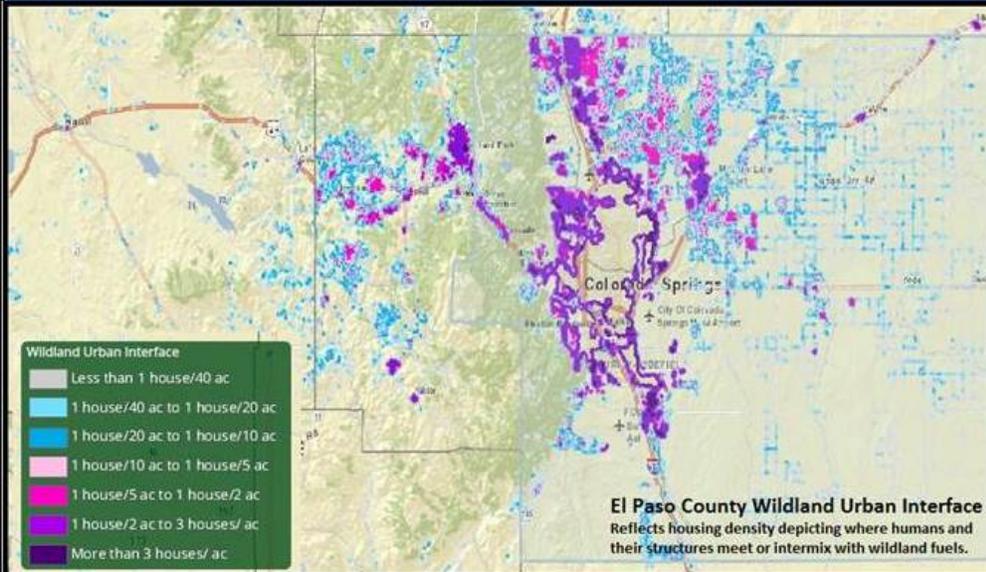


El Paso County Multi- Jurisdictional, Hazard Mitigation Plan

June 2015



El Paso County
Office of Emergency Management
3755 Mark Dabling Blvd.
Colorado Springs, CO 80907

**El Paso County
HAZARD MITIGATION PLAN**

JUNE 2015

El Paso County
Public Services Department
Office of Emergency Management
3755 Mark Dabling Blvd.
Colorado Springs, CO 80907

El Paso County
Hazard Mitigation Plan Update

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

The Disaster Mitigation Act (DMA) is federal legislation that requires proactive, pre-disaster planning as a prerequisite for some funding available under the Robert T. Stafford Act. The DMA encourages state and local authorities to work together on pre-disaster planning. The planning network called for by the DMA helps local governments articulate accurate needs for mitigation, resulting in faster allocation of funding and more cost-effective risk reduction projects.

Hazard mitigation is the use of long- and short-term strategies to reduce or alleviate the loss of life, personal injury, and property damage that can result from a disaster. It involves strategies such as planning, policy changes, programs, projects, and other activities that can mitigate the impacts of hazards. It is impossible to predict exactly when and where disasters will occur or the extent to which they will impact an area, but with careful planning and collaboration among public agencies, stakeholders and citizens, it is possible to minimize losses that disasters can cause. The responsibility for hazard mitigation lies with many, including private property owners; business and industry; and local, state, and federal government.

El Paso County and a partnership of local governments within the county have developed and maintained a hazard mitigation plan to reduce risks from natural disasters and to comply with the DMA.

PLAN UPDATE

Federal regulations require monitoring, evaluation and updating of hazard mitigation plans. An update provides an opportunity to reevaluate recommendations, monitor the impacts of actions that have been accomplished, and determine if there is a need to change the focus of mitigation strategies. A jurisdiction covered by a plan that has expired is no longer in compliance with the DMA.

El Paso County prepared a previous plan, the *El Paso County Pre-Disaster Mitigation Plan*, in 2008. Since then, the partnership has completed or initiated ongoing action on over 75 percent of the 51 initiatives identified in the previous plan; 11 initiatives have been completed and 28 initiatives are in progress.

Updating the plan consisted of the following phases:

- **Phase 1, Organize and Review**—A planning team was assembled to provide technical support for the plan update, consisting of key County staff from the Sheriff's Office, Emergency Services Division, and a technical consultant. The first step in developing the plan update was to re-establish a planning partnership. Planning partners participating in the update were the Cities of Fountain and Manitou Springs and the Towns of Monument, Green Mountain Falls, Calhan, Ramah, and Palmer Lake. A Steering Committee was assembled to oversee the plan update, consisting of planning partner staff and community representatives from the planning area. Coordination with other county, state, and federal agencies involved in hazard mitigation occurred throughout the plan update process. This phase included a comprehensive review of the existing plan, the Colorado State Hazard Mitigation Plan, and existing programs that may support or enhance hazard mitigation initiatives.
- **Phase 2, Update the Risk Assessment**—Risk assessment is the process of measuring the potential loss of life, personal injury, economic injury, and property damage resulting from natural hazards. This process assesses the vulnerability of people, buildings, and infrastructure to natural hazards. All facets of the risk assessment of the plan were re-visited by the planning team and updated with the best available data and technology. The work included the following:
 - Hazard identification and profiling
 - Assessment of the impact of hazards on physical, social, and economic assets

- Vulnerability identification
- Estimates of the cost of potential damage.
- **Phase 3, Engage the Public**—A public involvement strategy agreed upon by the Steering Committee was implemented by the planning team – all meetings were open to the public. Public meetings were held to present the risk assessment as well as the draft plan. Participation in the hazard mitigation survey occurred across the County, a County website included plan updates, and information on the process and meetings was distributed via media releases.
- **Phase 4, Assemble the Updated Plan**—The planning team and Steering Committee assembled key information into a document to meet the DMA requirements for all planning partners.
- **Phase 5, Plan Adoption/Implementation**—Once pre-adoption approval has been granted by Colorado’s Office of Emergency Management and Region VIII of the Federal Emergency Management Agency, the final adoption phase will begin. Each planning partner will individually adopt the updated plan. The plan maintenance process includes a schedule for monitoring and evaluating the plan’s progress annually and producing a plan revision every five years. Throughout the life of this plan, a Steering Committee representative of the original committee will provide a consistent source of guidance and oversight.

MITIGATION GUIDING PRINCIPLE, GOALS AND OBJECTIVES

The following guiding principle for this plan update process guided the Committee:

Reduce risks to life safety and property in El Paso County from natural and human-caused hazards, incidents/events.

The following plan goals and objectives were determined by the Committee:

- **Goal 1:** Reduce loss of life and injury
 - **Objective 1.1:** Explore current emergency notification systems to ensure reliable, diverse and redundant public communication of potential hazards
 - **Objective 1.2:** Ensure all municipalities within El Paso County have a well prepared, implementable, and vetted emergency operations plan
 - **Objective 1.3:** Review and assess County and local plans for current best practices, standards, and appropriate integration of risk reduction elements resulting in a more resilient community
 - **Objective 1.4:** Assess and improve hazard-specific mapping and warning systems associated with high risk hazards to provide accurate and accessible information to ensure that citizens and visitors can respond appropriately
- **Goal 2:** Reduce property and economic losses
 - **Objective 2.1:** Proactively protect and reduce vulnerability of critical facilities, infrastructure, and other key community assets from hazards
 - **Objective 2.2:** Develop and implement strategies that make public and private properties more resistant to the impact of hazard events and explore potential incentives for businesses and residents to improve disaster resistance
 - **Objective 2.3:** Facilitate businesses within the County in developing Continuity of Operations Plans

- **Objective 2.4:** Identify federal, state and other local legislation that impacts emergency management activities
- **Goal 3:** Enhance communication of risks and threats in El Paso County to empower personal preparedness and responsibility
 - **Objective 3.1:** Improve community education programs to increase awareness of hazards and mitigation opportunities to reduce personal risk to citizens
 - **Objective 3.2:** Identify creative and alternative cost effective methods to provide multiple public education forums to teach citizens how to mitigate natural hazards on their property
 - **Objective 3.3:** Take proactive steps to ensure businesses and residents have information regarding necessary resources available to them pre, during and post an event
- **Goal 4:** Improve collaboration and cooperation throughout El Paso and partnering jurisdictions
 - **Objective 4.1:** Develop and implement strategies to improve communication and coordination of mitigation activities between federal, state and local governments, as well as private and non-profit organizations
 - **Objective 4.2:** Increase the level of coordination between all stakeholders in order to effectively and efficiently implement preparedness and mitigation strategies
 - **Objective 4.3:** Establish multi-jurisdictional methodologies and inter-operability to allow better information sharing and resource tracking
- **Goal 5:** Incorporate hazard mitigation into future plans and policies
 - **Objective 5.1:** Incorporate hazard analysis and emergency preparedness planning into county and local future development planning
 - **Objective 5.2:** Integrate mitigation priorities with watershed and storm water planning, natural resource management, and sound land use planning to protect life, property and the environment
 - **Objective 5.3:** Implement the All-Hazard Mitigation Plan proactively and effectively by clearly communicating the process for plan implementation, maintenance and updates
- **Goal 6:** Continuity of government services and business operations
 - **Objective 6.1:** Identify needs and leverage available funding streams to improve public safety, response, and recovery programs to ensure essential services can be maintained
 - **Objective 6.2:** Develop effective primary and alternate emergency operations facilities to facilitate effective incident/event support
 - **Objective 6.3:** Partner with local businesses, Chamber of Commerce and Non-Governmental Organizations (NGOs) that provide critical services to residents to ensure continuity of services and a coordinated response

IDENTIFIED HAZARDS OF CONCERN

For this plan, the Steering Committee considered the full range of natural hazards that could impact the planning area and then listed hazards that present the greatest concern. The process incorporated review of state and local hazard planning documents, as well as information on the frequency, magnitude and costs associated with hazards that have impacted or could impact the planning area. Anecdotal

information regarding natural hazards and the perceived vulnerability of the planning area's assets to them was also used. Based on the review, this plan addresses the following natural hazards of concern:

- Avalanche
- Dam failure
- Drought
- Earthquake
- Erosion and Deposition
- Flooding
- Hailstorm
- Landslide or Rockfall
- Lightning
- Mud or Debris Flow
- Pandemic Disease
- Tornado
- Subsidence and Sink Holes
- Severe Wind
- Wildfire
- Winter Storm.

In addition, three man-made hazards were identified for the planning area:

- Aircraft Accident
- Extreme Acts of Violence
- Hazardous Material Release (Transportation).

MITIGATION INITIATIVES

Mitigation initiatives presented in this update are activities designed to reduce or eliminate losses resulting from natural hazards. The update process resulted in the identification 85 mitigation initiatives for implementation by individual planning partners as listed in Table ES-1.

**TABLE ES-1.
RECOMMENDED MITIGATION INITIATIVES**

Priority	Project Status	Benefit To County	Hazards Mitigated (<i>see hazard ID codes at end of table</i>)																	Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal/Obj.	
			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS	AA					EV
EL PASO COUNTYWIDE MITIGATION INITIATIVES																								
Initiative #1—Improve Multi-Jurisdictional Hazard Mitigation Plan																								
Description: Continue to improve the El Paso County Multi-Jurisdictional Hazard Mitigation Plan through annual reviews and incorporation of incident lessons learned																								
Lead & Support Agency: El Paso County Office of Emergency Management - Public Services Department																								
High	New	High			X		X	X	X	X	X	X	X			X	X	X		X	Low	Local Budgets	Ongoing	Goals 1, 2, 3, 4, & 5 Objectives 1.2,1.3,1.4,2.1, 2.2,3.3,4.1,4.2,5.1,5.3
Initiative #2— Review and Update EOP																								
Description: Conduct annual review and tri-annual update of the El Paso County Emergency Operations Plan																								
Lead & Support Agency: El Paso County Office of Emergency Management - Public Services Department																								
High	New/ Modified from Previous Plan (16.3)	High			X		X	X	X	X	X	X	X			X	X	X		X	Low	Local Budgets	Ongoing	Goals 1, 2, 3, 4, & 5 Objectives 1.2,1.3,1.4,2.1, 2.2,3.3,4.2,5.1
Initiative #3— Perform Continuity of Operations Planning																								
Description: Perform Continuity of Operations planning to identify critical functions, essential personnel, vital resources, and critical infrastructure within the county that is necessary to maintain public safety and services																								
Lead & Support Agency: El Paso County Office of Emergency Management - Public Services Department, Municipalities and County Agencies																								
Low	Carried Over from Previous Plan (16.3)	Medium			X		X	X	X	X	X	X	X			X	X	X		X	Medium	Local Budgets, Grant	Short-term	Goals 1, 2, 4, & 6 Objectives 1.3, 2.2, 2.3, 4.1, 4.2, 6.1, 6.2, & 6.3

**TABLE ES-1.
RECOMMENDED MITIGATION INITIATIVES**

Priority	Project Status	Benefit To County	Hazards Mitigated (<i>see hazard ID codes at end of table</i>)																	Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal/Obj.												
			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS	AA					EV	HZ										
Initiative #4 — Partner with Local Businesses, CoC, NGOs to provide critical services																																			
Description: Partner with local businesses, Chamber of Commerce, and NGOs that provide critical services to citizens to ensure continuity of services and a coordinated response																																			
Lead & Support Agency: El Paso County Office of Emergency Management - Public Services Department, Municipalities and County Agencies																																			
Low	Carried Over from Previous Plan (17.2)	Medium			X		X	X	X	X	X	X	X			X	X	X		X	Medium	Local Budgets	Ongoing	Goals 2, 4, & 6 Objectives 2.2, 2.3, 4.1, 4.2, & 6.3											
Initiative #5 — Enhance Awareness and Preparedness of Residents																																			
Description: Enhance awareness and preparedness of residents through quarterly Citizen Emergency Response Training and facilitate community training requests for emergency preparedness education																																			
Lead & Support Agency: El Paso County Office of Emergency Management - Public Services Department																																			
High	Carried Over from Previous Plan (15.2)	High			X		X	X	X	X	X	X	X			X	X	X		X	Low	Local Budget and Volunteers	Short-term	Goal 3 Objectives 3.1, 3.2, & 3.3											
Initiative #6 — Enhance Emergency Preparedness Information and Community Outreach																																			
Description: Continue to enhance emergency preparedness information available to citizens and visitors through the county website and community outreach opportunities																																			
Lead & Support Agency: El Paso County Office of Emergency Management - Public Services Department, El Paso County Information Technology/Public Information Officer																																			
High	Carried Over from Previous Plan (15.1)	High			X		X	X	X	X	X	X	X			X	X	X		X	Medium	Local Budgets	Short-term	Goal 3 Objectives 3.1, 3.2, & 3.3											
Initiative #7 — Develop Emergency Preparedness Public Service Announcements and Educational Content																																			
Description: Work with the county PIO and Information Technology to develop emergency preparedness public service announcements and educational content to be televised on the El Paso County broadcast station																																			
Lead & Support Agency: El Paso County Office of Emergency Management - Public Services Department, El Paso County Information Technology/Public Information Officer																																			
Low	Modified from Previous Plan (15.1)	Medium			X		X	X	X	X	X	X	X			X	X	X		X	High	To Be Determined	Short-term	Goal 3 Objectives 3.1, 3.2, & 3.3											

**TABLE ES-1.
RECOMMENDED MITIGATION INITIATIVES**

Priority	Project Status	Benefit To County	Hazards Mitigated (<i>see hazard ID codes at end of table</i>)																		Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal/Obj.	
			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS	AA	EV					HZ
Initiative #8 — Multi-faceted Public Awareness Campaign to Increase Enrollment in Emergency Notification System Description: Develop a multi-faceted public awareness campaign to increase citizen enrollment in the El Paso County Emergency Notification System. Lead & Support Agency: El Paso County Office of Emergency Management - Public Services Department, El Paso County Public Information Office, El Paso/Teller 911																									
High	Modified from Previous Plan (15.1)	High			X		X	X	X	X	X	X	X	X			X	X	X		X	Medium	Local Budgets, Grant	Ongoing	Goals 1, 2, & 3 Objectives 1.1, 2.2, & 3.1
Initiative #9 — Create an All-Hazard Zoning Plan Description: Create an all-hazard zoning plan to facilitate a more rapid evacuation capability within El Paso County. Lead & Support Agency: El Paso County Office of Emergency Management - Public Services Department, El Paso County Sheriff Office- Dispatch																									
Low	New/ Modified from Previous Plan (2.4, 5.3, 7.3, 9.1, 13.3)	Medium			X		X	X	X	X	X	X	X				X	X	X		X	Medium	Local Budgets	Short-term	Goals 1 & 2 Objectives 1.2, 1.3, & 2.2
Initiative #10 — Encourage Communities to Adopt Fire Adaptive Community Standards Description: Work with individual communities within the county, such as HOAs and municipalities, to adopt Fire Adaptive Community standards and practices. Lead & Support Agency: El Paso County Office of Emergency Management - Public Services Department, HOAs/ Municipalities																									
Medium	New/ Modified from Previous Plan (1.3)	Medium											X								X	Medium	To Be Determined	Long-term	Goals 2, 3, & 4 Objectives 2.1, 2.2, 3.1, 3.3, & 4.2
Initiative #11 — Identify Areas for Cisterns or Hydrants Description: Conduct an analysis identifying areas in the county that may benefit from the installation of cisterns or hydrants to provide water delivery during firefighting operations in concurrence with the El Paso County Land Development Code. Lead & Support Agency: Fire Protection Districts, Pikes Peak Regional Building Division																									
Low	Carried Over from Previous Plan (2.2)	Medium			X																X	High	Local Budgets, Grant	Long-term	Goals 1, 2, & 5 Objectives 1.3, 2.1, 2.2, & 5.1

**TABLE ES-1.
RECOMMENDED MITIGATION INITIATIVES**

Priority	Project Status	Benefit To County	Hazards Mitigated (<i>see hazard ID codes at end of table</i>)																	Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal/Obj.				
			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS	AA					EV	HZ		
Initiative #12— Mitigation Efforts on Publicly Owned Properties Based on Fire Adaptive Community Standards Description: Perform mitigation efforts within publicly owned properties based on Fire Adaptive Community standards. Lead & Support Agency: El Paso County Office of Emergency Management - Public Services Department, El Paso County Sheriff Office- Emergency Service Division/Wildland																											
High	Modified from Previous Plan (1.2, 1.3)	High											X	X										Medium	Local Budgets, Grant	Ongoing	Goals 2 & 4 Objectives 2.1, 2.2, 4.1, 4.2, & 4.3
Initiative #13— Conduct Hazardous Materials Flow Study Description: Conduct a hazardous materials flow study for high volume road and rail ways within the county. Lead & Support Agency: El Paso County Office of Emergency Management - Public Services Department, El Paso County GIS																											
Medium	Carried Over from Previous Plan (4.1)	Medium																					X	Medium	Grant	Short-term	Goals 1, 2, & 5 Objectives 1.4, 2.1, 2.2, & 5.1
Initiative #14— Increase Number of Personnel Trained as HAZMAT Technicians and Specialists Description: Increase the number of personnel trained as HAZMAT technicians and specialists to elevate regional response capability. Lead & Support Agency: El Paso County Office of Emergency Management - Public Services Department /HAZMAT																											
Medium	Modified from Previous Plan (4.2)	Medium																					X	Medium	Local Budget, Grant	Short-term	Goals 1, 2, & 4 Objectives 1.2, 2.1, 4.2, & 4.3
Initiative #15— Acquire Software for Facility Tracking and Multi-Jurisdictional Response Description: Acquire common software to aid in Tier II facility tracking and multi-jurisdictional response, improving interoperability between Colorado Springs and El Paso County HAZMAT teams. Lead & Support Agency: El Paso County Office of Emergency Management - Public Services Department, El Paso County Information Technology																											
Medium	New	High																					X	Medium	Grant	Short-term	Goals 2, 4, & 6 Objectives 2.1, 2.2, 2.3, 4.3, & 6.3

**TABLE ES-1.
RECOMMENDED MITIGATION INITIATIVES**

Priority	Project Status	Benefit To County	Hazards Mitigated (<i>see hazard ID codes at end of table</i>)																	Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal/Obj.
			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS	AA				
Initiative #16— Expand Local Emergency Planning Committee Description: Expand the community cross-section and membership of the Local Emergency Planning Committee and research methods to increase its role within the county emergency management program. Lead & Support Agency: El Paso County Office of Emergency Management - Public Services Department, Local Emergency Planning Committee Chairman																							
Medium	New	Medium																X	Low	Local Budget	Short-term	Goals 1, 4, 5, & 6 Objectives 1.4, 4.1, 4.2, 4.3, 5.3, & 6.3	
Initiative #17— Enhance Communication Network Related to Delay or Closure of County Facilities and Roadways Description: Continue to enhance the communication network related to the delay or closure of county facilities and roadways. Lead & Support Agency: El Paso County Office of Emergency Management - Public Services Department, El Paso County Public Information Officer																							
High	New/ Modified from Previous Plan (9.2)	High				X	X			X						X	X		Medium	Local Budget, Grant	Short-term	Goals 1, 3, & 4 Objectives 1.1, 1.4, 3.1, 3.2, 3.3, & 4.2	
Initiative #18— Identify Critical Roads and Emergency Routes Description: Identify critical roads and emergency routes within El Paso County and coordinate inter-jurisdictional plans to insure they remain clear. Lead & Support Agency: El Paso County Office of Emergency Management - Public Services Department , El Paso County Department of Transportation																							
High	Modified from Previous Plan (9.2)	High						X		X	X				X	X		High	Local Budget	Short- to Long-term	Goals 1, 2, & 4 Objectives 1.2, 1.3, 2.1, 2.2, 4.1, & 4.2		
Initiative #19— Reduce Roadway Hazards Description: Reduce roadway hazards to maintain safe ingress/egress for El Paso County residents and first responders. Lead & Support Agency: El Paso County Office of Emergency Management - Public Services Department - El Paso County Department of Transportation																							
Medium	Modified from Previous Plan (9.1)	Medium				X	X		X	X					X	X		High	Local Budget	Short- to Long-term	Goals 1, 2, & 4 Objectives 1.3, 2.1, 2.2, 4.1, & 4.2		

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RECOMMENDED MITIGATION INITIATIVES**

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			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS	AA					EV	HZ
Initiative #20— Develop Strategic Flood Warning Plan Description: Develop an integrated strategic flood warning plan that addresses the repair, repositioning, or upgrade of existing flood warning systems. Lead & Support Agency: El Paso County Office of Emergency Management - Public Services Department, Local Jurisdictions																									
Medium	Carried Over from Previous Plan (6.1)	High						X					X									High	Local Budget	Short- to Long-term	Goals 1, 2, 3, & 4 Objectives 1.1, 1.4, 2.1, 3.1, 3.3, & 4.3
Initiative #21— Identify Drainage Basins that Require Flood Warning Systems and Explore Early Warning Systems for Flash Floods Description: Identify drainage basins that require installation of a flood warning system, and explore technology solutions to improve threat recognition to provide early warning of potential flash flood and debris flow incidents. Lead & Support Agency: El Paso County Office of Emergency Management - Public Services Department, Local Jurisdictions																									
High	Carried Over from Previous Plan (6.3)	High						X					X									Medium	Grant	Short- to Long-term	Goals 1 & 2 Objectives 1.1, 1.4, & 2.1
Initiative #22— Install Electronic Warning Signs and Road Closure Barriers on Highway 24 Description: Install electronic warning signage and permanent road closure barriers on Highway 24 in the Ute Pass area. Lead & Support Agency: Colorado Department of Transportation, El Paso County Department of Transportation, El Paso County Office of Emergency Management - Public Services Department																									
Low	New	Medium					X	X					X				X	X				High	Grant	Short-term	Goals 1 & 4 Objectives 1.1, 1.4, 4.1, & 4.2
Initiative #23— Maintain Catch Basins and Debris Fences in Critical Areas Description: Continue to maintain catch basins and debris fences in critical areas to reduce the threat to population centers. Lead & Support Agency: El Paso County Office of Emergency Management - Public Services Department																									
High	New/ Modified from Previous Plan (7.2)	High					X	X					X									High	Local Budget, Grant	Ongoing	Goals 1, 2, 4, 5, & 6 Objectives 1.3, 2.1, 2.2, 4.2, 5.2, 5.3, & 6.1

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RECOMMENDED MITIGATION INITIATIVES**

Priority	Project Status	Benefit To County	Hazards Mitigated (<i>see hazard ID codes at end of table</i>)																	Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal/Obj.	
			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS	AA					EV
Initiative #28 — Increase Municipalities That Meet Criteria of Storm Ready or Weather Ambassador Programs																								
Description: Increase the number of municipalities within the county that meet the Storm Ready and/or Weather Ambassador program criteria.																								
Lead & Support Agency: National Weather Service, Local Jurisdictions																								
Low	New	High							X	X		X								Low	Local Budget, Grant	Short-term	Goals 1, 3, & 4 Objectives 1.1, 1.3, 3.1, 3.2, 3.3, 4.1, & 4.2	
Initiative #29 — Ensure Runway Safety Zones are Considered During Community Planning																								
Description: Continue to ensure runway safety zones are considered during community planning for new construction/development applications.																								
Lead & Support Agency: Pikes Peak Regional Building Department/ Colorado Springs Airport																								
Low	New	Medium																	X	X	Low	Local Budget	Ongoing	Goals 1, 2, 3, 4, & 5 Objectives 1.4, 2.2, 2.3, 3.2, 4.1, 4.2, & 5.1
Initiative #30 — Establish Severe Weather Protective Areas																								
Description: Establish severe weather protective areas within county parks and open space.																								
Lead & Support Agency: El Paso County Parks Department/Public Works, El Paso County Office of Emergency Management - Public Services Department																								
Low	New	Medium							X	X		X							X	X	Medium	Grant, Volunteers	Short- to Long-term	Goals 1, 4, & 5 Objectives 1.3, 4.1, 4.2, & 5.3
Initiative #31 — Provide Education to First Responders to Minimize Effects of Disease on Response Capability																								
Description: Provide education to first responders to minimize the effects of disease on response capability.																								
Lead & Support Agency: El Paso County Public Health																								
Low	Carried Over from Previous Plan (16.2)	Medium										X								Medium	Local Budget	Ongoing	Goals 3, 4, & 6 Objectives 3.1, 3.3, 4.2, & 6.1	
Initiative #32 — Establish More Robust Vaccination Program																								
Description: Establish a more robust county employee vaccination program to maximize available workforce during a potential outbreak.																								
Lead & Support Agency: El Paso County Public Health																								
Low	New	Medium										X								Medium	Local Budget	Ongoing	Goals 1, 4, & 6 Objectives 1.3, 4.1, 4.2, & 6.1	

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RECOMMENDED MITIGATION INITIATIVES**

Priority	Project Status	Benefit To County	Hazards Mitigated (<i>see hazard ID codes at end of table</i>)																	Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal/Obj.
			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS	AA				
CALHAN/RAMAH INITIATIVES																							
Initiative #33— Identify At-Risk Residents and Potential Safe Shelters																							
Description: Identify at risk residents – those without basements, limited mobility and find them safe spots to take shelter in case of emergency.																							
Lead & Support Agency: Town of Ramah/Calhan																							
Medium	New	Medium							X	X				X	X	X				Low	Town Budget	Short-term	Goals 1, 3, & 4 Objectives 1.1, 3.1, 3.2, 3.3, & 4.1
Initiative #34— Utilize Water Bills to Disseminate Emergency Response Information																							
Description: Develop season-specific fliers to address hazards and ways each resident can mitigate their own risks and mail to residents with their water bill.																							
Lead & Support Agency: Town of Ramah/Calhan																							
High	New	High		X	X	X			X	X				X	X	X				Low	Town Budget	Short-term	Goals 1, 2, & 3 Objectives 1.4, 2.2, 3.1, & 3.3
Initiative #35— Plant Vegetation Along Roadways to Mitigate Erosion																							
Description: Develop a drainage or erosion control plan to incorporate plants and natural resources to mitigate erosion along roadways.																							
Lead & Support Agency: Town of Ramah/Calhan																							
Low	New	Medium					X	X												Medium	Grants, Town Budget	Short- to Long-term	Goals 2, 3, & 5 Objectives 2.1, 2.2, 3.2, 3.3, & 5.2
Initiative #36— Develop Decision Tree Outlining Roles and Responsibilities During Emergencies																							
Description: Develop a decision tree fully outlining the roles and responsibilities of local, regional, and state response teams, including HAZMAT teams and other specialized response teams. Coordinate with the county to develop a plan and point person to contact immediately.																							
Lead & Support Agency: Town of Ramah/Calhan and El Paso County																							
Medium	New	Medium		X	X		X					X	X		X			X	X	Low	Town Budget	Short-term	Goals 1, 2, & 4 Objectives 1.2, 2.4, 4.1, 4.2, & 4.3

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RECOMMENDED MITIGATION INITIATIVES**

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			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS	AA					EV	HZ	
Initiative #37— Obtain GIS Data																										
Description: Work with county, regional, and state organizations to obtain GIS data for the town. Use existing GIS data to identify areas at risk for natural or man-made hazards, to aid responders during emergencies (locations of critical facilities, infrastructure, alternative access routes, etc), and to incorporate the areas at risk for hazards into local planning and land use document.																										
Lead & Support Agency: Town of Ramah/Calhan																										
Low	New	Medium		X				X	X									X		X			Medium	Grants, Town Budget	Short-term	Goals 1 & 5 Objectives 1.2, 1.4, 5.1, & 5.2
Initiative #38— Identify Temporary Source of Water																										
Description: Identify a temporary supply of water in case of contamination or any other hazard that would affect the treatment or transportation of water to the towns. Coordinate with local, county, or regional governments (IGA or MOA) to supply water temporarily during or immediately following a hazard event																										
Lead & Support Agency: Town of Ramah/Calhan																										
High	New/ Modified from Previous Plan (2.2)	Medium			X				X										X		X		Low	Town Budget	Short-term	Goals 2, 4, 5, & 6 Objectives 2.1, 4.1, 4.2, 4.3, 5.2, 6.1, 6.2, & 6.3
FOUNTAIN INITIATIVES																										
Initiative #39— Put Flood Information on the City Website																										
Description: Put flood information on City website to educate the community about flood risk and emergency actions																										
Lead & Support Agency: City of Fountain Office of Emergency Management																										
High	Modified from Previous Plan (7.6)	High		X					X													Low	City Budget	Short-term	Goals 1 & 3 Objectives 1.2, 3.1, 3.2, & 3.3	
Initiative #40— Flood Information Handouts at City Hall																										
Description: Put flood information handouts at City Hall to educate the community about flood risk and emergency actions																										
Lead & Support Agency: City of Fountain Office of Emergency Management																										
Medium	Modified from Previous Plan (7.6)	High		X					X													Low	City Budget	Short-term	Goals 1 & 3 Objectives 1.2, 3.1, 3.2, & 3.3	

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			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS	AA					EV
Initiative #41 — Put Flood Information in the Local Paper Description: Put flood information in the local paper to educate the community about flood risk and emergency actions Lead & Support Agency: City of Fountain Office of Emergency Management																								
Medium	Modified from Previous Plan (7.6)	High		X						X											Low	City Budget	Short-term	Goals 1 & 3 Objectives 1.2, 3.1, 3.2, & 3.3
Initiative #42 — Map and Assess Community Vulnerability to Seismic Hazards Description: Map and assess community vulnerability to seismic hazards and implement the maps and assessments into local planning regulations and plans Lead & Support Agency: City of Fountain Office of Emergency Management																								
High	New	High				X															Low	City Budget	Short- to Long-term	Goals 1 & 5 Objectives 1.3, 1.4, & 5.1
Initiative #43 — Coordinate Conservation and Mitigation Actions with the Water Department Description: Coordinate conservation and mitigation actions with the Water Department to reduce the impact of droughts Lead & Support Agency: City of Fountain Utilities Department																								
High	New	High			X																Low	City Budget	Short-term	Goals 1, 3, & 4 Objectives 1.3, 3.1, 4.1, & 4.2
Initiative #44 — Conduct Lightning Awareness Description: Educate the community about Lightning Awareness Lead & Support Agency: City of Fountain Office of Emergency Management																								
Medium	New	High																X			Low	City Budget	Short-term	Goal 3 Objectives 3.1, 3.2, & 3.3
Initiative #45 — Protect Critical infrastructure Description: Protect critical Infrastructure from lightning strikes Lead & Support Agency: City of Fountain Office of Emergency Management																								
Low	New/ Modified from Previous Plan (17.1)	Medium																X			Medium	To Be Determined	Short- to Long-term	Goal 2 Objectives 2.1 & 2.2

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RECOMMENDED MITIGATION INITIATIVES**

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			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS	AA				
Initiative #46— Coordinate Flood Mitigation with City Drainage Plans Description: Coordinate flood mitigation planning and activities with City Drainage Plans Lead & Support Agency: City of Fountain Department of Public Works																							
High	New	High	X					X												Low	City Budget	Long-term	Goals 1, 2, 4, & 5 Objectives 1.2, 1.3, 1.4, 2.1, 2.2, 4.1, 4.2, & 5.2
Initiative #47— Tornado Plans and Drills for Public Buildings Description: Develop tornado plans and implement drills for public buildings to protect citizens Lead & Support Agency: City of Fountain Emergency Management																							
Low	New/ Modified from Previous Plan (8.1)	Medium													X					Low	City Budget	Short-term	Goals 1, 2, & 3 Objectives 1.2, 1.3, 2.1, & 3.1
Initiative #48— Develop Community Wildland Fire Protection Plan Description: Develop protection plans for Wildland Fire in the Interface Zone to identify specific areas and mitigation technologies by areas that have a potential to be affected by wildland fires Lead & Support Agency: City of Fountain Emergency Management																							
High	New/ Modified from Previous Plan (2.3, 17.1)	High														X				Low	City Budget	Short- to Long-term	Goals 1, 3, 4, & 5 Objectives 1.2, 1.3, 1.4, 3.1, 4.2, & 5.1
Initiative #49— Develop Wildland Fire Interface Code Description: Develop a Wildland Fire Interface Code to ensure defensible space from open space and wildland areas from built up areas to protect structures Lead & Support Agency: City of Fountain Fire Prevention Division																							
High	New/ Modified from Previous Plan (2.3, 3.1, 17.1)	High														X				Low	City Budget	Short- to Long-term	Goals 1, 3, 4, & 5 Objectives 1.2, 1.3, 1.4, 3.1, 4.2, & 5.1

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RECOMMENDED MITIGATION INITIATIVES**

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			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS	AA					EV	HZ			
Initiative #50 — Participate in Local Emergency Planning Committee																												
Description: Include the city in the LEPC and increased awareness and response planning																												
Lead & Support Agency: City of Fountain Office of Fire Department																												
Low	New	Medium																	X	Low	Not Applicable	Short- to Long-term	Goals 1, 4, 5, & 6 Objectives 1.4, 4.1, 4.2, 4.3, 5.3, & 6.3					
Initiative #51 — Expand Vaccination Program																												
Description: Expand vaccination program to include all first responders and emergency management staff who may have an emergency role such as EOC personnel and the emergency communications personnel to help ensure emergency personnel are available to assist in an incident.																												
Lead & Support Agency: City of Fountain Office of Human Resources Department																												
Medium	New	High																	X	Medium	City Budget, Grants	Short- to Long-term	Goals 3, 4, & 6 Objectives 3.1, 3.3, 4.2, & 6.1					
Initiative #52 — Meet Criteria for Storm Ready Community																												
Description: Meet the criteria for a Storm Ready Community to prepare the community to be storm ready and resistant.																												
Lead & Support Agency: City of Fountain Office of Emergency Management																												
Medium	New	High																	X	X		X	X	X	Low	City Budget, Grants	Short- to Long-term	Goals 1, 3, & 4 Objectives 1.1, 3.1, 3.2, 4.1, & 4.2
Initiative #53 — Develop a Coordinated Response Plan for Acts of Violence																												
Description: Develop coordinated rapid response for extreme acts of violence by coordinating with the police department, fire department, school district, city hall and emergency management.																												
Lead & Support Agency: City of Fountain Office of Emergency Management																												
Low	New/ Modified from Previous Plan (13.2, 13.4)	Medium																		X	Low	City Budget, Grants	Short- to Long-term	Goals 1, 3, & 4 Objectives 1.1, 3.1, 3.2, 4.1, & 4.2				

**TABLE ES-1.
RECOMMENDED MITIGATION INITIATIVES**

Priority	Project Status	Benefit To County	Hazards Mitigated (<i>see hazard ID codes at end of table</i>)																	Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal/Obj.			
			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS	AA					EV	HZ	
Initiative #58 — Update Town Website with Emergency Information Description: Update town website with emergency information; create “Emergency Information” tab on Town website. Lead & Support Agency: Town of Green Mountain Falls																										
Low	Modified from Previous Plan (15.1)	High		X						X													Low	County Budget	Short-term	Goals 1 & 3 Objectives 1.1, 3.1, 3.2, & 3.3
Initiative #59 — Review and Update Current Disaster Plan Description: Review and update current emergency disaster plan for town. Lead & Support Agency: Town of Green Mountain Falls																										
Low	New	High	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Low	Volunteers	Short-term	Goals 1, 2, & 3 Objectives 1.2,1.3,1.4,2.1, & 3.3
Initiative #60 — Install Early Warning System in Town Hall Description: Install early warning system in our new Town Hall to inform citizens of immediate danger and educate community on siren sounds. Lead & Support Agency: Fire Protection District																										
High	Modified from Previous Plan (6.1, 8.1)	High		X						X													High	Grants, Donations	Short-term	Goals 1, 3, & 6 Objectives 1.1, 1.4, 3.3, 3.1, & 6.1
Initiative #61 — Mitigating Flood Debris on Green Mountain Falls Property Description: Pre flood mitigation efforts to remove debris and restore the creeks to prevent flooding concerns, coordinated by town Public Works Department. Lead & Support Agency: Town of Green Mountain Falls																										
Medium	New	High						X	X					X									Medium	Grants, Volunteers	Short-term	Goals 1, 4, & 6 Objectives 2.1, 2.2, 4.2, & 6.1

**TABLE ES-1.
RECOMMENDED MITIGATION INITIATIVES**

Priority	Project Status	Benefit To County	Hazards Mitigated (<i>see hazard ID codes at end of table</i>)																	Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal/Obj.				
			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS	AA					EV	HZ		
MONUMENT INITIATIVES																											
Initiative #62— MOU with D38 for Use of Their Facilities if needed																											
Description: Develop MOU with school district D38 for the use of their facilities to assist in restoring the function of natural systems in the event Town of Monument facilities are compromised.																											
Lead & Support Agency: Town of Monument																											
High	Modified from Previous Plan (17.2)	High			X	X			X	X			X	X			X	X	X			X	Low	Not Applicable	Short-term	Goals 1, 2, 3, 4, 5, & 6 Objectives 1.2, 2.3, 3.3, 4.1, 4.2, 4.3, 5.1, 5.3, 6.1, 6.2, & 6.3	
Initiative #63— Obtain Generators for Critical Infrastructure																											
Description: Obtain generators to provide backup power for critical infrastructure during emergencies.																											
Lead & Support Agency: Town of Monument																											
Medium	New	High	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	High	Budget Restate	Short-term	Goals 2, 5, & 6 Objectives 2.1, 2.2, 5.1, & 6.1		
Initiative #64— Add a Link to the Town Website "Emergency Preparedness"																											
Description: Create an "Emergency Preparedness" link on the Town website with emergency prevention/preparedness information.																											
Lead & Support Agency: Town of Monument																											
Medium	Modified from Previous Plan (15.1)	High	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Low	Town Budget	Short-term	Goals 1 & 3 Objectives 1.1, 3.1, 3.2, & 3.3			
Initiative #65— Ensure Water Tanks/Water Sheds Have Adequate Fire Protection																											
Description: Ensure water tanks/water sheds have adequate fire protection, for example, protected with concrete walls/roofs; 30-foot mitigation zones.																											
Lead & Support Agency: Town of Monument																											
Low	Modified from Previous Plan (2.2)	Medium																		X				Medium	Town Budget	Short-term	Goals 1, 2, 3, 4, 5, & 6 Objectives 1.3, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, 4.3, 5.1, 5.2, 5.3, & 6.1

**TABLE ES-1.
RECOMMENDED MITIGATION INITIATIVES**

Priority	Project Status	Benefit To County	Hazards Mitigated (<i>see hazard ID codes at end of table</i>)																	Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal/Obj.
			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS	AA				
Initiative #66 — Adopt Water Mitigation Plan, Water Conservation Plan and Reusable/Renewable Water Plan Description: Adopt water mitigation plan, water conservation plan, and reusable/renewable water plan, including ordinances limiting landscape/types of grasses and trees grown; water restrictions; and mitigation program offered by the Town (free disposal of shrubs/brush tress for mitigating property). Lead & Support Agency: Town of Monument																							
High	New	High			X															Medium	Town Budget	Short-term	Goals 1, 2, 3, 4, & 5 Objectives 1.3, 2.1, 2.2, 2.4, 3.1, 3.2, 3.3, 4.1, 4.2, 5.1, 5.2, & 5.3
Initiative #67 — Adopt Emergency Operations Plan and Pre-Disaster Mitigation Plan Description: Adopt Emergency Operations Plan and Pre-Disaster Mitigation Plan. Lead & Support Agency: Town of Monument																							
High	New	High	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Medium	Town Budget	Short-term	Goals 1, 2, 3, 4, & 5 Objectives 1.3, 2.1, 2.2, 2.4, 3.1, 3.2, 3.3, 4.1, 4.2, 5.1, 5.2, & 5.3
Initiative #68 — Enhance Use of Emergency Notification System within the Town Description: Enhance use of emergency notification system within the Town. Lead & Support Agency: Town of Monument																							
Low	New/ Modified from Previous Plan (8.1)	Medium	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	High	Grant	Long-term	Goals 1, 3, 5, & 6 Objectives 1.1, 1.2, 3.1, 5.1, 6.1, 6.2, & 6.3

**TABLE ES-1.
RECOMMENDED MITIGATION INITIATIVES**

Priority	Project Status	Benefit To County	Hazards Mitigated (<i>see hazard ID codes at end of table</i>)																		Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal/Obj.
			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS	AA	EV				
Initiative #69 — Coordinate with County GIS to Develop Layer for High Risk Areas/Hazards Description: Coordinate with County GIS to develop layer for high risk areas/hazards to educate citizens. Lead & Support Agency: Town of Monument																								
Low	New	High	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Medium	Town Budget	Long-term	Goals 1, 2, 3, 4, 5, & 6 Objectives 1.4, 2.1, 2.2, 3.1, 3.2, 4.3, 5.1, 5.3, & 6.1
Initiative #70 — Install Lightning/Ground Protection on Critical Infrastructure Description: Install lightning/ground protection on critical infrastructure. Lead & Support Agency: Town of Monument																								
Medium	New	High									X			X							Medium	Budget Restate	Short-term	Goals 2, 5, & 6 Objectives 2.1, 2.2, 5.1, & 6.1
PALMER LAKE INITIATIVES																								
Initiative #71 — Adopt Emergency Operations Plan and Pre-Disaster Mitigation Plan Description: Adopt Emergency Operations Plan, Pre-Disaster Mitigation Plan, water mitigation plan, water conservation plan and reusable/renewable water plan, including ordinances limiting landscape/types of grasses and trees grown; water restrictions; mitigation program offered by the Town (free disposal of shrubs/brush tress for mitigating property). Lead & Support Agency: Town of Palmer Lake																								
High	New	High	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Medium	Town Budget	Short-term	Goals 1, 2, 3, 4, & 5 Objectives 1.3, 2.1, 2.2, 2.4, 3.1, 3.2, 3.3, 4.1, 4.2, 5.1, 5.2, & 5.3
Initiative #72 — Install Lightning/Ground Protection on Critical Infrastructure Description: Obtain/maintain generators for critical infrastructure Lead & Support Agency: Town of Palmer Lake																								
High	New	High									X		X		X						High	Town Budget	Short-term	Goals 2, 5, & 6 Objectives 2.1, 2.2, 5.1, & 6.1

**TABLE ES-1.
RECOMMENDED MITIGATION INITIATIVES**

Priority	Project Status	Benefit To County	Hazards Mitigated (<i>see hazard ID codes at end of table</i>)																	Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal/Obj.	
			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS	AA					EV
Initiative #77 — Ensure Water Sheds have Adequate Fire Protection Description: Ensure water tanks/water sheds have adequate fire protection by developing adequate alternative storage facilities via installation of water tanks, holding ponds etc. Lead & Support Agency: Town of Palmer Lake																								
Low	Modified from Previous Plan (2.2)	Medium																	X	Medium	Town Budget	Short-term	Goals 1, 2, 3, 4, 5, & 6 Objectives 1.3, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, 4.3, 5.1, 5.2, 5.3, & 6.1	
MANITOU SPRINGS INITIATIVES																								
Initiative #78 — Conduct Annual Review and Update of the City of Manitou Springs Emergency Operations Plan Description: Conduct annual review and updates to the City of Manitou Springs EOP. Lead & Support Agency: Manitou Springs Police Department																								
High	New	High		X	X	X		X	X	X	X	X	X	X		X	X	X		X	Low	City Budget	Ongoing	Goals 1, 2, 3, 4, & 5 Objectives 1.2, 1.3, 1.4, 2.1, 2.2, 3.3, 4.2, & 5.1
Initiative #79 — Perform Continuity of Operations Planning Description: Perform Continuity of Operations planning to identify critical functions, essential personnel, vital resources, and critical infrastructure within the county that is necessary to maintain public safety and services. Lead & Support Agency: Manitou Springs Police Department																								
High	Carried Over from Previous Plan (16.3)	High		X	X	X		X	X	X	X	X	X		X	X	X		X	Medium	City Budget, Grant	Short-term	Goals 1, 2, 4, & 6 Objectives 1.3, 2.2, 2.3, 4.1, 4.2, 6.1, 6.2, & 6.3	
Initiative #80 — Conduct Training to Certify Fire Department Personnel in Wildland Operations Description: Conduct training to certify fire department personnel in Wildland operations. Lead & Support Agency: Manitou Springs Police Department																								
Low	New	Medium																	X	Medium	City Budget, Grant	Short- to Long-term	Goals 2, 4, & 6 Objectives 2.1, 4.1, & 6.2	

**TABLE ES-1.
RECOMMENDED MITIGATION INITIATIVES**

Priority	Project Status	Benefit To County	Hazards Mitigated (<i>see hazard ID codes at end of table</i>)																	Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal/Obj.			
			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS	AA					EV	HZ	
Initiative #81 — Adopt Fire Adaptive Community Standards and Practices Description: Encourage communities within the county to adopt Fire Adaptive Community Standards and Practices. Lead & Support Agency: HOAs/ Municipality/Fire Department																										
Medium	New/ Modified from Previous Plan (1.3)	High									X								X				Medium	To Be Determined	Long-term	Goals 2, 3, & 4 Objectives 2.1, 2.2, 3.1, 3.3, & 4.2
Initiative #82 — Fund and Execute Phase II and Phase III of Fountain Creek Structural Mitigation Projects Description: Fund and execute Phase II and Phase III of Fountain Creek Structural mitigation projects. Lead & Support Agency: Manitou Springs Recovery Manager																										
Medium	Carried Over from Previous Plan (7.1, 7.2, 7.5)	High		X					X			X							X				High	City Budget, Grants	Short-term	Goals 2 & 5 Objectives 2.2 & 5.2
Initiative #83 — Dredging of Fountain Creek within Manitou Springs Description: Dredging of Fountain Creek within Manitou Springs. Lead & Support Agency: Manitou Springs Recovery Manager																										
Medium	Carried Over from Previous Plan (7.1, 7.2, 7.5)	High		X					X			X							X				High	City Budget, Grants	Short-term	Goals 2 & 5 Objectives 2.2 & 5.2
Initiative #84 — Expand the Local Early Warning System to Encompass All Hazards Description: Expand the local early warning system to encompass all-hazards. Lead & Support Agency: City of Manitou Springs																										
High	Modified from Previous Plan (15.1)	High	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Low	City Budget, Grants	Short-term	Goals 1 & 3 Objectives 1.1, 1.4, 3.1, 3.2, & 3.3	

**TABLE ES-1.
RECOMMENDED MITIGATION INITIATIVES**

Priority	Project Status	Benefit To County	Hazards Mitigated (<i>see hazard ID codes at end of table</i>)															Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal/Obj.						
			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W					WS	AA	EV	HZ		
Initiative #85 — Increase Number of Local Responders Trained as HAZMAT Technicians																											
Description: Increase the number of local responders trained as HAZMAT technicians.																											
Lead & Support Agency: Manitou Springs Fire Department																											
Low	Carried Over from Previous Plan (4.3)	Medium																X		X	Medium	City Budget, Grants	Short-term	Goals 1, 4, & 6 Objectives 1.2, 4.2, 4.3, & 6.1			
Hazard ID Codes: A = Avalanche; DF = Dam Failure; D = Drought; E = Earthquake; ED = Erosion and Deposition; F = Flood; H= Hailstorm; LR = Landslide or Rockfall; L = Lightning; MD = Mud or Debris Flow; PD = Pandemic Disease; T= Tornado; SS = Subsidence and Sinkholes; SW = Severe Wind; W = Wildfire; WS = Winter Storm; AA = Aircraft Accident; EV = Acts of Extreme Violence; HZ = Hazardous Material Release																											

PART 1
THE PLANNING PROCESS

CHAPTER 1.

INTRODUCTION TO THE PLANNING PROCESS

1.1 WHY PREPARE THIS PLAN?

1.1.1 The Big Picture

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

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

The DMA encourages state and local authorities to work together on pre-disaster planning. It promotes “sustainable hazard mitigation,” which includes the sound management of natural resources and the recognition that hazards and mitigation must be understood in the largest possible social and economic context. The planning network called for by the DMA helps local governments articulate accurate needs for mitigation, resulting in faster allocation of funding and more cost-effective risk reduction projects.

1.1.2 Local Concerns

Several factors initiated this planning effort:

- El Paso County is exposed to hazards that have caused extensive past damage.
- Limited local resources make it difficult to be pre-emptive in reducing risk. Eligibility for federal financial assistance is paramount to successful hazard mitigation in the area.
- El Paso County and its partners participating in this plan want to be proactive in preparing for the probable impacts of natural hazards.
- Federal Emergency Management Agency (FEMA) approval of the 2008 *El Paso County Pre-Disaster Mitigation Plan* expired on December 16, 2013. A current, FEMA-approved hazard mitigation plan is necessary for the County to obtain additional emergency funds after a disaster declaration. The 2008 mitigation plan was a single-jurisdiction plan developed with input from many stakeholders. This updated hazard mitigation plan is a multi-jurisdictional plan that represents not only the unincorporated County, but also the specific concerns of participating incorporated municipalities.

1.1.3 Purposes for Planning

This hazard mitigation plan update identifies resources, information, and strategies for reducing risk from natural hazards. Elements and strategies in the plan were selected because they meet a program requirement and because they best meet the needs of the planning partners and their citizens. One of the benefits of multi-jurisdictional planning is the ability to pool resources and eliminate redundant activities within a planning area that has uniform risk exposure and vulnerabilities. FEMA encourages multi-jurisdictional planning under its guidance for the DMA. The plan will help guide and coordinate mitigation activities throughout the planning area. The plan was developed to meet the following objectives:

- Meet or exceed requirements of the DMA.

- Enable all planning partners to continue using federal grant funding to reduce risk through mitigation.
- Meet the needs of each planning partner as well as state and federal requirements.
- Create a risk assessment that focuses on El Paso County hazards of concern.
- Create a single planning document that integrates all planning partners into a framework that supports partnerships within the County, and puts all partners on the same planning cycle for future updates.
- Meet the planning requirements of FEMA’s Community Rating System (CRS), allowing planning partners that participate in the CRS program to maintain or enhance their CRS classifications.
- Coordinate existing plans and programs so that high-priority initiatives and projects to mitigate possible disaster impacts are funded and implemented.

1.2 WHO WILL BENEFIT FROM THIS PLAN?

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

1.3 ELEMENTS OF THIS PLAN

This plan includes all federally required elements of a disaster mitigation plan:

- Countywide elements:
 - A description of the planning process
 - The public involvement strategy
 - A list of goals and objectives
 - A countywide hazard risk assessment
 - Countywide mitigation initiatives
 - A plan maintenance strategy.
- Jurisdiction-specific elements for each participating jurisdiction, including a description of the participation requirements established by the Steering Committee

The following appendices include information or explanations to support the main content of the plan:

- Appendix A—A glossary of acronyms and definitions
- Appendix B—Public outreach information, including the hazard mitigation questionnaire and summary and documentation of public meetings
- Appendix C—A menu of mitigation alternatives reviewed for this plan
- Appendix D—Worksheets for each recommended mitigation initiative
- Appendix E—Plan adoption resolutions from planning partners
- Appendix F—A template for progress reports to be completed as this plan is implemented

All planning partners will adopt the plan in its entirety.

CHAPTER 2. PLAN UPDATE—WHAT HAS CHANGED

2.1 THE PREVIOUS PLAN

El Paso County and six of its municipalities prepared the *El Paso County Pre-Disaster Mitigation Plan* in 2008. The plan identified and investigated 14 hazards. Of these hazards, six were identified as posing high enough risk to warrant mitigation initiatives: wildfire; hazardous material spills; severe weather; disease outbreak; rockslides or landslides; and school violence.

The plan identified seven goals for mitigating the identified high-risk hazards, with one or more specific objectives defined for each goal. The plan then identified one or more mitigation initiatives to accomplish each objective. These actions constitute the action plan from the 2008 document. The following goals, objectives, and actions were identified in the 2008 plan:

- Goal: Reduce the probability and effect of a catastrophic wild land fire (WLF)
 - Objective: Identify those areas of the County that require WLF fuels mitigation efforts and establish programs to reduce fuel loading in those areas.
 - Action 1.1: Identify those areas of the county that pose significant threat of a WLF to residents due to lack of forest mitigation.
 - Action 1.2: Conduct forest mitigation procedures to reduce the amount of fuel loading especially in areas that have a high residential population.
 - Action 1.3: Increase the number of Fire Wise Communities in the County.
 - Action 1.4: Establish and fund a County Mitigation Officer.
 - Objective: Improve the ability of First Responders to reach WLF and improve their ability to fight the fire.
 - Action 2.1: Improve rural roads to ensure that emergency vehicles can provide a quick response to keep WLFs small.
 - Action 2.2: Identify those areas that require the installation of cisterns or hydrants to assist in providing water to the fire fighters.
 - Action 2.3: Ensure that a County WLF emergency plan is written, approved and exercised to allow for a coordinated effort to fight a large WLF.
 - Action 2.4: Establish a large scale evacuation plan of the wildland urban interface (WUI) including a mass sheltering plan for such an incident.
 - Objective: Improve the ability of residents to prevent fires.
 - Action 3.1: Provide for public education forums to teach residents how to build “eye-pleasing” defensible space into their property.
 - Action 3.2: Provide for a public wood chipping program that allows residents to clear away trees and brush on private property.
- Goal: Reduce the probability of a HAZMAT release and reduce the impact to residents should a release take place.
 - Objective 1: Identify and characterize the facilities and roads utilized for HAZMAT transportation and storage to ensure quick and safe response actions.
 - Action 4.1: Conduct a HAZMAT Flow Study.
 - Action 4.2: Hire an additional HAZMAT technician that can be dedicated to Tier II inspections and courtesy surveys for Tier II facilities and to maintain emergency plans for HAZMAT spills.

- Objective 2: Provide for improved response by the public in case of a HAZMAT release.
 - Action 5.1: Expand the current public education programs to include HAZMAT awareness and Shelter-In-Place (SIP) procedures.
 - Action 5.2: Increase the ability to contact residents in case of a HAZMAT spill to provide emergency information to residents to SIP or evacuate.
 - Action 5.3: Develop an evaluation plan that includes a means to notify and evacuate homeless people that reside in areas that could have a HAZMAT spill. This is especially critical along railroad tracks and near major bridges.
 - Goal: Minimize the impact of severe weather to County residents.
 - Objective 1: Upgrade and expand the flood warning system within the County to include new residential areas that are in a designated drainage basin.
 - Action 6.1: Develop a strategic plan for the flood warning system.
 - Action 6.2: Repair, reposition, and upgrade the existing flood warning system.
 - Action 6.3: Identify those drainage basins that require installation of a flood warning system sensor.
 - Objective 2: Reduce the effects of flooding and its impact on residents, businesses, agriculture, infrastructure, and natural areas.
 - Action 7.1: Develop a Strategic Plan for the Fountain Creek Watershed. (<http://www.fountain-crk.org/>)
 - Action 7.2: Develop projects and policies that support the recommendations of the Army Corps of Engineer Watershed Study.
 - Action 7.3: Develop future policies that encourage low impact development and will minimize the amount of flooding, erosion and sedimentation problems.
 - Action 7.4: Fund a buy-out program for those structures that are in the floodplain beginning with those that are repetitive damage structures.
 - Action 7.5: Re-evaluate the 100-year FEMA floodplain of Fountain Creek, Monument Creek, and the major tributaries.
 - Action 7.6: Continue to provide a public education program to inform residents about mitigation measures and means for them to protect themselves and their property during a flood.
 - Objective 3: Improve tornado warning in rural areas of the county especially in highly tornado-prone areas.
 - Action 8.1: Expand tornado warning system to include rural communities not currently possessing a tornado siren system including new residential areas.
 - Objective 4: Improve the traffic control on rural roads that are subject to snow drifting and white-out driving conditions.
 - Action 9.1: Identify hazard areas in the county.
 - Action 9.2: Insure that critical roads/emergency routes are identified to El Paso County DOT and CDOT to insure they remain clear during snow conditions.
 - Action 9.3: Maintain sufficient snowplows and drivers to support severe snow conditions in the county.
 - Goal: Reduce the rockslide/mudslide occurrences and impact potential to residents and their property.
 - Objective 1: Identify, characterize mudslide/landslide prone areas and mitigate effects to residents.
-

- Action 10.1: Identify areas that are prone to mudslides/landslides.
 - Action 10.2: Stabilize or remove rocks that pose a hazard.
 - Action 10.3: Ensure that areas that have suffered from a Wildland Fire are properly reseeded and maintained to avoid slides.
- Goal: Reduce the potential and impact of a severe act of violence in County schools or on school buses.
 - Objective 1: Reduce the ability of unauthorized persons to access schools and cause a severe act of violence in County schools.
 - Action 11.1: Conduct a risk assessment of schools in the County.
 - Action 11.2: Install access control and monitoring capabilities in schools.
 - Action 11.3: Fund for School Resource Officers (SRO) in each school in the county.
 - Objective 2: Improve the ability to locate school buses and provide for a quick response for emergencies.
 - Action 12.1: Install GPS trackers in school buses.
 - Action 12.2: Provide education programs for bus drivers to improve their ability to act and react during emergencies.
 - Objective 3: Improve First Responders' ability to respond to school emergencies. This includes the designing of new buildings to support response operations.
 - Action 13.1: Ensure that each school has emergency procedures and plans in place for severe acts of violence.
 - Action 13.2: Ensure that school plans are coordinated with local police and Sheriff's Office to ensure that the plan is supportable by local SWAT/Tactical units.
 - Action 13.3: Ensure that new construction is designed to support First Responders' ability to access and support response to a severe act of violence.
 - Action 13.4: Maintain an updated plan for responding to Extreme Acts of Violence in schools. This includes active shooter, hostage, and intentional release of a Toxic Industrial Chemical (TIC). Exercise the plan annually.
 - Action 13.5: Ensure that First Responders are trained in up-to-date Tactics, Techniques, and Procedures (TTPs) for responding to Extreme Acts of Violence including active shooter, hostage, and the intentional release of a TIC as a minimum.
 - Objective 4: Improve the ability of teachers and school staff to act and react to acts of violence.
 - Action 14.1: Ensure that school personnel are trained in how to respond to acts of violence in their school.
 - Action 14.2: Ensure that schools have equipment and supplies on hand to support procedures in case of an act of violence.
 - Action 14.3: Establish a means for law enforcement and all school districts to share information on a routine as well as emergent basis.
- Goal: Reduce disease outbreak occurrences and severity in the County
 - Objective 1: Provide for public education to increase awareness on how to prevent or minimize disease outbreak.
 - Action 15.1: Enhance awareness and preparedness of residents through a public education program.

- Action 15.2: Allow for residents to participate in County exercises, where applicable, to educate residents and to provide residents with the knowledge of county readiness.
- Objective 2: Improve the County’s ability to respond to a potential or actual disease outbreak.
 - Action 16.1: Ensure emergency plans are approved and exercised to ensure a coordinated effort to protect residents from a disease outbreak. Plans should include Points of Distribution and medical surge capability/capacity as a minimum.
 - Action 16.2: Provide for education of First Responders to minimize the effects of disease on them and their families.
 - Action 16.3: Identify critical functions within the county and ensure that sufficient trained personnel are available to support these functions. This includes a Continuity of Operations Plan (COOP) for government officials as well as sufficient personnel to maintain public utilities, law and order, safety and critical medical support.
- Goal: Insure continuity of critical services in the County
 - Objective: Protect critical infrastructure from all hazards.
 - Action 17.1: Develop plans to protect critical infrastructure at risk from WLF.
 - Action 17.2: Partner with local businesses, Chamber of Commerce, Non-Governmental Organizations (NGOs) that provide critical services to residents to insure continuity of services and a coordinated response..

The current status of each of the actions identified in the 2008 plan is shown on Table 2-1.

**TABLE 2-1.
EL PASO COUNTY PROJECT IMPLEMENTATION WORKSHEET (UPDATE OF 2008 PLAN PROJECTS)**

Action No.	Action	Project Status				Funding				Comments
		Ongoing	Delayed	Completed	Deleted	Budgeted	Apply for Grant	Grant Received	Target Completion	
1.1	Identify those areas of the county that pose significant threat of a WLF to residents due to lack of forest mitigation. (EPC Sheriff)			x					x	
1.2	Conduct forest mitigation procedures to reduce the amount of fuel loading especially in areas that have a high residential population. (EPC Sheriff)	x								
1.3	Increase the number of Fire Wise Communities in the County. (EPC OEM)	x								Working in the Monument and Green Mountain Falls areas
1.4	Establish and fund a County Mitigation Officer. (EPC OEM)	x							x	Waldo Canyon Fire mitigation team
2.1	Improve rural roads to ensure that Emergency vehicles can provide a quick response to keep WLFs small. (EPC DOT)	x					x			Roads are being looked at in the Broadmoor area and in Woodman Valley
2.2	Identify those areas that require the installation of cisterns or hydrants to assist in providing water to the fire fighters. (EPC Sheriff)		x							Some have been identified in the Black Forest area
2.3	Ensure that a County WLF emergency plan is written, approved and exercised to allow for a coordinated effort to fight a large WLF. (EPC Sheriff)			x					x	
2.4	Establish a large scale evacuation plan of the WUI including a mass sheltering plan for such an incident. (EPC OEM)			x					x	Mass Care Sheltering plan and MOU were established and signed
3.1	Provide for public education forums to teach residents how to build "eye-pleasing" defensible space into their property. (EPC Sheriff/EPC OEM/PPWWP)	x								

**TABLE 2-1.
EL PASO COUNTY PROJECT IMPLEMENTATION WORKSHEET (UPDATE OF 2008 PLAN PROJECTS)**

Action No.	Action	Project Status				Funding			Comments	
		Ongoing	Delayed	Completed	Deleted	Budgeted	Apply for Grant	Grant Received		Target Completion
3.2	Provide for a public wood chipping program that allows residents to clear away trees and brush on private property. (EPC OEM/PPWWP)	x						x		This is being done in the Black Forest area
4.1	Conduct a HAZMAT Flow Study. (EPC OEM)		x							
4.2	Hire an additional HAZMAT Technician that can be dedicated to Tier II inspections and courtesy surveys for Tier II facilities and to maintain emergency plans for HAZMAT spills. (EPC OEM)			x					x	1A funding allowed for this completion
5.1	Expand the current public education programs to include HAZMAT awareness and Shelter-In-Place (SIP) procedures. (EPC OEM)	x				x				After the Flash Flooding and Wildfire priorities are met
5.2	Increase the ability to contact residents in case of a HAZMAT spill to provide emergency information to residents to SIP or evacuate. (EPC OEM)	x				x				E911 and notification system in place
5.3	Develop an evaluation plan that includes a means to notify and evacuate homeless people that reside in areas that could have a HAZMAT spill. This is especially critical along railroad tracks and near major bridges. (EPC OEM)				x				x	Deputies are aware of the homeless populace along the creeks during flooding, this can be extended to the railroads
6.1	Develop a strategic plan for the flood warning system. (El Paso County (EPC) Department of Transportation (DOT) and Office of Emergency Management OEM)	x								A Flash Flood Plan has been established and reviewed by all applicable parties but not yet finalized
6.2	Repair, reposition, and upgrade the existing flood warning system. (EPC DOT and OEM)	x								Sirens are tested and repaired. Additional have been installed by Manitou Springs. E911 has been updated
6.3	Identify those drainage basins that require installation of a flood warning system sensor. (EPC DOT and OEM)	x								Several projects are underway that include applying sensors to drainage basins

**TABLE 2-1.
EL PASO COUNTY PROJECT IMPLEMENTATION WORKSHEET (UPDATE OF 2008 PLAN PROJECTS)**

Action No.	Action	Project Status				Funding			Comments
		Ongoing	Delayed	Completed	Deleted	Budgeted	Apply for Grant	Grant Received	
7.1	Develop a Strategic Plan for the Fountain Creek Watershed. (FCW TAC and Vision Task Force) (http://www.fountain-crk.org/)		x						Pending completion of projects
7.2	Develop projects and policies that support the recommendations of the Army Corps of Engineer Watershed Study. (FCW TAC and Vision TF)		x						
7.3	Develop future policies that encourage low impact development and will minimize the amount of flooding, erosion and sedimentation problems. (FCW Vision TF)	x				x			
7.4	Fund a buy-out program for those structures that are in the floodplain beginning with those that are repetitive damage structures. (Floodplain Manager and EPC OEM)			x					x Three houses were identified and purchased using the HMGP grant funding to relocate those residents
7.5	Re-evaluate the 100-year FEMA floodplain of Fountain Creek, Monument Creek, and the major tributaries. (EPC Floodplain Manager)		x			x			Due to flooding, this needs to be updated.
7.6	Continue to provide a public education program to inform residents about mitigation measures and means for them to protect themselves and their property during a flood. (EPC OEM/Floodplain Manager)	x				x			These have taken place in the form of Townhall meetings.
8.1	Expand tornado warning system to include rural communities not currently possessing a tornado siren system including new residential areas. (EPC OEM)	x					x		Bring this forward
9.1	Identify hazard (traffic control) areas in the county. (EPC DOT)				x				x
9.2	Insure that critical roads/emergency routes are identified to El Paso County DoT and CDOT to insure they remain clear during snow conditions. (EPC DOT)	x				x			Bring this forward

**TABLE 2-1.
EL PASO COUNTY PROJECT IMPLEMENTATION WORKSHEET (UPDATE OF 2008 PLAN PROJECTS)**

Action No.	Action	Project Status				Funding				Comments
		Ongoing	Delayed	Completed	Deleted	Budgeted	Apply for Grant	Grant Received	Target Completion	
9.3	Maintain sufficient snowplows and drivers to support severe snow conditions in the county. (EPC DOT)	x				x				This is always an issue
10.1	Identify areas that are prone to mudslides/landslides. (EPC DOT)			x					x	Highway 24 by The Cave of the Winds, Highway 24 & Topeka Avenue in Cascade
10.2	Stabilize or remove rocks that pose a hazard. (EPC DOT)	x				x				ongoing
10.3	Ensure that areas that have suffered from a Wildland Fire are properly reseeded and maintained to avoid slides. (EPC OEM)		x			x	x			In partnering with the United States Forest Service this has been accomplished for Waldo and Black Forest
11.1	Conduct a risk assessment of schools in the County. (School Districts/EPC OEM)			x	x					ongoing/modify - Updated Hazard Vulnerability Analysis completed for PDMP
11.2	Install access control and monitoring capabilities in schools. (School Districts)	x			x					ongoing - This Hazard was not rated High/Medium for 2014
11.3	Fund for School Resource Officers (SRO) in each school in the county. (EPC Sheriff)		x		x					
12.1	Install GPS trackers in school buses. (School Districts)				x					
12.2	Provide education programs for bus drivers to improve their ability to act and react during emergencies. (School Districts)		x		x					
13.1	Ensure that each school has emergency procedures and plans in place for severe acts of violence. (School Districts/EPC OEM)	x			x					
13.2	Ensure that school plans are coordinated with local police and Sheriff's Office to ensure that the plan is supportable by local SWAT/Tactical units. (School Districts/EPC OEM)	x			x					Schools coordinate with local law enforcement for training

**TABLE 2-1.
EL PASO COUNTY PROJECT IMPLEMENTATION WORKSHEET (UPDATE OF 2008 PLAN PROJECTS)**

Action No.	Action	Project Status				Funding				Comments
		Ongoing	Delayed	Completed	Deleted	Budgeted	Apply for Grant	Grant Received	Target Completion	
13.3	Ensure that new construction is designed to support First Responders' ability to access and support response to a severe act of violence. (School Districts)	x			x					Floor plans forwarded to local law enforcement
13.4	Maintain an updated plan for responding to Extreme Acts of Violence in schools. This includes active shooter, hostage, and intentional release of a Toxic Industrial Chemical (TIC). Exercise the plan annually. (EPC Sheriff and EPC OEM)		x		x					A school exercise maybe valuable in the future
13.5	Ensure that First Responders are trained in up-to-date Tactics, Techniques, and Procedures (TTPs) for responding to Extreme Acts of Violence including active shooter, hostage, and the intentional release of a TIC as a minimum. (EPC Sheriff/EPC OEM)	x			x					
14.1	Ensure that school personnel are trained in how to respond to acts of violence in their school. (School Districts)			x	x					
14.2	Ensure that schools have equipment and supplies on hand to support procedures in case of an act of violence. (School Districts)	x			x					
14.3	Establish a means for law enforcement and all school districts to share information on a routine as well as emergent basis. (EPC Sheriff)			x	x					
15.1	Enhance awareness and preparedness of residents through a public education program. (EPC Department of Health (DoH))	x				x		x		ongoing/modified - expanding to all-hazards
15.2	Allow for residents to participate in County exercises, where applicable, to educate residents and to provide residents with the knowledge of county readiness. (EPC OEM/DoH)	x				x		x		Use of volunteers in exercises is now commonplace throughout the county

**TABLE 2-1.
EL PASO COUNTY PROJECT IMPLEMENTATION WORKSHEET (UPDATE OF 2008 PLAN PROJECTS)**

Action No.	Action	Project Status				Funding				Comments
		Ongoing	Delayed	Completed	Deleted	Budgeted	Apply for Grant	Grant Received	Target Completion	
16.1	Ensure emergency plans are approved and exercised to ensure a coordinated effort to protect residents from a disease outbreak. Plans should include Points of Distribution and medical surge capability/capacity as a minimum. (EPC DoH)	x								This will be need to be reviewed and updated.
16.2	Provide for education of First Responders to minimize the effects of disease on them and their families. (EPC DoH)	x								Bring this forward
16.3	Identify critical functions within the county and ensure that sufficient trained personnel are available to support these functions. This includes a Continuity of Operations Plan (COOP) for government officials as well as sufficient personnel to maintain public utilities, law and order, safety and critical medical support. (EPC OEM)		x			x				ongoing/modified - COOP training on electronic system has been completed with additional training on responsibilities and methodology scheduled in 2014
17.1	Develop plans to protect Critical Infrastructure at risk from Wildland Fire. (EPC Sheriff)	x								ongoing/modified - expanding to all-hazards
17.2	Partner with local businesses, Chamber of Commerce, Non-Governmental Organizations (NGOs) that provide critical services to residents to insure continuity of services and a coordinated response. (EPC OEM)	x								ongoing

2.2 WHY UPDATE?

Title 44 of the Code of Federal Regulations (44 CFR) stipulates that hazard mitigation plans must present a schedule for monitoring, evaluating, and updating the plan. This provides an opportunity to reevaluate recommendations, monitor the impacts of actions that have been accomplished, and determine if there is a need to change the focus of mitigation strategies. A jurisdiction covered by a plan that has expired is not able to pursue elements of federal funding under the Robert T. Stafford Act for which a current hazard mitigation plan is a prerequisite.

