESOURCES

Earthquakes can have significant impacts to the historic and cultural resources of the County which is home to many heritage sites, historic buildings, and cultural landmarks. Even though the region has a relatively low seismic risk, the potential for damage is still present especially to older structures that were not built to modern seismic standards. Historic adobe buildings, stone structures, and unreinforced masonry are particularly vulnerable to ground shaking which can lead to partial collapse or total structural failure. In addition to physical damage, earthquakes can also disrupt access to archives, museums, and cultural institutions which could potentially result in the loss of irreplaceable artifacts and records.

22.3 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

22.3.1 LAND USE AND DEVELOPMENT

Development in the County is regulated through a combination of building standards and other measures designed to reduce risk from hazards including earthquakes. Although the region is not considered highly seismically active the County still enforces construction practices for potential ground shaking. Local building departments adopt and enforce the International Building Code (IBC), which includes specific language for seismic design based on geographic location, soil conditions, and building occupancy type. These codes ensure that new construction is designed to withstand seismic forces and minimize the risk of structural failure to enhance public safety.

In addition to these requirements, IBC mandates that critical infrastructure, such as hospitals, emergency response facilities, and schools are built to higher seismic standards due to their essential role during disasters. The County's planning and permitting processes incorporate hazard mitigation principles which encourage developers to consider site-specific risks and resilience strategies. By aligning local regulations with national standards, the County protects both people and property to promote sustainable growth in a region that remains vulnerable to potential earthquake impacts.

22.3.2 PROJECTED CHANGES IN POPULATION PATTERNS

The County population is projected to increase by over 32 percent by 2050. Between 2010 and 2025 alone, the County population rose by nearly 21 percent. As the population grows, the risk from earthquakes also increases. More people residing and living in an earthquake hazard area directly increases the exposure to this hazard in the event it may occur. Additionally, an increase in projected populations in the future will also indicate an increase in earthquake risk. It is critically important that the County plans for and mitigates against earthquake hazards for the current population and the projected new population in the future.

22.3.3 CLIMATE CHANGE

Climate change and its impact on weather and interaction on the surface may have an impact on future probability and severity of earthquakes; however, the extent of those impacts is unknown. Future climate scenarios generally suggest that the climate in Colorado will be warmer and drier with occasional extreme precipitation. Increased temperature and extreme precipitation may also increase the potential for secondary impacts due to seismic activity, such as increased liquefaction due to saturated soils. Refer to section 16 (landslides, subsidence, and mud flows) for more information on these hazards.

22.3.4 OTHER IDENTIFIED CONDITIONS

Important issues associated with earthquakes include but are not limited to the following:

- Approximately 34 percent of the planning area's building stock was built after 1994, when seismic provisions became uniformly applied through building code applications.
- Critical facility owners should be encouraged to create or enhance continuity of operations plans using the information on risk and vulnerability contained in this plan.
- Geotechnical standards should be established that take into account the probable impacts from earthquakes in the design and construction of new or enhanced facilities.
- Earthquakes could trigger other hazard events such as dam failures and landslides, which could severely impact the region.
- A worst-case scenario would be the occurrence of a large seismic event during a flood or high-water event. Failures could happen at multiple locations, increasing the impacts of the individual events.
- Retrofitting buildings to meet earthquake seismicity standards may be cost-prohibitive
- Dams in the County may not have been engineered to withstand probable seismic events

22.4 CONSEQUENCE ANALYSIS

Table 22-10 presents the results of the consequence analysis for the earthquake hazard.

Table 22-10. Consequence Analysis for the Earthquake Hazard

Category	Narrative
Hazard Description	Earthquakes are a regional hazard that can affect all areas of the Pikes Peak region with varying degrees of magnitude and severity. The Ute Pass Fault Zone runs approximately along State Highway 67 and U.S. Highway 24 to the western edge of the city. A smaller fault, the Rampart Range Fault, lies to the east of the Ute Pass Fault Zone.
Impact on Property, Facilities, and Infrastructure	Earthquakes can damage or destroy buildings, vehicles, signage, and any unsecured property. While all buildings in the planning area are potentially exposed, those located near the Rampart and Ute Pass Faults are at greater risk. Older structures that lack modern seismic design standards are also more vulnerable. The planning area could face close to a billion dollars in property losses from a major earthquake. Facilities and infrastructure near fault zones are especially at risk. Roads and bridges may be damaged, affecting emergency response and general transportation. Critical infrastructure failures—such as utility outages or dam breaches—could lead to cascading impacts. Communication systems may also be disrupted.
Impact on the Environment	In addition to initial damage, earthquakes can trigger aftershocks that last for days or weeks, causing further destruction and complicating recovery efforts. According to the Colorado State Emergency Operations Plan (SEOP), earthquakes may also trigger secondary hazards such as avalanches, dam failures, landslides, and subsidence. Damage to hazardous materials (HAZMAT) facilities could result in the release of dangerous substances, causing significant environmental harm. Earthquakes may also damage water treatment facilities, leading to water quality issues.
Impact on Responders	Damaged roadways and stalled vehicles can impede emergency responders' ability to reach affected areas. A high volume of response requests may overwhelm local emergency services, requiring assistance from neighboring jurisdictions. Evacuation support, including door-to-door notifications and traffic management, may increase risks to responders. Communication line disruptions can further hinder coordination. First responders may face physical and psychological strain, and concerns about their families can increase overall risk. Infrastructure personnel, due to their responsibilities, are also considered responders and may be impacted by earthquake-related disruptions.
Impact on Continuity of Operations, Continuity of Government, and Delivery of Services	Earthquakes can interrupt essential facilities and services for more than 72 hours. Power outages are likely, especially in areas without adequate backup generation. Large-scale events may overwhelm emergency response and coordination services, requiring mutual aid from outside the impacted area. PPROEM maintains the Continuity of Operations Plan and the Continuity of Government Plan for the County of El Paso and the City of Colorado Springs; other jurisdictions in the Pikes Peak Region are in the process of developing continuity plans and procedures.

Category	Narrative
Impact on the Public	Earthquakes can result in multiple deaths, injuries, and individuals trapped in collapsed structures requiring search and rescue. Modeled scenarios indicate that the most intense ground shaking and damage would occur in the western half of El Paso County, including downtown Colorado Springs and Manitou Springs. These areas are densely populated, with many people at work, commuting, or at home. Significant ground shaking could damage buildings, roads, and critical infrastructure, posing serious risks to public safety.
Impact on the Economic Condition of the County	Earthquakes may result in the loss of facility functionality, infrastructure accessibility, and uninsured property damage. A limited workforce, business closures, and reduced tourism could significantly impact the local economy.
Impact on Public Confidence in Government	Public confidence is closely tied to perceptions of how effectively response and recovery efforts are managed during and after a large-scale disaster such as an earthquake. The public holds high expectations for rapid restoration of critical lifelines and services. Transparent communication and timely action are essential to maintaining trust and ensuring community resilience.

23. LANDSLIDE AND ROCKFALL

23.1 HAZARD PROFILE

23.1.1 HAZARD DESCRIPTION

Landslides are the sliding movement of masses of loosened rock and soil down a hillside or slope. Such failures occur when the strength of the soil forming the slope is exceeded by pressure, such as weight or saturation, acting upon them. Landslides include a wide range of ground movements from rock fall to slope failure and are primarily attributed to gravity acting on steep slopes. 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, increasing 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 percent
- 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.

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

A rockfall is the falling of a detached mass of rocks from a cliff or down a very steep slope. Weathering and decomposition of geological materials produce conditions favorable to rock falls. 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 rockfall. Rocks in a rockfall can be of any dimension, from the size of baseballs to houses. Rockfalls can threaten human life, impact transportation corridors and communication systems, and result in other property damage.

Spring is typically the landslide and rockfall season in Colorado as snow melts and saturates soil, and temperatures enter freeze and thaw cycles. Rockfalls and landslides are influenced by seasonal patterns, precipitation and temperature patterns. Earthquakes can also trigger rockfalls and landslides. Mass movement is the collective term for landslides, debris flow, falls, and sinkholes.

23.1.2 LOCATION

Landslides and rockfalls can occur anywhere there are unstable slopes, vulnerable underlying bedrock, or other conditions leading to slope instability. The best available predictor of where movement of slides and earth flows might occur is the location of past movements. Past slides can be recognized by their distinctive topographic shape, which can remain in place for thousands of years. The recognition of ancient dormant mass movement sites is important in the identification of areas susceptible to flows and slides because they can be reactivated by earthquakes or by exceptionally wet weather. Also, because they consist of broken materials and frequently involve disruption of groundwater flow, these dormant sites are vulnerable to construction-triggered sliding. Figure 23-1 shows the landslide and rockfall hazard areas in El Paso County.

According to the FEMA National Risk Index (NRI) database (refer to Figure 23-2 and Figure 23-3), Countywide, El Paso County has a relatively high landslide risk. By census tract, areas in the western portion of the county generally have higher risk than the eastern areas.

According to the State of Colorado Hazard Mitigation Plan, “Many of Colorado’s landslides occur along transportation networks because soil and rock along the transportation corridor has been disturbed by roadway construction. Construction along roads can occur with or without proper landslide hazard mitigation procedures” (Colorado Climate Action 2018).

An article published by The Gazette describes “Western Colorado Springs as landslide territory. Maps from Colorado Geological Survey (CGS) place all of the neighborhoods between Cheyenne Mountain and Fort Carson in landslide zones, in addition to areas in City of Manitou Springs, Mountain Shadows and near Ute Valley Park. West of U.S. Highway 24, landslide zones cover Cascade and neighborhoods across the highway from Town of Green Mountain Falls” (Colorado Springs Gazette n.d.).

Figure 23-1. Landslide and Rockfall Hazard Areas

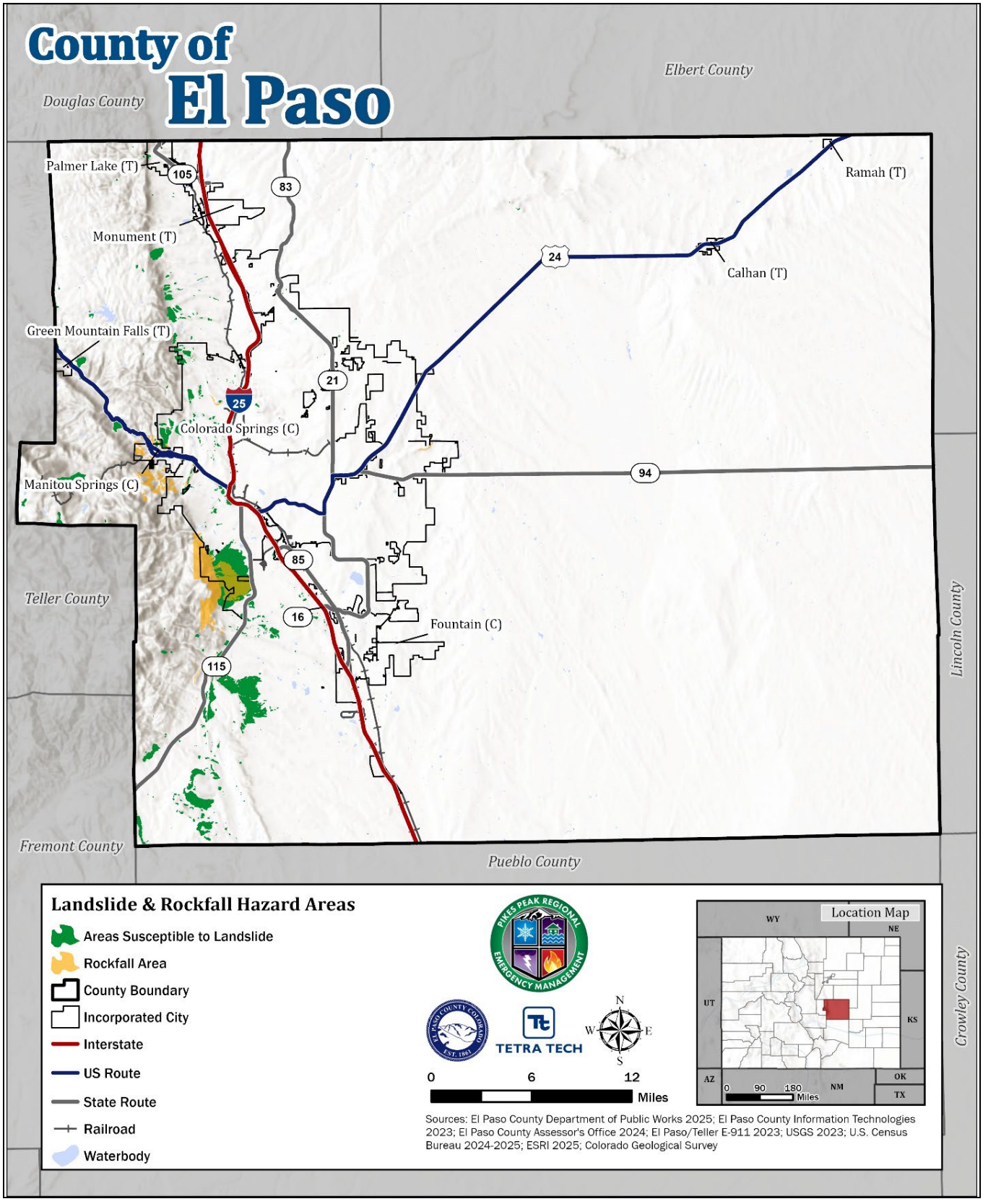
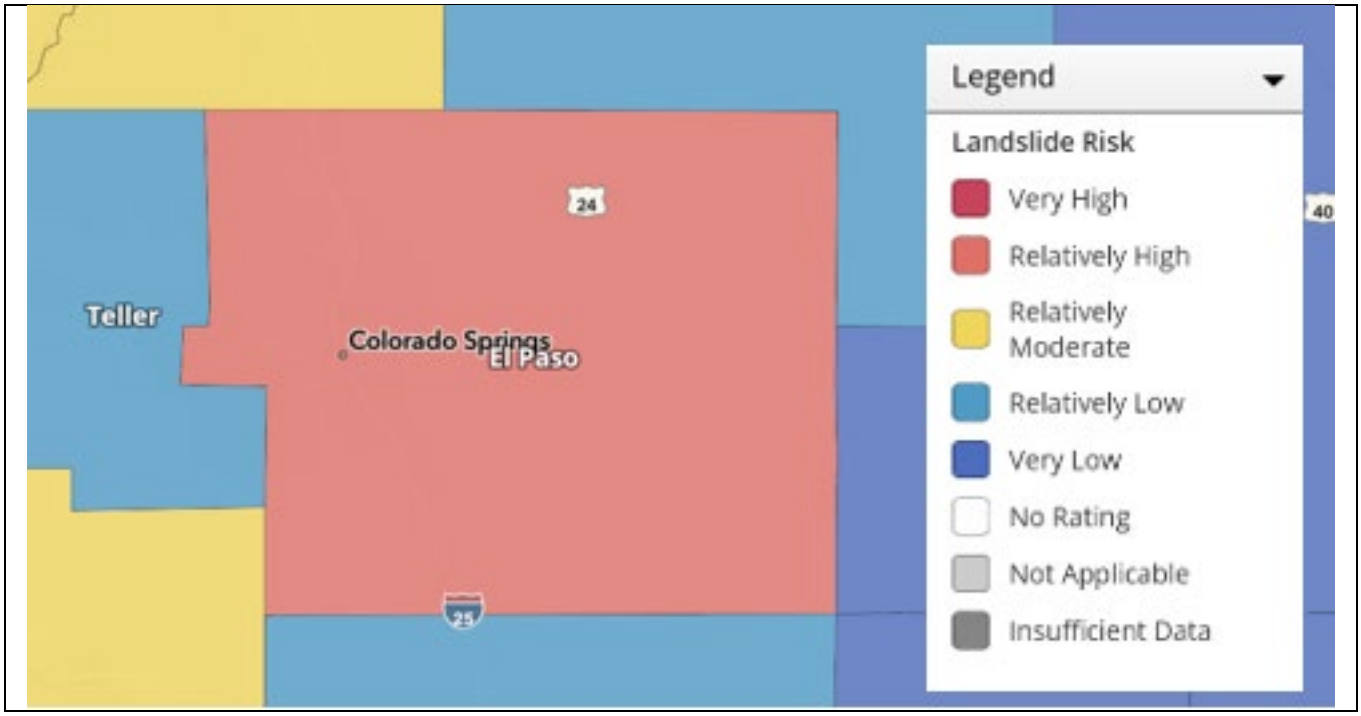
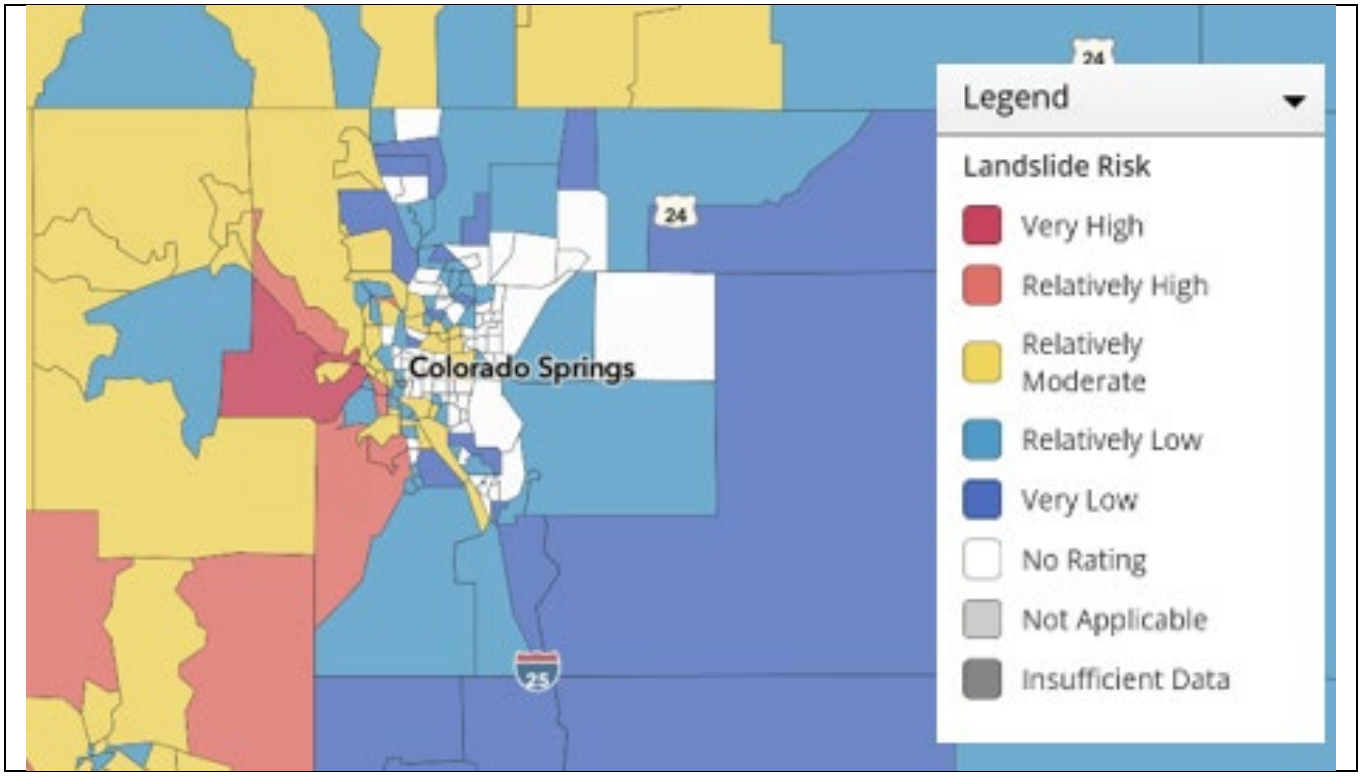


Figure 23-2. FEMA National Risk Index Map for Landslide Hazard in El Paso County by County View



Source: FEMA NRI, 2025

Figure 23-3. FEMA National Risk Index Map for Landslide Hazard in El Paso County by Census Tract View



Source: FEMA NRI, 2025

23.1.3 EXTENT

Landslides and rockfalls destroy property and infrastructure and can take the lives of people. Slope failures in the United States result in an average of 25 to 50 lives lost per year and an annual cost to society of about $1.5 billion. Rockfalls can travel at 60 feet per second or more and even small rocks can instantly kill (Colorado Geological Survey n.d.). The magnitude and severity of a landslide and rockfall event in City of Colorado Springs is Critical. It is likely that events can result in isolated deaths and/or multiple injuries as well as major or long-term property damage that threatens structural stability; and/or interruption of essential facilities for 24 to 72 hours. However, these impacts are highly localized, so the overall significance to the County and to the participating jurisdictions that are not near landslide-prone areas (for example the towns of Calhan and Ramah) is considered limited: low potential impact.

Warning Time

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

- Springs, seeps, or saturated ground in areas that have not typically been wet before
- New cracks or unusual bulges in the ground, street pavements or sidewalks
- Soil moving away from foundations
- Ancillary structures such as decks and patios tilting and/or moving relative to the main house
- Tilting or cracking of concrete floors and foundations
- Broken water lines and other underground utilities
- Leaning telephone poles, trees, retaining walls or fences
- Offset fence lines
- Sunken or down dropped roadbeds
- Rapid increase in creek water levels, possibly accompanied by increased soil content
- Sudden decrease in creek water levels though rain is still falling or just recently stopped
- Sticking doors and windows and visible gaps indicating jambs and frames out of plumb
- A faint rumbling sound that increases in volume as the landslide nears
- Unusual sounds, such as trees cracking or boulders knocking together.

23.1.4 PREVIOUS OCCURRENCES

Federal Emergency Management Agency (FEMA) Disaster Declarations

Table 23-1 lists all landslide-related major disasters declarations that have included the Pikes Peak Region since 1953.

Table 23-1. Federal Emergency Management Agency (FEMA) Disaster Declarations for Landslide and Rockfall Events in the Pikes Peak Region

FEMA Declaration Date	Declaration Number	Description
May 17, 1999	DR-1276	Severe storms, flooding, mudslides, and landslides
September 12, 2013	EM-3365	Severe storms, flooding, landslides, and mudslides
September 14, 2013	DR-4145	Severe storms, flooding, landslides, and mudslides
July 16, 2015	DR-4229	Severe storms, tornadoes, flooding, landslides, and mudslides

Source: FEMA n.d.

State Emergency Proclamations

Between 2020 and 2024, the Pikes Peak Region was not included in any state emergency proclamation for a landslide-related event.

U.S. Department of Agriculture (USDA) Declarations

Between 2020 and 2024, the Pikes Peak Region was not included in any USDA landslide-related agricultural disaster declarations.

All Recent Events

Table 23-2 lists the major recorded landslide-related event that impacted the Pikes Peak Region since the previous HMP was developed. The previous HMP lists seven occurrences of landslides or rockfalls in the Pikes Peak Region beginning in 1995.

Table 23-2. Landslide Events in Pikes Peak Region (2020 to 2024)

Date	Hazard	Event Narrative
August 5, 2020	Debris Flod	Several boulders washed onto Highway 24 due to heavy rainfall.

Source: NOAA-NCEI, 2025.