2.3 THE UPDATED PLAN—WHAT IS DIFFERENT?

The previous regional plan has been improved for El Paso County using the best and most current data and technology available. All participating municipalities were fully involved in the preparation of the plan. The updated plan includes a more robust hazard analysis. Mitigation initiatives were reviewed and amended to only include those that would move the community toward a higher degree of resiliency while being feasible, practical and implementable given current finances. Federal and state funds for projects have become difficult to obtain. The update recommends 85 mitigation initiatives:

- 32 Countywide initiatives
- 6 initiatives specifically for Calhan/Ramah
- 6 initiatives specifically for Green Mountain Falls
- 17 initiatives specifically for Fountain
- 8 initiatives specifically for Manitou Springs
- 9 initiatives specifically for Monument
- 7 initiatives specifically for Palmer Lake.

2.4 LOCAL MITIGATION PLAN REVIEW TOOL

The *Local Mitigation Plan Review Tool* demonstrates how the Local Mitigation Plan meets the regulation in 44 CFR §201.6 and offers States and FEMA Mitigation Planners an opportunity to provide feedback to the community.

- The Regulation Checklist provides a summary of FEMA’s evaluation of whether the Plan has addressed all requirements.
- The Plan Assessment identifies the plan’s strengths as well as documents areas for future improvement.
- The Multi-jurisdiction Summary Sheet is an optional worksheet that can be used to document how each jurisdiction met the requirements of the each Element of the Plan (Planning Process; Hazard Identification and Risk Assessment; Mitigation Strategy; Plan Review, Evaluation, and Implementation; and Plan Adoption).

The FEMA Mitigation Planner must reference this *Local Mitigation Plan Review Guide* when completing the *Local Mitigation Plan Review Tool*.

Jurisdiction: El Paso County	Title of Plan: El Paso Hazard Mitigation Plan Update	Date of Plan: December 2014
Local Point of Contact: El Paso	Address: 3755 Mark Dabling Blvd. Colorado Springs, CO 80907	
Title: Emergency Preparedness Planner		
Agency: Public Services Department Office of Emergency Management		
Phone Number: (719) 575-8400	E-Mail: lonnieinzer@elpasoco.com	

State Reviewer: Patricia L. Gavelda	Title: Colorado DHSEM - Local Mitigation Planning Program Manager	Date: March 25, 2015
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FEMA Reviewer:	Date:	Name/Title:
Date Received in FEMA Region VIII	May, 2015 Patricia Gavelda to FEMA	
Plan Not Approved		
Plan Approvable Pending Adoption	5/22/2015 per Patricia Gavelda, Colorado Mitigation Planning Manager and Margaret Doherty, FEMA Region VIII Mitigation	
Plan Approved		

**SECTION 1:
MULTI-JURISDICTION SUMMARY SHEET**

#	Jurisdiction Name	Jurisdiction Type	Jurisdiction Contact	Email	Requirements Met (Y/N)				
					A. Planning Process	B. HIRA	C. Mitigation Strategy	D. Update Rqmts.	E. Adoption Resolution
1	El Paso County	County	Lonnie Inzer (2015)	lonnieinzer@elpasoco.com	See Tables 3-1 & 3.2 (p.3-1 to 3-3) and Table 3-3 (p.3-11 to 3-12 and Appendix B (p. B-1 to B-2)				
2	Town of Calhan	Town	Cindy Tompkins	calhanclerk@qwestoffice.net					
3	City of Fountain	City	Luchia Tingley	ltingley@fountaincolorado.org					
4	Town of Green Mountain Falls	City	Lorrie Worthey	gmfmayor@gmail.com					

#	Jurisdiction Name	Jurisdiction Type	Jurisdiction Contact	Email	Requirements Met (Y/N)				
					A. Planning Process	B. HIRA	C. Mitigation Strategy	D. Update Rqmts.	E. Adoption Resolution
5	City of Manitou Springs	City	Joe Ribeiro	jribeiro@comsgov.com	See Tables 3-1 & 3.2 (p.3-1 to 3-3) and Table 3-3 (p.3-11 to 3-12 and Appendix B (p. B-1 to B-2))				
6	Town of Monument	Town	Cynthia Sirochman	csirochman@townofmonument.net					
7	Town of Palmer Lake	Town	Tera Berreth	judithreginaharrington@gmail.com tara@palmerlake.org					
8	Town of Ramah	Town	Cindy Tompkins	calhandclerk@qwestoffice.net					

**SECTION 2:
REGULATION CHECKLIST**

REGULATION CHECKLIST		Location in Plan (section and/or page number)	Met	Not Met
Regulation (44 CFR 201.6 Local Mitigation Plans)				
ELEMENT A. PLANNING PROCESS				
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))	Part 1 in its entirety.		X	
A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2))	Chapter 3, section 3.2-3.5		X	
A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))	Chapter3, section 3.7		X	
A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))	Chapter 3, section 3.6.		X	
A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))	Chapter 29, Section 29.4.5		X	
A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))	Chapter 29, Section 29.4.3		X	
ELEMENT A: REQUIRED REVISIONS				
ELEMENT B. HAZARD IDENTIFICATION AND RISK ASSESSMENT				
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? (Requirement §201.6(c)(2)(i))	Part 2, Chapters 8-260 Section 2 - for hazard profile and location discussion		X	
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))	Part 2, Chapters 8-26 Section 6.1 and 6.2 - for hazard past events and frequency discussion		X	
B3. Is there a description of each identified hazard’s impact on the community as well as an overall summary of the community’s vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))	Part 2, section 2 of Chapters 8 to 26		X	
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))	Part 2, Chapter 13, Section 13.1.6		X	

REGULATION CHECKLIST		Location in Plan (section and/or page number)	Met	Not Met
Regulation (44 CFR 201.6 Local Mitigation Plans)				
ELEMENT B: REQUIRED REVISIONS				
<i>Plan describes B1 through B3 as a whole via El Paso County; unknown if this approach fulfills B1 through B3 FEMA requirement of descriptions for “each (participating) jurisdiction.”</i>				
ELEMENT C. MITIGATION STRATEGY				
C1. Does the plan document each jurisdiction’s existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))	Part 2, Chapter 6 Section 6.9	X		
C2. Does the Plan address each jurisdiction’s participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii))	Chapter 13, Section 13.6.2 (Table 13-16)	X		
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))	Part 1 Chapter 4	X		
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))	Part 3, Chapter 29. See also Tables ES-1	X		
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))	Part 3, Chapter 29, sections 29.1-29.2	X		
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))	Part 3, Chapter 29, Section 29.4.6	X		
ELEMENT C: REQUIRED REVISIONS				
ELEMENT D. PLAN REVIEW, EVALUATION, AND IMPLEMENTATION (applicable to plan updates only)				
D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))	Part 2 , Sections 8.7,9.6,10.7, 11.7, 12.7, 13.7, 14.7, 15.7, 16.7, 17.6.5, 18.8, 19.7, 20.7, 21.6, 22.7, 23.7, 26.7	X		
D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3))	Part 3, Chapter 20 Table	X		
D3. Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))	Part 3, Chapter 20 Table	X		
ELEMENT D: REQUIRED REVISIONS				
ELEMENT E. PLAN ADOPTION				

REGULATION CHECKLIST		Location in Plan (section and/or page number)	Met	Not Met
Regulation (44 CFR 201.6 Local Mitigation Plans)				
<i>E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement §201.6(c)(5))</i>	Pre-adoption review. Documentation to be provided upon issuance of pre-adoption approval by CDEM and FEMA region VIII	x		
<i>E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))</i>	Pre-adoption review. Documentation to be provided upon issuance of pre-adoption approval by CDEM and FEMA region VIII	x		
<u>ELEMENT E: REQUIRED REVISIONS</u>				
ELEMENT F. ADDITIONAL STATE REQUIREMENTS (OPTIONAL FOR STATE REVIEWERS ONLY; NOT TO BE COMPLETED BY FEMA)				
<i>F1.</i>				
<i>F2.</i>				
<u>ELEMENT F: REQUIRED REVISIONS</u>				

**SECTION 3:
PLAN ASSESSMENT**

A. Plan Strengths and Opportunities for Improvement

This section provides a discussion of the strengths of the plan document and identifies areas where these could be improved beyond minimum requirements.

Element A: Planning Process

Element B: Hazard Identification and Risk Assessment

Element C: Mitigation Strategy

Element D: Plan Review, Evaluation, and Implementation (Plan Updates Only)

B. Resources for Implementing Your Approved Plan

CHAPTER 3. PLAN METHODOLOGY

3.1 GRANT FUNDING

This planning effort was supplemented by a grant from the Colorado Division of Homeland Security and Emergency Management. El Paso County was the applicant agent for the grant. The grant was applied for and funding was appropriated in March 2014. It covered 75 percent of the cost for development of this plan; El Paso County Commissioners covered the balance. El Paso County hired Tetra Tech, Inc. to assist with development and implementation of the plan. The Tetra Tech project manager assumed the role of the lead planner, reporting directly to the County-designated project manager. In 2015 the Office of Emergency Management was moved under the Public Services Department and in 2015 Lonnie Inzer became the El Paso County project manager.

3.2 ESTABLISHMENT OF THE PLANNING PARTNERSHIP

El Paso County opened this planning effort to all eligible local governments in the County. The planning partners covered under this plan are shown in Table 3-1.

TABLE 3-1. COUNTY AND CITY PLANNING PARTNERS		
Jurisdiction	Point of Contact	Title
El Paso County	Lonnie Inzer (2015)	Emergency Preparedness Planner
Town of Calhan	Cindy Tompkins	Town Clerk
City of Fountain	Luchia Tingley	Emergency Manager
Town of Green Mountain Falls	Lorrie Worthey	Mayor
City of Manitou Springs	Joe Ribeiro	Police Chief
Town of Monument	Cynthia Sirochman	Town Clerk
Town of Palmer Lake	Tera Berreth	Town Clerk
Town of Ramah	Cindy Tompkins	Town Clerk

Each jurisdiction wishing to join the planning partnership was asked to commit to the process and have a clear understanding of expectations. These include:

- Each partner will support and participate in the meetings of the Steering Committee overseeing the development of the update. Support includes allowing this body to make decisions regarding plan development and scope on behalf of the partnership.
- Each partner will provide support as needed for the public involvement strategy developed by the Steering Committee in the form of mailing lists, possible meeting space, and media outreach such as newsletters, newspapers or direct-mailed brochures.
- Each partner will participate in plan update development activities such as:
 - Steering Committee meetings
 - Public meetings or open houses
 - Workshops and planning partner training sessions
 - Public review and comment periods prior to adoption.

Attendance will be tracked at such activities, and attendance records will be used to track and document participation for each planning partner. All participating communities are expected to attend and actively participate in all meetings.

- Each partner will be expected to review the risk assessment and identify hazards and vulnerabilities specific to its jurisdiction. Contract resources will provide jurisdiction-specific mapping and technical consultation to aid in this task, but the determination of risk and vulnerability will be up to each partner.
- Each partner will be expected to review the mitigation recommendations chosen for the overall county and determine if they will meet the needs of its jurisdiction. Projects within each jurisdiction consistent with the overall plan recommendations will need to be identified, prioritized, and reviewed to determine their benefits and costs.
- Each partner will sponsor at least one public meeting to present the draft plan at least two weeks prior to adoption.
- Each partner will be required to formally adopt the plan.
- Each partner agrees to the plan implementation and maintenance protocol.

3.3 DEFINING THE PLANNING AREA

The planning area was defined to consist of all of El Paso County. All partners to this plan have jurisdictional authority within this planning area. It should be noted that Colorado Springs has developed its own freestanding Hazard Mitigation Plan.

3.4 THE STEERING COMMITTEE

Hazard mitigation planning enhances collaboration and support among diverse parties whose interests can be affected by hazard losses. A steering committee was formed to oversee all phases of the plan. The members of this committee included key planning partner staff, citizens, and other stakeholders from within the planning area. Table 3-2 lists the committee members.

Name	Title	Jurisdiction/Agency
Peggy Littleton	County Commissioner	El Paso County
Sally Clark	County Commissioner	El Paso County
Lizbeth Jordan	Emergency Manager	El Paso County
Mark Boley	Emergency Preparedness Program Specialist	El Paso County
Jim Reid	Exec. Dir. of Public Services	El Paso County
R.C. Smith	Fire Recovery Manager	El Paso County
Cindy Tompkins	Town Clerk	Calhan/Ramah
Tobi Blanchard	Emergency Management Coordinator	Colorado Springs
Ken Hughlett	Senior Emergency Management Specialist	Colorado Springs Utilities
Luchia Tingley and/or Mark Stanwood	Emergency Manager/Assistant Emergency Manager	Fountain
Lorrie Worthey	Mayor	Green Mountain Falls
Joe Ribeiro	Police Chief	Manitou Springs

**TABLE 3-2.
STEERING COMMITTEE MEMBERS**

Name	Title	Jurisdiction/Agency
Cynthia Sirochman	Town Clerk	Monument
Tera Berreth	Town Clerk	Palmer Lake

The Steering Committee agreed to meet a three times or as needed throughout the course of the plan’s development. The consultant and El Paso County Emergency Preparedness Program Specialist facilitated each Steering Committee meeting, which addressed a set of objectives based on the work plan established for the plan. The Steering Committee met in March, May, and July, 2014. Meeting agendas, notes and attendance logs can be found in Appendix B of this document. All Steering Committee meetings were open to the public and the meeting times and locations were posted to the County website and at Centennial Hall.

The planning team made a presentation at a Steering Committee meeting on March 27, 2014 to introduce the mitigation planning process. The Steering Committee, planning partners and public all were encouraged to participate in the plan update process. Key meeting objectives were as follows:

- Provide an overview of the Disaster Mitigation Act.
- Describe the reasons for a plan.
- Outline the County work plan.
- Outline planning partner expectations.
- Seek commitment to the planning partnership.
- Affirm expectations for the Steering Committee.

3.5 COORDINATION WITH OTHER AGENCIES

Opportunities for involvement in the planning process must be provided to neighboring communities, local and regional agencies involved in hazard mitigation, agencies with authority to regulate development, businesses, academia, and other private and nonprofit interests (44 CFR, Section 201.6(b)(2)). This task was accomplished by the planning team as follows:

- **Steering Committee Involvement**—Agency representatives were invited to participate on the Steering Committee.
- **Agency Notification**—The following agencies were invited to participate in the plan development process from the beginning and were kept apprised of plan development milestones:
 - State of Colorado Office of Emergency Management
 - El Paso County Departments
 - BNSF Railroad
 - Colorado Army National Guard
 - Colorado Springs Airport (COS) Operations
 - NOAA/National Weather Service
 - Rural School District Board of Superintendents
 - Chamber of Commerce

- Military Base representative(s)

These agencies received meeting announcements, meeting agendas, and meeting minutes by e-mail throughout the plan development process. These agencies supported the effort by attending meetings or providing feedback on issues.

- **Pre-Adoption Review**—All the agencies listed above were provided an opportunity to review and comment on this plan, primarily through the hazard mitigation plan website (see Section 3.7). Each agency was sent an e-mail message informing them that draft portions of the plan were available for review. In addition, the complete draft plan was sent to the State of Colorado for a pre-adoption review to ensure program compliance.

3.6 REVIEW OF EXISTING PROGRAMS

Hazard mitigation planning must include review and incorporation, if appropriate, of existing plans, studies, reports, and technical information (44 CFR, Section 201.6(b)(3)). Chapter 6 of this plan provides a review of laws and ordinances in effect within the planning area that can affect hazard mitigation initiatives. In addition, the following departments, programs, and documents can affect mitigation within the planning area:

- Pikes Peak Area Council of Governments
- El Paso County Strategic Plan, 2012
- El Paso County Master Plan
- El Paso County Development Services Department
 - El Paso County Planning Commission
 - El Paso County Land Development Code (Zoning), 2007
 - Code Enforcement
- El Paso County Community Services Department
- El Paso County Community Wildfire Protection Plan, 2011
- El Paso County Wildfire Preparedness Plan, 2014
- El Paso County Sheriff's Office, Emergency Management Division
 - Emergency Operations Plan, 2009
 - Local Emergency Planning Committee
- El Paso County Public Health
- Colorado Voluntary Organizations Active in Disaster

An assessment of all planning partners' regulatory, technical and financial capabilities to implement hazard mitigation initiatives is presented in Chapter 7. Many of these relevant plans, studies and regulations are cited in the capability assessment.

3.7 PUBLIC INVOLVEMENT

Broad public participation in the planning process helps ensure that diverse points of view about the planning area's needs are considered and addressed. The public must have opportunities to comment on disaster mitigation plans during the drafting stages and prior to plan approval (44 CFR, Section 201.6(b)(1)). The Community Rating System expands on these requirements by making CRS credits available for optional public involvement activities. The strategy for involving the public in this plan emphasized the following elements:

- Include members of the public on the Steering Committee.
- Use a questionnaire to determine if the public's perception of risk and support of hazard mitigation has changed since the initial planning process.
- Attempt to reach as many planning area citizens as possible using multiple media.
- Identify and involve planning area stakeholders.

3.7.1 Stakeholders and the Steering Committee

Stakeholders are the individuals, agencies and jurisdictions that have a vested interest in the recommendations of the hazard mitigation plan, including planning partners. The effort to include stakeholders in this process included stakeholder participation on the Steering Committee. Stakeholders were encouraged to attend and participate in all committee meetings.

3.7.2 Questionnaire

A hazard mitigation plan questionnaire (see Figure 3-1) was developed to gauge household preparedness for natural hazards and the level of knowledge of tools and techniques that assist in reducing risk and loss from natural hazards as well as to assess the perceived impact of natural hazards on El Paso County residents and businesses. This on-line questionnaire was designed to help identify areas vulnerable to one or more natural hazards. The answers to its questions helped guide the Steering Committee in prioritizing hazards of impact and in selecting goals, objectives and mitigation strategies. Seventy three questionnaires were completed during the course of this planning process. The complete questionnaire and a summary of its findings can be found in Appendix B.

The image shows a survey page for El Paso County. At the top left is the El Paso County logo, which features a mountain, a river, and a sun, with the text 'EL PASO COUNTY COLORADO' and 'EST. 1861'. To the right of the logo is the title 'Hazards in El Paso County' in a large, bold, blue font. Below the title is a dark blue banner with white text that reads 'We need your help to update the Pre-Disaster Mitigation Plan'. The main body of the page contains the following text: 'El Paso County is working with 23 local governments to update and improve the El Paso County Pre-Disaster Mitigation Plan (PDMP). By updating this plan, participating communities can help reduce their risks from natural or human-caused hazards, and maintain their eligibility for certain types of federal disaster mitigation grants.' This is followed by 'Please tell us how different hazards affect you, and what hazards pose the greatest risk to you.' and 'This short survey should take less than 15 minutes to complete.' The survey question is 'Where in El Paso County do you live?' and it lists several options with radio buttons: Calhan, Colorado Springs, Fountain, Green Mountain Falls, Manitou Springs, Monument, Palmer Lake, Ramah, Unincorporated county: East of I-25, and north of Hwy. 94, Unincorporated county: East of I-25, and south of Hwy. 94, and Unincorporated county: West of I-25. At the bottom center is a 'Next' button. Below the button, it says 'Powered by SurveyMonkey' and 'Check out our sample surveys and create your own now!'.

Figure 3-1. Sample Page from Questionnaire Distributed to the Public

3.7.3 Meetings

Steering Committee meetings were all open to the public, as well as one meeting before the Board of County Commissioners. Steering Committee meetings were held on March 27, 2014, May 28, 2014, and July 18, 2014 in the Pikes Peak Regional Building Division (see Figure 3-2). The draft was then presented and reviewed before the El Paso County Board of County Commissioners on **XXXXXX XX, 2014**. The meeting format allowed attendees to review handouts, maps, and other resources and have direct conversations with project staff. The reasons for planning and the information generated for the risk assessment were shared with attendees via a PowerPoint presentation. Planning partners and the planning team were present to answer questions. Local media outlets were informed of the meetings and the process.



Figure 3-2. Steering Committee Meeting May 28, 2014

3.7.4 Press Releases/News Articles

Press releases were distributed over the course of the plan's development as key milestones were achieved and prior to each public meeting. The planning effort received press coverage during the plan review period, as well as the BOCC plan approval and adoption process, as shown in Figure 3-3.

El Paso County News Release 200 S. Cascade Avenue Colorado Springs, CO 80903 www.elpasoco.com		Commissioners Amy Lathen, Chair District 2 Sallie Clark, Vice Chair District 3 Dennis Hisey District 4 Darryl Glenn District 1 Peggy Littleton District 5
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For Immediate Release

Contact: Dave Rose
Public Information Officer
Phone: 520-6540 Cell: 337-9239
DaveRose@elpasoco.com

Public Input Needed for El Paso County Pre-Disaster Mitigation Plan
Online Survey Available to Public

Colorado Springs, CO, Monday, Dec. 10, 2012 – The El Paso County Office of Emergency Management is asking for citizen input to help update the El Paso County Pre-Disaster Mitigation Plan (PDMP). An online survey has been created to access the public’s perception of local risks.

“By developing a PDMP, a community can reduce its risk from natural and human-caused hazards,” said Kathy Russell, Emergency Preparedness Planner. “By adopting a PDMP, and updating it every five years, a community also remains eligible for federal grant funding for disaster mitigation projects.”

By taking the short online survey, citizens can help identify the hazards that pose the greatest risk to our communities. A link to this survey and more information about the PDMP is available on the El Paso County web site at <http://adm.elpasoco.com/emprep/Pages/PDMP.aspx>. The survey is available to the public until January 4, 2013.

El Paso County adopted its first Pre-Disaster Mitigation Plan in 2008. A group of 24 local governments has begun work to update that PDMP to become a multi-jurisdictional plan that represents the concerns of the unincorporated County, seven towns and cities, and 16 special districts.

For more information contact Kathy Russell at 575-8418 or kathynrussell@elpasoco.com

Figure 3-3. Planning Process Press Coverage

3.7.5 Internet

At the beginning of the plan development process, the County posted information regarding the update process, a link to the community survey and a link to the mitigation plan on the County website (www.elpasoco.com; see Figure 3-4). The website was used to keep the public informed on initial plan development milestones and to solicit input. Information was made available to the public on the site throughout the process. The County intends to keep a link on the website active after the plan’s completion to keep the public informed about successful mitigation projects and future plan updates.



Figure 3-4. Sample Page from the El Paso County Web Site

3.8 PLAN DEVELOPMENT CHRONOLOGY/MILESTONES

Table 3-3 summarizes important milestones in the development of the plan.

**TABLE 3-3.
PLAN DEVELOPMENT MILESTONES**

Date	Event	Description	Attendance
2013			
10/11	Initiate consultant procurement	Seek a planning expert to facilitate the process	N/A
2014			
3/5	Submit grant application	Seek funding for plan development process	N/A
3/13	Receive notice of grant award	Funding secured.	N/A
3/6	Select Tetra Tech to facilitate plan development	Facilitation contractor secured	N/A
3/10	Identify of Steering Committee	Formation of the Steering Committee	N/A
3/27	Steering Committee/Stakeholder Meeting #1	Presentation on plan process given, participation, review of community survey, hazards identified in previous plan, etc.	County, Calhan/Ramah, Fountain, Manitou Springs, Monument, Palmer Lake
4/9	One-on-one meetings with representative from Fountain	Overview of hazard mitigation plan update	County, Fountain
4/11 and 5/6	One-on-one meetings with representative from Green Mountain Falls	Overview of hazard mitigation plan update	County, Green Mountain Falls
5/28	Steering Committee Meeting #2	Review of hazard identification and risk assessment, review and update plan goals and objectives	County, Calhan/Ramah, Fountain, Green Mountain Falls, Monument, Palmer Lake
6/5	One-on-one meetings with representative from Manitou Springs	Identification of mitigation initiatives	County, Manitou Springs
6/6	One-on-one meetings with representative from Green Mountain Falls	Identification of mitigation initiatives	County, Green Mountain Falls
6/16	One-on-one meetings with representative from Monument	Assessment of Town of Monument's legal, administrative, and financial capabilities	County, Monument
7/18	Steering Committee Meeting #3	Review of hazard identification and risk assessment results, review and updated plan goals and objectives, mitigation initiatives presentation and project development	County, Fountain, Green Mountain Falls, Manitou Springs, Monument, Palmer Lake
7/18	One-on-one meetings with representative from Fountain	Identification of mitigation initiatives	County, Fountain
7/25	One-on-one meetings with representative from Manitou Springs	Assessment of City of Manitou Springs' legal, administrative, and financial capabilities	County, Manitou Springs
7/30	One-on-one meetings with representative from Calhan/Ramah	Identification of mitigation initiatives	County, Calhan/Ramah

**TABLE 3-3.
PLAN DEVELOPMENT MILESTONES**

Date	Event	Description	Attendance
8/27	One-on-one meetings with representative from Green Mountain Falls	Assessment of Town of Green Mountain Falls' legal, administrative, and financial capabilities	County, Green Mountain Falls
Ongoing	Public Outreach	News articles and website posting	N/A
9/29	Draft Plan	Internal review draft provided to County OEM for review	N/A
10/27	Draft Plan	Internal review draft provided to Steering Committee	N/A
12/01-12/31	Public Comment Period	Initial public comment period of draft plan opens. Draft plan posted on plan website with press release notifying public of plan availability	N/A
2015			
05/22	Plan Approved Pending Adoption	Final draft plan submitted to Colorado Division of Homeland Security and Emergency Management, then to FEMA Region VIII for review: Approved!	N/A
XX	Adoption by BoCC and EPC Municipalities		N/A
X/X	Plan Approval	Final plan approved by FEMA	N/A

CHAPTER 4.

GUIDING PRINCIPLE, GOALS, AND OBJECTIVES

Hazard mitigation plans must identify goals for reducing long-term vulnerabilities to identified hazards (44 CFR Section 201.6(c)(3)(i)). The Steering Committee established a guiding principle, a set of goals and measurable objectives for this plan, based on data from the preliminary risk assessment and the results of the public involvement strategy. The guiding principle, goals, objectives and initiatives in this plan all support each other. Goals were selected to support the guiding principle. Objectives were selected that met the goals. Initiatives were prioritized based on the initiative meeting multiple objectives.

4.1 GUIDING PRINCIPLE

A guiding principle focuses the range of objectives and initiatives to be considered. This is not a goal because it does not describe a hazard mitigation outcome, and it is broader than a hazard-specific objective. The guiding principle for the El Paso County Hazard Mitigation Plan Update is as follows:

Reduce risks to life safety and property in El Paso County from natural and human-caused hazards, incidents/events.

4.2 GOALS

The following are the mitigation goals for this plan:

- **Goal 1:** Reduced loss of life and injury
- **Goal 2:** Reduced property and economic losses
- **Goal 3:** Enhanced communication of risks and threats in El Paso County to empower personal preparedness and responsibility
- **Goal 4:** Improved collaboration and cooperation throughout El Paso and partnering jurisdictions
- **Goal 5:** Incorporate hazard mitigation into future plans and policies
- **Goal 6:** Continuity of government services and business operations

The effectiveness of a mitigation strategy is assessed by determining how well these goals are achieved.

4.3 OBJECTIVES

The objectives are used to help establish priorities and support the agreed upon goals. The objectives are as follows:

- Objectives in support of Goal 1 (Reduced loss of life and injury):
 - **Objective 1.1:** Explore current emergency notification systems to ensure reliable, diverse and redundant public communication of potential hazards
 - **Objective 1.2:** Ensure all municipalities within El Paso County have a well prepared, implementable, and vetted emergency operations plan
 - **Objective 1.3:** Review and assess County and local plans for current best practices, standards, and appropriate integration of risk reduction elements resulting in a more resilient community
 - **Objective 1.4:** Assess and improve hazard-specific mapping and warning systems associated with high risk hazards to provide accurate and accessible information to ensure that citizens and visitors can respond appropriately

- Objectives in support of Goal 2 (Reduced property and economic losses):
 - **Objective 2.1:** Proactively protect and reduce vulnerability of critical facilities, infrastructure, and other key community assets from hazards
 - **Objective 2.2:** Develop and implement strategies that make public and private properties more resistant to the impact of hazard events and explore potential incentives for businesses and residents to improve disaster resistance
 - **Objective 2.3:** Facilitate businesses within the County in developing Continuity of Operations Plans
 - **Objective 2.4:** Identify federal, state and other local legislation that impacts emergency management activities
- Objectives in support of Goal 3 (Enhanced communication of risks and threats in El Paso County to empower personal preparedness and responsibility):
 - **Objective 3.1:** Improve community education programs to increase awareness of hazards and mitigation opportunities to reduce personal risk to citizens
 - **Objective 3.2:** Identify creative and alternative cost effective methods to provide multiple public education forums to teach citizens how to mitigate natural hazards on their property
 - **Objective 3.3:** Take proactive steps to ensure businesses and residents have information regarding necessary resources available to them pre, during and post an event
- Objectives in support of Goal 4 (Improved collaboration and cooperation throughout El Paso and partnering jurisdictions):
 - **Objective 4.1:** Develop and implement strategies to improve communication and coordination of mitigation activities between federal, state and local governments, as well as private and non-profit organizations
 - **Objective 4.2:** Increase the level of coordination between all stakeholders in order to effectively and efficiently implement preparedness and mitigation strategies
 - **Objective 4.3:** Establish multi-jurisdictional methodologies and inter-operability to allow better information sharing and resource tracking
- Objectives in support of Goal 5 (Incorporate hazard mitigation into future plans and policies):
 - **Objective 5.1:** Incorporate hazard analysis and emergency preparedness planning into county and local future development planning
 - **Objective 5.2:** Integrate mitigation priorities with watershed and storm water planning, natural resource management, and sound land use planning to protect life, property and the environment
 - **Objective 5.3:** Implement the All-Hazard Mitigation Plan proactively and effectively by clearly communicating the process for plan implementation, maintenance and updates
- Objectives in support of Goal 6 (Continuity of government services and business operations):
 - **Objective 6.1:** Identify needs and leverage available funding streams to improve public safety, response, and recovery programs to ensure essential services can be maintained
 - **Objective 6.2:** Develop effective primary and alternate emergency operations facilities to facilitate effective incident/event support

- **Objective 6.3:** Partner with local businesses, Chamber of Commerce and Non-Governmental Organizations (NGOs) that provide critical services to residents to ensure continuity of services and a coordinated response

**PART 2—
RISK ASSESSMENT**

CHAPTER 5.

IDENTIFIED HAZARDS OF CONCERN AND RISK ASSESSMENT METHODOLOGY

Risk assessment is the process of measuring the potential loss of life, personal injury, economic injury, and property damage resulting from natural hazards. It allows emergency management personnel to establish early response priorities by identifying potential hazards and vulnerable assets. The process focuses on the following elements:

- Hazard identification—Use all available information to determine what types of disasters may affect a jurisdiction, how often they can occur, and their potential severity.
- Vulnerability identification—Determine the impact of natural hazard events on the people, property, environment, economy, and lands of the region.
- Cost evaluation—Estimate the cost of potential damage or cost that can be avoided by mitigation.

The risk assessment for this hazard mitigation plan update evaluates the risk of natural hazards prevalent in the planning area and meets requirements of the DMA (44 CFR, Section 201.6(c)(2)).

5.1 IDENTIFIED HAZARDS OF CONCERN

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

- Avalanche
- Dam failure
- Drought
- Earthquake
- Erosion and Deposition
- Flooding
- Hailstorm
- Landslide or Rockfall
- Lightning
- Mud or Debris Flow
- Pandemic Disease
- Tornado
- Subsidence and Sink Holes
- Severe Wind
- Wildfire
- Winter Storm.

In addition, three man-made hazards were identified for the planning area:

- Aircraft Accident
- Extreme Acts of Violence
- Hazardous Material Release (Transportation).

5.2 CLIMATE CHANGE

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

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

Climate change will affect communities in a variety of ways. Impacts could include an increased risk for extreme events such as drought, storms, flooding, and wildfires; more heat-related stress; and the spread of existing or new vector-borne disease into a community. In many cases, communities are already facing these problems to some degree. Climate change alters the frequency, intensity, extent, and/or magnitude of the problems.

This hazard mitigation plan update addresses climate change as a secondary impact for each identified hazard of concern. Each chapter addressing one of the hazards of concern includes a section with a qualitative discussion on the probable impacts of climate change for that hazard. While many models are being developed to assess the potential impacts of climate change, none are currently available to support hazard mitigation planning. As these models are developed in the future, this risk assessment may be enhanced to better estimate these impacts.

5.3 METHODOLOGY

The risk assessments in Chapter 8 through Chapter 23 describe the risks associated with each identified natural hazard of concern. Each chapter describes the hazard, the planning area’s vulnerabilities, and probable event scenarios. The following steps were used to define the risk of each hazard:

- Identify and profile each hazard—The following information is given for each hazard:
 - Geographic areas most affected by the hazard
 - Event frequency estimates
 - Severity estimates
 - Warning time likely to be available for response.
- Determine exposure to each hazard—Exposure was determined by overlaying hazard maps, when available, with an inventory of structures, facilities, and systems to determine which of them would be exposed to each hazard. When hazard mapping was not available, a more qualitative discussion of exposure is presented.

- Assess the vulnerability of exposed facilities—Vulnerability of exposed structures and infrastructure was determined by interpreting the probability of occurrence of each event and assessing structures, facilities, and systems that are exposed to each hazard. Tools such as GIS and FEMA’s hazard-modeling program called HAZUS-MH were used to perform this assessment for the flood, dam failure and earthquake hazards. Outputs similar to those from HAZUS were generated for other hazards, using maps generated by the HAZUS program.

5.4 RISK ASSESSMENT TOOLS

5.4.1 Earthquake, Flood, and Dam Failure—HAZUS-MH

Overview

In 1997, FEMA developed the standardized Hazards U.S., or HAZUS, model to estimate losses caused by earthquakes and identify areas that face the highest risk and potential for loss. HAZUS was later expanded into a multi-hazard methodology, HAZUS-MH, with new models for estimating potential losses from hurricanes and floods.

HAZUS-MH is a GIS-based software program used to support risk assessments, mitigation planning, and emergency planning and response. It provides a wide range of inventory data, such as demographics, building stock, critical facility, transportation and utility lifeline, and multiple models to estimate potential losses from natural disasters. The program maps and displays hazard data and the results of damage and economic loss estimates for buildings and infrastructure. Its advantages include the following:

- Provides a consistent methodology for assessing risk across geographic and political entities.
- Provides a way to save data so that it can readily be updated as population, inventory, and other factors change and as mitigation planning efforts evolve.
- Facilitates the review of mitigation plans because it helps to ensure that FEMA methodologies are incorporated.
- Supports grant applications by calculating benefits using FEMA definitions and terminology.
- Produces hazard data and loss estimates that can be used in communication with local stakeholders.
- Is administered by the local government and can be used to manage and update a hazard mitigation plan throughout its implementation.

Levels of Detail for Evaluation

HAZUS-MH provides default data for inventory, vulnerability and hazards; this default data can be supplemented with local data to provide a more refined analysis. The model can carry out three levels of analysis, depending on the format and level of detail of information about the planning area:

- **Level 1**—All of the information needed to produce an estimate of losses is included in the software’s default data. These data are derived from national databases and described in general terms the characteristic parameters of the planning area.
- **Level 2**—More accurate estimates of losses require more detailed information about the planning area. To produce Level 2 estimates of losses, detailed information is required about local geology, hydrology, hydraulics and building inventory, as well as data about utilities and critical facilities. This information is needed in a GIS format.
- **Level 3**—This level of analysis generates the most accurate estimate of losses. It requires detailed engineering and geotechnical information to customize it for the planning area.

Application for This Plan

The following methods were used to assess specific hazards for this plan:

- **Dam Failure**—Dam failure inundation mapping for the planning area has been completed within high risk dam emergency action plans. For security reasons, these maps were excluded from this plan.
- **Earthquake**—A Level 2 analysis was performed to assess earthquake risk and exposure. Earthquake scenario and probabilistic data prepared by the U.S. Geological Survey (USGS) and State of Colorado were used for the analysis of this hazard. An updated general building stock inventory was developed using replacement cost values and detailed structure information from assessor tables. An updated inventory of essential facilities, transportation and utility features was used in place of the HAZUS-MH defaults. Two scenario events and one probabilistic event were modeled:
 - The scenario events were Magnitude-7.0 events on the Rampart and Ute Pass Faults
 - The standard HAZUS analysis for the 500-year probabilistic event was run.
- **Flooding**—A Level 2, general building stock analysis was performed. GIS building and assessor data (replacement cost values and detailed structure information) were loaded into HAZUS-MH. An updated inventory was used in place of the HAZUS-MH defaults for essential facilities, transportation and utilities. Current El Paso County digital flood insurance rate maps (DFIRMs) were used to delineate flood hazard areas and estimate potential losses from the 100-year flood event. Using the DFIRM floodplain boundaries and a countywide 10-meter digital elevation model (DEM) flood depth grid were generated and integrated into the model.

5.4.2 Other Hazards of Concern

For hazards of concern that are not directly modeled in HAZUS, specific future losses could not be estimated. However, HAZUS-MH is able to map hazard areas and calculate exposures if geographic information is available on the locations of the hazards and inventory data. Areas and inventory susceptible to some of the hazards of concern were mapped and exposure was evaluated. For other hazards, a qualitative analysis was conducted using the best available data and professional judgment. Locally relevant information was gathered from a variety of sources. Frequency and severity indicators include past events and the expert opinions of geologists, emergency management specialists, and others. The primary data source was the El Paso County GIS database, augmented with state and federal data sets. Additional data sources for specific hazards were as follows:

- **Avalanche**— The Colorado Avalanche Information Center (CAIC) was used to forecast backcountry and mountain weather conditions for ten avalanche zones, including the area surrounding Pikes Peak which is part of the Front Range forecast zone. In addition, a slope analysis was performed in order to identify areas that may potentially be at risk for an avalanche event (that is, slopes greater than 25 degrees).
- **Drought**—Information on historical and projected impacts from drought was obtained from the National Drought Mitigation Center and National Oceanic and Atmospheric Administration (NOAA).
- **Erosion and Deposition** – Information on historical and projected erosion and deposition in El Paso County was obtained from the *Strategic Plan for the Fountain Creek Watershed* (Fountain Creek Vision Task Force, 2009) and the Waldo Canyon Fire-Burned Area Emergency Response Soil Assessment (Young and Rust, 2012).

- **Hailstorm** – Information on previous hailstorm events was obtained from National Climatic Data Center’s Storm Events Database. In addition, a general building stock analysis was performed using GIS building and assessor data (replacement cost values and detailed structure information) to estimate the potential economic losses from hailstorms.
- **Landslide or Rockfall** – Areas of previous, documented landslides in El Paso County were obtained from the U.S. Geological Survey.
- **Lightning** – Information on historical lightning strikes and injuries, fatalities, and property damage was obtained from the National Climatic Data Center Storm Events Database and National Lightning Detection Network. A general building stock analysis was performed using GIS building and assessor data (replacement cost values and detailed structure information) to estimate the potential economic losses from lightning strikes.
- **Mud or Debris Flow** – Information on the potential for future mud or debris flow events was obtained from the *Probability and Volume of Potential Post Wildfire Debris Flows in the 2012 Waldo Canyon Burn Area near Colorado Springs, Colorado* (Verdin and others, 2012).
- **Pandemic Disease** – No data on economic loss estimates were available for pandemic disease. Information on disease statistics in Colorado was obtained from the Colorado Department of Public Health and Environment.
- **Tornado** - Information on previous tornadoes in El Paso County were obtained from National Climatic Data Center’s Storm Events Database, the National Weather Service, and NOAA. A general building stock analysis was performed using GIS building and assessor data to estimate the potential economic losses from tornadoes.
- **Subsidence and Sinkholes** - No data on economic loss estimates were available for subsidence and sinkhole events. Information on subsidence and sinkholes in El Paso County were obtained from the Colorado Geological Survey.
- **Severe Wind** - Information on previous severe wind events in El Paso County was obtained from National Climatic Data Center’s Storm Events Database and NOAA. A general building stock analysis was performed using GIS building and assessor data to estimate the potential economic losses from severe wind events.
- **Wildfire**—Information on wildfire hazards areas was provided by Colorado Wildfire Risk Assessment Portal (CO-WRAP).
- **Winter Storm** – Information on previous winter storms in El Paso County was obtained from National Climatic Data Center’s Storm Events Database. A general building stock analysis was performed using GIS building and assessor data to estimate the potential economic losses from severe winter storms.

5.4.3 Limitations

Loss estimates, exposure assessments and hazard-specific vulnerability 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 natural hazards and their effects on the built environment. Uncertainties also result from the following:

- Approximations and simplifications necessary to conduct a study
- Incomplete or outdated inventory, demographic or economic parameter data
- The unique nature, geographic extent and severity of each hazard
- Mitigation measures already employed

- The amount of advance notice residents have to prepare for a specific hazard event.

These factors can affect loss estimates by a factor of two or more. Therefore, potential exposure and loss estimates are approximate. The results do not predict precise results and should be used only to understand relative risk. Over the long term, El Paso County and its planning partners will collect additional data to assist in estimating potential losses associated with other non-natural hazards.

CHAPTER 6. EL PASO COUNTY PROFILE

El Paso County is approximately 50 miles south of Denver and includes portions of the Rocky Mountains as well as the western plains (see Figure 6-1). The County is the most populous in the state and covers an area of 2,126 square miles that includes mountainous terrain in the western portion and prairie or plains in the eastern sector. The elevation of the County varies from the top of Pikes Peak (14,115 feet) to Black Squirrel Creek on the southern county line at 5,095 feet. Most of the county land area is unincorporated.

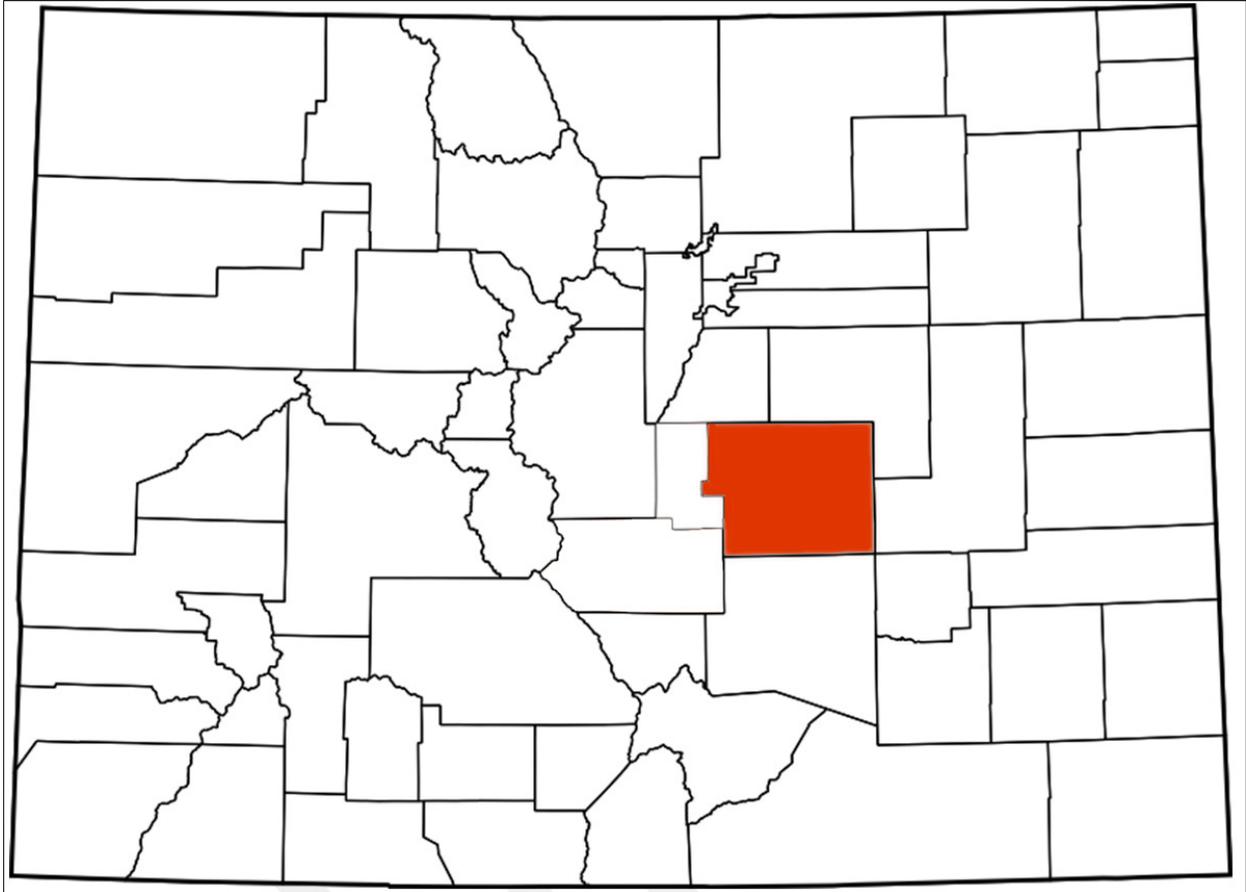


Figure 6-1. Location of the El Paso County Planning Area within the State of Colorado

El Paso County is urban along the Interstate 25 corridor but primarily rural elsewhere. The largest city in the County is Colorado Springs (the second largest city in the state) at an elevation of 6,035 feet above sea level. Colorado Springs has an estimated population of 432,000, about 67 percent of the total county population of approximately 646,000 (2012 State of Colorado estimates). Other municipalities in the county are the cities of Fountain and Manitou Springs and the towns of Calhan, Green Mountain Falls, Monument, Palmer Lake, and Ramah. The County's major north-south transportation routes are Interstate 25 and a major BNSF Railway line.

Unincorporated population centers in the county include Black Forest to the north, Security and Widefield to the south, Cascade and Chipita Park to the west, and Peyton, Falcon, and Ellicott to the east. There are also five military installations: Schriever Air Force Base, Peterson Air Force Base, Fort Carson, Cheyenne Mountain Air Station, and the U.S. Air Force Academy.

6.1 HISTORICAL OVERVIEW

In 1861, a bill to create Colorado Territory was passed and President Lincoln appointed William Gilpin as the state's first territorial governor. The population of Colorado in 1861 was 21,000. The first legislature, sitting in Denver, selected Colorado City (west of present day Colorado Springs) as the capitol. The second legislature met there only a few days, in 1862, and adjourned to Denver. The assembly met in Denver and Golden up to 1867 when Denver was named the permanent seat of the territory. In 1876 - fifteen years after becoming a territory - Colorado was admitted as the thirty-eighth state in the union. Colorado was called the "Centennial State" in honor of the one-hundredth year of the Declaration of Independence.

Gold was discovered in Cherry Creek in 1859 and in nearby Cripple Creek in 1891. Historians estimate that approximately 50,000 people came to Colorado in search of gold in 1858-59. The "golden" years lasted until 1917, when the U.S. switched to silver for its coinage and the local economy once again emphasized tourism. With the start of World War II, Fort Carson was established on 137,000 acres to the south of Colorado Springs. The military's presence grew in the 1950s with the opening of the U.S. Air Force Academy. Over the next 35 years, Peterson Air Force Base, Cheyenne Mountain Air Force Station, and Schriever Air Force Base were established within the County.

With the establishment of the United States Space Command in the county, a large commercial market was created for the space industry. With this industry came a large influx of people and businesses into El Paso County specifically aimed at the government's Space industry. In 1986, the Space Shuttle Challenger exploded during the initial launch phase with the subsequent ceasing of space launches for several years. This created a severe impact on the economy of El Paso County with a large number of businesses closing and numerous residents defaulting on home loans. It was not until 1992 that economic recovery took hold. Today, U.S. Northern Command has replaced U.S. Space Command (moved to Omaha, NE) with an extremely large number of Homeland Security businesses opening to support this new command. With 5 military installations located in the county, the economics of the area is highly dependent on military contract jobs. Additionally, computers, electronic equipment, semiconductors, precision parts, plastics, equipment, and many other high-quality products are manufactured in the Pikes Peak region and shipped to national and international markets.

Currently El Paso County is the most populous of the 65 counties in the State. It is estimated that the county population was 576,884 in 2006, an 11.60 percent increase since the 2000 U.S. Census. This increase in population occurs mostly in the unincorporated areas of the county. From 1992 until approximately 2004, residential and commercial property trends included extensive development in the urban wildland interface and along the I-25 and State Highway 24 corridors. This has significantly increased the risk from wildfire and HAZMAT spills and places a significant demand on emergency planning and response resources. From 2004 until today, the majority of new residential areas are developing east of Colorado Springs as well as to the north and south.

El Paso County is a highly popular winter and summer recreation destination. It features uncrowded trails, numerous creeks for fishing, Pikes Peak, and numerous recreational opportunities including all snow sports, mountain climbing, skating, ice fishing, hunting and, in the summer, golf, hot air balloon rides, boating, camping and more. El Paso County is home to the spectacular beauty of the Pike National Forest. Elk, moose, deer, and bighorn sheep are frequent autumn visitors on the various roads and trails.

6.2 MAJOR PAST HAZARD EVENTS

Federal disaster declarations are typically issued for hazard events that cause more damage than state and local governments can handle without assistance from the federal government, although no specific dollar loss threshold has been established for these declarations. A federal disaster declaration puts federal recovery programs into motion to help disaster victims, businesses and public entities. Some of the

programs are matched by state programs. The planning area has experienced 15 events since 1965 for which federal disaster declarations were issued. These events are listed in Table 6-1.

**TABLE 6-1.
PAST FEDERAL DISASTER DECLARATIONS IN EL PASO COUNTY**

Disaster Declaration ^a	Description	Incident Dates
DR-200	Tornadoes, severe storms and flooding	6/19/1965
DR-261	Severe storms and flooding	5/19/1969
DR-385	Heavy rains, snowmelt and flooding	5/23/1973
DR-517	Severe storms and flash flooding	8/2/1976
DR-1276	Severe storm, flooding 4/30/99	4/29/1999 – 5/19/1999
DR-1421	Wildfires	4/23/2002 – 8/6/2002
FM-2984	Waldo Canyon fire	6/23/2012 – 7/8/2012
EM-3025	Drought	1/29/1977
EM-3185	Snow	3/17/2003 – 3/20/2003
EM-3224	Hurricane Katrina evacuation	8/29/2005 – 10/1/2005
EM-3270	Snow	12/18/2006 – 12/22/2006
EM-3365	Severe storms, flooding, landslides, and mudslides	9/11/2013 – 9/30/2013
DR-4067	High Park and Waldo Canyon wildfires	6/9/2012 – 7/11/2012
DR-4134	Black Forest wildfire	6/11/2013 – 6/21/2013
DR-4145	Severe storms, flooding, landslides, and mudslides	9/11/2013 – 9/30/2013

a. Federal disaster declarations are coded as follows: DR = Major Disaster Declaration; EM = Emergency Declaration; FM = Fire Management Assistance; FS = Fire Suppression Authorization

Source: FEMA Disaster Declarations Summary - Open Government Dataset (<http://www.fema.gov/media-library/assets/documents/28318?id=6292>)

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

6.3 CLIMATE

Severe weather is commonplace in El Paso County. Of primary concern are the severe thunder/lightning storms that start fires and create flash flood conditions; snowstorms that create large drifts; and tornadoes that frequent the eastern part of the county. The County’s meteorological classification is semi-arid alpine desert with approximately 250-285 days of sunshine and 15-16 inches of precipitation per year. Humidity is very low, typically in the single digits or in the teens. These conditions provide for an intense wildland fire season, yet the periodic flash floods can menace many of the creeks that have had minimal mitigation completed.

The Western Regional Climate Center reports data from the Colorado Springs Municipal Airport weather station in El Paso County. Table 6-2 contains temperature summaries for the station. Figure 6-2 graphs the daily temperature averages and extremes. Figure 6-3 and Figure 6-4 show the geographic distribution

of average minimum and maximum temperatures in El Paso County. Figure 6-5 shows the geographic distribution of annual average precipitation.

TABLE 6-2. EL PASO COUNTY TEMPERATURE SUMMARIES, COLORADO SPRINGS STATION	
Period of record	1948 – 2012
Winter ^a Average Minimum Temperature	17.9°F
Winter ^a Mean Temperature	30.9°F
Summer ^a Average Maximum Temperature	82.3°F
Summer ^a Mean Temperature	68.5°F
Maximum Temperature	101°F; June 26, 2012
Minimum Temperature	-27°F; February 1, 1951
Average Annual # Days >90°F	18.5
Average Annual # Days <32°F/ Year	161.6

a. Winter: December, January, February; Summer: June, July, August
 Source: Western Regional Climate Center, www.wrcc.dri.edu/

Source: Western Regional Climate Center, www.wrcc.dri.edu/

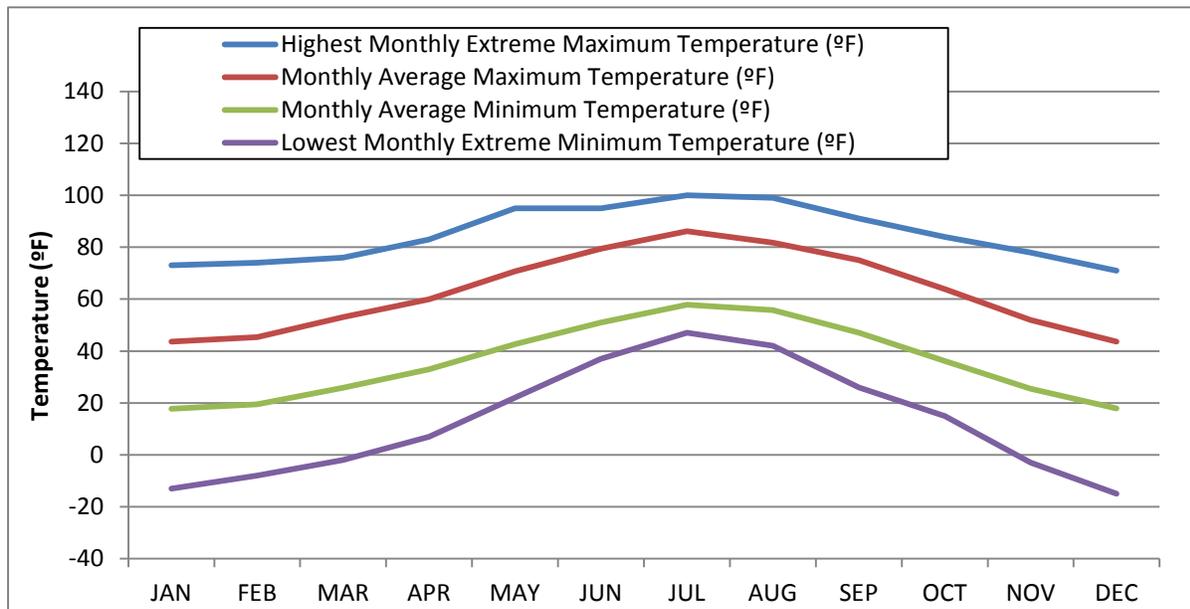


Figure 6-2. Colorado Springs Municipal Airport Station Monthly Temperature Data (3/1/1983 – 3/31/2013)

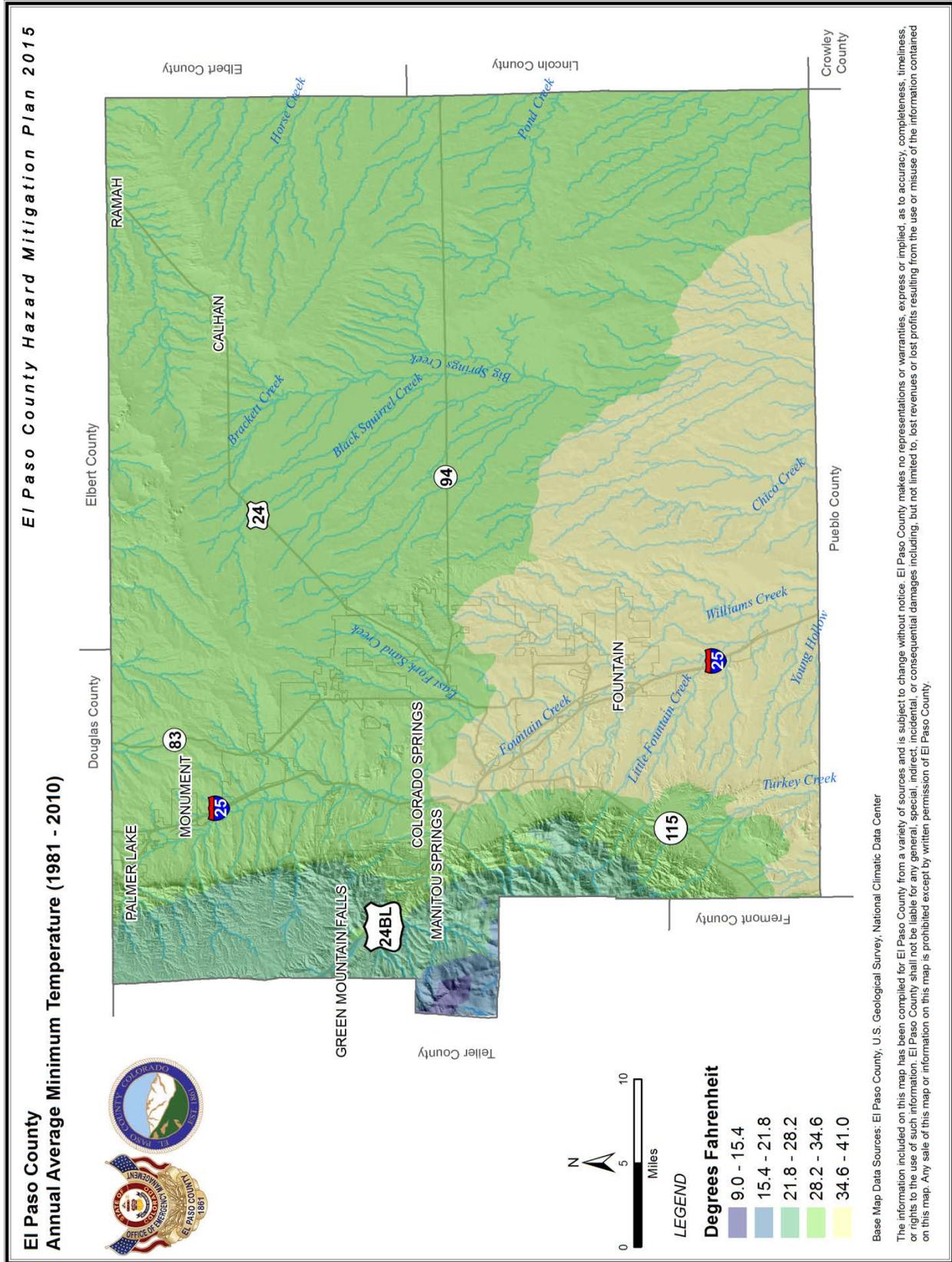


Figure 6-3. Average Minimum Temperatures in El Paso County

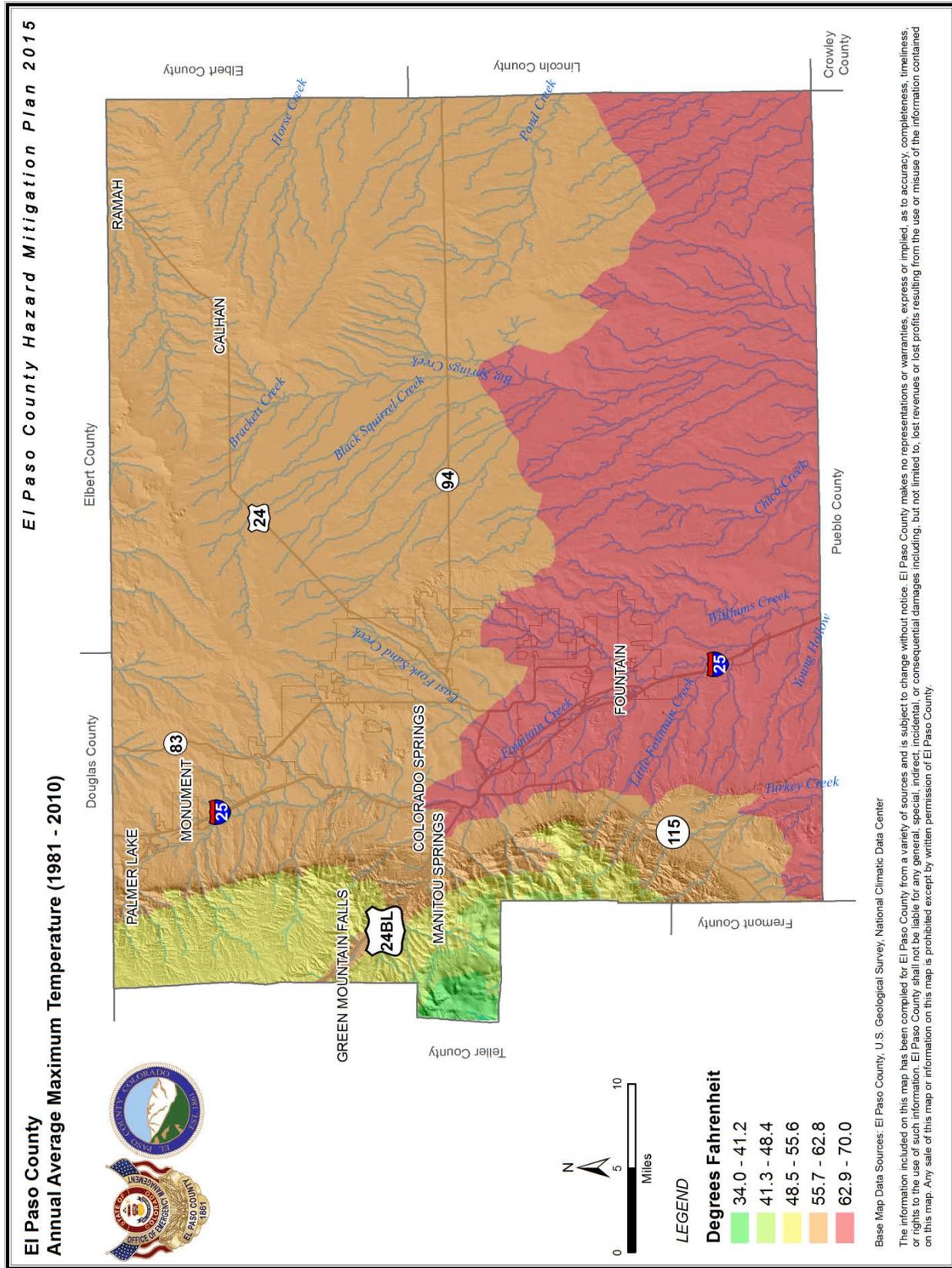


Figure 6-4. Average Maximum Temperatures in El Paso County

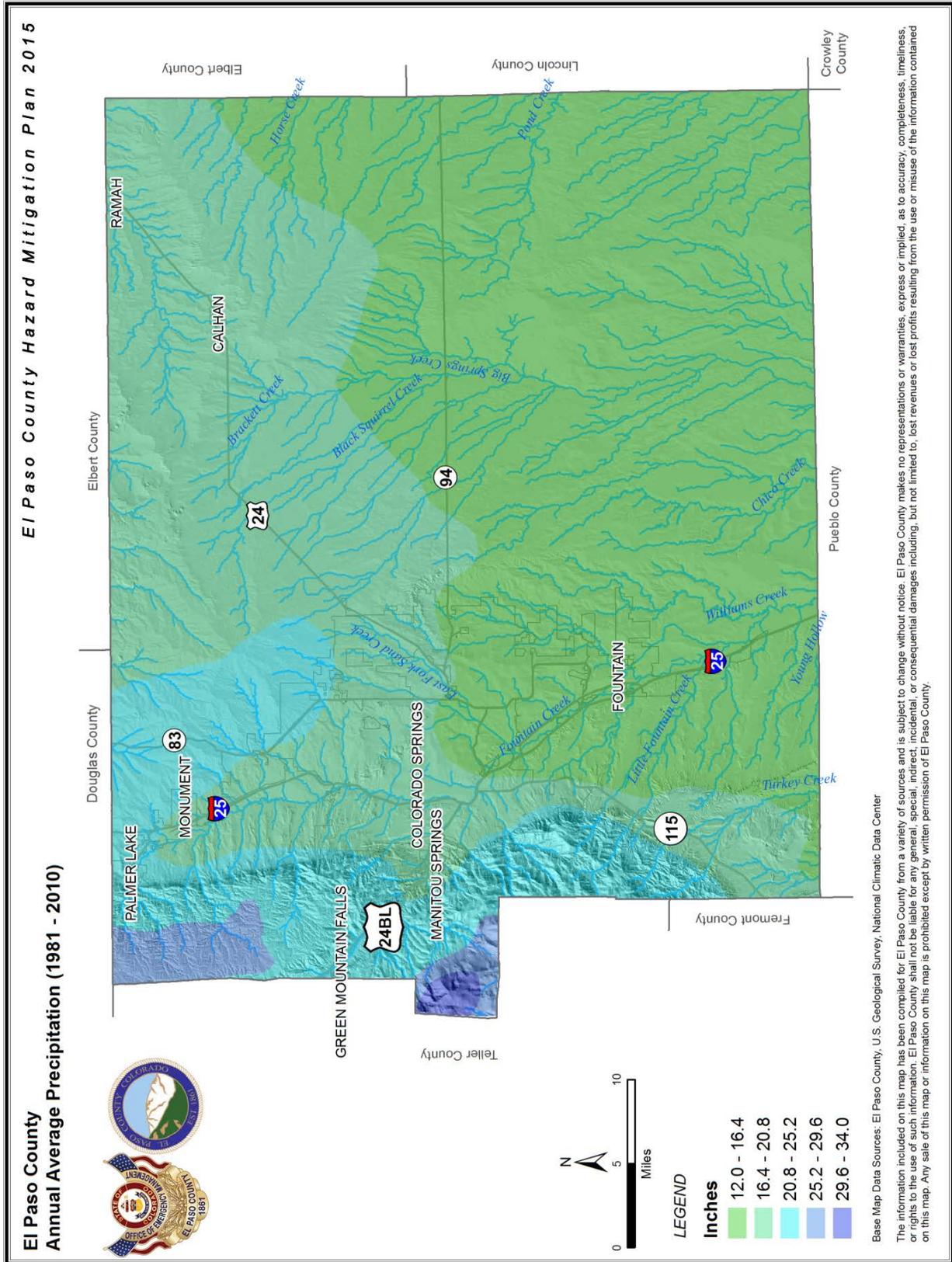


Figure 6-5. Annual Average Precipitation in El Paso County

6.4 GEOLOGY AND SOILS

The geology of El Paso County varies from the plains in the eastern portion of the County to the Front Range that forms the western boundary of El Paso County. According to the Colorado Geological Survey, the plains are characterized predominantly by sedimentary rocks and the mountainous regions are comprised of a structurally complex assortment of igneous, metamorphic, and sedimentary rocks, with the igneous and metamorphic rocks predominating at higher elevations.

The most geologically significant feature of El Paso County is Pikes Peak. At 14,115 feet, it is one of Colorado's 54 "fourteeners," mountains that rise more than 14,000 feet above mean sea level, and rises 8,000 feet above downtown Colorado Springs. Pikes Peak is a designated National Historic Landmark. Pikes Peak is composed of a characteristic pink granite called Pikes Peak granite. The color is caused by a large amount of potassium feldspar. It is thought that the granite was once magma that crystallized at least 20 miles beneath the Earth's surface. Through the process of uplifting, the hardened rock pushed through the Earth's crust and created a dome-like mountain, covered with less-resistant rock. Years of erosion and weathering removed the soil and rock leaving the exposed mountain. The Pikes Peak area is popular among gem and mineral collectors and is widely known for high quality specimens, especially amazonite and smoky quartz.