23.1.5 PROBABILITY OF FUTURE OCCURRENCES

Historical data suggests that a major landslide or rockfall event may occur in City of Colorado Springs, El Paso County, City of Fountain, and City of Manitou Springs once every few years. However, several prolonged low intensity sustaining rainstorms may increase slide occurrence. Information on previous landslide occurrences in the County was used to calculate the probability

of future occurrences for these events. Table 23-3 lists the number of events from various sources over the 30-year period from 1995 to 2025, which is the most complete period of record for all sources reviewed. Based on these records and input from the Steering Committee, the probability of occurrence for landslide in the County is considered "occasional."

Table 23-3. Probability of Future Landslide Events in Pikes Peak Region

Hazard Type	Number of Occurrences Between 1995 and 2025	% Chance of Occurring in Any Given Year
Landslide or Rockfall	8	26.7%

Source: NOAA-NCEI, 2025

The 2016 City of Colorado Springs Hazard Mitigation Plan update points out that the City has completed several programs for mitigation of landslides, thus decreasing the likelihood that an event would occur or result in levels of damage previously experienced. Among other mitigation efforts, since 1996 the City has required builders to test building sites for landslide potential.

23.1.6 CASCADING IMPACTS ON OTHER HAZARDS

Landslides can cause secondary effects such as blocked roads, which can isolate residents and businesses and delay commercial, public and private transportation. This could result in economic losses for businesses. Other potential problems resulting from landslides are power and communication failures. Vegetation or poles on slopes can be knocked over, resulting in possible losses to power and communication lines. Landslides also have the potential of destabilizing the foundation of structures, which may result in monetary loss for residents. They also can damage rivers or streams, potentially harming water quality, fisheries, and spawning habitat.

23.2 VULNERABILITY AND IMPACT ASSESSMENT

A vulnerability analysis was conducted using areas susceptible to landslide and rockfall areas developed by the Colorado Geological Survey. The analysis was performed as described in Section 4.3.

23.2.1 LIFE, HEALTH, AND SAFETY

Overall Population

The general assessment for where landslides may occur within the Pikes Peak Region is somewhat predictable based on slope, aspect, vegetation, moisture content, and angle of bedrock amongst other variables. At the individual parcel level however, the threat of landslides typically requires further study. Individual soil properties, the type of human activity on the lot, and understanding previous failures in the specific area all influence the probability of a future event occurring.

People living or working near steep slopes are exposed to landslides and rockfall hazards. Individuals travelling on roads that cut through mountainous terrain or recreating in such areas are

also exposed. Residents living downslope of wildfire burn scars are also exposed to landslide and rockfall hazards.

All persons exposed to landslide and rockfall hazards are vulnerable. Populations with mobility issues, the elderly and young populations may be more vulnerable as there is usually little warning for such events and these individuals may have difficulty moving out of the path of a slide or fall. Refer to the next section on Socially Vulnerable Populations for more.

Table 23-4 identifies the number of people residing in landslide and rockfall susceptibility areas. The City of Colorado Springs has the highest number of people in the landslide hazard area, with 7,932 people. There are a total of 2,757 people living in the rockfall hazard area. The City of Colorado Springs has the highest number of people in the rockfall hazard area, with 2,560 people.

Table 23-4. Population in the Landslide and Rockfall Hazard Areas

	Total Population 2023 ACS	**Landslide:** Population in Hazard Area	**Landslide:** Population in Hazard Area as % of Total in Jurisdiction	**Rockfall:** Population in Hazard Area	**Rockfall:** Population in Hazard Area as % of Total in Jurisdiction
Town of Calhan	510	0	0.0%	0	0.0%
City of Colorado Springs	405,307	7,932	2.0%	2,560	0.6%
City of Fountain	92,873	0	0.0%	0	0.0%
Town of Green Mountain Falls	690	0	0.0%	0	0.0%
City of Manitou Springs	4,796	18	0.4%	4	0.1%
Town of Monument	11,035	0	0.0%	0	0.0%
Town of Palmer Lake	2,635	4	0.2%	0	0.0%
Town of Ramah	130	0	0.0%	0	0.0%
Unincorporated County	218,032	427	0.2%	193	0.1%
El Paso County (Total)	**736,008**	**8,381**	**1.1%**	**2,757**	**0.4%**

Source: U.S. Census Bureau 2023, American Community Survey; U.S. Army Corps of Engineers, National Structure Inventory 2022; Colorado Geological Survey

Socially Vulnerable Population

Table 23-5 shows the estimated number of vulnerable persons living in the landslide and rockfall hazard areas. There are 1,268 people over the age of 65, 484 children under the age of 5, 158 non-English speakers, 1,114 disabled persons, and 840 people below the poverty line who reside in the landslide hazard area. There are 415 people over the age of 65, 159 children under the age of 5, 51 non-English speakers, 363 disabled persons, and 272 people below the poverty line who reside in the rockfall hazard area

Table 23-5. Estimated Number of Vulnerable Persons Living in the Landslide and Rockfall Hazard Areas

	Landslide: Vulnerable Population in Hazard Area	**Landslide:** Vulnerable Population in Hazard Area as % of Total in Jurisdiction	**Rockfall:** Vulnerable Population in Hazard Area	**Rockfall:** Vulnerable Population in Hazard Area as % of Total in Jurisdiction
People Over 65				
Town of Calhan	0	0.0%	0	0.0%
City of Colorado Springs	1,211	2.0%	391	0.6%
City of Fountain	0	0.0%	0	0.0%
Town of Green Mountain Falls	0	0.0%	0	0.0%
City of Manitou Springs	3	0.3%	0	0.0%
Town of Monument	0	0.0%	0	0.0%
Town of Palmer Lake	0	0.0%	0	0.0%
Town of Ramah	0	0.0%	0	0.0%
Unincorporated County	54	0.2%	24	0.1%
El Paso County (Total)	**1,268**	**1.3%**	**415**	**0.4%**
People Under 5				
Town of Calhan	0	0.0%	0	0.0%
City of Colorado Springs	456	2.0%	147	0.6%
City of Fountain	0	0.0%	0	0.0%
Town of Green Mountain Falls	0	0.0%	0	0.0%
City of Manitou Springs	0	0.0%	0	0.0%
Town of Monument	0	0.0%	0	0.0%
Town of Palmer Lake	0	0.0%	0	0.0%
Town of Ramah	0	0.0%	0	0.0%
Unincorporated County	28	0.2%	12	0.1%
El Paso County (Total)	**484**	**1.1%**	**159**	**0.3%**
Non-English Speaking Population				
Town of Calhan	0	0.0%	0	0.0%
City of Colorado Springs	155	1.9%	50	0.6%
City of Fountain	0	0.0%	0	0.0%
Town of Green Mountain Falls	0	0.0%	0	0.0%
City of Manitou Springs	0	0.0%	0	0.0%
Town of Monument	0	0.0%	0	0.0%

	Landslide: Vulnerable Population in Hazard Area	**Landslide:** Vulnerable Population in Hazard Area as % of Total in Jurisdiction	**Rockfall:** Vulnerable Population in Hazard Area	**Rockfall:** Vulnerable Population in Hazard Area as % of Total in Jurisdiction
Town of Palmer Lake	0	0.0%	0	0.0%
Town of Ramah	0	0.0%	0	0.0%
Unincorporated County	3	0.2%	1	0.1%
El Paso County (Total)	**158**	**1.4%**	**51**	**0.5%**
Population with Disability				
Town of Calhan	0	0.0%	0	0.0%
City of Colorado Springs	1,071	2.0%	345	0.6%
City of Fountain	0	0.0%	0	0.0%
Town of Green Mountain Falls	0	0.0%	0	0.0%
City of Manitou Springs	2	0.3%	0	0.0%
Town of Monument	0	0.0%	0	0.0%
Town of Palmer Lake	0	0.0%	0	0.0%
Town of Ramah	0	0.0%	0	0.0%
Unincorporated County	41	0.2%	18	0.1%
El Paso County (Total)	**1,114**	**1.3%**	**363**	**0.4%**
Population Below Poverty Level				
Town of Calhan	0	0.0%	0	0.0%
City of Colorado Springs	820	2.0%	264	0.6%
City of Fountain	0	0.0%	0	0.0%
Town of Green Mountain Falls	0	0.0%	0	0.0%
City of Manitou Springs	1	0.2%	0	0.0%
Town of Monument	0	0.0%	0	0.0%
Town of Palmer Lake	0	0.0%	0	0.0%
Town of Ramah	0	0.0%	0	0.0%
Unincorporated County	19	0.2%	8	0.1%
El Paso County (Total)	**840**	**1.4%**	**272**	**0.4%**

As previously mentioned, socially vulnerable populations have a disproportionate risk to landslide and rockfall hazards. For example, populations with mobility issues such as the elderly, disabled, and children under the age of 5 years old may be more vulnerable as there is usually little warning about such events and these individuals may have difficulty moving out of the path of a slide or fall.

Those below the poverty line may struggle financially to restore homes and utilities that have been damaged by landslides or rockfalls.

23.2.2 GENERAL BUILDING STOCK

Property located near steep slopes or downslope from wildfire burn scars is exposed to landslide and rock fall hazards. All property exposed to the landslide and rockfall hazard is vulnerable. Structural damage can range from minor damage to destruction. More than 50 percent damage to structures is considered to be substantial by most building codes and typically requires total reconstruction.

Table 23-6 includes the number of buildings located in the landslide hazard area. There is a total of 3,291 buildings located in the landslide hazard area with a replacement cost value of over $1 billion. City of Colorado Springs has the highest number of buildings in the landslide hazard area with 3,150, and a replacement cost value of over $1 billion.

Table 23-7 includes the number of buildings located in the rockfall hazard area. There is a total of 1,065 buildings located in the landslide hazard area with a replacement cost value of over $631 million. The city of Colorado Springs has the highest number of buildings in the landslide hazard area with 1,004, and a replacement cost value of over $606 million.

Table 23-8 includes the number of buildings by general occupancy located in the landslide hazard area. There are 3,076 residential, 170 commercial, 32 industrial, and 13 other types of buildings located in the landslide hazard area. Table 23-9 includes the number of buildings by general occupancy located in the rockfall hazard area. There are 1,008 residential, 48 commercial, 8 industrial, and 1 other types of building located in the landslide hazard area.

Table 23-6. Buildings in the Landslide Hazard Area

Jurisdiction	Jurisdiction Total Buildings	Jurisdiction Total Replacement Cost Value	Number of Buildings in Hazard Area	Buildings in Hazard Area as % of Jurisdiction Total	Replacement Cost Value in Hazard Area	Replacement Cost Value in Hazard Area as % of Jurisdiction Total
Town of Calhan	424	$383,083,382	0	0.0%	$0	0.0%
City of Colorado Springs	166,064	$105,908,247,826	3,150	1.9%	$1,750,462,068	1.7%
City of Fountain	9,810	$5,036,639,818	1	<0.1%	$57,021,171	1.1%
Town of Green Mountain Falls	556	$170,290,831	0	0.0%	$0	0.0%
City of Manitou Springs	2,412	$1,261,305,232	8	0.3%	$1,178,596	0.1%
Town of Monument	3,594	$2,441,721,337	0	0.0%	$0	0.0%
Town of Palmer Lake	1,304	$706,564,041	2	0.2%	$627,390	0.1%
Town of Ramah	83	$25,682,659	0	0.0%	$0	0.0%
Unincorporated County	68,245	$36,530,240,639	130	0.2%	$51,400,524	0.1%
El Paso County (Total)	**252,492**	**$152,463,775,764**	**3,291**	**1.3%**	**$1,860,689,749**	**1.2%**

Source: U.S. Army Corps of Engineers, National Structure Inventory 2022; RSMeans 2024; Colorado Geological Survey

Table 23-7. Buildings in the Rockfall Hazard Area

Jurisdiction	Jurisdiction Total Buildings	Jurisdiction Total Replacement Cost Value	Number of Buildings in Hazard Area	Buildings in Hazard Area as % of Jurisdiction Total	Replacement Cost Value in Hazard Area	Replacement Cost Value in Hazard Area as % of Jurisdiction Total
Town of Calhan	424	$383,083,382	0	0.0%	$0	0.0%
City of Colorado Springs	166,064	$105,908,247,826	1,004	0.6%	$606,541,633	0.6%
City of Fountain	9,810	$5,036,639,818	0	0.0%	$0	0.0%
Town of Green Mountain Falls	556	$170,290,831	0	0.0%	$0	0.0%
City of Manitou Springs	2,412	$1,261,305,232	2	0.1%	$353,032	<0.1%
Town of Monument	3,594	$2,441,721,337	0	0.0%	$0	0.0%
Town of Palmer Lake	1,304	$706,564,041	0	0.0%	$0	0.0%
Town of Ramah	83	$25,682,659	0	0.0%	$0	0.0%
Unincorporated County	68,245	$36,530,240,639	59	0.1%	$24,744,317	0.1%
El Paso County (Total)	**252,492**	**$152,463,775,764**	**1,065**	**0.4%**	**$631,638,981**	**0.4%**

Source: U.S. Army Corps of Engineers, National Structure Inventory 2022; RSMeans 2024; Colorado Geological Survey

Table 23-8. Buildings in the Landslide Hazard Area by General Occupancy Class

	Residential Buildings in the Landslide Hazard Area	Commercial Buildings in the Landslide Hazard Area	Industrial Buildings in the Landslide Hazard Area	Other Buildings in the Landslide Hazard Area
Town of Calhan	0	0	0	0
City of Colorado Springs	2,940	166	32	12
City of Fountain	0	1	0	0
Town of Green Mountain Falls	0	0	0	0
City of Manitou Springs	8	0	0	0
Town of Monument	0	0	0	0
Town of Palmer Lake	2	0	0	0
Town of Ramah	0	0	0	0
Unincorporated County	126	3	0	1
El Paso County (Total)	**3,076**	**170**	**32**	**13**

Source: U.S. Army Corps of Engineers, National Structure Inventory 2022; Colorado Geological Survey
Note: Other = Government, Religion, Agricultural, and Education

Table 23-9. Buildings in the Rockfall Hazard Area by General Occupancy Class

	Residential Buildings in the Rockfall Hazard Area	Commercial Buildings in the Rockfall Hazard Area	Industrial Buildings in the Rockfall Hazard Area	Other Buildings in the Rockfall Hazard Area
Town of Calhan	0	0	0	0
City of Colorado Springs	949	46	8	1
City of Fountain	0	0	0	0
Town of Green Mountain Falls	0	0	0	0
City of Manitou Springs	2	0	0	0
Town of Monument	0	0	0	0
Town of Palmer Lake	0	0	0	0
Town of Ramah	0	0	0	0
Unincorporated County	57	2	0	0
El Paso County (Total)	**1,008**	**48**	**8**	**1**

Source: U.S. Army Corps of Engineers, National Structure Inventory 2022; Colorado Geological Survey
Note: Other = Government, Religion, Agricultural, and Education

23.2.3 COMMUNITY LIFELINES AND OTHER CRITICAL FACILITIES

Several types of infrastructure are exposed to mass movements, including transportation, water and sewer, communication, and power infrastructure. Highly susceptible areas of the county include mountain roads and transportation infrastructure.

- Roads—Landslides can block egress and ingress on roads, causing isolation for neighborhoods, traffic problems and delays for public and private transportation. This can result in economic losses for businesses. The Colorado Department of Transportation (CDOT) has a rockfall program that identifies, assesses, and mitigates rock fall hazards along Colorado's state highways. CDOT employs a rock fall rating scheme to prioritize areas for mitigation.
- Bridges—Landslides can significantly impact road bridges. Mass movements can knock out bridge abutments or significantly weaken the soil supporting them, making them hazardous for use.
- Power Lines—Power lines are generally elevated above steep slopes; the towers supporting them can be subject to landslides. A landslide could trigger failure of the soil underneath a tower, causing it to collapse and ripping down the lines. Power and communication failures due to landslides can create problems for vulnerable populations and businesses.
- Water Supply and Distribution Systems—Large amounts of debris that wash into streams can clog reservoirs, pipelines, or treatment facilities.
- Railroad - Landslide events occurring on, or near, railways have the potential to significantly impact rail transportation in Colorado, as there is no cost-effective way of routing railroads around landslides, especially rockfall.

Table 23-10 and Table 23-11 present the number of facilities located within the landslide and rockfall hazard areas. El Paso County has 28 facilities in the landslide hazard area and 14 in the rockfall hazard area. For both hazards, the Water Systems sector contains the highest number of facilities, 14 in the landslide area and 6 in the rockfall area. The majority of these facilities are situated in the City of Colorado Springs.

23.2.4 ECONOMY

Landslides can have severe economic impacts on the County by disrupting infrastructure, daily lives, and local development. When critical infrastructure such as roads, bridges, and utility lines is damaged or destroyed the transportation and communication networks are interrupted. This can lead to costly repairs and delays in the commerce sector. Agricultural areas impacted by landslides may suffer crop losses and reduced productivity which can impact the food supply and incomes. Tourism, which is a source of revenue for the County, can also decline due to damaged attractions and increased safety concerns. Additionally, emergency response and recovery efforts strain annual budgets which divert funds from other essential services.

Table 23-10. Number of Facilities in the Landslide Hazard Area

Jurisdiction	Communica-tions	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transpor-tation	Water Systems	Other Critical Facilities	Total	Facilities in Hazard Area as % of Jurisdiction Total
Town of Calhan	0	0	0	0	0	0	0	0	0	0	0.0%
City of Colorado Springs	0	2	0	0	2	6	0	13	0	23	1.8%
City of Fountain	0	0	0	0	0	0	0	0	0	0	0.0%
Town of Green Mountain Falls	0	0	0	0	0	0	0	0	0	0	0.0%
City of Manitou Springs	0	0	0	0	0	0	0	0	0	0	0.0%
Town of Monument	0	0	0	0	0	0	0	0	0	0	0.0%
Town of Palmer Lake	0	0	0	0	0	0	0	0	0	0	0.0%
Town of Ramah	0	0	0	0	0	0	0	0	0	0	0.0%
Unincorporated County	0	1	0	2	0	1	0	1	0	5	1.2%
El Paso County (Total)	**0**	**3**	**0**	**2**	**2**	**7**	**0**	**14**	**0**	**28**	**1.6%**

Source: Colorado Department of Public Health and Environment 2019, 2024-2025; Colorado Springs 2025; Colorado Springs Utilities 2025; El Paso County 2024-2025; Federal Aviation Administration 2025; Homeland Infrastructure Foundation-Level Data 2025; National Center for Education Statistics 2025; U.S. Army Corps of Engineers 2025; Colorado Geological Survey

Table 23-11. Number of Facilities in the Rockfall Hazard Area

Jurisdiction	Communica-tions	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transpor-tation	Water Systems	Other Critical Facilities	Total	Facilities in Hazard Area as % of Jurisdiction Total
Town of Calhan	0	0	0	0	0	0	0	0	0	0	0.0%
City of Colorado Springs	0	1	0	0	0	4	0	5	0	10	0.8%
City of Fountain	0	0	0	0	0	0	0	0	0	0	0.0%
Town of Green Mountain Falls	0	0	0	0	0	0	0	0	0	0	0.0%
City of Manitou Springs	0	0	0	0	0	0	0	0	0	0	0.0%
Town of Monument	0	0	0	0	0	0	0	0	0	0	0.0%
Town of Palmer Lake	0	0	0	0	0	0	0	0	0	0	0.0%
Town of Ramah	0	0	0	0	0	0	0	0	0	0	0.0%
Unincorporated County	0	1	0	2	0	0	0	1	0	4	1.0%
El Paso County (Total)	**0**	**2**	**0**	**2**	**0**	**4**	**0**	**6**	**0**	**14**	**0.8%**

Source: Colorado Department of Public Health and Environment 2019, 2024-2025; Colorado Springs 2025; Colorado Springs Utilities 2025; El Paso County 2024-2025; Federal Aviation Administration 2025; Homeland Infrastructure Foundation-Level Data 2025; National Center for Education Statistics 2025; U.S. Army Corps of Engineers 2025; Colorado Geological Survey

23.2.5 ENVIRONMENT

Environmental problems because of mass movements can be numerous. Landslides that fall into streams may significantly impact fish and wildlife habitat, as well as affecting water quality. Hillsides that provide wildlife habitat can be lost for prolonged periods of time due to landslides.

23.2.6 HISTORIC AND CULTURAL RESOURCES

Landslides in El Paso County can have severe impacts to the historic and cultural resources, especially in areas like the City of Manitou Springs Incline and the Manitou Hydro-Electric Plant Pipeline. These sites are listed on the National Register of Historic Places and have faced severe damage from past landslide events. Especially those triggered by the severe storms and flooding in 2013 (FEMA n.d.). Landslides and rockfalls not only compromise the structural integrity of historical landmarks but also disrupt the use as recreational and cultural assets. Preservation efforts require mitigation which can include drainage improvements and structural reinforcements in order to protect these culturally significant sites from increased erosion.

23.3 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

23.3.1 LAND USE AND DEVELOPMENT

The County is experiencing significant growth and this growth is expected to continue in the coming decades. More development in the County may increase the number of persons and structures exposed to landslide and rockfall hazards. Future climate conditions are also a critical consideration. “Climate change and rising temperatures are expected to trigger more landslides, especially in mountainous areas with snow and ice (World Health Organization, 2020).” Land use planning and permit authorization conducted by the County and incorporated areas can be used to guide development away from slide and fall prone areas.

23.3.2 PROJECTED CHANGES IN POPULATION PATTERNS

The County population is projected to increase by over 32 percent by 2050. Between 2010 and 2025 alone, the County population rose by nearly 21 percent. With this increase in population, the risk to landslides has also increased. More people residing and living in the County and landslide hazard areas directly increases the exposure to this hazard in the event it may occur. Additionally, an increase in projected populations in the future will also indicate an increase in landslide risk. It is critically important that the County plans for and mitigates against landslide hazards for the current population and the projected new population in the future.

23.3.3 CLIMATE CHANGE

Climate change is expected to increase the frequency and severity of landslides in Colorado, especially in mountainous regions like the Front Range. Rising temperatures and shifting precipitation patterns which are characterized by intense storms and longer dry spells are altering the soil moisture and slope stability. A recent study modeling landslide risk in the Colorado Front Range found that climate-driven changes in vegetation such as reduced root cohesion due to tree mortality can weaken slopes and result in more failures (Byron 2021). Additionally, extreme rainfall events like those experiences in 2013 are projected to become more common. This can further increase the risk of landslides throughout the state. These changes not only impact infrastructure and communities but also cause difficulties for long-term land use planning and emergency preparedness across the region.

23.3.4 OTHER IDENTIFIED CONDITIONS

Important issues associated with landslides and rockfall in the planning area include the following:

- There are existing homes in landslide risk areas throughout the County. The degree of
- vulnerability of these structures depends on the codes and standards the structures were constructed to. Information to this level of detail is limited.
- As incidents of wildfires increase and hillsides are void of vegetation, rain-soaked hillsides are more likely to slide resulting in increased damage countywide.
- Future development could lead to more homes in landslide/rockfall risk areas.
- Mapping and assessment of landslide hazards are constantly evolving. As new data and science become available, assessments of landslide/rockfall risk should be reevaluated.
- Landslides/rockfalls may cause negative environmental consequences, including water quality degradation.
- The risk associated with the landslide or rockfall hazard overlaps the risk associated with other hazards such as earthquake, flood, and wildfire. This provides an opportunity to seek mitigation alternatives with multiple objectives that can reduce risk for multiple hazards.
- Any structure is vulnerable to landslide or rockfall, particularly structures built in foothills areas or below burn scars.
- The greatest infrastructure risk is to Highway 24 through Ute Pass. Any closure of Highway 24 has a large economic impact.
- Many homeowners are not aware that they reside in areas with landslide/rockfall hazards. Outreach to educate and increase public awareness is recommended.

23.4 CONSEQUENCE ANALYSIS

Table 23-12 presents the results of the consequence analysis for the landslide and rockfall hazard.

Table 23-12. Consequence Analysis for the Landslide and Rockfall Hazard

Category	Narrative
Hazard Description	Landslides and rockfalls can occur anywhere unstable slopes, vulnerable bedrock, or other geological conditions lead to slope instability. The areas most susceptible to these hazards are generally located in the western half of the region, near foothills and steep mountainous terrain. Landslides and rockfalls can also trigger secondary or cascading hazards. As outlined in the Colorado State Emergency Operations Plan (SEOP), a landslide near a dam could lead to dam failure. These events may also cause flooding by damming waterways, subsidence, transportation disruptions, and utility outages.
Impact on Property, Facilities, and Infrastructure	Landslides and rockfalls can cause major or long-term property damage that threatens structural stability. There are 5,922 structures located within identified landslide and rockfall susceptibility zones. Past slope failures have caused significant damage to homes and businesses. A large-scale landslide could destroy above-ground infrastructure and severely damage underground utilities such as gas, electric, and water lines. In addition to initial destruction, these events can hinder recovery and rebuilding efforts. Land movement may also trigger hazardous materials (HAZMAT) incidents by damaging facilities or utility infrastructure, potentially causing mass casualties, urban fires, and further utility disruptions.
Impact on the Environment	Landslides that enter streams can significantly affect fish and wildlife habitats and degrade water quality. Hillsides that serve as wildlife habitats may be lost for extended periods due to slope failures, resulting in long-term ecological impacts.
Impact on Responders	Damaged roadways and stalled vehicles can obstruct emergency responders from accessing affected areas. A high volume of response requests may overwhelm local emergency services, requiring assistance from neighboring jurisdictions. Evacuation support, such as door-to-door notifications and traffic management, may increase risks to responders. Communication line disruptions can further hinder coordination. First responders may face physical and psychological strain, and concerns about their families can increase overall risk. Ambulance services may be delayed due to blocked roads. Infrastructure personnel, considered responders due to their responsibilities, may also be impacted.
Impact on Continuity of Operations, Continuity of Government, and Delivery of Services	Landslide events may cause short-term interruptions to essential facilities and services, typically lasting less than 24 hours. PPROEM maintains the Continuity of Operations Plan and the Continuity of Government Plan for the County of El Paso and the City of Colorado Springs; other jurisdictions in the Pikes Peak Region are in the process of developing continuity plans and procedures.
Impact on the Public	Landslides and slope failures can result in isolated deaths and multiple injuries. Past events have caused major structural damage to homes and businesses. A significant landslide could destroy above-ground structures and damage underground utilities, posing serious risks to human life—especially if the event occurs suddenly and without warning.

Category	Narrative
Impact on the Economic Condition of the County	Landslides may lead to a limited workforce, business closures, and reduced tourism, all of which can negatively impact the local economy. While property exposure is limited, disruptions to transportation and commerce may still result in economic losses.
Impact on the Public Confidence in Government	The duration of response and repair efforts—particularly for closed or blocked roadways—is highly visible and often reported in the media. This visibility can influence public perceptions of government capability. Public confidence is closely tied to how effectively response and recovery efforts are managed during and after a landslide event. Timely notification and communication, especially with vulnerable populations, are essential to maintaining trust and ensuring safety.

24. SUBSIDENCE AND SINKHOLES

24.1 HAZARD PROFILE

24.1.1 HAZARD DESCRIPTION

Subsidence is defined by the Colorado Geological Survey as the sinking of the land over man-made or natural underground voids. Subsidence can occur gradually over a prolonged period of time, or abruptly in the form of sinkholes. In Colorado there are three types of subsidence that warrant the most concern: settlement related to collapsing soils, sinkholes in karst areas, and the ground subsidence over abandoned mine workings (Colorado Geological Survey n.d.).

- Subsidence: The sinking of land over human caused or natural underground voids and the settlement of native low-density soils.
- Sinkhole: A collapse of the land surface to form a hole in the ground.

Collapsible Soils

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

Sinkholes in Karst Areas

Most sinkholes in Colorado are related to the dissolution of evaporative rocks. Evaporative rocks are composed of minerals that dissolve in water, including gypsum, halite, or limestone. The term karst describes a landscape that has been shaped by the dissolution of these types of bedrocks (Colorado Geological Survey n.d.). According to a newsletter issued by the Colorado Geological Survey, “two characteristics of evaporative bedrock are important. One is that evaporative minerals can flow, like hot plastic, when certain pressures and temperatures are exceeded. The second, and most important to land use and development, is that evaporative minerals dissolve in the presence of freshwater. It is this dissolution of the rock that creates caverns, open fissures, streams out letting from bedrock, breccia pipes, subsidence sags and depressions, and sinkholes.

Factors leading to the formation of sinkholes in these landscapes may be natural or may be induced by human activities. Natural contributing factors include the downward percolation of

surface water through the rock formation or the lateral movement of water within a water table. Human activities that may contribute to such subsistence include stream channel changes, irrigation ditches, land irrigation, leaking or broken pipes, temporary or permanent ponding of surface waters, and mining of soluble materials by means of forced circulation or water (Colorado Geological Survey n.d.).

Abandoned Mine Workings

The underground removal of minerals and rock can undermine underground support systems and lead to void spaces. These voids can then be affected by natural and man-made processes such as caving, changes in flowage, or changes on overlying rock and soil material resulting in collapse or subsidence. Hazards from these abandoned sites are complicated by the fact that many "final mine maps" are inaccurate or incomplete (Colorado Geological Survey n.d.). Mines operating after August of 1997 were required by Federal and State law to take potential surface subsidence into account; however, mining has been an activity in the State since the 1860s (Colorado Geological Survey 2009). There are some mapped, known hazard areas in Colorado; however, it is likely that there are additional hazard areas for which no records exist.

24.1.2 LOCATION

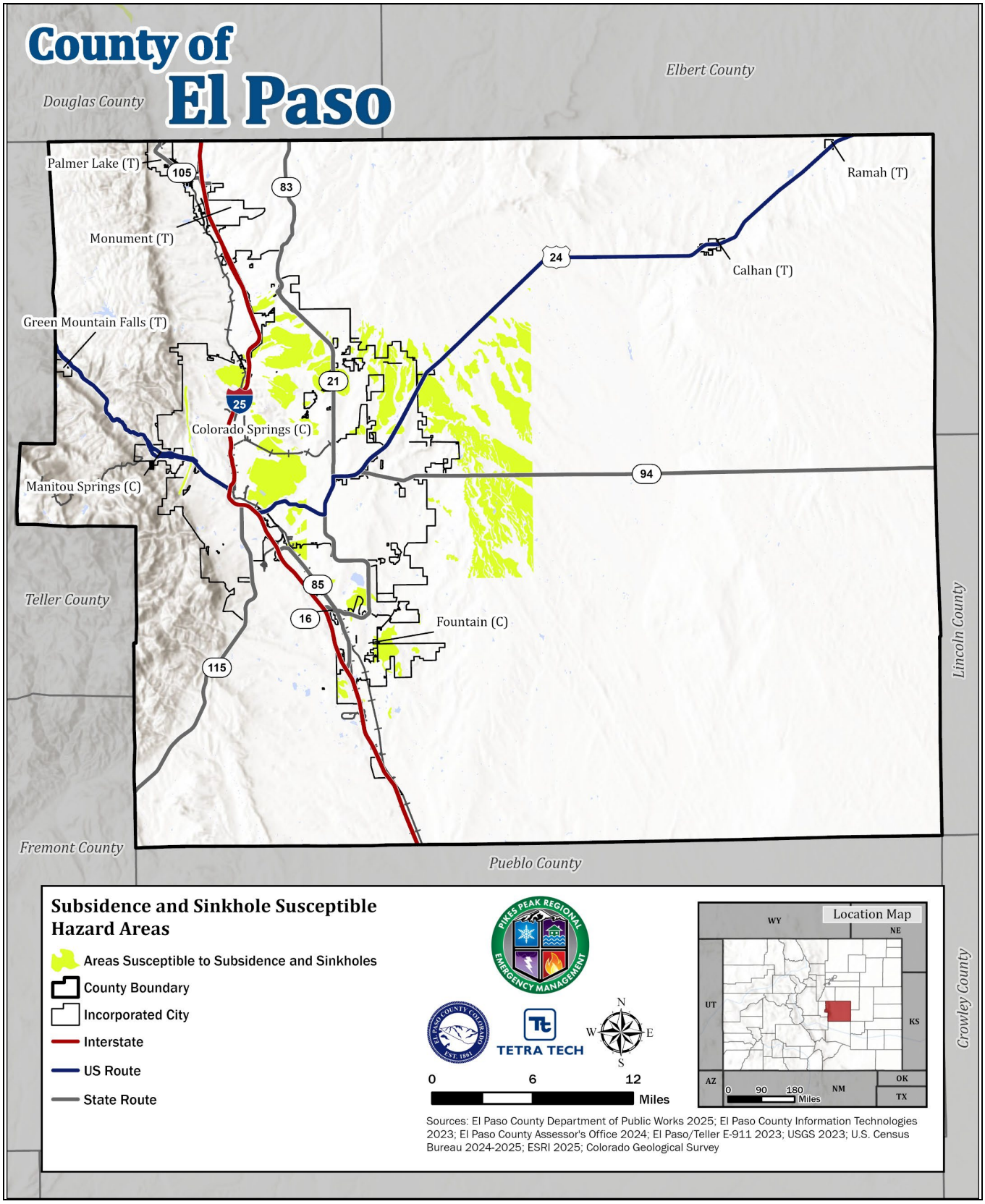
Subsidence is more likely to occur on the surface directly above abandoned coal mining operations. The Colorado Geological Survey (CGS) Abandoned Mine Land Inventory (AMLI) project identified roughly 18,000 abandoned mine-related features on National Forest System lands in Colorado between 1991 and 1999. The mine-related features include mine openings, waste rock dumps, tailings dumps, and mine structures. The Colorado Division of Reclamation, Mining and Safety (DRMS) estimated that there are approximately 23,000 abandoned mines in Colorado. The Region's mining past may pose potential risk to current and future development (Colorado Geological Survey n.d.).

Within Colorado, the City of Colorado Springs area probably has the highest potential for subsidence and related damage because the region includes several fully developed areas located over very shallow mines. Approximately 2,400 acres of the city are undermined by inactive coal mines (Colorado Geological Survey 2009). The Rockrimmon Area, Cragmor/Country Club Area, Palmer Park, and Rustic Hills are at increased risk of subsidence due to their location atop very shallow mine workings.

In a study conducted by Dames and Moore in 1985 (The City of Colorado Springs Subsidence Investigation), it was determined that the highest hazards for subsidence occurred in the Cragmor/Country Club Area, Palmer Park, and Rustic Hills, over areas where room and pillar and extraction techniques were utilized by previous mining activity.

A vulnerability analysis was conducted using areas susceptible to collapsible soils, evaporite bedrock and subsidence areas developed by the Colorado Geological Survey. The Colorado Geologic Survey's maps of these areas were combined to form a single map of subsidence and sinkhole hazard areas, as shown on Figure 24-1.

Figure 24-1. Subsidence and Sinkhole Hazard Area



24.1.3 EXTENT

Damage from subsidence can range from hairline cracks in plaster or wall board, to damaged foundations, to major road failure with injury and/or death in the case of abrupt failure. The severity of subsidence and sinkholes as well as soil erosion and deposition are largely related to the extent and location of areas that are impacted. Such events can cause property damage as well as loss of life; however, events may also occur in remote areas of the County where there is little to no impact on people or property. According to the CGS, "In general, the type and severity of surface subsistence is governed by the amount of ground surface and the location of removal or compression, and the geological conditions of a particular site" (Colorado Geological Survey n.d.).

However, these impacts are highly localized, so the overall significance to the County and to the participating jurisdictions that are not near subsidence-prone areas (for example the towns of Calhan and Ramah) is considered limited: low potential impact.

Warning Time

Subsidence can happen suddenly and without warning or can occur gradually over time. The rate of subsidence may be intensified because of natural or human-induced activities. According to CGS, there are some instances where the rate of subsidence can be calculated, particularly subsidence that occurs because of mining activities:

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

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

- The larger the mine opening height and width, the larger the subsidence features at the surface.
- The shallower the mine below ground, the more noticeable the surface subsidence evidence; however, in Colorado, pits have been found over mines as deep as 350 feet.
- The strength of the rock above the coal seam influences whether subsidence will reach the surface and the kind of features that can appear (Colorado Geological Survey 2009).

24.1.4 PREVIOUS OCCURRENCES

The occurrence of subsidence is an on-going process resulting from natural and human induced causes. From 1979 to 1983 there were 22 mine subsidence events classified as emergencies in City of Colorado Springs and the majority occurred in the Cragmor-Country Club area. The Office of Surface Mining incurred $767,000 in costs due to the events (Colorado Geological Survey 2009).

Federal Emergency Management Agency (FEMA) Disaster Declarations

The Pikes Peak Region has never received a major disaster declaration for subsidence/sinkhole-related event.

State Emergency Proclamations

Between 2020 and 2024, the Pikes Peak Region was not included in any state emergency proclamation for a subsidence/sinkhole-related event.

U.S. Department of Agriculture (USDA) Declarations

Between 2020 and 2024, the Pikes Peak Region was not included in any USDA subsidence/sinkhole-related agricultural disaster declarations.

All Recent Events

Table 24-1 lists major recorded subsidence/sinkhole-related events that impacted Pikes Peak Region since the previous HMP was developed. For earlier events, refer to the previous HMP.

Table 24-1. Subsidence/Sinkhole Events in Pikes Peak Region (2020 to 2024)

Date	Hazard	Event Narrative
July 15, 2020	Flash Flooding and Sinkhole	Heavy rain resulted in flash flooding. At least one road was damaged from flood waters and debris. Holly Drive experienced a large sinkhole which opened in the road. No injuries were reported.
May 12, 2023	Heavy Rain and Sinkhole	A large sinkhole was created due to heavy rains and flash flooding along Black Forest, Colorado. This resulted in Brentwood Drive near Black Forest Road being closed due to washouts and sinkholes.

Source: KOAA News 2020; KKTV 2023

24.1.5 PROBABILITY OF FUTURE OCCURRENCES

Information on previous subsidence/sinkhole occurrences in the County was used to calculate the probability of future occurrence of such events. Table 24-2 lists the number of events from various sources over the 30-year period from 1979 to 2023, which is the most complete period of record for all sources reviewed. Based on these records and input from the Steering Committee, the probability of occurrence for subsidence/sinkholes in the County is considered “occasional.”

Table 24-2. Probability of Future Subsidence/Sinkhole Events in Pikes Peak Region

Hazard Type	Number of Occurrences Between 1979 and 2023	% Chance of Occurring in Any Given Year
Subsidence and Sinkholes	8	17.8%

Source: PPR HMP 2020; KOAA News 2020; KKTV 2023

24.1.6 CASCADING IMPACTS ON OTHER HAZARDS

Events that cause damage to improved areas can result in secondary hazards such as explosions from natural gas lines, loss of utilities such as water and sewer due to shifting infrastructure, or failures of dams. These events may occur simultaneously with other hazards such as flooding.

Erosion can cause undercutting that can result in an increase in landslide or rockfall hazards. Additionally, erosion can result in the loss of topsoil, which can affect agricultural production in the area. It can also damage the engines of machinery and reduce visibility for drivers. Deposition can have impacts that aggravate flooding, bury crops, or reduce capacities of water reservoirs.

24.2 VULNERABILITY AND IMPACT ASSESSMENT

A vulnerability analysis was conducted as described in Section 4.3 using the combined areas susceptible to collapsible soils, evaporite bedrock and subsidence areas (Figure 24-1).

24.2.1 LIFE, HEALTH, AND SAFETY

Overall Population

Table 24-3 includes the number of people located in the subsidence and sinkhole hazard areas. There is a total of 135,712 people, which is over 18 percent of the County population, which is in the subsidence and sinkhole hazard area. The City of Colorado Springs has the highest population (115,518) located in the subsidence and sinkhole hazard area, which constitutes over 28 percent of the City's total population.

Table 24-3. Population in the Subsidence & Sinkhole Hazard Area

	Total Population 2023 ACS	Population in Hazard Area	Population in Hazard Area as % of Total in Jurisdiction
Town of Calhan	510	0	0.0%
City of Colorado Springs	405,307	115,518	28.5%
City of Fountain	92,873	7,227	7.8%
Town of Green Mountain Falls	690	0	0.0%
City of Manitou Springs	4,796	0	0.0%
Town of Monument	11,035	0	0.0%
Town of Palmer Lake	2,635	0	0.0%
Town of Ramah	130	0	0.0%
Unincorporated County	218,032	12,967	5.9%
El Paso County (Total)	**736,008**	**135,712**	**18.4%**

Source: U.S. Census Bureau 2023, American Community Survey; U.S. Army Corps of Engineers, National Structure Inventory 2022; Colorado Geological Survey

Residents of the County living or traveling in areas prone to subsidence and erosion are exposed to the hazard. The risk of injury or fatalities because of this hazard is limited, but possible. Spontaneous collapse and opening of voids are rare but still may occur resulting in death or injury to any people in the area at the time. It is likely that any such injuries would be highly localized to the area directly impacted by an event.

Socially Vulnerable Population

Sinkholes and subsidence events can have severe impacts on socially vulnerable populations such as the elderly, people with disabilities, children under the age of 5 years, and those living in poverty. These population groups often reside in older or lower-cost housing which can be more susceptible to damage from ground instability and are less likely to be built with specific engineering standards. The collapse of ground due to sinkholes can also lead to displacement, injury, or loss of essential utilities like water, electricity, and transportation lifelines. For individuals with limited mobility or access to emergency resources, such as the elderly or disabled, evacuation and recovery can be especially challenging. Also, those living in poverty may lack insurance or financial means to repair their damaged housing or relocate their families. This could result in prolonged impacts to their lives. These events can increase already existing inequalities for these populations which means it is critical for land use planning and hazard mitigation strategies to prioritize these at-risk populations.

Table 24-4 includes the total number of vulnerable persons located in the subsidence and sinkhole hazard areas (2023 American Community Survey). According to this information, there are a total of 19,904 people over the age of 65, 8,085 people under the age of 5, 2,459 non-English speakers, 17,600 people with disabilities, and 13,149 people below the poverty level which are in the subsidence and sinkhole hazard areas. The City of Colorado Springs has the highest number of vulnerable individuals located in the subsidence and sinkhole hazard areas with 17,644 peoples over the age of 65, 6,652 peoples under the age of 5, 2,271 non-English speakers, 15,600 people with disabilities, and 11,950 people below the poverty level.

24.2.2 GENERAL BUILDING STOCK

Structures and other improvements located in areas prone to subsidence or soil erosion are exposed to risk from these hazards. Property exposed to subsidence can sustain minor damage or can result in complete destruction. According to CGS, merely an inch of differential subsidence beneath a residential structure can cause several thousand dollars of damage. Structures may be condemned because of this damage resulting in large losses. FEMA estimates that there are over $125 million in losses in the U.S. annually because of subsidence. Structures exposed to erosion hazard areas may be undermined, resulting in damage. This may also result in the condemnation of a structure.

Table 24-5 and Table 24-6 include the number and type of buildings in the subsidence and sinkhole hazard areas. There are a total of 51,783 buildings with a replacement cost value of over $28 billion in the subsidence and sinkhole hazard areas. The City of Colorado Springs has the highest number of buildings in the subsidence and sinkhole hazard areas with 46,969 buildings at a RCV of over $26 billion. There are a total of 47,361 residential buildings, 3,333 commercial buildings, 582 industrial buildings, and 507 other types of buildings in the subsidence and sinkhole hazard areas. The City of Colorado Springs has the highest number of residential buildings (42,813), commercial buildings (3,170), industrial buildings (526), and other types of buildings (460) in the subsidence and sinkhole hazard areas.

Table 24-4. Estimated Number of Vulnerable Persons Located in the Subsidence & Sinkhole Hazard Area

	Population Over 65 Living in Hazard Area	Population Over 65 in Hazard Area as % of Total In Jurisdiction	Population Under 5 Living in Hazard Area	Population Under 5 in Hazard Area as % of Total In Jurisdiction	Non-English Speaking Population Living in Hazard Area	Non-English Speaking Population in Hazard Area as % of Total In Jurisdiction	Population with Disability Living in Hazard Area	Population with Disability in Hazard Area as % of Total In Jurisdiction	Population Below Poverty Level Living in Hazard Area	Population Below Poverty Level in Hazard Area as % of Total In Jurisdiction
Town of Calhan	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
City of Colorado Springs	17,644	28.5%	6,652	28.5%	2,271	28.5%	15,600	28.5%	11,950	28.5%
City of Fountain	605	7.8%	580	7.8%	74	7.7%	741	7.8%	601	7.8%
Town of Green Mountain Falls	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
City of Manitou Springs	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Town of Monument	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Town of Palmer Lake	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Town of Ramah	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Unincorporated County	1,655	5.9%	853	5.9%	114	5.9%	1,259	5.9%	598	5.9%
El Paso County (Total)	**19,904**	**19.8%**	**8,085**	**17.6%**	**2,459**	**22.4%**	**17,600**	**20.2%**	**13,149**	**21.6%**

Source: U.S. Census Bureau 2023, American Community Survey; U.S. Army Corps of Engineers, National Structure Inventory 2022; Colorado Geological Survey

Table 24-5. Buildings in the Subsidence & Sinkhole Hazard Area

	Jurisdiction Total Buildings	Jurisdiction Total Replacement Cost Value	Number of Buildings in Hazard Area	Buildings in Hazard Area as % of Jurisdiction Total	Replacement Cost Value in Hazard Area	Replacement Cost Value in Hazard Area as % of Jurisdiction Total
Town of Calhan	424	$383,083,382	0	0.0%	$0	0.0%
City of Colorado Springs	166,064	$105,908,247,826	46,969	28.3%	$26,428,490,084	25.0%
City of Fountain	9,810	$5,036,639,818	758	7.7%	$338,718,889	6.7%
Town of Green Mountain Falls	556	$170,290,831	0	0.0%	$0	0.0%
City of Manitou Springs	2,412	$1,261,305,232	0	0.0%	$0	0.0%
Town of Monument	3,594	$2,441,721,337	0	0.0%	$0	0.0%
Town of Palmer Lake	1,304	$706,564,041	0	0.0%	$0	0.0%
Town of Ramah	83	$25,682,659	0	0.0%	$0	0.0%
Unincorporated County	68,245	$36,530,240,639	4,056	5.9%	$1,871,498,277	5.1%
El Paso County (Total)	**252,492**	**$152,463,775,764**	**51,783**	**20.5%**	**$28,638,707,250**	**18.8%**

Source: U.S. Army Corps of Engineers, National Structure Inventory 2022; RSMeans 2024; Colorado Geological Survey

Table 24-6. Buildings in the Subsidence & Sinkhole Hazard Area

	Residential Buildings in the Subsidence & Sinkhole Hazard Area	Commercial Buildings in the Subsidence & Sinkhole Hazard Area	Industrial Buildings in the Subsidence & Sinkhole Hazard Area	Other Buildings in the Subsidence & Sinkhole Hazard Area
Town of Calhan	0	0	0	0
City of Colorado Springs	42,813	3,170	526	460
City of Fountain	724	28	2	4
Town of Green Mountain Falls	0	0	0	0
City of Manitou Springs	0	0	0	0
Town of Monument	0	0	0	0
Town of Palmer Lake	0	0	0	0
Town of Ramah	0	0	0	0
Unincorporated County	3,824	135	54	43
El Paso County (Total)	**47,361**	**3,333**	**582**	**507**

Source: U.S. Army Corps of Engineers, National Structure Inventory 2022; Colorado Geological Survey
Note: Other = Government, Religion, Agricultural, and Education

24.2.3 COMMUNITY LIFELINES AND OTHER CRITICAL FACILITIES

Any critical facilities or infrastructure that are located on or near areas prone to subsidence or soil erosion are exposed to risk from the hazard. Subsidence can result in serious structural damage to critical facilities and infrastructure such as roads, irrigation ditches, underground utilities, and pipelines. According to CGS, large ground displacements caused by collapsing soils can destroy roads and structures and alter surface drainage. Minor cracking and distress may result as the improvements respond to small adjustments in the ground beneath them. Structures and underground utilities found in areas prone to subsidence can suffer from distress. The shifting and settling of the structure can be seen in several ways (Colorado Geological Survey 2009):

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

Table 24-7 shows that a total of 332 facilities in El Paso County are located within the subsidence and sinkhole hazard area. The highest concentration is in the Health and Medical sector, with 149 facilities, followed by 112 in the Safety and Security sector. The majority of these facilities are situated in the City of Colorado Springs.