6.5 CRITICAL FACILITIES AND INFRASTRUCTURE

Critical facilities and infrastructure are those that are essential to the health and welfare of the population. These become especially important after a hazard event. As defined for this hazard mitigation plan update, critical facilities include but are not limited to the following (as defined by the Colorado Water Conservation Board), as required by the State of Colorado Office of Emergency Management:

- Essential services facilities:
 - Public safety (police stations, fire and rescue stations, emergency vehicle and equipment storage, and, emergency operation centers)
 - Emergency medical (hospitals, ambulance service centers, urgent care centers having emergency treatment functions, and non-ambulatory surgical structures but excluding clinics, doctors' offices, and non-urgent care medical structures that do not provide these functions)
 - Designated emergency shelters
 - Communications (main hubs for telephone, broadcasting equipment for cable systems, satellite dish systems, cellular systems, television, radio, and other emergency warning systems, but excluding towers, poles, lines, cables, and conduits)
 - Public utility plant facilities for power, water, and gas generation and distribution (hubs, treatment plants, substations and pumping stations for water, power and gas, but not including towers, poles, power lines, buried pipelines, transmission lines, distribution lines, and service lines)
 - Air transportation lifelines (airports, municipal and larger), helicopter pads and structures serving emergency functions, and associated infrastructure (aviation control towers, air traffic control centers, and emergency equipment aircraft hangars).
- Hazardous materials facilities:
 - Chemical and pharmaceutical plants (chemical plant, pharmaceutical manufacturing)
 - Laboratories containing highly volatile, flammable, explosive, toxic and/or water-reactive materials

- Refineries
- Hazardous waste storage and disposal sites
- Aboveground gasoline or propane storage or sales centers.
- At-risk population facilities:
 - Elder care (nursing homes)
 - Congregate care serving 12 or more individuals (day care and assisted living)
 - Public and private schools (pre-schools, K-12 schools, before-school and after-school care serving 12 or more children)
- Facilities vital to restoring normal services:
 - Essential government operations (public records, courts, jails, building permitting and inspection services, community administration and management, maintenance and equipment centers)
 - Essential structures for public colleges and universities (dormitories, offices, and classrooms only).

Table 6-3 and Table 6-4 summarize the general types of critical facilities and infrastructure in each municipality and unincorporated county areas. Because of the sensitivity of this information, a detailed list of facilities is not provided. The list is on file with each planning partner. Critical facilities and infrastructure were analyzed in HAZUS to help rank risk and identify mitigation initiatives. The risk assessment for each hazard discusses critical facilities with regard to that hazard. Figure 6-6 through Figure 6-19 show the location of critical facilities and infrastructure in the county and participating municipalities.

TABLE 6-3. CRITICAL FACILITIES IN THE PLANNING AREA						
	Medical & Health	Government Functions	Protective Functions	Schools	Hazardous Materials	Total
Calhan	0	0	2	4	0	6
Colorado Springs	6	2	17	185	51	261
Fountain	1	1	4	10	0	16
Green Mountain Falls	0	0	2	0	0	2
Manitou Springs	0	0	2	3	0	5
Monument	0	0	2	4	0	6
Palmer Lake	0	0	2	1	0	3
Ramah	0	0	1	0	0	1
Unincorporated	2	0	23	68	15	108
Total	9	3	55	275	66	408

**TABLE 6-4.
CRITICAL INFRASTRUCTURE IN THE PLANNING AREA**

	Bridges	Water Storage	Waste Water	Power	Communi cations	Transporta tion	Dams	Total
Calhan	2	1	0	0	0	0	0	3
Colorado Springs	209	36	2	5	6	7	20	285
Fountain	14	1	2	4	2	1	0	24
Green Mountain Falls	0	0	0	0	0	0	0	0
Manitou Springs	9	2	0	0	1	0	0	12
Monument	2	0	1	0	0	0	1	4
Palmer Lake	2	0	0	0	0	0	0	2
Ramah	1	1	0	0	0	0	0	2
Unincorporated	200	2	5	2	24	8	61	302
Total	439	43	10	11	33	16	82	636

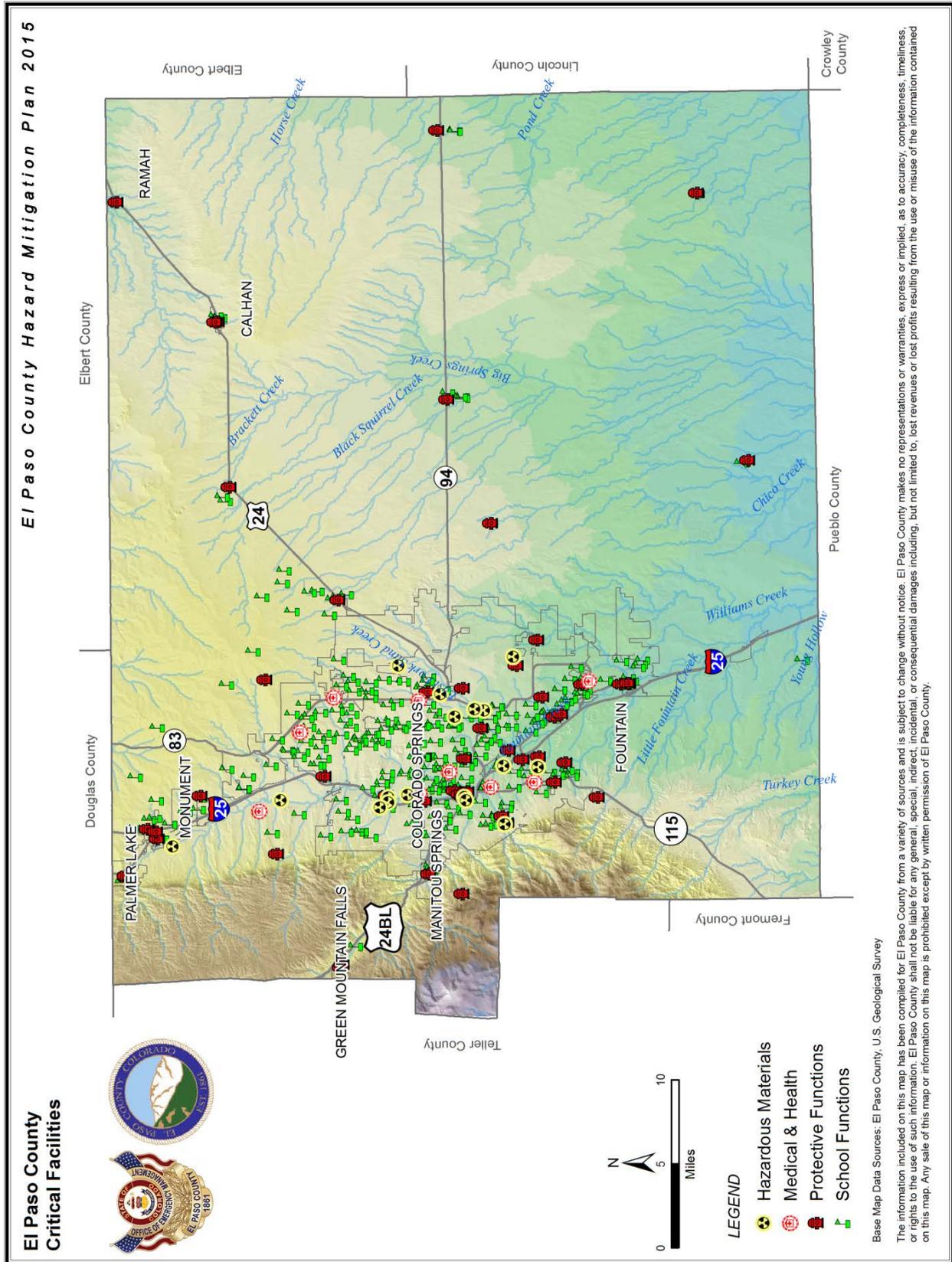


Figure 6-6. Locations of Critical Facilities in El Paso County

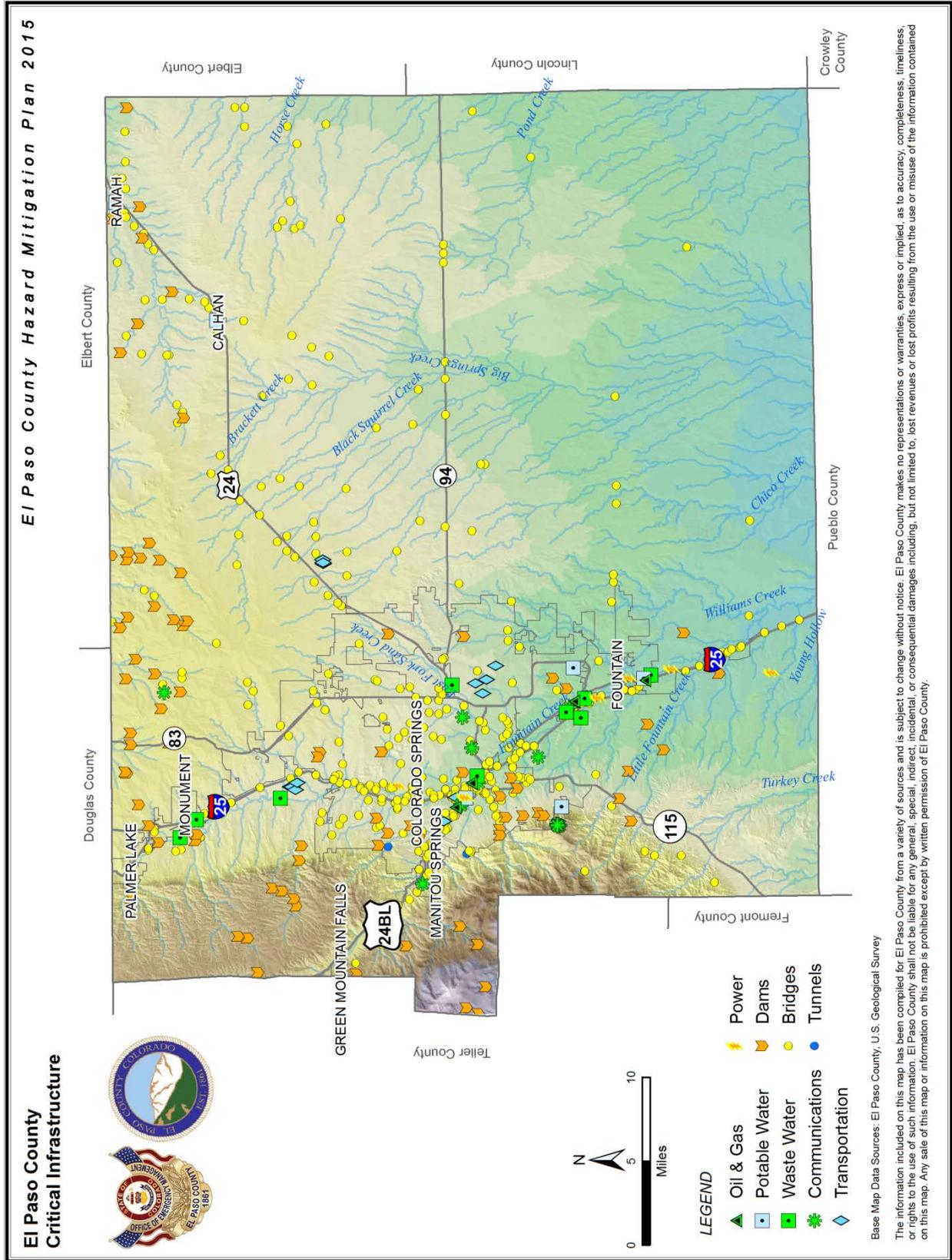


Figure 6-7. Locations of Critical Infrastructure in El Paso County

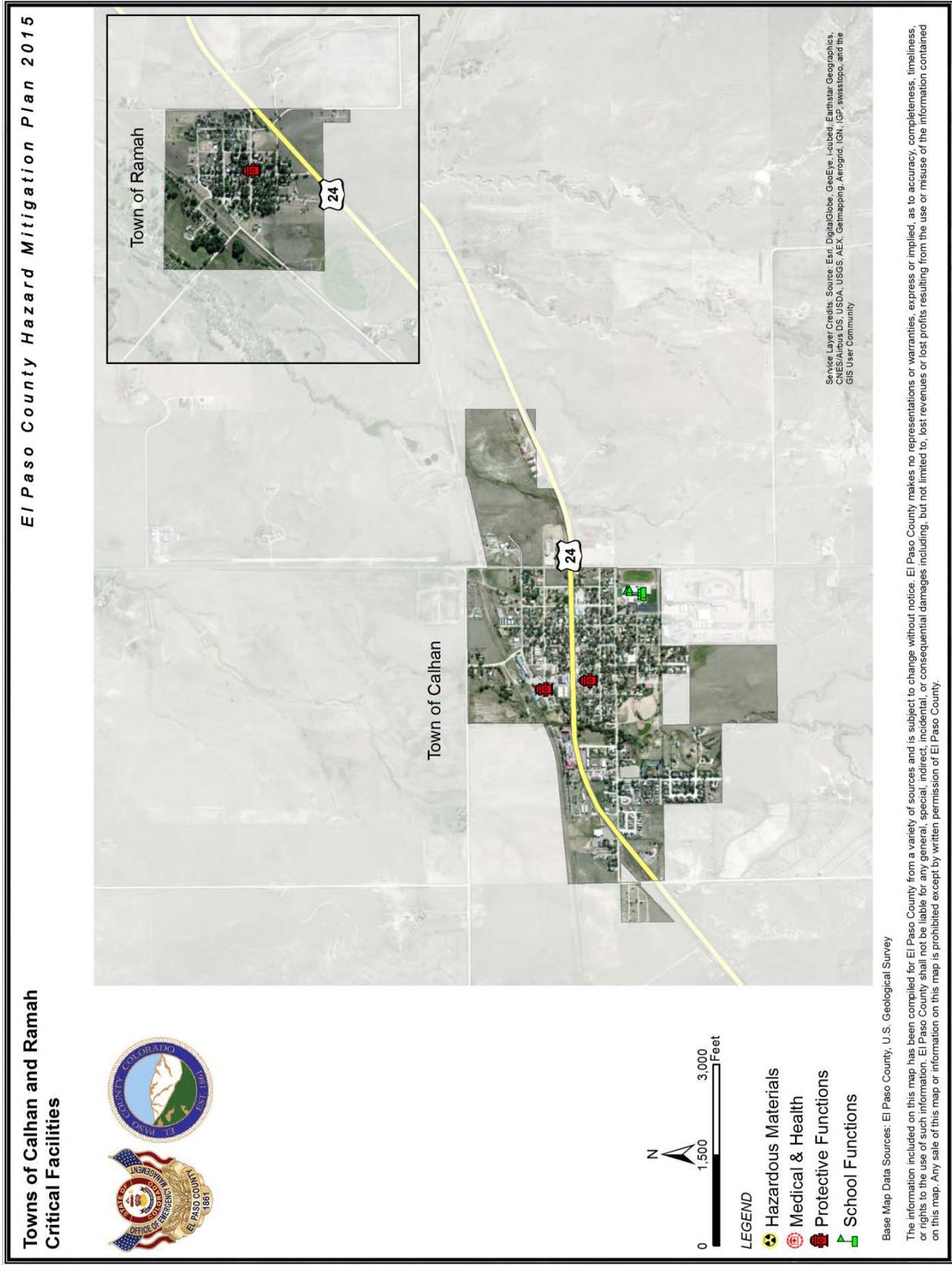


Figure 6-8. Locations of Critical Facilities in the Towns of Calhan and Ramah

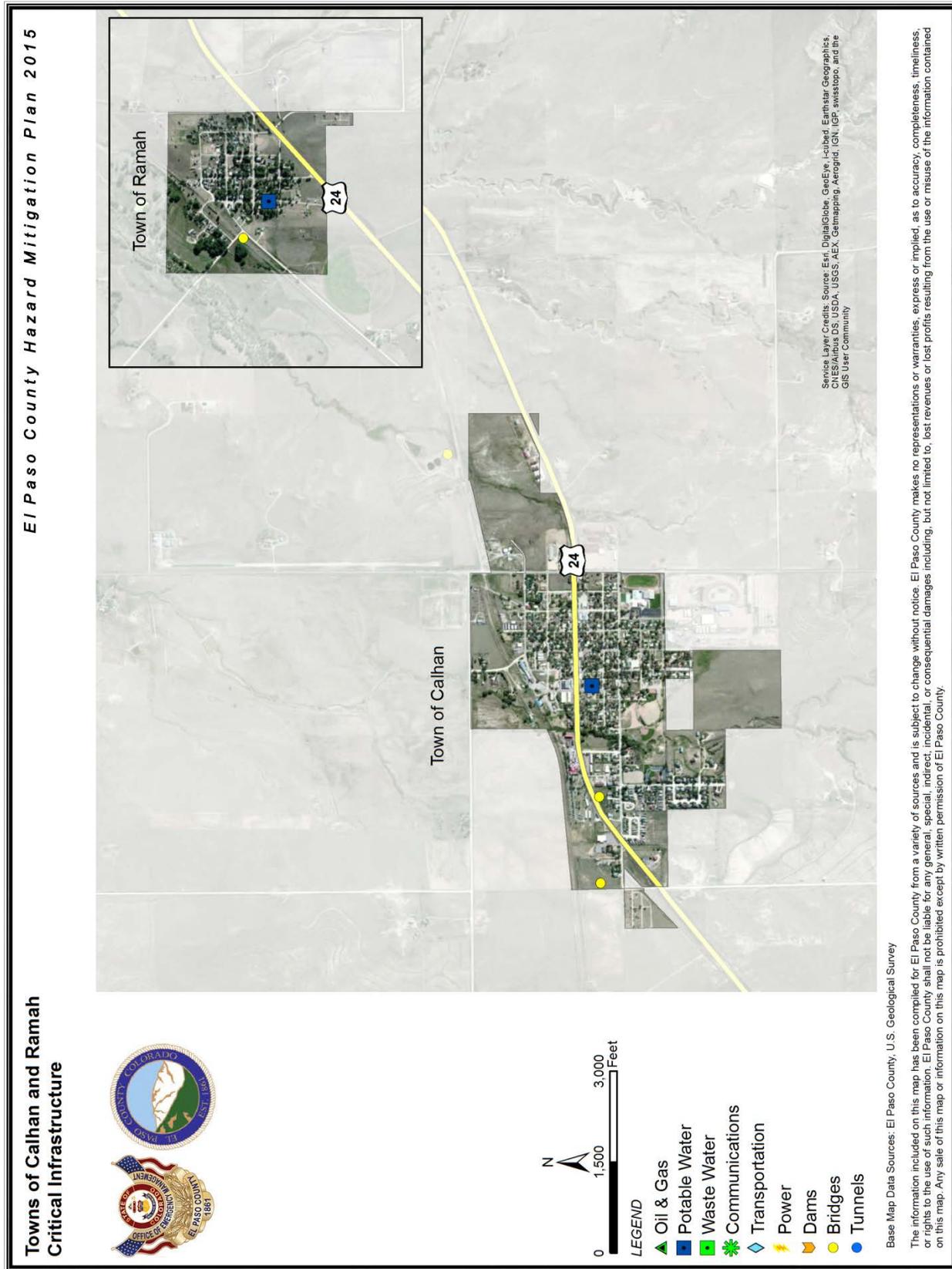


Figure 6-9. Locations of Critical Infrastructure in the Towns of Calhan and Ramah

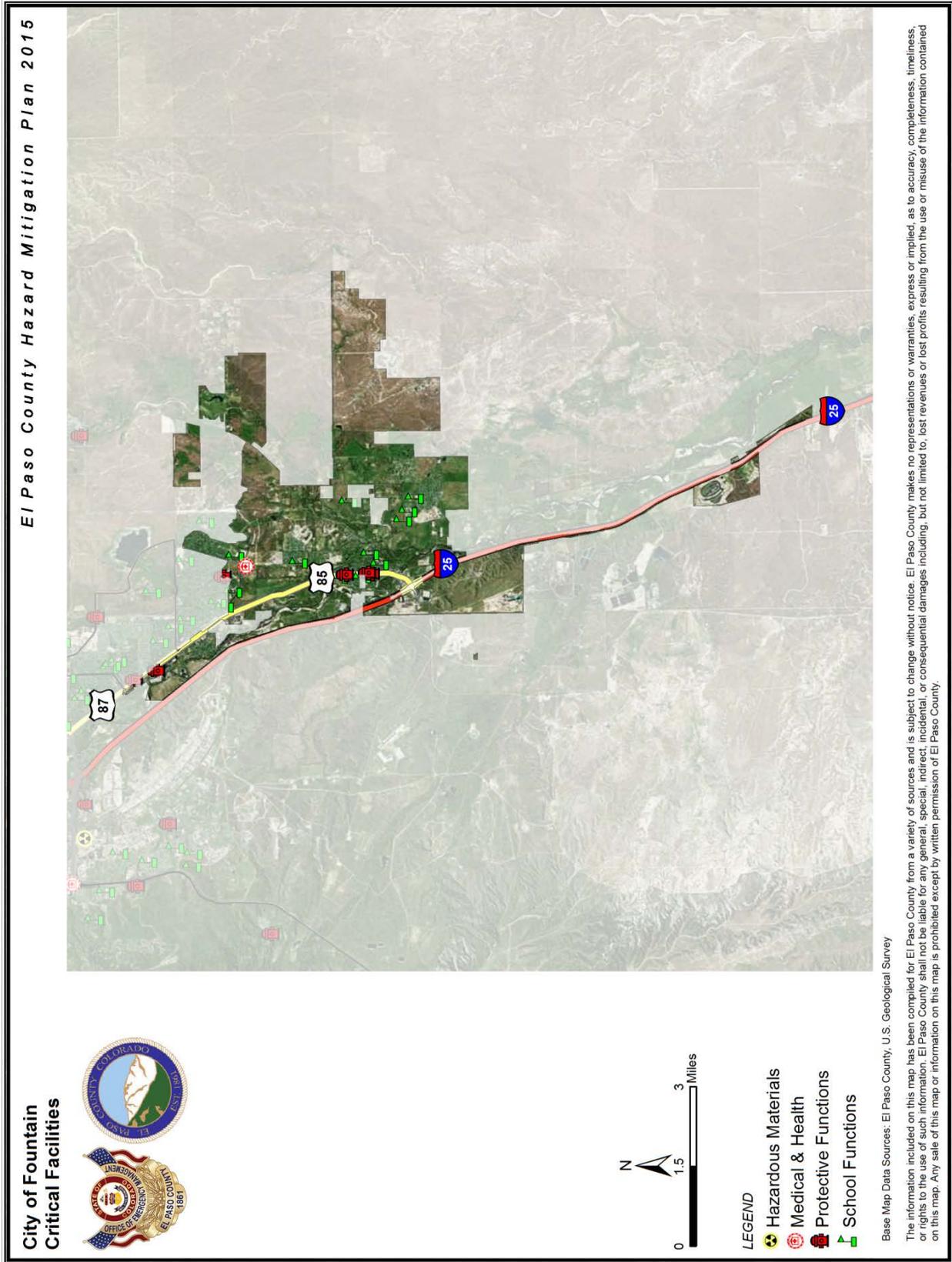


Figure 6-10. Locations of Critical Facilities in the City of Fountain

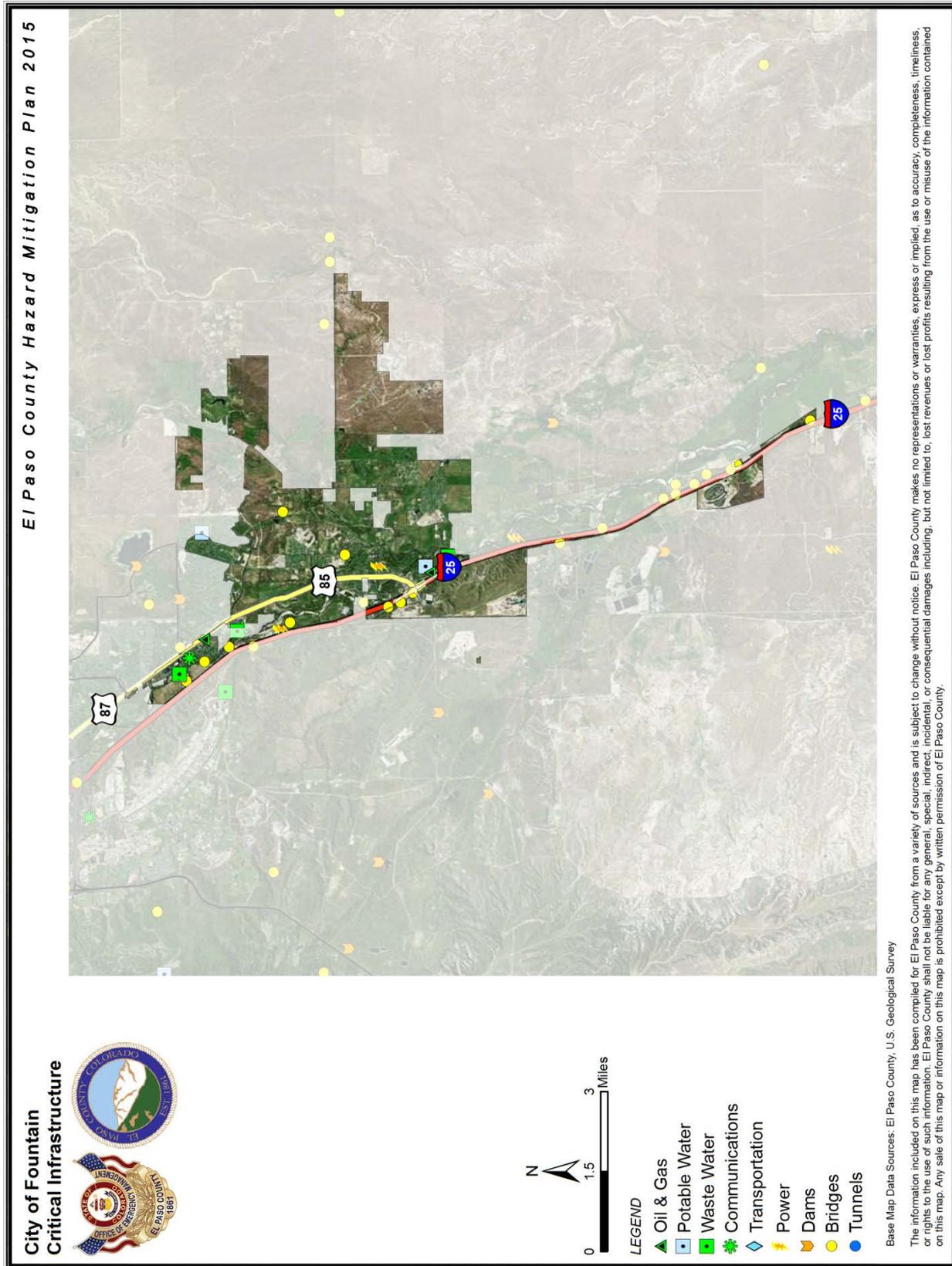


Figure 6-11. Locations of Critical Infrastructure in the City of Fountain

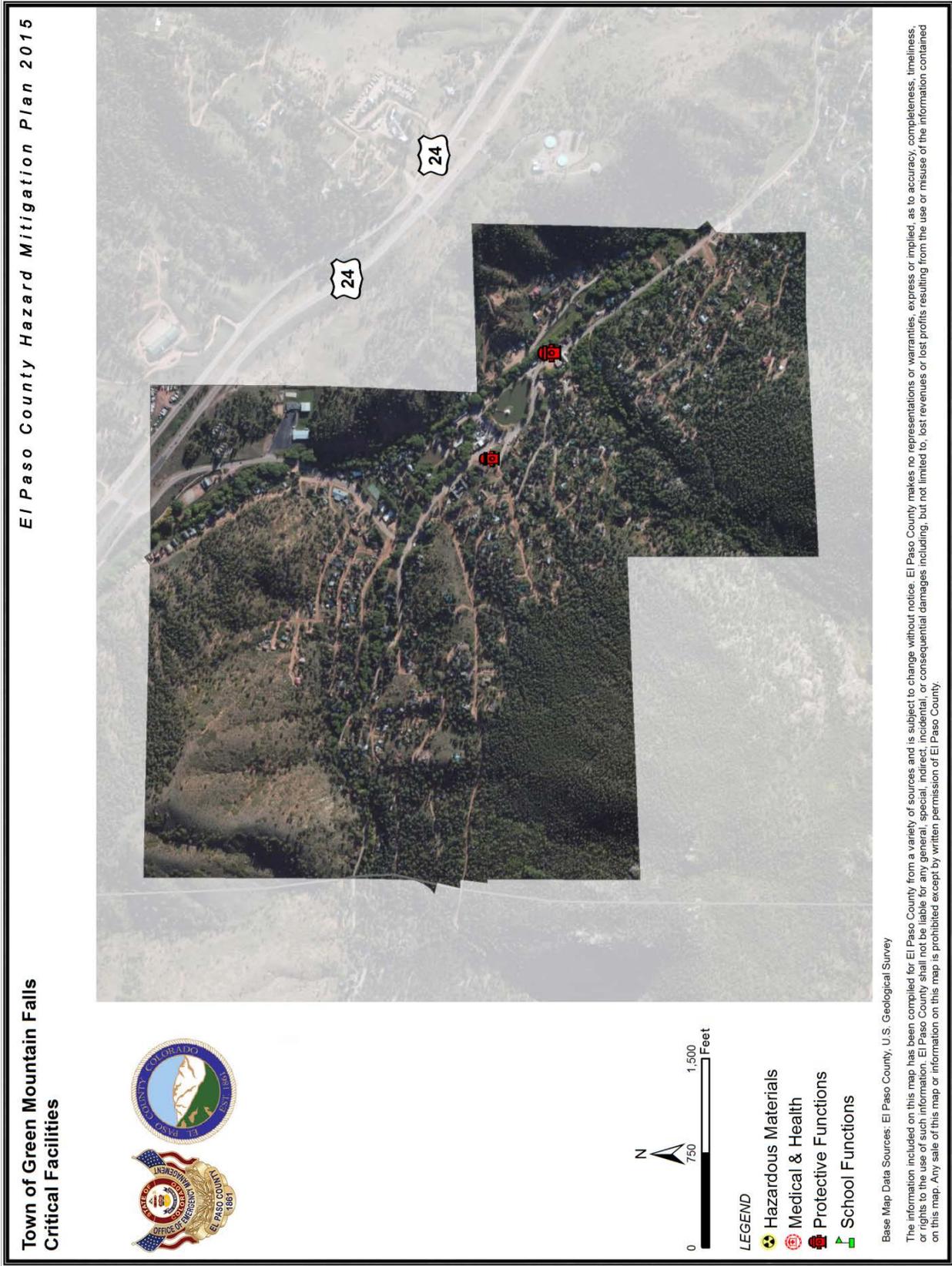


Figure 6-12. Locations of Critical Facilities in the Town of Green Mountain Falls

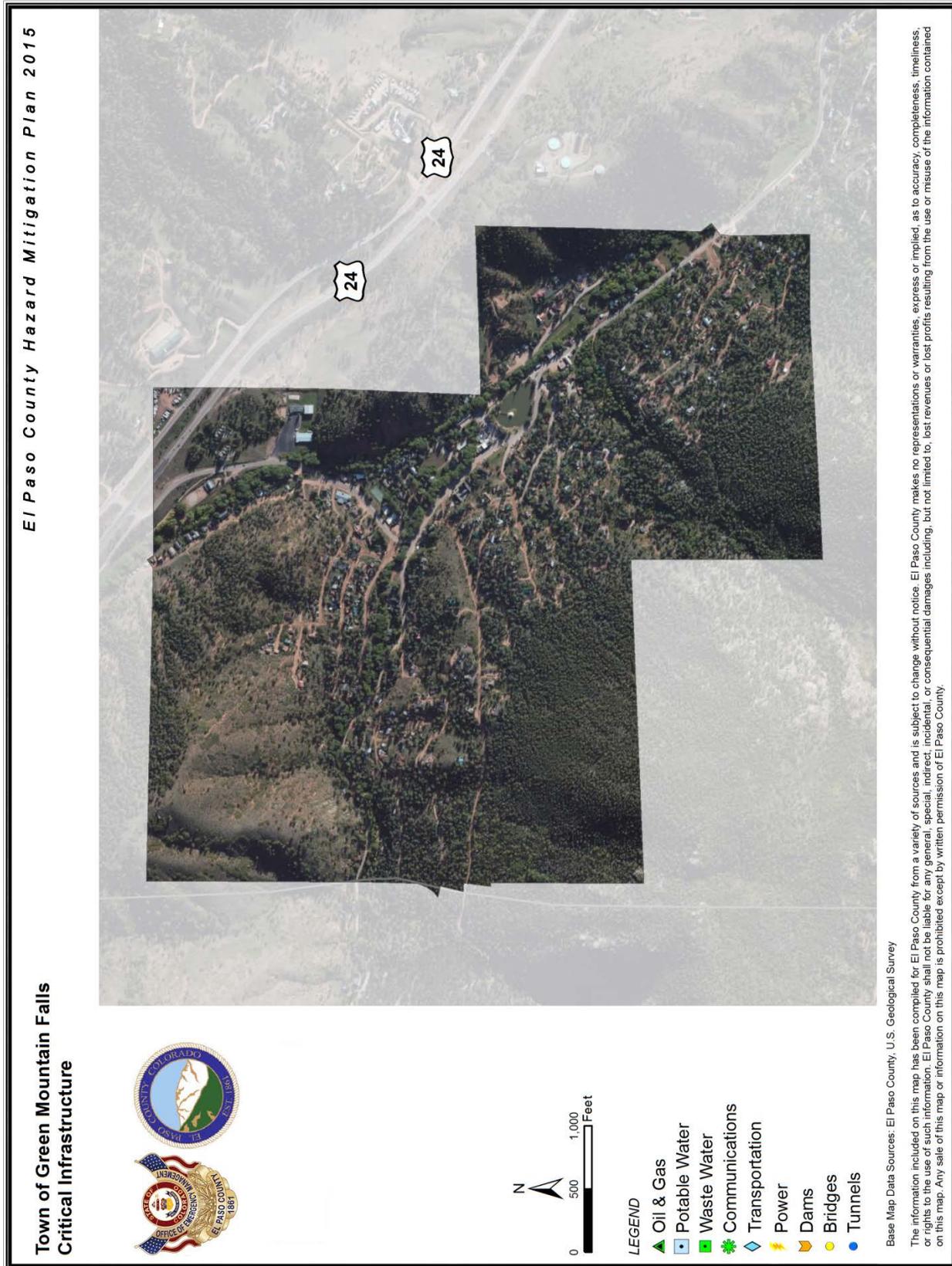


Figure 6-13. Locations of Critical Infrastructure in the Town of Green Mountain Falls

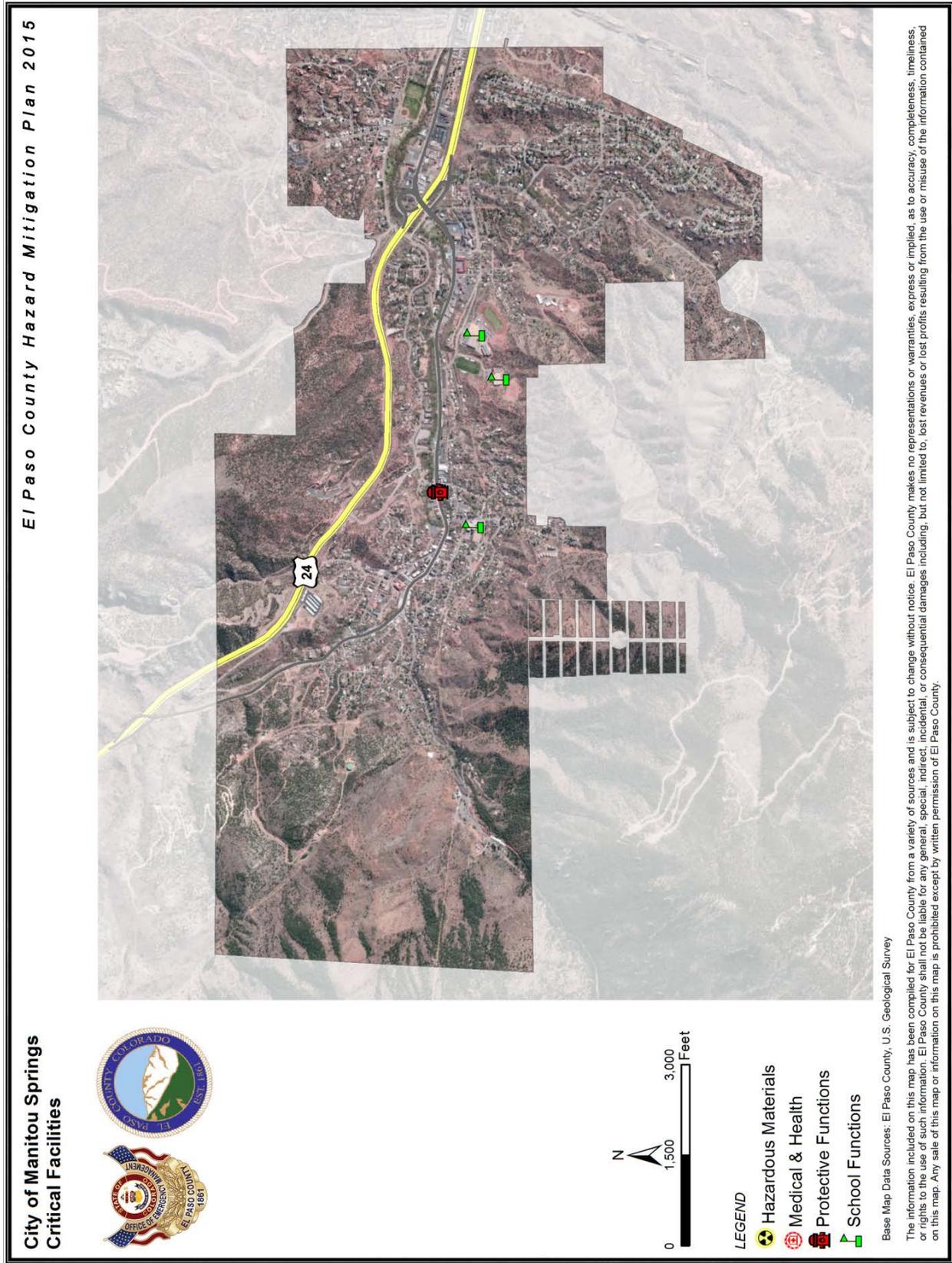


Figure 6-14. Locations of Critical Facilities in the City of Manitou Springs

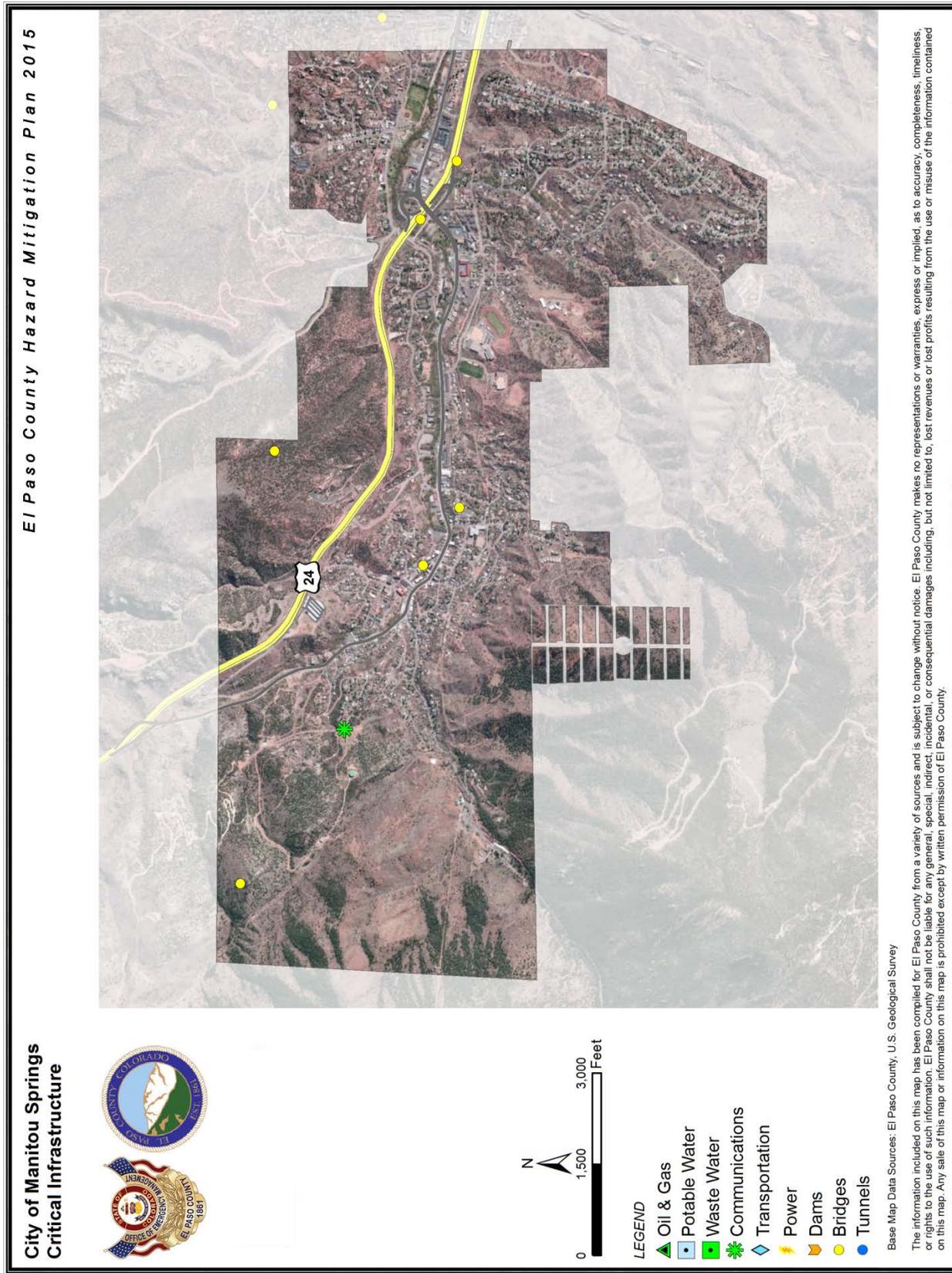


Figure 6-15. Locations of Critical Infrastructure in the City of Manitou Springs

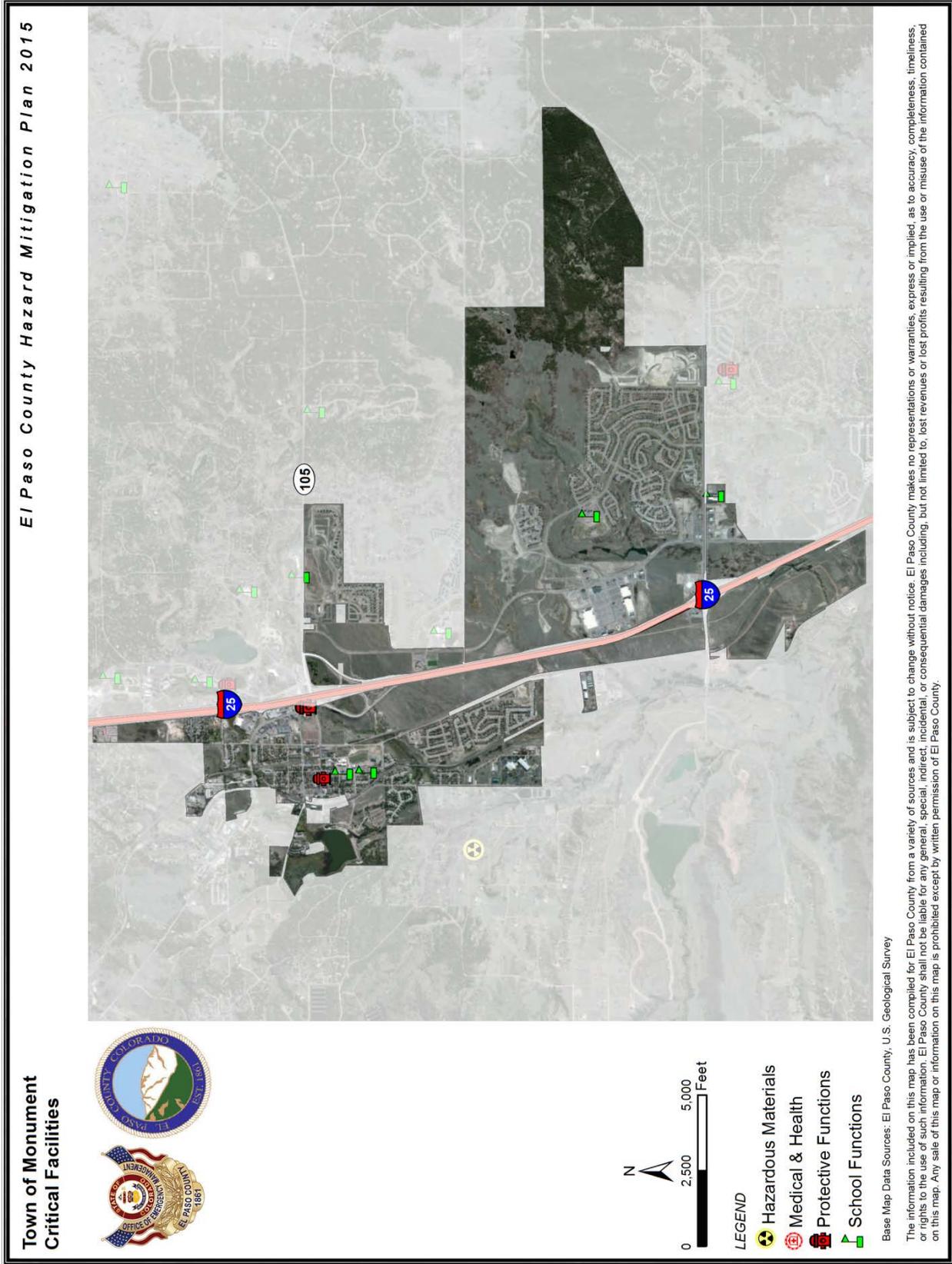


Figure 6-16. Locations of Critical Facilities in the Town of Monument

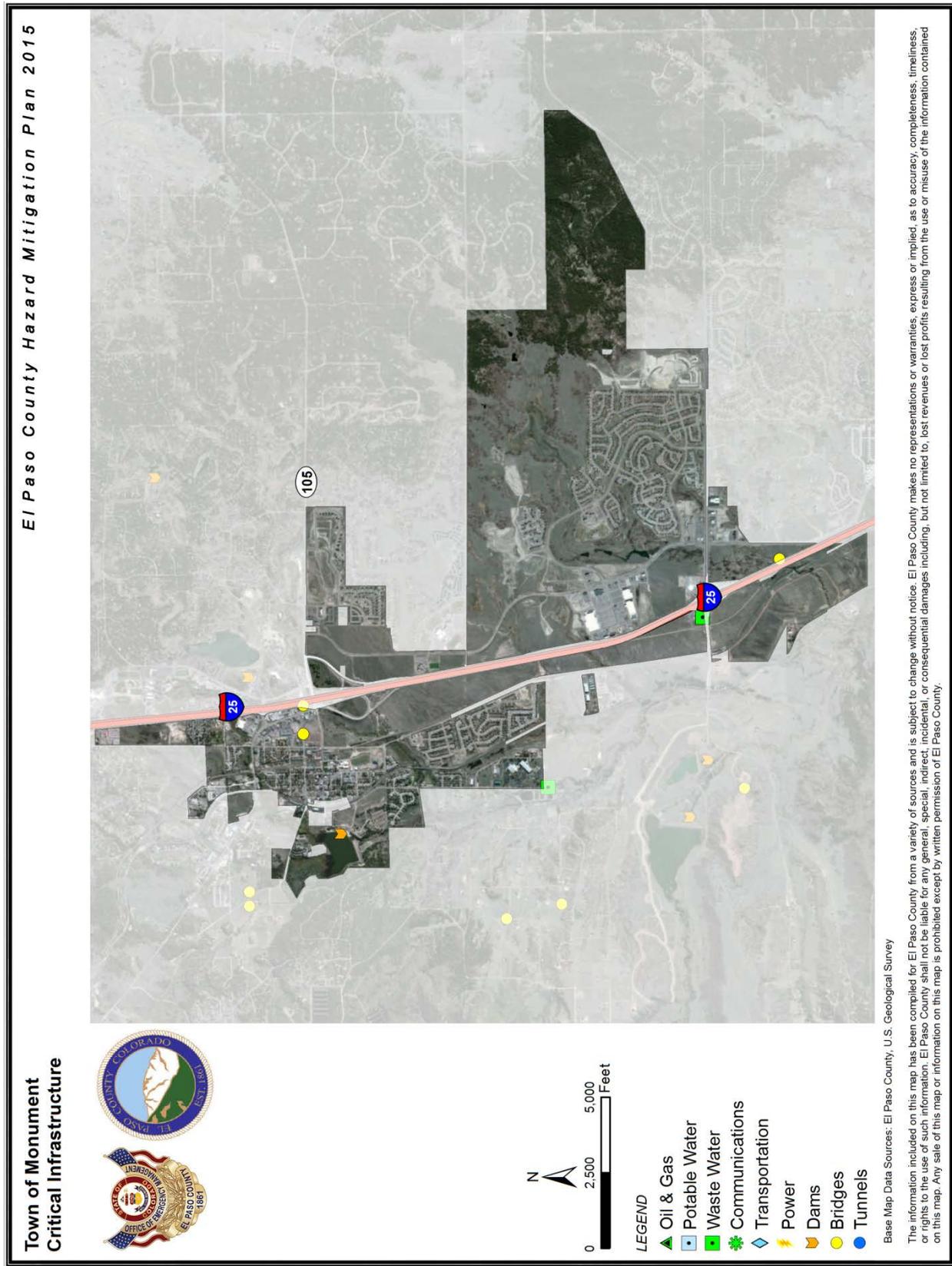


Figure 6-17. Locations of Critical Infrastructure in the Town of Monument

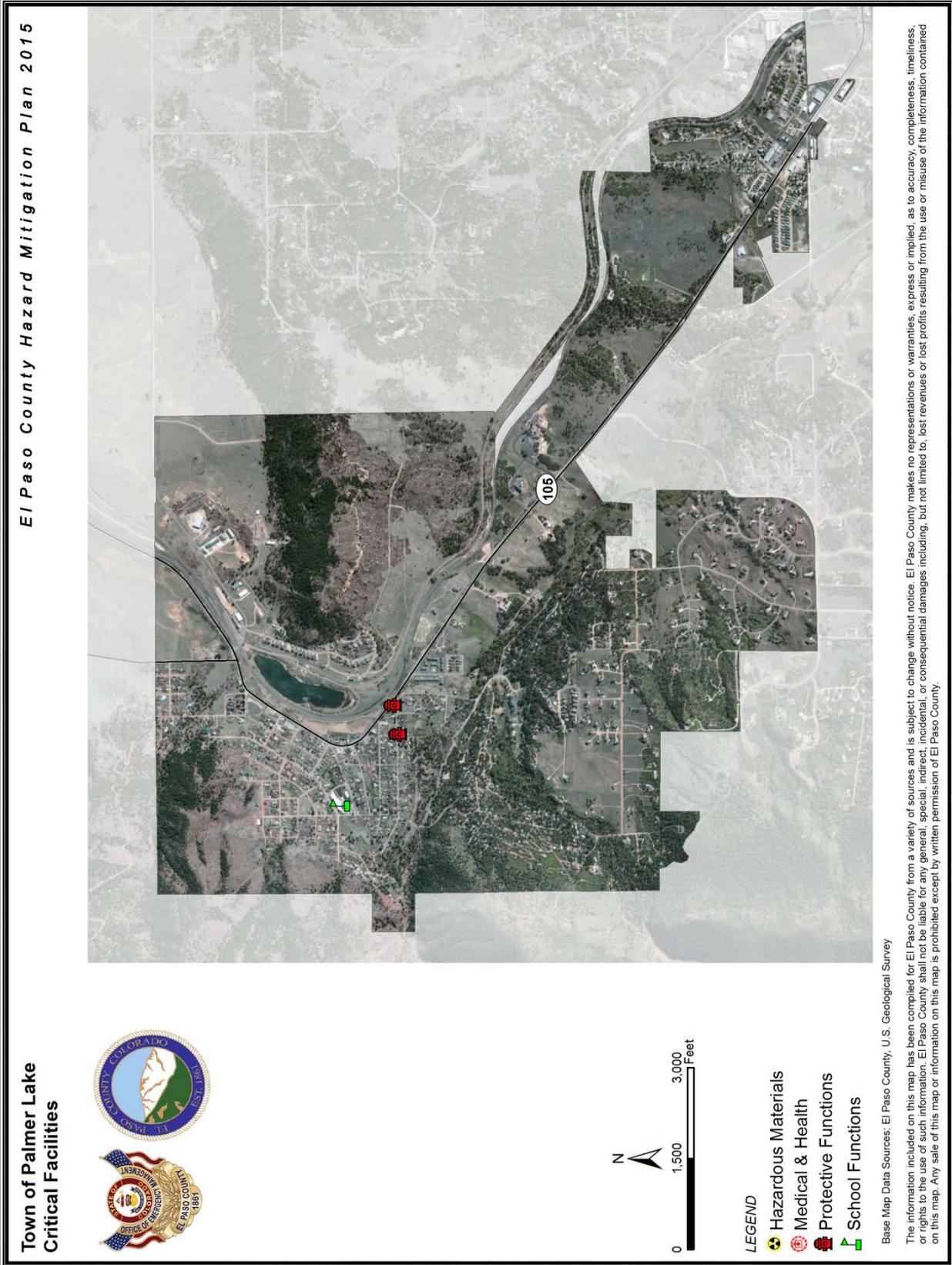


Figure 6-18. Locations of Critical Facilities in the Town of Palmer Lake

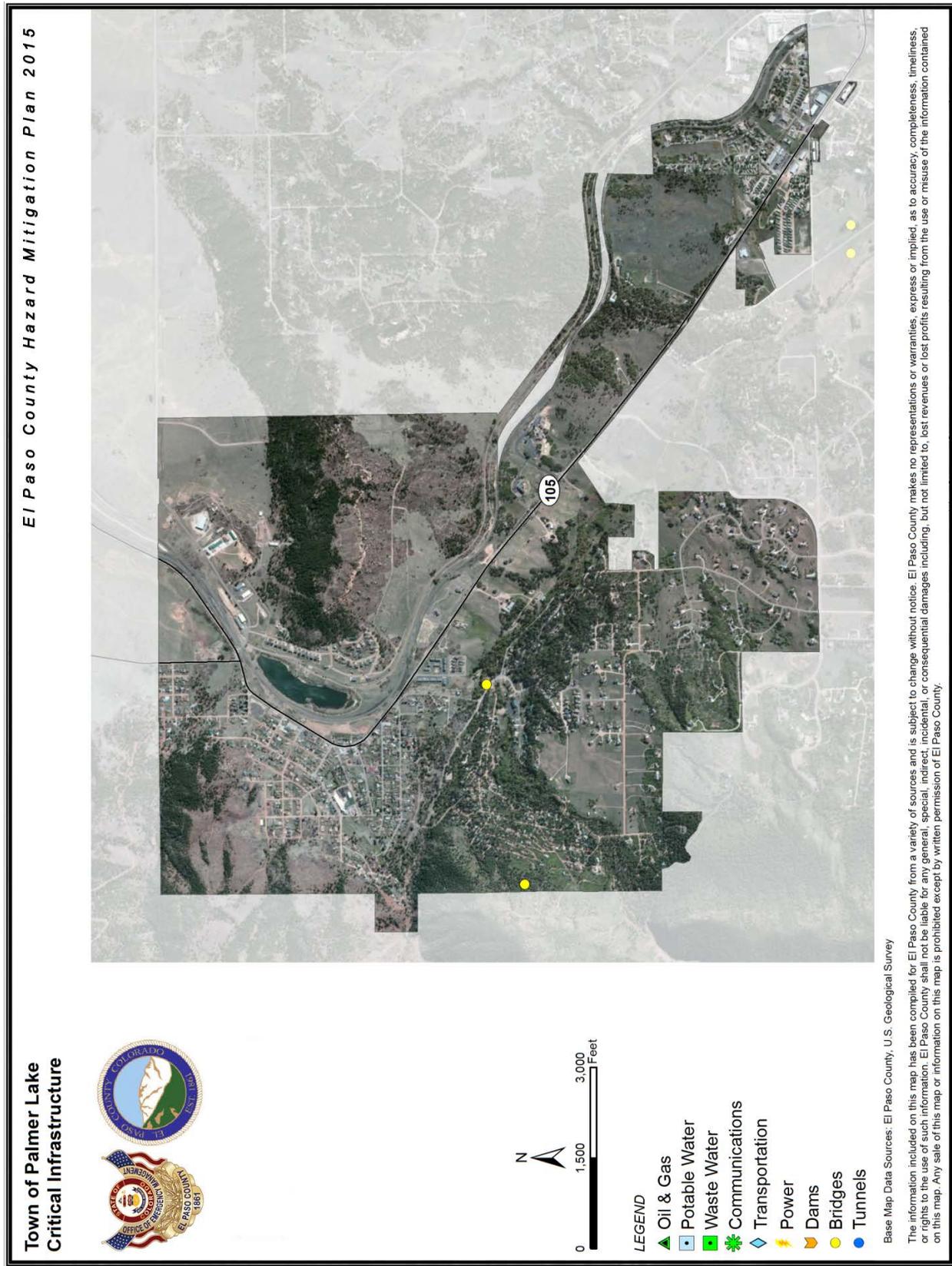


Figure 6-19. Locations of Critical Infrastructure in the Town of Palmer Lake

6.6 DEMOGRAPHICS

Information on population and how it has changed in the past and may change in the future is needed for making informed decisions about the future. Population directly relates to land needs such as housing, industry, stores, public facilities and services, and transportation. Population changes are useful socio-economic indicators, as a growing population generally indicates a growing economy and a decreasing population signifies economic decline.

Some populations are at greater risk from hazard events because of decreased resources or physical abilities. Elderly people, for example, may be more likely to require additional assistance. Research has shown that people living near or below the poverty line, the elderly (especially older single men), the disabled, women, children, ethnic minorities and renters all experience, to some degree, more severe effects from disasters than the general population. These vulnerable populations may vary from the general population in risk perception, living conditions, access to information before, during and after a hazard event, capabilities during an event, and access to resources for post-disaster recovery. Indicators of vulnerability—such as disability, age, poverty, and minority race and ethnicity—often overlap spatially and often in the geographically most vulnerable locations. Detailed spatial analysis to locate areas where there are higher concentrations of vulnerable community members would assist the County in extending focused public outreach and education to these most vulnerable citizens. Select Census 2012 demographic and social characteristics for El Paso County are shown in Table 6-5.

6.6.1 Population

El Paso County is the most populous of Colorado's 64 counties. Colorado's Department of Local Affairs estimated the planning area's population at 646,162 as of 2012. Table 6-5 shows planning area population data from 1980 through 2012. The Cities of Colorado Springs and Fountain are the County's principal population centers. Colorado Springs made up 69.5 percent of the overall County population in 1980 and 66.8 percent in 2012. In 1980, 25.3 percent of the planning area's residents lived outside incorporated areas, compared to 26.6 percent in 2012.

Average annual growth of El Paso County's incorporated areas from 1980 to 2012 ranged from 0.20 percent (for the Town of Ramah) to 6.91 percent (for the Town of Monument). Unincorporated areas saw an average annual growth over that period of 2.48 percent, and the average for the entire county was 2.33 percent. Figure 6-20 shows 5-year population changes in the planning area and the State Colorado from 1980 to 2010. For that total period, Colorado's population grew by 74.7 percent (about 1.9 percent per year) while the county's population increased by 102.7 percent (2.4 percent per year).

6.6.2 Age Distribution

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

**TABLE 6-5.
EL PASO COUNTY HISTORICAL AND PRESENT POPULATION ESTIMATES**

	1980	1985	1990	1995	2000	2005	2010	2012
Calhan	541	850	562	623	893	803	786	807
Colorado Springs	215,105	262,005	280,430	328,782	361,901	384,409	420,529	431,710
Fountain	8,324	9,737	10,754	13,487	15,356	19,794	26,056	27,018
Green Mtn. Falls	607	705	663	751	766	654	808	833
Manitou Springs	4,475	4,834	4,535	4,843	4,971	4,826	5,034	5,215
Monument	690	952	1,020	1,527	1,987	4,225	5,572	5,859
Palmer Lake	1,130	1,248	1,480	1,898	2,185	2,245	2,440	2,528
Ramah	119	113	94	101	117	117	124	127
Unincorporated	78,451	88,083	97,505	117,722	131,672	152,285	165,911	172,091
County Total^a	309,424	368,506	397,014	469,693	519,802	569,322	627,232	646,162

a. County population is not equal to the sum of incorporated and unincorporated areas shown in this table because the populations presented for Green Mountain Falls include the part of the town that is outside El Paso County.

Source: Colorado Department of Local Affairs

https://dola.colorado.gov/demog_webapps/mpeParameters.jsf;jsessionid=d3953e08cbc6801412bc17561485

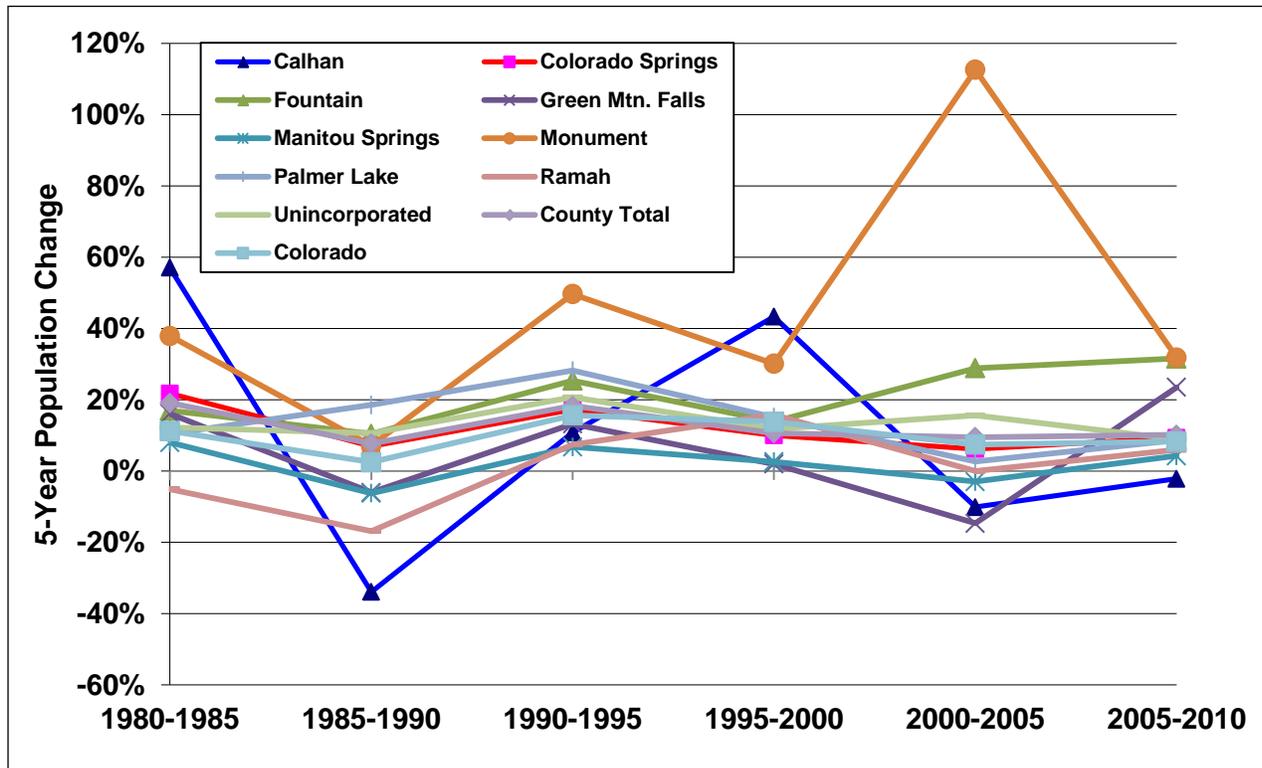


Figure 6-20. State of Colorado and Planning Area Population Change

Children under 14 are particularly vulnerable to disaster events because of their young age and dependence on others for basic necessities. Very young children may additionally be vulnerable to injury or sickness; this vulnerability can be worsened during a natural disaster because they may not understand the measures that need to be taken to protect themselves from hazards. The overall age distribution for the planning area is illustrated in Figure 6-21. Based on U.S. Census data estimates, 10 percent of the planning area’s population is 65 or older, and 34 percent of the over-65 population has disabilities of some kind. The census also estimates that 21 percent of the County’s population is 14 or younger.

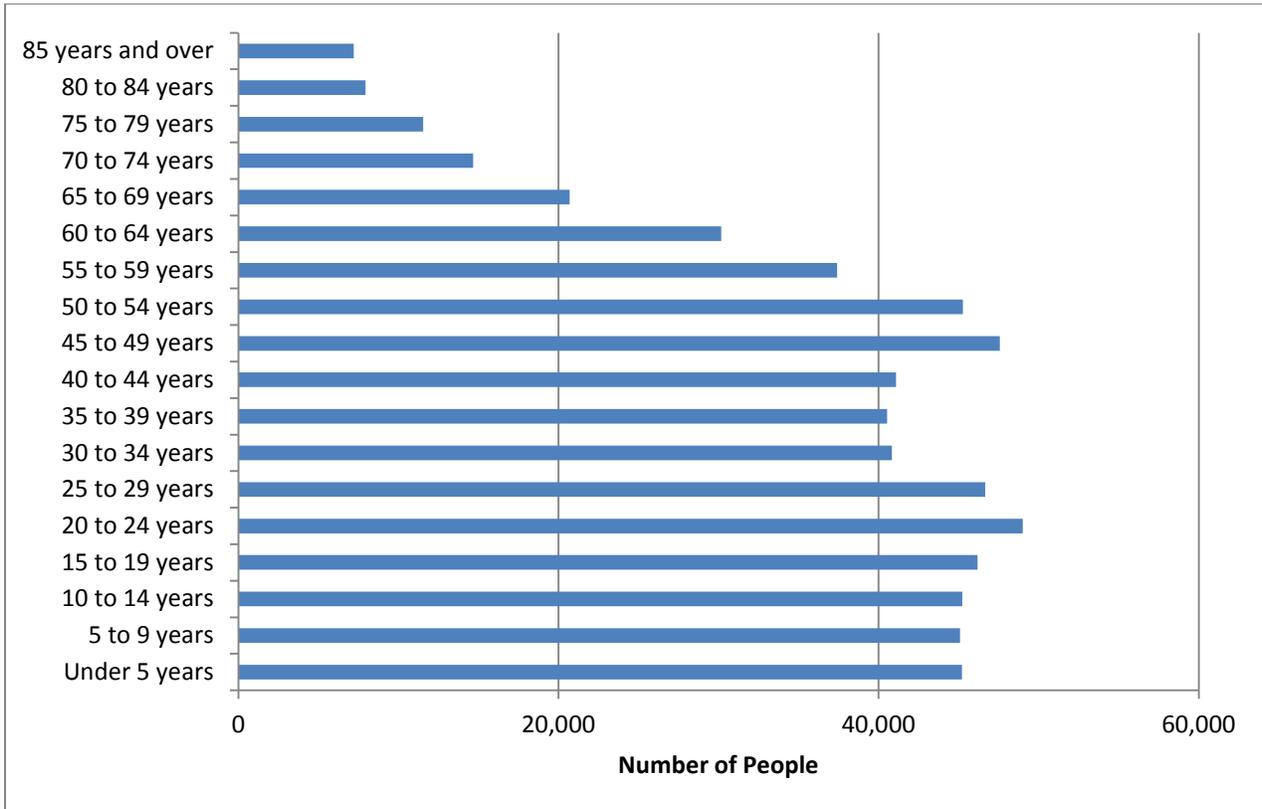


Figure 6-21. El Paso County Age Distribution

6.6.3 Disabled Populations

The 2010 U.S. Census estimates that 54 million non-institutionalized Americans with disabilities live in the U.S. This equates to about one-in-five persons. People with disabilities are more likely to have difficulty responding to a hazard event than the general population. Local government is the first level of response to assist these individuals, and coordination of efforts to meet their access and functional needs is paramount to life safety efforts. It is important for emergency managers to distinguish between functional and medical needs in order to plan for incidents that require evacuation and sheltering. Knowing the percentage of population with a disability will allow emergency management personnel and first responders to have personnel available who can provide services needed by those with access and functional needs. According to 2012 Census data, 11.2 percent of the population in El Paso County lives with some form of disability.

6.6.4 Ethnic Population

Research shows that minorities are less likely to be involved in pre-disaster planning and experience higher mortality rates during a disaster event. Post-disaster recovery can be ineffective and is often characterized by cultural insensitivity. Since higher proportions of ethnic minorities live below the

poverty line than the majority white population, poverty can compound vulnerability. According to the U.S. Census, the racial composition of the planning area is predominantly white, at approximately 82 percent (Table 6-6). The largest minority populations are African American at 6 percent and “two or more races” at 5 percent. The population also is 15.4 percent Hispanic. Figure 6-22 shows the population distribution by race in the planning area.