Table 24-7. Number of Facilities in the Subsidence & Sinkhole Hazard Area

Jurisdiction	Communica-tions	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transpor-tation	Water Systems	Other Critical Facilities	Total	Facilities in Hazard Area as % of Jurisdiction Total
Town of Calhan	0	0	0	0	0	0	0	0	0	0	0.0%
City of Colorado Springs	0	7	0	29	145	101	0	10	14	306	24.3%
City of Fountain	0	0	0	1	4	1	0	1	0	7	17.1%
Town of Green Mountain Falls	0	0	0	0	0	0	0	0	0	0	0.0%
City of Manitou Springs	0	0	0	0	0	0	0	0	0	0	0.0%
Town of Monument	0	0	0	0	0	0	0	0	0	0	0.0%
Town of Palmer Lake	0	0	0	0	0	0	0	0	0	0	0.0%
Town of Ramah	0	0	0	0	0	0	0	0	0	0	0.0%
Unincorporated County	1	0	0	4	0	10	0	3	1	19	4.6%
El Paso County (Total)	**1**	**7**	**0**	**34**	**149**	**112**	**0**	**14**	**15**	**332**	**18.8%**

Source: Colorado Department of Public Health and Environment 2019, 2024-2025; Colorado Springs 2025; Colorado Springs Utilities 2025; El Paso County 2024-2025; Federal Aviation Administration 2025; Homeland Infrastructure Foundation-Level Data 2025; National Center for Education Statistics 2025; U.S. Army Corps of Engineers 2025; Colorado Geological Survey

24.2.4 ECONOMY

Subsidence and sinkholes can have economic impacts for the County including effect on both public and private sectors. When ground collapses impact critical facilities and lifelines such as roads, utilities, and buildings the County local government must allocate funds for emergency response, repairs, and long-term mitigation. This can divert resources from other planned services which are also essential for County operations. Property owners also face costly structural repairs, reduced property values, and increased insurance premiums. Local businesses can suffer from daily closures, potential lost revenue, and disrupted supply chains. Also, tourism and recreation may decline in the County if natural or cultural landmarks are damaged or perceived as unsafe. Tourism is a large economic driver for the County and could mean an overall loss in economic advantages.

24.2.5 ENVIRONMENT

Subsidence is a naturally occurring processes but can still cause damage to the natural environment. Environments located in areas prone to subsidence and deposition are exposed.

24.2.6 HISTORIC AND CULTURAL RESOURCES

Sinkholes and subsidence can threaten the historic and cultural resources of El Paso County especially in areas like City of Colorado Springs and City of Manitou Springs where there are shallow abandoned coal mines and karst geology. According to the Colorado Geological Survey, subsidence can occur abruptly, forming dangerous ground openings that may damage or destroy historic buildings, monuments, and cultural landmarks (Colorado Geological Survey n.d.). Many of these structures which are built decades or even over a century ago are not designed to withstand ground movement and may suffer from damage such as cracking, tilting, or full collapse. The loss or degradation of these historic sites not only impacts the County's cultural identity but also can impact tourism, which is a major economic driver for the community. Also, preservation efforts are often difficult due to the unpredictability of subsidence and sinkhole events.

24.3 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

24.3.1 LAND USE AND DEVELOPMENT

Central Colorado Springs and the Rockrimmon undermined areas are already heavily developed; subsidence would be a concern for continued development and redevelopment in these areas. Jurisdictions in the planning area should ensure that known hazard areas are regulated under their planning and zoning programs. In areas where hazards may be present, permitting processes should require geotechnical investigations to access risk and vulnerability to hazard areas.

24.3.2 PROJECTED CHANGES IN POPULATION PATTERNS

The County population is projected to increase by over 32 percent by 2050. Between 2010 and 2025 alone, the County population rose by nearly 21 percent. With this increase in population, the risk of subsidence and sinkholes has also increased. More people residing and living in the County and living in subsidence and sinkholes directly increases the exposure to this hazard in the event it may occur. Additionally, an increase in projected populations in the future will also indicate an increase in subsidence/sinkhole risk. It is critically important that the County plans for and mitigates against subsidence/sinkhole hazards for the current population and the projected new population in the future.

24.3.3 CLIMATE CHANGE

Changes in precipitation events and the hydrological cycle may result in changes in the rate of subsidence and soil erosion. According to a 2003 paper published by the Soil and Water Conservation Society:

The potential for climate change–as expressed in changed precipitation regimes–to increase the risk of soil erosion, surface runoff, and related environmental consequences is clear. The actual damage that would result from such a change is unclear. Regional, seasonal, and temporal variability in precipitation is large both in simulated climate regimes and in the existing climate record. Different landscapes vary greatly in their vulnerability to soil erosion and runoff. Timing of agricultural production practices creates even greater vulnerability to soil erosion and runoff during certain seasons. The effect of a particular storm event depends on the moisture content of the soil before the storm starts. These interactions between precipitation, landscape, and management mean the actual outcomes of any change in precipitation regime will be complex (Soil and Water Conservation Society 2003).

24.3.4 OTHER IDENTIFIED CONDITIONS

The major issues for subsidence and sinkholes are the following

- Onset of actual or observed subsidence in many cases is related to changes in land use. Land uses permitted in known hazard areas should be carefully evaluated.
- Knowledge of hydrologic factors is critical for evaluating most types of ground subsidence.
- Abandoned mine information is incomplete. There are likely to be hazardous areas in addition to known locations.
- Some housing developments have had subsidence hazard investigations completed before development. This practice should be expanded.
- Homeowners within an undermined area that were built before 1989 are eligible to participate in the Mine Subsidence Protection Program, a federal program operated by the Mined Land Reclamation Board of the Division of Minerals and Geology. Homes built after 1989 are not covered.
- Many older sinkholes have been covered with recent soil infilling and are completely concealed at the surface

- More detailed analysis should be conducted for critical facilities and infrastructure exposed to hazard areas. This analysis should address how potential structural issues were addressed in facility design and construction.

24.4 CONSEQUENCE ANALYSIS

Table 24-8 presents the results of the consequence analysis for the subsidence and sinkhole hazard.

Table 24-8. Consequence Analysis for the Subsidence and Sinkhole Hazard

Category	Narrative
Hazard Description	Former mining areas in the region pose a potential risk for subsidence. The City of Colorado Springs' mining history may impact current and future development, particularly in areas located directly above abandoned coal mining operations. These areas include Rockrimmon, Cragmor/Country Club, Palmer Park, and Rustic Hills. In addition to mining-related risks, karst terrain, subterranean drainage systems, and collapsible soils may also contribute to subsidence hazards. Subsidence and landslides can trigger secondary or cascading impacts, such as dam failure, flooding due to blocked waterways, transportation disruptions, and utility outages. Subsidence may also undermine transportation routes, increasing risk to infrastructure and public safety.
Impact on Property, Facilities, and Infrastructure	Damage from subsidence can range from minor cosmetic issues, such as hairline cracks in plaster or drywall, to severe structural failures, including foundation damage and major roadway collapse. In extreme cases, abrupt subsidence can result in injury or death. Hundreds of structures located in central Colorado Springs and the Rockrimmon area are vulnerable due to their location above undermined land. These structures are at increased risk of damage from ground movement.
Impact on the Environment	Subsidence events can alter the morphology and hydrology of affected areas. Changes in land elevation and drainage patterns may impact ecosystems, water flow, and soil stability, potentially leading to long-term environmental degradation.
Impact on Responders	Damaged roadways and stalled vehicles can obstruct emergency responders from accessing affected areas. A high volume of response requests may overwhelm local emergency services, requiring assistance from neighboring jurisdictions. Evacuation support, including door-to-door notifications and traffic management, may increase risks to responders. Communication line disruptions can further hinder coordination. First responders may face physical and psychological strain, and concerns about their families can increase overall risk. Ambulance services may be delayed due to damaged infrastructure.

Category	Narrative
Impact on Continuity of Operations, Continuity of Government, and Delivery of Services	Subsidence events typically result in minimal or no loss of facility functionality or accessibility. However, limited power interruptions may occur in areas without adequate backup generation. PPROEM maintains the Continuity of Operations Plan and the Continuity of Government Plan for the County of El Paso and the City of Colorado Springs; other jurisdictions in the Pikes Peak Region are in the process of developing continuity plans and procedures.
Impact on the Public	Subsidence can result in isolated deaths and multiple injuries. Damage may range from minor cosmetic issues to severe structural failures. Abrupt ground movement can cause significant harm, particularly if it occurs without warning and affects occupied buildings or roadways.
Impact on the Economic Condition of the County	Subsidence events typically result in limited loss of facility functionality and minimal uninsured property damage. However, disruptions to transportation and infrastructure may still impact local businesses and economic activity.
Impact on the Public Confidence in Government	The characteristics of expansive soils and subsidence—such as slow onset and localized impact—result in limited government response functions beyond building inspection and repair. Public confidence is closely tied to perceptions of how effectively response and recovery efforts are managed. Timely communication, especially with vulnerable populations, is essential to maintaining trust and ensuring safety.

25. HAZARD RANKING

Hazard rankings have been used as one of the bases for identifying the jurisdictional hazard mitigation strategies included in Volume 2. These rankings may vary among the jurisdictions. For example, a hazard may be ranked low in one municipality but due to differences in vulnerability and impact, be ranked as high for the County or another municipality. Jurisdictional ranking results are presented in each jurisdictional annex in Volume 2.

25.1 HAZARD RANKING METHODOLOGY

Each jurisdiction participating in this HMP has differing levels of vulnerability to and potential impacts from each of the hazards assessed in this plan. Each jurisdiction needs to recognize the hazards that pose the greatest risk to its community and direct its attention and resources accordingly to manage risk and reduce losses. To achieve this, a holistic hazard ranking methodology was developed and utilized to evaluate the degree of risk for all identified hazards in the planning area. It utilizes numerical values that allow identified hazards to be ranked against one another; the higher the relative risk factor calculated, the greater the hazard risk.

25.1.1 CATEGORIES USED IN RANKING

The following sections describe the categories used to rank the hazards of concern and their associated scoring parameters.

Probability of Occurrence

Probability of occurrence is the likelihood of a hazard event occurring in a given year. For some hazards, probability of occurrence was based on the likelihood that an event scenario of a specified magnitude (such as a 1 percent annual chance flood or a M7.2 earthquake) would occur in any given year. When no scenario was assessed, an examination of the historical record and judgment was used to estimate the probability of occurrence of an event that will impact the County. Table 25-1 to Table 25-3 summarizes the scoring parameters for probability of occurrence.

Table 25-1. Historic Precedence

Level	Degree of Risk	Numeric Value
Unlikely	Less than 1% Annual Probability	1
Occasional	Between 1% and 24% Annual Probability	2
Likely	Between 25% and 75% Annual Probability	3
Highly Likely	Greater than 75% Annual Probability	4

Table 25-2. Exacerbated by Other Conditions

Level	Degree of Risk	Numeric Value
Unlikely	No	1
Occasional	Small/Uncertain Effects	2
Likely	Likely Effects	3
Highly Likely	Certain Effects	4

Table 25-3. Exacerbated by Climate Change

Level	Degree of Risk	Numeric Value
Unlikely	No	1
Occasional	Small/Uncertain Effects	2
Likely	Likely Effects	3
Highly Likely	Certain Effects	4

Magnitude/Severity

Magnitude/severity represents the expected impact associated with the hazard. This is rated for three subcategories: vulnerability of people; vulnerability of property; and vulnerability of critical facilities and infrastructure. Table 25-4 to Table 25-6 summarize the scoring parameters for magnitude/severity.

Table 25-4. Population Impacts

Level	Degree of Risk	Numeric Value
Minor	No anticipated displacement or injuries; minimal disruption on quality of life	1
Limited	Minor injuries and illnesses	2
Critical	Isolated deaths and/or multiple injuries and illness	3
Catastrophic	Multiple deaths/injuries	4

Table 25-5. Property Loss

Level	Degree of Risk	Numeric Value
Minor	Little or no property damage	1
Limited	Minimal property damage that does no threaten structural stability	2
Critical	Major or long-term property damage that threatens structural stability	3
Catastrophic	Property destroyed and severely damaged	4

Table 25-6. Critical Facilities and Infrastructure

Level	Degree of Risk	Numeric Value
Minor	No or brief interruption of essential facilities and services	1
Limited	Interruption of essential facilities and services for less than 24 hours	2
Critical	Interruption of essential facilities and services for 24-72 hours	3
Catastrophic	Interruption of essential facilities and services for more than 72 hours	4

Spatial Extent

Spatial extent considers how large of an area could be impacted by a hazard event. Table 25-7 summarizes the scoring parameters for spatial extent.

Table 25-7. Spatial Extent

Level	Degree of Risk	Numeric Value
Negligible	Less than 1% if area affected	1
Limited	Between 1% and 25% of area affected	2
Moderate	Between 25% and 50% of area affected	3
Significant	Greater than 50% of area affected	4

Warning Time

Warning time considers whether there is usually some lead time associated with the hazard event. Another factor of this score is whether warning measures have been implemented. Table 25-8 summarizes the scoring parameters for climate change.

Table 25-8. Warning Time

Level	Degree of Risk	Numeric Value
Maximum	Warning time is more than 24 hours	1
Significant	Warning time is 12 to 24 hours	2
Moderate	Warning time is 6 to 12 hours	3
Minimal	Warning time is less than 6 hours	4

Environmental Damage

Environmental damage considers the negative consequences of a hazard on the environment, including soil, water, air, and/or plants and animals. Table 25-9 summarizes the scoring parameters for environmental damage.

Table 25-9. Environmental Damage

Level	Degree of Risk	Numeric Value
None	Not likely to result in environmental damage	1
Minor	Could cause localized and reversible damage; quick clean up is possible	2
Moderate	Could cause major but reversible damage; full clean up is difficult	3
Severe	Could cause irreversible environmental damage; full clean up is not possible	4

25.1.2 TOTAL RANKING SCORE

The total ranking score based on the categories described above is calculated using the following equation:

Risk Ranking Score Equation

Relative Risk = [(Probability × 0.25) + (Magnitude/Severity × 0.25) + (Spatial Extent × 0.18) + (Warning Time × 0.18) + (Environmental Damage × 0.14)]

All Planning Partners applied the same methodology to develop the hazard rankings to ensure consistency in the overall ranking of risk.

25.2 HAZARD RANKING RESULTS

Using the methodology described above, the hazard ranking for the identified hazards of concern was determined for each planning partner. The region hazard ranking includes the entire planning area and may not reflect the highest risk for all Planning Partners. The overall ranking for each jurisdiction is included in Table 25-10 and in the annexes in Volume 2.

Table 25-10. Overall Ranking of Hazards by Jurisdiction

Hazard	Town of Calhan	City of Colorado Springs	El Paso County	City of Fountain	Town of Green Mountain Falls	City of Manitou Springs	Town of Monument	Town of Palmer Lake	Town of Ramah	Region
Avalanche	Negligible	Low	Low	Negligible	Low	Negligible	Negligible	Negligible	Negligible	Low
Cyber Attack	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Dam/Levee Failure	Low	Moderate	Moderate	Low	Low	Moderate	Moderate	Low	Low	Moderate
Drought and Extreme Heat	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Earthquake	Negligible	Moderate	Moderate	Low	Moderate	Moderate	Moderate	Low	Negligible	Moderate
Extreme Acts of Violence	Negligible	Moderate	Moderate	Low	Negligible	Low	Low	Low	Negligible	Low
Flood	Low	High	High	Moderate	High	High	Moderate	Low	Low	Moderate
Hail	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Hazardous Materials	Low	High	Moderate	High	Low	Moderate	High	Moderate	Low	Moderate
Landslide/Rockfall	Negligible	High	Moderate	Low	Low	Moderate	Low	Negligible	Negligible	Low
Lightning	Low	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Low	Low	Moderate
Major Aircraft Incident	Moderate	Moderate	Moderate	Moderate	Low	Low	Moderate	Low	Low	Moderate
Mud or Debris Flow	Negligible	High	Moderate	Low	High	High	Low	Moderate	Negligible	Moderate
Pandemic/Epidemic	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Subsidence and Sinkholes	Low	Moderate	Low	Negligible	Negligible	Low	Negligible	Negligible	Negligible	Low
Tornado	Moderate	Moderate	Moderate	Moderate	Low	Low	Low	Low	Moderate	Moderate
Wildfire	Moderate	High	High	Moderate	High	High	High	High	Moderate	High
Wind	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Winter Storm	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate

26. CAPABILITY ASSESSMENT

A capability assessment is an inventory of a community's missions, programs, and policies and an analysis of its capacity to carry them out (FEMA 2003). This integral part of the planning process analyzes current governmental programs, policies, regulations, and funding that could either facilitate or hinder mitigation. Through assessing its capabilities, a jurisdiction learns whether it can implement certain mitigation actions by determining the following:

- The range of local and/or state administrative, programmatic, regulatory, financial, and technical resources available to assist in implementing mitigation actions
- Types of mitigation actions that may be technically, legally, administratively, politically, or fiscally challenging or infeasible because they are outside of current capabilities
- Opportunities to enhance local capabilities to support long-term mitigation and risk reduction

This chapter summarizes existing capabilities at all levels of government (federal, state, county, local) for supporting hazard mitigation within the planning area. These capabilities are presented in three categories:

- Planning and regulatory capabilities
- Administrative and technical capabilities
- Fiscal capabilities

Each Planning Partner's annex in Volume 2 also includes a capability assessment specific to those jurisdictions. In addition to the above categories, the annexes review capabilities in the more localized categories of adaptive capacity, education and outreach, community classifications, and warning systems. Participating jurisdictions evaluated the effectiveness of their capabilities for supporting hazard mitigation and identified opportunities to enhance those capabilities. Each jurisdiction identified how it has integrated hazard mitigation into its existing planning, regulatory, and operational/administrative framework and how it intends to promote ongoing integration.

26.1 PLANNING AND REGULATORY CAPABILITIES

Planning and regulatory capabilities are based on ordinances, policies, local laws, state statutes, plans, and programs that relate to managing growth and development. Planning and regulatory capabilities refer not only to current plans and regulations, but also to the jurisdiction's ability to change and improve those plans and regulations as needed. This section summarizes planning and regulatory capabilities for the Pikes Peak Region. Further information is provided in the jurisdictional annexes in Volume 2.

26.1.1 STATE AND FEDERAL

National Flood Insurance Program

The U.S. Congress established the National Flood Insurance Program (NFIP) with the passage of the National Flood Insurance Act of 1968 (FEMA's 2002 NFIP: Program Description). The NFIP is a Federal program enabling property owners in participating communities to purchase insurance as a protection against flood losses in exchange for State and community floodplain management regulations that reduce future flood damages. The flood hazard profile in Chapter 6 provides further information on the NFIP as implemented in the Pikes Peak Region.

There are three components to the NFIP: flood insurance, floodplain management and flood hazard mapping. Communities participate in the NFIP by adopting and enforcing floodplain management ordinances to reduce future flood damage. In exchange, the NFIP makes federally backed flood insurance available to homeowners, renters, and business owners in these communities. Community participation in the NFIP is voluntary. Flood insurance is designed to provide an alternative to disaster assistance to reduce the escalating costs of repairing damage to buildings and their contents caused by floods. Flood damage in the U.S. is reduced by nearly $1 billion each year through communities implementing sound floodplain management requirements and property owners purchasing flood insurance. Additionally, buildings constructed in compliance with NFIP building standards suffer approximately 80% less damage annually than those not built in compliance (FEMA, 2008).

The County and partner cities for this plan participate in the NFIP and have adopted regulations that meet the NFIP requirements. At the time of the preparation of this plan, all other participating jurisdictions in the partnership were in good standing with NFIP requirements. The jurisdictional annexes in Volume 2 describe NFIP participation for each planning partner.

Municipal compliance with the NFIP is described in each of the jurisdictional annexes in Volume 2. The County's municipalities have been compliant with the NFIP. To enhance their flood damage prevention programs and enhance compliance with the NFIP in the future, several municipalities propose actions in their mitigation strategies to ensure that their floodplain administrators complete training on floodplain management and the NFIP or update their flood damage prevention ordinance. Additional information on the NFIP program and its implementation throughout the County may be found in the flood hazard profile (Section 6 - Flood).

NFIP Community Rating System

As an additional component of the NFIP, the Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting the three goals of the CRS: (1) reduce flood losses; (2) facilitate accurate insurance rating; and (3) promote the awareness of flood insurance (FEMA, 2012).

As of 2025, there are seven communities within El Paso County that participate in the CRS program: City of Colorado Springs (Class 5), El Paso County (Class 7), City of Manitou Springs (Class

7), City of Fountain (Class 10), Town of Green Mountain Falls (Class 10), Town of Monument (Class 10), and Town of Palmer Lake (Class 10).

U.S. Army Corps of Engineers

Under Section 404(e) of the Clean Water Act, the U.S. Army Corps of Engineers (USACE) can issue general permits to authorize activities that have only minimal individual and cumulative adverse environmental effects. A nationwide permit (NWP) is a general permit that authorizes activities across the country unless a district or division commander revokes the nationwide permit in a state or other geographic region. There are 57 nationwide permits, and they authorize a wide variety of activities, including linear transportation projects, bank stabilization activities, residential development, commercial and industrial developments, aids to navigation and certain maintenance activities (USACE 2021). This is the most recent data available at the time of this 2026 HMP.

There are three types of USACE permits: standard, nationwide (described above), and regional. Standard permits are individual permits that involve full public interest review of an individual permit application and includes the issuance of a public notice for any project that does not meet the terms and conditions of an NWP or a Letter of Permission (LOP). Regional general permits are for small, specialized projects. In Colorado, there are four regional general permit categories:

- RGP 96-DEN: Natural Disaster Mitigation and Flood Related Activities
- RGP-7-DEN: Channel Maintenance and Construction on the South Platte River and Tributaries
- RGP 37-DEN: Stream Stabilization Projects
- RGP-5-DEN: Ditch Related Activities

Disaster Mitigation Assistance (DMA)

The DMA is the current federal legislation addressing hazard mitigation planning. It emphasizes planning for disasters before they occur. It specifically addresses planning at the local level, requiring plans to be in place before Hazard Mitigation Grant Program funds are available to communities. This Plan is designed to meet the requirements of DMA, improving the planning partners' eligibility for future hazard mitigation funds.