TABLE 6-6. 2012 RACE AND ETHNICITY CHARACTERISTICS								
	Race/Ethnicity (% of Total Population)							
	White	Black or African American	American Indian/Alaska Native	Asian	Hawaiian or Pacific Islander	Other Race	More Than One Race	Hispanic or Latino (of any race)
Calhan	98.0%	0.0%	0.0%	0.0%	0.0%	0.6%	1.4%	2.7%
Colorado Springs	80.7%	6.5%	0.8%	2.8%	0.3%	4.3%	4.8%	16.3%
Fountain	76.1%	11.1%	1.0%	2.5%	0.7%	1.6%	7.1%	16.0%
Green Mountain Falls	85.4%	1.1%	1.1%	1.7%	0.0%	1.2%	9.5%	6.9%
Manitou Springs	95.4%	0.8%	1.3%	0.6%	0.0%	1.1%	0.8%	5.0%
Monument	91.6%	2.3%	0.0%	1.0%	0.0%	1.3%	3.9%	7.8%
Palmer Lake	92.0%	0.0%	0.6%	0.0%	0.0%	2.8%	4.7%	6.3%
Ramah	94.4%	0.0%	0.0%	0.0%	0.0%	5.6%	0.0%	12.5%
Unincorporated	83.8%	4.8%	0.8%	2.3%	0.3%	1.9%	6.1%	12.6%
County Total	81.6%	6.1%	0.8%	2.6%	0.3%	3.5%	5.2%	15.1%

Source: U.S. Census Bureau, 2012, www.census.gov

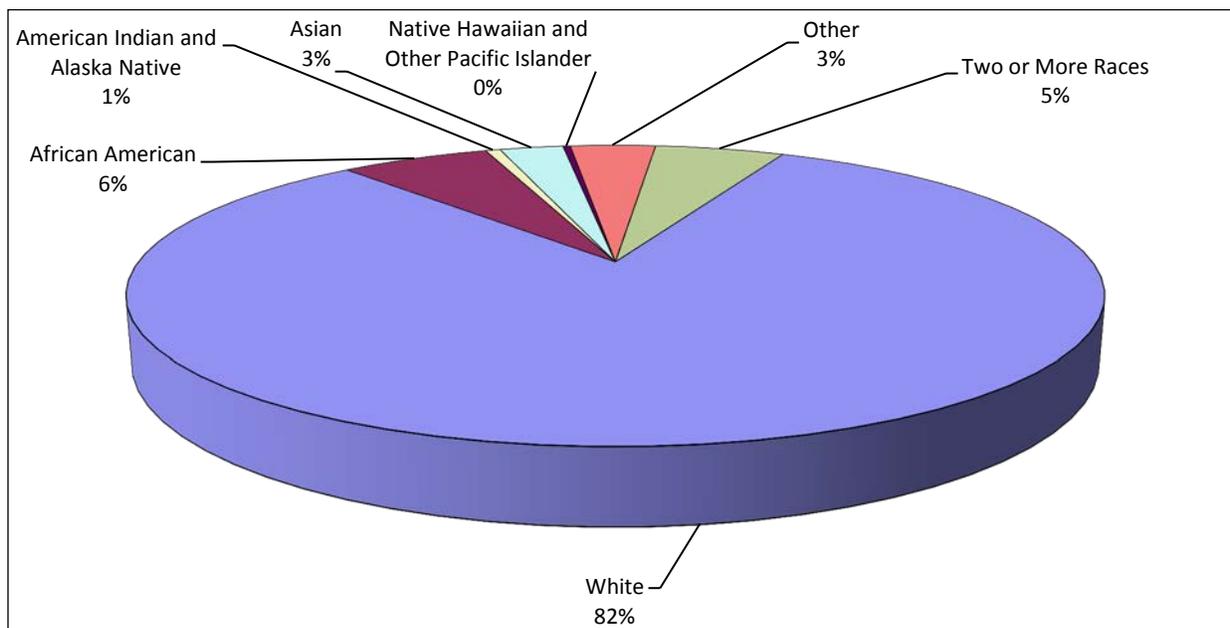


Figure 6-22. El Paso County Race Distribution

The planning area has a 7.4-percent foreign-born population. Other than English, the most commonly spoken language in the planning area is Spanish. The census estimates 3.8 percent of the residents speak English “less than very well.”

6.7 ECONOMY

Select 2012 economic characteristics estimated for El Paso County by the U.S. Census Bureau are shown in Table 6-7.

6.7.1 Income

In the United States, individual households are expected to use private resources to prepare for, respond to, and recover from disasters to some extent. This means that households living in poverty are automatically disadvantaged when confronting hazards. Additionally, the poor typically occupy more poorly built and inadequately maintained housing. Mobile or modular homes, for example, are more susceptible to damage in earthquakes and floods than other types of housing. In urban areas, the poor often live in older houses and apartment complexes, which are more likely to be made of un-reinforced masonry, a building type that is particularly susceptible to damage during earthquakes. Furthermore, residents below the poverty level are less likely to have insurance to compensate for losses incurred from natural disasters. This means that residents below the poverty level have a great deal to lose during an event and are the least prepared to deal with potential losses. The events following Hurricane Katrina in 2005 illustrated that personal household economics significantly impact people’s decisions on evacuation. Individuals who cannot afford gas for their cars will likely decide not to evacuate.

Based on U.S. Census Bureau estimates, per capita income in the planning area in 2012 was \$28,776, and the median household income was \$57,531. It is estimated that 14.5 percent of households receive an income between \$100,000 and \$149,999 per year and 9.4 percent are above \$150,000 annually. People with incomes below the poverty level in 2012 made up 9.1 percent of all families and 12.5 percent of the total county population. Census estimates indicate that 14.5 percent of El Paso County families with children under 18 had incomes below the poverty line for 2012.

	% of Families below poverty level	% of Individuals below poverty level	Median Home Value	Median Household Income	Per Capita Income	% of Population >16 in Labor Force	% of Population >16 Employed (Civilian + Military)
Calhan	4.1	11.3	\$163,800	\$46,607	\$18,526	58.9	52.2
Colorado Springs	9.9	13.7	\$213,400	\$54,351	\$29,064	68.9	62.9
Fountain	9.4	10.3	\$181,500	\$57,015	\$22,941	71.6	67.4
Green Mountain Falls	0	5.5	\$195,000	\$36,875	\$30,370	66.6	61.0
Manitou Springs	10.8	14.6	\$332,900	\$49,432	\$40,207	67.1	61.9
Monument	3.7	2.8	\$301,900	\$87,090	\$31,381	70.3	65.5
Palmer Lake	4.6	7.4	\$255,100	\$58,000	\$30,004	72.9	69.5
Ramah	0	2.8	\$112,500	\$63,214	\$37,104	59.7	59.7
County Total	9.1	12.5	\$217,500	\$57,531	\$28,776	69.3	63.5

Source: U.S. Census Bureau, 2012, www.census.gov

6.7.2 Employment Trends

According to the 2012 American Community Survey, 69.3 percent of El Paso County’s population 16 years and older is in the labor force. According to the Colorado Department of Labor and Employment, El Paso County’s unemployment rate as of December 2013 was 7.2 percent, compared to a statewide rate of 5.9 percent. Figure 6-23 compares Colorado’s and El Paso County’s unemployment trends from 2003 through 2013, based on data from the U.S. Bureau of Labor Statistics. El Paso County’s unemployment rate was lowest in 2007 at 4.2 percent and peaked in 2010 at 9.6 percent.

Source: U.S. Bureau of Labor Statistics, 2014

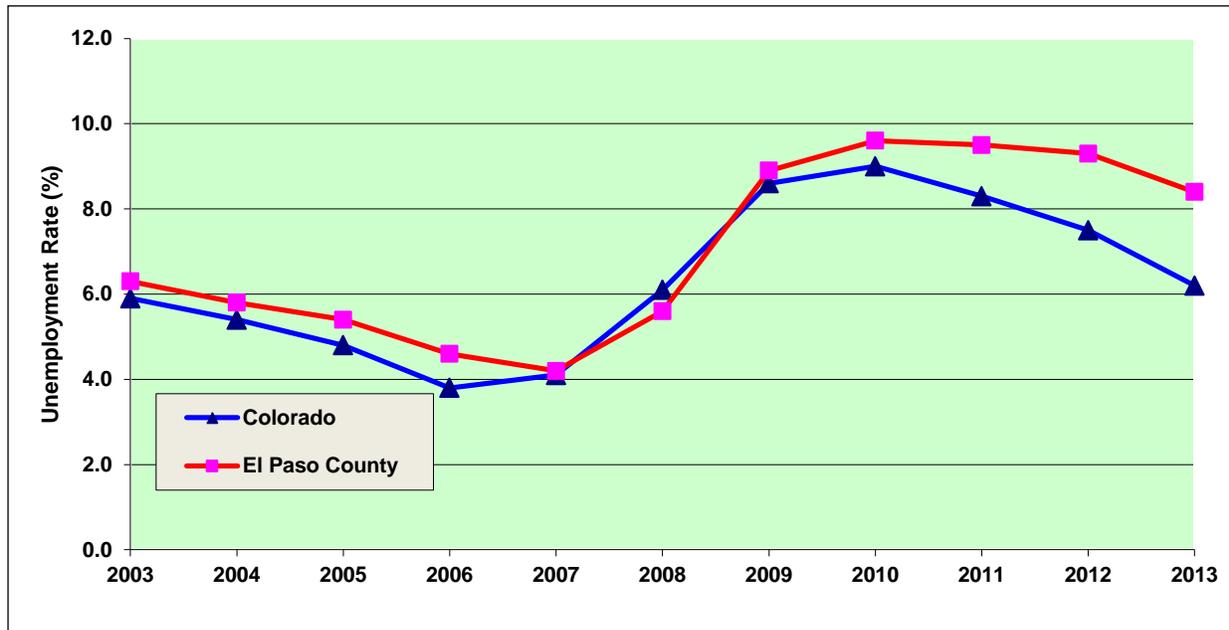


Figure 6-23. State of Colorado and El Paso County Unemployment Rate

6.7.3 Occupations and Industries

According to U.S. Census data, the 2011 distribution of occupation types by percent of total employment in El Paso County was as follows:

- Management, business, science, and arts occupations, 40.5 percent
- Service occupations, 18.2 percent
- Sales and office occupations, 24.6 percent
- Natural resources, construction, and maintenance occupations, 8.5 percent
- Production, transportation, and material moving occupations, 8.3 percent.

According to 2012 Census data, the planning area’s economy is strongly based in the education, health care and social assistance industries (21.7 percent of total employment), followed by the professional and administrative industry (13.2 percent) and retail trade (11.3 percent). Figure 6-24 shows the distribution of industry types in El Paso County, based on share of total employment.

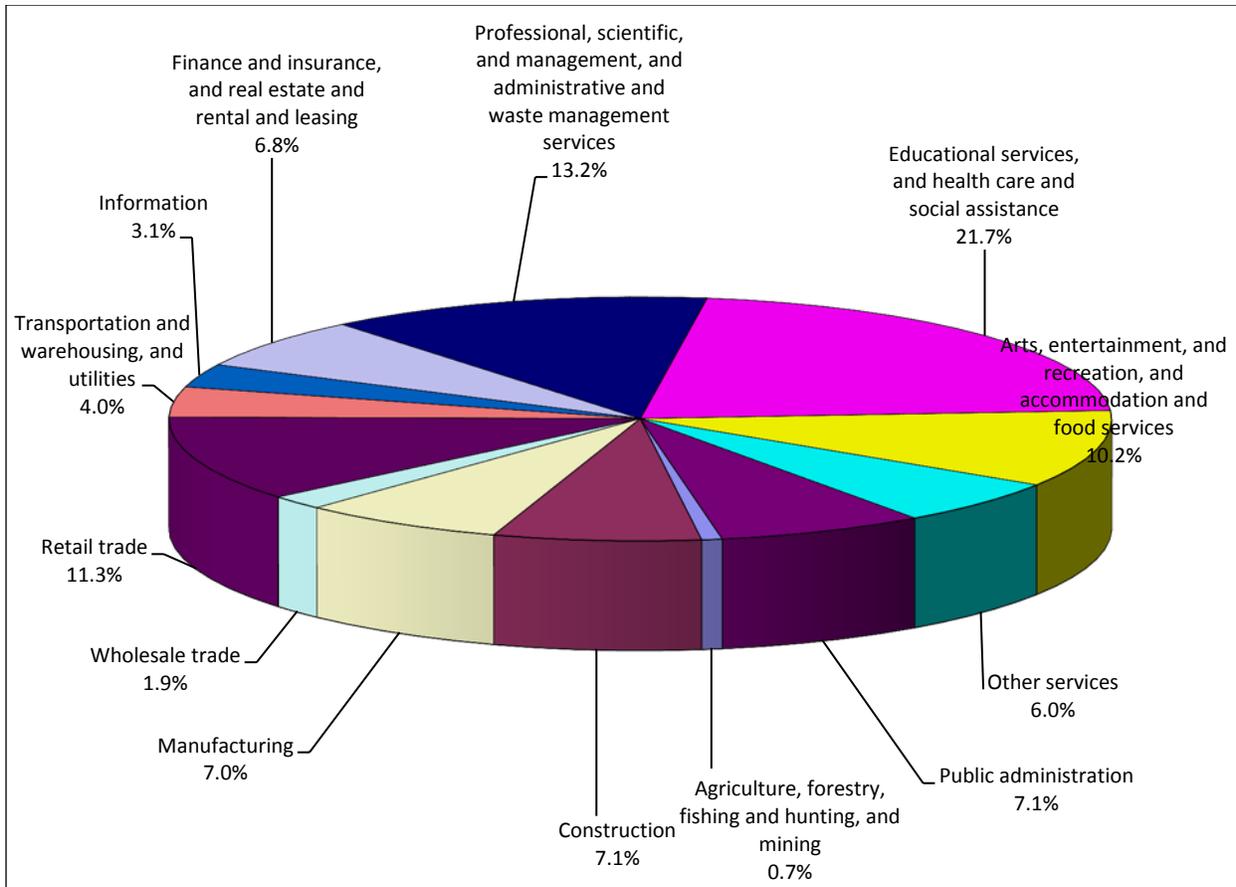


Figure 6-24. Percent of Total Employment by Industry in El Paso County

According to the Colorado Department of Labor and Employment, Peterson Air Force Base is the largest employer in El Paso County, with more than 5,000 employees. An additional 22 employers in the county have 1,000 or more employees. Almost all are in Colorado Springs. They include the following (Colorado LMI, 2014; Gateway website, <https://www.colmigateway.com>):

- U.S. Air Force Academy
- Atmel Corporation
- Broadmoor Hotel
- Cheyenne Mountain Air Station
- Compassion International
- Direct Checks Unlimited
- Hewlett-Packard
- Memorial Hospital
- Penrose Hospital
- Pikes Peak Community College
- Schriever Air Force Base
- Verizon Wireless.

The U.S. Census estimates that 77.3 percent of El Paso County workers commute alone (by car, truck or van) to work, and mean travel time to work is 21.8 minutes.

6.8 FUTURE TRENDS IN DEVELOPMENT

The municipal planning partners have adopted comprehensive plans that govern land use decision and policy making their jurisdictions. Decisions on land use will be governed by these programs. This plan will work together with these programs to support wise land use in the future by providing vital information on the risk associated with natural hazards in the planning area. The present land use in El Paso County is shown on Table 6-8.

Municipal planning partners intend to incorporate this hazard mitigation plan update in their comprehensive plans by reference and practice. This will ensure that future development trends can be established with the benefits of the information on risk and vulnerability to natural hazards identified in this plan.

TABLE 6-8. PRESENT LAND USE IN PLANNING AREA		
Present Use Classification	Area (acres)	% of total
Agriculture	41,718	3.14
Commercial	21,884	1.65
Education	182	0.01
Government	155,967	11.73
Industrial	1,298	0.10
Religion/Non-Profit	3,688	0.28
Residential	402,837	30.30
Uncategorized	701,810	52.79
Total	1,329,385	100.0

Note: Acreage covers only mapped parcels and may exclude many rights of way and major water features.

There are an estimated 234,843 structures within the planning area. Table 6-9 shows the number of structures by jurisdiction and the number and percent of these structures that are estimated to be residential.

TABLE 6-9. STRUCTURES WITHIN THE PLANNING AREA				
	Total Structures		Residential Structures	
	Number	% of Total	Number	% of Total
Calhan	529	0.2	374	70.7
Colorado Springs	149,467	63.6	140,120	93.7
Fountain	9,140	3.9	8,559	93.6

TABLE 6-9. STRUCTURES WITHIN THE PLANNING AREA				
	Total Structures		Residential Structures	
	Number	% of Total	Number	% of Total
Green Mtn. Falls	575	0.2	548	95.3
Manitou Springs	2,678	1.1	2,441	91.2
Monument	2,665	1.1	2,428	91.1
Palmer Lake	1,281	0.5	1,158	90.4
Ramah	126	0.1	81	64.3
Unincorporated	68,382	29.1	56,627	82.8
Total	234,843	100.0	212,336	90.4

6.9 LAWS AND ORDINANCES

Existing laws, ordinances and plans at the federal, state and local level can support or impact hazard mitigation initiatives identified in this plan. Hazard mitigation plans are required to include a review and incorporation, if appropriate, of existing plans, studies, reports, and technical information as part of the planning process (44 CFR, Section 201.6(b)(3)). Pertinent federal, state and local laws are described below.

6.9.1 Federal

Disaster Mitigation Act

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.”

Five sections of the ESA are of critical importance to understanding it:

- **Section 4: Listing of a Species**—The National Oceanic and Atmospheric Administration Fisheries Service (NOAA Fisheries) is responsible for listing marine species; the U.S. Fish and Wildlife Service is responsible for listing terrestrial and freshwater aquatic species. The agencies may initiate reviews for listings, or citizens may petition for them. A listing must be made “solely on the basis of the best scientific and commercial data available.” After a listing has been proposed, agencies receive comment and conduct further scientific reviews for 12 to 18 months, after which they must decide if the listing is warranted. Economic impacts cannot be considered in this decision, but it may include an evaluation of the adequacy of local and state protections. Critical habitat for the species may be designated at the time of listing.
- **Section 7: Consultation**—Federal agencies must ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed or proposed species or adversely modify its critical habitat. This includes private and public actions that require a federal permit. Once a final listing is made, non-federal actions are subject to the same review, termed a “consultation.” If the listing agency finds that an action will “take” a species, it must propose mitigations or “reasonable and prudent” alternatives to the action; if the proponent rejects these, the action cannot proceed.
- **Section 9: Prohibition of Take**—It is unlawful to “take” an endangered species, including killing or injuring it or modifying its habitat in a way that interferes with essential behavioral patterns, including breeding, feeding, or sheltering.
- **Section 10: Permitted Take**—Through voluntary agreements with the federal government that provide protections to an endangered species, a non-federal applicant may commit a take that would otherwise be prohibited as long as it is incidental to an otherwise lawful activity (such as developing land or building a road). These agreements often take the form of a “Habitat Conservation Plan.”
- **Section 11: Citizen Lawsuits**—Civil actions initiated by any citizen can require the listing agency to enforce the ESA’s prohibition of taking or to meet the requirements of the consultation process.

The 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. A full array of issues are addressed, not just those subject to CWA regulatory authority. Involvement of stakeholder groups in the development and implementation of strategies for achieving and maintaining water quality and other environmental goals is a hallmark of this approach.

National Flood Insurance Program

The National Flood Insurance Program (NFIP) provides federally backed flood insurance in exchange for communities enacting floodplain regulations. Participation and good standing under NFIP are prerequisites to grant funding eligibility under the Robert T. Stafford Act. The County and most of the 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 participating jurisdictions in the partnership were in good standing with NFIP requirements.

6.9.2 State and Regional

Colorado Division of Emergency Management

Pursuant to House Bill 12-1283, the former Division of Emergency Management moved from the Department of Local Affairs to the newly created Division of Homeland Security and Emergency Management under the Colorado Department of Public Safety, effective July 1, 2012. The division is now comprised of three offices:

- Office of Emergency Management
- Office of Preparedness
- Office of Prevention and Security

Homeland Security and Emergency Management operate under the following division mission: The Mission of the Division of Homeland Security and Emergency Management is to support the needs of local government and partner with them before, during and after a disaster and to enhance preparedness statewide by devoting available resources toward prevention, protection, mitigation, response and recovery, which will ensure greater resiliency of our communities. The Division vision is: The vision of the Division of Homeland Security and Emergency Management is to unify homeland security and emergency management within the Colorado Department of Public Safety to support tribal and local government and ensure State and Federal agency coordination.

Colorado Water Conservation Board

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

Colorado Geological Survey

The Colorado Geological Survey 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 citizens of Colorado, to promote responsible economic development of mineral and energy resources, provide geologic insight into water resources, provide avalanche safety training and forecasting, and to provide geologic advice and information to a variety of constituencies. 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.

Pikes Peak Area Council of Governments

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.

6.9.3 El Paso County

Excerpts from applicable policies, regulations, plans, and program descriptions follow to provide more detail on existing mitigation capabilities of El Paso County.

The organizational structure of the El Paso County government is shown on Figure 6-25.

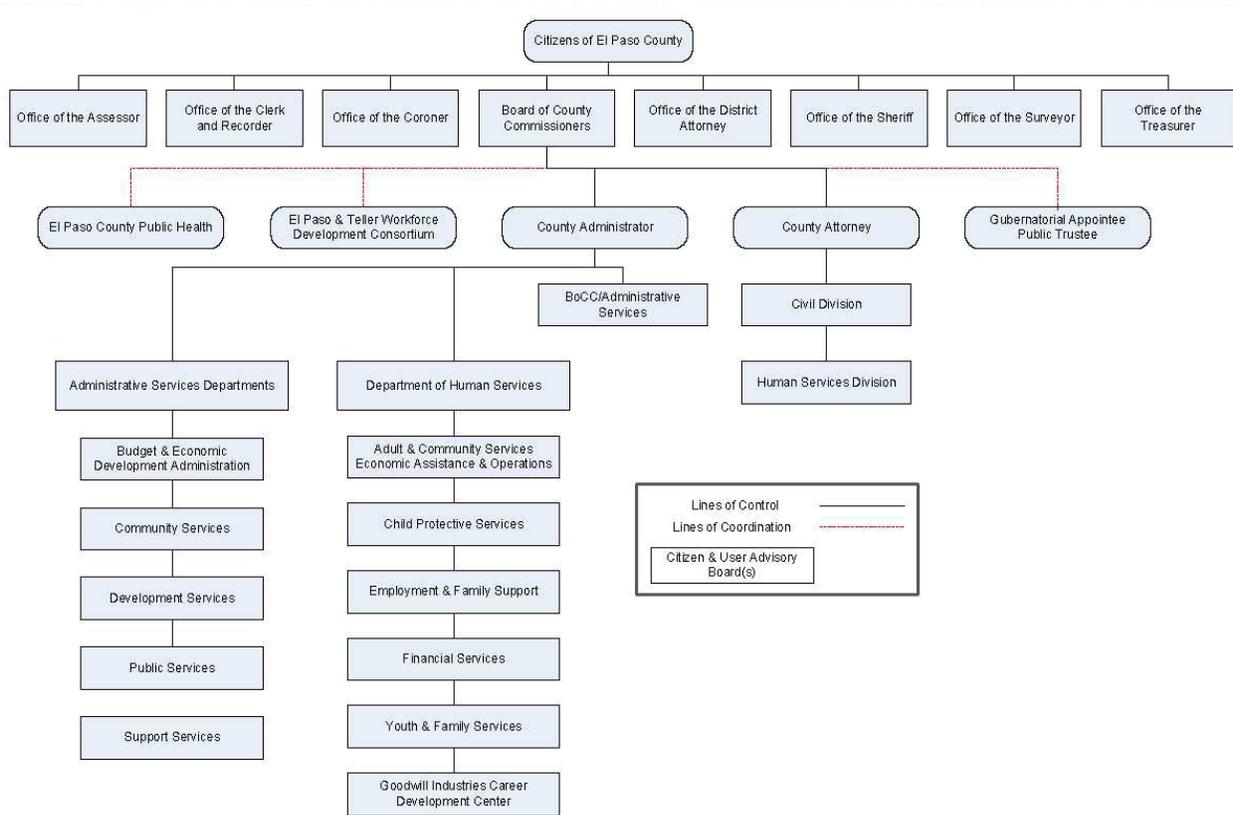


Figure 6-25. El Paso County Organizational Chart

El Paso County derives its elected official structure and its powers from State of Colorado enabling legislation. The State grants the County such powers as required for the health, welfare, and safety of its residents. County government is made up of the following offices and departments:

- Administration
 - Budget Administration
 - Community Services
 - Development Services
 - Employment
 - Facilities Management
 - Fleet Management
 - Information Technology
 - Justice Services
 - County Fairgrounds
 - Procurement and Contracts
 - Public Communications
 - Security and Parking
 - Transportation
- Assessor
- Board of County Commissioners
- Clerk and Recorder
- County Attorney
- Colorado State University Extension
- Coroner
- District Attorney
- Department of Human Services
- County Public Health
- Public Trustee
- Sheriff
- Surveyor
- Treasurer

The Board of County Commissioners serves as both the administrative and policy-making body for the County. All powers of the County are exercised by the Board of County Commissioners and not by its individual members.

The Assessor is a constitutional officer elected to a four-year term. The Assessor discovers, lists, and values real and taxable personal property.

The County Clerk and Recorder administers state laws related to motor vehicles and certification of automobile titles; administers primary, general, and special County elections; issues marriage licenses; maintains records and books for the Board of County Commissioners; collects state mandated license fees; maintains property records; and furnishes deed abstracts.

The County Coroner is responsible for the certification of all deaths in its jurisdiction.

The District Attorney is the prosecutor for El Paso and Teller Counties. The District Attorney appears on behalf of the State and counties of the district in all pending criminal proceedings. Other duties include prosecution of criminal violations of state statutes; response to victim's needs; pursuit of consumer fraud complaints; and crime prevention.

The Sheriff maintains the peace, enforces State Statutes, serves court-issued civil process, executes arrest warrants, performs extraditions, transports the mentally ill, maintains criminal justice records, issues concealed weapon permits, coordinates search and rescue activities, and acts as the Fire Warden. The Sheriff operates the El Paso County Criminal Justice Center and also the Community Detoxification Facility.

The County Surveyor represents the County in boundary disputes, notifies the County Attorney of any unsettled boundary disputes or boundary discrepancies with the County, and files all surveys, field notes, calculations, maps, and any other records related to work authorized and financed by the Board of County Commissioners.

The Treasurer is responsible for the receipt, custody, and disbursements of County funds. The Treasurer collects some state taxes and all property taxes including those for other units of local government. The

Treasurer sends property tax notices, collects local government property taxes, disburses collection fee receipts, and conducts sales of property for delinquent taxes.

El Paso County Strategic Plan, 2012

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 goals of the Strategic Plan are to :

- Maintain and promote a financially sustainable County government that is transparent and effective.
- Continue to enhance the understanding of civic services and promote participation, engagement, and confidence in County government.
- Maintain and improve the County transportation system, facilities, infrastructure, and technology.
- Consistently support regional economic strength.
- Strive to ensure a safe, secure and healthy community.

El Paso County Master Plan

The Plan establishes broad goals and policies that are intended to serve as a framework for the development of the County.

It was the intent of the Oversight Committee that developed the Plan that the Plan will:

- Be consistent with and mutually supportive of existing and future Small-Area Plans and topical elements of the County Master Plan.
- Provide a balance between protection of the environment within the County and the growth which occurs as part of a healthy economy.
- Balance development, property rights, and preservation of natural resources.
- Provide a framework for development patterns specific enough to provide some certainty for cost-effective, long-term planning, yet flexible enough to accommodate changing market conditions.
- Address growth assumptions through the year 2020.
- Be fiscally responsible in identifying sources of public funding, addressing short- and long-term costs of development alternatives, and providing for equitable allocation of direct and indirect costs.
- Be an action-oriented document that prescribes a series of recommendations leading to the implementation of the adopted goals and policies.
- Include a mechanism for periodic evaluation of the Plan's effectiveness.
- Be widely used as a reflection of community goals, perspectives, and priorities.

- Recognize the region’s unique physical features and environment and their contributions to the character of the area.

Since the mid-1970s, the primary focus of El Paso County’s comprehensive planning efforts has been on the development and updating of plans for identified sub-areas of the unincorporated County. These documents are collectively known as Small-Area Plans and are incorporated as elements into the County’s Master Plan.

The County Master Plan includes the following sections:

- 1.0 Small-Area Plans
- 2.0 Natural Systems
- 3.0 Water Resources
- 4.0 Historic Resources
- 5.0 Economic Development
- 6.0 Growth and Land Use
- 7.0 Special and Unique Land Uses
- 8.0 Parks, Trails, and Open Space
- 9.0 Transportation
- 10.0 Water and Wastewater Facilities and Service
- 11.0 Drainage and Flood Protection
- 12.0 Other Services and Utilities
- 13.0 Housing
- 14.0 Public Financing Districts
- 15.0 Land Development Regulations

The Plan includes a discussion of issues, goals, and policies for each element of the plan.

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 Land Development Code (Zoning), 2007

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 citizens 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 resubdivision to further the orderly layout and use of land and to ensure proper legal descriptions and monumenting 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.

Code Enforcement

The Development Services Department, Code Enforcement Officers enforce the El Paso County Land Development Code. Depending upon the type of Violation, Code Enforcement Officers 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 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:** Management of the County's facilities are executed by two divisions within Public Services – the Engineering Division and the Operations Division. The Engineering Division's Infrastructure Planning Section handles property management, site and space planning, energy management and environmental compliance. The Operations Division Facility Management Section maintains over 70 County-owned buildings totaling more than 2,400,000 square feet of space. It also provides janitorial service, pest management, and environmental remediation. These two sections also cooperate to maintain more than 130 buildings owned by the City of Colorado Springs and provide engineering services under the terms of a Service Level 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 1,000 assets. The Fleet Management Section provides transportation and construction assets to 17 entities within El Paso County. The section also maintains three underground storage tanks.
- **Transportation:** Transportation functions are executed by two divisions within Public Services – the Engineering Division and the Operations Division. Together the two 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.
- **Office of Emergency Management (OEM):** The mission of the OEM is to ensure that local governments within El Paso County have the capability to survive a disaster. The OEM also manages and conducts essential emergency functions to support the citizens of El Paso County. The OEM's capability to manage a survivable crisis includes the ability to support emergency operations in cooperation with other county departments, local governments, the State and Federal government, and non-profit organizations. The OEM maintains and develops a capability built on people (staff and volunteers), communications, equipment, and plans. OEM is responsible for operating the County's Emergency Operations Center (EOC). The EOC provides for the coordination of all requirements for any emergency or disaster that affects the County.

- **HAZMAT:** In conjunction with the **Office of Emergency Management** the El Paso County Hazardous Materials Response Team is comprised of two Haz Mat Coordinators, Deputies, personnel from county departments, and volunteers. The Hazardous Materials Team is part of the South Central All Hazards Region, which is comprised of HAZMAT teams within El Paso, Chaffee, Lake, Park, and Teller Counties. All members of the team must undergo additional training in order to obtain state and national certifications. The two HAZMAT Coordinators are responsible for the coordination of incident response, maintenance of all equipment, and the coordination of training for the team. The County also assists in training and response for 22 rural fire districts within the county.
- **Security:** Security and Parking Operations' mission is to vigorously protect El Paso County assets (facilities, people, information, and physical assets) and provide professional parking services. To accomplish our 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. Parking Operations staff manage the operation of the County owned parking lots and garages, which includes overseeing the efficient use of parking spaces, the collection and accounting of parking revenue, and the reasonable enforcement of parking regulations.
- **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 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 Community Wildfire Protection Plan, 2015

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 Wildfire Preparedness Plan, 2014

The purpose of the County Wildfire Preparedness Plan is to clarify the roles and responsibilities of Fire Protection Districts, Departments, County Sheriff, and the Colorado Division of Fire Prevention and Control in responding to wildfires; 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, from County to State.

El Paso County Sheriff's Office, Emergency Services Division

The County Sheriff's Office, Emergency Services Division is responsible for coordinating forest and prairie fire response, fire investigations in unincorporated county areas, and search and rescue. To support each of these statutory requirements, the Emergency Services Division is incorporates 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 Crew (EPSOWF):** The EPSOWF is an all-volunteer team comprised of citizens from El Paso County and the surrounding area dedicated to saving lives and property. All crew members are dedicated, highly trained, and hard-working individuals who take satisfaction in delivering a much-needed and important service to the community. EPSOWF provides engines and a Type II IA Hand Crew for wildland fire suppression, from initial attack to mop-up, prescribed burns, and WUI structure protection. In addition to fire suppression activities, the crew provides public services in the form of training and education. They also assist the U.S. Forest Service, Bureau of Land Management, Colorado State Forest Service, Department of Defense (Air Force, Army), and the National Park Service.
- **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.
- **Fire Investigators:** The El Paso County fire investigators work full-time and maintain an on-call schedule that makes an investigator available to respond to fire scenes 24 hours a day. Fire investigators support 22 fire districts in the unincorporated areas of El Paso County and are available for mutual aid requests for municipalities in El Paso County, as well as the surrounding counties. Fire Investigators maintain national certifications from the National Association of Fire Investigators and the International Association of Arson Investigators. They attend continuing education to maintain their certifications and obtain information on advances and trends in the field of fire investigations. Fire investigators maintain close working relationships with fire investigators from the U.S. Forest Service, Colorado Bureau of Investigation, ATF, and local municipalities. The quality of these relationships has enhances their ability to share information and call on additional resources during the recent large fires which have occurred in the region.
- **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 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.

Emergency Operations Plan, 2009

The Emergency Operations Plan (EOP) for the County is currently under review and being updated. The goal of the El Paso County EOP is to outline the primary organizational structure, roles, and responsibilities of all partner agencies and organizations during and after a disaster. The purpose of the EOP is to establish procedures, and assign tasks and responsibilities to El Paso County elected officials, departments, and participating agencies, volunteer agencies, local jurisdictions, and municipalities for the conduct of operations during the limited time frame of a threatened, imminent, or actual disaster. The EOP is intended to:

- Outline an all-hazards approach to the actions to be taken during the response, and recovery phases of a disaster.
- Provide for the maximum protection, care, and support of all people in the County in an emergency/disaster, during sheltering or evacuation of residents from areas of high risk.
- Maintain and support essential services in the County, for the protection, care, and support of the people.
- Provide for continuity of local government and essential services.
- Provide county residents with guidance and timely information, in cooperation with other participating public, private and volunteer organizations.
- Support the emergency activities of county government, and the governments of communities within the county.
- Control and coordinate the orderly movement and support of the population from actual or potential disaster areas, when ordered by the State due to a severe state or national emergency.
- To establish procedures to implement those segments of the Colorado Disaster Emergency Act of 1992, and the El Paso County Resolution establishing the County Office of Emergency Management, as it pertains to a threatened or actual disaster. Procedures emphasize the reduction of vulnerability.

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 citizens of El Paso County receive quality, efficient, effective public health services.

Local Emergency Planning Committee

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.

The objectives of the Medical Reserve Corps are to:

- Establish a collaborative community-based citizen volunteer unit in El Paso County, integrated with city and county emergency operations plans.
- Recruit health care professionals and others as needed to serve as volunteer members of the Medical Reserve Corps.
- Assess needs and develop training and education opportunities for volunteers to assure that they are effective, efficient, and safely integrated into current emergency planning and response.
- Provide volunteers with additional skills to work effectively in emergencies with patients and be available to assist and support public health efforts as needed.
- Provide an organized framework for Medical Reserve Corps activities.

Colorado Voluntary Organizations Active in Disaster

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.

6.9.4 Town of Calhan

Excerpts from applicable policies, regulations, and plans and program descriptions follow to provide more detail on existing mitigation capabilities within the Town of Calhan.

The Town of Calhan's governance and administration consists of a Mayor, six-member Board of Trustees elected by the citizens and a full-time Town Clerk/Treasurer. The town has a population of approximately 800 residents. There have been no zoning regulations enacted within the town except for banning marijuana clubs. Growth management has not been an issue for many years, requiring no ordinances or regulations at this time.

Calhan Comprehensive Plan, 2002

This plan includes details about Calhan at the time the plan was completed, an analysis of current trends, a forecast of potential future growth, and long term goals and implementation strategies. This plan was developed with the assistance of a grant from Colorado Center for Community Development and is currently being reviewed to determine if an update is required. The following goals, objectives, and actions are related to hazard mitigation:

- 9.2 Goal One: Historic and Cultural Development
 - Objective A: Create an assessment of historic and cultural landmarks
 - Action A-4: Form a historic preservation commission to preserve and protect Calhan's heritage
- 9.3 Goal Two: Parks and Recreation Improvements
 - Objective A: Maintain and protect the town's special and natural features, open space, and watershed areas
 - Action A-1: Collaborate with El Paso County and surrounding towns to protect the areas major attractions: Paint Mines, Big Sandy Creek, and Ramah Reservoir
 - Action A-3: Encourage new development to protect terrain and preserve significant vegetation, scenic views, and incorporate natural trees and shrubs into landscape plans
 - Action A-4: Update town codes and ordinances to protect sensitive natural areas and open spaces
- 9.5 Goal Two: Land use and Growth Management
 - Objective B: Provide for the orderly growth of the town to be consistent with the community vision
 - Action B-1: Implement floodplain management
 - Action B-2: Increase coordination with El Paso County, regarding growth and development using IGAs
- 9.6 Goal Two: Community Infrastructure and Public Facilities
 - Objective A: Ensure that future growth and development does not exceed the capabilities of public services and facilities
 - Action A-3: Develop an urban growth area map
 - Action A-4: Inventory utility boundaries and locations
 - Objective B: Implement traffic control and planning techniques that protect the small town character
 - Action B-1: Improve safety for pedestrians along U.S. Highway 24
 - Objective C: Improve the overall appearance and condition of the existing infrastructure
 - Action C-2: Improve the surface conditions and drainage of all roads

Subdivision Ordinances Town of Calhan Ordinance Book – Chapter 15, ~1988

This section contains excerpts from the Subdivision Ordinances that are related to hazard mitigation.

Section 15-1-020. Purpose.

- A. The subdivision of land is the first step in the process of urban development. The arrangement of land parcels for residential, commercial, industrial, recreational, utility and other public purposes will determine to a large degree the qualities of health, safety, convenience, environment, and general welfare of the Town.
- B. These regulations are designed, intended, and should be administered in a manner to:
 - 1. Implement the Town’s master plan.
 - 2. Establish adequate and accurate records of land subdivision.
 - 3. Harmoniously relate the development of the various tracts of land to the existing community and facilitate the future development of appropriate adjoining tracts.
 - 4. Provide for adequate, safe and efficient public utilities and improvements and provide for other general community facilities and public places.
 - 5. Provide for light, air, parks and other spaces for public use.
 - 6. Provide for protection from fire, flood and other dangers and provide for proper design of storm water drainage and streets.
 - 7. Provide that the cost of improvements, which primarily benefit the tract of land developed, be borne by the owners/developers of the tracts and the costs of improvements, which primarily benefit the whole community, be borne by the entire community.

Section 15-17-020. Streets and traffic patterns.

D. Whenever a proposed subdivision is not served by proper community access roads, utilities and other basic needs of the future residents, the Board may deny the subdivision until such needs are properly met.

E. Tracts of land or portions thereof lying within the one hundred (100) year floodplain shall not be subdivided except for open space until the sub-divider has complied with requirements of the floodplain ordinance of the town.

Section 15-17-030. Drainage.

B. Land within an adopted one hundred (100) year floodplain zone, or land which is subject to inundation by a one hundred (100) year flood, shall not be platted for occupancy unless the flooding condition is alleviated in conformance with the Town’s floodplain regulation.

C. Historical flow patterns and runoff amounts are to be maintained in such a manner that would preserve the natural character of the area and prevent property damage of the type generally attributed to runoff rate and velocity increases, diversion concentrations and/or unplanned collection of storm runoff.

E. Detention storage shall be provided by any method specified in the Drainage Criteria Manual.

Section 15-25-010. Drainage Report.

A preliminary drainage report must be approved prior to the approval of any final plat, planned building group or planned unit development. The report must be approved prior to Planning Commission action.

The purpose of the preliminary drainage study is to identify and propose specific solutions to any problems that may occur as a result of the proposed development. Offsite information required on the

preliminary drainage study is similar to that of the Master Drainage Study and may be omitted from the preliminary drainage study when adequately analyzed by a Master Drainage Study.

The preliminary drainage report must include adequate topography to verify all conclusions regarding offsite drainage. Unless known, the capacity of downstream drainage structures must be thoroughly analyzed to determine their ability to convey the developed discharge. Whenever the possibility of downstream flooding or property damage exists, it will be necessary to utilize either detention or retention ponds to reduce the developed discharge to an acceptable rate.

The preliminary drainage report shall include but not be limited to the following information:

1. Detailed analysis of on-site and off-site tributary drainage areas.
2. Detailed analysis of receiving structures.
3. Adequate analysis on site to determine the location and required capacity of culverts, bridges, open channels, detention ponds and storm sewers.

Flood Ordinance, 2013 (ORDINANCE NO. 2013-09)

Purpose. It is the purpose of this Article is to promote the public health, safety, and welfare by provisions designed to:

- (1) Protect human life and health;
- (2) Minimize expenditure of public funds for costly flood control projects;
- (3) Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
- (4) Minimize prolonged business interruptions caused by flooding;
- (5) Minimize damage to critical facilities, infrastructure and other public facilities such as water, sewer and gas mains; electric and communications stations; and streets and bridges located in floodplains;
- (6) Maintain a stable tax base by providing for the sound use and development of flood-prone areas in such a manner as to minimize future flood blight areas; and
- (7) Ensure that potential buyers are notified that property is located in a flood hazard area.

Building and Code Enforcement

The Town of Calhan employs a part-time building inspector to handle any new structures, improvements to existing buildings, and all building code reviews. The building inspector, in conjunction with the Planning and Development Committee reviews all plans for new structures prior to construction to ensure all requirements are met. The town adopted the International Building Code for 2006 after an extensive review by the building inspector. Code enforcement is handled by the Calhan Police Department.

Local Emergency Operations Plan, 2007

The Town of Calhan has in place a Local Emergency Operations Plan, last updated May, 2007. This plan is reviewed every year and updated as needed. There have also been meetings to review the entire plan when a high percentage of personnel or significant positions, such as board members, have changed. This plan includes: a help list for the public including a list of tasks to help mitigate the effects of emergencies; an outline of the basic plan and who is in charge of particular tasks; specific actions for specific emergencies including flash flooding, severe thunderstorms, and tornadoes; and a local disaster contact list including shelters that is updated annually.

Police

The Calhan Police Department provides law enforcement services to protect life and property for the community within the town limits. The Town currently employs one full-time Police Chief, two full-time officers, and three reserve officers. Emergency communications are a joint responsibility between the local jurisdiction, the El Paso County Sheriff's Office, and the El Paso-Teller County 911 Authority.

Fire

The Town of Calhan is part of the Calhan Fire Protection District based in Calhan, Colorado in El Paso County. All fire departments within El Paso County, as well as some in Elbert and Teller County have a Mutual Aid Agreement in place. This agreement was executed and signed by all departments in 2000. The Town of Calhan currently has an ISO rating of six. The Fire Department is very active within the community despite being a volunteer fire department.

Public Works

The Public Works Department consists of a Public Works Director, two full-time employees and part-time help in the summer that handle town roads, parks, the cemetery, as well as water and sewer services. The Town of Calhan has been working to pave streets and improve drainage within the town limits to increase access. The town passed a sales tax in 2013 for street maintenance to improve roads and develop a town-wide drainage plan. While flash flooding has not been a large issue, drainage has proven to be inadequate on the streets.

Water and Wastewater

The Public Works Department handles all aspects for the water and wastewater system. The town is supplied with three deep wells that provide potable water for the residents. The town also has a lagoon system for wastewater. While the lagoons provide adequate capacity at this time for town use, this system will need to be upgraded in the near future. Calhan is responsible for the safety, protection, and maintenance of both water and wastewater systems within town boundaries. The main near-term objective is to replace old mains for both water and sewer. The system is more than 15 years old for the newest lines and more than 20 years old for some of the older lines. The Town is also researching the potential for an Intergovernmental Agreement with the Towns of Ramah and Simla for emergency water supplies.

6.9.5 City of Fountain

Excerpts from applicable policies, regulations, and plans and program descriptions follow to provide more detail on existing mitigation capabilities within the City of Fountain.

Fountain is a vibrant community just south of Colorado Springs, Colorado located adjacent to Fort Carson. The City of Fountain has a rich heritage, rooted in the military, agriculture, and the railroads. Fort Carson calls itself the "best hometown in the Army" and the City of Fountain is home to many of the men and women serving our country. The City of Fountain's governance and administration consists of a mayor, six-member City Council elected by the citizens, and a full-time staff. The town has a population of approximately 28,000 residents.

City of Fountain: Comprehensive Development Plan, Resolution 05-054, 2005

The City adopted a major update to its Comprehensive Development Plan in 2005. The Fountain Planning Commission uses this Comprehensive Development Plan as a guide to determine if land use changes are in keeping with the overall pattern of development desired by the City and its citizens. The Plan is an advisory guide to land use decisions in the community.

The following plans are incorporated as a part of the Comprehensive Development Plan 2005.

- The City of Fountain Annexation Plan; Fall 2005–2006

- Traffic Master Plan; October 8, 2002
- Water System Master Plan; 2002
- Water Resource Study; 2004
- Parks, Recreation and Trails Master Plan; May 13, 2003
- Fountain Strategic Downtown Plan-A Blue Print for the Future; October 2000
- City of Fountain Economic Development Plan; February 11, 2004
- Water Conservation Plan; August 2001

In 2009, the City adopted a Strategic Plan, which provides a framework for rational decision making. Growth management strategies and policies are incorporated in the Comprehensive Development Plan.

City of Fountain Zoning Ordinance, 2003

Last major update to Zoning Ordinance (Title 17 of the Fountain Municipal Code [FMC]) was approved by the City in 2003. Several minor amendments have occurred since then. This Ordinance is written in accordance with the Fountain Comprehensive Development Plan and is designed for promoting the health, safety, convenience, and welfare of the citizens of Fountain. The ordinance is intended to lessen congestion in the streets, provide adequate light and air, encourage the most appropriate use of land, ensure the protection and preservation of open lands and natural amenities, and conserve the value of property in accordance with the Fountain Comprehensive Development Plan

City of Fountain Subdivision Regulations, 2008

A major update to the Subdivision Regulations (Title 16.20 FMC) was approved by the City in 2008 with a few minor updates since then. The Fountain Subdivision Regulations were enacted to promote the health, safety, convenience, and general welfare of the citizens of the City. The subdivision of land is the first step in the process of urban development. The arrangement of land parcels for residential, commercial, industrial, recreational, utility, and other public purposes will determine to a large degree the qualities of health, safety, convenience, environment, and general welfare of the City. These regulations are designed, intended, and administered in a manner to:

- Implement the City's Comprehensive Development Plan; specific area plans; resource, utility and other master plans; Planned Unit Development (PUD) ordinances; and other development policies and ordinances, as such may be amended from time to time.
- Establish adequate and accurate records of land subdivision.
- Protect and provide for the public health, safety, and general welfare of the citizens of the City.
- Establish reasonable standards of design and procedures for subdivisions and re-subdivisions of land to further the orderly layout and use of land.
- Harmoniously relate the development of land to the existing community and facilitate the future development of adjoining tracts.
- Provide for adequate, safe and efficient public utilities and improvements; and provide for other general community facilities and public places.
- Ensure adequate and efficient transportation, water, sewerage, schools, parks, playgrounds, recreation, and other public requirements and facilities.
- Preserve important natural features, vegetation and viewsheds.
- Protect the community from fire, flood and other dangers.

- Provide for proper design of stormwater drainage and streets.
- Ensure the cost of improvements, which primarily benefit the tract of land being developed, be borne by the subdivider of the tract.
- Make certain that public facilities are available and will have a sufficient capacity to serve a proposed subdivision.
- Coordinate timely agency review of subdivisions and associated improvements.

These establish standards of subdivision design that will

- Encourage the development of sound, economical, and stable neighborhoods; ensure a healthy living environment; and protect the natural environment.
- Ensure the desirable development of the community through the adherence to accepted principles of land use, intensity of development, distribution of growth, preservation of natural amenities, and other elements of the City's development plans.
- Prevent flood damage to persons and properties and minimize expenditures for flood control.
- Restrict building on flood lands, shorelands, wetlands, areas covered by poor soils, or in areas otherwise poorly suited for building or construction.

City of Fountain Floodplain Ordinance, 2002

The last major update to the Floodplain Management regulations (Title 16.10 FMC) was in 2002 with several minor amendments since then. The flood hazard areas of Fountain are subject to periodic inundation which could result in loss of life and property, health and safety hazards, disruption commerce and governmental services, extraordinary public expenditures for flood protection and relief, and impairment of the tax base, all of which could adversely affect the public health, safety and general welfare. These flood losses could be caused by the cumulative effect of obstructions in areas of special flood hazards, which increase flood heights and velocities, and when inadequately anchored, damage uses in other areas. Uses that are inadequately flood-proofed, elevated, or otherwise protected from flood damage also contribute to the flood loss.

It is the purpose of this section to promote the public health, safety, and general welfare, and to minimize public and private losses due to flood conditions in specific areas by provisions designed:

- A. To protect human life and health;
- B. To minimize expenditure of public money for costly flood control projects;
- C. To minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
- D. To minimize prolonged business interruptions;
- E. To minimize damage to public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, streets and bridges located in areas of special flood hazard;
- F. To help maintain a stable tax base by providing for the sound use and development of areas of special flood hazard;
- G. To insure that potential buyers are notified that the property is in an area of special flood hazard; and
- H. To ensure that those who occupy the areas of special flood hazard assume responsibility for their actions.

City of Fountain Storm Water Quality Management and Discharge Plan, 2007

The City adopted the Storm Water Quality Management and Discharge Code (Title 16.10 FMC) in 2007 with a few minor amendments since then. The purpose and intent of this chapter is to ensure the health, safety and general welfare of citizens, and to protect the water quality of watercourses and water bodies in a manner pursuant to and consistent with the Federal Clean Water Act (33 U.S.C. Section 1251 et seq.) by reducing pollutants in storm water discharges to the maximum extent practicable and by prohibiting non-storm water discharges to the City's municipal separate storm sewer system. This plan is managed by the City of Fountain Storm Water Enterprise and the City of Fountain Department of Public Works.

City of Fountain Building Code

The 2009 International Building Code as amended by the 2011 Edition of the Pikes Peak Regional Building code and was adopted by the City of Fountain in 2012 (Title 16 FMC). The 2012 edition of the International Fire Code with appendices and amendments was adopted by the City of Fountain in 2014 (Title 15 FMC).

City of Fountain Community Services Department

The mission of the Community Services Department is to enrich individuals, families and the community through the provision of services, facilities and programs; to enhance the character and diversity of the City's neighborhoods; and to support sustainable land use practices which contribute to a better quality of life.

The Community Services Department includes the following divisions:

- Planning Division
- Code Enforcement Division
- Parks Division

Fountain Planning Division

The mission of the Planning Division is to provide prompt, accurate customer service and to promote the health, safety and prosperity of all present and future residents by effectively planning for the physical development of the community.

Major activities of the Planning Division include:

- Preparation of visionary and responsible long-range plans to guide the growth and development of the community.
- Coordination and review of proposed land use projects to ensure conformance with City standards and to promote quality of life issues.
- Fair and comprehensive enforcement of City codes, including animals, junk, trash, nuisance, weeds and zoning.
- Dissemination of information to the public and private sectors.
- Research and policy analysis involving community issues.
- Implementing the site plan review requirements in the Zoning Ordinance (2003).

Fountain Code Enforcement Division

Code Enforcement plays an important role in preserving the attractive appearance of neighborhoods in the City of Fountain. The mission of Code Enforcement is to provide fair and comprehensive enforcement of City Codes, which include junk, debris, trash, nuisance, weeds, zoning, and rental/leased property maintenance. The City of Fountain encourages its citizens to become community minded.

City of Fountain Emergency Operations Plan, 2012

This plan was completely rewritten and adopted by the City of Fountain in 2012. The purpose of the EOP is to minimize the loss of life and property during and while recovering from an emergency or disaster through effective management of the emergency. The Plan is applicable to all elements of city government and the private sector engaged in, or acting in support of, emergency operations.

These tasks will be accomplished through:

- (a). Identification of the roles, responsibilities and actions required of City departments and other agencies in preparing for and responding to major emergencies and disasters;
- (b). Ensuring a coordinated response by local, State, and Federal governments by the use of the NIMS in managing emergencies or disasters; to save lives, prevent injuries, protect property and the environment, and to return the affected area to a state of normalcy as quickly as possible;
- (c). Providing a framework for coordinating, integrating, and administering the emergency operations plan and related programs of local, State, and Federal governments;
- (d). Providing for the integration and coordination of volunteer agencies and private organizations involved in emergency response and relief efforts;
- (e). Establishing the framework for all plans developed and used by participating agencies, City departments and enterprises; and
- (f). Establishing the governing plan for all emergency plans within the City of Fountain.

City of Fountain Police Department

The Police Department protects the community and provides law enforcement services to protect life and property within the City of Fountain. The Fountain Police Department is a full-service department, with Patrol, Detectives, Emergency Service Unit, School Resource Officer, Drug Abuse Resistance Education, K-9, Dispatch, Records, Traffic, and Support Services units. The Police Department currently has 40 full-time patrol officers assigned to seven teams, each supervised by a sergeant. Officers on each team are permanently assigned to one of four districts within the City.

Fountain Emergency Communications (Component of Police Department)

The Fountain Emergency Communications Center operates 24 hours a day, seven days a week and is responsible for answering all 911 and non-emergency calls for the citizens of Fountain, Colorado. The Communications Center personnel also dispatch Police, Fire, and Emergency Medical Services for the City of Fountain. The citizens of Fountain are provided quick access to emergency services by a team of ten personnel.

The Communications Division is committed to the delivery of effective police, fire and medical services by utilizing teamwork, training, and technology, while remaining sensitive to the needs of the Community. Even though the Communications Center has multiple functions, there are two primary job functions within the Communications Center:

1. Receiving incoming calls. When a telephone call is received by the Center either via 911 or on a non-emergency line, the Telecommunicator collects the information from the caller. The information is then prioritized for dispatching.
2. Dispatching the call. The operator then dispatches the call to the appropriate agency or agencies.

The center is equipped with the latest technology in order to maintain Fountain's commitment to quality service. The main components include Enhanced 911, Emergency Medical Dispatch, and a

Telecommunications Device for the Deaf (TDD). In 2009 the Fountain Communications Center handled over 70,000 incoming and outgoing calls. There were over 31,250 police calls for service and 3,834 fire and medical calls for service. Emergency communications are a joint responsibility between the local jurisdiction, the El Paso County Sheriff's Office, and the El Paso-Teller County 911 Authority.

City of Fountain Fire Department

The City of Fountain Fire Department is committed to protecting citizens, visitors, animals, property and the environment within the community. The Fire Department will be responsive to the needs of citizens and visitors by providing rapid, professional, humanitarian services essential to the health, safety and well-being of the community. The Fire Department accomplishes its mission through prevention, fire suppression, advanced medical services, hazard mitigation and other related emergency and nonemergency activities. The department actively participates in the community, serves as role models, and strives to effectively utilize all of the necessary resources available to provide a service deemed excellent by the citizens of Fountain.

The City of Fountain Fire Department covers a city of 25 square miles and 19 miles of Interstate 25 from mile post 135 south to the Pueblo County line, mile post 116. The department has 33 career fire fighters and 40 volunteer fire fighters and support staff, which work out of three fire stations. The Fire Department provides fire suppression, fire prevention and education, basic and advanced medical life support, ambulance transport, hazardous materials unit, heavy rescue unit, technical rescue team, and wildland fire team. The City of Fountain Fire Department has an ISO rating of three.

City of Fountain Public Works Department

The Public Works Department provides essential infrastructure construction and maintenance, municipal services, and mitigation of emergency conditions for the benefit of Fountain's residents, and to impact the infrastructure and municipal services so the streets and sidewalks remain sound and serviceable and the environment remains safe and healthy. Public Works includes Storm Water Management, the City Transportation Division, and the City Street Department.

The City Street Department provides numerous services for the operations of the City's streets including: street cleaning, snow removal, patching, mowing and weed control, sign maintenance, and sand and salt application during winter conditions. The City maintains approximately 99 miles of streets, both paved and gravel. The Street Department has seven full-time positions and two seasonal positions. The Street Department also assists other City Departments wherever needed.

City of Fountain Utilities Department

The City of Fountain Utilities Department includes the City Electric Department and City Water Department. The mission of the City of Fountain Electric Department is to meet the current and future needs of their customers by providing reliable, cost effective energy and services, in a responsible, courteous and efficient manner. The Water Department includes the Water Superintendent, Water Resources Engineer, Water Foreman, and six Water System Operators. Also among the Water Department's crew are the Water Meter Technician and Administrative Assistant. Together, this team continues to meet daily operational needs and water demands while fulfilling the Water Department's primary goals and objectives to "Provide Fountain residents with the highest quality of water at a reasonable price."

Water and Wastewater

There are three special districts that also provide water and wastewater services to portions of the City of Fountain. The Security Water and Sanitation District provides services to the northern portion of the City off of S. Highway 85/87, North of Fontaine Boulevard. The Widefield Water and Sanitation District provides services along the east of the railroad tracks, S. Highway 85/87 south of Fontaine Boulevard and north of Rice Lane. The Widefield Water and Sanitation District also provides services to Northeast

Fountain east of Sniffles Road and north of C&S Road. The Fountain Sanitation District provides services to the majority of the City covered by Fountain Water Department. The three Special Districts coordinate closely with the Fountain Water Department, Fire Department, and Planning Division.

6.9.6 Town of Green Mountain Falls

Excerpts from applicable policies, regulations, and plans and program descriptions follow to provide more detail on existing mitigation capabilities within the Town of Green Mountain Falls.

The Town of Green Mountain Falls has multiple plans and functions in place that guide growth and development within the community. The town governance and administration consists of a Board of Trustees elected by the citizens, a full-time Town Clerk who is appointed by the Board of Trustees, a Public Works Director, and a Police Chief. The policies and procedures of the town, including codes and regulations, are set by the Board of Trustees.

Green Mountain Falls Comprehensive Plan, 2007

Green Mountain Falls has a Comprehensive Plan first written in 1996 and updated in 2007. The Plan provides information, policies, and guidance on community topics, including land use, community character, public services and facilities, and environmental quality. Community goals as stated in the plan:

- Retain the peaceful, small town atmosphere of Green Mountain Falls.
- Preserve and protect the natural environment.
- Celebrate and preserve Green Mountain Falls heritage.
- Continue to improve the appearance and function of Green Mountain Falls public facilities and amenities (e.g., trails, pool, parks, gazebo, and lake.)
- Attract businesses that meet the everyday convenience needs of Green Mountain Falls residents and visitors.
- Improve and upgrade the Town's infrastructure (e.g., drainage, and roads).
- Enhance communication between the Town and its citizens, and continue to promote community improvement.
- Encourage better property maintenance to enhance the overall appearance of the community.

The following excerpts from the plan relate to hazard mitigation:

- 1.5.2 Update the Town's Capital Improvements Program:** Continue to revise and adopt a Capital Improvements Program annually to ensure that major public capital improvements are adequately planned and funded.
- 2.8 PP4 Trees:** In 2006, the town initiated a strong program to address the spread of bark beetles by encouraging the cutting and removal of infested trees.
- 3.2.2 Water, Septic, and Sewer:** Provide an adequate level of public services and utilities to the residents of Green Mountain Falls.
- 3.2.3 Public Safety/Emergency Services:** Provide adequate police and fire protection throughout the town.
- 3.2.4 Transportation:** Maintain a system of streets that will insure safe and efficient movement of people and goods throughout the town.

Green Mountain Falls Land Use Code, Chapter 6, (Last Amended Ordinance 03-2011)

Based on the terrain features in Green Mountain Falls, growth is limited and managed. Approximately 675 people reside in Green Mountain Falls year round. That number increases significantly in the summer as people from other states arrive to use their family cabins. All zoning, subdivision and housing regulations, and building codes not covered under the Pikes Peak Regional Building Department (PPRBD), and land use guidelines are addressed within the Land Use Code.

6-1-3 Purpose: This Land Use Code is designed and enacted for the purpose of promoting the health, safety, morals, convenience, order, prosperity and welfare of the present and future inhabitants of the town. Some major focuses of this plan include identification of natural and man-caused hazards, drainage, roads, utilities and water resources.

6-2-5 Drainage: Preservation of natural drainage patterns and provision for detention facilities.

6-2-8 and 6-2-9 Road Design and Construction: New and upgrading of roadways and development impact.

6-5-5 Preliminary Plat: This section defines procedures for approval of land improvements.

Planning Commission

The Green Mountain Falls Planning Commission offers information and assistance in matters of permitting, zoning requirements, and the Master Plan for the town. The Commission works in close conjunction with the PPRBD.

Flood Ordinance, 2002 (03-2002)

Purpose. It is the purpose of this section to promote the public health, safety, and general welfare and to minimize public and private losses due to flood conditions in specific areas by provisions designated to:

- (1) Protect human life and health;
- (2) Minimize expenditure of public funds for costly flood control projects;
- (3) Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
- (4) Minimize prolonged business interruptions caused by flooding;
- (5) Minimize damage to critical facilities, infrastructure and other public facilities such as water, sewer and gas mains; electric and communications stations; and streets and bridges located in floodplains;
- (6) Help maintain a stable tax base by providing for the sound use and development of flood-prone areas in such a manner as to minimize future flood blight areas;
- (7) Ensure that potential buyers are notified that property is located in a flood hazard area; and
- (8) Ensure that those who occupy the areas of special flood hazard assume responsibility for their actions.

Building and Code Enforcement, 2012 (Ordinance 02-2012)

Floodplain and Building Codes are established through the PPRBD in Colorado Springs. The PPRBD's main goal is to safeguard life and limb, health, property, and public welfare by regulating and controlling the design, construction, quality of materials, as well as use and occupancy of all buildings and structures

within Green Mountain Falls. This is accomplished through the enforcement of minimum building code standards. Also, the building department performs comprehensive inspections of alterations and additions to all buildings to ascertain compliance with numerous building codes.

The Floodplain Management Office provides services including:

- Plans review for proposed alterations and construction
- Issuing Floodplain Development Permits
- Maintaining local floodplain maps and documents
- Inspections of approved new development
- Investigations of floodplain violations
- Resolving violations and enforcing regulations.

Local Emergency Operations Plan, 1998

The Local EOP for the town is currently under review and is being updated with assistance from the El Paso County OEM. The mission stated within the EOP is to protect life and property, sustain survivors, repair essential facilities and utilities, and ensure continuity of governance and services. Because of the small size of the municipality and the lack of current personnel, Green Mountain Falls has an extremely limited capability to provide personnel resources with the exception of an Emergency Manager. The Police Chief also acts as the Emergency Manager for the town.

Police

The Green Mountain Falls Police Department provides law enforcement services to protect life and property for the community within the town limits. Currently, Green Mountain Falls employs one full-time Police Chief, one full-time Sergeant, and four reserve officers. Emergency communications are a joint responsibility between the local jurisdiction, the El Paso County Sheriff's Office, and the El Paso-Teller County 911 Authority.

Fire

The Green Mountain Falls/Chipita Park Fire Protection District services the Town of Green Mountain Falls and is based within the town boundaries. The District provides fire, rescue, and emergency medical services to protect life and property in Green Mountain Falls. It is considered a Special District with its own governing board. The Green Mountain Falls/Chipita Park Department has an ISO rating of six.

Public Works

The Green Mountain Falls Public Works Department ensures that the town streets are maintained. Roads in Green Mountain Falls are mainly gravel and therefore require grading on a regular basis. The department is also in charge of all snow removal in town. Currently, the town employs one person in this department.

Water and Wastewater

All water service within the town is provided through Colorado Springs Utilities. The town collects no fees for wastewater as individual septic systems are required. The Public Works Department works closely with Colorado Springs Utilities to insure continuity of service.

6.9.7 City of Manitou Springs

Excerpts from applicable policies, regulations, and plans and program descriptions follow to provide more detail on existing mitigation capabilities within the City of Manitou Springs.

The City of Manitou Springs was incorporated in 1876 at the foot of Pikes Peak and the start of Ute Pass. The current population is approximately 5,000 residents and the size of the City is about 3.5 square miles within the incorporated area. Manitou Springs is located at the confluence of three major drainage basins (Ruxton Creek, Fountain Creek, and Williams Canyon), which converge in the center of downtown. Additional creek/drainage routes within the City are:

- Sutherland Creek, which runs through the Crystal Hills neighborhood approximately along Crystal Park Road on the southeast side of the community, and
- Beckers Lane Drainage, which runs parallel to Beckers Lane out of Garden of the Gods in the northeast part of the City.

The City's governance and administration consists of a mayor and six council members elected by the citizens. The City employs a full-time City Administrator, City Clerk and Deputy City Clerk, Finance Director (with three employees), Planning Director (with three staff members), and a Public Services Director (with 17 full-time and seven part-time seasonal employees). The Public Services Director is in charge of the City's streets, water and wastewater utilities, water treatment, and parks/buildings maintenance.

The City has multiple plans and functions in place that guide growth and development within the community, such as comprehensive zoning and subdivision regulations, as well as other development-related codes such as historic preservation and signage. Applicable codes/provisions related to hazard mitigation capabilities are noted as follows:

Manitou Springs Forward Vision Plan, 2012

Manitou Springs Rainbow Vision Comprehensive Plan was updated in 2012 through a citizen-led process. The current plan comprises the public outreach portion of any good plan (i.e. the vision); however does not contain the other elements (such as objectives and guidelines) necessary for a complete and functional comprehensive plan. The City has received a 2-year grant to fund a Planner II position that will focus on developing a complete Comprehensive Plan for the community. The Manitou Springs Forward Key Vision Areas are as follows:

Arts and Culture

Our community is a vibrant arts destination known for using its assets to provide life enrichment through unique artistic and cultural experiences.

Built Environment

Our built environment reflects the core character and values of our community by applying sustainable technologies to strengthen and connect our neighborhoods and bolster a healthy sense of place.

Community Engagement

We are a diverse village which celebrates, supports, protects and fosters a creative and interconnected community and provides multiple opportunities that allow each resident to uniquely contribute to the well-being and enhancement of our community.

Economic Development

Ours is a model collaborative community committed to economic vitality and sustainability. We preserve and protect our heritage and natural beauty and are a renowned destination for arts, culture, life-long learning and wellness.

Education

Our community is innovative and we nurture and invest in life-long learning of the mind, body and spirit for all.

Health and Well-Being

Our community is The Place for health, healing and wellbeing.

Historic Preservation

Historic preservation and change dynamically interact to guide, inspire and promote our future.

Natural Environment

All residents and visitors act as stewards of our natural environment in a sustainable manner for current and future generations, recognizing our natural environment has intrinsic worth and provides the foundation for all life.

Public Services

We continually invent and invest in our community's safety and services. We provide great, engaging public spaces which compel people to participate, commune and play.

Transportation

Our community has a safe, intermodal transportation and parking network that balances the needs of our residents, visitors and commerce while enhancing our natural environment and cultural history.

Zoning Ordinance – Manitou Springs Municipal Code, Title 18

The Manitou Springs City Council recognizes community development is a dynamic process. Therefore, in 2004, it initiated a complete revision of the Zoning Code, which was originally adopted on September 25, 1975. To meet changing conditions, this Code had been amended on numerous occasions and in 2005, an updated Zoning Code was adopted.

18.04.050 Purpose. The purpose of the Zoning Code is to promote the health, safety, convenience, order, property aesthetics, environmental quality, and general welfare of the present and future inhabitants of Manitou Springs, Colorado, by:

- A. Encouraging the total planning of all land tracts and parcels consistent with the goals and objectives of the City's Rainbow Vision/Comprehensive Plan.
- B. Encouraging innovative approaches to urban design and the sound application of proven design methods.
- C. Encouraging new buildings and new development to be, as much as possible, in keeping with the general existing characteristics of the area.
- D. Provide a flexible framework in which a variety of land uses might coexist harmoniously.

The Zoning Code contains a number of provisions relating to development in hillside areas and other criteria relating to sound land development practices.

18.68 Grading Ordinance/Permit Appendix. The purpose of this code is to protect the health, safety, and welfare of the citizens of Manitou Springs by:

- A. Ensuring that the development of each site occurs in a manner harmonious with adjacent land so as to minimize problems of drainage, erosion, earth movement, and similar hazards as well as visually unpleasant relationships.
- B. Ensuring that the planning, design, and construction of a development will be done in a manner that provides both maximum safety and human enjoyment, while making it as unobtrusive in the natural terrain as possible.
- C. Ensuring, insofar as practical in permitting reasonable development of land and minimizing fire hazard, the maximum retention of natural vegetation to aid in protection against erosion, earth movement and other similar hazards and to aid in preservation of natural scenic qualities of the City.
- D. Reducing air pollution caused by dust blown from areas under development.

- E. Preventing the premature cutting of roads and building sites in newly developing areas of the City.

Subdivision Ordinance – Manitou Springs Municipal Code, Title 16

The subdivision regulations were codified by the City in 2002; there were no major changes or updates to this chapter for a number of years.

16.04.040 Purpose. The purpose of these regulations is to promote the health, safety, and general welfare of the citizens of Manitou Springs, by:

- A. Ensuring that land is subdivided correctly into lots that are of adequate size and configuration for the purpose for which they are intended to be used;
- B. Providing that streets will be laid out in relation to existing streets or according to the vision plan of Manitou Springs and that said streets will be built to adequate construction standards;
- C. Producing sound living environments with the necessary open spaces for people, traffic, utilities, public protection, light, air, recreation and other community facilities;
- D. Implementing the vision plan of Manitou Springs;
- E. Protecting the natural resources of the community; and
- F. Encouraging imagination and innovation in the design of any subdivisions.

16.28.010-060 Uniform Street Standards. Standards for arterial, collector, residential, minor residential, hillside minor residential streets and alleys are provided in this section.

16.32.010 Requirements for drainage plans and reports submitted to the City of Manitou Springs. This section specifies the type and format of drainage information to be provided to the City by a registered engineer.

Buildings and Construction – Manitou Springs Municipal Code, Title 15

Chapter 15.04 Building Code. This chapter adopts by reference the 2011 Edition of the Pikes Peak Regional Building Code and maintains local control of building codes, including, but not limited to, building, electrical, energy, mechanical and plumbing codes, and retains the Pikes Peak Regional Building Department and Pikes Peak Regional Building Department's Committees and Boards to implement, interpret, and grant variances for building codes within Pikes Peak Regional Building Department's jurisdiction. Adoption of floodplain regulations and provisions for their administration are addressed within Chapter 13 of the Regional Building Code.

Chapter 15.12 Fire Code. This chapter adopts the 2003 edition of the International Fire Code (IFC) and International Fire Code Standards are adopted by reference and establishes, provides for the duties of and outlines the procedures of the Fire Board of Appeals.

Local Emergency Operations Plan, 2014

1.1. Purpose. The purpose of the Manitou Springs Emergency Operations Plan is to provide general guidelines and principles for planning, managing, and coordinating the overall response and recovery activities of The City of Manitou Springs government before, during, and after major emergency and disaster events. It delineates the roles and responsibilities of City departments, outside agencies, and volunteer organizations expected to contribute to the protection of people and property. This Emergency Operations Plan was prepared under the Comprehensive Emergency Management Concept developed by FEMA to integrate the response of all available emergency management resources and increase the level of emergency preparedness in Manitou Springs. The Plan should be reviewed annually and updated as necessary.

2.5. Concept of Operations. If a disaster occurs within the City of Manitou Springs with little or no warning, immediate response by the City will be required. Only personnel trained in the prearranged plans and procedures will be prepared to make the coordinated efforts necessary to meet a threat of life

and/or property. When response to a disaster exceeds the capabilities of Manitou Springs, emergency response agencies may request resources through mutual aid agreements (usually discipline specific, such as fire, law enforcement, emergency medical, or public works). All local governments and special districts within El Paso County are responsible for coordinating with one another and for providing mutual aid within their capabilities and according to established written agreements. When all local resources and mutual aid resources are exhausted, the City of Manitou Springs, through El Paso County, may request aid from the state. The Emergency Operations Plan is based on the concept that emergency response functions will generally parallel the normal operations of all city departments. To the extent possible, the same personnel will be utilized in both cases. Those day-to-day functions which would not contribute to emergency operations may be suspended for the duration of the emergency and recovery period. Resources normally required for day-to-day operations may be redirected for accomplishment of emergency tasks.

The Disaster Mitigation Act of 2000 provided for new approaches and support for comprehensive hazard mitigation planning. One of the requirements of this Act was the development of a State Mitigation Plan as a condition of federal disaster assistance. It also established a new requirement for local government planning efforts. The following are identified hazards to the City of Manitou Springs:

Natural Hazards:

- Flash Flood
- Wildfire
- Severe Winter Storm
- Flood
- Tornado

Technological/Human-Caused:

- Hazardous Materials Releases
- Terrorism
- Civil Disturbances
- Major Power Outage

Police

The Manitou Springs Police Department provides law enforcement services to protect life and property for the community within the city limits. The city currently employs one full-time Police Chief, three Sergeants, 12 officers, and two administrative staff. Emergency communications are a joint responsibility between the local jurisdiction, the El Paso County Sheriff's Office, and the El Paso-Teller County 911 Authority.

Fire

The City of Manitou Springs Volunteer Fire Department has six full and part-time firefighters and 41 volunteers who respond to both medical and fire emergencies. All fire departments within El Paso County, as well as some in Elbert and Teller County have a Mutual Aid Agreement in place. This agreement was executed and signed by all departments in 2000. The City of Manitou Springs currently has an ISO rating of five. The Fire Department is very active within the community despite being a volunteer fire department.

Health and Safety – Manitou Springs Municipal Code, Title 6

Chapter 6.16 Water – Streams. This chapter contains prohibitions on dumping or accumulating trash or debris into the City’s creeks and streams.

Chapter 6.18 Watershed District. This chapter provides protection of the City’s watershed as it specifically relates to the mineral springs for which it is famous. The purpose of the Watershed District is the full exercise of the powers of the City in maintaining and protecting Manitou Springs' historic mineral springs from injury and pollution as well as from activities that may create a hazard to health and water quality or a danger of pollution, or interfere with continuous recharge. This District is created under the authority granted in Section 31-15-707(1)(b) Colorado Revised Statutes, 1973, and other Colorado statutes. The City Council of the City of Manitou Springs, in public hearings on this Watershed District Ordinance, has found and concluded that the systems of aquifers, springs, wells, pipes, valves, faucets, and drains, which constitute the historic mineral springs, are a "waterworks." Further, this District and the following regulations are created for the purpose of protecting Manitou Springs' free-flowing springs only, and not for the purpose of regulating land use activities outside the corporate limits of Manitou Springs. The regulation of land use activities beyond the corporate limits of Manitou Springs within the Watershed District shall be and remain the responsibility of El Paso County and of the City of Colorado Springs, as the case may be, and nothing herein shall restrict or supersede other governmental land use approval authority. Manitou Springs' authority herein shall be for the purpose of reviewing and restricting any activity within the District which creates a foreseeable risk of damage or injury to Manitou Springs' historic springs. Manitou Springs' review authority within the District shall therefore be concurrent to the authority of said counties and/or City or any other government entity which require permits for the same activity as Manitou Springs may regulate.

Chapter 6.34 Restrictions on Open Fires and Open Burning. This chapter provides for the declaration of high fire danger and for the prohibition of certain outdoor burning when declared by the Fire Chief.

Chapter 6.36 Transportation of Flammable Liquids. This chapter contains the provisions and restrictions on the transport of flammable liquids by tank truck within the City.

Chapter 6.65 All-Hazards Pre-Disaster Mitigation Plan. This chapter adopts by reference the June 2008 version of the All-Hazards Pre-Disaster Mitigation Plan published by the El Paso County Office of Emergency Management.

Streets and Other Public Places – Manitou Springs Municipal Code, Title 12

Chapter 12.08 Excavations – Landfills. This chapter requires permits for excavation or filling activities and specifies permitting for work near or in drainage channels and waterways.

Utilities – Manitou Springs Municipal Code, Title 13

Chapter 13.36 Storm Water Utility. The purpose of this chapter is to promote the public health, safety and welfare by minimizing flood losses and damage from stormwater runoff; to establish a stormwater utility to coordinate, design, construct, manage, operate, and maintain the stormwater management system; to establish a program to finance stormwater management capital projects and operation, maintenance and administrative activities; and to encourage and facilitate the control of stormwater, to reduce pollution and to enhance the environment.

Stormwater Quality Management and Discharge Control Code – Manitou Springs Municipal Code, Title 14

The purpose and intent of this title is to protect the water quality of watercourses and water bodies in a manner pursuant to and consistent with the Federal Clean Water Act (33 U.S.C. Section 1251 et seq.) by reducing pollutants in stormwater discharges to the maximum extent practicable and by prohibiting nonstormwater discharges into the City's Municipal Separate Storm Sewer System (MS4).

A. The objectives of this Code are as follows:

1. To promote, preserve, and enhance the natural resources within the City of Manitou Springs from adverse or undesirable impacts caused by development or other activities;
2. To protect and promote the health, safety, and welfare of the people and property through effective stormwater quality management practices;
3. To regulate land development activity, land disturbing activity, or other activities that may have an adverse impact on stormwater quality, and/or environmentally sensitive lands and to encourage compatibility between such uses;
4. To establish detailed review standards and procedures for land development activities throughout the City of Manitou Springs, thereby achieving a balance between growth and development and the protection of water quality; and
5. To provide for adequate stormwater system analysis and design as necessary to protect public and private property, water quality and existing natural resources.

B. This Code sets forth uniform requirements for Stormwater Management Systems within the City of Manitou Springs. In the event of any conflict between the City of Manitou Springs, El Paso County, State or Federal authorities, the more restrictive standard shall prevail.

C. This Code applies in the City of Manitou Springs, Colorado and to persons outside the City who are, by contract or agreement with the City, users of the City Stormwater Management System. Except as otherwise provided herein, the Stormwater Manager shall administer, implement, and enforce the provisions of this Code.

Public Services

The Public Services Department strives to make Manitou Springs a better place to live and work while making customer service a priority. Public Services reports to the City Administrator and oversees the department's five divisions:

- Parks Division
- Streets Division
- Water Division
- Sewer Division
- Stormwater Division

Some of the Public Service's primary missions include:

- Road and Curb Repair: The Street Division repairs potholes, sunken roadway areas, and in certain instances curbs and gutters.
- Snow Removal and Ice Control: Public Service's snow removal priority is to first plow and sand the school bus routes once a snowstorm begins. After these streets are in an acceptable condition, the City starts plowing residential streets. During a snow emergency, our road crews work around the clock to clear roadways. You may not see plows and spreader trucks on secondary routes, as our crews are working to keep primary routes open. Typically, it will take up to eight hours to plow and sand Manitou's streets during a heavy snow.
- Water Maintenance: Residents of Manitou Springs are connected to the City of Manitou Springs' water system. Public Services' Water Division maintains the City's water mains. Residents and business owners are responsible for maintenance of their private water service line from the water main to the building structure.

- Manitou Springs Reservoir: The Manitou Springs reservoir and watershed area is nestled high up on Pikes Peak. This watershed takes in some 30 acres of national forest, and the reservoir holds 720 acre-feet of water. Even though the reservoir is on national forest, the entire Manitou reservoir watershed area is closed to recreational use. The City monitors the flows of incoming waters and what is being released from the reservoir, along with surrounding weather conditions that may affect the downstream areas.
- Water Treatment Plant: At our water treatment plant, the raw (untreated) water goes through a process that removes suspended matter and provides disinfection. The end product or finished water then enters the Mesa and Crystal Hill water storage tanks high above the city, then into the distribution system, where it eventually arrives at our residences and businesses. The City of Manitou Springs completes six water quality tests per month in the distribution system, as well as constant monitoring of the water quality at the treatment plant, to ensure that the drinking water is clean, and safe, for you, the consumer.
- Sewer Maintenance: Residents of Manitou Springs are connected to the City of Manitou Springs' sewer system. Public Services' Sewer Division maintains the City's sewer mains. Residents and business owners are responsible for maintenance of their private sewer service lines from the sewer main to the building structure.
- Sewer and Water Upgrades: In mid-2009, Manitou Springs received federal funding to upgrade over 4 1/2 miles of waterline piping and 3 1/3 miles of wastewater piping. This is the largest utility upgrade in the history of Manitou Springs. The project began in September 2009 and was completed in September 2011.

6.9.8 Town of Monument

Excerpts from applicable policies, regulations, and plans and program descriptions follow to provide more detail on existing mitigation capabilities within the Town of Monument.

The Town of Monument has multiple plans and functions in place that guide growth and development within the community. The Town staff includes the Town Manager, Town Clerk, Public Works Director, Planning Director, and the Chief of Police, all of whom have significant responsibility for the development and implementation of development plans, codes, and regulations in the Town. The Town's planning mechanisms include the following:

Monument Master Plan, 1984

The Town of Monument Comprehensive Plan was first adopted in 1984. In compliance with Colorado Law, the Comprehensive Plan is advisory and does not affect legally protected interests of property owners. It provides a framework that supports informed and consistent decision making by Town-elected officials, appointed officials and staff. The Comprehensive Plan also outlines principles and policies concerning land use, housing, parks, development, transportation, and other elements, as well as guides public investment and the provision of public services.

The Town of Monument Comprehensive Plan embodies policy and guiding principles for the community zoning ordinances, subdivision regulations, and capital improvement programs, then provides the detailed means of implementing those principles encompassing the following: land use; annexations; transportation system; economic development; housing; community character and design; historic preservation; parks and recreation; trails; visual resources; open space; public health and safety; services and utilities; intergovernmental collaboration; environmental; education; and downtown.

Monument Subdivision Regulations, 2014

The Monument Subdivision Regulations were enacted to promote the health, safety, convenience, prosperity, aesthetics, and general welfare of the citizens of the Town. The subdivision of land is the first

step in the process of urban development. The arrangement of land parcels for residential, commercial, industrial, recreational, utility, and other public purposes will determine to a large degree the qualities of health, safety, convenience, environment, and general welfare of the Town.

Established standards of subdivision design will encourage the development of sound, economical, and stable neighborhoods; ensure a healthy living environment; and protect the natural environment. The following are currently administered regulations to ensure the desirable development of the community through the adherence to accepted principles of land use, intensity of development, distribution of growth, preservation of natural amenities, and other elements of the Town's development plans. The standards are intended to prevent flood damage to persons and properties and minimize expenditures for flood control; restrict building on flood lands, shorelands, wetlands, areas covered by poor soils, or in areas otherwise poorly suited for building or construction; and prevent loss or injury from landslides, expansive soils, and other geological hazards.

The subdivision regulations:

1. Implement the Town's comprehensive plan;
2. Establish adequate and accurate records of land subdivision;
3. Harmoniously relate the development of the various tracts of land to the existing community and facilitate the future development of appropriate tracts;
4. Provide for adequate, safe, and efficient public utilities, transportation, and pedestrian circulation and improvements; and to provide for other general community facilities and public places;
5. Provide for light, air, parks, open space, and other spaces for public use;
6. Provide for protection from fire, flood, geologic hazards and other dangers; and to provide for proper design of stormwater drainage and streets;
7. Provide that the cost of improvements which benefit the tract of land being developed be borne by the owners/developers of the tract, and the costs of improvements which benefit the entire community be borne by the entire community;
8. Promote the general health, safety, and welfare of the present and future inhabitants of Monument;
9. Provide for the preservation and conservation of unique or distinctive natural areas, scenic areas and views, natural landmarks, including rock outcroppings, significant wildlife habitats and migration areas, drainage areas, riparian areas, wetlands, historic features and archaeologically sensitive sites, recognizing the irreplaceable character of such resources and their importance to the quality of life in Monument;
10. Provide for the preservation and conservation of significant stands of native vegetation; and
11. Ensure adequate access is provided within the subdivision.

Monument Master Drainage Plan, 2014

The Town of Monument Board of Trustees enacted the Town's stormwater drainage system impact fee regulations in 2000 based upon studies conducted by El Paso County, Colorado.

The regulations were adopted based on the following findings:

- Need for Capacity Expansion and Major Stormwater Drainage System Improvements: The future growth and new development in the Town (from 2000 forward) will require a substantial expansion and major improvements in stormwater drainage system facilities if

adequate levels of service are to be maintained on the Town's major stormwater drainage system.

- Major Stormwater Drainage System Capital Improvement Project: In 2000, the Board of Trustees identified the improvements required to maintain adequate levels of service on the Town's major stormwater drainage system. The highest priority improvements that should be completed over the next several years (from 2000 forward) were listed, along with descriptions and cost estimates.
- Revenue Shortfall: In 2000, the Board of Trustees determined that revenue generated by new growth (from 2000 forward) and development under the Town's existing fiscal structure (in 2000) would not be adequate to fund the needed stormwater drainage system improvements necessary to accommodate the new growth and development if the desired levels of service on the Town's major stormwater drainage system were to be maintained.
- Proportionate Share Policy: In 2000, the Board of Trustees determined that future growth and new development (from 2000 forward) should contribute its proportionate share of the costs of providing such stormwater drainage system facilities to the Town's major stormwater drainage system.
- Stormwater Drainage System Impact Fee Preferred: In 2000, the Board of Trustees further determined that the imposition of a stormwater drainage system impact fee was one of the preferred methods of regulating new growth and development in the Town in order to ensure new growth and development bears a proportionate share of the costs of the stormwater drainage system facilities necessary to accommodate that new development and provide for the public health, safety, and welfare.
- Interim Impact Fee: In previous years, El Paso County, Colorado, conducted detailed studies of four of the five drainage basins traversing the Town and, pursuant to an extensive public review and hearing process, the County adopted a per impervious acre stormwater drainage impact fee for each of these basins applicable to unincorporated lands. As an interim measure pending completion of the development of (by system) a formal needs analysis, cost allocations to growth, and capacity data bases, the Board of Trustees determined it would be in the best interests of the Town to implement an interim stormwater drainage system impact fee, based on El Paso County's drainage basin studies and consistent with the Town's drainage consultant's recommendations.
- Consistent with Master Plan. In 2000, it was determined a stormwater drainage system impact fee that contributes a proportionate share would assist in the implementation and be consistent with the Town's Master Plan.

Monument Stormwater Discharge And Erosion Control

The purpose of stormwater discharge and erosion control is to protect the public health, safety, and welfare of the citizens of Monument, to protect the public infrastructure, and to protect downstream environments from detrimental effects caused by illicit discharge, excessive stormwater runoff, and sedimentation by eliminating and controlling, to the maximum extent possible, sources of concentrated stormwater runoff from private property in excess of historical flows, volumes, and velocities; and by eliminating and controlling erosion, and the resulting migration of sediment and other debris at the source.

As part of the National Pollutant Discharge Elimination System (NPDES) - Phase II program administered in Colorado by the Colorado Department of Public Health and Environment, the Town of Monument has been awarded a Colorado Discharge Permit System General Permit (MS4 Permit). This permit, made effective March 10, 2008, authorizes the Town of Monument to discharge stormwater

associated with municipal separate storm sewers in its permitted area into state waters. As part of this permit, the Town of Monument is required to establish measures to protect the quality of stormwater entering state waters.

Any individual construction site with a gross area of disturbance greater than one-half acre shall be required to provide evidence through a sketch, narrative, or other means, that best management practices (BMPs) are being implemented to assure compliance. In order to mitigate the potential for erosion, sedimentation, excessive stormwater runoff, dust, and other hazards associated with earthmoving and grading operations, the maximum area of any site that can be graded or otherwise disturbed from its natural state at one time is 25 acres. Compliance inspections shall be conducted by Town of Monument representatives on a routine basis to determine if the site development contractor is adhering to all of the regulations as well as Town of Monument Design Principles Code.

Emergency Watering Restrictions

Emergency watering restrictions prohibit specific outside uses of water during emergency situations except with special exceptions granted by either the Town Board, Town Manager, or his or her designee.

Emergency water restrictions can be declared by the Town board or any two of the following:

1. Mayor;
2. Town maintenance supervisor or appointee;
3. Town manager or appointee.

An emergency water restriction may be imposed when the Town's storage tank reaches condition red and cannot be replenished within a reasonable period of time:

Condition red	=	Tank level is 0 to 9 feet
Condition yellow	=	Tank level is 9 to 12 feet
Condition green	=	Tank level is 12 to 18 feet

Notice of emergency water restrictions will include the following:

1. Notification of local radio and television stations;
2. Police traveling throughout Town using a megaphone; and
3. Designated neighborhood representatives going door to door.

Flood Ordinance, 20-02, 2002

The flood hazard areas of Monument are subject to periodic inundation which could result in loss of life and property, health and safety hazards, disruption of commerce and governmental services, extraordinary public expenditures for flood protection and relief, and impairment of the tax base, all of which could adversely affect the public health, safety and general welfare. These flood losses could be caused by the cumulative effect of obstructions in areas of special flood hazards which increase flood heights and velocities, and when inadequately anchored, damage uses in other areas. Uses that are inadequately flood-proofed, elevated or otherwise protected from flood damage also contribute to the flood loss. It is the purpose of the flood regulations to promote the public health, safety, and general welfare, and to minimize public and private losses caused by flood conditions in specific areas by provisions designed:

- A. To protect human life and health;
- B. To minimize expenditure of public money for costly flood control projects;

- C. To minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
- D. To minimize prolonged business interruptions;
- E. To minimize damage to public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, streets and bridges located in areas of special flood hazard;
- F. To help maintain a stable tax base by providing for the sound use and development of areas of special flood hazard;
- G. To insure that potential buyers are notified that the property is in an area of special flood hazard; and
- H. To ensure that those who occupy the areas of special flood hazard assume responsibility for their actions.

Planning Department

The Planning Department offers information and assistance in directing the land development entitlement process for the Town. The Planning Department offers assistance from the time of application through record of applicable plans and documents to include, but not limited to: plan review, processing of development permits, preparation of staff reports, compilation of data and drafting of documentation relative to long-range planning projects, urban planning and redevelopment functions, and Comprehensive Plan, Subdivision and Zoning Code revisions.

The mission of the department is to conduct plan review and inspect public and private improvements to ensure compliance with approved construction drawings, monthly and event-based stormwater inspections on all active construction sites and to provide recommendations for non-compliant projects to ensure the health, welfare and safety of the citizens of Monument as well as maintain aesthetics within Town boundaries.

Building and Code Enforcement/Project Management Department

The mission of the Building and Code Enforcement/Project Management Department is to conduct plan review and inspect public and private improvements to ensure compliance with approved construction drawings, monthly and event-based stormwater inspections on all active construction sites and to provide recommendations for non-compliant projects to ensure the health, welfare and safety of the citizens of Monument as well as maintain aesthetics within Town boundaries. The Code Enforcement Officer performs enforcement of municipal ordinances as needed, with a primary focus on the immediate public safety and health of the residents of the Town of Monument.

Monument Emergency Operations Plan, 2013 (Draft)

The Town of Monument is working in conjunction with the El Paso County OEM on an EOP. The ability to respond to a man-made or natural disaster is a necessary function of government. Common to all emergency situations are functions that require the protection of life and property. Specifically, these functions include planning and identification of responsibilities, warning and evacuation, communication, direction and control, public information, resource management, damage assessment, emergency health and medical services, and sheltering.

Purpose

The primary emphasis of the Town of Monument EOP is on town government responsibilities and functions, public warning, direction and coordination. The purpose of the Town of Monument EOP is to provide general guidelines and principles for planning, managing and coordinating the overall response

and recovery activities of town departments, and participating agencies to be used before, during, and after the limited timeframe of a threatened, imminent, or actual major emergency or disaster.

Major emergencies and disasters are unique events that present communities and emergency personnel with extraordinary problems and challenges that cannot be adequately addressed within the routine operations of local government. Since disasters differ in important ways and it is impossible to plan for every contingency, highly detailed operational procedures are avoided in the plan in favor of a streamlined all-hazard preparedness approach. This plan is intended to provide town officials and participating agencies the basis for the coordinated management of disaster incidents so that impacts to people, property, public services and economy are minimized and so that normal community conditions can be restored as quickly as possible.

All town departments are responsible for developing and maintaining up-to-date internal plans and procedures for carrying out assigned emergency functions and for ensuring that their personnel are adequately trained. The coordination and integration of emergency plans and procedures is an ongoing process that should be promoted by convening town department/agency meetings, developing mutual aid agreements and by conducting inter-jurisdictional exercises. The EOP:

- Sets forth fundamental policies, planning assumptions, a concept of operations, response and recovery actions, and department and agency responsibilities.
- Describes the process and methodology for implementing and managing recovery and mitigation programs and support/technical services.
- Addresses linkages to other emergency operations plans developed for specific incidents.
- Provides a focus for interagency and intergovernmental emergency preparedness, planning, training, exercising, coordination, and information exchange.
- Serves as the foundation for the development of detailed supplemental plans and procedures to implement response and recovery activities rapidly and efficiently. It will not detail operating policies for specific departments, agencies, or organizations nor will it replace a list of resources or contain information that is specific to any one department or organization.

Scope

- The EOP concepts apply to a major disaster or emergency which includes a natural catastrophe; fire, flood, or man-caused event; or any other occasion or instance for which the Town of Monument determines that it is needed to supplement state and local efforts and capabilities.
- The EOP covers the full range of complex and constantly changing requirements for an emergency or disaster: saving lives, protecting property, and meeting basic human needs (response); restoring the disaster-affected area (recovery); and reducing vulnerability to future disasters (mitigation). The EOP does not specifically address long-term reconstruction and redevelopment.
- The EOP applies to all departments and agencies that may be tasked to provide assistance in a major disaster or emergency.
- The contents of this plan are intended to provide a basis for the coordinated planning and management of the types of emergencies and disaster events most likely to occur in the Town of Monument.
- All town departments as well as other agencies and organizations included in this plan are responsible for developing, maintaining, and training in up-to-date standard operating procedures necessary for implementing assigned duties, responsibilities, and functions.

- Attachments to this EOP may be developed as needed. Such attachments shall be called appendices and shall be incorporated into this EOP by reference.
- The Town of Monument Safety Committee is responsible for required periodic updates and revisions to the EOP.

Planning Assumptions

- Citizens expect government to keep them informed and to provide guidance and assistance in the threat of or in an actual emergency.
- Departments and agencies will need to respond on short notice to provide timely and effective assistance.
- Town of Monument government, departments, and agencies will provide assistance and support each other, within their ability, and will cooperate to ensure coordinated emergency operations at all times.
- Incidents will be managed at a local government level to the extent of available resources. Once those resources are exhausted, mutual aid will be requested. Local jurisdictions should not plan on the arrival of State response assets until 24 hours after the incident and 48 to 72 hours for Federal response assets.
- A major disaster or emergency in the Town of Monument could cause injuries, fatalities, property loss, damage to transportation infrastructure, damage to commercial telecommunications facilities, disruption of public safety communication, disruption to public utility services, and impede the response of emergency medical, fire, and police services. Additionally, supplies such as fuel, groceries, medicines, rental equipment, and other gear may be short supply.
- The priorities for incident management are:
 1. Save lives and protect the health and safety of the public, responders and recovery workers.
 2. Protect and restore critical infrastructure.
 3. Conduct law enforcement investigations when appropriate.
 4. Protect property and mitigate damages and impacts to individuals, the community and the environment.
 5. Facilitate the recovery.
- Effective emergency operations require periodic training and exercise of all potentially involved personnel and agencies.

Police

The Police Department protects the community and provides law enforcement services to protect life and property in the following areas:

- Patrol Division: covers 7 days a week, 24 hours a day. Officers respond to emergency and non-emergency calls for service. They strive to work in partnership with our community in seeking out and solving problems in order to maintain the peace, prevent crime, and to enhance the safety for all of our citizens.
- Investigations: One detective is assigned full time to the Investigations Unit to investigate major crimes such as sexual assault, robberies, burglaries, felony thefts, narcotics investigations, and any other crime which requires additional resources and expertise.

- Community Resource Officer: One officer is assigned, on a part-time basis, to interact with businesses, schools, and citizens. The Community Resource Officer provides high visibility and recognizable response to day-to-day issues surrounding the school and community environment.
- S.W.A.T. Team: 6 members of the Monument Police Department are part of a combined Special Weapons and Tactics (S.W.A.T.) team comprised of members from two different police departments. The S.W.A.T. team provides a higher level of specialized tactics and capabilities to address higher risk situations than can be handled at the patrol level.
- Community Resources: The Monument Police Department is a full-service organization that offers citizens additional opportunities and programs designed to further cooperation between the police department and the citizens. The ultimate goal is to keep our community safe. Community Resources include, but are not limited to Neighborhood Watch, Business Watch, Citizens Police Academy, Scout Tours, and Safety Bulletins.

Emergency communications are a joint responsibility between the local jurisdiction, the El Paso County Sheriff's Office, and the El Paso-Teller County 911 Authority.

Fire

The Town of Monument is part of the Tri-Lakes Monument Fire Protection District. The mission of the Tri-Lakes Monument Fire Protection District is to minimize the loss of life and property resulting from fires, medical emergencies, environmental and other disasters. That mission is accomplished through a progressive and professional system of personnel development, public education, fire suppression, code enforcement, medical services and rescue skills, as well as aggressive community involvement.

Home fire safety inspections and FireWise property inspections are conducted free of charge. These inspections consist of an assessment of the home and property with relation to wildland fire threats. Wildfire is a growing threat in the Rocky Mountain region. Homeowners need to be aware of the importance of mitigating wildfire hazards and be aware of the impact of living in high-risks area. The Tri-Lakes Monument Fire Protection District follows guidelines for the FireWise Program. The FireWise Program shows homeowners how to mitigate their property and reduce the risk of a wildfire.

All new one- and two-family homes are required to have smoke alarms and carbon monoxide alarms installed. Smoke alarms must be installed in each sleeping room and outside of each bedroom in the hallway/room. Each floor must have at least one smoke alarm, regardless of bedrooms. Effective 2006, carbon monoxide detectors are required in new homes or rental homes.

Public Works

The Monument Public Works Department includes streets, parks and cemetery divisions.

The Streets Division is responsible for maintaining and preserving the Town's roadway and drainage infrastructure which includes, but is not limited to the following: snow plowing roadways; street sweeping; patching and resurfacing roadways; and storm drainage system maintenance. The Streets Division also includes Fleet Management, which is responsible for preventive maintenance and emergency repairs on all equipment to minimize equipment down time.

The Parks and Open Space Division has many responsibilities that include management, maintenance, and the protection of the natural resources within parks and open space properties. Division staff also repair, monitor, and renovate irrigation, lighting, and plumbing systems; maintain, renovate, and construct buildings, structures, walkways, curbing, parking facilities, and fences; and repair all manner of vandalized facilities.

Water and Wastewater

The Monument Public Works Department also includes the Water Department. The Water Department is responsible for operating and maintaining the town's nine water wells, treatment facilities, distribution system, and the management of water treatment chemicals with constant monitoring and testing for water quality.

The mission of the department is to:

- Ensure training, operations, compliance testing, budget controls, safe working conditions and environment for all treatment activities.
- Ensure that all plant parameters are met in regard to current Colorado Primary Drinking Water Regulations.
- Manage and direct plant staff to ensure that a stable and high quality operation is maintained.
- Oversee water department purchasing requirements and budget controls.
- Prepare monthly reports and ensure maintenance is being performed in a routine manner while maintaining constant vigilance and contact with the State of Colorado Water Quality Control Division to ensure compliance with all current Colorado Primary Drinking Water Regulations.

The Town of Monument does not have a Wastewater Department. This function covered by the Monument Sanitation District.

6.9.9 Town of Palmer Lake

Excerpts from applicable policies, regulations, and plans and program descriptions follow to provide more detail on existing mitigation capabilities within the Town of Palmer Lake.

The Town of Palmer Lake has multiple plans and functions in place that guide growth and development within the community. The Town is governed by the town council with staff positions that include the Town Clerk, Deputy Clerk, Water Supervisor, Roads Supervisor, Volunteer Fire Chief, and a Police Lieutenant who have significant responsibility for the development and implementation of development plans, codes and regulations in the Town.

Town of Palmer Lake Master Plan, 2013

The Town of Palmer Lake Comprehensive Plan was first adopted in March of 1993. In compliance with Colorado Law, the Comprehensive Plan was reviewed, amended, and approved by the Town Council in September 2013. The plan encompasses the following:

- Natural Environment
- Physical and Community Services
- Land Use
- Downtown Design Plan
- Infrastructure Recommendations
- Administration and Implementation Program

This plan is only to be used as advisory and does not affect legally protected interests of property owners.

The Palmer Lake Vision: The citizens of Palmer Lake want a town that provides the traditional public services while maintaining its historical, small-town atmosphere. They accept the fact that in order to

preserve this atmosphere, they may not, in the near future, be able to have all the amenities of larger more industrial-based municipalities, such as all paved streets.

To maintain the desired character of the town while continuing to provide and upgrade current services, Palmer Lake will do the following:

- Provide an environment conducive to measured, but steady growth.
- Encourage cottage industries, service industries, low-impact light manufacturing, and other small businesses to locate within the Town.
- Encourage development of residential areas in accordance with current zoning codes.
- Ensure that facilities and utilities plans are accomplished to support the above.

Palmer Lake Subdivision Regulations, 1995

The Palmer Lake Subdivision Regulations were developed to promote the health, safety, convenience and general welfare of the citizens of Palmer Lake by ensuring that land is subdivided correctly into lots that adhere to the following:

- A specific legal description
- Name and address of owner or agent and of person preparing the plan
- Date of preparation, scale, and northpoint
- A vicinity location map
- Proposed land uses together with densities
- Topography with a contour interval of no more than 20 feet from the appropriate USGS quadrangle
- Proposed sewage treatment systems
- Proposed water supply system with adequate evidence that sufficient water exists to supply the proposed development
- Any unusual or important man-made or natural features
- Summary statement of the characteristics of the proposed area
- Any potential radiation hazard
- Present land use
- Letter of commitment for the appropriate supplier of energy

Palmer Lake Building and Code Enforcement

The Town of Palmer Lake does not have a building inspector, but contracts with PPRBD. PPRBD's main goal is to safeguard life and limb, health, property, and public welfare by regulating and controlling the design, construction, quality of materials, as well as use and occupancy of all buildings and structures within Palmer Lake. This is accomplished through the enforcement of minimum building code standards. Also, the building department performs comprehensive inspections of alterations and additions to all buildings to ascertain compliance with numerous building codes. The Town Clerk and Deputy Clerk review all plans to insure current zoning requirements have been met.

Local Emergency Operations Plan, 2012

A function of government is to protect life and property. Equally important is the public's obligation to be informed, take a community interest, and assist when possible. This plan encourages citizens to review

and discuss the plan with family and friends. As a minimum, citizens should know the hazards in the community and have a plan for themselves and their family.

The plan encourages citizens to:

- Take a course in First Aid
- Get a weather alert radio
- Always check the weather forecast more than once a day
- Know the areas where they live, work and play that is subject to flooding
- Know the best routes in and out of an area that are subject to flash flooding
- Know where potential shelters are in the community
- Make their homes safe
- Obey law enforcement personnel instructions in an emergency

Police Department

The Palmer Lake Police Department protects the community and provides law enforcement services to protect life and property. There is one full-time Lieutenant and seven part-time officers. Emergency communications are a joint responsibility between the local jurisdiction, the El Paso County Sheriff's Office, and the El Paso-Teller County 911 Authority.

Fire Department

The Palmer Lake Volunteer Fire Department has a staff that operates Monday through Friday; 8a.m. to 4 p.m. Staffing is provided by three part-time emergency medical technician/firefighters and a cadre of 27 volunteers. All fire departments within El Paso County have a Mutual Aid Agreement in place. The agreement is with the Tri-Lakes Fire District and the North End Group (Donald Wescott, Air Force Academy, and Larkspur, to name a few)

Public Works Department

The Streets Division is responsible for maintaining and preserving the Town's roadway and drainage infrastructure which includes, but is not limited to the following:

- Snowplowing roadways
- Street sweeping
- Patching and resurfacing roadways
- Storm drainage system maintenance.

Palmer Lake Water Department

The Town's Water Department responsibilities include, but are not limited to the following:

- Operating and maintaining the town's nine water wells and treatment facilities
- Management of water treatment chemicals and constant monitoring and testing for water quality
- Operating and maintaining the Town's water distribution system comprised of underground piping, fire hydrants, booster pumps, and the storage tanks
- 1 surface treatment plant
- 1 ground water treatment plant

The mission of the department is to:

- Ensure training, operations, compliance testing, budget controls, safe working conditions and environment for all treatment activities;
- Maintaining constant vigilance and contact with the State of Colorado Water Quality Control Division to ensure compliance with all current Colorado Primary Drinking Water Regulations;
- Manage and direct plant staff to ensure that a stable and high quality operation is maintained;
- Oversee water department purchasing requirements and budget controls;
- Planning, engineering and administration of all infrastructure, operations, future raw water development and long-term asset management; and
- Prepare monthly reports and ensure maintenance is being performed in a routine manner.

6.9.10 Town of Ramah

Excerpts from applicable policies, regulations, and plans and program descriptions follow to provide more detail on existing mitigation capabilities within the Town of Ramah.

The Town of Ramah's governance and administration consists of a Board of Trustees elected by the citizens and a part-time Town Clerk. The Town of Ramah currently has no master plan, zoning ordinances, or subdivision ordinances. The current population is approximately 121 residents. Growth management has not been an issue for at least the last 25 years and is not anticipated to be over the next decade. Ramah was previously a sizable small town with a railroad, banks, gas stations, and other stores. When the railroad discontinued use of the line, the town saw a considerable decline. There are no current economic development plans or capital improvement plans in place. The current Board of Trustees is actively looking toward the future by seeking out various grant opportunities to update infrastructure.

Flood Ordinance, 2014 (ORDINANCE NO. 2014-02)

Purpose. It is the purpose of this Article to promote the public health, safety, and welfare by provisions designed to:

- (1) Protect human life and health;
- (2) Minimize expenditure of public funds for costly flood control projects;
- (3) Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
- (4) Minimize prolonged business interruptions caused by flooding;
- (5) Minimize damage to critical facilities, infrastructure and other public facilities such as water, sewer, and gas mains; electric and communications stations; and streets and bridges located in floodplains;
- (6) Maintain a stable tax base by providing for the sound use and development of flood-prone areas in such a manner as to minimize future flood blight areas; and
- (7) Ensure that potential buyers are notified that property is located in a flood hazard area.

Building and Code Enforcement

The Town of Ramah employs a part-time building inspector to handle any new structures, as well as improvements to existing buildings. There has been very little new construction or significant structural improvement, such as new outbuildings, over the past five years. The town follows the International

Residential Code for new structures, but almost every building in town is “grandfathered in” from prior building regulations. Code enforcement is minimal as Ramah has no local police force. El Paso County Sheriff’s Office provides law enforcement for the town; however, code enforcement is not included with their coverage at this time.

Police

El Paso County Sheriff’s Office provides law enforcement for the town. Emergency communications are a joint responsibility between the local jurisdiction, the El Paso County Sheriff’s Office, and the El Paso-Teller County 911 Authority.

Fire

The Town of Ramah is part of the Big Sandy Fire Protection District based out of Simla, Colorado in Elbert County. Ramah currently has an ISO rating of seven. The Fire Department is very active within the community and has specifically sought to increase the capabilities of the department through grant opportunities and funding from an adopted property tax assessment. The Calhan Fire Department also partners with the Big Sandy Fire to ensure all emergencies are handled in a timely manner.

Public Works

The Public Works Department consists of two part-time employees that handle town roads, parks, the cemetery, as well as water and sewer services. The town has been moving forward with efforts to pave all unpaved streets within town with the help of Community Development Block Grants. The grant program has also assisted with needed improvements to the water and sewer systems. Ramah will continue to improve infrastructure with funding from the Pikes Peak Rural Transportation Authority.

Water and Wastewater

The Public Works Department handles all aspects for the water and wastewater system. The town is supplied with two deep wells that provide potable water for the residents, and one alluvial well for non-potable use. The town is responsible for the safety, protection, and maintenance of both water and wastewater systems within town boundaries. Current objectives include: replacing old mains; maintaining the current system through proactive projects; finding and exercising water valves; start an on-going inspection program of the water tank; and scheduled cleaning of the septic system. The Town of Ramah is also researching the potential for an Intergovernmental Agreement with the Towns of Calhan and Simla for emergency water supplies.

CHAPTER 7. HAZARD MITIGATION CAPABILITIES ASSESSMENT

The planning team performed an inventory and analysis of existing authorities and capabilities called a “capability assessment.” A capability assessment creates an inventory of an agency’s mission, programs and policies, and evaluates its capacity to carry them out.

7.1 EL PASO COUNTY

7.1.1 Legal and Regulatory Capabilities

Table 7-1 lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in El Paso County.

7.1.2 Administrative and Technical Capabilities

Table 7-2 identifies the County personnel responsible for activities related to mitigation and loss prevention in El Paso County.

7.1.3 Financial Capabilities

Table 7-3 identifies financial tools or resources that El Paso County could use to help fund mitigation activities.

TABLE 7-1. EL PASO COUNTY REGULATORY MITIGATION CAPABILITIES MATRIX		
Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
General plan	YES	Policy Plan (1998) Small-Area Plans (Various Dates)
Zoning ordinance	YES	Regulations not Ordinance (2007)
Subdivision ordinance	YES	Regulations not Ordinance (2007)
Growth management	NO	
Floodplain ordinance	YES	Section Rbc313 - Floodplain Code
Other special purpose ordinance (stormwater, steep slope, wildfire)	YES	Emergency Watershed Protection Ordinance 07-03: Prohibition of Illicit Discharges into El Paso County Storm Water System
Building code	YES	Pikes Peak Regional Building Code, 2011
Fire department ISO rating	YES	Individual fire departments and fire protection districts are rated separately
Erosion or sediment control program	YES	Permitting process for construction over 1 acre defined in Engineering Criteria Manual Ch 5 & App I
Stormwater management	YES	Drainage Criteria Manual Vol I & II (2002, 2014 revision pending)
Site plan review requirements	YES	El Paso County Land Development Code (2007)
Capital improvements plan	YES	PPRTA

TABLE 7-1. EL PASO COUNTY REGULATORY MITIGATION CAPABILITIES MATRIX		
Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
Economic development plan	YES	
Local emergency operations plan	YES	El Paso County Emergency Operations Plan, 2009
Other special plans	NO	
Flood insurance study or other engineering study for streams	YES	Flood Insurance Study, 1999, Flood Plain Map (currently under revision)
Elevation certificates	YES	Pikes Peak Regional Building Department

TABLE 7-2. EL PASO COUNTY ADMINISTRATIVE/TECHNICAL MITIGATION CAPABILITIES MATRIX		
Personnel Resources	Yes/No	Department/Position
Planner/engineer with knowledge of land development/land management practices	YES	Development Services Department
Engineer/professional trained in construction practices related to buildings and/or infrastructure	YES	Pikes Peak Regional Building Department and Development Services Department and Public Services Department
Planner/engineer/scientist with an understanding of natural hazards	YES	Development Services Department
Personnel skilled in GIS	YES	El Paso County IT-GIS Services
Full-time building official	YES	Pikes Peak Regional Building Department
Floodplain manager	YES	Pikes Peak Regional Building Department
Emergency manager	YES	El Paso County Sheriff-ESD
Grant writer	YES	El Paso County Sheriff-ESD/Comptroller
Other personnel	YES	El Paso County Sheriff-ESD/Prep. Planner (x3)
GIS data: Hazard areas	YES	El Paso County IT-GIS Services
GIS data: Critical facilities	YES	El Paso County IT-GIS Services
GIS data: Building footprints	YES	El Paso County IT-GIS Services
GIS data: Land use	YES	El Paso County IT-GIS Services
GIS data: Links to Assessor's data	YES	El Paso County IT-GIS Services
Warning systems/services (Reverse callback, cable override, outdoor warning signals)	YES	El Paso/Teller County 911 Everbridge EAS
Other	YES	El Paso County Public Health/Environmental

**TABLE 7-3.
EL PASO COUNTY FINANCIAL MITIGATION CAPABILITIES MATRIX**

Financial Resources	Accessible/Eligible to Use (Yes/No)
Community Development Block Grants	YES
Capital improvements project funding	YES
Authority to levy taxes for specific purposes	YES, If Voter Approved
Fees for water, sewer, gas, or electric services	NO
Impact fees for new development	YES
Incur debt through general obligation bonds	YES, If Voter Approved
Incur debt through special tax bonds	YES, Short Term
Incur debt through private activities	YES
Withhold spending in hazard prone areas	YES
Other	NO

7.2 TOWN OF CALHAN

7.2.1 Legal and Regulatory Capabilities

Table 7-4 lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Town of Calhan.

7.2.2 Administrative and Technical Capabilities

Table 7-5 identifies the Town personnel responsible for activities related to mitigation and loss prevention in Calhan.

7.2.3 Financial Capabilities

Table 7-6 identifies financial tools or resources that Calhan could use to help fund mitigation activities.

**TABLE 7-4.
CALHAN REGULATORY MITIGATION CAPABILITIES MATRIX**

Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
General plan	YES	Comprehensive plan adopted in 2002
Zoning ordinance	YES	Only 1 item (marijuana) – town is not zoned
Subdivision ordinance	YES	
Growth management	NO	
Floodplain ordinance	YES	Adopted per State recommendations
Other special purpose ordinance (stormwater, steep slope, wildfire)	NO	
Building code	YES	IRC 2006

TABLE 7-4. CALHAN REGULATORY MITIGATION CAPABILITIES MATRIX		
Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
Fire department ISO rating	YES	Rated 6
Erosion or sediment control program	NO	
Stormwater management	NO	
Site plan review requirements	YES	Within our building codes
Capital improvements plan	NO	
Economic development plan	NO	
Local emergency operations plan	YES	
Other special plans	NO	
Flood insurance study or other engineering study for streams	NO	
Elevation certificates	NO	

TABLE 7-5. CALHAN ADMINISTRATIVE/TECHNICAL MITIGATION CAPABILITIES MATRIX		
Personnel Resources	Yes/No	Department/Position
Planner/engineer with knowledge of land development/land management practices	NO	
Engineer/professional trained in construction practices related to buildings and/or infrastructure	NO	
Planner/engineer/scientist with an understanding of natural hazards	NO	
Personnel skilled in GIS	NO	Under the Purview of El Paso County GIS Services
Full-time building official	NO	Part-time
Floodplain manager	NO	Town Board
Emergency manager	YES	Fire Chief
Grant writer	NO	
Other personnel	YES	Part-time building official, engineer hired for projects
GIS data: Hazard areas	NO	Under the Purview of El Paso County GIS Services

**TABLE 7-5.
CALHAN ADMINISTRATIVE/TECHNICAL MITIGATION CAPABILITIES MATRIX**

Personnel Resources	Yes/No	Department/Position
GIS data: Critical facilities	NO	Under the Purview of El Paso County GIS Services
GIS data: Building footprints	NO	Under the Purview of El Paso County GIS Services
GIS data: Land use	NO	Under the Purview of El Paso County GIS Services
GIS data: Links to Assessor's data	NO	Under the Purview of El Paso County GIS Services
Warning systems/services (Reverse callback, cable override, outdoor warning signals)	YES	El Paso/Teller County 911 Everbridge EAS
Other	NO	

**TABLE 7-6.
CALHAN FINANCIAL MITIGATION CAPABILITIES MATRIX**

Financial Resources	Accessible/Eligible to Use (Yes/No)
Community Development Block Grants	YES
Capital improvements project funding	YES
Authority to levy taxes for specific purposes	YES
Fees for water, sewer, gas, or electric services	YES
Impact fees for new development	NO
Incur debt through general obligation bonds	YES, If Voter Approved
Incur debt through special tax bonds	NO
Incur debt through private activities	NO
Withhold spending in hazard prone areas	NO
Other	NO

7.3 CITY OF FOUNTAIN

7.3.1 Legal and Regulatory Capabilities

Table 7-7 lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the City of Fountain.

7.3.2 Administrative and Technical Capabilities

Table 7-8 identifies the City personnel responsible for activities related to mitigation and loss prevention in Fountain.

7.3.3 Financial Capabilities

Table 7-9 identifies financial tools or resources that Fountain could use to help fund mitigation activities.

**TABLE 7-7.
FOUNTAIN REGULATORY MITIGATION CAPABILITIES MATRIX**

Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
General plan	YES	The City adopted a major update to its Comprehensive Development Plan in 2005. The Plan is an advisory guide to land use decisions in the community. In 2009, the City adopted a Strategic Plan, which provides a framework for rational decision making.
Zoning ordinance	YES	Last major update to the Zoning Ordinance was approved by the City in 2003. Several minor amendments have occurred since then.
Subdivision ordinance	YES	A major update to the Subdivision Regulations was approved by the City in 2008 with a few minor updates since then.
Growth management	YES	Growth management strategies and policies are incorporated in the Comprehensive Development Plan.
Floodplain ordinance	YES	
Other special purpose ordinance (stormwater, steep slope, wildfire)	NO	
Building code	YES	2011 Edition of the Pikes Peak Regional Building Code As Amended and all code referred to within. 2012 Edition of the International Fire Code with appendices and amendments.
Fire department ISO rating	YES	
Erosion or sediment control program	YES	Public Works Director/City Engineer
Stormwater management	YES	Public Works Director/City Engineer
Site plan review requirements	YES	2003 Zoning Ordinance, as amended.
Capital improvements plan	YES	Public Works Director/City Engineer
Economic development plan	YES	Adopted by City in 2009
Local emergency operations plan	YES	
Other special plans	NO	
Flood insurance study or other engineering study for streams	YES	City is enrolled in the National Flood Insurance Program. A Flood Insurance Study was conducted by FEMA and Flood Insurance Rate Maps (FIRM) were prepared. A Master Development Drainage Plan for the Jimmy Camp Creek Drainage Basin has been developed and adopted by the City.
Elevation certificates	YES	Public Works Director/City Engineer

TABLE 7-8. FOUNTAIN ADMINISTRATIVE/TECHNICAL MITIGATION CAPABILITIES MATRIX		
Personnel Resources	Yes/No	Department/Position
Planner/engineer with knowledge of land development/land management practices	YES	Planning Division of the Community Services Department and Engineering Division of the Public Works Department
Engineer/professional trained in construction practices related to buildings and/or infrastructure	YES	Public Works Director/City Engineer
Planner/engineer/scientist with an understanding of natural hazards	YES	Planning Division of the Community Services Department and Engineering Division of the Public Works Department
Personnel skilled in GIS	YES	
Full-time building official	NO	Under the purview of PPRBD
Floodplain manager	NO	Under the purview of PPRBD
Emergency manager	YES	
Grant writer	YES	
Other personnel	NO	
GIS data: Hazard areas	NO	
GIS data: Critical facilities	YES	Limited
GIS data: Building footprints	YES	
GIS data: Land use	YES	
GIS data: Links to Assessor's data	NO	
Warning systems/services (Reverse callback, cable override, outdoor warning signals)	YES	El Paso/Teller County 911 Everbridge EAS
Other	NO	

TABLE 7-9. FOUNTAIN FINANCIAL MITIGATION CAPABILITIES MATRIX	
Financial Resources	Accessible/Eligible to Use (Yes/No)
Community Development Block Grants	YES
Capital improvements project funding	YES
Authority to levy taxes for specific purposes	YES
Fees for water, sewer, gas, or electric services	YES
Impact fees for new development	YES
Incur debt through general obligation bonds	YES
Incur debt through special tax bonds	YES
Incur debt through private activities	NO
Withhold spending in hazard prone areas	NO

TABLE 7-9. FOUNTAIN FINANCIAL MITIGATION CAPABILITIES MATRIX	
Financial Resources	Accessible/Eligible to Use (Yes/No)
Other	NO

7.4 TOWN OF GREEN MOUNTAIN FALLS

7.4.1 Legal and Regulatory Capabilities

Table 7-10 lists regulatory and planning tools typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Town of Green Mountain Falls.

7.4.2 Administrative and Technical Capabilities

Table 7-11 identifies the Town personnel responsible for activities related to mitigation and loss prevention in Green Mountain Falls.

7.4.3 Financial Capabilities

Table 7-12 identifies financial tools or resources that Green Mountain Falls could use to help fund mitigation activities.

TABLE 7-10. GREEN MOUNTAIN FALLS REGULATORY MITIGATION CAPABILITIES MATRIX		
Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
General plan	YES	Town has a Comprehensive Plan Developed in 2008
Zoning ordinance	YES	
Subdivision ordinance	NO	
Growth management	YES	Limited by terrain
Floodplain ordinance	YES	Through Regional Building El Paso County
Other special purpose ordinance (stormwater, steep slope, wildfire)	YES	Wildfire Ordinance
Building code	YES	Through Regional Building
Fire department ISO rating	N/A	Fire Protection District services our town
Erosion or sediment control program	NO	
Stormwater management	NO	
Site plan review requirements	NO	
Capital improvements plan	NO	

TABLE 7-10. GREEN MOUNTAIN FALLS REGULATORY MITIGATION CAPABILITIES MATRIX		
Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
Economic development plan	NO	
Local emergency operations plan	YES	
Other special plans		
Flood insurance study or other engineering study for streams	NO	
Elevation certificates	NO	

TABLE 7-11. GREEN MOUNTAIN FALLS ADMINISTRATIVE/TECHNICAL MITIGATION CAPABILITIES MATRIX		
Personnel Resources	Yes/No	Department/Position
Planner/engineer with knowledge of land development/land management practices	NO	
Engineer/professional trained in construction practices related to buildings and/or infrastructure	NO	
Planner/engineer/scientist with an understanding of natural hazards	NO	
Personnel skilled in GIS	NO	Under the Purview of El Paso County GIS Services
Full-time building official	NO	Under the purview of PPRBD
Floodplain manager	NO	Under the purview of PPRBD
Emergency manager	YES	Police Chief
Grant writer	NO	
Other personnel	NO	
GIS data: Hazard areas	NO	Under the Purview of El Paso County GIS Services
GIS data: Critical facilities	NO	Under the Purview of El Paso County GIS Services
GIS data: Building footprints	NO	Under the Purview of El Paso County GIS Services
GIS data: Land use	NO	Under the Purview of El Paso County GIS Services
GIS data: Links to Assessor's data	NO	Under the Purview of El Paso County GIS Services
Warning systems/services (Reverse callback, cable override, outdoor warning signals)	YES	El Paso/Teller County 911 Everbridge EAS

TABLE 7-11. GREEN MOUNTAIN FALLS ADMINISTRATIVE/TECHNICAL MITIGATION CAPABILITIES MATRIX		
Personnel Resources	Yes/No	Department/Position
Other	NO	We are a very small municipality with limited resources including personnel to administer these services.

TABLE 7-12. GREEN MOUNTAIN FALLS FINANCIAL MITIGATION CAPABILITIES MATRIX	
Financial Resources	Accessible/Eligible to Use (Yes/No)
Community Development Block Grants	YES
Capital improvements project funding	YES
Authority to levy taxes for specific purposes	YES
Fees for water, sewer, gas, or electric services	NO – all through Colorado Springs Utilities/ Gas company
Impact fees for new development	NO
Incur debt through general obligation bonds	NO
Incur debt through special tax bonds	NO
Incur debt through private activities	NO
Withhold spending in hazard prone areas	NO
Other	NO

7.5 CITY OF MANITOU SPRINGS

7.5.1 Legal and Regulatory Capabilities

Table 7-13 lists regulatory and planning tools typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the City of Manitou Springs.

7.5.2 Administrative and Technical Capabilities

Table 7-14 identifies the City personnel responsible for activities related to mitigation and loss prevention in Manitou Springs.

7.5.3 Financial Capabilities

Table 7-15 identifies financial tools or resources that Manitou Springs could use to help fund mitigation activities.

TABLE 7-13. MANITOU SPRINGS REGULATORY MITIGATION CAPABILITIES MATRIX		
Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
General plan	YES	Emergency Operation Plan, Historic Bridges and Walls Assessment report, Historic District Design Guidelines
Zoning ordinance	YES	
Subdivision ordinance	YES	
Growth management	NO	
Floodplain ordinance	YES	County Flood Plain Management
Other special purpose ordinance (stormwater, steep slope, wildfire)	YES	Stormwater, Drinking water.
Building code	YES	PPRBD
Fire department ISO rating	YES	5
Erosion or sediment control program	YES	Ongoing mitigation work Williams Canyon and Fountain Creek
Stormwater management	YES	
Site plan review requirements	YES	
Capital improvements plan	NO	
Economic development plan	YES	Economic Consolidation Project 2010, Urban renewal Plan
Local emergency operations plan	YES	Updated 2014
Other special plans	YES	Open Space Plan, Rainbow Vision Plan
Flood insurance study or other engineering study for streams	YES	2014
Elevation certificates	YES	

TABLE 7-14. MANITOU SPRINGS ADMINISTRATIVE/TECHNICAL MITIGATION CAPABILITIES MATRIX		
Personnel Resources	Yes/No	Department/Position
Planner/engineer with knowledge of land development/land management practices	YES	Planning Department
Engineer/professional trained in construction practices related to buildings and/or infrastructure	YES	PPRBD

TABLE 7-14. MANITOU SPRINGS ADMINISTRATIVE/TECHNICAL MITIGATION CAPABILITIES MATRIX		
Personnel Resources	Yes/No	Department/Position
Planner/engineer/scientist with an understanding of natural hazards	YES	Public Works
Personnel skilled in GIS	YES	Contractor
Full-time building official	YES	Under the purview of PPRBD
Floodplain manager	YES	Under the purview of PPRBD
Emergency manager	YES	Police Chief liaisons with EPSO OEM
Grant writer	NO	
Other personnel	NO	
GIS data: Hazard areas	NO	
GIS data: Critical facilities	YES	
GIS data: Building footprints	YES	
GIS data: Land use	YES	
GIS data: Links to Assessor's data	YES	
Warning systems/services (Reverse callback, cable override, outdoor warning signals)	YES	El Paso/Teller County 911 Everbridge EAS, Warning Sirens (3)
Other	NO	

TABLE 7-15. MANITOU SPRINGS FINANCIAL MITIGATION CAPABILITIES MATRIX	
Financial Resources	Accessible/Eligible to Use (Yes/No)
Community Development Block Grants	YES
Capital improvements project funding	YES
Authority to levy taxes for specific purposes	YES
Fees for water, sewer, gas, or electric services	YES
Impact fees for new development	YES
Incur debt through general obligation bonds	YES
Incur debt through special tax bonds	YES
Incur debt through private activities	NO
Withhold spending in hazard prone areas	NO
Other	NO

7.6 TOWN OF MONUMENT

7.6.1 Legal and Regulatory Capabilities

Table 7-16 lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Town of Monument.

7.6.2 Administrative and Technical Capabilities

Table 7-17 identifies the Town personnel responsible for activities related to mitigation and loss prevention in Monument.

7.6.3 Financial Capabilities

Table 7-18 identifies financial tools or resources that Monument could use to help fund mitigation activities.

TABLE 7-16. MONUMENT REGULATORY MITIGATION CAPABILITIES MATRIX		
Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
General plan	YES	The Town of Monument Comprehensive Plan and Parks, Trails, and Open Space Plan contain recommendations for future growth and the development of recreational amenities for the citizens of Monument. The Comprehensive Plan also contains several sub-area plans, such as the Downtown Area and the I-25 Corridor, that provide specific guidelines for growth and development in these areas. The Town of Monument Zoning and Subdivision Codes contain specific regulations to assist the Development Services Department in evaluating and reviewing new development plans. These Code sections also include hazard mitigation language to guide the Town Staff and elected officials in assuring that new development meets the requirements for the safety of existing and future residents and businesses. Chapter 8 of the Monument Municipal Code also contains information regarding the management of storm water.
Zoning ordinance	YES	See above
Subdivision ordinance	YES	See above.
Growth management	YES	The Town’s Comprehensive Plan, which is recommendatory, and Zoning and Subdivision Codes provide guidance on growth management.
Floodplain ordinance	YES	The Town Code refers to floodplain management, and the Development Services Department coordinates with the Pikes Peak Regional Building Department on an as-needed basis regarding floodplain management.

**TABLE 7-16.
MONUMENT REGULATORY MITIGATION CAPABILITIES MATRIX**

Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
Other special purpose ordinance (stormwater, steep slope, wildfire)	YES	Chapter 8 of the Municipal Code contains stringent guidelines for construction and post-construction storm water management and erosion control. Steep slopes created by development are required to provide erosion control measures to prevent sedimentation and slope failure. Where applicable, particularly in wildland/urban interface areas, the Development Services Department coordinates with the Tri-Lakes/Monument Fire Protection District to assure that newly developing areas adhere to FireWise standards and other regulatory requirements administered by the Fire District. The Town of Monument has one employee whose pay is based partially on the stormwater funding/compliance.
Building code	YES	The Pikes Peak Regional Building Department (PPRBD) administers the International Building Code (IBC), as applicable, on behalf of the Town of Monument through an intergovernmental agreement, and by reference in the Monument Municipal Code. The Town coordinates with PPRBD on the issuance of building permits and certificates of occupancy.
Fire department ISO rating	NO	This is within the purview of the Tri-Lakes/Monument Fire Protection District.
Erosion or sediment control program	YES	The Town monitors all new construction for proper erosion and sedimentation control, and through a program outlined in Chapter 8, follows up with private property owners on post-construction maintenance of storm water facilities. The Town's Public Works Department also maintains several regional detention ponds and assures that they meet all the requirements of the NPDES program.
Stormwater management	YES	The Town's Development Services Department reviews all new storm water facilities proposed for new development for compliance with Town standards, and, by reference, the City of Colorado Springs/El Paso County Drainage Criteria Manual. All developed storm water flows must be equal to or less than historic flows, and water quality capture volumes must meet established criteria before a new development can be constructed. As stated above, the Town then monitors all storm water detention facilities for compliance with Town and regional regulations.
Site plan review requirements	YES	All site plan review requirements are outlined in Chapters 16 and 17 (Subdivision and Zoning) of the Monument Municipal Code. The Development Services Department also provides developers with checklists that must be complied with in order for a project to meet the Code's Review and Approval Criteria.
Capital improvements plan	YES	The Town regularly updates its Capital Improvements Plan (CIP) in conjunction with its annual budget. Town Staff presents the CIP to the Board of Trustees for approval during the annual budget hearings.
Economic development plan	NO	

**TABLE 7-16.
MONUMENT REGULATORY MITIGATION CAPABILITIES MATRIX**

Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
Local emergency operations plan	YES	This plan is managed by the Police Department and Town Clerk. The Town Clerk has met with El Paso County Sheriff's Office Emergency Manager in regards to their base plan and is currently working on a final draft of the EOP.
Other special plans	YES	The Town of Monument is working with the PDMP Committee in obtaining an updated version of the Pre-Disaster Mitigation Plan which will be adopted by the Town Board when finalized.
Flood insurance study or other engineering study for streams	NO	
Elevation certificates	NO	These are within the purview of the Pikes Peak Regional Building Department.

**TABLE 7-17.
MONUMENT ADMINISTRATIVE/TECHNICAL MITIGATION CAPABILITIES MATRIX**

Personnel Resources	Yes/No	Department/Position
Planner/engineer with knowledge of land development/land management practices	YES	Development Services Director (P.E.); Principal Planner; Engineering Assistant.
Engineer/professional trained in construction practices related to buildings and/or infrastructure	YES	Engineering Assistant
Planner/engineer/scientist with an understanding of natural hazards	YES	Development Services Director (P.E.); Principal Planner; Engineering Assistant.
Personnel skilled in GIS	YES	Planning Technician
Full-time building official	NO	Under the purview of PPRBD
Floodplain manager	NO	Under the purview of PPRBD
Emergency manager	YES	Police Chief; Town Clerk
Grant writer	YES	Community Relations Specialist
Other personnel	YES	Other NIMS trained personnel
GIS data: Hazard areas	NO/YES	Newly hired Planning Technician who will concentrate on GIS data/layers; Other areas identified by El Paso County
GIS data: Critical facilities	NO/YES	See Above
GIS data: Building footprints	NO/YES	See Above
GIS data: Land use	NO/YES	See Above
GIS data: Links to Assessor's data	NO/YES	See Above
Warning systems/services (Reverse callback, cable override, outdoor warning signals)	YES	El Paso/Teller County 911 Everbridge EAS PDMP long term plan for ENS within the Town of Monument

TABLE 7-17. MONUMENT ADMINISTRATIVE/TECHNICAL MITIGATION CAPABILITIES MATRIX		
Personnel Resources	Yes/No	Department/Position
Other	NO	

TABLE 7-18. MONUMENT FINANCIAL MITIGATION CAPABILITIES MATRIX	
Financial Resources	Accessible/Eligible to Use (Yes/No)
Community Development Block Grants	YES
Capital improvements project funding	YES
Authority to levy taxes for specific purposes	YES
Fees for water, sewer, gas, or electric services	YES
Impact fees for new development	YES
Incur debt through general obligation bonds	NO
Incur debt through special tax bonds	YES
Incur debt through private activities	NO
Withhold spending in hazard prone areas	NO
Other	NO

7.7 TOWN OF PALMER LAKE

7.7.1 Legal and Regulatory Capabilities

Table 7-19 lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Town of Palmer Lake.

7.7.2 Administrative and Technical Capabilities

Table 7-20 identifies the Town personnel responsible for activities related to mitigation and loss prevention in Palmer Lake.

7.7.3 Financial Capabilities

Table 7-21 identifies financial tools or resources that Palmer Lake could use to help fund mitigation activities.

**TABLE 7-19.
PALMER LAKE REGULATORY MITIGATION CAPABILITIES MATRIX**

Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
General plan	YES	The Town of Palmer Lake has a Comprehensive Plan that includes a Parks, Trails, and Open Space Plan contains recommendations for future growth and the development of recreational amenities for the citizens of Palmer Lake. The Comprehensive Plan also contains several sub-area plans, such as the Downtown Area that provide specific guidelines for growth and development in these areas. The Town of Palmer Lake Zoning and Subdivision Codes contain specific regulations to assist in evaluating and reviewing new development plans. These Code sections also include hazard mitigation language to guide the Town Staff and elected officials in assuring that new development meets the requirements for the safety of existing and future residents and businesses. Chapters 14, 16, and 17 of the Palmer Lake Municipal Code also contains information regarding the management of storm water.
Zoning ordinance	YES	See above
Subdivision ordinance	YES	See above
Growth management	YES	The Town's Comprehensive Plan, which is recommendatory, and zoning and subdivisions codes provide guidance on growth management.
Floodplain ordinance	YES	The Town code refers to floodplain management which coordinates with Pikes Peak Regional Building Department on an as-needed basis.
Other special purpose ordinance (stormwater, steep slope, wildfire)	YES	Chapter 16 of the Municipal Code contains stringent guidelines for construction and post-construction storm water management and erosion control. Steep slopes created by development are required to provide erosion control measures to prevent sedimentation and slope failure. The Town of Palmer Lake is in the process of working on a wildfire program. Currently we work closely with the Palmer Lake Volunteer Fire Department to address any new building.
Building code	YES	The Pikes Peak Regional Building Department (PPRBD) administers the International Building Code (IBC), as applicable, on behalf of the Town of Palmer Lake through an intergovernmental agreement, and by reference in the Palmer Lake Municipal Code. The Town coordinates with PPRBD on the issuance of building permits and certificates of occupancy.
Fire department ISO rating	YES	The Palmer Lake Volunteer Fire Department has an ISO rating of 5 anywhere with a fire hydrant and a 9 without a hydrant.
Erosion or sediment control program	YES	The Town will monitor erosion or sediment control pre-constructions as outlined in Chapter 16 of our Town Code.
Stormwater management	NO	Working on a plan, but for now we use an engineering firm for large projects.
Site plan review requirements	YES	All plan reviews are done by town staff under the guidelines set in Chapters 14, 16, and 17 of our Municipal Code.
Capital improvements plan	YES	The Town staff presents any proposed capital improvement plans at budget time.

**TABLE 7-19.
PALMER LAKE REGULATORY MITIGATION CAPABILITIES MATRIX**

Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
Economic development plan	NO	Currently we have no Economic Development, but have just formed a committee.
Local emergency operations plan	YES	This plan is maintained by the Town Clerk with the help and input from Police and Fire. Would like to in the future meet with El Paso County Sheriff's Office Emergency Manager to go over our plan.
Other special plans	NO	
Flood insurance study or other engineering study for streams	NO	
Elevation certificates	NO	These are within the purview of the Pikes Peak Regional Building Department.

**TABLE 7-20.
PALMER LAKE ADMINISTRATIVE/TECHNICAL MITIGATION CAPABILITIES MATRIX**

Personnel Resources	Yes/No	Department/Position
Planner/engineer with knowledge of land development/land management practices	YES	Out sourced, if cannot be handled by staff
Engineer/professional trained in construction practices related to buildings and/or infrastructure	NO	
Planner/engineer/scientist with an understanding of natural hazards	NO	
Personnel skilled in GIS	NO	Under the Purview of El Paso County GIS Services
Full-time building official	NO	Under the purview of PPRD
Floodplain manager	NO	Under the purview of PPRD
Emergency manager	YES	Town Clerk
Grant writer	NO	Sometimes volunteers
Other personnel	NO	
GIS data: Hazard areas	NO	Under the Purview of El Paso County GIS Services
GIS data: Critical facilities	NO	Under the Purview of El Paso County GIS Services
GIS data: Building footprints	NO	Under the Purview of El Paso County GIS Services
GIS data: Land use	NO	Under the Purview of El Paso County GIS Services
GIS data: Links to Assessor's data	NO	Under the Purview of El Paso County GIS Services
Warning systems/services (Reverse callback, cable override, outdoor warning signals)	YES	El Paso/Teller County 911 Everbridge EAS warning siren in the middle of town

TABLE 7-20. PALMER LAKE ADMINISTRATIVE/TECHNICAL MITIGATION CAPABILITIES MATRIX		
Personnel Resources	Yes/No	Department/Position
Other	NO	

TABLE 7-21. PALMER LAKE FINANCIAL MITIGATION CAPABILITIES MATRIX	
Financial Resources	Accessible/Eligible to Use (Yes/No)
Community Development Block Grants	YES
Capital improvements project funding	YES
Authority to levy taxes for specific purposes	YES
Fees for water, sewer, gas, or electric services	YES
Impact fees for new development	YES
Incur debt through general obligation bonds	YES
Incur debt through special tax bonds	NO
Incur debt through private activities	NO
Withhold spending in hazard prone areas	NO
Other	NO

7.8 TOWN OF RAMAH

7.8.1 Legal and Regulatory Capabilities

Table 7-22 lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Town of Ramah.

7.8.2 Administrative and Technical Capabilities

Table 7-23 identifies the Town personnel responsible for activities related to mitigation and loss prevention in Ramah.

7.8.3 Financial Capabilities

Table 7-24 identifies financial tools or resources that Ramah could use to help fund mitigation activities.

TABLE 7-22. RAMAH REGULATORY MITIGATION CAPABILITIES MATRIX		
Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
General plan	NO	
Zoning ordinance	NO	No zoning within town limits
Subdivision ordinance	NO	
Growth management	NO	
Floodplain ordinance	YES	
Other special purpose ordinance (stormwater, steep slope, wildfire)	NO	
Building code	YES	IRC 2006 – part-time building inspector
Fire department ISO rating	YES	Rated 7
Erosion or sediment control program	NO	
Stormwater management	NO	
Site plan review requirements	YES	Part of the building permit process
Capital improvements plan	NO	
Economic development plan	NO	
Local emergency operations plan	YES	
Other special plans	NO	
Flood insurance study or other engineering study for streams	NO	
Elevation certificates	NO	

TABLE 7-23. RAMAH ADMINISTRATIVE/TECHNICAL MITIGATION CAPABILITIES MATRIX		
Personnel Resources	Yes/No	Department/Position
Planner/engineer with knowledge of land development/land management practices	NO	
Engineer/professional trained in construction practices related to buildings and/or infrastructure	NO	

TABLE 7-23. RAMAH ADMINISTRATIVE/TECHNICAL MITIGATION CAPABILITIES MATRIX		
Personnel Resources	Yes/No	Department/Position
Planner/engineer/scientist with an understanding of natural hazards	NO	
Personnel skilled in GIS	NO	Under the Purview of El Paso County GIS Services
Full-time building official	NO	Part-time
Floodplain manager	NO	Under the purview of the Town Board
Emergency manager	NO	In process of developing this position
Grant writer	NO	
Other personnel	NO	
GIS data: Hazard areas	NO	Under the Purview of El Paso County GIS Services
GIS data: Critical facilities	NO	Under the Purview of El Paso County GIS Services
GIS data: Building footprints	NO	Under the Purview of El Paso County GIS Services
GIS data: Land use	NO	Under the Purview of El Paso County GIS Services
GIS data: Links to Assessor's data	NO	Under the Purview of El Paso County GIS Services
Warning systems/services (Reverse callback, cable override, outdoor warning signals)	YES	El Paso/Teller County 911 Everbridge EAS
Other	NO	

TABLE 7-24. RAMAH FINANCIAL MITIGATION CAPABILITIES MATRIX	
Financial Resources	Accessible/Eligible to Use (Yes/No)
Community Development Block Grants	YES
Capital improvements project funding	NO
Authority to levy taxes for specific purposes	YES
Fees for water, sewer, gas, or electric services	YES
Impact fees for new development	NO
Incur debt through general obligation bonds	YES, If Voter Approved
Incur debt through special tax bonds	NO
Incur debt through private activities	NO
Withhold spending in hazard prone areas	NO
Other	NO

CHAPTER 8. AVALANCHE

AVALANCHE RANKING						
El Paso County	Calhan/Ramah	Fountain	Green Mountain Falls	Manitou Springs	Monument	Palmer Lake
Low	Low	Low	Low	Low	Low	Low

8.1 GENERAL BACKGROUND

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

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

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

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

DEFINITIONS

Avalanche—Any mass of loosened snow or ice and/or earth that suddenly and rapidly breaks loose from a snowfield and slides down a mountain slope, often growing and accumulating additional material as it descends.