Endangered Species Act

The federal Endangered Species Act (ESA) was enacted in 1973 to conserve species facing depletion or extinction and the ecosystems that support them. The act sets forth a process for determining which species are threatened and endangered and requires the conservation of the critical habitat in which those species live. The ESA provides broad protection for species of fish, wildlife and plants that are listed as threatened or endangered. Provisions are made for listing species, as well as for recovery plans and the designation of critical habitat for listed species. The ESA outlines procedures for federal agencies to follow when taking actions that may jeopardize listed species and contains exceptions and exemptions. It is the enabling legislation for the Convention on International Trade in Endangered Species of Wild Fauna and Flora. Criminal and civil penalties are provided for violations of the ESA and the Convention.

Federal agencies must seek to conserve endangered and threatened species and use their authorities in furtherance of the ESA's purposes. The ESA defines three fundamental terms:

- Endangered means that a species of fish, animal, or plant is "in danger of extinction throughout all or a significant portion of its range." (For salmon and other vertebrate species, this may include subspecies and distinct population segments.)
- Threatened means that a species "is likely to become endangered within the foreseeable future."
- Regulations may be less restrictive for threatened species than for endangered species. Critical habitat means "specific geographical areas that are… essential for the conservation and management of a listed species, whether occupied by the species or not."

Clean Water Act

The federal Clean Water Act (CWA) employs regulatory and non-regulatory tools to reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff. These tools are employed to achieve the broader goal of restoring and maintaining the chemical, physical, and biological integrity of the nation's surface waters so that they can support "the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water."

Evolution of CWA programs over the last decade has included a shift from a program-by-program, source- by-source, pollutant-by-pollutant approach to more holistic watershed-based strategies. Under the watershed approach, equal emphasis is placed on protecting healthy waters and restoring impaired ones

Colorado Department of Public Safety – Division of Homeland Security and Emergency Management

The mission of Colorado's Homeland Security and Emergency Management Division is to lead and support Colorado's effort to prevent, protect, mitigate, respond to and recover from all-hazards events. The Division is the statewide coordinating agency for disaster management and supports counties when a disaster exceeds county capabilities. In addition, the Division coordinates several committees related to emergency management, including the Homeland Security and All-Hazards Senior Advisory Committee and the Natural Disaster Mitigation Enterprise.

Colorado Floodplain Management Program

The Colorado Water Conservation Board manages the statewide Floodplain Management Program. The program aims to reduce flood risks and enhance public safety by ensuring effective floodplain management across the state. It provides guidelines, technical assistance, and regulatory oversight to local governments to manage flood hazards and protect properties. The program also supports development and implementation of flood mitigation projects to minimize impact of flooding events. The CWCB is also responsible for the coordination of the NFIP in Colorado and for aiding local communities in meeting NFIP requirements, including floodplain studies.

Colorado Department of Public Health and Environment – Water Quality Control Division

The Water Quality Control Division monitors and reports on the quality of state waters to prevent water pollution, protect, restore and enhance the quality of surface and groundwater while ensuring that all drinking water systems provide safe drinking water. The Division inspect water systems, issue permits, ensure compliance, and take action against entities who violate state and federal regulations. The Division work in partnership with utilities, counties, and other agencies to oversee, improve, and maintain quality drinking, surface, and ground water.

Colorado Department of Natural Resources – Division of Water Resources

The Dam Safety Program is administered by the Division's Dam Safety Branch. Although the Branch carries out two principal statutorily defined duties; determining the safe storage level of the reservoir dams and reviewing and approving plans and specifications for the construction and repair of Jurisdictional dams, modern dam safety best-practice includes an assortment of engineering and risk management tools. The Dam Safety Branch regulates approximately 1800 dams, all of which are filled primarily with snowmelt runoff. Colorado Dam Safety works to reduce both the likelihood of failure and the potential consequences.

Colorado Department of Natural Resources – Colorado Geologic Survey

The Colorado Geological Survey is a state government agency within the Colorado Department of Natural Resources. Its mission is to help reduce the impact of geologic hazards on the residents of Colorado, to promote responsible economic development of mineral and energy resources, provide geologic insight into water resources, provide avalanche safety training and forecasting, and to provide geologic advice and information to a variety of constituencies. The Colorado Avalanche Information Center is housed in the Colorado Geological Survey.

Colorado State Forest Service

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

26.1.2 COUNTY AND LOCAL

Municipal Land Use Planning and Regulatory Authority

The County and municipalities have various land use planning mechanisms that can be leveraged to mitigate flooding and support hazard risk reduction. Specific County and local planning and regulatory capabilities are identified in their jurisdictional annexes in Volume 2. These include but are not limited to comprehensive plans, flood damage prevention ordinances, local codes and regulations, stormwater regulations, and municipal level plans. A list of plans reviewed is provided in each annex.

Pikes Peak Regional Office of Emergency Management

The Pikes Peak Regional Office of Emergency Management (PPROEM) is responsible for providing mitigation, preparedness, response, recovery, and coordination for large-scale emergencies and disasters, both natural and human-caused, to residents of El Paso County and City of Colorado Springs for the purpose of saving lives and preventing property damage. PPROEM proactively plans for hazards, works to reduce threats, and prepares the community to respond to and recover from a disaster. PPROEM is responsible for maintaining and updating this HMP.

Emergency and Evacuation Plans

PPROEM is designated to coordinate all emergency management activities in the County, including planning, response, and management. The department works collaboratively with many other agencies and organizations which enables the County to better protect life and property during disasters and emergencies. The American Red Cross is the lead organization for Regional sheltering operations.

PPROEM maintains several other regional plans to ensure preparedness and response capabilities. These include the Public Health Emergency Operations Plan which outlines strategies for managing public health crises, and the Hazard Mitigation Plan aimed at reducing long-term risks to life and property from various hazards. Also, PPROEM oversees the Regional Sheltering Plan which details the coordination and management of sheltering operations during emergencies.

El Paso Emergency Operations Plan, 2020

The Base Emergency Operations Plan was developed for use by PPROEM, in support of county and municipal governments, as well as support and coordination with individual agencies to ensure prevention, preparedness, mitigation, response and recovery for hazards that may affect the City of Colorado Springs, other municipalities, and unincorporated areas in El Paso County, Colorado. The plan is used to:

- Support PPROEM's program and Emergency Coordination Center (ECC) activations as an all-hazards plan by defining the structure and processes utilized to prevent, mitigate, prepare for, respond to, and recover from an event.
- Establish coordinated processes for supporting regional emergency management by defining roles and responsibilities and providing guidelines to maintain and restore essential functions.
- Identify scalable, flexible, and adaptable coordinating structures linking local, state, and federal governments, the private sector and nongovernmental and community organizations that play vital roles in emergency management.
- Provide emergency management planning and program guidance to support the Pikes Peak Region's agencies so that they can achieve essential missions and functions under all threats and conditions.

This plan is supported by functional annexes, plans and processes that focus on emergency and disaster missions, actions, roles, and responsibilities for PPROEM and other departments, agencies, and supporting organizations. In addition, all these groups have internal policies, procedures, and plans which further define how the community is supported.

Pikes Peak Regional Building Department (PPRBD)

PPRBD is responsible for the permitting and inspection of construction activities in the unincorporated areas of El Paso County as well as in the City of Colorado Springs, City of Fountain, and City of Manitou Springs, the Town of Green Mountain Falls, Town of Monument, and Town of Palmer Lake. The Department supported this HMP as the primary source for building permit and development data.

El Paso County Strategic Plan

El Paso County has utilized a Strategic Plan for many years as its road map to efficient and effective County government. The Plan promotes the creative provision of services; partnerships with other government agencies, non-profit organizations, and the business community; and excellent customer service. The Plan also helps identify priorities for community investment. The Plan is used by County Offices and Administration Departments when developing their respective annual plans that address specific objectives to help address the County's vision, mission, and goals. The objectives of the Strategic Plan are to:

- Assess the condition of roadway, stormwater, facility, fleet, and park assets and implement strategies to sustainably fund, manage, and improve public-owned infrastructure.
- Improve the quality of county services with a qualified and engaged workforce dedicated to continuous improvement.
- Strengthen community trust through improved communications and transparency.
- Foster partnerships to support community efforts to improve health and safety.

El Paso County Master Plan

The most recent Master Plan for the County was adopted on May 26, 2021. The Plan establishes broad goals and policies that are intended to serve as a framework for the development of the County. Among other topics, the draft plan recommendations include updates on zoning and land use, transportation, economic development and health and safety. These topics are connected to risk reduction for El Paso County.

El Paso County Land Development Code, 2024

The El Paso County Land Development Code was adopted for the purpose of preserving and improving the public health, safety, and general welfare of the residents and businesses of El Paso County. More specifically, it is the purpose of this Code to:
Implement the Master Plan and related elements.

- Promote predictability, consistency, and efficiency in the land development process for residents, neighborhoods, businesses, agricultural, and development interests.
- Ensure appropriate opportunities for participation and involvement in the development process by all affected parties.
- Be fair to all by ensuring due consideration is given to protecting private property rights, the rights of individuals and the rights of the community as a whole.
- Guide the future growth and development of the County in accordance with the Master Plan.

- Guide public and private policy and action in order to provide adequate and efficient transportation, water, sewerage, schools, parks, playgrounds, recreation, and other public requirements and facilities.
- Establish reasonable standards of design and procedures for subdivision and resub division to further the orderly layout and use of land and to ensure proper legal descriptions and documenting of subdivided land.
- Ensure that public facilities and services are available concurrent with development and will have a sufficient capacity to serve the proposed subdivision, and, in so doing, ensure that current residents will be required to bear no more than their fair share of the cost of providing the facilities and services by requiring the developer to pay fees, furnish land, or establish mitigation measures to cover the development's fair share of the capital facilities needs generated by the development.
- Prevent the pollution of air, streams, and ponds; assure the adequacy of drainage facilities; and encourage the wise use and management of natural and biological resources throughout the County to preserve the integrity, stability, and beauty of the community and the value of the land.

El Paso County Community Wildfire Protection Plan, 2011

In 2010, the El Paso County Board of County Commissioners passed a resolution establishing the El Paso County Community Wildfire Protection Plan Commission to prepare and implement the El Paso County Community Wildfire Protection Plan (CWPP). This El Paso County CWPP is broad-scale, and not suitable for site-specific project design; nor was it the intention of the plan developers that this CWPP would replace any existing CWPPs completed by local communities. CWPPs prepared for individual subdivisions, neighborhoods, or fire protection districts capture the level of detail needed to take specific local actions. The development of local CWPPs brings together the neighborhood groups that plan mitigation projects and, in many cases, do the hands-on work.

El Paso County Wildland Fire Preparedness Plan, 2020

The purpose of this County Wildfire Preparedness Plan is to clarify roles and responsibilities of Fire Protection Districts, Fire Departments, the El Paso County Sheriff and the Colorado Division of Fire Prevention and Control (DFPC) in responding to wildfires, to establish standard operating guidelines, to implement cooperative fire protection on all lands in El Paso County and identify a process for transfer of an incident from District to County and if needed County to State.

Pikes Peak Area Council of Governments (PPACG)

The Pikes Peak Area Council of Governments (PPACG) is a voluntary organization of municipal and county governments in Park, Teller, and El Paso counties. The PPACG offers participating communities a forum to discuss issues that cross their political boundaries, identify shared opportunities and challenges, and develop collaborative strategies for action. One of the basic activities of PPACG is planning. PPACG assists local elected officials in making coordinated decisions affecting the development of all geographic areas of the Pikes Peak region. The PPACG's role in mitigation is primarily through its environmental program's involvement in the multi-jurisdictional Fountain Creek Watershed Plan.

Pikes Peak Water Quality Management Plan

This plan establishes roles and responsibilities related to water quality, including stormwater management. The plan establishes regional policy recommendations related to riparian and wetland areas, source water protection for public water supplies, and stormwater and urban runoff.

26.2 ADMINISTRATIVE AND TECHNICAL CAPABILITIES

This section summarizes administrative and technical capabilities in the Pikes Peak Region. Further information is provided in the jurisdictional annexes in Volume 2.

26.2.1 STATE AND FEDERAL

Planning for Hazards: Land Use Solutions for Colorado

This website contains a suite of tools and resources that enable counties and municipalities to prepare for and mitigate multiple hazards by integrating resilience and hazard mitigation principles into plans, codes, and standards related to land use and the built environment. This website provides detailed, Colorado-specific information about how to assess a community's risk level to hazards and how to implement numerous land use planning tools and strategies for reducing a community's risk.

Colorado Climate Center

The Center serves as the Regional Climate Center for the state and is located at Colorado State University in Fort Collins. Its primary purpose is to provide comprehensive climate data, monitoring, and research to support the understanding and management of the state's complex climate. The center offers resources and expertise to local governments, researchers, and the public that help make informed decisions related to weather and climate impacts. By conducting climate assessments, maintaining climate records, and engaging in outreach and education the Colorado Climate Center plays a crucial role in enhancing Colorado's resilience to climate variability and climate change.

Department of State's Division of Code Enforcement and Administration (DCEA)

The DCEA within the Colorado Department of State is responsible for ensuring compliance with building codes and regulations across the state. This division oversees the implementation and enforcement of state building codes and they ensure that construction projects meet safety and structural standards. DCEA provides guidance and support to local code enforcement agencies, conduct inspections, and offer training programs for code officials. The division's purpose is to enhance public safety, promote uniformity in building practices, and support the development of resilient and sustainable infrastructure throughout the state.

Colorado Voluntary Organizations Active in Disaster (COVOAD)

Colorado Voluntary Organizations Active in Disaster (COVOAD) is a network of voluntary organizations working together to encourage more efficient service delivery to people affected by disasters in the State of Colorado. COVOAD achieves this by facilitating effective cooperation,

coordination, communication, and collaboration at all community levels, and by providing a platform to foster partnerships among non- profit and faith-based organizations, the private sector, and government agencies.

26.2.2 COUNTY AND LOCAL

El Paso Code Enforcement

The Development Services Department, Code Enforcement Officers enforce the El Paso County Land Development Code. Depending upon the type of violation, enforcement staff contact violators who have been reported by neighbors or have been seen by the Code Enforcement Officer when in the field.

El Paso County Community Services Department

The Community Services Department strives to provide excellent quality of life services that are valued by the residents of El Paso County. The Department includes the following divisions: Park Operations, Planning, Recreation and Cultural Services, Environmental Health, Veteran Services, Grants/Community Outreach, and CSU Extension. The divisions or focuses of the Community Services Department that pertain to hazard mitigation activities are discussed below:

- Planning Division: The Planning Division provides professional planning, landscape architecture, and project management services. The Division's focus is on parks, trails, and open space planning and support of the annual Capital Improvement Program. The Division also provides expertise in water resources, long range planning for El Paso County, and regional collaborative initiatives.
- Environmental Health Division: The Environmental Health Division encompasses Environmental Compliance, Forestry and Noxious Weeds, Household Hazardous Waste, and Natural Resources. El Paso County embraces its responsibility for environmental stewardship
  by its commitment to initiating innovative, desirable, and sustainable practices in all environmental disciplines. Environmental Compliance ensures that County-owned and operated facilities are compliant with all local, state, and federal environmental regulations
- Forestry and Noxious Weeds: The Community Services Department develops and implements policies, procedures, and standards for efficient mapping, monitoring, enforcement, education, and control of tree diseases, forest pests, and noxious weeds.
- Household Hazardous Waste: The Department addresses environmental and recycling programs within El Paso County by promoting the philosophy of "reduce, reuse, and recycle," and by accepting an extensive variety of household hazardous waste streams for recycling and/or proper disposal.
- Natural Resources: The Department ensures compliance with laws pertaining to threatened and endangered species and wetlands, monitors conservation easements, and reviews subdivision development plans for environmental impacts.

El Paso County Planning Commission

The El Paso County Planning Commission advises the Board of County Commissioners on land use requests (with the exception of County Master Plan issues and Location Approvals). The Commission approves rezoning applications, develops or recommends subdivision regulations, reviews plats of subdivisions, and approves the location and extent of roads, parks, public ways, and public utilities

El Paso County Public Services Department

El Paso County Colorado Public Services Department is committed to helping the public by providing the best possible service including: contracts and procurement, transportation, maintaining the County's facilities and fleet, security, parking, and the Office of Emergency Management. The primary operations of the Public Services Department include:

- Facilities Management: Within the department, the Engineering and the Operations Divisions manage county facilities. Engineering's Infrastructure Planning Section handles property management, site and space planning, energy management and environmental compliance. The Operations Division Facility Management Section maintains over 130 County-owned or leased buildings across 2,126 square miles totaling more than 4,600,000 square feet of space. These two sections also cooperate to maintain more than 132 buildings owned by the City of Colorado Springs and provide engineering services under the terms of an Intergovernmental Agreement approved annually by both City and County.
- Fleet Management Section: The Fleet Management Section maintains the County's vehicles and equipment fleet of more than 1,200 assets. The Fleet Management Section provides transportation and construction assets to 21 entities within El Paso County.
- Transportation: The Engineering and Operations divisions manage the County's transportation network consisting of more than 2,000 miles of paved and gravel roads and related right-of-way assets. The Engineering Division's Traffic Engineering, Design, Construction Management, Real Estate and Infrastructure Planning Sections handle all aspects of the transportation system from policy and standards to planning to contract project execution. The Operations Division's Highway Section handles in-house maintenance and repair of County roads and bridges, drainage, signs and signals, and right-of-way.
- Pikes Peak Region Office of Emergency Management (PPROEM): PPROEM is responsible for providing mitigation, preparedness, response, recovery, and coordination for large-scale emergencies and disasters, both natural and human-caused, to residents of El Paso County and City of Colorado Springs for the purpose of saving lives and preventing property damage.
- HAZMAT: The PPROEM HAZMAT team coordinates hazardous materials responses within the unincorporated portions of El Paso County, as the Board of County Commissioners Designated Emergency Response Authority (DERA) for El Paso County, in support of the local fire districts and small municipalities. It conducts and coordinate training for the El Paso County Hazardous Materials Team, coordinates hazardous materials responses with other local, state, and regional fire districts and law enforcement agencies in response to requests for assistance, participates in the Local Emergency Planning Committee (LEPC) for El Paso County– a function which is required by SARA Title III Federal Regulations. The regulations

implementing SARA Title III are codified in Title 40 of the Code of Federal Regulations, parts 350 through 372. In addition, the HAZMAT team:

- Maintains and distribute Tier II data as required by SARA Title III Regulations.
- Conducts site visits of county Tier II facilities and local industry to plan for safer coordinated response to incidents in those facilities.
- Coordinates El Paso County hazardous materials team participation with local, state, and federal agencies during training exercises.
- Conducts training with local fire districts and other agencies to enhance initial hazmat response capabilities.
- Operates as the PPROEM liaisons to Incident Command Posts, Emergency Operations Centers, and Department Operations Centers during emergencies.
- Staffs the PPROEM ECC as assigned.
- Participates in PPROEM planning, exercises, and training, as assigned.

- Security: The mission of Security and Parking Operations is to protect El Paso County assets (facilities, people, information, and physical assets) and provide professional parking services. To accomplish this mission and to provide the most efficient and effective services possible, the section is divided into three major units: Security officers protect people (elected officials, employees, and visitors to County buildings) and County assets (building infrastructure, equipment, vehicles, information, and other property). Officers also provide escorts, handle access control screening, conduct mail inspections, and perform a variety of patrol assignments. Security analysts conduct risk assessments, evaluate physical protection systems, inspect security and fire systems, conduct investigations, manage the emergency response and evacuation plan, manage the mechanical lock and electronic access control systems, and provide security training.
- The Special Communications Unit (SCU): The SCU provides radio operators for all forms of communication, as well as providing supplemental communications to the Sheriff's Office. These supplemental communications include low band, UHF, VHF, HF, digital communications, and repeater capabilities to First Responders, the Incident Command Post, and the Emergency Operations Center (EOC). SCU members staff the EOC, Incident Command Post, and other locations as
required. They also provide field communications for the El Paso County Search and Rescue team.
- Radio Amateur Civil Emergency Service (RACES) Unit: The RACES Unit is a component of the SCU. RACES is administered by FEMA and is part of the Amateur Radio Service that provide communication for civil-preparedness purposes only during periods of local, regional, or national civil emergencies. During times of federal emergencies, RACES members are the only amateur radio operators allowed to transmit over federally-specified frequencies. Only volunteers who hold a valid FCC license are able to join the RACES unit.

El Paso County Sheriff's Office, Emergency Services Department

This Division is responsible for coordinating forest and prairie fire response, fire investigations in unincorporated county areas, and search and rescue. In fulfillment of statutory responsibilities, the Division oversees the El Paso County Search and Rescue, the El Paso County Wildland Fire Team,

and the Sheriff's Fire Investigation's Team. These Teams are supported by over 150 volunteer responders who are dedicated professionals in their career fields. The teams and organizations that support the Emergency Services Division include:

- El Paso County Wildland Fire Management (EPSOWF): El Paso County Wildland Fire Management is a combination of career and volunteer members comprised of residents from El Paso County and the surrounding areas dedicated to saving lives and property that are affected by fire. The crew members come from all walks of life to assist in these endeavors. Members are highly trained, hard-working individuals that give their time in protecting the residents of El Paso County. The fire season in Colorado is year around and Wildland Fire Management members are available 24-7 to provide suppression efforts. Additionally, members provide mitigation and hazard fuels removal, prescription burns and public education. During major weather events team members have been called upon to assist El Paso County OEM with search and rescue and clearing roads of debris. The Wildland Fire Crew has responded to and assisted in suppressing wildland fires in El Paso County and surrounding areas for 26 years. These fires are as small as camp fires and small lightning strike fires to major wildland fires including the Hayman fire in 2002, the Waldo Canyon fire in 2012, the Black Forest Fire in 2013, and the 117 Fire in 2018. Wildland Fire Management assists all area cooperators including the U.S. Forest Service, the Bureau of Land Management, the Colorado State Forest Service and the Department of Defense.
- El Paso County Search & Rescue: The El Paso County Search & Rescue is a mountain search and rescue unit dedicated to saving lives through search, rescue, and mountain safety education. The team is composed solely of volunteers and is available upon request for help with mountain search and rescue anywhere in Colorado under the authority of the local county sheriff or in other states and countries under local authority. The team is able to search for downed aircraft and lost people by tracing the location of the aircrafts emergency location transmitter, as well as personal locator beacons. There is never a charge for search and rescue services and they are on call year round 24 hours a day. The members of the team are unpaid volunteers selected from the community.

El Paso County Public Health Department

The mission of the El Paso County Public Health Department is to promote and protect public health and environmental quality in the community through people, prevention, and partnerships. The vision of the Department is to provide the highest level of customer service and to be recognized as the healthiest county in the nation. The Public Health Department is dedicated to assuring that the residents of El Paso County receive quality, efficient, effective public health services.