Slab avalanches—The most dangerous type of avalanche, occurring when a layer of coherent snow ruptures over a large area of a mountainside as a single mass. Like other avalanches, slab avalanches can be triggered by the wind, by vibration, or even by a loud noise, and will pull in surrounding rock, debris and even trees.

Climax avalanches—An avalanche involving multiple layers of snow, usually with the ground as a bed surface.

Loose snow avalanches—An avalanche that occurs when loose, dry snow on a slope becomes unstable and slides. Loose snow avalanches start from a point and gather more snow as they descend, fanning out to fill the topography.

Powder snow avalanches—An avalanche that occurs when sliding snow has been pulverized into powder, either by rapid motion of low-density snow or by vigorous movement over rugged terrain.

Surface avalanches—An avalanche that occurs only in the uppermost snow layers.

Wet snow avalanche—An avalanche in wet snow, also referred to as a wet loose avalanche or a wet slab avalanche. Often the basal shear zone is a water-saturated layer that overlies an ice zone.

hastens their melt over the sheltered valleys.

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.

According to the Colorado Avalanche Information Center, 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 (Colorado Avalanche Information Center, no date). Avalanche forecasts were first issued by the Colorado Avalanche Warning Center in 1973. The program was originally part of a federal research program, but has been a part of the Colorado State government since 1983. The Colorado Avalanche Information Center (CAIC) is now a program within the Colorado Department of Natural Resources, Executive Director's Office. The program is a partnership between the Department of Natural Resources (DNR), Department of Transportation (CDOT), and the Friends of the CAIC (FoCAIC) a 501c3 group. The mission of the CAIC is to provide avalanche information and education and to promote research for the protection of life, property, and the enhancement of the state's economy (CAIC, no date).

8.2 HAZARD PROFILE

8.2.1 Past Events

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, 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; therefore, there were no injuries or property damages caused by this avalanche. Other than these incidents, there has been no record of avalanches occurring in El Paso County in the last 10 years.

8.2.2 Location

The greatest impact from an avalanche is to those mountain communities of Green Mountain Falls, Chipita Park, and Cascade as well as Highway 24, but avalanches are also a danger to hikers, mountain bike riders, and others involved in outdoor sports in these areas. The CAIC forecasts backcountry and mountain weather conditions for ten zones. The area surrounding Pikes Peak is part of the Front Range forecast zone. Figure 8-1 shows the CAIC forecast zones.

There is no mapped avalanche risk zone information available forpage El Paso County; however, a slope analysis was performed in order to identify areas that may potentially be at risk for an avalanche event. Figure 8-2 shows slopes in the County that are greater than 25 degrees.

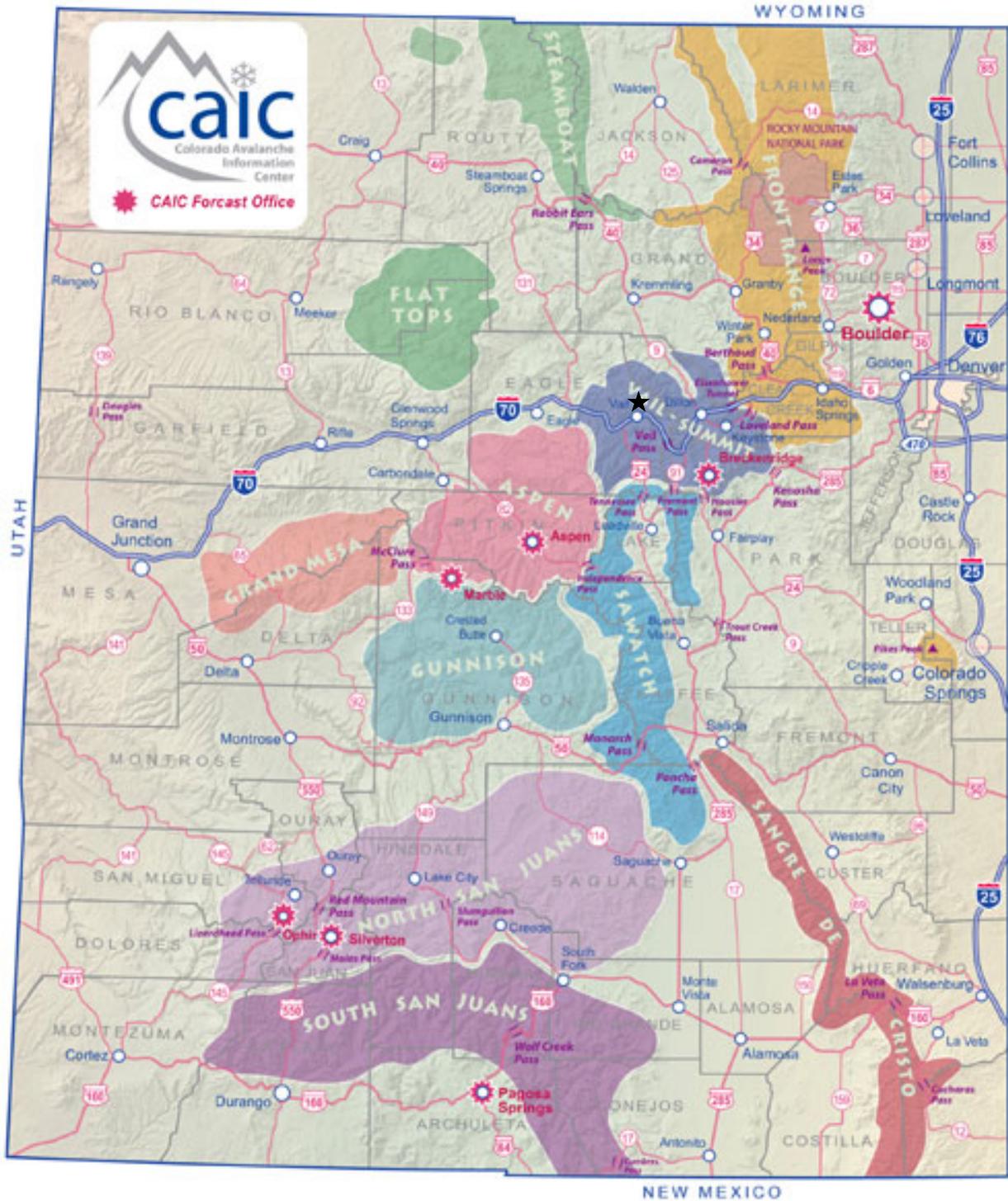


Figure 8-1. Avalanche Forecast Zones in Colorado

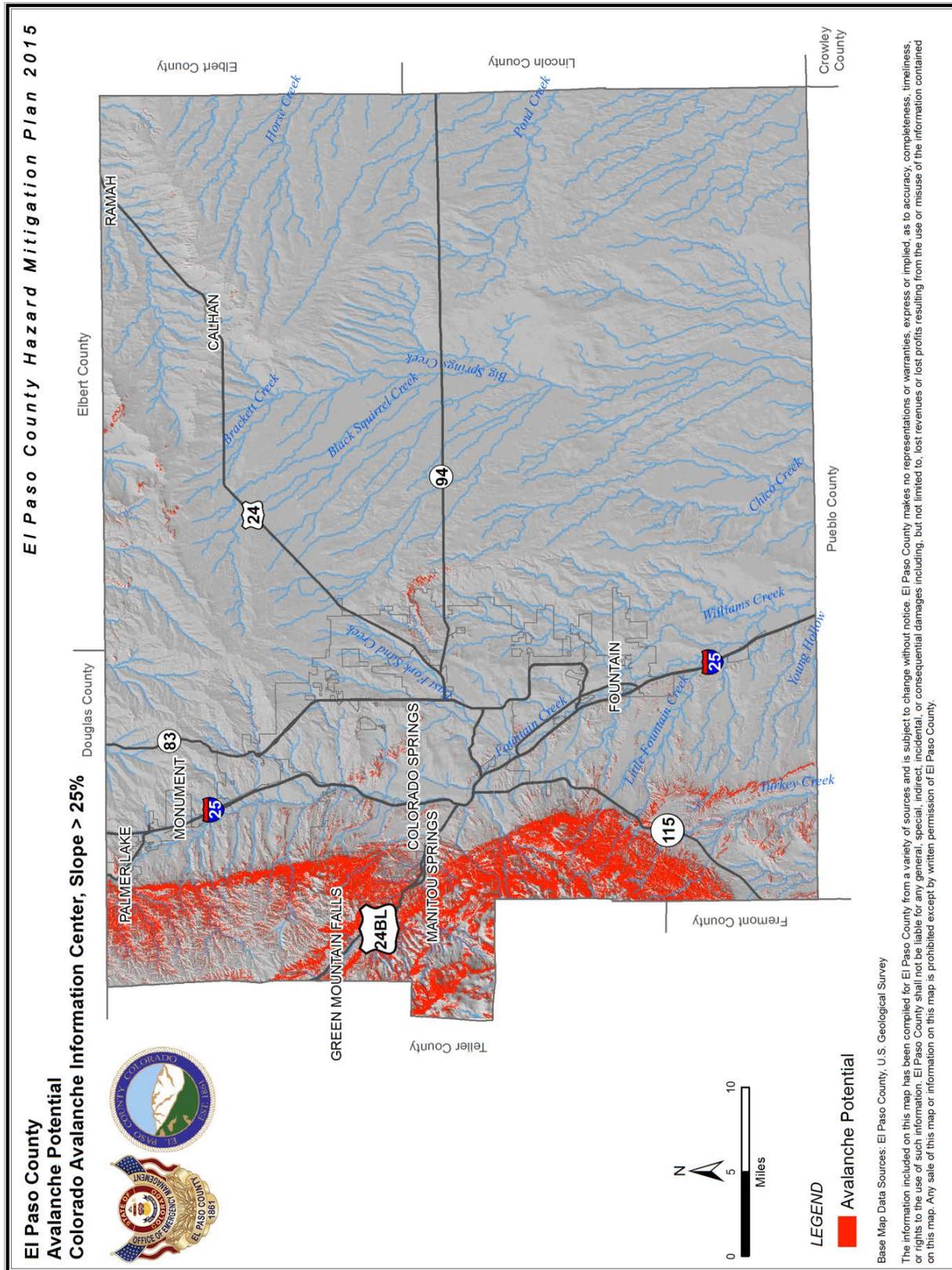


Figure 8-2. Avalanche Potential in El Paso County

8.2.3 Frequency

The probability of an avalanche occurring in the future is low and was considered as such by the planning committee.

8.2.4 Severity

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

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

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

According to the Colorado Avalanche Information Center an average of 28 people have died in avalanches in the United States over the past ten winters. Most fatal incidents are investigated and reported; however, non-fatal incidents are likely to go unreported (CAIC, no date). Colorado has recorded the greatest number of fatalities due to avalanches of all states in the U.S., as shown in Figure 8-3. One of the recorded fatalities occurred in El Paso County (see Figure 8-4).

The severity of the avalanche hazard in the County is considered to be limited with minor injuries and illnesses; minimal property damage that does not threaten structural stability; and or interruption of essential facilities and services for less than 24 hours.

Source: Colorado Avalanche Information Center Website ([http://avalanche.state.co.us/accidents/statistics-and-reporting/.](http://avalanche.state.co.us/accidents/statistics-and-reporting/))

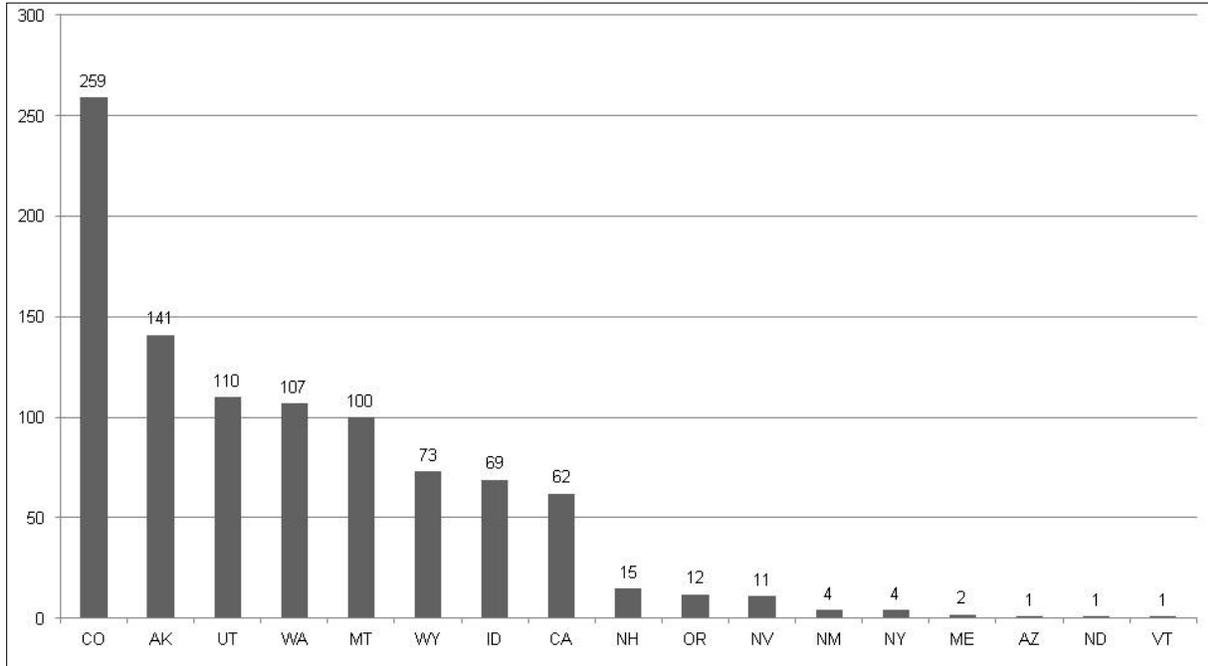


Figure 8-3. Avalanche Fatalities by State, 1950/51 - 2012/13

Source: Colorado Avalanche Information Center Website ([http://avalanche.state.co.us/accidents/statistics-and-reporting/.](http://avalanche.state.co.us/accidents/statistics-and-reporting/))

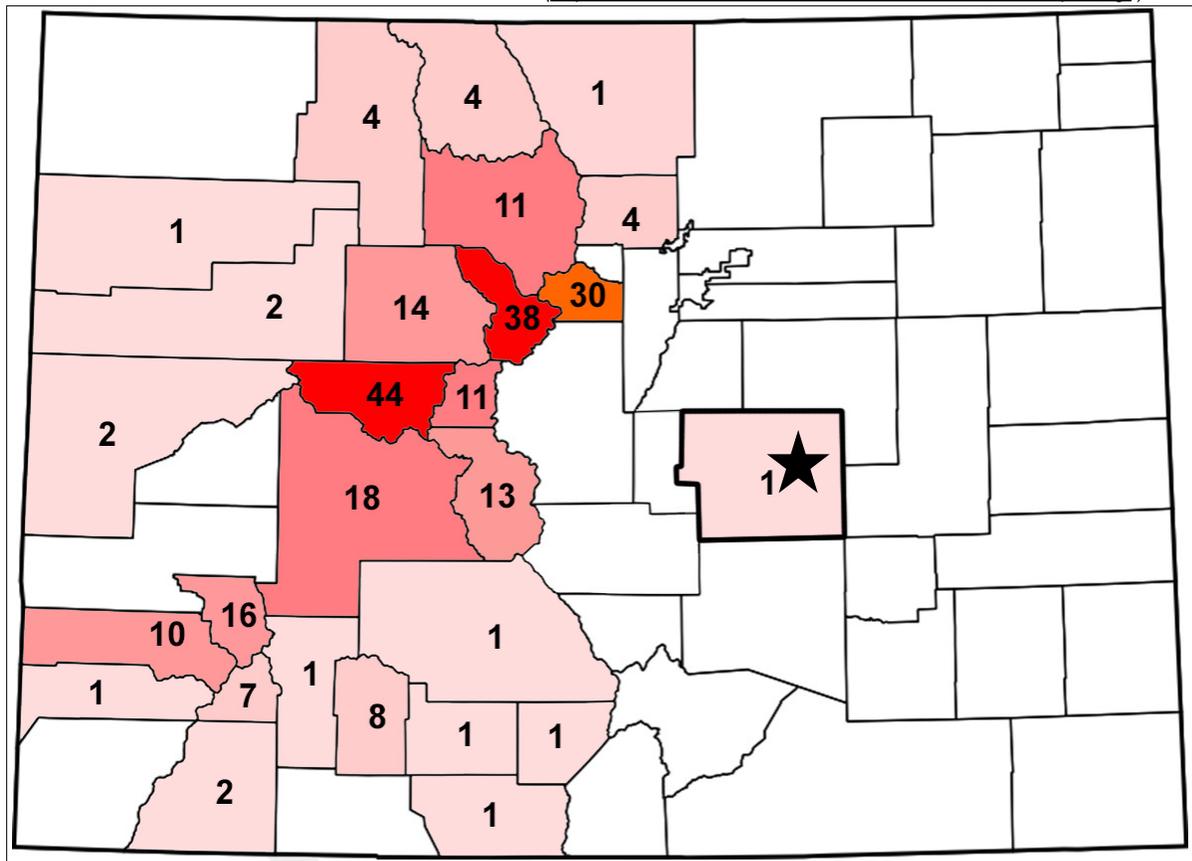


Figure 8-4. Colorado Avalanche Fatalities by County, 1950/51 - 2012/13

8.2.5 Warning Time

The time of an avalanche release depends on the condition of the snow pack; 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.

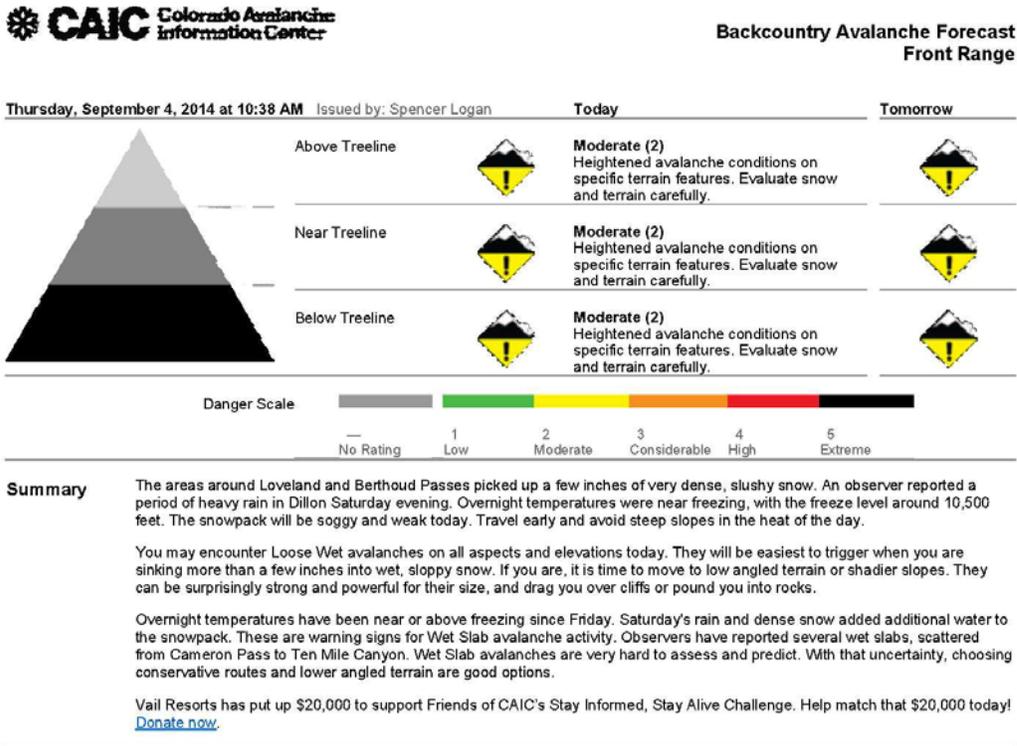
CAIC issues watches and warnings to communicate avalanche danger levels to those recreating in backcountry areas by zone. The North American Danger Scale, which ranges from low to extreme danger is shown in Figure 8-5. An example of this forecast for the Front Range is shown in Figure 8-6.

Source: Colorado Avalanche Information Center Website (<http://avalanche.state.co.us/wp-content/uploads/2013/09/ads.jpg>.)

North American Public Avalanche Danger Scale				
Avalanche danger is determined by the likelihood, size and distribution of avalanches.				
Danger Level		Travel Advice	Likelihood of Avalanches	Avalanche Size and Distribution
5 Extreme		Avoid all avalanche terrain.	Natural and human-triggered avalanches certain.	Large to very large avalanches in many areas.
4 High		Very dangerous avalanche conditions. Travel in avalanche terrain <u>not</u> recommended.	Natural avalanches likely; human-triggered avalanches very likely.	Large avalanches in many areas; or very large avalanches in specific areas.
3 Considerable		Dangerous avalanche conditions. Careful snowpack evaluation, cautious route-finding and conservative decision-making essential.	Natural avalanches possible; human-triggered avalanches likely.	Small avalanches in many areas; or large avalanches in specific areas; or very large avalanches in isolated areas.
2 Moderate		Heightened avalanche conditions on specific terrain features. Evaluate snow and terrain carefully; identify features of concern.	Natural avalanches unlikely; human-triggered avalanches possible.	Small avalanches in specific areas; or large avalanches in isolated areas.
1 Low		Generally safe avalanche conditions. Watch for unstable snow on isolated terrain features.	Natural and human-triggered avalanches unlikely.	Small avalanches in isolated areas or extreme terrain.
Safe backcountry travel requires training and experience. You control your own risk by choosing where, when and how you travel.				
No Rating		Insufficient information to establish avalanche danger rating. Check zone forecast for local information.		

Figure 8-5. Avalanche Danger Scale

Source: Colorado Avalanche Information Center Website (<http://avalanche.state.co.us/forecasts/backcountry-avalanche/front-range/>)



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

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

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

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Figure 8-6. Sample Front Range Avalanche Danger Forecast

8.3 SECONDARY 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.

8.4 CLIMATE CHANGE IMPACTS

Unlike other phenomena such as tropical storms, snow avalanches are rarely used as indicators of climate change. The effects of climate change on avalanche frequency and magnitude are uncertain and will likely be dependent on local climate change impacts, such as changes in snow fall events and temperature series. Some studies have indicated that the types of avalanche events (wet or dry) may shift as a result of changes in snow cover (Martin et al., 2001). Avalanches, however, are not influenced by snow cover

alone, but several interrelated factors including forest structure, surface energy balance, melt water routing, precipitation, air temperature, and wind (Teich et al., 2012, Eckert, 2009 and Lazar and Williams, 2008).

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

8.5 EXPOSURE

Mountain communities are exposed to avalanche risk; however, the greatest exposure to the avalanche hazard is to persons participating in outdoor recreation in backcountry areas. Transportation routes, including Highway 24, are also exposed to avalanches. The Colorado Department of Transportation (CDOT) monitors and controls 278 of 522 known avalanche paths in Colorado. According to their website “When there is a high risk of avalanche danger, CDOT will close highways at the location of the avalanche path in order to conduct avalanche control. Once all the unstable snow has been brought down, CDOT crews have to clear all of the snow and debris from the roadway before reopening the highway to traffic. Since it is impossible to predict how much snow will be brought down during a control mission, CDOT cannot estimate how long a highway closure will be in place. CDOT will open the highway as soon as it is safe for the traveling public” (CDOT, no date).

8.5.1 Population

The greatest impact from an avalanche is to those mountain communities of Green Mountain Falls, Chipita Park, and Cascade as well as Highway 24, but avalanches are also a danger to hikers, mountain bike riders, and others involved in outdoor sports in these areas.

8.5.2 Property

Avalanche exposure in the County is minimal. Property and buildings within runout areas are exposed.

8.5.3 Critical Facilities and Infrastructure

It is unlikely that there are critical facilities exposed to avalanche hazards, although there may be some facilities exposed in mountain communities. There is a small amount of infrastructure that could be blocked by avalanches, such as Highway 24.

8.5.4 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.

8.6 VULNERABILITY

8.6.1 Population

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.

8.7 FUTURE TRENDS IN DEVELOPMENT

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

8.8 SCENARIO

In a worst-case scenario, an avalanche would occur in the Rocky Mountains after a series of storms. 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.

8.9 ISSUES

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

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.

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.

CHAPTER 9. DAM FAILURE

DAM FAILURE RANKING						
El Paso County	Calhan/Ramah	Fountain	Green Mountain Falls	Manitou Springs	Monument	Palmer Lake
Low	Medium	Medium	Medium	High	Low	High

9.1 GENERAL BACKGROUND

9.1.1 Causes of Dam Failure

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

- Overtopping of the primary dam structure, which accounts for 34 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 and valves, typically 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

DEFINITIONS

Dam—A man-made barrier, together with appurtenant structures, constructed above the natural surface of the ground for the purpose of impounding water. Flood control and storm runoff detention dams are included (2-CCR 402-1, Rule 4, Section 4.2.5).

Dam Failure—An uncontrolled release of impounded water due to structural deficiencies in dam.

Emergency Action Plan—A document that identifies potential emergency conditions at a dam and specifies actions to be followed to minimize property damage and loss of life. The plan specifies actions the dam owner should take to alleviate problems at a dam. It contains procedures and information to assist the dam owner in issuing early warning and notification messages to responsible downstream emergency management authorities of the emergency situation. It also contains inundation maps to show emergency management authorities the critical areas for action in case of an emergency. (FEMA 64)

High Hazard Dam—Dams where failure or operational error will probably cause loss of human life. (FEMA 333)

Significant Hazard Dam—Dams where failure or operational error will result in no probable loss of human life but can cause economic loss, environmental damage or disruption of lifeline facilities, or can impact other concerns. Significant hazard dams are often located in rural or agricultural areas but could be located in areas with population and significant infrastructure. (FEMA 333)

continuous review by public safety agencies.

9.1.2 Causes of Levee Failure

The description of levee failures in this section is excerpted from the State of Colorado Flood Mitigation Plan. The U.S. Army Corps of Engineers National Levee Database lists two known levees in El Paso County. It is possible that there are additional levees located within the County that are not listed in this database.

A levee breach occurs when part of a levee gives way, creating an opening through which floodwaters 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. Seismic activity can also cause levees to slide or slump, both of which can lead to failure. Unfortunately, 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. It is also important to remember that no levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure. In some cases, flooding may not be directly attributable to a river, stream, or lake overflowing its banks. Rather, it may simply be the combination of excessive rainfall or snowmelt, saturated ground, and inadequate drainage. With no place to go, the water will find the lowest elevations – areas that are often not in a floodplain. This type of flooding, often referred to as sheet flooding, is becoming increasingly prevalent as development outstrips the ability of the drainage infrastructure to properly carry and disburse the water flow. Flooding also occurs due to combined storm and sanitary sewers that cannot handle the amount of water.

The complicated nature of levee protection was made evident by events such as Hurricane Katrina. Flooding can be exacerbated by levees that are breached or overtopped. As a result, FEMA and the U.S. Army Corps of Engineers are re-evaluating their policies regarding enforcement of levee maintenance and post-flood rebuilding. Both agencies are also conducting stricter inspections to determine how much protection individual levees actually provide. The CWCB is committed to aiding local governments with the increased levels of compliance with federal regulations. CWCB will assist qualifying entities who are in good standing with the NFIP through technical and financial assistance. CWCB assistance may include grant funding, participation in levee inspections, assistance in developing Maintenance Deficiency Correction Plans, site visits, and participation in public hearings. In addition, the CWCB will also discourage the construction of new levees to protect new developments, and instead encourage other types of flood mitigation projects.

9.1.3 Regulatory Oversight

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

Colorado Rules and Regulations for Dam Safety and Dam Construction

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

U.S. Army Corps of Engineers Dam Safety Program

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

Federal Energy Regulatory Commission Dam Safety Program

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

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

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

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

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

9.2 HAZARD PROFILE

9.2.1 Past Events

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

Incidents also included on the WY 11-12 list were associated with the large and damaging wildfires that occurred, particularly the High Park fire and the Waldo Canyon fire. These fires were tracked to ensure no damage would occur on dams within or near the fire areas.

El Paso County had 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.

9.2.2 Location

Levees

There are two known levees in El Paso County, both located in Colorado Springs: Templeton Gap Floodway, North Levee and the Templeton Gap Floodway, South Levee. Both levees were inspected in April of 2011 and found to be minimally acceptable. Figure 9-1 shows the approximate leveed area as shown in the U.S. Army Corps of Engineers National Levee Database. A description of the levee from the U.S. Army Corps of Engineers inspection report follows (U.S. Army Corps of Engineers, 2012a):

The Templeton Gap Floodway is a man-made flood-control channel located north of downtown Colorado Springs, Colorado, and east of Monument Creek and Interstate 25. Templeton Gap is a tributary to Monument Creek. The confluence is located east of Interstate 25. Templeton Gap Floodway was designed and constructed by the U.S. Army Corps of Engineers (USACE), and is operated and maintained by the City of Colorado Springs.

Designed to alleviate heavy flooding in the downtown area of Colorado Springs, the Templeton Gap Floodway intercepts the upstream area of Shooks Run drainage basin, and diverts flows from its natural alignment directly to Monument Creek. The floodway shortens the length of the channel, provides a steeper connection, and moves the flood hazard away from downtown Colorado Springs. The floodway parallels natural contours associated with the north bank, generally matching existing ground and the south bank constructed levee.

Source: U.S. Army Corps of Engineers National Levee Database Interactive Map

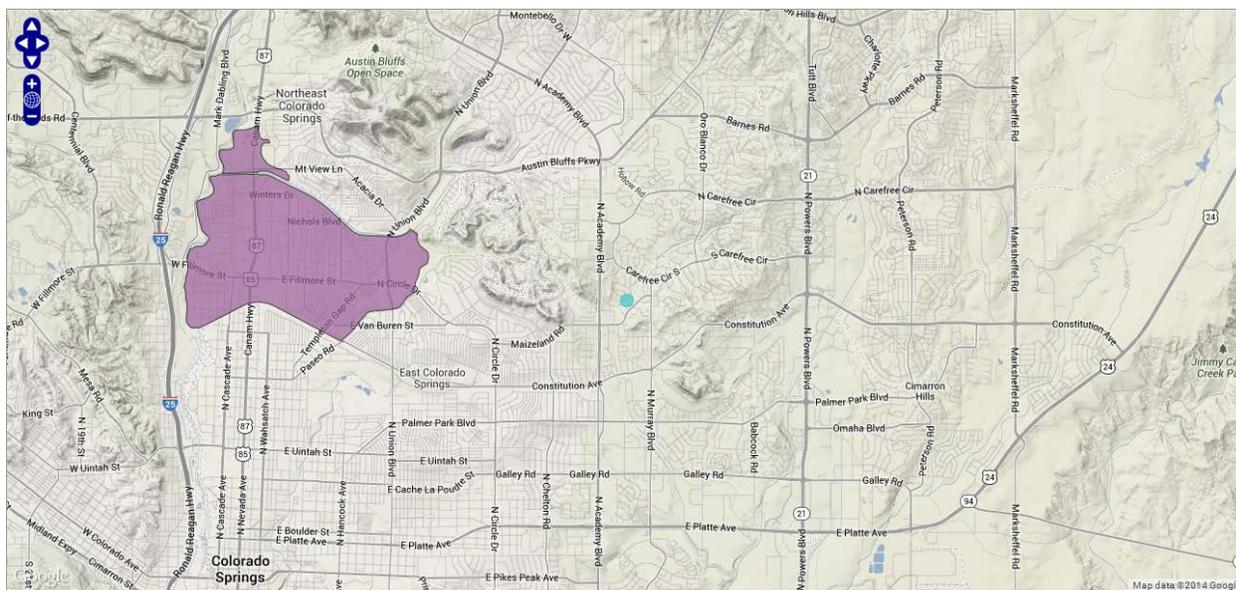


Figure 9-1. Levees in El Paso County

Dams

HAZUS-MH contains a database of dams based on the National Inventory of Dams. This database lists 82 dams in the County and classifies dams based on the potential hazard to the downstream area resulting from failure or mis-operation of the dam or facilities:

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

Based on these classifications, there are 12 high hazard dams and 15 significant hazard dams in El Paso County. These dams are listed in Table 9-1. The locations of dams in the county are shown on Figure 6-7, which shows the critical infrastructure in the county. Most of these dams are owned by Colorado Springs Utilities for local water supply and many are located upstream from residential communities, posing a significant risk.

TABLE 9-1. HIGH AND SIGNIFICANT HAZARD DAMS IN EL PASO COUNTY				
Name	River	Near City	Max Storage (Acre-Feet)	Hazard Class
Big Tooth	Sweet Water Creek	Manitou Springs	791	H
Bristlecone	Beaver Creek	Colorado Springs	2,293	S
Cheyenne Lake	N Cheyenne CR-OS	Colorado Springs	286	S

**TABLE 9-1.
HIGH AND SIGNIFICANT HAZARD DAMS IN EL PASO COUNTY**

Name	River	Near City	Max Storage (Acre-Feet)	Hazard Class
Crystal Creek	Crystal Creek	Green Mountain Falls	6,200	H
Curr	Fountain Creek-TR	Colorado Springs	706	S
Fishers Canyon Debris Basin	Fishers Canyon	Stratmoor Hills	28	H
Fountain Valley No. 2	Fountain Creek-TR	Widefield	4,250	H
Gold Camp	North Cheyenne Creek-OS	Colorado Springs	460	H
Lake Moraine	Ruxton Creek	Manitou Springs	1,280	H
Manitou	North Folk French Creek	Cascade	1,100	H
McCullough	West Monument Creek-OS	Colorado Springs	22	S
Monument Lake	Monument Creek	Monument	1,135	S
Nichols	West Monument Creek	Colorado Springs	707	S
Northfield	West Monument Creek	Colorado Springs	382	S
Palmer Lake No. 2	North Monument Creek	Palmer Lake	200	H
Pinon	Beaver Creek	Colorado Springs	188	S
Prospect Lake	Fountain Creek-OS	Colorado Springs	368	S
R.D. Nixon	Fountain Creek-TR	Pueblo	1,557	S
Ramah Det. and Rec.	Big Sandy Creek	Ramah	7,641	S
Rampart	West Monument Creek	Colorado Springs	41,000	H
Regulating Reservoir	West Monument Creek-TR	Colorado Springs	544	H
South Suburban	North Cheyenne Creek-OS	Colorado Springs	303	H
Spring Run No. 2	Spring Run	Colorado Springs	511	S
Valley No. 2	Camp Creek-TR	Colorado Springs	252	S
Wilson	East Fork West Beaver Creek-TR	Pueblo	909	S
Woodland Park	Loy Gulch	Woodland Park	67	S
Woodmoor Lake	Dirty Woman Creek-TR	Monument	1,350	H

Source: HAZUS-MH 2.1 National Inventory of Dams

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.

9.2.3 Frequency

Based on one occurrence of dam failure in the past 85 years in El Paso County, it is estimated that there is between 1- and 10-percent chance of occurrence in any given year, or a recurrence interval of 11 to 100 years.

9.2.4 Severity

The U.S. Army Corps of Engineers developed the classification system shown in Table 9-2 for the hazard potential of dam failures. The Corps of Engineers hazard rating systems are both based only on the potential consequences of a dam failure; neither system takes into account the probability of such failures.

TABLE 9-2. CORPS OF ENGINEERS HAZARD POTENTIAL CLASSIFICATION				
Hazard Category ^a	Direct Loss of Life ^b	Lifeline Losses ^c	Property Losses ^d	Environmental Losses ^e
Low	None (rural location, no permanent structures for human habitation)	No disruption of services (cosmetic or rapidly repairable damage)	Private agricultural lands, equipment, and isolated buildings	Minimal incremental damage
Significant	Rural location, only transient or day-use facilities	Disruption of essential facilities and access	Major public and private facilities	Major mitigation required
High	Certain (one or more) extensive residential, commercial, or industrial development	Disruption of essential facilities and access	Extensive public and private facilities	Extensive mitigation cost or impossible to mitigate

a. Categories are assigned to overall projects, not individual structures at a project.

b. Loss of life potential based on inundation mapping of area downstream of the project. Analyses of loss of life potential should take into account the population at risk, time of flood wave travel, and warning time.

c. Indirect threats to life caused by the interruption of lifeline services due to project failure or operational disruption; for example, loss of critical medical facilities or access to them.

d. Damage to project facilities and downstream property and indirect impact due to loss of project services, such as impact due to loss of a dam and navigation pool, or impact due to loss of water or power supply.

e. Environmental impact downstream caused by the incremental flood wave produced by the project failure, beyond what would normally be expected for the magnitude flood event under which the failure occurs.

Source: U.S. Army Corps of Engineers, 1995

9.2.5 Warning Time

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 (U.S. Army Corps of Engineers, 1997).

El Paso County and its planning partners 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.

9.3 SECONDARY 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.

9.4 CLIMATE CHANGE IMPACTS

Dams are designed partly based on assumptions about a river's flow behavior, expressed as hydrographs. Changes in weather patterns can have significant effects on the hydrograph used for the design of a dam. If the hydrograph changes, it is conceivable that the dam can lose some or all of its designed margin of safety, also known as freeboard. If freeboard is reduced, dam operators may be forced to release increased volumes earlier in a storm cycle in order to maintain the required margins of safety. Such early releases of increased volumes can increase flood potential downstream. Throughout the west, communities downstream of dams 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.

9.5 EXPOSURE AND VULNERABILITY

No information on dam failure inundation areas was available to use in evaluating exposure for this risk assessment. Overall, dam failure impacts would likely be catastrophic in El Paso County, but the probability of such an event occurring is low. Exposure for both people and property would likely overlap flood inundation areas, but the boundaries of the dam inundation areas would likely be expanded. A dam failure could result in a significant number of fatalities if little to no warning time was available. Roads closed due to dam failure floods could result in serious transportation disruptions. Due to the low probability of dam failures, the overall significance is considered medium, with moderate potential impact. A qualitative assessment of vulnerability is presented in the following sections.

9.5.1 Population

Vulnerable populations are all populations downstream from dam failures that are incapable of escaping the area within the allowable time frame. This population includes the elderly and young who may be unable to get themselves out of the inundation area. The vulnerable population also includes those who would not have adequate warning from a television or radio emergency warning system.

9.5.2 Property

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

9.5.3 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 river beds and banks.

The environment would be vulnerable to a number of 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.

9.6 FUTURE TRENDS IN DEVELOPMENT

The planning partners 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.

9.7 SCENARIO

An earthquake in the region could lead to liquefaction of soils around a dam. This could occur without warning during any time of the day. A human-caused failure such as a terrorist attack also could trigger a catastrophic failure of a dam that impacts the planning area. While the probability of dam failure is very low, the probability of flooding associated with changes to dam operational parameters in response to climate change is higher. Dam designs and operations are developed based on hydrographs with historical record. If these hydrographs experience significant changes over time due to the impacts of climate change, the design and operations may no longer be valid for the changed condition. This could have significant impacts on dams that provide flood control. Specified release rates and impound thresholds may have to be changed. This would result in increased discharges downstream of these facilities, thus increasing the probability and severity of flooding.

9.8 ISSUES

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

CHAPTER 10. DROUGHT AND EXTREME HEAT

DROUGHT AND EXTREME HEAT RANKING						
El Paso County	Calhan/Ramah	Fountain	Green Mountain Falls	Manitou Springs	Monument	Palmer Lake
Medium	Medium	Medium	Low	Medium	Medium	Medium

10.1 GENERAL BACKGROUND

10.1.1 Drought

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

DEFINITIONS

Drought—The cumulative impacts of several dry years on water users. It can include deficiencies in surface and subsurface water supplies and generally impacts health, well-being, and quality of life.

Extreme Heat—Summertime weather that is substantially hotter and/or more humid than average for a location at that time of year.

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

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

10.1.2 Extreme Heat

Note: While Extreme Heat was not included in the hazard ranking process, it does go hand in hand with drought. To that point we have included Excessive heat events are defined by the U.S. EPA as “summertime weather that is substantially hotter and/or more humid than average for a location at that time of year” (EPA, 2006). Criteria that define an excessive heat event may differ among jurisdictions and in the same jurisdiction depending on the time of year. Figure 10-1 developed by the National Resource Defense Council (NRDC) shows the average number of extreme heat days per county from 2000 to 2009. 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 13.8 days per year of extreme heat days than would be expected from the reference period.

Source: NRDC, no date

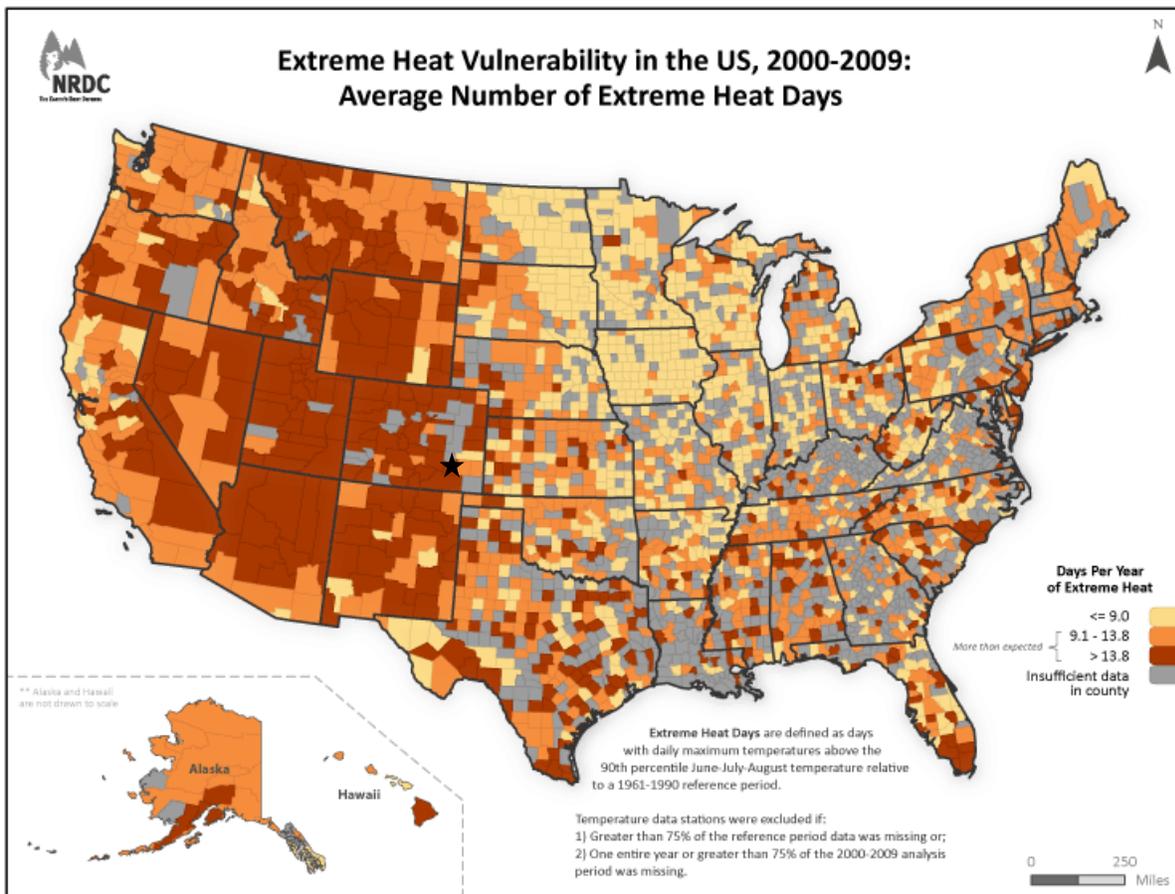


Figure 10-1. Extreme Heat Vulnerability in the U.S., 2000-2009

Excessive heat events are often a result of more than just ambient air temperature. Heat index tables (see Table 10-1) are commonly used to provide information about how hot it feels, which is based on the interactions between several meteorological conditions. Since heat index values were devised for shady,

light wind conditions, exposure to full sunshine can increase heat index values by up to 15°F. Also, strong winds, particularly with very hot, dry air, can be extremely hazardous.

**TABLE 10-1.
HEAT INDEX CHART**

Temperature (°F)																	
		80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
Relative Humidity (%)	40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
	45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
	50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
	55	81	84	86	89	93	97	101	106	112	117	124	130	137			
	60	82	84	88	91	95	100	105	110	116	123	129	137				
	65	82	85	89	93	98	103	108	114	121	128	136					
	70	83	86	90	95	100	105	112	119	126	134						
	75	84	88	92	97	103	109	116	124	132							
	80	84	89	94	100	106	113	121	129								
	85	85	90	96	102	110	117	126	135								
	90	86	91	98	105	113	122	131									
	95	86	93	100	108	117	127										
100	87	95	103	112	121	132											
Category		Heat Index					Health Hazards										
Extreme Danger		130 °F – Higher					Heat Stroke or Sunstroke is likely with continued exposure.										
Danger		105 °F – 129 °F					Sunstroke, muscle cramps, and/or heat exhaustion possible with prolonged exposure and/or physical activity.										
Extreme Caution		90 °F – 105 °F					Sunstroke, muscle cramps, and/or heat exhaustions possible with prolonged exposure and/or physical activity.										
Caution		80 °F – 90 °F					Fatigue possible with prolonged exposure and/or physical activity.										

Source: <http://www.nws.noaa.gov/om/heat/index.shtml#wwa>

10.2 HAZARD PROFILE

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

Extreme heat is usually 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.

10.2.1 Past Events

Drought

According to the 2004 Drought and Water Supply Assessment, Colorado has experienced multiple severe droughts. Colorado has experienced drought in 2012-2013, 2000-2004, 1996, 1994, 1990, 1989, 1979-1975, 1965-1963, 1957-1951, 1941-1931, and 1905-1893. According to the 2010 Colorado Drought

Mitigation and Response Plan, between 2007 and March 2010, there were six drought reported impacts in El Paso County in USDA Secretarial Disaster Declarations: S2188, S2329, S2750, S3113, S3229, and S3548. In order to receive these designations, damages and losses must have resulted in the production loss of at least 30 percent of one crop in the County as the result of a natural disaster (Colorado Water Conservation Board, 2013).

Beginning in 1998, the Colorado Front Range, including El Paso County, experienced below-normal precipitation and unseasonably dry air masses. Drought conditions continued over the next few years and the forests throughout the region became drier with each passing season. Drought conditions worsened in the winter of 2001/2002 and set the stage for the Hayman fire, which is the largest fire in Colorado history to date.

A long term drought, which began to affect Colorado in earnest in May 2002, continued through July 2002. Conditions were described as severe to extreme during May through July. Snow pack had essentially melted by early May. Streams and rivers were flowing at very low levels, if at all. The effect on agricultural interests and recreation (rafting and kayaking) increased into and through July. The threat for major wildfires continued, but windy conditions subsided and some rain fell in July. Water conservation measures were implemented in nearly all communities in the area in June, and continued through July.

The National Drought Mitigation Center developed the Drought Impact Reporter in response to the need for a national drought impact database for the United States. Information comes from a variety of sources: on-line drought-related news stories and scientific publications, members of the public who visit the website and submit a drought-related impact for their region, members of the media, and members of relevant government agencies. The database is being populated beginning with the most recent impacts and working backward in time. The Drought Impact Reporter contains information on 224 impacts from droughts that affected El Paso County between 2004 and August 19, 2014. Most of the impacts, 114, were classified as “agriculture.” Other impacts include “relief, response & restrictions” (60), “society and public health” (40), “water supply and quality” (35), “plants and wildlife” (34), and “fire” (29). These categories are described as follows:

- **Agriculture**—Drought effects associated with agriculture, farming, aquaculture, horticulture, forestry, or ranching. Examples of drought-induced agricultural impacts include damage to crop quality; income loss for farmers due to reduced crop yields; reduced productivity of cropland; insect infestation; plant disease; increased irrigation costs; cost of new or supplemental water resource development (wells, dams, pipelines) for agriculture; reduced productivity of rangeland; forced reduction of foundation stock; closure/limitation of public lands to grazing; high cost or unavailability of water for livestock, Christmas tree farms, forestry, raising domesticated horses, bees, fish, shellfish, or horticulture.
- **Relief, Response and Restrictions**—Drought effects associated with disaster declarations, aid programs, requests for disaster declaration or aid, water restrictions, fire restrictions. Impacts include: Disaster declarations, aid programs, USDA Secretarial disaster declarations, Small Business Association disaster declarations, government relief and response programs, state-level declarations, county-level declarations, a declared "state of emergency," requests for declarations or aid, non-profit organization-based relief, water restrictions, fire restrictions, and declaration of drought watches or warnings.
- **Plants and Wildlife**—Drought effects associated with unmanaged plants and wildlife, fisheries, forests, and other fauna. Examples of drought-induced impacts on plants and wildlife include: loss of biodiversity of plants or wildlife; loss of trees from rural or urban landscapes, shelterbelts, or wooded conservation areas; reduction and degradation of fish and wildlife habitat; lack of feed and drinking water; greater mortality due to increased contact with agricultural producers, as animals seek food from farms and producers are less tolerant

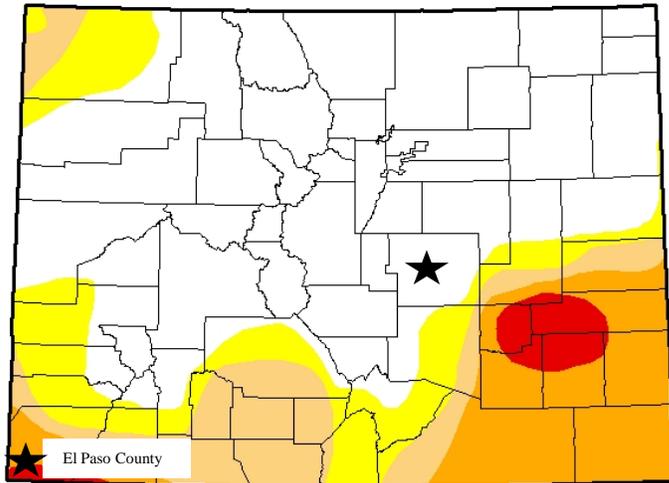
of the intrusion; disease; increased vulnerability to predation (from species concentrated near water); migration and concentration (loss of wildlife in some areas and too many wildlife in other areas); increased stress to endangered species; salinity levels affecting wildlife, wildlife encroaching into urban areas, loss of wetlands.

- **Society and Public Health** - Drought effects associated with human, public, and social health include health-related problems related to reduced water quantity and/or quality, such as increased concentration of contaminants; loss of human life (e.g., from heat stress, suicide); increased respiratory ailments; increased disease caused by wildlife concentrations; increased human disease caused by changes in insect carrier populations; population migration (rural to urban areas, migrants into the United States); loss of aesthetic values; change in daily activities (non-recreational, like putting a bucket in the shower to catch water); elevated stress levels; meetings to discuss drought; communities creating drought plans; lawmakers altering penalties for violation of water restrictions; demand for higher water rates; cultural/historical discoveries from low water levels; cancellation of fundraising events; cancellation/alteration of festivals or holiday traditions; stockpiling water; public service announcements and drought information websites; protests; and conflicts within the community due to competition for water.
- **Fire**—Drought often contributes to forest, range, rural, or urban fires, fire danger, and burning restrictions. Specific impacts include enacting or increasing burning restrictions, fireworks bans, increased fire risk, occurrence of fire (number of acres burned, number of wildfires compared to average, people displaced, etc.), state of emergency during periods of high fire danger, closure of roads or land due to fire occurrence or risk, and expenses to state and county governments of paying firefighters overtime and paying equipment (helicopter) costs.
- **Water Supply and Quality**—Drought effects associated with water supply and water quality include dry wells, voluntary and mandatory water restrictions, changes in water rates, increasing water restrictions, increases in requests for new well permits, changes in water use due to water restrictions, greater water demand, decreases in water allocation or allotments, installation or alteration of water pumps or water intakes, changes to allowable water contaminants, water line damage or repairs due to drought stress, drinking water turbidity, change in water color or odor, declaration of drought watches or warnings, and mitigation activities.

At the time of the writing of this plan (August 2014) El Paso County is currently experiencing abnormally dry conditions in the southeastern portion of the County. As of August 13, 2014, the USDA had declared El Paso as a Designated Drought Disaster County. Current drought conditions in the County range from none to abnormally dry (Figure 10-2).

U.S. Drought Monitor Colorado

August 26, 2014
(Released Thursday, Aug. 28, 2014)
Valid 8 a.m. EDT



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	60.21	39.79	26.31	15.58	2.67	0.00
Last Week <i>8/19/2014</i>	59.90	40.10	26.79	15.58	2.67	0.00
3 Months Ago <i>5/27/2014</i>	44.71	55.29	30.04	18.86	12.49	1.93
Start of Calendar Year <i>1/20/2013</i>	32.04	67.96	22.33	13.56	4.01	1.47
Start of Water Year <i>10/1/2013</i>	24.91	75.09	37.88	12.01	4.01	1.47
One Year Ago <i>8/27/2013</i>	1.91	98.09	93.81	59.65	22.17	2.48

Intensity:

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

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

Author:

David Simeral
Western Regional Climate Center



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

Figure 10-2. U.S. Drought Monitor for Week Ending August 26, 2014

Extreme Heat

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. In June 2012, El Paso County experienced extreme heat: from June 17 to the end of the month there were only two days with a recorded high below 90 degrees in the Colorado Springs area (Steiner, 2013). The average high temperature was 89 degrees, 10 degrees above normal in June 2012.

The Western Regional Climate Center contains records of climate norms for stations across the United States. Table 10-2 contains temperature summaries related to extreme heat for the Colorado Springs Municipal Airport (KCOS) station. Records of local extremes and average number of days above 90 degrees are not available for this station.

**TABLE 10-2.
TEMPERATURE DATA FROM COLORADO SPRINGS MUNICIPAL AIRPORT (1996-2008)**

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Temperature (degrees Fahrenheit)												
Average Maximum Temperature	43.6	45.4	53.1	59.9	70.7	79.4	86.2	81.8	75.0	63.9	52.0	43.6
Average Minimum Temperature	17.8	19.5	25.9	33.0	42.6	51.0	57.8	55.8	47.1	36.1	25.5	17.9
Average Temperature	30.7	32.4	39.5	46.4	56.6	65.2	72.0	68.8	61.1	50.0	38.7	30.8
Extreme Temperatures (degrees Fahrenheit)												
Extreme Maximum Temperature	73	74	76	83	95	95	100	99	91	84	78	71
Average Number of Days												
Maximum temperature above 90	0.0	0.0	0.0	0.0	0.6	4.3	11.0	3.3	0.3	0.0	0.0	0.0
Maximum temperature above 75	0.0	0.0	0.2	3.5	12.8	21.1	29.5	26.2	17.6	6.4	0.6	0.0

10.2.2 Location

Drought

El Paso County is a semi-arid region with annual average precipitation levels of 14.5 inches and an annual average of 35 inches of snow. County residents receive water from two sources: surface water (much of which is brought from outside of the region) and from water districts that draw water from groundwater aquifers.

According to a water supply assessment published by the Colorado Water Conservation Board in 2004 the northern portion of the County is supplied by the Denver Basin aquifers and the southern portion of the County draws from the Pierre Shale and Dakota/Cheyenne aquifers. A description of these aquifers from the 2004 Colorado Drought and Water Supply Assessment follows (Colorado Water Conservation Board, 2004):

- Denver Basin**—The Denver Basin consists of four aquifers that include the Dawson, Denver, Arapahoe, and Laramie-Fox Hill. The four aquifers that make up the Denver Basin are layered one on top of the other. Because of these confining layers and the limited connection between the four aquifers and surface water, the ground water in the aquifers are not considered renewable. The water in these aquifers was deposited thousands of years ago and is considered a finite resource. A US Geological Survey estimates that 467 million acre-feet of water is stored in the Denver Basin aquifers, but only 259 million acre-feet of this water are recoverable. Because the water is not renewable once it is “mined” it is gone forever. With as many as 300,000 to 400,000 people relying on the Denver Basin along the Front Range the water levels are dropping 20-30 feet per year.
- Pierre Shale and Dakota/Cheyenne**—The southern portion of the county utilizes groundwater found in the Pierre Shale and Dakota/Cheyenne aquifers. The aquifers are low yielding but are

renewable. In the western side of the county, the pre-Cambrian granitic rocks is the source for groundwater; it is also low yielding but is recharged on an annual basis. In the eastern part of the county, the Pierre Shale aquifer is the most utilized. There are currently 22,000 wells in the county with 19,000 accessing the Denver Basin and 3,000 accessing the Pierre Shale aquifer. The Pierre Shale aquifer appears to be in a declining state causing ranchers and those living in the east to consider digging deeper wells, developing community wells and trucking water, or developing a distribution system into the area.

These aquifers can be used to draw upon when drought conditions reduce surface water availability for the County. However, it is important to understand that continuously increasing draws on these aquifers is unsustainable.

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

- The **Palmer Crop Moisture Index** measures short-term drought on a weekly scale and is used to quantify drought's impacts on agriculture during the growing season. Figure 10-3 shows this index for the week ending May 3, 2014.
- The **Palmer Z Index** measures short-term drought on a monthly scale. Figure 10-4 shows this index for February 2014.
- The **Palmer Drought Index (PDI)** measures the duration and intensity of long-term drought-inducing circulation patterns. Long-term drought is cumulative, so the intensity of drought during a given month is dependent on the current weather patterns plus the cumulative patterns of previous months. Weather patterns can change quickly from a long-term drought pattern to a long-term wet pattern, and the PDI can respond fairly rapidly. Figure 10-5 shows this index for February 2014.
- The hydrological impacts of drought (e.g., reservoir levels, groundwater levels, etc.) take longer to develop and it takes longer to recover from them. The **Palmer Hydrological Drought Index (PHDI)**, another long-term index, was developed to quantify hydrological effects. The PHDI responds more slowly to changing conditions than the PDI. Figure 10-6 shows this index for February 2014.
- While the Palmer indices consider precipitation, evapotranspiration, and runoff, the **Standardized Precipitation Index (SPI)** considers only precipitation. In the SPI, an index of zero indicates the median precipitation amount; the index is negative for drought and positive for wet conditions. The SPI is computed for time scales ranging from one month to 24 months. Figure 10-7 shows the 24-month SPI map for May 2011 through April 2013.

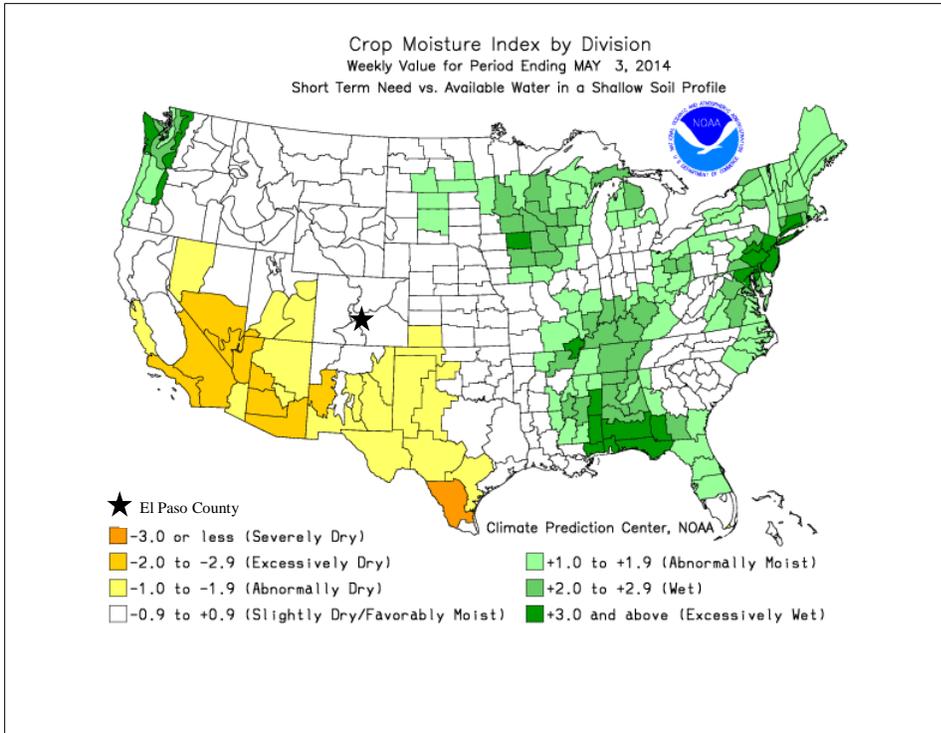


Figure 10-3. Crop Moisture Index for Week Ending May 3, 2014

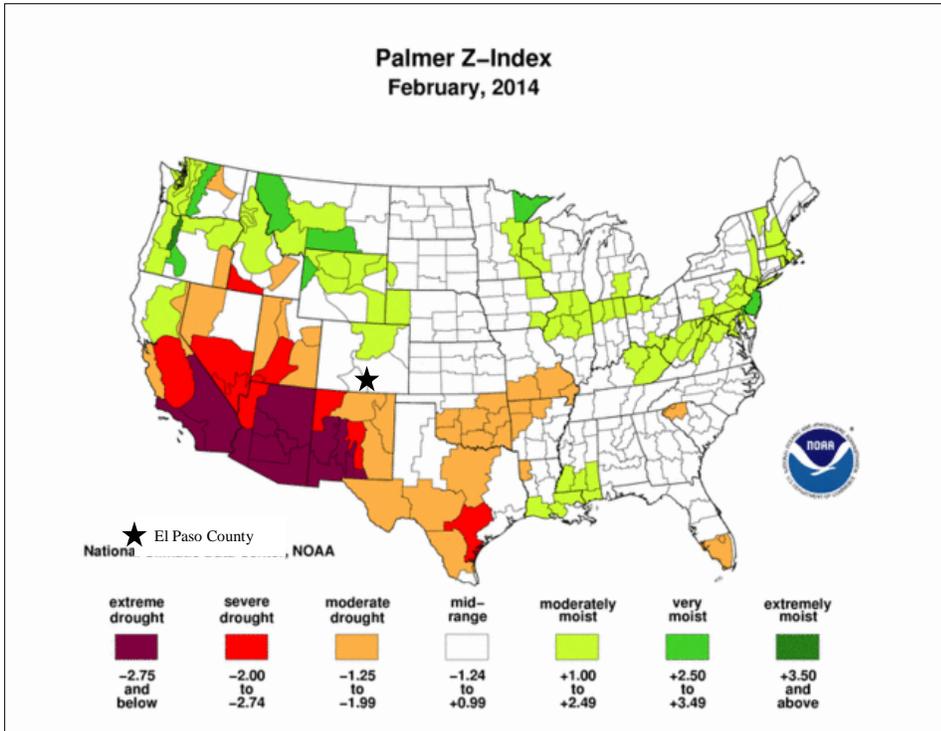


Figure 10-4. Palmer Z Index Short-Term Drought Conditions (February 2014)

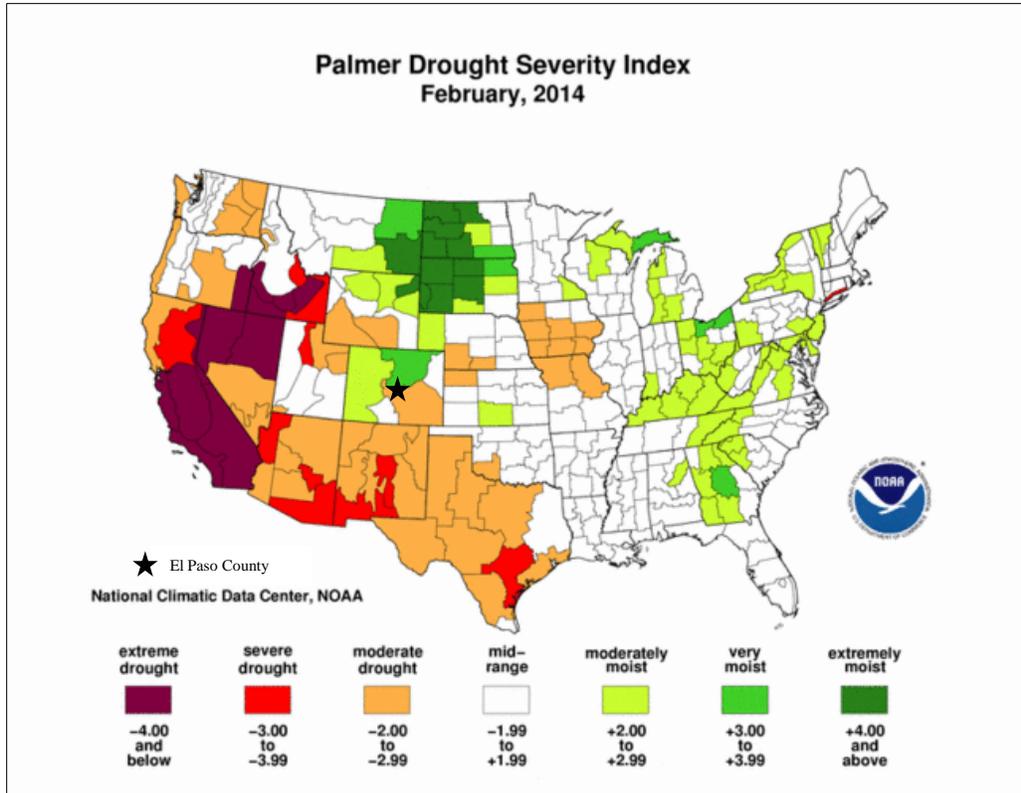


Figure 10-5. Palmer Drought Severity Index (February 2014)

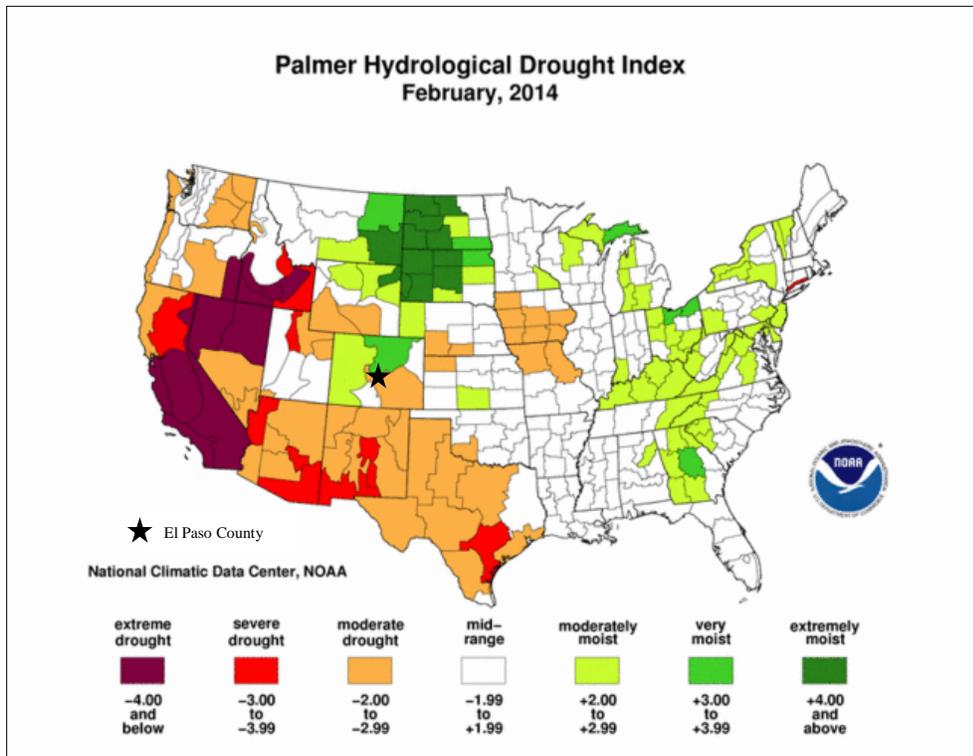


Figure 10-6. Palmer Hydrological Drought Index Long-Term Conditions (February 2014)

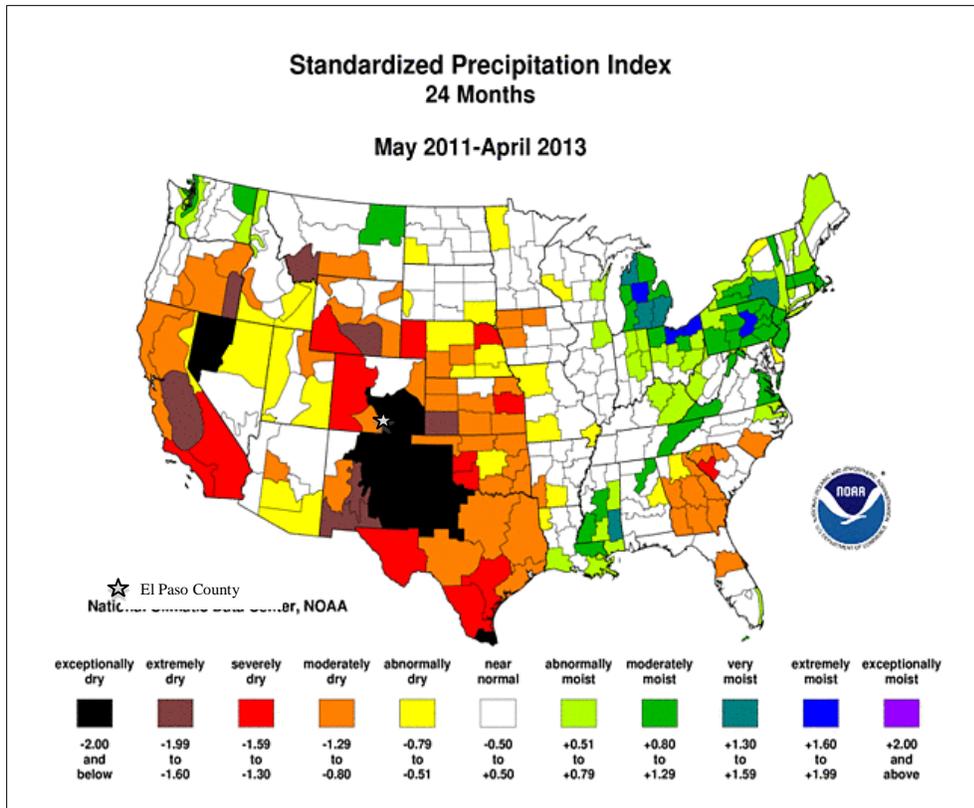


Figure 10-7. 24-Month Standardized Precipitation Index (May 2011 – April 2013)

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

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

Extreme Heat

The entire County is at risk to extreme heat events; however, these events may be exacerbated in urban areas, where reduced air flow, reduced vegetation, 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 urban heat island effect.