Local Emergency Planning Committee (LEPC)

The Emergency Planning and Community Right to Know Act of 1986 called for the establishment of local emergency planning committees. The mission of the El Paso County local emergency planning committee is to promote safety in the community through hazardous materials awareness, planning efforts, encouragement of cooperative partnerships between the community and industry, and development of educational and training programs relative to hazardous materials and emergency preparations for County Emergency Responders, Industry, and the Community.

The El Paso County Local Emergency Planning Committee has two goals: (1) to improve emergency response capabilities by maintaining accurate and pertinent information about hazardous materials in the community so emergency responders can safely respond to accidents; and (2) to promote community awareness. In addition to its formal duties, the Committee can provide the community information about hazard substance emergency planning, and health and environmental risks.

Medical Reserve Corps of El Paso County

Medical Reserve Corps of El Paso County was officially chartered in January 2004 through a Department of Health and Human Services grant. The Medical Reserve Corps brings together persons and agencies involved in emergency planning and response to share and coordinate information and plans in a manner most beneficial to the region.

The Corps works with the city and county offices of emergency management, regional Citizen Corps,' health departments, and state agencies to coordinate and integrate, as appropriate, into existing, broader emergency and response plans. Through these efforts, the Corps brings a greater predictability to volunteer resource capability and strengthens the medical response in disaster and public health areas of need.

26.3 FISCAL CAPABILITIES

This section summarizes fiscal capabilities in the Pikes Peak Region. Further information is provided in the jurisdictional annexes in Volume 2. Page 549 of the 2023 Colorado State Enhanced Hazard Mitigation Plan features a section on mitigation-related funding administered by state and federal agencies that eligible jurisdictions can use to fund mitigation actions.

26.3.1 STATE AND FEDERAL

Federal Hazard Mitigation Funding Opportunities

As noted on the FEMA hazard mitigation assistance website (FEMA n.d.), FEMA administers five programs that provide funding for eligible mitigation planning and projects that reduces disaster losses and protect life and property from future disaster damages. The programs are the Hazard Mitigation Grant Program (HMGP), and the HMGP Post Fire Grant, the Flood Mitigation Assistance (FMA) Program, and the Pre-Disaster Mitigation (PDM) Program. Table 26-1 provides an overview of program funding eligibility and cost share.

HMGP assists in implementing long-term hazard mitigation planning and projects following a Presidential major disaster declaration. PDM provides funds for hazard mitigation planning and projects on an annual basis. FMA provides funds for planning and projects to reduce or eliminate risk of flood damage to buildings that are insured under the National Flood Insurance Program (NFIP) on an annual basis.

Table 26-1. Federal Emergency Management Agency (FEMA) Hazard Mitigation Assistance (HMA) Grant Cost Share Requirements

Programs	Cost Share (Percent of Federal / Non-Federal Share)
Hazard Mitigation Grant Program (HMGP)	75 / 25
Hazard Mitigation Grant Program (HMGP) Post Fire	75 / 25
Flood Mitigation Assistance (FMA) (community flood mitigation, project scoping, individual mitigation of insured properties, and planning grants)	75 / 25
Flood Mitigation Assistance (FMA)—repetitive loss property(2)	90 / 10
Flood Mitigation Assistance (FMA)—severe repetitive loss property(2)	100 / 0
Pre-Disaster Mitigation (PDM)	75 / 25
Pre-Disaster Mitigation (PDM)—small and impoverished community	Up to 90 / 10

Source: FEMA 2023; FEMA 2023

Subapplicants should consult their State Hazard Mitigation Officer (SHMO) for the amount of percentage of HMGP subrecipient management cost funding their State has determined to be passed through subrecipients.

To be eligible for an increased federal cost share, a FEMA-approved state or tribal (standard or enhanced) mitigation plan that addressed repetitive loss properties must be in effect at the time of award, and the property is being submitted for consideration must be a repetitive loss property.

HMGP funding is generally 15 percent of the total amount of Federal assistance provided to a State, Territory, or federally recognized tribe following a major disaster declaration. Pre-Disaster Mitigation (PDM) and Flood Mitigation Assistance (FMA) funding depends on the amount congress appropriates each year for those programs.

Individual homeowners and business owners may not apply directly to FEMA. Eligible local governments may apply on their behalf (FEMA 2023).

Federal mitigation grant funding is available to all communities with a current hazard mitigation plan (this plan); however, most of these grants require a “local share” in the range of 10-25 percent of the total grant amount. The FEMA mitigation grant programs are described below.

Hazard Mitigation Grant Program

The Hazard Mitigation Grant Program (HMGP) is a post-disaster mitigation program. It is made available to states by FEMA after each Federal disaster declaration. The HMGP can provide up to 75 percent funding for hazard mitigation measures. The HMGP can be used to fund cost-effective projects that will protect public or private property in an area covered by a federal disaster declaration or that will reduce the likely damage from future disasters. Examples of projects include acquisition and demolition of structures in hazard-prone areas, flood-proofing or elevation to reduce future damage, minor structural improvements, and development of state or local standards. Projects must fit into an overall mitigation strategy for the area identified as part of a local planning effort. All applicants must have a FEMA-approved hazard mitigation plan (this plan).

Applicants who are eligible for the HMGP are state and local governments, certain nonprofit organizations or institutions that perform essential government services, and Indian tribes and

authorized tribal organizations. Individuals or homeowners cannot apply directly for the HMGP; a local government must apply on their behalf. Applications are submitted to DHSEM and placed in rank order for available funding and submitted to FEMA for final approval. Eligible projects not selected for funding are placed in an inactive status and may be considered as additional HMGP funding becomes available.

Flood Mitigation Assistance Program

The Flood Mitigation Assistance (FMA) program combines the previous Repetitive Flood Claims and Severe Repetitive Loss Grants into one grant program. The FMA provides funding to assist states and communities in implementing measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the NFIP. The FMA is funded annually; no federal disaster declaration is required. Only NFIP insured homes and businesses are eligible for mitigation in this program. Funding for FMA is very limited and, as with the HMGP, individuals cannot apply directly for the program. Applications must come from local governments or other eligible organizations. The federal cost share for an FMA project is at least 75 percent. At most, 25 percent of the total eligible costs must be provided by a non-federal source. Of this 25 percent, no more than half can be provided as in-kind contributions from third parties. At minimum, a FEMA-approved local flood mitigation plan is required before a project can be approved. The FMA funds are distributed from FEMA to the state.

Rehabilitation of High Hazard Potential Dams Program

The Rehabilitation of High Hazard Potential Dams (HHPD) grant program provides technical, planning, design, and construction assistance for eligible rehabilitation activities that reduce dam risk and increase community preparedness.

The HHPD Grant Program will provide assistance for technical, planning, design, and construction activities toward:

- Repair
- Removal
- Structural/nonstructural rehabilitation of eligible high hazard potential dams

Extraordinary Circumstances

For Flood Mitigation Assistance (FMA) project subawards, the FEMA Region may apply extraordinary circumstances when justification is provided and with concurrence from FEMA Headquarters (Risk Reduction and Risk Analysis Divisions) prior to granting an exception. If this exception is granted, a local mitigation plan must be approved by FEMA within 12 months of the award of the project subaward to that community.

For HMGP and FMA, extraordinary circumstances exist when a determination is made by the Applicant and FEMA that the proposed project is consistent with the priorities and strategies identified in the State (Standard or Enhanced) Mitigation Plan and that the jurisdiction meets at least one of the criteria below. If the jurisdiction does not meet at least one of these criteria, the Region must coordinate with FEMA Headquarters (Risk Reduction and Risk Analysis Divisions) for

HMGP; however, for FMA the Region must coordinate and seek concurrence prior to granting an exception:

- The jurisdiction meets the small, impoverished community criteria (see Part VIII, B.2).
- The jurisdiction has been determined to have had insufficient capacity due to lack of available funding, staffing, or other necessary expertise to satisfy the mitigation planning requirement prior to the current disaster or application deadline.
- The jurisdiction has been determined to have been at low risk from hazards because of low frequency of occurrence or minimal damage from previous occurrences as a result of sparse development.
- The jurisdiction experienced significant disruption from a declared disaster or another event that impacts its ability to complete the mitigation planning process prior to award or final approval of a project award.
- The jurisdiction does not have a mitigation plan for reasons beyond the control of the State, federally-recognized tribe, or local community, such as Disaster Relief Fund restrictions that delay FEMA from granting a subaward prior to the expiration of the local or Tribal Mitigation Plan.

For HMGP and FMA, the Applicant must provide written justification that identifies the specific criteria or circumstance listed above, explains why there is no longer an impediment to satisfying the mitigation planning requirement and identifies the specific actions or circumstances that eliminated the deficiency.

When an HMGP project funding is awarded under extraordinary circumstances, the Recipient shall acknowledge in writing to the Regional Administrator that a plan will be completed within 12 months of the subaward. The Recipient must provide a work plan for completing the local or Tribal Mitigation Plan, including milestones and a timetable, to ensure that the jurisdiction will complete the plan in the required time. This requirement shall be incorporated into the award (both the planning and project subaward agreements if a planning subaward is also awarded).

Federal and State Disaster and Recovery Assistance Programs

Following a disaster, various types of assistance may be made available by local, state, and federal governments. The types and levels of disaster assistance depend on the severity of the damage and the declarations that result from the disaster event. Among the general types of assistance that may be provided should the President of the United States declare the event a major disaster includes the following:

Individual Assistance

Individual Assistance (IA) provides help for homeowners, renters, businesses, and some nonprofit entities after disasters occur. This program is largely funded by the U.S. Small Business Administration. For homeowners and renters, those who suffered uninsured or underinsured losses may be eligible for a Home Disaster Loan to repair or replace damaged real estate or personal property. Renters are eligible for loans to cover personal property losses. Individuals may borrow up to $200,000 to repair or replace real estate, $40,000 to cover losses to personal property, and an additional 20 percent for mitigation. For businesses, loans may be made to repair or replace

disaster damages to property owned by the business, including real estate, machinery and equipment, inventory, and supplies. Businesses of any size are eligible. Nonprofit organizations such as charities, churches, private universities, etc. are also eligible. An Economic Injury Disaster Loan provides necessary working capital until normal operations resume after a physical disaster. These loans are restricted, by law, to small businesses only.

Public Assistance

Public Assistance (PA) provides cost reimbursement aid to local governments (state, county, local, municipal authorities, and school districts) and certain nonprofit agencies that were involved in disaster response and recovery programs or that suffered loss or damage to facilities or property used to deliver government-like services. This program is largely funded by FEMA with both local and state matching contributions required.

Small Business Administration Loans

The Small Business Administration (SBA) provides low-interest disaster loans to homeowners, renters, business of all sizes, and most private nonprofit organizations. SBA disaster loans can be used to repair or replace the following items damaged or destroyed in a declared disaster: real estate, personal property, machinery and equipment, and inventory and business assets.

Homeowners may apply for up to $200,000 to replace or repair their primary residence. Renters and homeowners may borrow up to $40,000 to replace or repair personal property (such as clothing, furniture, cars, and appliances) damaged or destroyed in a disaster. Physical disaster loans of up to $2 million are available to qualified businesses or most private nonprofit organizations.

Department of Homeland Security Grant Program

The Homeland Security Grant Program (HSGP) plays an important role in the implementation of the National Preparedness System by supporting the building, sustainment, and delivery of core capabilities essential to achieving the National Preparedness Goal of a secure and resilient nation. The program supports efforts to build and sustain core capabilities across the Prevention, Protection, Mitigation, Response, and Recovery mission areas. This includes two priorities: building and sustaining law enforcement terrorism prevention capabilities and maturation and enhancement of state and major urban area fusion centers. HSGP is composed of three interconnected grant programs including the State Homeland Security Program (SHSP), Urban Areas Security Initiative (UASI), and the Operation Stonegarden (OPSG). Together, these grant programs fund a range of preparedness activities, including planning, organization, equipment purchase, training, exercises, and management and administration.

Community Development Block Grants

Community Development Block Grants (CDBG) are federal funds intended to provide low and moderate-income households with viable communities, including decent housing, as suitable living environment, and expanded economic opportunities. Eligible activities include community facilities and improvements, roads and infrastructure, housing rehabilitation and preservation, development

activities, public services, economic development, planning, and administration. Public improvements may include flood and drainage improvements. In limited instances, and during the times of "urgent need" (e.g., post-disaster) as defined by the CDBG National Objectives, CDBG funding may be used to acquire a property located in a floodplain that was severely damaged by a recent flood, demolish a structure severely damaged by an earthquake, or repair a public facility severely damaged by a hazard event.

U.S. Economic Development Administration

The U.S. Economic Development Administration (USEDA) is an agency of the U.S. Department of Commerce that supports regional economic development in communities around the country. It provides funding to support comprehensive planning and makes strategic investments that foster employment creation and attract private investment in economically distressed areas of the United States. Through its Public Works Program, USEDA invests in key public infrastructure, such as in traditional public works projects, including water and sewer systems improvements, expansion of port and harbor facilities, brownfields, multitenant manufacturing and other facilities, business and industrial parks, business incubator facilities, redevelopment technology-based facilities, telecommunications, and development facilities. Through its Economic Adjustment Program, USEDA administers its Revolving Loan Fund (RLF) Program, which supplies small businesses and entrepreneurs with the gap financing needed to start or expand their business, in areas that have experienced or are under threat of serious structural damage to the underlying economic base.

Federal Highway Administration Emergency Relief

Federal Highway Administration Emergency Relief (FHWA-ER) is a grant program that may be used for repair or reconstruction of Federal-aid highways and roads on Federal lands which have suffered serious damage as a result of a disaster.

Federal Transit Administration Emergency Relief

Federal Transit Administration Emergency Relief (FTA-E) is a grant program that funds capital projects to protect, repair, reconstruct, or replace equipment and facilities of public transportation systems. Administered by the Federal Transit Authority at the U.S. Department of Transportation and directly allocated to metropolitan transit authorities (MTA) and port authorities, this transportation-specific fund was created as an alternative to FEMA PA.

State Hazard Mitigation Funding Opportunities

Colorado Division of Homeland Security and Emergency Management (DHSEM) Natural Disaster Mitigation Enterprise

The National Disaster Mitigation Enterprise (NDME) was created by House Bill 21-1208. The enterprise imposes a fee on insurance companies that offer certain insurance policies or contracts. The enterprise uses the fee revenue to finance the natural disaster mitigation grant program and to provide local governments technical assistance on natural disaster mitigation. The enterprise awards natural disaster mitigation grants to assist in the implementation of resilience and natural disaster mitigation measures. It also helps entities that apply for federal grants requiring matching

funds. It is dedicated to assisting in the implementation of pre-disaster natural disaster mitigation measures.

Colorado Department of Transportation (CDOT) Materials and Geotechnical Services

The CDOT Materials and Geotechnical Services is responsible for addressing geohazard mitigation through the Transportation Asset Management Program. This program allocates a budget ranging from $9 million to $10 million annually for the management and mitigation of geological hazards that could impact transportation infrastructure. As well, the CDOT Resilience Program serves as a supplementary source of funding for mitigation efforts. However, it does not guarantee a dedicated minimum amount specifically for geologic hazard mitigation. This funding approach allows for CDOT to adapt to varying needs and priorities and ensures that critical infrastructure remains resilient against hazards.

Colorado Wildfire Mitigation Program (CWMP)

The CWMP offers the opportunity for homeowners to apply for grants that involve retrofitting or enhancing their homes and other structures on their property. These grants support the implementation of various strategies designed for structure hardening which increases the resilience of buildings against the risk of wildfires. Through investments in these improvements, homeowners can better protect their properties from the effects of wildfires and ensure a greater safety for themselves and their communities. The program emphasizes the importance of proactive measures for wildfire-prone areas and promotes a culture of preparedness and resilience.

State Disaster Emergency Fund

This program is designed to ensure that financial resources are available to address disaster emergencies. The State Disaster Emergency Fund is managed by the Division of Homeland Security and Emergency Management which provides essential support for immediate response and recovery efforts following various disasters. The governor holds the authority to allocate these funds as necessary and enabling state and local agencies to effectively manage the impacts of disasters. By maintaining a dedicated source of funding, the State Disaster Emergency Fund enhances the state's ability to respond to emergencies, in return safeguarding communities, and facilitating a more resilient recovery.

Forest Restoration and Wildfire Risk Mitigation Grant (FRWRM) program

The FRWRM program is an annually funded initiative by the state aimed at reducing wildfire fuels and conducting forest restoration projects. This program is established under HB22-1011 and provides financial support for activities designed to enhance forest health and mitigate wildfire risks. These activities include fuel reduction projects which help decrease the amount of combustible material in forests, and forest restoration efforts that promote ecological balance. Also, the FRWRM program supports capacity-building projects which enables communities and organizations to develop skills and resources needed for effective wildfire management. By investing in these critical areas, the FRWRM program plays a critical role in safeguarding the state’s forests and communities from wildfire threats.

Live Wildfire Ready Public Outreach Campaign

This initiative is funded through a one-time allocation from SB22-007 and is designed to educate the public about wildfire preparedness. It provides essential information on how to protect homes and communities from the threat of wildfires. The campaign provides resources and guidance to residents on how to take proactive steps. Examples include creating defensible spaces around their properties and understanding evacuation procedures. Although the initial funding is a one-time provision, there is potential for additional funding to expand these efforts. Continued support would ensure that the message of wildfire readiness reaches a broad audience and fosters a culture of preparedness and resilience throughout Colorado.

Water Revenue Bonds Program

This funding mechanism is designed to support a wide range of water-related infrastructure projects. It provides financial resources for the construction and maintenance of water and wastewater treatment plants, pump stations, and dams/reservoirs. It also covers the acquisition of water rights, the development of pipelines, and the implementation of hydro-electric projects. The program also funds the drilling of wells, installation of meters, and the creation of storage tanks. The Water Revenue Bonds Program ensures the sustainability and reliability of water systems in Colorado which are vital for public health, environmental protection, and economic development.

The Colorado Strategic Wildfire Action Program (COSWAP)

The Colorado Strategic Wildfire Action Program (COSWAP) was created after the devastating 2020 fire season by the Colorado legislature through the bi-partisan supported SB21-258 in the summer of 2021. COSWAP is designed to move $17.5 million state stimulus dollars to start on-the-ground work on fuels reduction projects and increase Colorado's capacity to conduct critical forest restoration and wildfire mitigation work that will increase community resilience and protect life, property, and infrastructure.

Colorado Healthy Rivers Fund

The Colorado Healthy Rivers Fund provides funds for projects that promote improvements and protection of the watersheds including flood protection and channel stability. This funding source is managed by the Colorado Water Conservation Board (CWCB) and collaborates with the Water Quality Control Commission. This program provides grants to local watershed organizations to support efforts in providing clean water, protecting habitats, and improving recreation throughout the Colorado.

Colorado Watershed Restoration Protection Program

This program is managed by the Colorado Water Conservation Board (CWCB). It supports watershed planning and the implementation of projects designed to restore and protect watersheds. The CWCB collaborates with other organizations to carry out multi-objective projects aimed at reducing flood hazards, stabilizing stream channels, providing habitat, reducing erosion, and protecting the ecological processes that connect land to water.

Fish and Wildlife Resources Fund

This funding source supports river restoration feasibility studies and construction projects aimed at mitigating or improving the environmental impacts of existing water facilities. It is dedicated to enhancing Colorado's aquatic ecosystems by financing projects that address and/or reduce the negative impacts of water infrastructure on the environment. The Colorado Water Conservation Board (CWCB) manages this funding source.

Watershed Restoration Grants

This grant program provides funding for watershed and stream restoration, as well as flood mitigation projects throughout Colorado. These grants were initiated in response to the 2012 High Park and Waldo Canyon Fires to help restore affected areas and mitigate future flood risks. This grant program is managed by the Colorado Water Conservation Board (CWBC).

Wildfire Risk Reduction Grant Program (WRRG)

This program provides funding to reduce the risk of wildfire in areas where development and forested lands overlap known as the wildland-urban interface (WUI). This program supports projects that aim to protect people, property, and infrastructure by mitigating wildfire hazards in these high-risk areas and is managed by the Colorado State Forest Service.

Water Project Loan Program

This program provides funding for water projects, including the construction and rehabilitation of dams, pipelines, ditches, wells, and hydroelectric projects. It is managed by the Colorado Water Conservation Board (CWCB) and offers low-interest loans to support the development and maintenance of essential water infrastructure.

Drought Mitigation Planning Grant Program

This program funds water conservation planning, drought mitigation planning, and project implementation for these activities. It is consolidated with the current Colorado Water Plan Grant program (Conservation and Land Use Planning category). This program is managed by the Colorado Water Conservation Board (CWCB).

Water Efficiency Grant Program

This program is to aid in the goals of the Colorado Water Conservation Plans. It promotes the benefits of water resource conservation for education and outreach aimed at demonstrating the benefits of water efficiency. This program is consolidated with the current Colorado Water Plan Grant program (Conservation and Land Use Planning category).

Water Supply Reserve Program

This program provides grants to assist Colorado water users in addressing their critical water supply issues. It is managed by the Colorado Water Conservation Board (CWCB) and supports various water projects including technical assistance, feasibility studies, and infrastructure projects.

Agriculture Emergency Drought Response Fund

This funding source provides up to $1 million annually in loans or grants for emergency drought-related water projects to agricultural water users. It helps to ensures that farmers and agricultural organizations have the necessary resources to manage water shortages during drought conditions. The Colorado Water Conservation Board (CWCB) manages this funding source.

Colorado Flood and Drought Response Fund

This funding source provides financial resources for flood and drought preparedness as well as response and recovery activities following hazard events and disasters. It ensures that the state can swiftly address and mitigate the impacts of floods and droughts to enhance community resilience. The Colorado Water Conservation Board (CWCB) is responsible for managing this funding source.

Severance Tax Multi - Objective Watershed Protection

The account exists primarily to provide grants for regional water resource planning studies and associated demonstration projects. This grant is consolidated with the current Colorado Water Plan Grant program (Watershed Health and Recreation category).

Drinking Water Revolving Fund

This funding source provides low-interest loans to address drinking water treatment system needs. It is managed by the Department of Local Affairs (DOLA), the Colorado Department of Public Health and Environment (CDPHE), and the Colorado Water Resources and Power Development Authority (CWRPDA) to support the development and maintenance of essential water infrastructure.

Water Pollution Control Revolving Fund

This funding source provides low-interest loans to support public wastewater treatment system needs and watershed nonpoint source control projects. This program is managed by the Department of Local Affairs (DOLA), the Colorado Department of Public Health and Environment (CDPHE), and the Colorado Water Resources and Power Development Authority (CWRPDA). It ensures the development and maintenance of essential water infrastructure by offering affordable financing options to help protect public health and the environment through improved water quality management.

Revolving Loan Fund

This initiative is managed by the Department of Local Affairs (DOLA), the Colorado Department of Public Health and Environment (CDPHE), and the Colorado Water Resources and Power Development Authority (CWRPDA). This fund provides low-interest loans to finance the design and construction of water, wastewater, and stormwater infrastructure projects across Colorado. This fund supports the development and maintenance of essential water systems, ensuring public health and environmental protection, by offering affordable financing options.

Energy/Mineral Impact Assistance Fund (EIAF) Grants

This grant program funds projects that include water and sewer improvements, road improvements, construction improvements to public facilities, fire protection buildings, and local government planning. The Department of Local Affairs (DOLA) manages EIAF grants. This program assists political subdivisions that are socially and economically impacted by development or energy conversion of minerals and mineral fuels. DOLA's administration of this program ensures that funds are used to support sustainable community development and assist impacted communities.