10.2.3 Frequency

The probability of a future drought or extreme heat event in El Paso County is likely, with between 10 and 100 percent chance of occurrence in any given year, or a recurrence interval of 10 years or less. According to information from the Colorado Drought Mitigation and Response Plan, Colorado was in drought for 48 of the past 115 years (1893-2007). Thus, there is a 42 percent chance that a drought will happen in Colorado in any given year, and a drought can be expected somewhere in the state every 2.4 years.

10.2.4 Severity

Drought

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

According to the information in this hazard profile, a drought's impact on El Paso County could be considered limited—minor injuries and illnesses; minimal property damage that does not threaten structural stability; and/or interruption of essential facilities and services for less than 24 hours. Due to the high probability of severe drought, the overall significance is considered medium with moderate potential impact.

Drought can have a widespread impact on the environment and the economy, depending upon its severity, although it typically does not result in loss of life or damage to property, as do other natural disasters. The National Drought Mitigation Center uses three categories to describe likely drought impacts:

- Agricultural—Drought threatens crops that rely on natural precipitation.
- Water supply—Drought threatens supplies of water for irrigated crops and for communities.
- Fire hazard—Drought increases the threat of wildfires from dry conditions in forest and rangelands.

On average, the nationwide annual impacts of drought are greater than the impacts of any other natural hazard. They are estimated to be between \$6 billion and \$8 billion annually in the United States and occur primarily in the agriculture, transportation, recreation and tourism, forestry, and energy sectors. Social and environmental impacts are also significant, although it is difficult to put a precise cost on these impacts.

The severity of a drought depends on the degree of moisture deficiency, the duration, and the size and location of the affected area. The longer the duration of the drought and the larger the area impacted, the more severe the potential impacts. Droughts are not usually associated with direct impacts on people or property, but they can have significant impacts on agriculture, which can impact people indirectly.

When measuring the severity of droughts, analysts typically look at economic impacts on a planning area. A drought directly or indirectly impacts all people in affected areas. All people could pay more for water if utilities increase their rates due to shortages. Agricultural impacts can result in loss of work for farm workers and those in related food processing jobs. Other water- or electricity-dependent industries are commonly forced to shut down all or a portion of their facilities, resulting in further layoffs. A drought can harm recreational companies that use water (e.g., swimming pools, water parks, and river rafting companies) as well as landscape and nursery businesses because people will not invest in new plants if water is not available to sustain them.

Drought generally does not affect groundwater sources as quickly as surface water supplies, but groundwater supplies generally take longer to recover. Reduced precipitation during a drought means that groundwater supplies are not replenished at a normal rate. This can lead to a reduction in groundwater levels and problems such as reduced pumping capacity or wells going dry. Shallow wells are more susceptible than deep wells. Reduced replenishment of groundwater affects streams. Much of the flow in

streams comes from groundwater, especially during the summer when there is less precipitation and after snowmelt ends. Reduced groundwater levels mean that even less water will enter streams when stream flows are lowest.

Drought also is often accompanied by extreme heat. When temperatures reach 90°F and above, people are vulnerable to sunstroke, heat cramps, and heat exhaustion. Pets and livestock are also vulnerable to heat-related injuries. Crops can be vulnerable as well.

Additionally, there is increased danger of wildfires associated with most droughts. Millions of board feet of timber have been lost, and in many cases erosion occurred, which caused serious damage to aquatic life, irrigation, and power production by heavy silting of streams, reservoirs, and rivers. Overall significance is considered medium: moderate potential impact.

Extreme Heat

Heat waves cause more fatalities in the U.S. than the total of all other meteorological events combined. From 1999-2009, excessive heat exposure caused in excess of 7,200 deaths in the United States (CDC, 2013). During this period, more people in this country died from extreme heat than from hurricanes, lightning, tornadoes, floods, and earthquakes combined. Every year, on average, there are 658 deaths from extreme heat events (CDC, 2013). 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 significance is considered medium: moderate potential impact.

10.2.5 Warning Time

Drought

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 at this time do not know how to predict drought 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.

Extreme Heat

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. The heat index is based on temperature and relative humidity, as shown in Table 10-1.

10.3 SECONDARY HAZARDS

Drought

The secondary hazard most commonly 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.

Extreme Heat

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. The AQI focuses on health effects that may be experienced within a few hours or days after breathing polluted air. The U.S. Environmental Protection Agency (EPA) calculates the AQI for five major air pollutants regulated by the Clean Air Act: ground-level ozone, particle pollution (also known as particulate matter), carbon monoxide, sulfur dioxide, and nitrogen dioxide. For each of these pollutants, EPA has established national air quality standards to protect public health. 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.

Daily AQI values range from 0 to 500 (Figure 10-8. Daily Air Quality IndexFigure 10-8). The higher the AQI value, the greater the level of air pollution and the greater the health concern. For example, an AQI value of 50 represents good air quality with little potential to affect public health, while an AQI value over 300 represents hazardous air quality. An AQI value of 100 generally corresponds to the national air quality standard for the pollutant, which is the level EPA has set to protect public health. AQI values below 100 are generally thought of as satisfactory. When AQI values exceed 100, air quality is considered to be unhealthy, first for sensitive groups of people, then for everyone as values get higher. National Weather Service Forecast Offices issue air quality alerts for public notification and provide recommendations for reducing risks associated with poor air quality as needed. Daily values for AQI are posted at: http://airnow.gov/index.cfm?action=airnow.local_state.

Source: Air Now, 2014

Air Quality Index Levels of Health Concern	Numerical Value	Meaning
Good	0 to 50	Air quality is considered satisfactory, and air pollution poses little or no risk
Moderate	51 to 100	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.
Unhealthy for Sensitive Groups	101 to 150	Members of sensitive groups may experience health effects. The general public is not likely to be affected.
Unhealthy	151 to 200	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.
Very Unhealthy	201 to 300	Health warnings of emergency conditions. The entire population is more likely to be affected.
Hazardous	301 to 500	Health alert: everyone may experience more serious health effects

Figure 10-8. Daily Air Quality Index

Excessive heat events can also cause failure of motorized systems such as ventilation systems used to control temperatures inside buildings.

10.4 CLIMATE CHANGE IMPACTS

Drought

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

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

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

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.

Extreme Heat

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°F per decade. Average temperatures have risen more quickly since the late 1970s (0.36 to 0.55°F per decade). Seven of the top 10 warmest years on record for the contiguous 48 states have occurred since 1998, and 2012 was the warmest year on record” (EPA, 2013). 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.

10.5 EXPOSURE

All people, property and environments in the planning area would be exposed to some degree to the impacts of moderate to extreme drought and extreme heat conditions.

10.6 VULNERABILITY

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

10.6.1 Population

The planning partnership has the ability to minimize any impacts on residents and water consumers in the county should several consecutive dry years occur. No significant life or health impacts are anticipated as a result of drought within the planning area. Extreme heat events cause more deaths per year than hurricanes, lightning, tornadoes, earthquakes and flood combined. Particular populations have been identified by the CDC to be more vulnerable to extreme events. County residents that lack air conditioning, senior citizens, and young children are most likely to be impacted by severe heat events. Heat related death also occurs more frequently in populations who are unmarried or living alone and males are disproportionately affected (CDC, 2013).

10.6.2 Property

No structures will be directly affected by drought conditions, though some structures may become vulnerable to wildfires, which are more likely following years of drought. Droughts can also have significant impacts on landscapes, which could cause a financial burden to property owners. However, these impacts are not considered critical in planning for impacts from the drought hazard. Extreme heat events are unlikely to cause property damage, although air heating, ventilation and air-conditioning can be damaged during such events.

10.6.3 Critical Facilities

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

10.6.4 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.

10.6.5 Economic Impact

Economic impact will be largely associated with industries that use water or depend on water for their business. For example, landscaping businesses were affected in the droughts of the past as the demand for service significantly declined because landscaping was not watered. Agricultural industries will be impacted if water usage is restricted for irrigation.

10.7 FUTURE TRENDS IN DEVELOPMENT

Each municipal planning partner in this effort has an established comprehensive plan that includes policies directing land use and dealing with issues of water supply and the protection of water resources. These plans provide the capability at the local municipal level to protect future development from the impacts of drought. All planning partners reviewed their general plans under the capability assessments performed for this effort. Deficiencies identified by these reviews can be identified as mitigation initiatives to increase the capability to deal with future trends in development.

Vulnerability to drought will increase as population growth increases putting more demands on existing water supplies. Future water use planning should consider increase in population as well as potential impacts of climate change. A 2006 report entitled *Running on Empty? El Paso County Growth and the Denver Basin*, makes the following observations about water supply and future development in the northern region of the County (Stiedemann, 2006):

Water can be obtained through wells that tap groundwater (alluvial aquifers), from surface water (stream systems, lakes, and reservoirs) and from transbasin diversion resources. CSU [Colorado Springs Utility] obtains most of its water from reservoirs on Pikes Peak that collect snow melt and transmountain diversion pipelines which bring water from the Western Slope of the Rocky Mountains. The area studied in this report – the northern unincorporated parts of El Paso County – obtains virtually all its water from the Denver Basin, a sedimentary bedrock aquifer that is renewable only to the degree that it is recharged by precipitation and seasonal runoff [...]. New housing starts are booming in this portion of El Paso County. Yet future water supplies are uncertain because groundwater from the basin is currently being pumped with very little recharge. Despite this, El Paso County's population is projected to grow 54 percent from 2000 to 2030, and a substantial portion of the growth is expected to be in this part of the county.

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.

10.8 SCENARIO

An extreme multiyear drought could impact the region with little warning. Combinations of low precipitation and unusually high temperatures could occur over several consecutive years. Intensified by such conditions, extreme wildfires could break out throughout the planning area, increasing the need for water. Surrounding communities, also in drought conditions, could increase their demand for water supplies relied upon by the planning partnership, causing social and political conflicts. If such conditions persisted for several years, the economy of El Paso County could experience setbacks, especially in water dependent industries.

10.9 ISSUES

The planning team has identified the following drought-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.
- The promotion of active water conservation even during non-drought periods.
- Problems with long-term water supply can be exacerbated by lack of planning for long-term sustainability and by inefficient allocation of water property rights (Stiedmann, 2006).
- The county and incorporated areas should pursue wise-water management policies, protective regulations and conservation activities even when the County is not experiencing drought conditions.
- Extreme heat events may increase with the impacts of climate change.

CHAPTER 11. EARTHQUAKE

EARTHQUAKE RANKING						
El Paso County	Calhan/Ramah	Fountain	Green Mountain Falls	Manitou Springs	Monument	Palmer Lake
Low	Medium	Medium	Medium	Medium	High	High

11.1 GENERAL BACKGROUND

11.1.1 How Earthquakes Happen

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

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

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

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

DEFINITIONS

Earthquake—The shaking of the ground caused by an abrupt shift of rock along a fracture in the earth or a contact zone between tectonic plates.

Epicenter—The point on the earth’s surface directly above the hypocenter of an earthquake. The location of an earthquake is commonly described by the geographic position of its epicenter and by its focal depth.

Fault—A fracture in the earth’s crust along which two blocks of the crust have slipped with respect to each other.

Focal Depth—The depth from the earth’s surface to the hypocenter.

Hypocenter—The region underground where an earthquake’s energy originates.

Liquefaction—Loosely packed, water-logged sediments losing their strength in response to strong shaking, causing major damage during earthquakes.

11.1.2 Earthquake Classifications

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

Magnitude

Currently the most commonly used magnitude scale is the moment magnitude (M_w) scale, with the following classifications of magnitude:

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

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

Intensity

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

- I. Not felt except by a very few under especially favorable conditions
- II. Felt only by a few persons at rest, especially on upper floors of buildings.
- III. Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it is an earthquake. Standing cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
- IV. Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like a heavy truck striking building. Standing cars rocked noticeably.
- V. Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
- VI. Felt by all; many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
- VII. Damage negligible in buildings of good design and construction; slight in well-built ordinary structures; considerable in poorly built or badly designed structures. Some chimneys broken.
- VIII. Damage slight in specially designed structures; considerable damage in ordinary buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.

- IX. Damage considerable 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. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
- XI. Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
- XII. Damage total. Lines of sight and level are distorted. Objects thrown into the air.

11.1.3 Ground Motion

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

Maps of PGA values form the basis of seismic zone maps that are included in building codes such as the International Building Code. Building codes that include seismic provisions specify the horizontal force due to lateral acceleration that a building should be able to withstand during an earthquake. PGA values are directly related to these lateral forces that could damage “short period structures” (e.g. single-family dwellings). Longer period response components determine the lateral forces that damage larger structures with longer natural periods (apartment buildings, factories, high-rises, bridges). Table 11-1 lists damage potential and perceived shaking by PGA factors, compared to the Mercalli scale.

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

a. PGA measured in percent of g, where g is the acceleration of gravity
Sources: USGS, 2008; USGS, 2010

11.1.4 Effect of Soil Types

The impact of an earthquake on structures and infrastructure is largely a function of ground shaking, distance from the source of the quake, and liquefaction, a secondary effect of an earthquake in which soils lose their shear strength and flow or behave as liquid, thereby damaging structures that derive their support from the soil. Liquefaction generally occurs in soft, unconsolidated sedimentary soils. A program called the National Earthquake Hazard Reduction Program (NEHRP) creates maps based on soil characteristics to help identify locations subject to liquefaction. Table 11-2 summarizes NEHRP soil classifications. NEHRP Soils B and C typically can sustain ground shaking without much effect, dependent on the earthquake magnitude. The areas that are commonly most affected by ground shaking have NEHRP Soils D, E and F. In general, these areas are also most susceptible to liquefaction.

TABLE 11-2. NEHRP SOIL CLASSIFICATION SYSTEM		
NEHRP Soil Type	Description	Mean Shear Velocity to 30 m (m/s)
A	Hard Rock	1,500
B	Firm to Hard Rock	760-1,500
C	Dense Soil/Soft Rock	360-760
D	Stiff Soil	180-360
E	Soft Clays	< 180
F	Special Study Soils (liquefiable soils, sensitive clays, organic soils, soft clays >36 m thick)	

11.2 HAZARD PROFILE

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

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

11.2.1 Past Events

Colorado has a relatively short period of historical records for earthquakes. An earthquake and fault map developed by the Colorado Geological Survey depicts the location of historical epicenters and potentially active faults in the state. Figure 11-1 shows the mapping for El Paso County and vicinity. The map shows the following recorded earthquake events in El Paso County:

- **December 23, 1995** – Manitou Springs area, Magnitude 3.5
- **December 31, 1995** – Manitou Springs area, Magnitude 2.8

Figure 11-1 also shows that earthquakes have occurred in counties surrounding El Paso County. Any such earthquake that is strong enough and close enough to the county has the potential to have impacts inside El Paso County.

Source: Colorado Geological Survey (<http://dnrwebmapgdev.state.co.us/cgsonline/>)

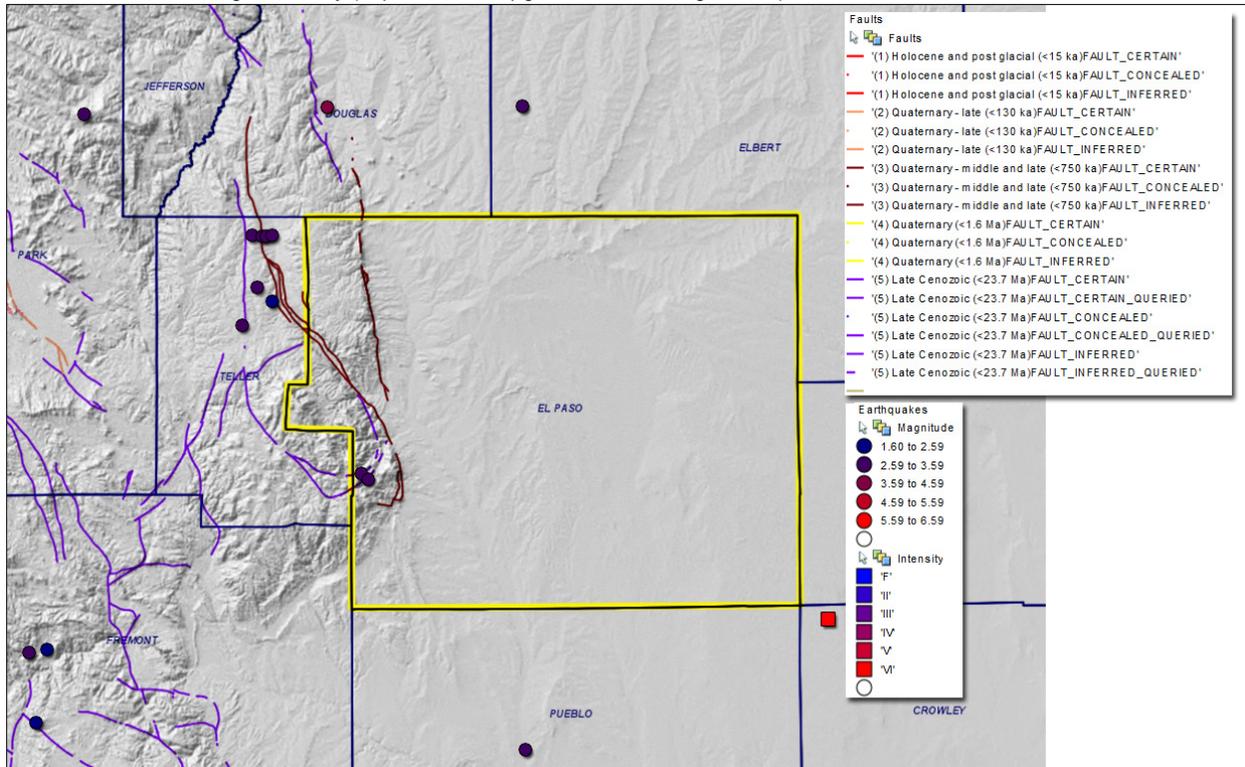


Figure 11-1. Earthquake Hazard Map for Central Colorado

11.2.2 Location

Geological research indicates that faults capable of producing earthquakes are prevalent in Colorado. There are about 90 potentially active faults in Colorado with documented movement within the last 1.6 million years. Figure 11-1 and Figure 11-2 show potentially active faults in El Paso County and in all of Colorado, respectively.

Source: Colorado Earthquake Hazard Mitigation Council 2008

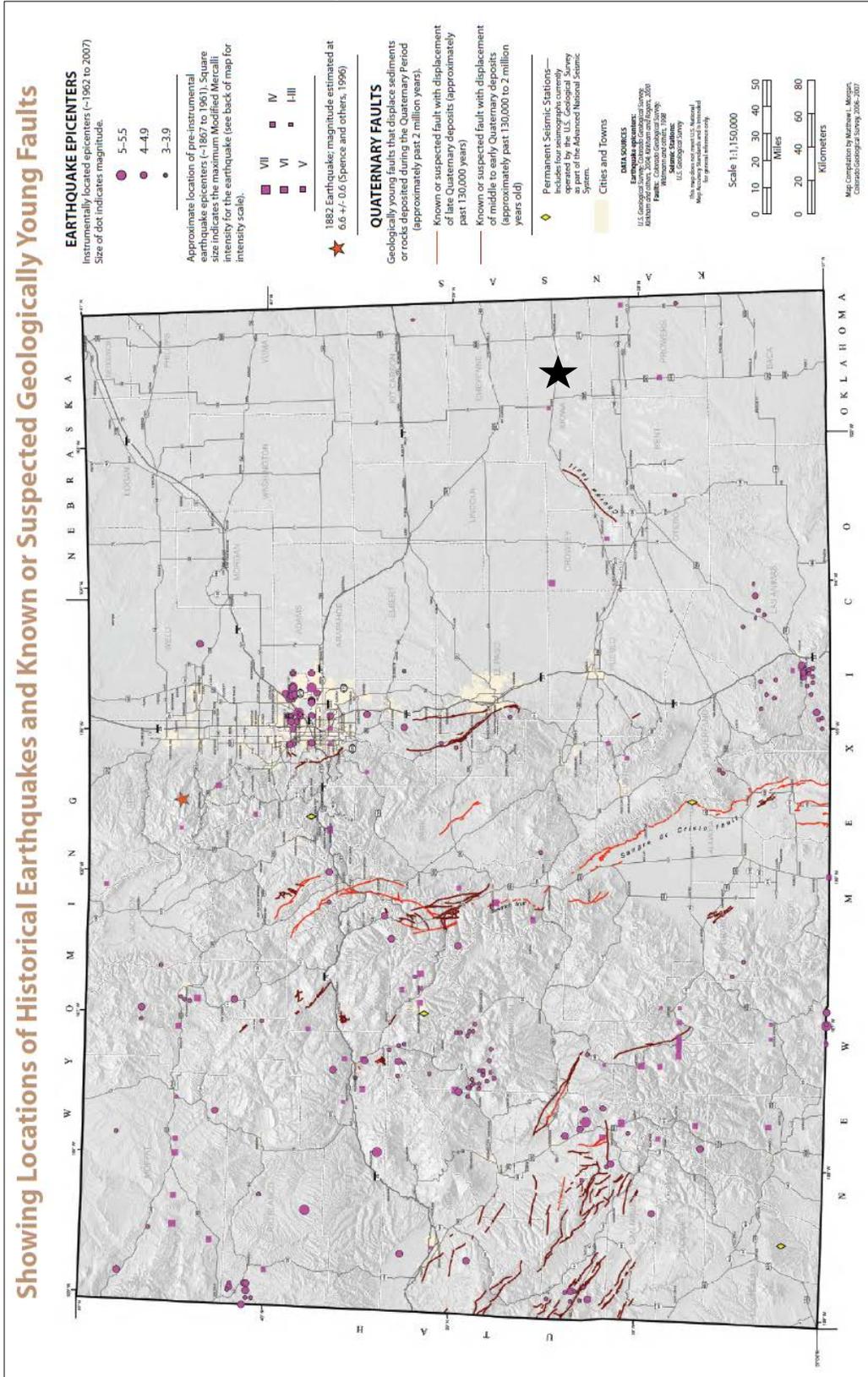


Figure 11-2. Colorado Earthquakes and Fault Map

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

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

Known faults in El Paso County include the Ute Pass and Rampart Range faults, which are classified as Quaternary, and unnamed faults near Colorado Springs that are classified as late Cenozoic.

The impact of an earthquake is largely a function of the following components:

- Ground shaking (ground motion accelerations)
- Liquefaction (soil instability)
- Distance from the source (both horizontally and vertically).

Mapping that shows the impacts of these components was used to assess the risk of earthquakes within the planning area. While the impacts from each of these components can build upon each other during an earthquake event, the mapping looks at each component individually. Scenarios selected for this plan include a 500-year probabilistic event, a magnitude-7.0 event on the Rampart fault and a magnitude-7.0 event on the Ute Pass fault:

- 500 Year Probabilistic Scenario (see Figure 11-3) —This is a HAZUS-MH probabilistic-event scenario, which allows the user to generate estimates of damage and loss based on the seismic hazard for a specified return period.
- Rampart Fault Zone Scenario (see Figure 11-4)—A Magnitude 7.0 event with a shallow depth and epicenter in 3.5 miles southwest of Monument. This is a HAZUS-MH arbitrary-event scenario, which is defined by the location of its epicenter and by its magnitude. The epicenter is defined by latitude and longitude. The user specifies the magnitude, depth, type, rupture orientation and length.
- Ute Pass Fault Zone Scenario (see Figure 11-5)—A Magnitude 7.0 event with a shallow depth and epicenter in 1.5 miles southeast of Green Mountain Falls. This is a HAZUS-MH arbitrary-event scenario, which is defined by the location of its epicenter and by its magnitude. The epicenter is defined by latitude and longitude. The user specifies the magnitude, depth, type, rupture orientation and length.

The earthquake scenarios (500 Year Probabilistic, Rampart Fault Zone, and Ute Pass Fault Zone) for each participating partner are shown on Figure 11-6 through Figure 11-23.

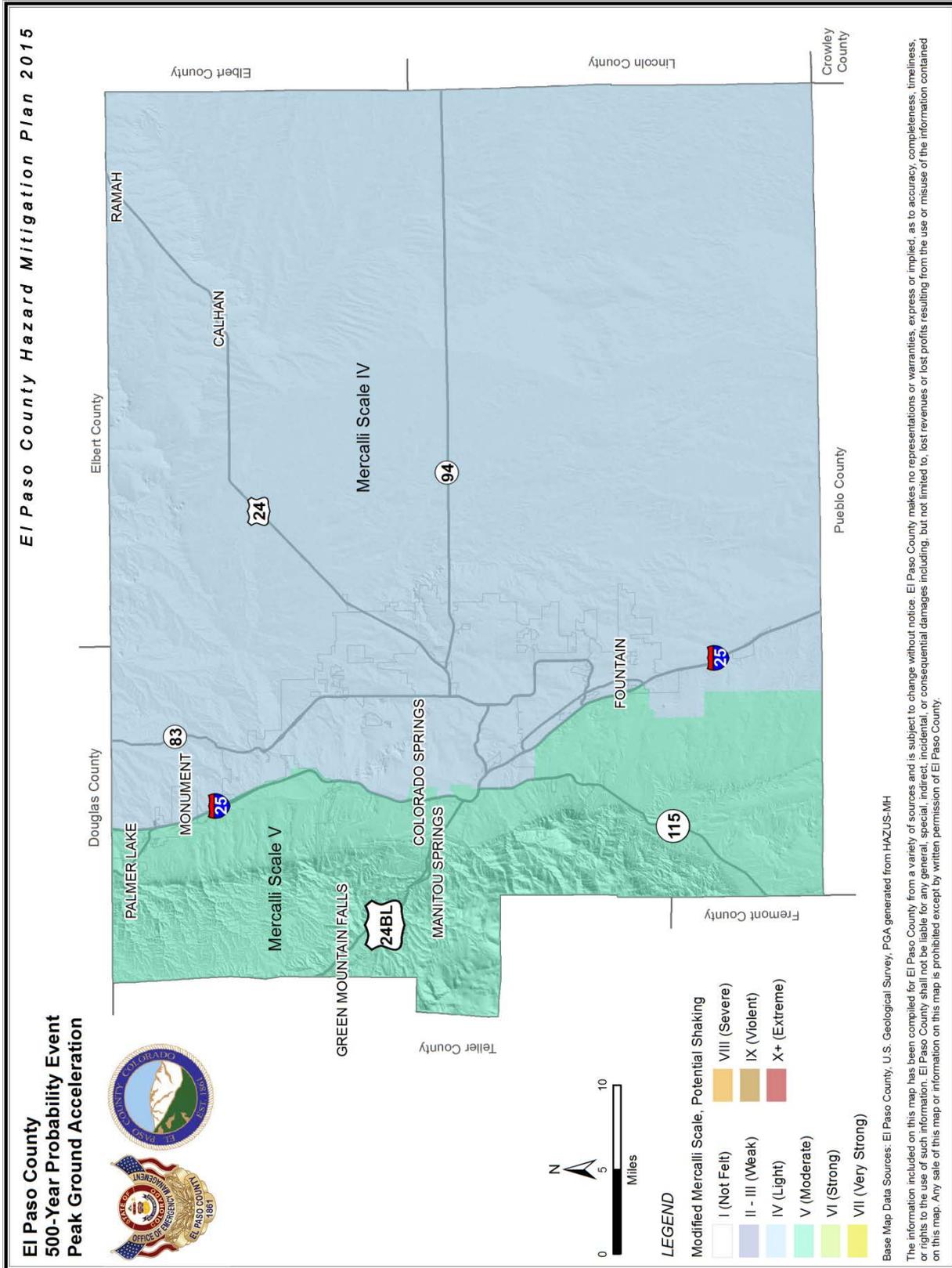


Figure 11-3. 500-Year Probability Event, Peak Ground Acceleration

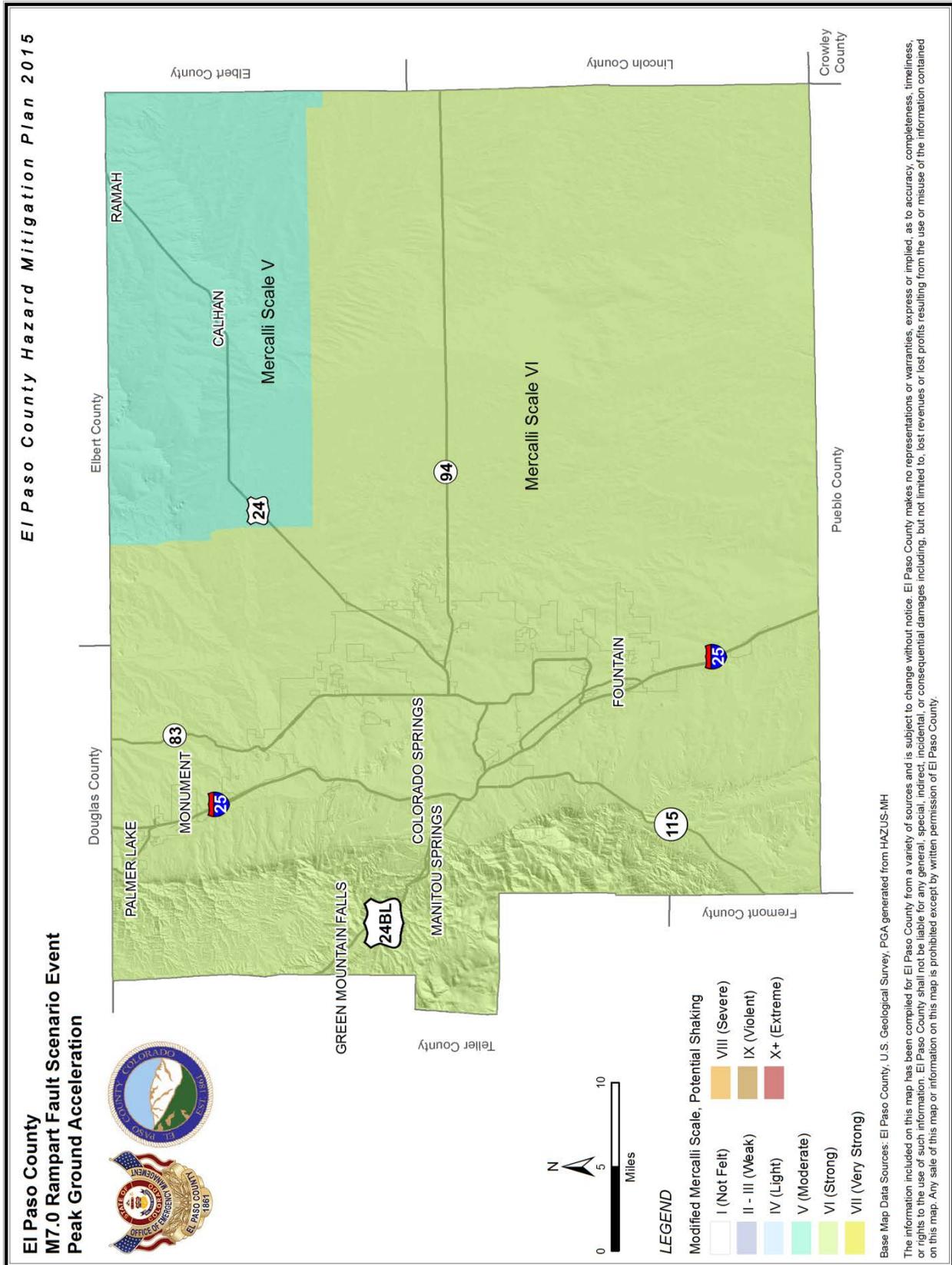


Figure 11-4. M7.0 Rampart Fault Scenario Event, Peak Ground Acceleration

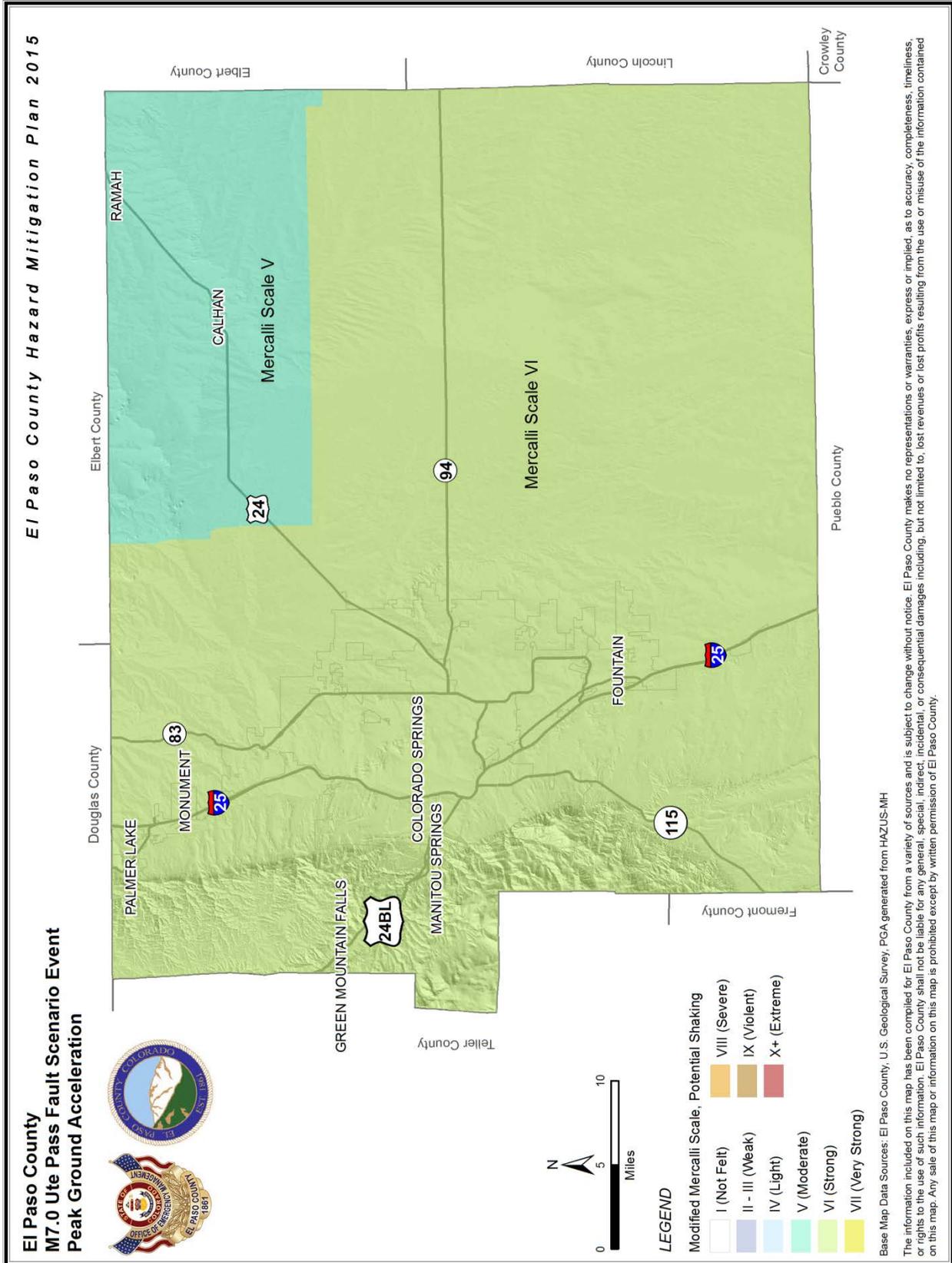


Figure 11-5. M7.0 Ute Pass Fault Scenario Event, Peak Ground Acceleration

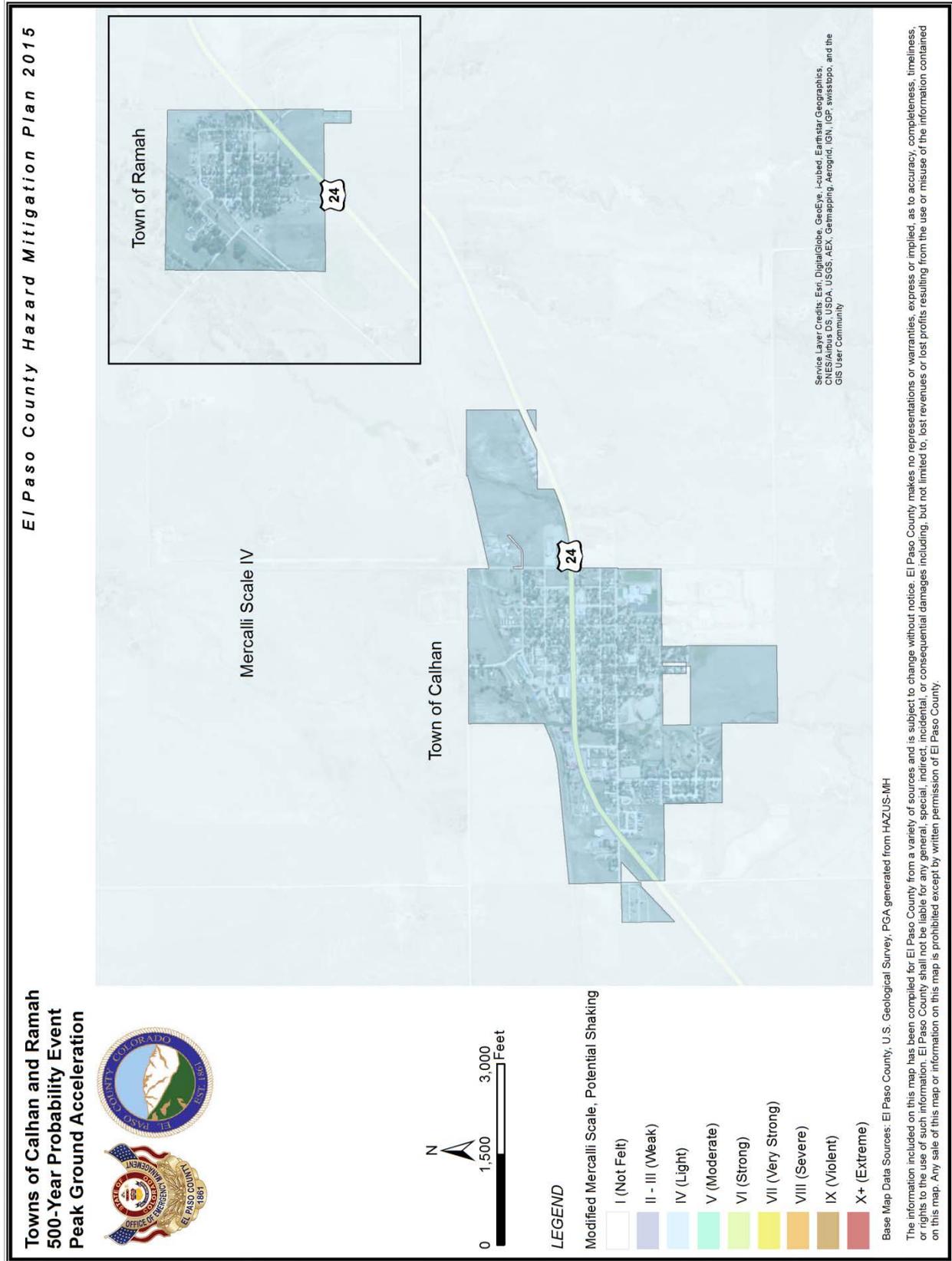


Figure 11-6. Towns of Calhan and Ramah, 500-Year Probability Event, Peak Ground Acceleration

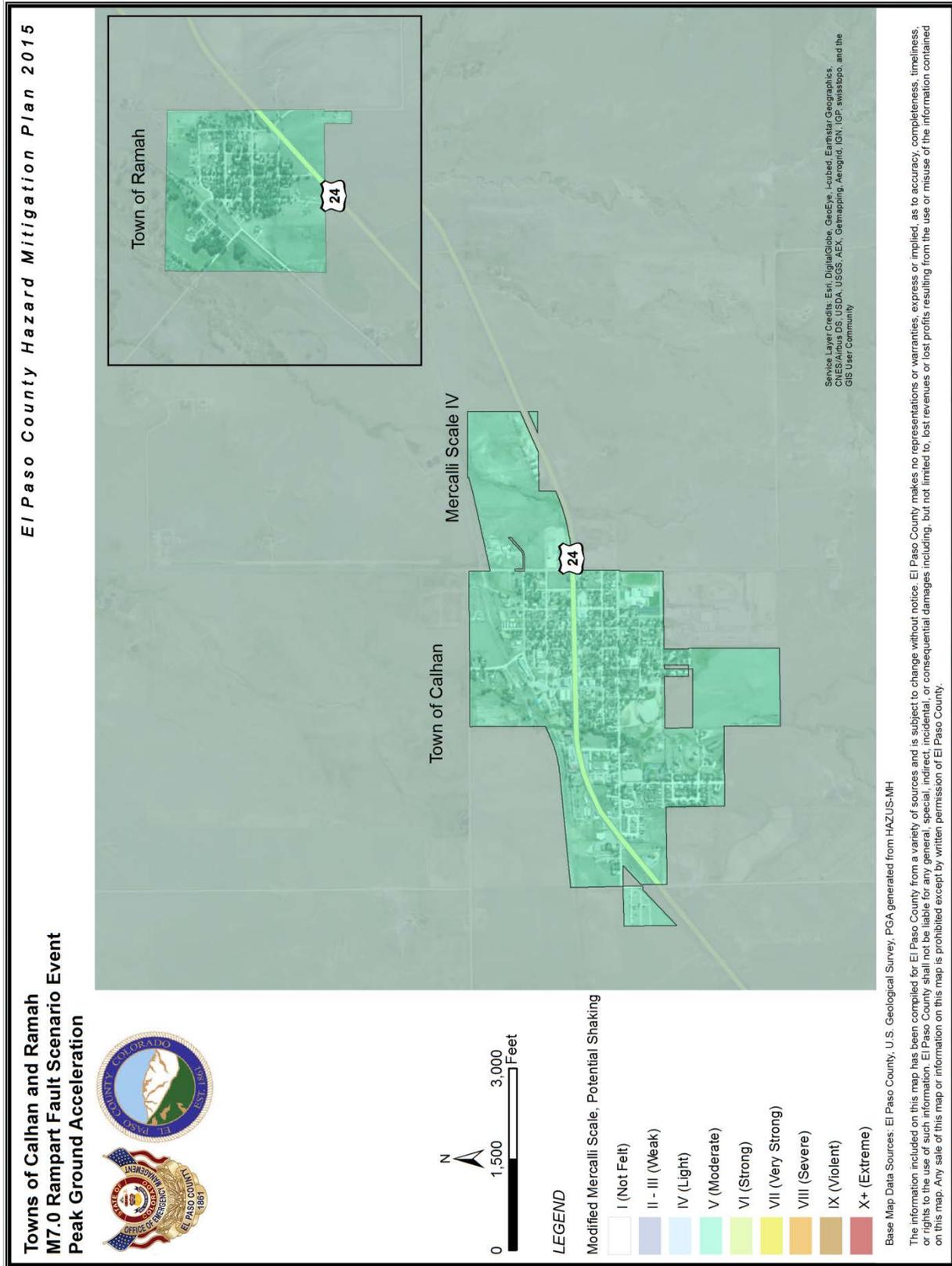


Figure 11-7. Towns of Calhan and Ramah, M7.0 Rampart Fault Scenario Event, Peak Ground Acceleration

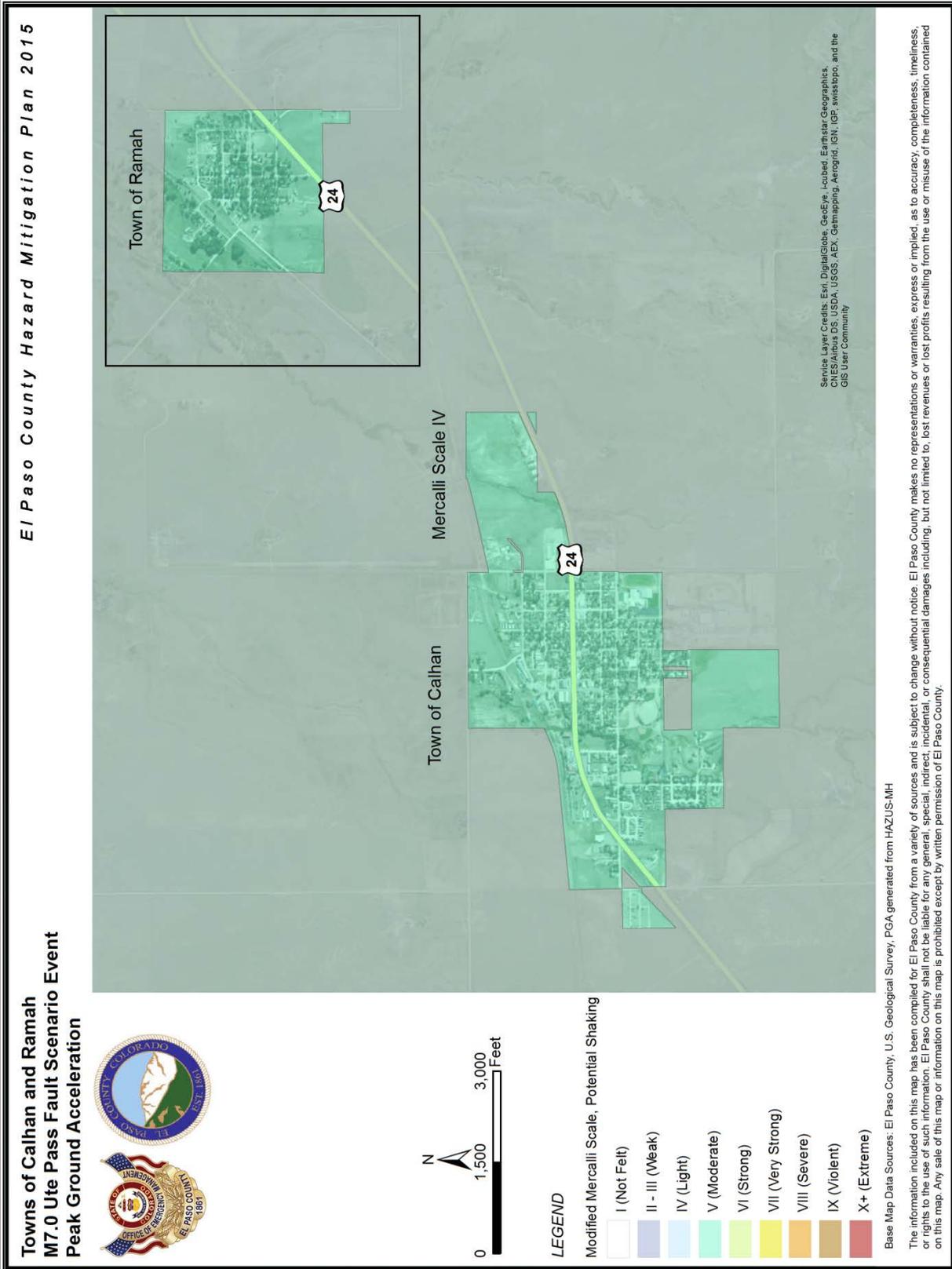


Figure 11-8. Towns of Calhan and Ramah, M7.0 Ute Pass Fault Scenario Event, Peak Ground Acceleration

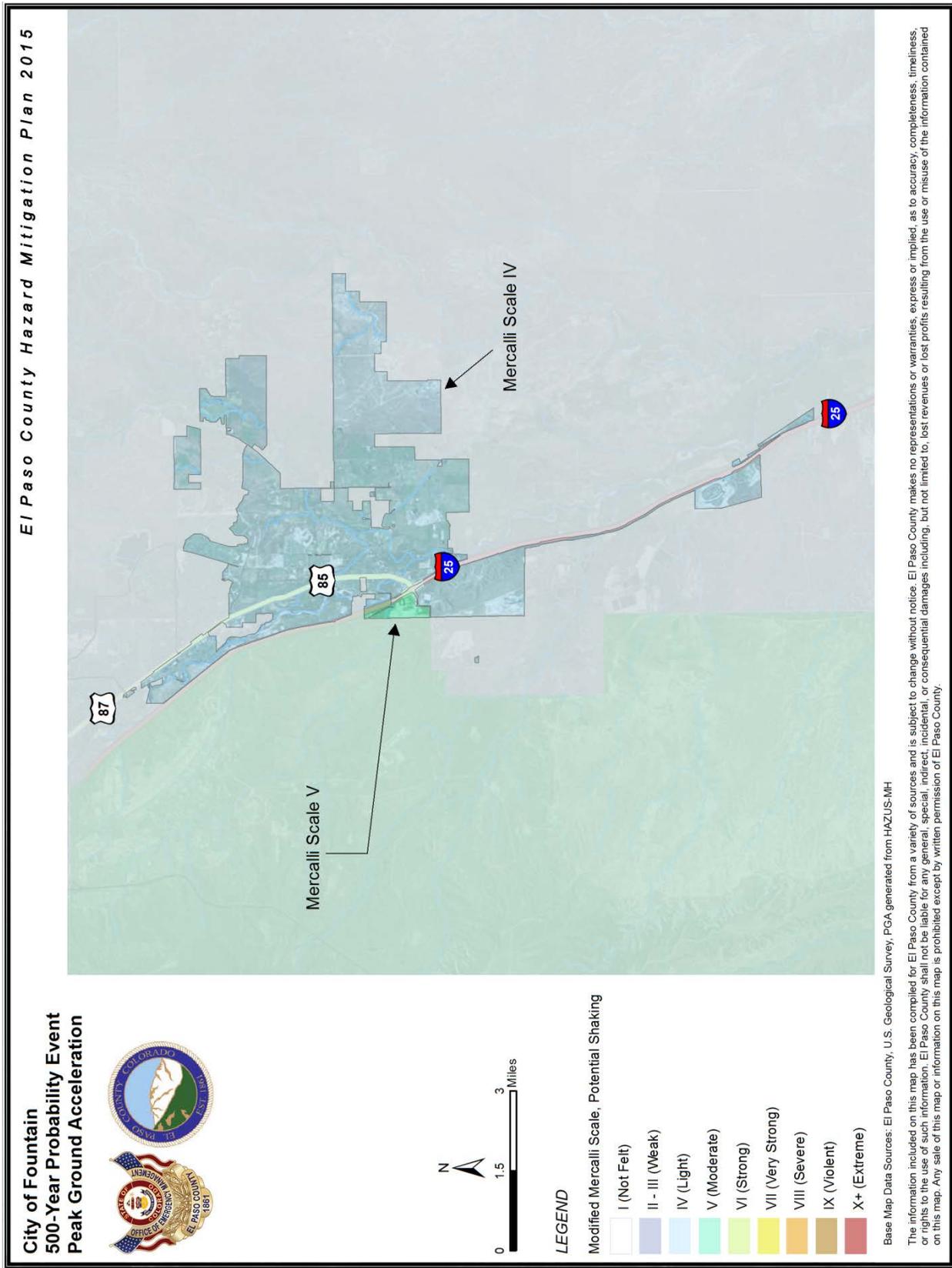


Figure 11-9. City of Fountain, 500-Year Probability Event, Peak Ground Acceleration

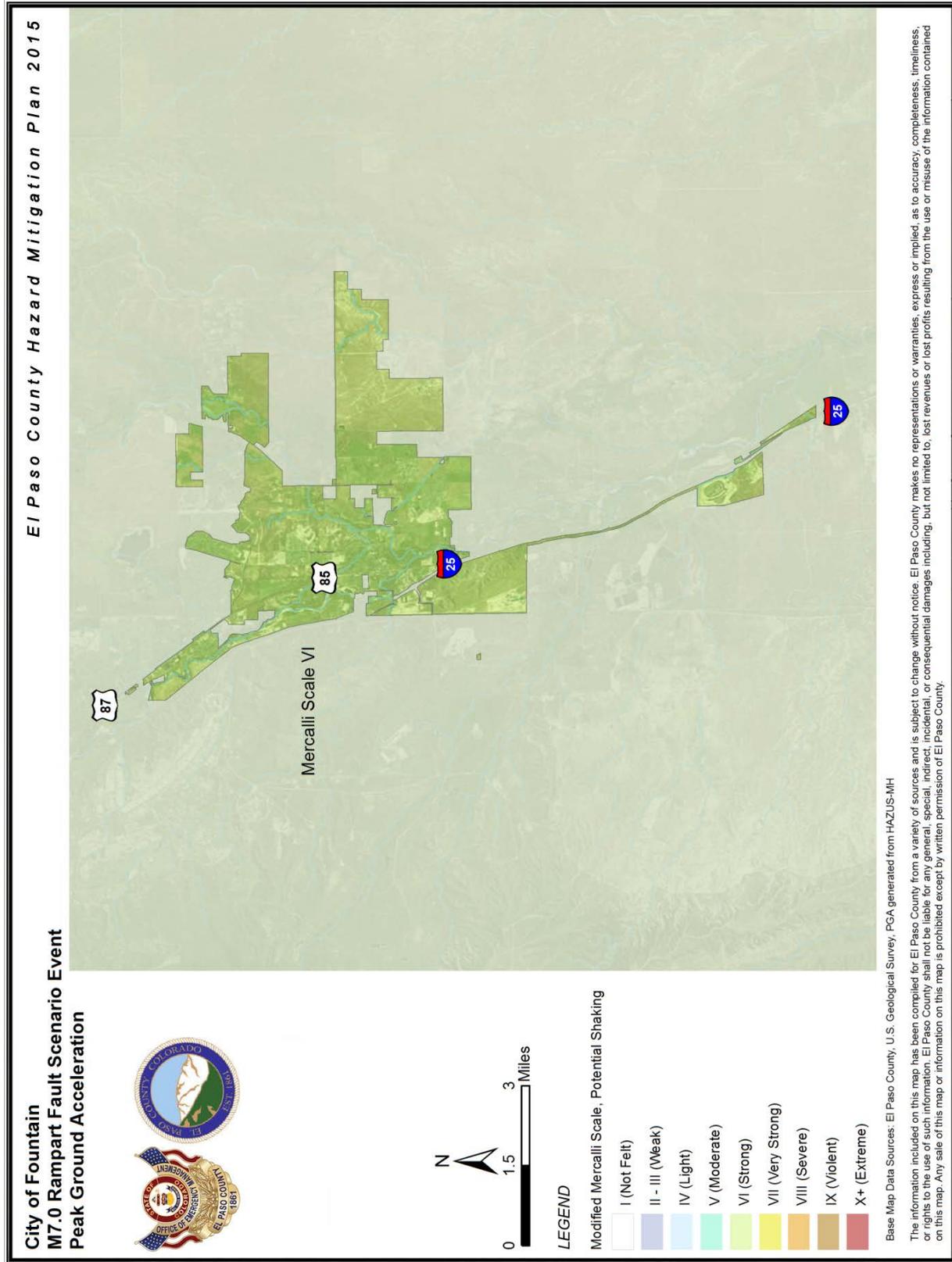


Figure 11-10. City of Fountain, M7.0 Rampart Fault Scenario Event, Peak Ground Acceleration

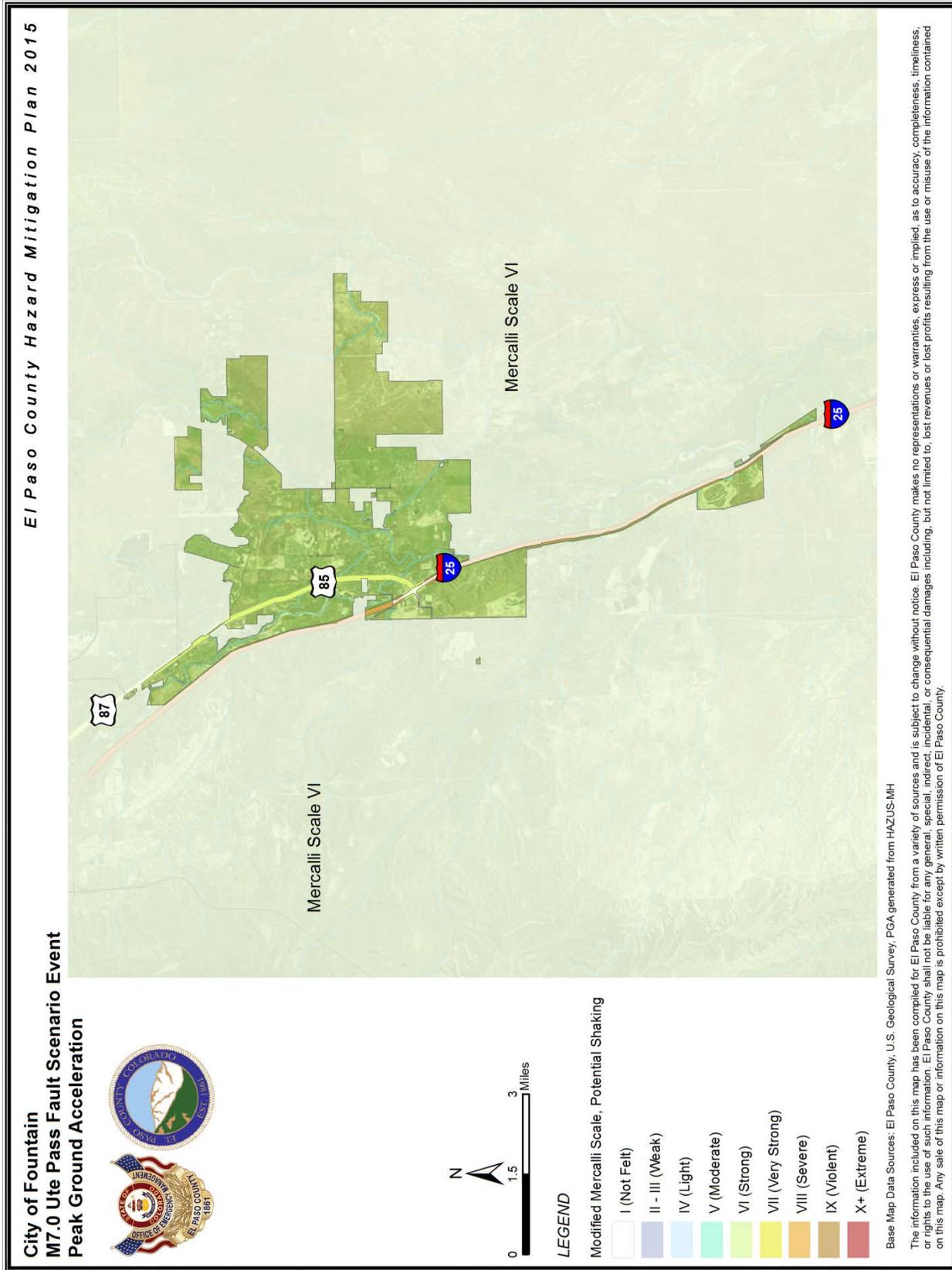


Figure 11-11. City of Fountain, M7.0 Ute Pass Fault Scenario Event, Peak Ground Acceleration

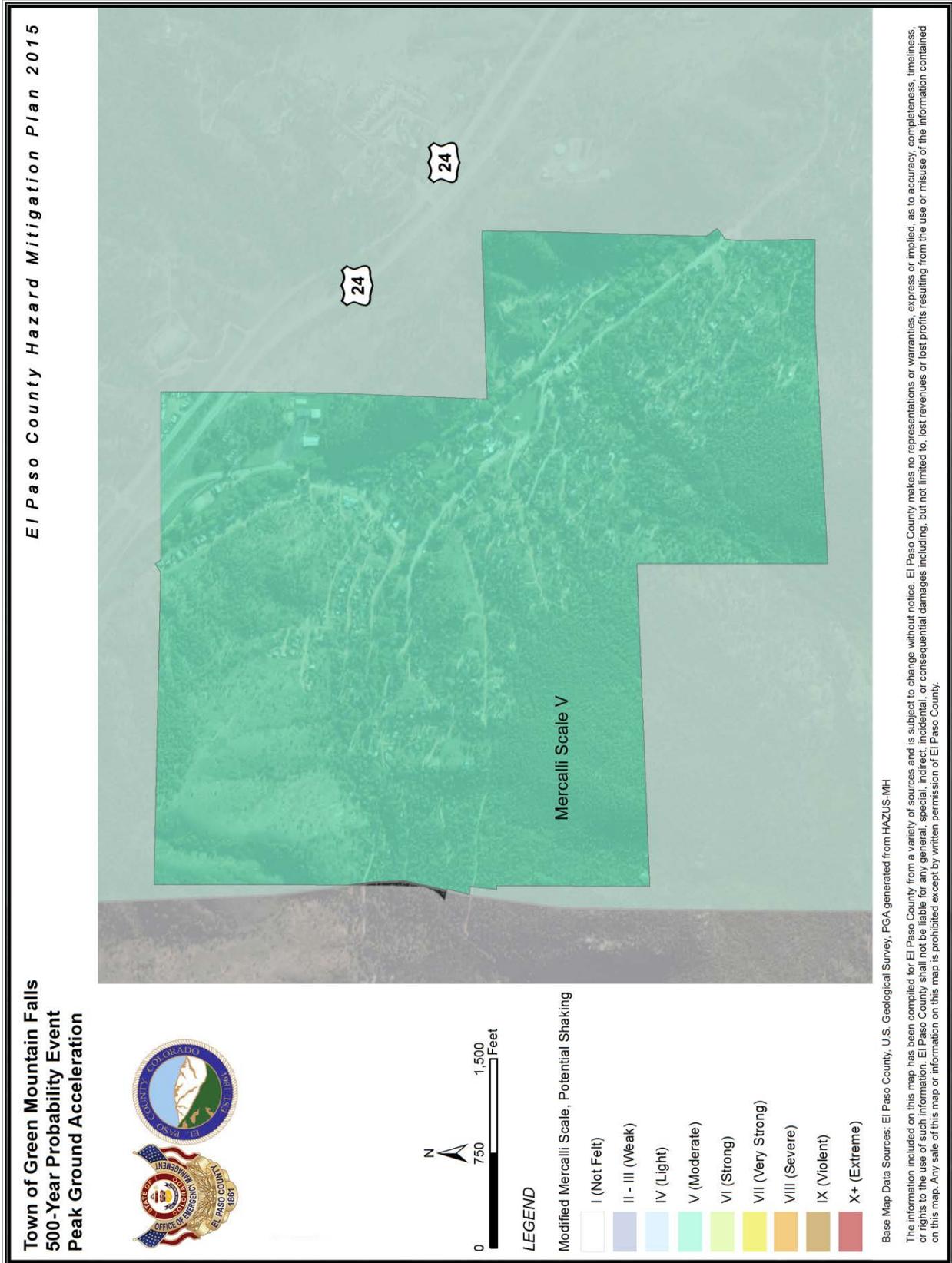


Figure 11-12. Town of Green Mountain Falls, 500-Year Probability Event, Peak Ground Acceleration

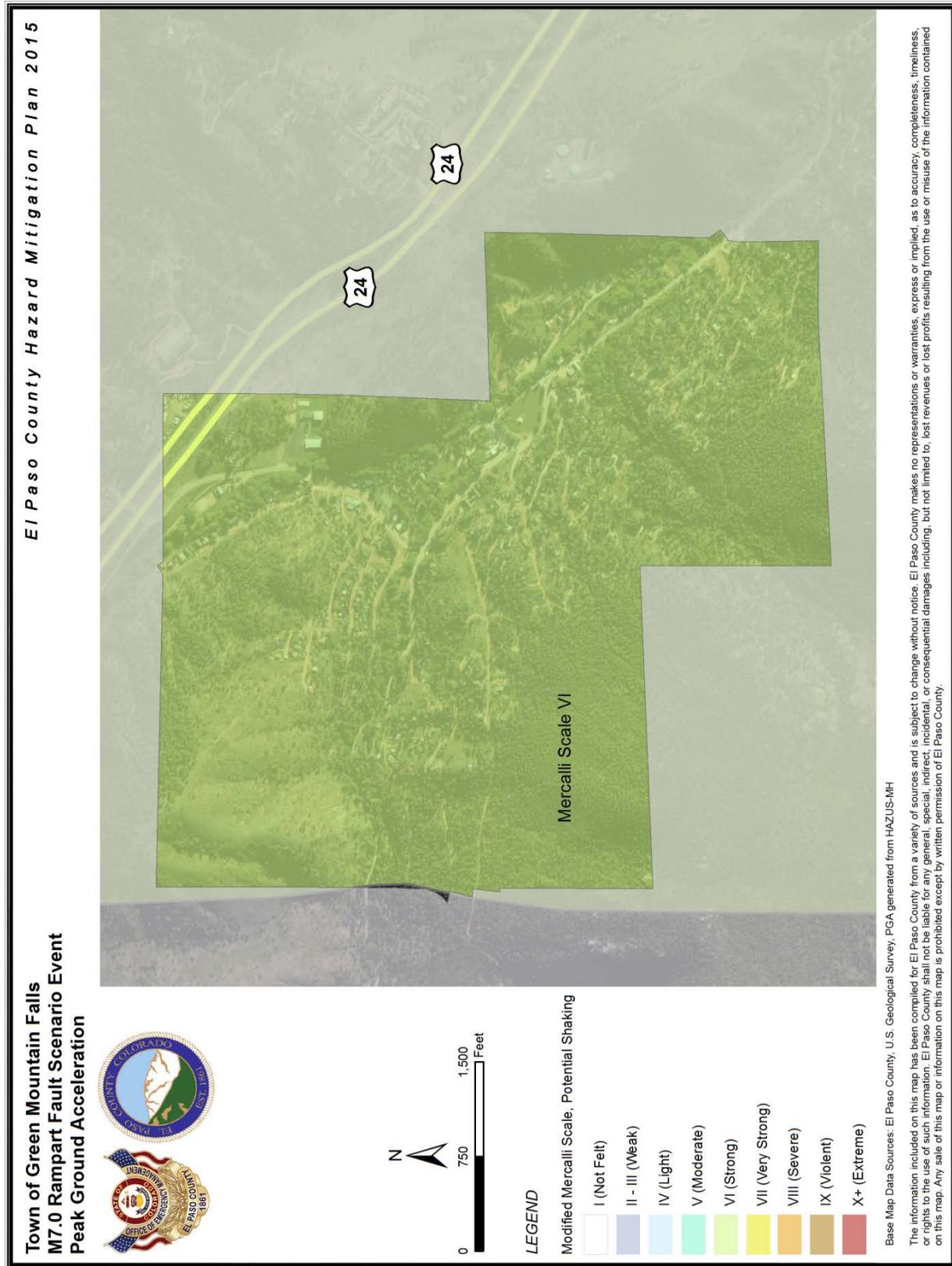


Figure 11-13. Town of Green Mountain Falls, M7.0 Rampart Fault Scenario Event, Peak Ground Acceleration

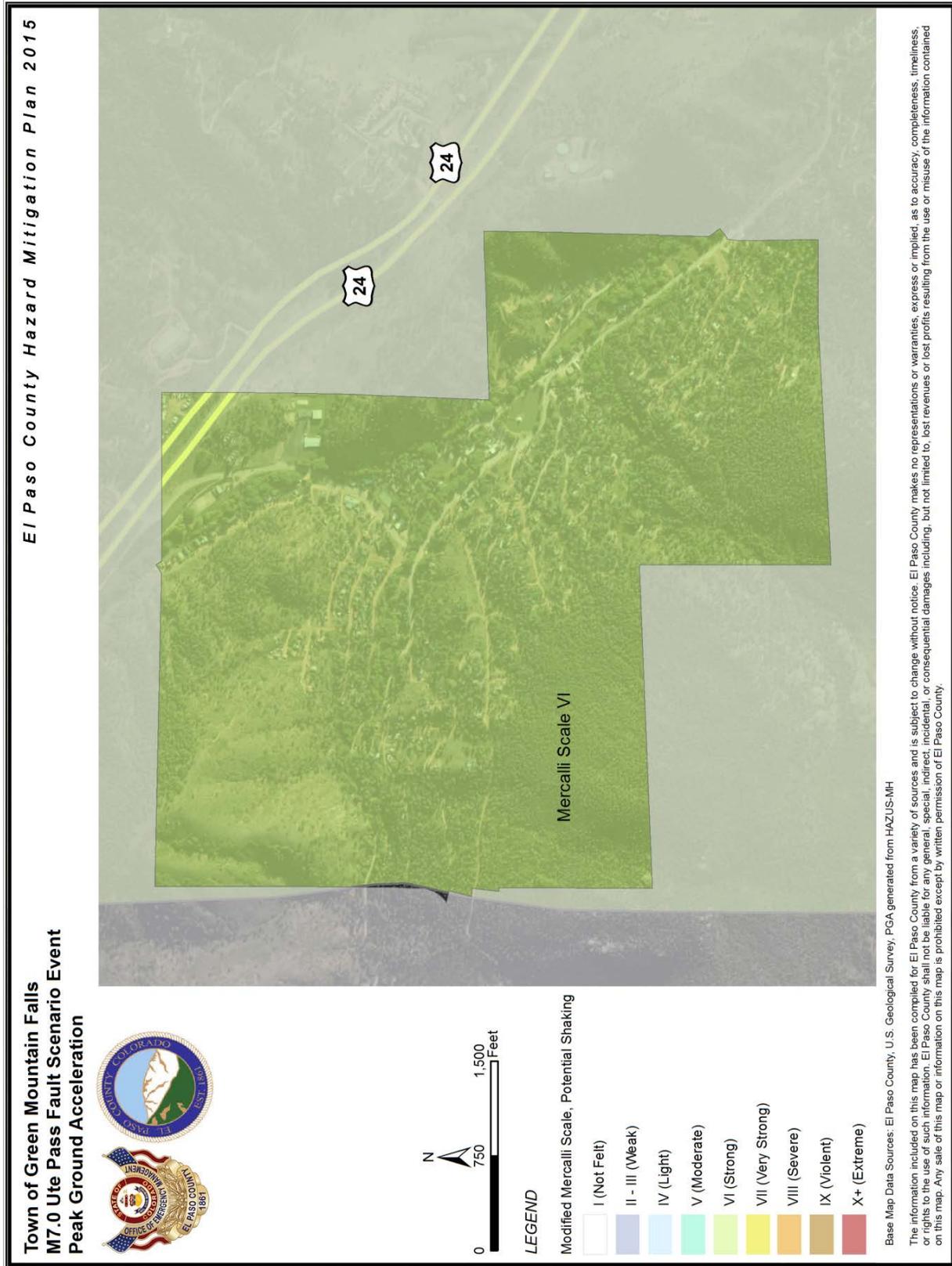


Figure 11-14. Town of Green Mountain Falls, M7.0 Ute Pass Fault Scenario Event, Peak Ground Acceleration