Microgrids for Community Resilience Program

This program provides grants to rural communities in Colorado to bolster their grid resiliency and reduce impacts from extreme weather events. This program was established 2022 legislative session and launched in February of 2023 and run through 2026. Department of Local Affairs (DOLA) is partnering with CEO to seek additional funding from the Infrastructure Investment and Jobs Act (IIJA) through the Department of Energy to expand this program for up to 10 years.

Strong Communities Program (HB22-1304)

This program incentivizes infill development and environmentally sustainable development patterns by avoiding sprawl into hazardous areas. A co-benefit of this program's initiatives is air pollution reduction by incentivizing sustainable development patterns to put people near transit and jobs. This program was established in 2022 legislative session and launched in January of 2023 to run through 2026.

Disaster Resilience Rebuilding Program

This grant and loan program established by the 2022 legislative session (SB22-206) is focused primarily on the resilient rebuilding of homes impacted by disasters from 2018 and on. This includes energy efficiency and fire and wind mitigation. (Note: pending funding availability, the DRR program, could expand to include local government and neighborhood recovery and economic recovery). New program as of the 2022 legislative session has limited funding sources that could have a broader impact for state mitigation if ongoing funding source are to be identified.

Watershed Resilience Pilot Program

This comprehensive program is aimed at promoting watershed restoration, risk mitigation, and community and economic development. It adopts a holistic approach by leveraging the resources of a diverse coalition of partners to achieve the goals. The program ensures that efforts are coordinated and effective in addressing multifaceted challenges faced by watersheds by fostering collaboration among various stakeholders. It not only focuses on restoring and protecting natural water systems but also emphasizes the importance of building a more resilient community and supporting local economy.

Infrastructure Investment and Jobs Act (IIJA) (IIJA) Local Match Program (LOMA)

The LOMA was established by SB22-215 as a collaborative effort between the Department of Local Affairs (DOLA), the Office of Economic Development and International Trade (OEDIT), and the

Governor's Office. This program is designed to assist local governments in meeting their non-federal match requirements when applying directly to the federal government for Infrastructure Investment and Jobs Act (IIJA) programs, including the Flood Mitigation Assistance (FMA) program. LOMA was introduced during the 2022 legislative session and provides financial support to local governments enabling them to leverage federal funds for important infrastructure projects. However, the program has limited funding available which will be distributed until the funds are exhausted unless additional allocations are made in future legislative sessions. This initiative emphasizes Colorado's commitment to enhancing local infrastructure and resilience through financial assistance.

26.3.2 COUNTY AND LOCAL

El Paso County and individual jurisdictions are (legally, not necessarily practically) able to fund mitigation projects though existing local budgets, local appropriations (including referendums and bonding), and a variety of federal and state loan and grant programs. Many jurisdictions noted throughout the planning process that they are faced with increasing fiscal constraints, including decreasing revenues, budget constraints, and tax caps. In an effort to overcome these fiscal challenges, jurisdictions have continued to leverage the sharing of resources and combining available funding with grants and other sources and note that plans and interjurisdictional cooperation are beneficial in obtaining grants.

27. MITIGATION STRATEGY

This chapter presents mitigation strategies for the Pikes Peak Region to reduce potential vulnerability and losses identified as concerns in the risk assessment portion of this plan. The Hazard Mitigation Planning Team reviewed the risk assessment and capability assessment to identify and develop these mitigation strategies.

Hazard mitigation reduces the potential impacts of, and costs associated with, emergency and disaster-related events. Mitigation actions address a range of impacts, including impacts on the population, property, the economy, and the environment. They can include activities such as revisions to land-use planning, training and education, and structural and nonstructural safety measures.

27.1 PAST MITIGATION ACCOMPLISHMENTS

The Region, through previous and ongoing hazard mitigation activities, has demonstrated that it is proactive in protecting its physical assets and residents against losses from hazards. Examples of previous and ongoing actions and projects include the following:

- The Region facilitated the development of the original Regional Hazard Mitigation Plan (HMP). The current planning process represents the regulatory five-year plan update process, which includes the participation of eight jurisdictions, along with key County and regional stakeholders.
- All municipalities participating in this HMP update participate in the National Flood Insurance Program (NFIP), which requires the adoption of FEMA floodplain mapping and certain minimum standards for building within the floodplain.
- El Paso County hired a Fire Safety and Wildfire Mitigation Program Manager
- The County along with Lake, Chafee, and Park Counties participated in a Regional Preparedness Guide
- City of Manitou Springs offered a free chipper service program to its residents
- Ramah continues to address drainage issues with the assistance in funding from a Community Development Block Grant (CDBG).

27.2 MITIGATION GOALS AND OBJECTIVES

This section describes the process of updating hazard mitigation goals and objectives for reducing or avoiding long-term vulnerabilities to identified hazards. For the purposes of this plan, goals and objectives are defined as follows:

- Goals are general guidelines that explain what is to be achieved. They are usually broad, long-term, policy-type statements and represent global visions. Goals help define the benefits that the plan is trying to achieve. The success of the plan, once implemented,

should be measured by the degree to which its goals have been met (that is, by the actual benefits in terms of hazard mitigation).

- **Objectives** are short-term aims that form a strategy or course of action to meet a goal. Objectives are stand-alone measurements of the effectiveness of a mitigation action. The objectives also are used to help establish priorities. Broadly defined mitigation objectives were eliminated from the updated strategy unless accompanied by discrete actions.

Policy Guide C3-a: The plan must include goals to reduce the risk of the identified hazards. The goals must be consistent with the hazards identified in the plan. Goals may be presented as general statements applying to more than one hazard, or they may be itemized to each of the identified hazards.

Goals are broad, long-term policy and vision statements that explain what is to be achieved by implementing the mitigation strategy.

The Hazard Mitigation Planning Team reviewed the 2020 goals and objectives and made revisions for the 2026 plan update based on the following considerations:

- Hazard events and losses since the 2020 plan
- The updated hazard profiles and risk assessment
- The goals and objectives established in the 2023 Colorado State Hazard Mitigation Plan
- The Planning Partnership's interests in integrating this plan with other planning mechanisms
- Direct input from the Hazard Mitigation Planning Team, stakeholders, and the public on how the County and jurisdictions need to move forward to best manage their hazard risk
- Discussions and research on existing authorities, policies, programs, resources
- Support for mitigation through the protection of natural systems

As a result of this review process, the goals and objectives for the 2026 update were updated to the following:

- Goal 1—Reduce Loss of Life and Injury
  - **Objective 1.1:** Expand existing emergency notification systems to ensure reliable, diverse and redundant public communication of potential hazards
  - **Objective 1.2:** Review and assess region, county and local plans for current best practices, standards, and appropriate integration of risk reduction elements resulting in a more resilient community
  - **Objective 1.3:** Assess and improve hazard-specific mapping and alert and warning systems to provide accurate and accessible information to ensure that residents and visitors can respond appropriately
- Goal 2—Reduce Property and Economic Loss
  - **Objective 2.1:** Proactively protect and reduce vulnerability of critical facilities, infrastructure, community lifelines, the environment, and other key community assets from hazards
  - **Objective 2.2:** Explore tools and strategies that make public and private properties more resilient and support economic development in the region

  - **Objective 2.3:** Identify and address proposed Federal, State and local legislation that could impact emergency services

- Goal 3—Promote Risk and Threat Awareness within the Pikes Peak Region
  - **Objective 3.1:** Promote risk awareness and mitigation strategies through effective community preparedness outreach programs
  - **Objective 3.2:** Ensure that businesses and residents are informed about resources specifically available before, during, and after a disaster
- Goal 4—Incorporate Hazard Mitigation into Future Plans and Policies
  - **Objective 4.1:** Evaluate and integrate mitigation priorities supporting watersheds, storm water management and natural resources to protect life, property and the environment
  - **Objective 4.2:** Expand coordination with federal, state, local governments, and regional stakeholders to identify and leverage mitigation opportunities
- Goal 5—Continuity of Governance
  - **Objective 5.1:** Identify needs and leverage available funding streams to improve public safety, response, and recovery programs
  - **Objective 5.2:** Expand the Pikes Peak Regional partnerships with local businesses, Chambers of Commerce, and Non-Governmental Organizations (NGOs) to provide critical support and services to residents

27.3 MITIGATION STRATEGY DEVELOPMENT AND UPDATE

27.3.1 UPDATE OF LOCAL JURISDICTION MITIGATION STRATEGIES

Review of Previous Actions

To evaluate progress on local mitigation actions, each planning partner was provided with a Mitigation Action Plan Review Worksheet, pre-populated with the actions identified for their jurisdiction in the prior (2020) plan. The Planning Partners were asked to indicate the status of each action and provide comments to quantify the extent of progress and provide reasons for the level of progress or why actions were discontinued. This information is included in the jurisdictional annexes.

Mitigation actions identified as “Complete” or “Discontinued” have been removed from the Planning Partners’ updated mitigation strategies. Actions identified as “No Progress/Unknown” or “In Progress/Not Yet Complete” have been carried forward in their local updated mitigation strategies. Planning partners were asked to provide further details on these projects to help better define the projects, identify benefits and costs, and improve implementation.

Certain continuous or ongoing actions (Ongoing Capabilities) from the previous plan that represent programs that are now fully integrated into the normal operational and administrative framework of the community are identified in the capabilities assessment of each annex and removed from the updated mitigation strategy (marked as “Discontinued”).

Identifying New Actions

At the kickoff and during subsequent local level planning meetings, all participating jurisdictions were further surveyed to identify completed mitigation actions, in progress actions, or ongoing capabilities, as well as potential new actions. Communities also were made aware of potential new mitigation actions as such actions became evident during the plan update process (e.g., through the capability assessment, risk assessment, or the public and stakeholder outreach process).

Developing the Overall Strategy

Beginning in April 2025, members of the Hazard Mitigation Planning Team and contract consultants worked directly with each jurisdiction (by phone, email, or virtual meetings) to update their annex with mitigation strategies that focus on well-defined, implementable projects that meet the definition or characteristics of mitigation. Mitigation actions were selected with a careful consideration of benefits (risk reduction, losses avoided), costs, and possible funding sources (including mitigation grant programs).

Addressing Known Vulnerabilities

To help support the selection of an appropriate risk-based mitigation strategy, each annex includes a summary of hazard vulnerabilities. These were identified during the plan update process by planning partner representatives, through review of available plans and reports, or through the hazard profiling and risk assessment process.

A mitigation strategy workshop was conducted on July 15, 2025, for all participating jurisdictions to support the development of focused problem statements based on the impacts of hazards in the County and their communities. These problem statements provide a detailed description of a problem area, including its impacts on the jurisdiction; past damage; loss of service; etc. An effort was made to include the street address of the problem location, adjacent streets, water bodies, and well-known structures as well as a brief description of existing conditions (topography, terrain, hydrology) of the site. These problem statements form a bridge between the hazard risk assessment, which quantifies impacts on each community, and the development of actionable mitigation strategies.

Incorporating a Range of Action Types

Policy Guide: C4-a. The mitigation strategy must include an analysis of a comprehensive range of actions or projects that the participants considered to specifically address vulnerabilities identified in the risk assessment.

Actions considered must emphasize reducing risk to existing buildings, structures and infrastructure, as well as limiting risk to new development and redevelopment.

The range of actions considered should include mitigation actions that benefit underserved communities and socially vulnerable populations.

It is important for all actions considered to be documented, be as specific as possible, and be clearly linked to the vulnerabilities and impacts identified in the risk assessment. This includes actions for alleviating data deficiencies or building up capabilities related to mitigation

implementation. Documenting all ideas provides a record of what actions were considered, and why. Additionally, this creates a list of actions that can be reconsidered as conditions change.

Analyzing a comprehensive range means considering mitigation alternatives spanning all types of solutions. These may include local plans and regulations, structure and infrastructure projects, natural systems protection, and education and awareness programs. This analysis helps a jurisdiction select actions based on its own capabilities, as well as the social, technical and economic feasibility of the action.

A mitigation action is a measure, project, plan or activity proposed to reduce current and future vulnerabilities described in the risk assessment.

Concerted efforts were made to ensure that Planning Partners develop updated mitigation strategies that cover the range of mitigation action types described in recent FEMA planning guidance (FEMA "Local Mitigation Planning Handbook" March 2013):

- Local 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 Project—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 community lifelines and other critical facilities. This type of action also involves projects to construct structures to reduce the impact of hazards.
- Natural Systems Protection—These are actions that minimize damage and losses to natural systems and preserve or restore their functions.
- Education and Awareness Programs—These are actions to inform and educate residents, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as the National Flood Insurance Program, Community Rating System, StormReady (NOAA), and Firewise (NFPA).
- Efforts were also made to develop mitigation strategies that cover the range of mitigation action types described in recent CRS guidance (FEMA 2018):
- Preventative Measures—Government administrative or regulatory actions or processes that influence the way land and buildings are developed and built. Examples include planning and zoning, local floodplain laws, capital improvement programs, open space preservation, and stormwater management regulations.
- Property Protection—These actions include public activities to reduce hazard losses or actions that involve modification of existing buildings or structures to protect them from a hazard or removal of the structures from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.
- Public Information—Actions to inform and educate residents, elected officials, and property owners about hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and educational programs for school-age children and adults.
- Natural Resource Protection—Actions that minimize hazard loss and also preserve or restore the functions of natural systems. These actions include sediment and erosion control,

stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.

- **Structural Flood Control Projects**—Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, setback levees, floodwalls, retaining walls, and safe rooms.
- **Emergency Services**—Actions that protect people and property during and immediately following a disaster or hazard event. Services include warning systems, emergency response services, and the protection of essential facilities

Protecting Critical Facilities

Planning partner mitigation actions that address vulnerable critical facilities have been proposed in consideration of protection against worst-case scenarios. For projects funded through federal mitigation programs, the level of protection may be influenced by cost-effectiveness as determined through a formal benefit-cost analysis. For locally self-funded projects, local jurisdiction discretion must be recognized. It must be recognized that the County and jurisdictions have limited authority with regard to mitigation at any level of protection over privately owned critical facilities.

Accounting for Climate Change

As discussed in the hazard profiles in this Hazard Mitigation Plan (HMP), the long-term effects of climate change are anticipated to exacerbate the impacts of weather-related hazards (e.g., flood, severe winter storm, and wildfire). Communities are working to evaluate and recognize these long-term implications and to incorporate their mitigation strategies into planning and capital improvement updates.

27.3.2 UPDATE OF REGIONAL MITIGATION STRATEGY

The update of the Regional mitigation strategies included a review of progress on the actions/initiatives identified in the 2020 HMP using a process similar to that used to review local jurisdiction mitigation strategy progress. PPROEM reviewed each action and provided progress. For each action, relevant County representatives were asked to indicate the status of each action (*No Progress/Unknown*, *In Progress/Not Yet Complete*, *Ongoing*, *Completed*, or *Discontinued*), and provide review comments on each.

Projects/initiatives identified as "*Complete*," as well as those actions identified as *Discontinued*, have been removed from this plan update. Those actions the County has identified as *No Progress/Unknown*, *In Progress/Not Yet Complete,* or *Ongoing* have been carried forward in the County's updated mitigation strategy. Actions considered ongoing capabilities were marked as *Discontinued* and included in the plan as ongoing capabilities.

Throughout the course of the plan update process, additional regional and County-level mitigation actions were identified by the following processes:

- Review of the results and findings of the updated risk assessment
- Review of available regional and County plans, reports, and studies
- Direct input from County departments and other regional agencies

- Input received through the public and stakeholder outreach process

The long-term effects of climate change are anticipated to exacerbate the impacts of weather-related hazards including drought, flood, and severe winter storm. The County has included mitigation actions, including continuing and long-term planning and emergency management support, to address these long-term implications and potential impacts.

Various mitigation actions to address vulnerable critical facilities were proposed in consideration of worst-case scenarios. It is recognized, however, that in the case of projects being funded through federal mitigation programs, the level of protection can be influenced by cost-effectiveness, as determined through a formal benefit-cost analysis. In the case of "self-funded" projects, local government authority can affect the ability to implement. Further, the County has limited authority over privately-owned critical facility owners regarding mitigation at any level of protection.

27.3.3 MITIGATION BEST PRACTICES

Catalogs of hazard mitigation best practices were developed that present a broad range of alternatives to be considered for use in the mitigation strategies, in compliance with 44 Code of Federal Regulations (CFR) Section 201.6(c)(3)(ii). One catalog was developed for each hazard of concern evaluated in this plan. The catalogs present alternatives that are categorized in two ways:

- By whom would have responsibility for implementation:
  - Individuals—personal scale
  - Businesses—corporate scale
  - Government—government scale
- By what the alternatives would do:
  - Manipulate the hazard
  - Reduce vulnerability to the hazard
  - Reduce impacts from the hazard
  - Build local capacity to respond to or be prepared for the hazard

The alternatives presented include actions that will mitigate current risk from hazards and actions that will help reduce risk from changes in the impacts of these hazards resulting from climate change. The catalogs provide a baseline of mitigation alternatives that are backed by a planning process, are consistent with the established goals and objectives, and are within the capabilities of the Planning Partners to implement. Some of these actions may not be feasible based on the selection criteria identified for this plan. The purpose of the catalogs was to provide a list of what could be considered to reduce risk from hazards within the planning area. Appropriate hazard mitigation actions were selected from among the alternatives in the catalogs for inclusion in the mitigation strategies. Actions in the catalog that are not included for the partnership's mitigation strategy were not selected for one or more of the following reasons:

- The action is not feasible
- The action is already being implemented
- There is an apparently more cost-effective alternative

- The action does not have public or political support.

27.3.4 MITIGATION STRATEGY PRIORITIZATION

Section 201.c.3.iii of 44 Code of Federal Regulations (CFR) establishes how mitigation strategies are to be prioritized, implemented, and administered by local jurisdictions. For this plan update, each mitigation action was prioritized using suitable criteria for evaluating hazard mitigation. This method provided a systematic approach that considered the opportunities and constraints of implementing each mitigation action.

For the plan update there has been an effort to develop a more clearly defined and action-oriented mitigation strategy. The updated strategy includes actions that are seen by the community as the most effective approaches to advance local mitigation goals within local capabilities. Ultimately, PPROEM developed an action-oriented and achievable mitigation strategy.

Review of Costs and Benefits

Section 201.6.c.3iii of 44 CFR requires the prioritization of the mitigation strategy to emphasize a benefit/cost comparison of the proposed actions. The Core Planning Team chose a set of 14 evaluation criteria for this process:

4. Life Safety—How effective will the action be at protecting lives and preventing injuries? Will the proposed action adversely affect one segment of the population?
5. Property Protection—How significant will the action be at eliminating or reducing damage to structures and infrastructure?
6. Cost-Effectiveness—Are the costs to implement the action commensurate with the benefits achieved?
7. Feasibility—Is the action technically feasible?
8. Political—Is there overall public support for the action? Is there the political will to support it? Is the action at odds with development pressures?
9. Legal—Does the jurisdiction have the authority to implement the action?
10. Fiscal—Can the action be funded under existing program budgets (i.e., is this action currently budgeted for)? Or would it require a new budget authorization or funding from another source such as grants?
11. Environmental—What are the potential environmental impacts of the action? Will it comply with environmental regulations? Are there co-benefits of this action?
12. Social—Is the action socially acceptable?
13. Administrative—Does the jurisdiction have the personnel and administrative capabilities to implement the action and maintain it or will outside help be necessary? Does the scale and scope of the action align with the jurisdiction's capabilities?
14. Hazards of Concern—Will the action reduce the risk to more than one hazard?
15. Timeline—Can the action be implemented quickly? Can the action be completed in less than five years?
16. Champion—Is there an agency or department champion for the action?

17. Community Objectives—Does the action advance other local objectives, such as capital improvements, economic development, environmental quality, or open space preservation? Does it support the policies of other plans and programs?

Participating jurisdictions were asked to use these criteria to prioritize their identified mitigation actions. For each mitigation action, the jurisdictions assigned a numeric score for each of the 14 evaluation criteria:

- 4 = Definitely Yes
- 3 = Maybe Yes
- 2 = Unknown/Neutral
- 1 = Probably No
- 0 = Definitely No

An impact multiplier of two was applied to the first two criteria to emphasize the importance of benefit to life safety and property protection. The numerical results were totaled and then used by each jurisdiction to prioritize the action as low, medium, or high. Actions that had a numerical value of less than 35 were categorized as low priority; actions with numerical values between 35 and 49 were categorized as medium priority; and actions with numerical values above 49 were categorized as high priority. While this provided a consistent, systematic methodology to support the evaluation and prioritization of mitigation actions, jurisdictions may have additional considerations that could influence their overall prioritization of mitigation actions.

It is noted that jurisdictions may be carrying forward mitigation actions from prior mitigation strategies that were prioritized using a different, but not inherently contrary, approach. Jurisdictions carrying forward prior actions re-evaluated the priority, particularly because conditions that would affect the prioritization criteria may have changed over the past five years.

Benefit/Cost Review

Section 201.6.c.3iii of 44 CFR requires the prioritization of the mitigation strategy to emphasize a benefit/cost comparison of the proposed actions. For all actions identified in the local strategies, jurisdictions identified the associated costs and benefits as follows:

- Costs presented include the total project estimation. This can include administrative, construction (engineering, design, and permitting), and maintenance costs.
- Benefits are the savings from losses avoided through project implementation. These can include life safety, structure and infrastructure damage, loss of service or function, and economic and environmental damage and losses.

When possible, jurisdictions were asked to estimate dollar costs and associated benefits. Where estimates of costs and benefits were available, the ratings were defined follows:

- Low = <$10,000
- Medium = $10,000 to $100,000
- High = >$100,000

Where costs or benefits could not be quantified, jurisdictions evaluated cost-effectiveness using qualitative high, medium, and low ratings based on the definitions in Table 27-1.

Table 27-1. Scoring System for Prioritizing Mitigation Actions

Criteria	Definition
Costs	
High	Existing funding levels are not adequate to cover the costs of the proposed project, and implementation would require an increase in revenue through an alternative source (e.g., bonds, grants, and fee increases).
Medium	The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.
Low	The project could be funded under the existing budget. The project is part of or can be part of an existing, ongoing program.
Benefits	
High	Project will have an immediate impact on the reduction of risk exposure to life and property.
Medium	Project will have a long-term impact on the reduction of risk exposure to life and property or will provide an immediate reduction in the risk exposure to property.
Low	Long-term benefits of the project are difficult to quantify in the short-term.

For some of the actions identified, the Planning Partnership may seek financial assistance under FEMA's Hazard Mitigation Assistance (HMA) programs. These programs require detailed benefit/cost analysis as part of the application process. The benefit/cost review for the prioritization of actions in this update did not include the level of detail required by FEMA for project grant eligibility under HMA grant programs. These analyses will be performed when funding applications are prepared, using FEMA's Benefit-Cost Analysis model.

The Planning Partnership is committed to implementing mitigation strategies with benefits that exceed costs. For projects not seeking financial assistance from grant programs that require this sort of analysis, the Planning Partnership reserves the right to define benefits according to parameters that meet its needs and the goals and objectives of this plan.

28. PLAN MAINTENANCE AND IMPLEMENTATION PROCEDURES

This chapter details the formal process that will ensure that the hazard mitigation plan remains an active and relevant document and that the Planning Partnership maintains its eligibility for applicable funding sources. The plan maintenance process includes a schedule for monitoring and evaluating the plan annually and producing an updated plan every five years. In addition, this chapter describes how public participation will be integrated throughout the plan maintenance and implementation process. It explains how the mitigation strategies outlined in this plan update will be incorporated into existing planning mechanisms and programs, such as comprehensive land use planning processes, capital improvement planning, and building code enforcement and implementation.

28.1 HAZARD MITIGATION PLAN (HMP) COORDINATOR AND JURISDICTION POINTS OF CONTACT

The HMP Coordinator is assigned to manage the maintenance and update of the plan during its approval period (the five-year period between FEMA's approval of the plan and its expiration), with the following responsibilities:

- Convene the Planning Partnership
- Be the prime point of contact for questions regarding the plan and its implementation
- Coordinate the incorporation of additional information into the plan
- Manage the monitoring, evaluation, and updating responsibilities identified in this section

As of the date of this plan, primary and secondary mitigation planning representatives (points of contact) are identified in each jurisdictional annex in Volume 2. It will be the responsibility of each jurisdiction and its representatives to inform the HMP Coordinator of any changes in representation.

The HMP Coordinator for the 2026 Pikes Peak Regional Hazard Mitigation Plan:

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28.2 MAINTENANCE AND IMPLEMENTATION TASKS

The procedures for monitoring, evaluating, and updating the plan are provided below. The plan maintenance matrix shown in Table 28-1 provides a synopsis of responsibilities for plan monitoring, integration, evaluation, and update, which are discussed in further detail in the sections below.

Table 28-1. Plan Maintenance Matrix

Task	Approach	Timeline	Lead Responsibility	Support Responsibility
Monitoring	Planning partners to recommend update of mitigation strategies, progress toward implementation of actions, identification of new actions, and update of information on funding opportunities.	Each June or after the occurrence of a federally declared disaster	Jurisdictional points of contact identified in Volume 2	HMP Coordinator
Integrating	Distribute the safe growth worksheet (see Table 28-2) for annual review and update by all participating jurisdictions.	June each year with interim email reminders to address integration in county and municipal activities	HMP Coordinator and jurisdictional points of contact identified in Volume 2	County and municipal departments
Evaluating	Review the status of previous actions, as submitted by the monitoring task lead, and assess the effectiveness of the plan; compile and finalize update of mitigation strategy.	Updated progress report completed by September 30 of each year	Jurisdictional points of contact identified in Volume 2	Alternate jurisdictional points of contact identified in Volume 2
Updating	Reconvene the Planning Partners to guide a comprehensive update to review and revise the plan.	Every 5 years or upon major update to Comprehensive Plan or after the occurrence of a major disaster	HMP Coordinator	Jurisdictional points of contacts identified in Volume 2
Grant Monitoring	Notify lead agencies about grant opportunities, maintain a list of eligible jurisdiction-specific projects for funding consideration, and notify lead agencies of fiscal year mitigation priorities.	Continuously and as grant opportunities are identified	HMP Coordinator	Jurisdictional points of contacts identified in Volume 2
Public Involvement	Develop and coordinate the dissemination of public outreach materials for hazard mitigation and disaster preparedness planning.	Every quarter, send out public outreach documents and social media posts to educate residents on safety and resiliency.	HMP Coordinator	Jurisdictional points of contacts identified in Volume 2

28.2.1 MONITORING

Monitoring means tracking the implementation of the plan over time. For example, monitoring may include a system for tracking the status of the identified hazard mitigation actions. The Planning Partnership will be responsible for monitoring and documenting annual progress on the plan. Each year, beginning one year after plan development, PPROEM and local Planning Partnership representatives will collect and process information from the persons responsible for initiating or overseeing the mitigation projects in each department, agency, and organization involved in implementing mitigation actions identified in their jurisdictional annexes.

28.2.2 INTEGRATING THE HAZARD MITIGATION PLAN (HMP) INTO MUNICIPAL PLANNING MECHANISMS

Hazard mitigation is sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards. Integrating hazard mitigation into a community's existing plans, policies, codes, and programs leads to development patterns that reduce risk from known hazards. The Planning Partnership was tasked with identifying how hazard mitigation is integrated into existing planning mechanisms. The jurisdictional annexes in Volume 2 describe how this is done for each planning partner. During this process, many partners recognized the importance and benefits of incorporating hazard mitigation into future local planning and regulatory processes.

Effective mitigation is achieved when hazard awareness and risk management strategies become an integral part of public activities and decision-making. Within the County, there are many existing plans and programs that support hazard risk management, and it is critical that this HMP integrate with and complement those existing plans and programs.

The Capability Assessment (Chapter 0) provides a summary and description of the existing plans, programs, and regulatory mechanisms at all levels of government (federal, state, county, and local) that support hazard mitigation within the County. In the jurisdictional annexes in Volume 2, each planning partner identified how it has integrated hazard risk management into its existing planning, regulatory, and administrative frameworks and how they intend to promote this integration further.

It is the intention of Planning Partnership representatives to incorporate mitigation planning as an integral component of daily government operations. Planning Partnership representatives will work with local government officials to integrate the newly adopted hazard mitigation goals and actions into the general operations of government. The jurisdictional adoption resolutions will include a resolution item stating the intent of the local governing body to incorporate mitigation planning as an integral component of government operations. By doing so, the Planning Partnership anticipates that:

- Hazard mitigation planning will be formally recognized as an integral part of overall emergency management efforts.
- The HMP, comprehensive plans, emergency management plans and other relevant planning mechanisms will become mutually supportive documents that work in concert to meet the goals and needs of regional residents.

Other planning processes and programs to be coordinated with the recommendations of the HMP include the following:

- Emergency response plans
- Training and exercise of emergency response plans
- Debris management plans
- Recovery plans
- Capital improvement programs
- Municipal codes
- Community design guidelines
- Water-efficient landscape design guidelines
- Stormwater management programs
- Water system vulnerability assessments
- Community wildfire protection plans
- Comprehensive flood hazard management plans
- Resiliency plans
- Community Development Block Grant Disaster Recovery action plans
- Public information and improved public participation
- Educational programs
- Continued interagency coordination

During the HMP annual review process, participating jurisdictions will be asked to document how they are utilizing and incorporating the HMP into their day-to-day operations and planning and regulatory processes. Each municipality will identify additional policies, programs, practices, and procedures that could be modified to accommodate hazard mitigation actions and include these findings and recommendations in the annual HMP progress report. The checklist in Table 28-2, adapted from FEMA's 2013 Local Mitigation Handbook, will help a community analyze how hazard mitigation is integrated into local plans, ordinances, regulations, and policies. Completing the checklist will help jurisdictions identify areas that currently integrate hazard mitigation and where to make improvements and reduce vulnerability to future development.

Table 28-2. Safe Growth Check List

Planning Mechanisms	Yes	No	How is it being done or how will this be utilized in the future?
Operating, Municipal, and Capital Improvement Program Budgets			
When constructing upcoming budgets, are hazard mitigation actions funded as budget allows?			
Are construction projects evaluated to see if they meet the hazard mitigation goals?			
Does the municipality review mitigation actions when allocating funding during annual budget adoption processes?			

Planning Mechanisms	Yes	No	How is it being done or how will this be utilized in the future?
Do budgets limit expenditures on projects that would encourage development in areas vulnerable to hazards?			
Do infrastructure policies limit extension of existing facilities and services that would encourage development in areas vulnerable to hazards?			
Do budgets provide funding for hazard mitigation projects identified in the HMP?			
Human Resource Manual			
Do any job descriptions specifically include identifying and/or implementing mitigation projects/actions or other efforts to reduce hazard risk?			
Building and Zoning Ordinances			
Prior to zoning changes or development permitting, does the municipality review the HMP and other hazard analyses to ensure consistent and compatible land use?			
Does the zoning ordinance discourage development or redevelopment within natural areas, including wetlands, floodways, and floodplains?			
Does the zoning ordinance contain natural overlay zones that set conditions			
Does the zoning ordinance require developers to take additional actions to mitigate hazard risk?			
Do rezoning procedures recognize hazard areas as limits on zoning changes that allow greater intensity or density of use?			
Does the zoning ordinance prohibit development within or filling of wetlands, floodways, and floodplains?			
Subdivision Regulations			
Do the subdivision regulations restrict the subdivision of land within or adjacent to hazard areas?			
Do the regulations provide for conservation subdivisions or cluster subdivisions in order to conserve environmental resources?			
Do the regulations allow density transfers where hazard areas exist?			
Comprehensive Plan			
Are the goals and policies of the plan related to those of the HMP?			
Does the future land use map clearly identify hazard areas?			

Planning Mechanisms	Yes	No	How is it being done or how will this be utilized in the future?
Does the plan provide adequate space for expected future growth in areas located outside hazard areas?			
Land Use			
Does the future land use map clearly identify hazard areas?			
Do the land use policies discourage development or redevelopment in hazard areas?			
Transportation Plan			
Does the transportation plan limit access to hazard areas?			
Is transportation policy used to guide growth to safe locations?			
Are transportation systems designed to function under disaster conditions (e.g., evacuation)?			
Environmental Management			
Are environmental systems that protect development from hazards identified and mapped?			
Do environmental policies maintain and restore protective ecosystems?			
Do environmental policies provide incentives to development located outside protective ecosystems?			
Grant Applications			
Are data and maps used as supporting documentation in grant applications?			
Municipal Ordinances			
Is hazard mitigation a priority when updating municipal ordinances?			
Economic Development			
Does the local economic development group take into account information regarding identified hazard areas when assisting new businesses in finding a location?			
Public Education and Outreach			
Does the municipality have any public outreach mechanisms/ programs in place to inform residents on hazards, risk, and ways to protect themselves during such events?			

28.2.3 EVALUATING

Evaluation of the mitigation plan is an assessment of whether the planning process and actions have been effective, whether the Hazard Mitigation Plan (HMP) goals are being achieved, and

whether changes are needed. The HMP Coordinator will consult with the Planning Partnership members to evaluate the effectiveness of the plan implementation and to reflect changes that could affect mitigation priorities or available funding.

The status of the HMP will be discussed and documented at an annual plan review meeting of the Planning Partnership to be held either in person or via teleconference approximately one year from the date of local adoption of this update and successively thereafter. The HMP Coordinator will be responsible for calling participants, coordinating the annual plan review meeting, and soliciting input regarding progress toward meeting plan goals and objectives. At least two weeks before the annual plan review meeting, the HMP Coordinator will advise Planning Partnership members of the meeting date, agenda, and expectations of the members. These evaluations will assess whether:

- Goals and objectives address current and expected conditions
- The nature or magnitude of the risks has changed
- Current resources are appropriate for implementing the HMP and if different or additional resources are now available
- Actions were cost effective
- Schedules and budgets are feasible
- Implementation problems are present, such as technical, political, legal, or coordination issues with other agencies
- Outcomes have occurred as expected
- Changes in local resources impacted plan implementation (e.g., funding, personnel, and equipment)
- New agencies, departments, and staff are included, involving other local governments as defined under 44 CFR 201.6.

Specifically, the Planning Partnership will review the mitigation goals, objectives, and activities using performance-based indicators, including:

- New agencies/departments
- Project completion
- Underspending/overspending
- Achievement of the goals and objectives
- Resource allocation
- Timeframes
- Budgets
- Lead/support agency commitment
- Resources
- Feasibility

Finally, the Planning Partnership will evaluate how other programs and policies have conflicted with or augmented planned or implemented mitigation actions and will identify policies, programs, practices, and procedures that could be modified to accommodate hazard mitigation actions. Other programs and policies can include those that address:

- Economic development
- Environmental preservation

- Historic preservation
- Redevelopment
- Health and safety
- Recreation
- Land use and zoning
- Public education and outreach
- Transportation

The Planning Partnership should refer to evaluation forms in the FEMA 386-4 guidance document to assist in the evaluation process (FEMA 2013). Further, the Planning Partnership should refer to any process and plan review deliverables developed by the County or participating jurisdictions as a part of the plan review processes established for prior or existing local HMPs within the county.

The HMP Coordinator will be responsible for preparing an annual HMP progress report for each year of the approval period based on the information provided by the Planning Partners and other information as appropriate. These annual reports will provide data for the five-year update of this HMP and will assist in pinpointing any implementation challenges. By monitoring the implementation of the HMP, the Planning Partnership will be able to assess which actions are completed, which are no longer feasible, and which require additional funding.

Following any major disasters, the HMP will be evaluated and revised to determine if the recommended actions remain relevant and appropriate. The risk assessment will also be revisited to see if any changes are necessary based on the pattern of disaster damage or if data listed in the hazard profiles of this plan has been collected to facilitate the risk assessment. This is an opportunity to increase the community's disaster resistance and build a better and stronger community.

28.2.4 UPDATING

44 CFR 201.6.d.3 requires that local hazard mitigation plans be reviewed, revised as appropriate, and resubmitted for approval to remain eligible for benefits awarded under DMA 2000. It is the intent of the Pikes Peak Regional Planning Partnership to update this plan on a five-year cycle from the date of initial plan adoption.

To facilitate the update process, the Hazard Mitigation Plan (HMP) Coordinator, with support of the Planning Partnership, will use the second annual Planning Partnership meeting to develop and commence the implementation of a detailed plan update program. Prior to the five-year update, the HMP Coordinator will invite representatives from DHSEM to provide guidance on plan update procedures. At a minimum, this will establish who will be responsible for managing and completing the plan update effort, items that need to be included in the updated plan, and a detailed timeline with milestones to ensure that the update is completed according to regulatory requirements. At this meeting, the project team will determine what resources will be needed to complete the update and seek to secure these resources.

Following each 5-year update of the HMP, the updated plan will be distributed for public comment. After all comments are addressed, the HMP will be revised and distributed to all Planning Partners.

28.2.5 GRANT MONITORING AND COORDINATION

PPROEM intends to be a resource to the Planning Partnership in the support of project grant writing and development. The degree of this support will depend on the level of assistance requested by the Planning Partners during openings for grant applications. As part of grant monitoring and coordination, PPROEM intends to provide the following:

- Notification to Planning Partners about impending grant opportunities
- A current list of eligible, jurisdiction-specific projects for funding pursuit consideration
- Notification about mitigation priorities for the fiscal year to assist the Planning Partners in the selection of appropriate projects.

28.2.6 CONTINUED PUBLIC INVOLVEMENT

The Planning Partners are committed to the continued involvement of the public in the hazard mitigation process. This Hazard Mitigation Plan (HMP) update will continue to be posted online at the following link: https://pproem.com/HMPUpdate. In addition, public outreach and dissemination of the HMP will include the following:

- Links to the plan on local websites of each jurisdiction with capability
- Continued utilization of existing social media outlets (Facebook, X) to inform the public of hazard events, such as floods and severe storms; the public can be educated via the jurisdictional websites on how these applications can be used in an emergency situation
- Promotion of articles or workshops on hazards to educate the public and keep them aware of the dangers of hazards

A notice regarding annual updates of the plan and the location of plan copies will be publicized annually after the Planning Partnership's annual evaluation and posted on the public website (https://pproem.com/HMPUpdate). The public will have an opportunity to comment on the plan as a part of the annual mitigation planning evaluation process and the next five-year mitigation plan update. The HMP Coordinator is responsible for coordinating the plan evaluation portion of the meeting, soliciting feedback, collecting, and reviewing the comments, and ensuring their incorporation in the 5-year plan update as appropriate; however, members of the Planning Partnership will assist the HMP Coordinator. Additional meetings may also be held as deemed necessary by the Planning Partnership. The purpose of these meetings would be to provide the public an opportunity to express concerns, opinions, and ideas about the plan.

The HMP Coordinator will ensure that:

- Public and stakeholder comments and input on the plan, and hazard mitigation in general, are collected, recorded, and addressed as appropriate.
- The HMP website is maintained and updated as appropriate.
- Copies of the latest approved plan are available for review at appropriate county facilities, along with instructions to facilitate public input and comment on the plan.
- Public notices, including media releases, are made (as appropriate) to inform the public of the availability of the plan, particularly during plan update cycles.

Mrs. Amanda Meldrum of PPROEM has been identified as the ongoing HMP Coordinator and is responsible for receiving, tracking, and filing public comments regarding this Plan Update. Her contact information is:

Mailing Address:	PPROEM 3755 Mark Dabling Blvd, City of Colorado Springs, CO, 80910.
Contact Name:	Amanda Meldrum, Emergency Management Specialist
Email Address:	amandameldrum@elpasoco.com
Telephone:	719-575-8416

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APPENDIX A. PLANNING PARTNER HAZARD MITIGATION PLAN (HMP) ADOPTION RESOLUTIONS

To Be Provided With Final Draft

APPENDIX B. DEFINITION OF TERMS AND ACRONYMS

ACS—American Community Survey

AFB—Air Force Bae

AMLI—Abandoned Mine Land Inventory

AP—airport

APA—approvable pending adoption

AQI—air quality index

AR—atmospheric river

ASDSO—Association of State Dam Safety Officials

ASOS—Automated Surface Observing System

ATF—Bureau of Alcohol, Tobacco and Firearms

BEA—U.S. Bureau of Economic Analysis

BLS—U.S. Bureau of Labor Statistics

CAIC—Colorado Avalanche Information Center

CDBG—Community Development Block Grants

CDC—U.S. Centers for Disease Control and Prevention

CDOT—Colorado Department of Transportation

CDPHE—Colorado Department of Public Health and Environment

CEC—California Energy Commission

CEM—Certified Emergency Manager

CEO—Colorado Energy Office

CEPA—Colorado Emergency Preparedness Assessment

CERT—Community Emergency Response Team

CFR—Code of Federal Regulations

CGS—Colorado Geological Survey

CHIRRP—Confronting Hazards, Impacts and Risks for a Resilient Planet

CIAC—Colorado Information Analysis Center

CIP—capital improvement program

CISA—Cybersecurity & Infrastructure Security Agency

CNRA—California Natural Resources Agency

CONUS—Continental United States

COOP—National Weather Service Cooperative Observer Program

COS—City of Colorado Springs Airport

COSWAP—Colorado Strategic Wildfire Action Program

COVOAD—Colorado Voluntary Organizations Active in Disaster

CRS—Community Rating System

CSEAP—Colorado State Emergency Action Plan

CSFS—Colorado State Forest Service

CSP—Colorado State Patrol

CSPD—Colorado Springs Police Department

CSU—Colorado Springs Utilities

CWA—Clean Water Act

CWCB—Colorado Water Conservation Board

CWMP—Colorado Wildfire Mitigation Program

CWPP—Community Wildfire Protection Plan

CWRPDA—Colorado Water Resources and Power Development Authority

DBIR—Data Breach Investigation Report

DCEA—Division of Code Enforcement and Administration

DEM—digital elevation model

DERA—Designated Emergency Response Authority

DFIRM—Digital Flood Insurance Rate Map

DFPC—Division of Fire Prevention and Control

DHSEM—Division of Homeland Security and Emergency Management

DMA—Disaster Mitigation Act of 2000

DOLA—Department of Local Affairs

DPW—Department of Public Works

DRMS—Division of Reclamation, Mining and Safety

DRR—Disaster Resilience Rebuilding

DWR—Colorado Department of Water Resources

EAP—Emergency Action Plan

ECC—Emergency Coordination Center

EDAT—Economic Development Assessment Team

EF—Enhanced Fujita

EIAF—Energy/Mineral Impact Assistance Fund

EMAP—Emergency Management Accreditation Program

EMS—emergency medical services

EOC—Emergency Operations Center

EPA—Environmental Protection Agency

EPC—Environmental Protection Agency's

EPCRA—Emergency Planning and Community Right-to-Know Act of 1986

EPSO—???

EPSOWF—El Paso County Wildland Fire Management

ESA—Endangered Species Act

FAA—Federal Aviation Administration

FBI—Federal Bureau of Investigation

FCC—Federal Communications Commission

FEMA—Federal Emergency Management Agency

FHWA-ER—Federal Highway Administration Emergency Relief

FIRM—Flood Insurance Rate Map

FIS—Flood Insurance Study

FMA—Flood Mitigation Assistance

FRWRM—Forest Restoration and Wildfire Risk Mitigation

FTA—Federal Transit Administration

FTO—Foreign Terrorist Organization

GIS—Geographic Information System

GPA—grade point average

HAZMAT—hazardous materials

HHPD—High Hazard Potential Dams

HMA—Hazard Mitigation Assistance

HMGP—Hazard Mitigation Grant Program

HMP—Hazard Mitigation Plan

HMPT—Hazard Mitigation Planning Team

HSGP—Homeland Security Grant Program

HVAC—heating, ventilation, and air conditioning

IA—Individual Assistance

IBC—International Building Code

IIJA—Infrastructure Investment and Jobs Act

LEPC—Local Emergency Planning Committee

LOMA—Local Match Program

LOMR—letter of map revision

LOP—Letter of Permission

MRP—mean return period

MTA—metropolitan transit authorities

MVEA—Mountain View Electric Association

NCEI—National Centers for Environmental Information

NDMC—National Drought Monitoring Center

NEHRP—National Earthquake Hazard Reduction Program

NFIP—National Flood Insurance Program

NFPA—National Fire Protection Association

NHC—National Hurricane Center

NLCD—National Land Cover Database

NLSC—National Lightning Safe Council

NOAA—National Oceanic and Atmospheric Administration

NORAD—North American Aerospace Defense Command

NPS—National Park Service

NRDC—National Resource Defense Council

NRI—National Risk Index

NSI—National Structure Inventory

NSSL—National Severe Storms Laboratory

NTAC—National Threat Assessment Center

NTSB—National Transportation Safety Board

NWP—nationwide permit

NWS—National Weather Service

OEDIT—Office of Economic Development and International Trade

OEM—Office of Emergency Management

OPR—California Governor's Office of Planning and Research

OPSG—Operation Stonegarden

PA—Public Assistance

PDM—Pre-Disaster Mitigation

PGA—peak ground acceleration

PPACG—Pikes Peak Area Council of Governments

PPE—personal protective equipment

PPR—Pikes Peak Region

PPRBD—Pikes Peak Regional Building Department

PPROEM—Pikes Peak Region Office of Emergency Management

PVC—poly-vinyl chloride

RCV—Replacement Cost Value

RLF—Revolving Loan Fund

SARA—Superfund Amendments and Reauthorization Act of 1986

SBA—Small Business Administration

SCADA—Supervisory Control and Data Acquisition

SCU—Special Communications Unit

SEOP—Colorado State Emergency Operations Plan

SFHA—special flood hazard area

SHMO—State Hazard Mitigation Officer

SHMP—State Hazard Mitigation Plan

SHSP—State Homeland Security Program

SPC—Storm Prediction Center

TORRO—Tornado and Storm Research Organisation

UASI—Urban Areas Security Initiative

UC—University of Colorado

UCCS—University of Colorado at Colorado Springs

USACE—U.S. Army Corps of Engineers

USC—United States Code

USDA—U.S. Department of Agriculture

USDM—U.S. Drought Monitor

USEDA—U.S. Economic Development Administration

USGS—U.S. Geological Survey

VOAD—Voluntary Organizations Active in Disasters

WRA—Wildfire Risk Assessment

WRAP—Wildfire Risk Assessment Portal

WRRG—Wildfire Risk Reduction Grant

WUI—Wildland-Urban Interface

APPENDIX C. PUBLIC AND STAKEHOLDER OUTREACH DOCUMENTATION

Insert Appendix Content

APPENDIX D. MEETING DOCUMENTATION

Insert Appendix Content

APPENDIX E. SURVEY RESULTS

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