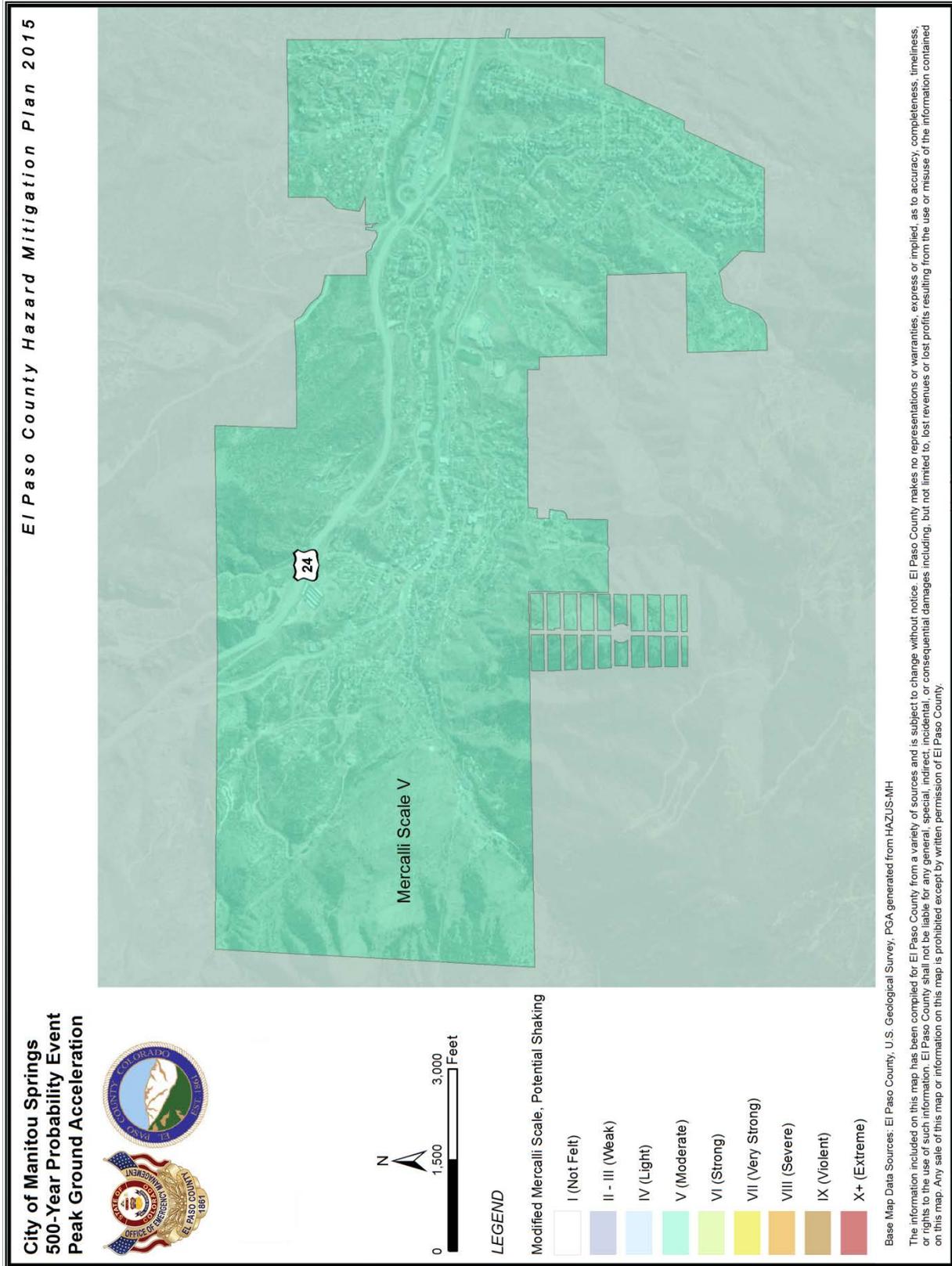


Figure 11-15. City of Manitou Springs, 500-Year Probability Event, Peak Ground Acceleration

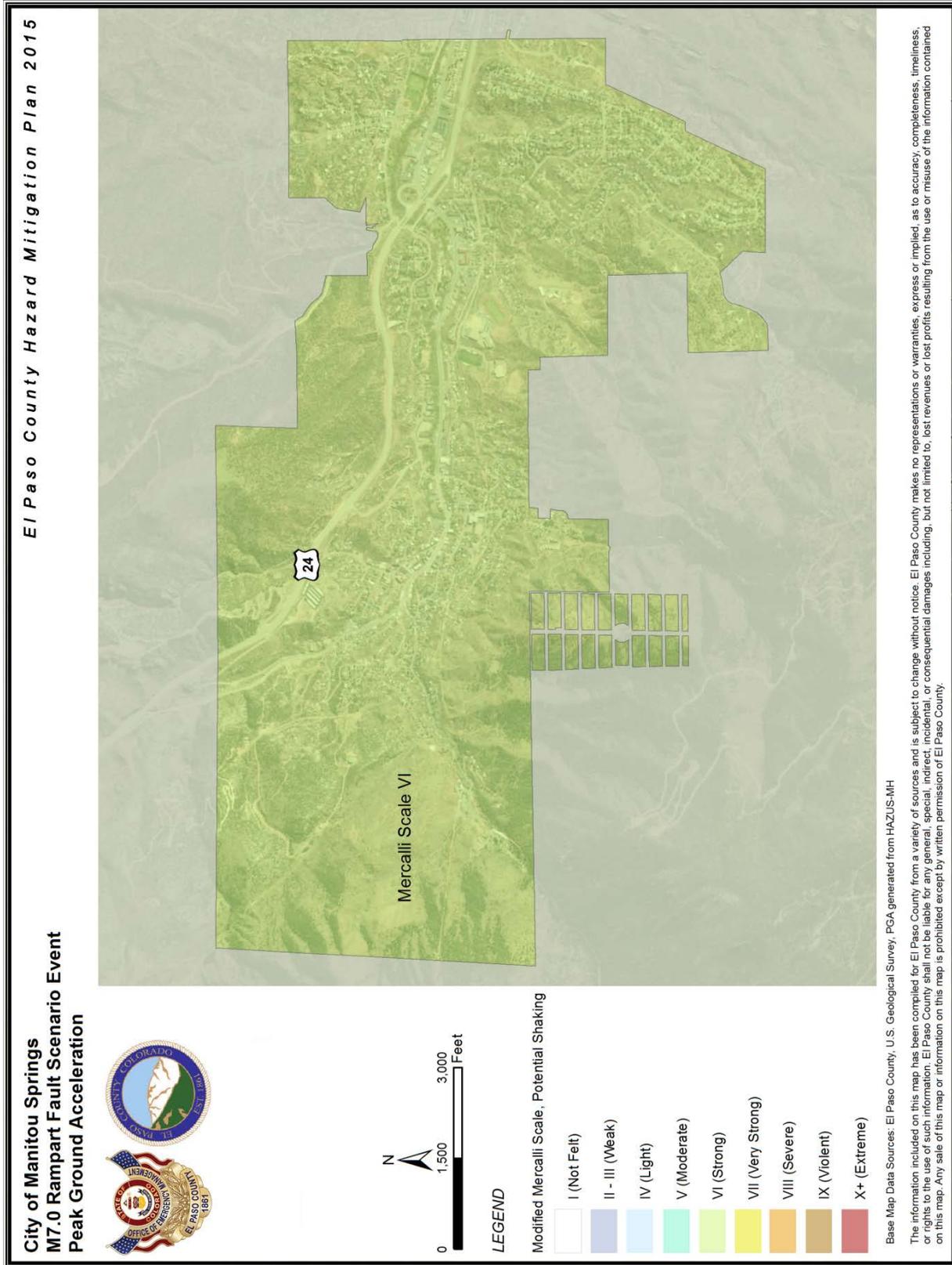


Figure 11-16. City of Manitou Springs, M7.0 Rampart Fault Scenario Event, Peak Ground Acceleration

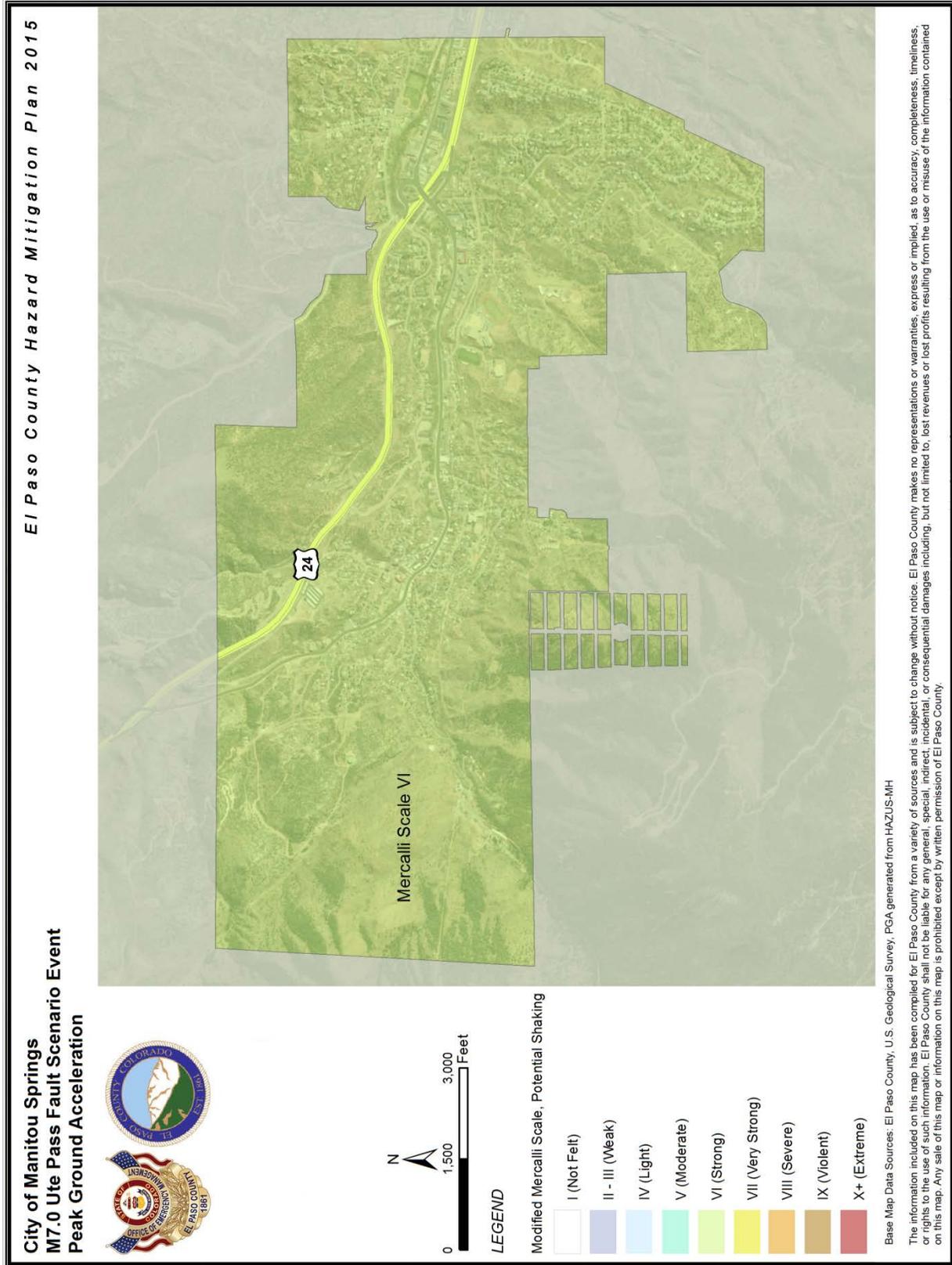


Figure 11-17. City of Manitou Springs, M7.0 Ute Pass Fault Scenario Event, Peak Ground Acceleration

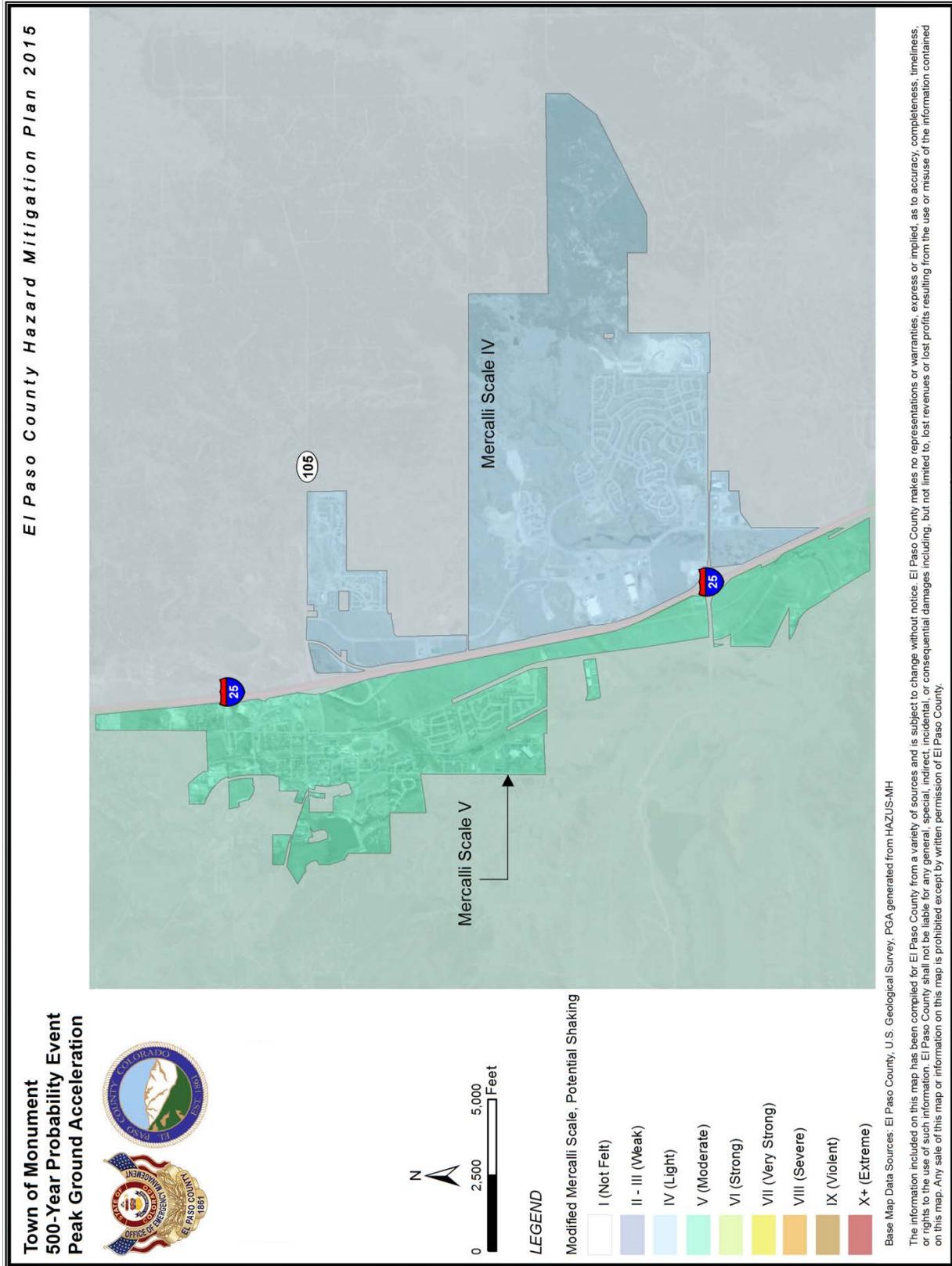


Figure 11-18. Town of Monument, 500-Year Probability Event, Peak Ground Acceleration

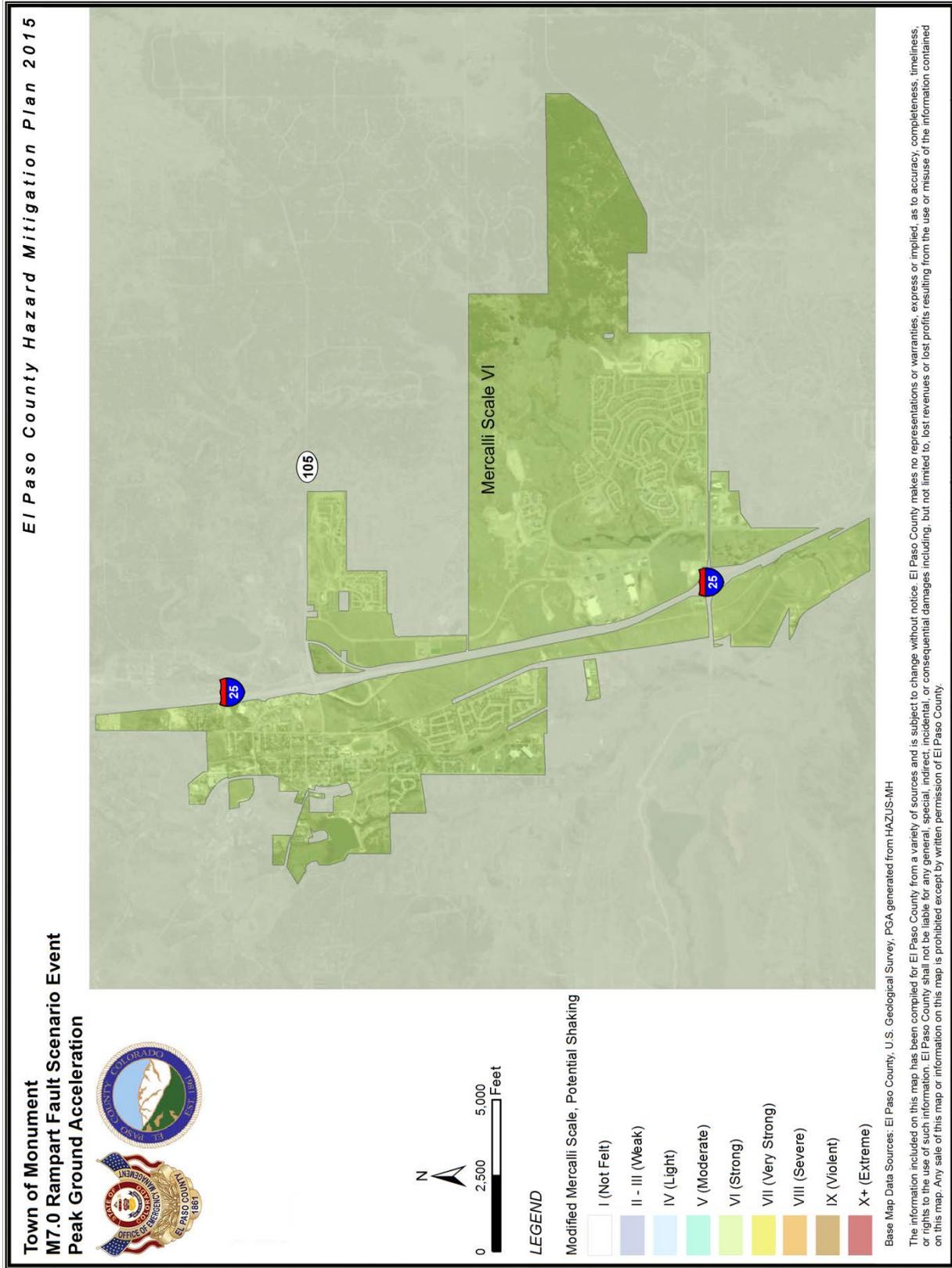


Figure 11-19. Town of Monument, M7.0 Rampart Fault Scenario Event, Peak Ground Acceleration

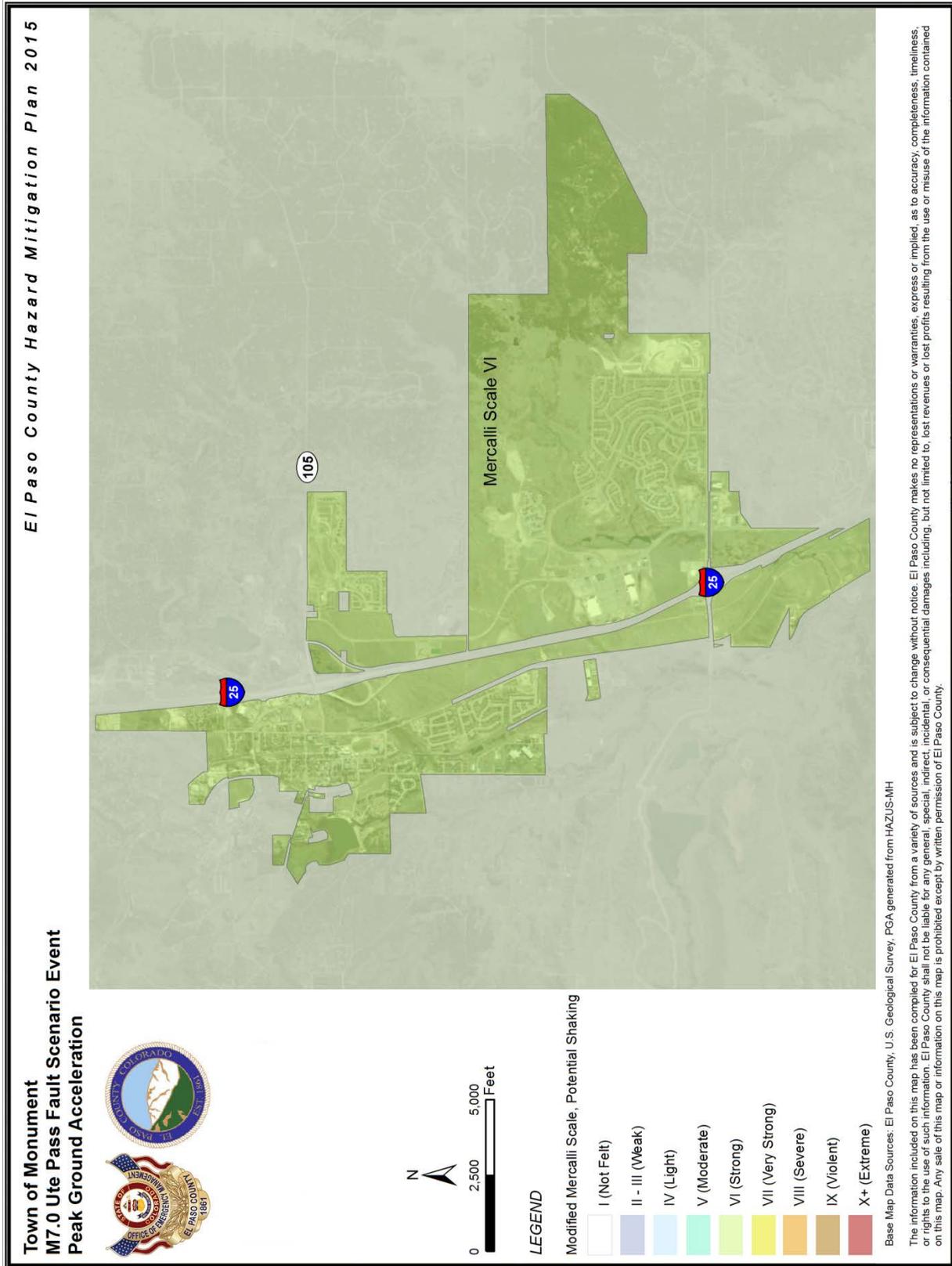


Figure 11-20. Town of Monument, M7.0 Ute Pass Fault Scenario Event, Peak Ground Acceleration

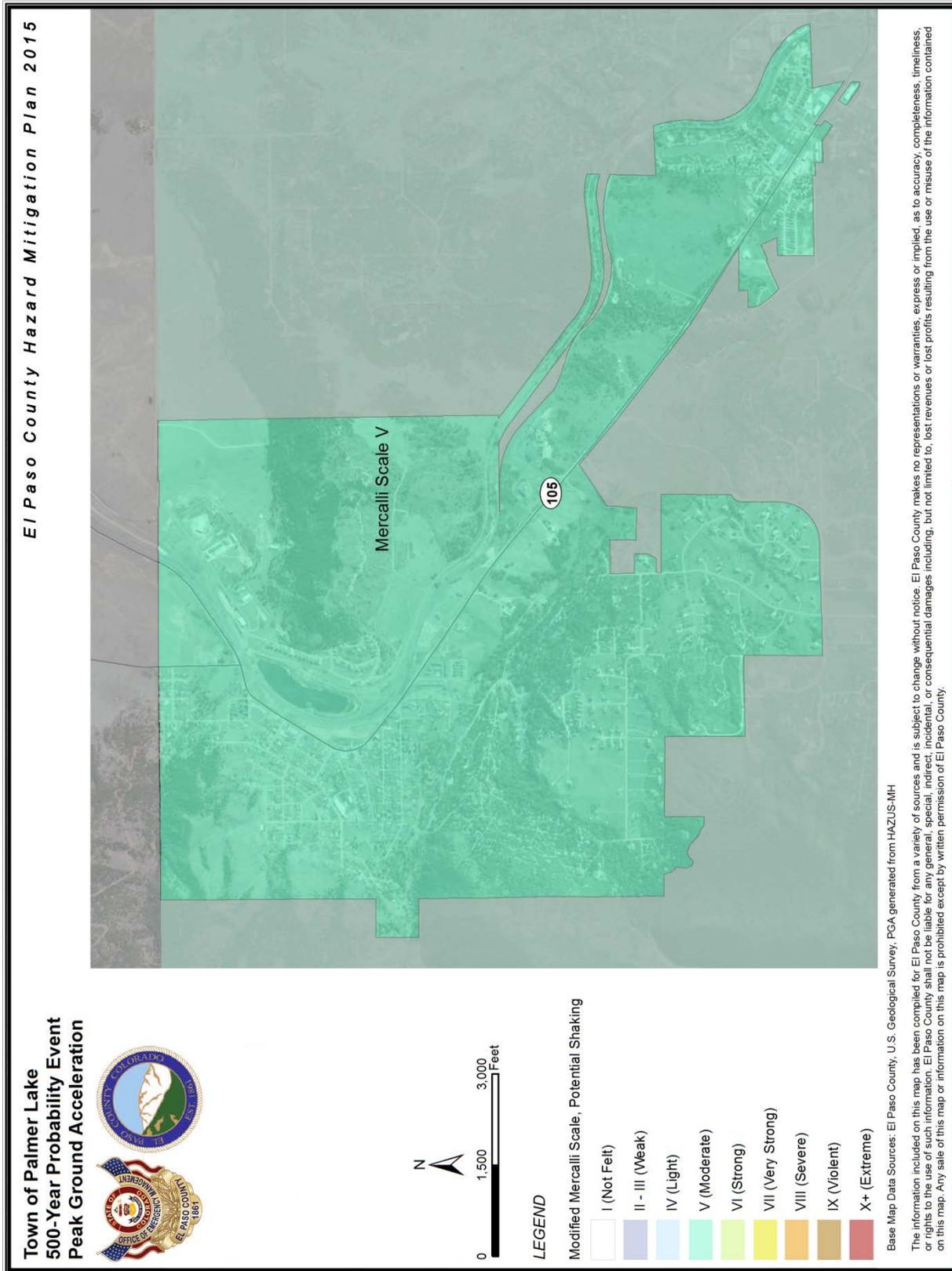


Figure 11-21. Town of Palmer Lake, 500-Year Probability Event, Peak Ground Acceleration

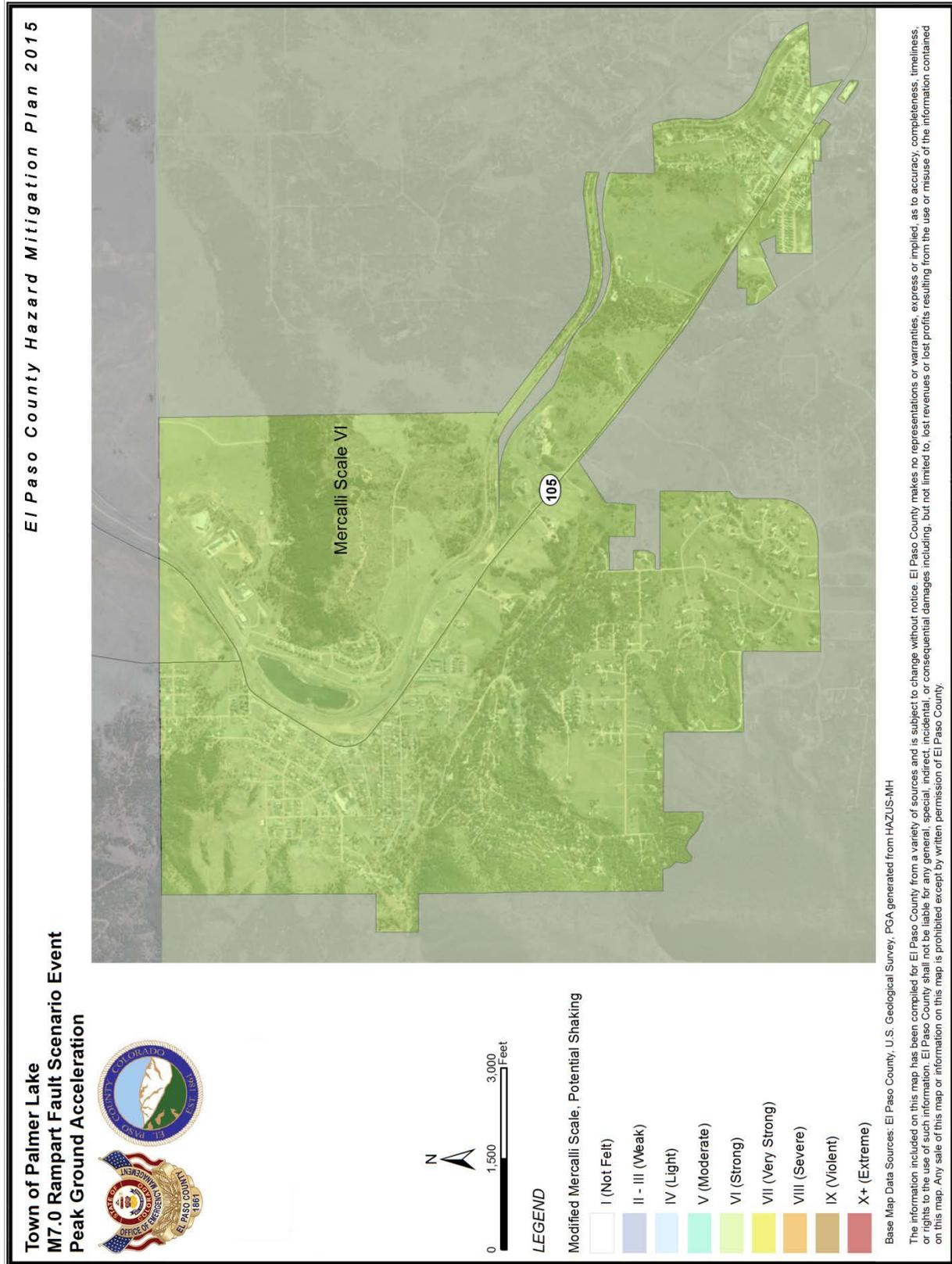


Figure 11-22. Town of Palmer Lake, M7.0 Rampart Fault Scenario Event, Peak Ground Acceleration

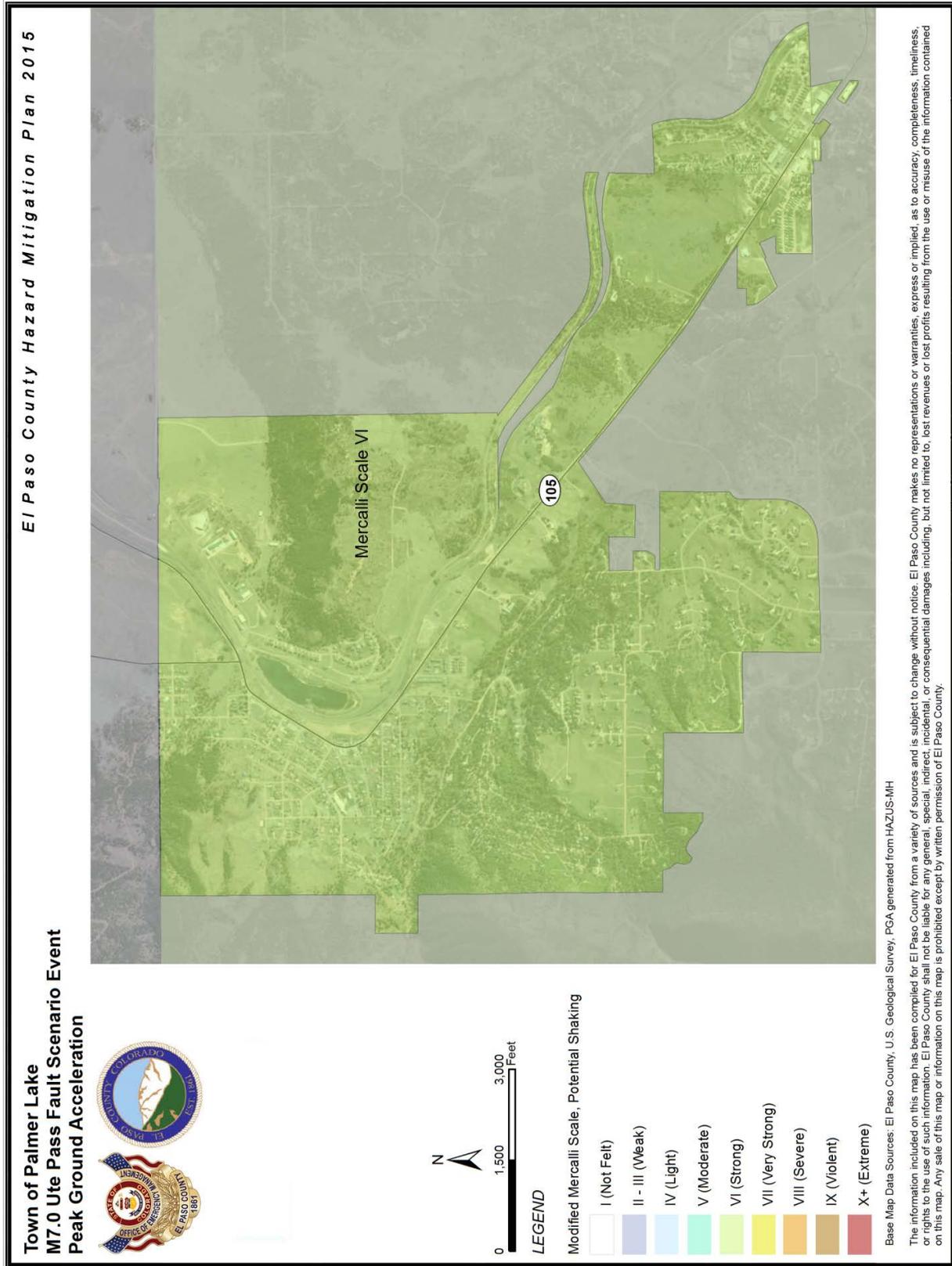


Figure 11-23. Town of Palmer Lake, M7.0 Ute Pass Fault Scenario Event, Peak Ground Acceleration

11.2.3 Frequency

Research based on Colorado's earthquake history suggests that an earthquake of 6.3 or larger has a one percent (1 percent) probability of occurring each year somewhere in Colorado (Charlie, Doehring, Oaks Colorado Earthquake Hazard Reduction Program Open File Report 93-01, 1993). 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. The probability of such an event occurring in the next 150 years is 6 percent or less (Figure 11-24). Small earthquakes that cause no or little damage are more likely. Overall, the probability of a damaging earthquake somewhere in the county is considered occasional, 1- to 10-percent chance of occurrence in any given year, or a recurrence interval of 11 to 100 years.

Source: USGS, 2010a

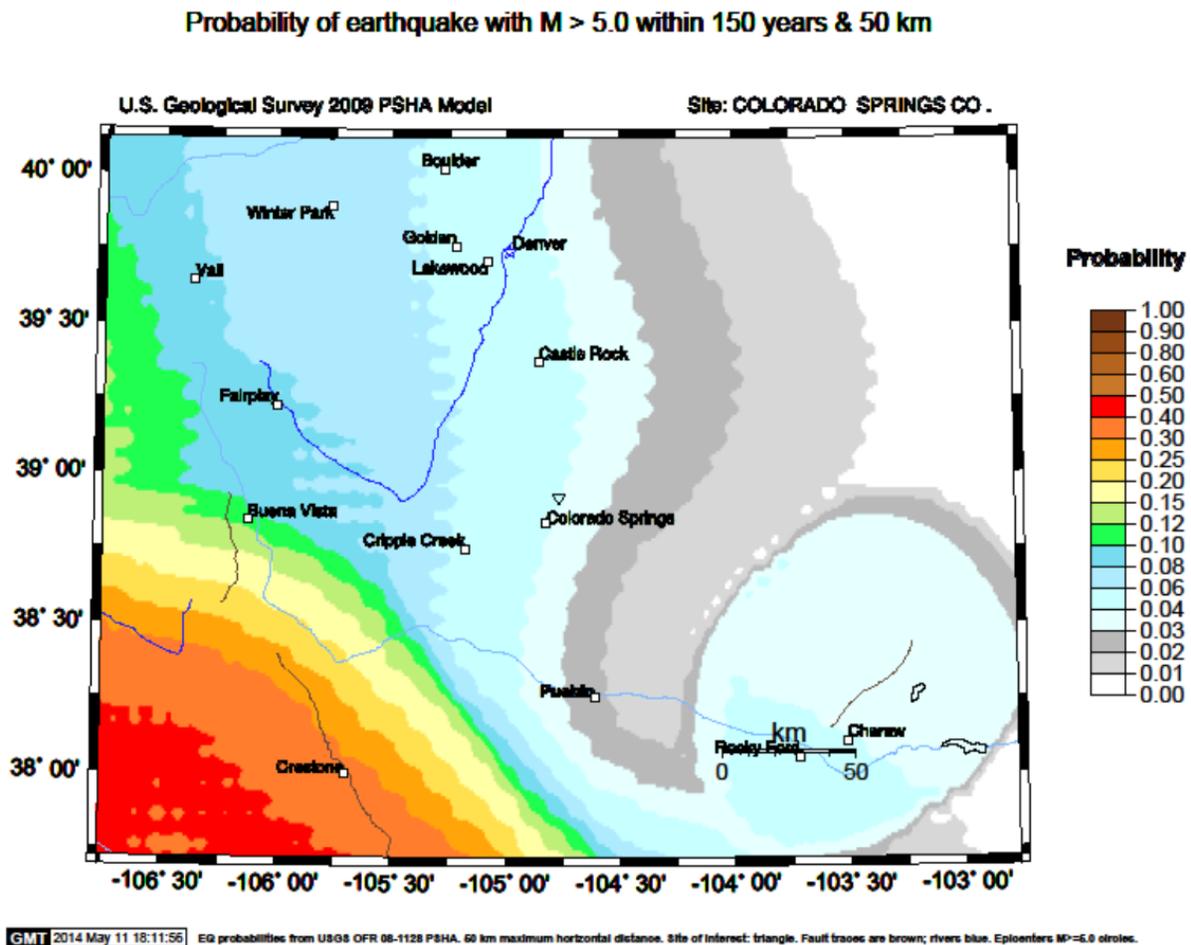


Figure 11-24. Probability of Earthquake with Magnitude Greater Than 5.0 Occurring Within 50 Kilometers of Colorado Springs, Colorado in 150 years

11.2.4 Severity

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

According to the information in this hazard profile, a large earthquake's impact on the county could be considered critical—25 to 50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability. Due to the low probability of damaging earthquakes, the overall significance is considered low, with limited potential impact.

The severity of an earthquake can be expressed in terms of intensity or magnitude. Intensity represents the observed effects of ground shaking on people, buildings, and natural features. The USGS has created ground motion maps based on current information about several fault zones. These maps show the PGA that has a certain probability (2 percent or 10 percent) of being exceeded in a 50-year period, as shown in Figure 11-25. The PGA is measured in numbers of g's (the acceleration associated with gravity).

Magnitude is related to the amount of seismic energy released at the hypocenter of an earthquake. It is determined by the amplitude of the earthquake waves recorded on instruments. Whereas intensity varies depending on location with respect to the earthquake epicenter, magnitude is represented by a single, instrumentally determined value for each earthquake event.

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

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

Source: FEMA.gov

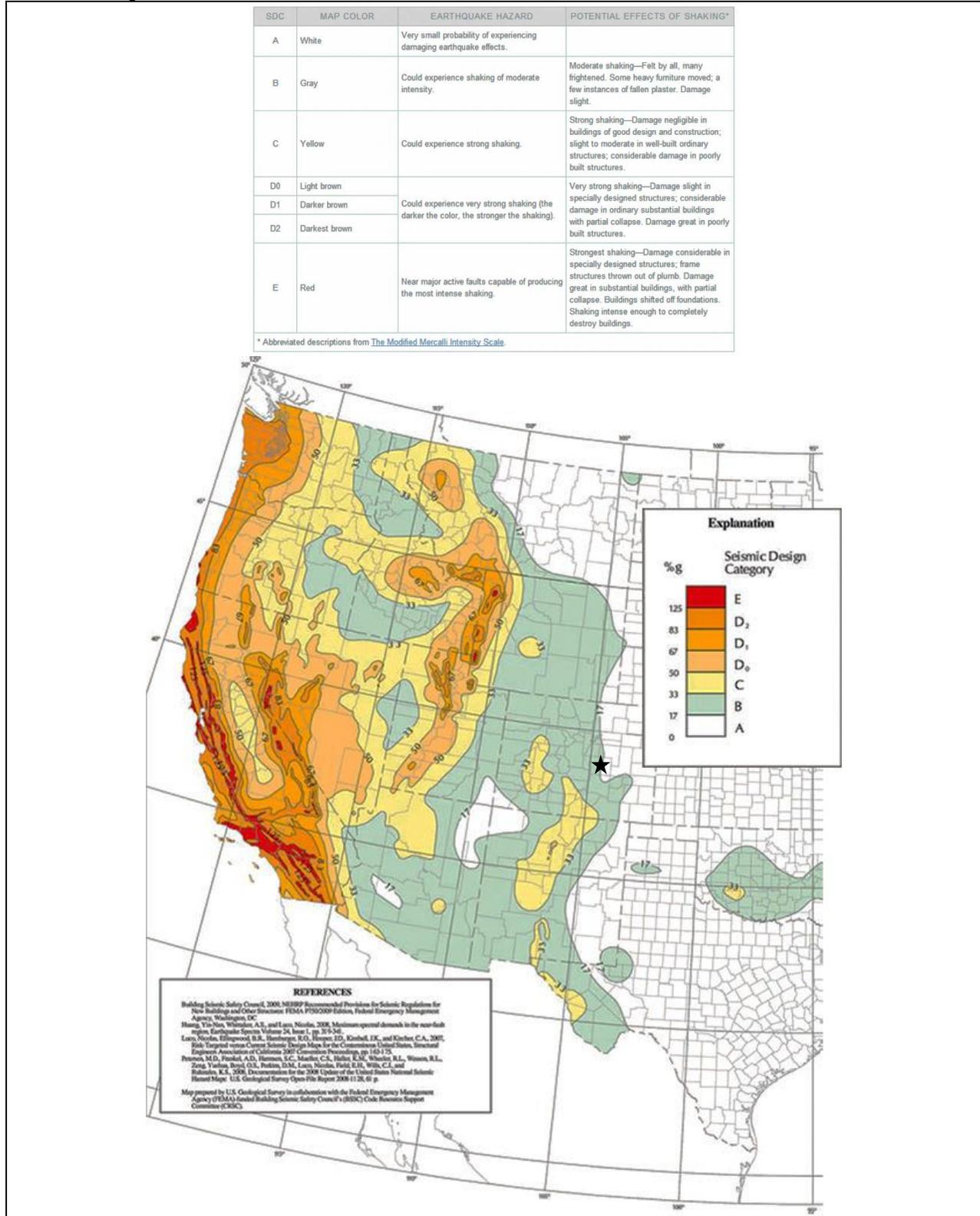


Figure 11-25. Earthquake Hazard and Potential Effects of Shaking

11.2.5 Warning Time

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 for someone to get under a desk, step away from a hazardous material they are working with, or shut down a computer system.

11.3 SECONDARY HAZARDS

Earthquakes can cause large and sometimes disastrous landslides and mudslides. River valleys are vulnerable to slope failure, often as a result 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. Earthen dams and levees are highly susceptible to seismic events and the impacts of their eventual failures can be considered secondary risks for earthquakes.

11.4 CLIMATE CHANGE IMPACTS

The impacts of global climate change on earthquake probability are unknown. Some scientists say that melting glaciers could induce tectonic activity. As ice melts and water runs off, tremendous amounts of weight are shifted on the earth's crust. As newly freed crust returns to its original, pre-glacier shape, it could cause seismic plates to slip and stimulate volcanic activity according to research into prehistoric earthquakes and volcanic activity. NASA and USGS scientists found that retreating glaciers in southern Alaska may be opening the way for future earthquakes (NASA, 2004).

Secondary impacts of earthquakes could be magnified by climate change. Soils saturated by repetitive storms could experience liquefaction during seismic activity due to the increased saturation. Dams storing increased volumes of water due to changes in the hydrograph could fail during seismic events. There are currently no models available to estimate these impacts.

11.5 EXPOSURE

11.5.1 Population

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

11.5.2 Property

According to County Assessor records, there are 234,843 buildings in the planning area, with a total assessed value of \$117 billion. Since all structures in the planning area are susceptible to earthquake impacts to varying degrees, this total represents the county-wide property exposure to seismic events. Most of the buildings (90 percent) are residential.

11.5.3 Critical Facilities and Infrastructure

All critical facilities in the planning area are exposed to the earthquake hazard. Table 6-3 lists the number of each type of facility by jurisdiction. 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.

11.5.4 Environment

Secondary hazards associated with earthquakes will likely have some of the most damaging effects on the environment. Earthquake-induced landslides can significantly impact surrounding habitat. It is also possible for streams to be rerouted after an earthquake. This can change the water quality, possibly damaging habitat and feeding areas. There is a possibility of streams fed by groundwater drying up because of changes in underlying geology.

11.6 VULNERABILITY

Earthquake vulnerability data was generated using a Level 2 HAZUS-MH analysis. Once the location and size of a hypothetical earthquake are identified, HAZUS-MH estimates the intensity of the ground shaking, the number of buildings damaged, the number of casualties, the damage to transportation systems and utilities, the number of people displaced from their homes, and the estimated cost of repair and clean up.

11.6.1 Population

Three population groups are particularly vulnerable to earthquake hazards:

- **Linguistically Isolated Populations**—Approximately 11.3 percent of the planning area population over 5 years old speaks a primary language other than English (U.S. Census Bureau, 2008-2012). Problems arise when there is an urgent need to inform non-English speaking residents of an earthquake event. They are vulnerable because of difficulties in understanding hazard-related information from predominantly English-speaking media and government agencies.
- **Population Below Poverty Level**—Families with incomes below the poverty level in 2012 made up 12.5 percent of the total county population (U.S. Census Bureau, 2008-2012). These families may lack the financial resources to improve their homes to prevent or mitigate earthquake damage. Poorer residents are also less likely to have insurance to compensate for losses in earthquakes.
- **Population Over 65 Years Old**—Approximately 10.7 percent of the residents in the planning area are over 65 years old (U.S. Census Bureau, 2012). This population group is vulnerable because they are more likely to need special medical attention, which may not be available due to isolation caused by earthquakes. Elderly residents also have more difficulty leaving their homes during earthquake events and could be stranded in dangerous situations.

Impacts on persons and households in the planning area were estimated for the 500-year probabilistic earthquake, the Rampart Fault scenario event and the Ute Fault scenario event through the Level 2 HAZUS-MH analysis. Table 11-3 summarizes the results.

TABLE 11-3. ESTIMATED EARTHQUAKE IMPACT ON PERSONS AND HOUSEHOLDS		
	Number of Displaced Households	Number of Persons Requiring Short-Term Shelter
500-Year Earthquake	3	2
Rampart Fault Scenario	300	189
Ute Pass Fault Scenario	300	189

11.6.2 Property

Building Age

Table 11-4 identifies significant milestones in building and seismic code requirements that directly affect the structural integrity of development. Using these time periods, the planning team used HAZUS to identify the number of structures in the planning area by date of construction. The number of structures does not reflect the number of total housing units, as many multi-family units and attached housing units are reported as one structure. Approximately 36 percent of the planning area’s structures were constructed after the Uniform Building Code was amended in 1994 to include seismic safety provisions. Approximately 6 percent were built before 1933 when there were no building permits, inspections, or seismic standards.

Loss Potential

Property losses were estimated through the Level 2 HAZUS-MH analysis for the 500-year earthquake, Rampart Fault scenario event and the Ute Pass scenario event. Table 11-5, Table 11-6, and Table 11-7 show the results for two types of property loss:

- Structural loss, representing damage to building structures
- Non-structural loss, representing the value of lost contents and inventory, relocation, income loss, rental loss, and wage loss.

TABLE 11-4. AGE OF STRUCTURES IN PLANNING AREA		
Time Period	Number of Current Planning Area Structures Built in Period	Significance of Time Frame
Pre-1933	13,455	Before 1933, there were no explicit earthquake requirements in building codes. State law did not require local governments to have building officials or issue building permits.
1933-1940	1,524	In 1940, the first strong motion recording was made.

**TABLE 11-4.
AGE OF STRUCTURES IN PLANNING AREA**

Time Period	Number of Current Planning Area Structures Built in Period	Significance of Time Frame
1941-1960	21,500	In 1960, the Structural Engineers Association of California published guidelines on recommended earthquake provisions.
1961-1975	43,945	In 1975, significant improvements were made to lateral force requirements.
1976-1994	69,909	In 1994, the Uniform Building Code was amended to include provisions for seismic safety.
1995 - present	84,510	Seismic code is currently enforced.
Total	234,843	

**TABLE 11-5.
LOSS ESTIMATES FOR 500- YEAR PROBABILISTIC EARTHQUAKE**

	Estimated Loss Associated with Earthquake		
	Structure	Contents	Total
Calhan	\$53,237	\$6,091	\$59,238
Colorado Springs	\$32,908,949	\$5,158,515	\$38,067,463
Fountain	\$1,113,874	\$154,457	\$1,268,330
Green Mt. Falls	\$84,336	\$12,608	\$96,944
Manitou Springs	\$504,415	\$77,413	\$581,828
Monument	\$613,145	\$91,031	\$704,176
Palmer Lake	\$203,584	\$33,714	\$237,298
Ramah	\$6,057	\$693	\$6,750
Unincorporated	\$8,237,862	\$1,093,806	\$9,331,668
Total	\$43,752,459	\$6,628,328	\$50,353,786

**TABLE 11-6.
LOSS ESTIMATES FOR THE RAMPART FAULT EARTHQUAKE SCENARIO**

	Estimated Loss Associated with Earthquake		
	Structure	Contents	Total
Calhan	\$828,228	\$218,544	\$1,046,773
Colorado Springs	\$1,039,009,387	\$273,561,782	\$1,312,571,168
Fountain	\$35,877,209	\$9,312,067	\$45,189,276

TABLE 11-6. LOSS ESTIMATES FOR THE RAMPART FAULT EARTHQUAKE SCENARIO			
	Estimated Loss Associated with Earthquake		
	Structure	Contents	Total
Green Mt. Falls	\$1,984,192	\$497,268	\$2,481,460
Manitou Springs	\$13,357,506	\$3,362,269	\$16,719,775
Monument	\$17,822,954	\$4,595,299	\$22,418,253
Palmer Lake	\$5,572,832	\$1,482,311	\$7,055,142
Ramah	\$94,229	\$24,864	\$119,093
Unincorporated	\$252,753	\$64,955,344	\$317,709,107
Total	\$1,367,300,298	\$358,009,747	\$1,725,310,045

TABLE 11-7. LOSS ESTIMATES FOR THE UTE PASS FAULT EARTHQUAKE SCENARIO			
	Estimated Loss Associated with Earthquake		
	Structure	Contents	Total
Calhan	\$611,379	\$153,989	\$765,367
Colorado Springs	\$1,039,015,878	\$273,563,643	\$1,312,579,521
Fountain	\$35,886,382	\$9,314,698	\$45,201,080
Green Mt. Falls	\$1,984,192	\$497,268	\$2,481,460
Manitou Springs	\$13,357,506	\$3,362,269	\$16,719,775
Monument	\$17,822,954	\$4,595,299	\$22,418,253
Palmer Lake	\$5,572,832	\$1,482,311	\$7,055,142
Ramah	\$69,558	\$17,520	\$87,077
Unincorporated	\$252,459,207	\$6,4854,353	\$317,313,560
Total	\$1,366,779,888	\$357,841,348	\$1,724,621,236

The total of the two types of losses is also shown in the tables. A summary of the property-related loss results is as follows:

- For a 500-year probabilistic earthquake, the estimated damage potential is \$50.35 million, or 0.04 percent of the total assessed value for the planning area.
- For a 7.0-magnitude Rampart Fault event, the estimated damage potential is \$1.73 billion, or 1.47 percent of the total assessed value for the planning area.
- For a 7.0-magnitude Ute Pass Fault event, the estimated damage potential is \$1.72 billion, or 1.47 percent of the total assessed value for the planning area.

The HAZUS-MH analysis also estimated the amount of earthquake-caused debris in the planning area for the 500-year earthquakes, Rampart Fault scenario event, and the Ute Pass Fault scenario event, as summarized in Table 11-8.

TABLE 11-8. ESTIMATED EARTHQUAKE-CAUSED DEBRIS	
Debris to Be Removed (tons)	
500-Year Earthquake	17,750
Rampart Fault Scenario	565,150
Ute Pass Fault Scenario	564,900

11.6.3 Critical Facilities and Infrastructure

Level of Damage

HAZUS-MH classifies the vulnerability of critical facilities to earthquake damage in five categories: no damage, slight damage, moderate damage, extensive damage, or complete damage. The model was used to assign a vulnerability category to each critical facility in the planning area except HAZMAT facilities and “other infrastructure” facilities, for which there are no established damage functions. The analysis of critical facilities in the planning area was performed for the 500-year and Rampart Fault earthquake events. Table 11-9 and Table 11-10 summarize the results.

Time to Return to Functionality

HAZUS-MH estimates the time to restore critical facilities to fully functional use. Results are presented as probability of being functional at specified time increments: 1, 3, 7, 14, 30 and 90 days after the event. For example, HAZUS-MH may estimate that a facility has 5 percent chance of being fully functional at Day 3, and a 95-percent chance of being fully functional at Day 90. The analysis of critical facilities in the planning area was performed for the 500-year and Rampart Fault earthquake events. Table 11-11 and Table 11-12 summarize the results.

11.6.4 Environment

The environment vulnerable to earthquake hazard is the same as the environment exposed to the hazard.

TABLE 11-9. ESTIMATED DAMAGE TO CRITICAL FACILITIES FROM 500-YEAR EARTHQUAKE					
Category ^a	No Damage	Slight Damage	Moderate Damage	Extensive Damage	Complete Damage
Medical and Health	9	0	0	0	0
Government Functions	3	0	0	0	0
Protective Functions	53	2	0	0	0
Schools	271	4	0	0	0
Bridges	439	0	0	0	0
Water Supply	6	0	0	0	0
Wastewater	9	0	0	0	0
Power	11	0	0	0	0
Communications	33	0	0	0	0
Transportation	16	0	0	0	0
Total	850	6	0	0	0

Vulnerability not estimated for dams or hazardous materials due to lack of established damage functions for this type of facilities.

TABLE 11-10. ESTIMATED DAMAGE TO CRITICAL FACILITIES FROM RAMPART FAULT SCENARIO					
Category ^a	No Damage	Slight Damage	Moderate Damage	Extensive Damage	Complete Damage
Medical and Health	9	0	0	0	0
Government Functions	1	2	0	0	0
Protective Functions	44	11	0	0	0
Schools	0	275	0	0	0
Bridges	439	0	0	0	0
Water Supply	2	4	0	0	0
Wastewater	0	9	0	0	0
Power	0	11	0	0	0
Communications	0	33	0	0	0
Transportation	10	6	0	0	0
Total	505	351	0	0	0

Vulnerability not estimated for dams or hazardous materials due to lack of established damage functions for this type of facilities.

**TABLE 11-11.
FUNCTIONALITY OF CRITICAL FACILITIES FOR 500-YEAR EVENT**

Planning Unit	# of Critical Facilities	Probability of Being Fully Functional (%)					
		at Day 1	at Day 3	at Day 7	at Day 14	at Day 30	at Day 90
Medical and Health	9	77	77	98	99	99	99
Government Functions	3	67	67	98	98	99	99
Protective Functions	55	89	89	99	99	99	99
Schools	275	52	53	97	98	99	99
Bridges	439	99	99	99	99	99	99
Water Supply	6	99	99	99	99	99	99
Wastewater	9	97	99	99	99	99	99
Power	11	98	99	99	99	99	99
Communications	33	99	99	99	99	99	99
Transportation	16	99	99	99	99	99	99
Total/Average	856	88	88	99	99	99	99

Vulnerability not estimated for dams or hazardous materials due to lack of established damage functions for this type of facilities.

**TABLE 11-12.
FUNCTIONALITY OF CRITICAL FACILITIES FOR RAMPART FAULT EVENT**

Planning Unit	# of Critical Facilities	Probability of Being Fully Functional (%)					
		at Day 1	at Day 3	at Day 7	at Day 14	at Day 30	at Day 90
Medical and Health	9	16	17	57	58	88	93
Government Functions	3	25	26	66	66	87	92
Protective Functions	55	58	58	85	86	96	98
Schools	275	3	5	54	55	82	88
Bridges	439	87	90	92	92	92	95
Water Supply	6	75	96	99	99	99	99
Wastewater	9	53	84	96	98	98	99
Power	11	62	88	96	99	99	99
Communications	33	89	98	99	99	99	99
Transportation	16	84	86	87	99	99	99
Total/Average	856	55	65	83	85	94	96

Vulnerability not estimated for dams or hazardous materials due to lack of established damage functions for this type of facilities.

11.7 FUTURE TRENDS IN DEVELOPMENT

Land use in the planning area will be directed by general plans adopted by the County and its partners as well as local permitting departments and zoning maps. Development in the planning area will be regulated through building standards and performance measures so that the degree of risk will be reduced. The International Building Code also establishes provisions to address seismic risk.

11.8 SCENARIO

An earthquake does not have to occur within the planning area to have a significant impact on the people, property and economy of the county. Any seismic activity of 6.0 or greater on faults within the planning area would have significant impacts throughout the county. Earthquakes of this magnitude or higher would lead to massive structural failure of property on highly liquefiable soils. Levees and revetments built on these poor soils would likely fail, representing a loss of critical infrastructure. These events could cause secondary hazards, including landslides and mudslides that would further damage structures. River valley hydraulic-fill sediment areas are also vulnerable to slope failure, often as a result of loss of cohesion in clay-rich soils.

11.9 ISSUES

Important issues associated with an earthquake include but are not limited to the following:

- Approximately 36 percent of the planning area's building stock was built prior to 1994, when seismic provisions became uniformly applied through building code applications.
- Critical facility owner 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 natural hazard events such as dam failures and landslides, which could severely impact the county.
- 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.
- The cost of retro-fitting buildings to meet earthquake seismicity standards may be cost-prohibitive.
- Dams located in the County may not have been engineered to withstand probable seismic events.
- Information regarding liquefaction susceptibility of soils in the planning area is lacking.

CHAPTER 12. EROSION AND DEPOSITION

EROSION AND DEPOSITION RANKING						
El Paso County	Calhan/Ramah	Fountain	Green Mountain Falls	Manitou Springs	Monument	Palmer Lake
High	Medium	Low	Medium	Low	Low	Medium

12.1 GENERAL BACKGROUND

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

DEFINITIONS

Soil Erosion— Soil erosion the removal and simultaneous transportation of earth materials from one location to another by water, wind, waves or moving ice.

Deposition— Deposition is the placing of eroded material in a new location

12.2 HAZARD PROFILE

12.2.1 Past Events

Soil erosion and deposition are ongoing events that can be impacted by both natural and human-induced processes. Both processes are continually occurring throughout the County. The intensity of these processes can be influenced by the previous or simultaneous occurrence of other natural hazard events such as wildland fires, droughts, or floods. The following description of some past events demonstrate the common causes and effects of erosion and deposition:

- In the City of Fountain, erosion has been encroaching on the Crest Mobile Home Park for several years. The end row was closed and a water line abandoned as a result of this erosion.
- In 1999 floodwaters from Fountain Creek undercut pavement and washed out soil from around a bridge, resulting in the closure of a portion of U.S. Highway 24. This erosion can be seen below in Figure 12-1. The erosion and flooding from the creek also resulted in the breaking of a wastewater pipe that spilled more than 60 million gallons of untreated wastewater into the creek. South of Colorado Springs, homes and businesses were threatened after significant erosion occurred (Figure 12-2).
- In 2012, flooding resulted in serious erosion damage to infrastructure along West Monument Creek. A soil washout resulted in the destabilization of a backup pipeline to the McCullough Water Treatment Plant, owned by Colorado Springs Utilities (Figure 12-3). The pipeline was unable to be used until the eroded soil was replaced and compacted.

Source: Colorado Water Conservation Board



Figure 12-1. Erosion Damage to U.S. 24 Bridge, 1999

Source: University Corporation for Atmospheric Research, 2013



Figure 12-2. Homes and Businesses Threatened After Erosion from Flood Waters, Fountain Creek, 1999

Source: El Paso County Public Information Officer Dave Rose



Figure 12-3. Damage to the Backup Pipeline to the McCullough Water Treatment Plant, West Monument Creek at Devil's Kitchen, 2012

- In August 2012, the Rainbow Falls Recreation Area, located near Manitou Springs was temporarily closed due to trail damage from storms. The significant stormwater runoff and erosion damaged the trail, including the washout of the primary trail to Rainbow Falls.

Fountain Creek Watershed

Erosion and sedimentation have been significant issues in the Fountain Creek watershed (Figure 12-4). The Fountain Creek Watershed Project was formed in 1995 to combat the numerous problems associated with streambank flooding and water quality occurring throughout the watershed. According to the Fountain Creek Watershed Study, the issues of flooding, erosion and sedimentation are interrelated and a simplified description of these issues is as follows:

- Population growth has led to changes in land use (e.g., increase in impervious surface area) and increased water use.
- Changes in land use and increased water use have led to an increase in the quantity of water, both peak flow and flow volume, in the stream system through increased flooding and increased baseflow.
- The stream system within the watershed is forced to “adjust” through the processes of erosion and sedimentation.
- Flooding, erosion, and sedimentation contribute to property and infrastructure damage, public health, safety, and welfare issues, and impacts to environmental resources (e.g., riparian habitat) and water quality.

Fountain Creek Watershed

Figure 1-3. Study Areas

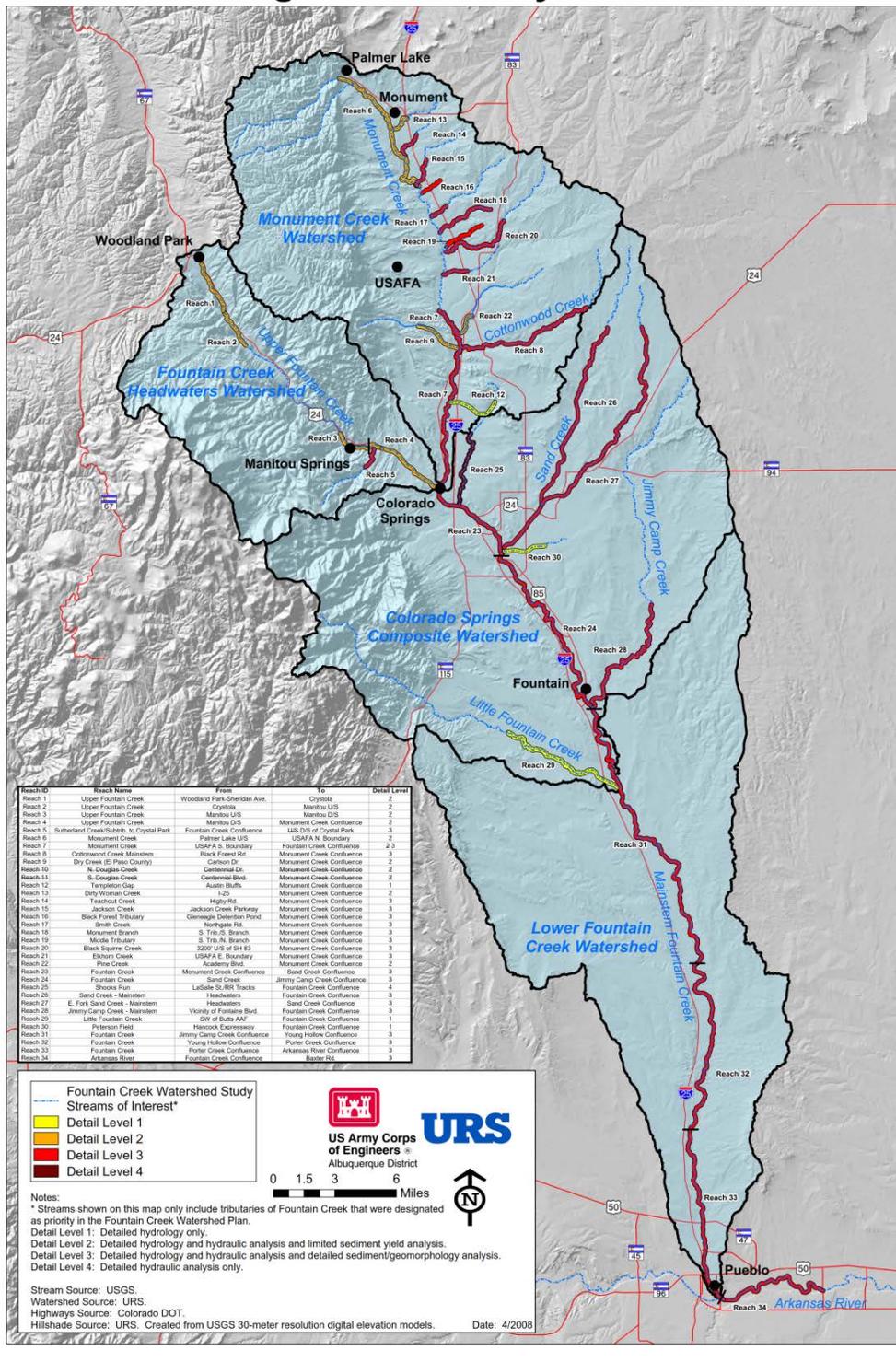


Figure 12-4. Fountain Creek Watershed Study Areas for U.S. Army Corps Report

Numerous studies have been conducted to better understand and assess these issues. Below are a few excerpts from the *Strategic Plan for the Fountain Creek Watershed* (Fountain Creek Vision Task Force, 2009) :

- Wetlands and riparian habitats at the headwaters of Fountain Creek are threatened by erosion and a variety of recreational activities occurring on Pikes Peak.
- Agricultural lands can negatively impact the quality of water in a riparian system if their management regime includes tilling practices that increase soil erosion or if fertilizers and pesticides added to croplands are transported into the water system.
- Specific factors leading to an increase in sediment transport include floodplain encroachment, construction and other ground disturbing activities, including higher frequency of channel forming flows (main stem and tributaries) and high flow events. The watershed has become increasingly urbanized which has led to higher base flow and more frequent flood flows.
- As the flows are increasing in the streams, the sediment transport capacity has also increased.
- Channel capacities have been reduced in the lower reaches of Fountain Creek due to sediment build-up and heavy vegetative growth, restricting channel widths and reducing channel depths. Study results indicate problems with sediment, flooding, and channel degradation ultimately threatening buildings and infrastructure.

12.2.2 Location

Soil erosion and deposition occur in all parts of the County. Point sources of erosion often occur in areas where humans interact with exposed areas of the earth's surface, such as construction sites. Waterways are continually involved in erosion and deposition processes. In El Paso County, most erosion is caused by water. There are many areas in the Fountain Creek Watershed that have been negatively impacted by erosion.

Erosion and deposition may be exacerbated in areas where wildfires have occurred. According to the State of Colorado's Hazard Mitigation Plan, "there is a high risk for erosion in the aftermath of a wildfire event. As a fire burns, it destroys plant material and the layers of litter that blanket the floor of an ecosystem. These materials, as well as trees, grasses, and shrubs, buffer and stabilize the soil from intense rainstorms. The plant materials slow runoff to give rainwater time to percolate into the ground. When fire destroys this protective layer, rain and wind wash over the unprotected soil and erosion occurs" (Colorado Division of Emergency Management, 2011). Areas in El Paso County that were recently burned or are located near areas or downstream from areas that were recently burned are more susceptible to exacerbated erosion and deposition.

After the 2012 Waldo Canyon Fire burned over 18,000 acres west of Colorado Springs, the burn area was assessed for burn severity and the potential for erosion hazards. Overall, burn severity was found to be 0.4 percent unburned, 41 percent low, 40 percent moderate, and 19 percent high (see Figure 12-5). Those areas in high and moderate severity have long-term soil damage and high erosion hazard (Young and Rust, 2012).

Source: U.S. Forest Service

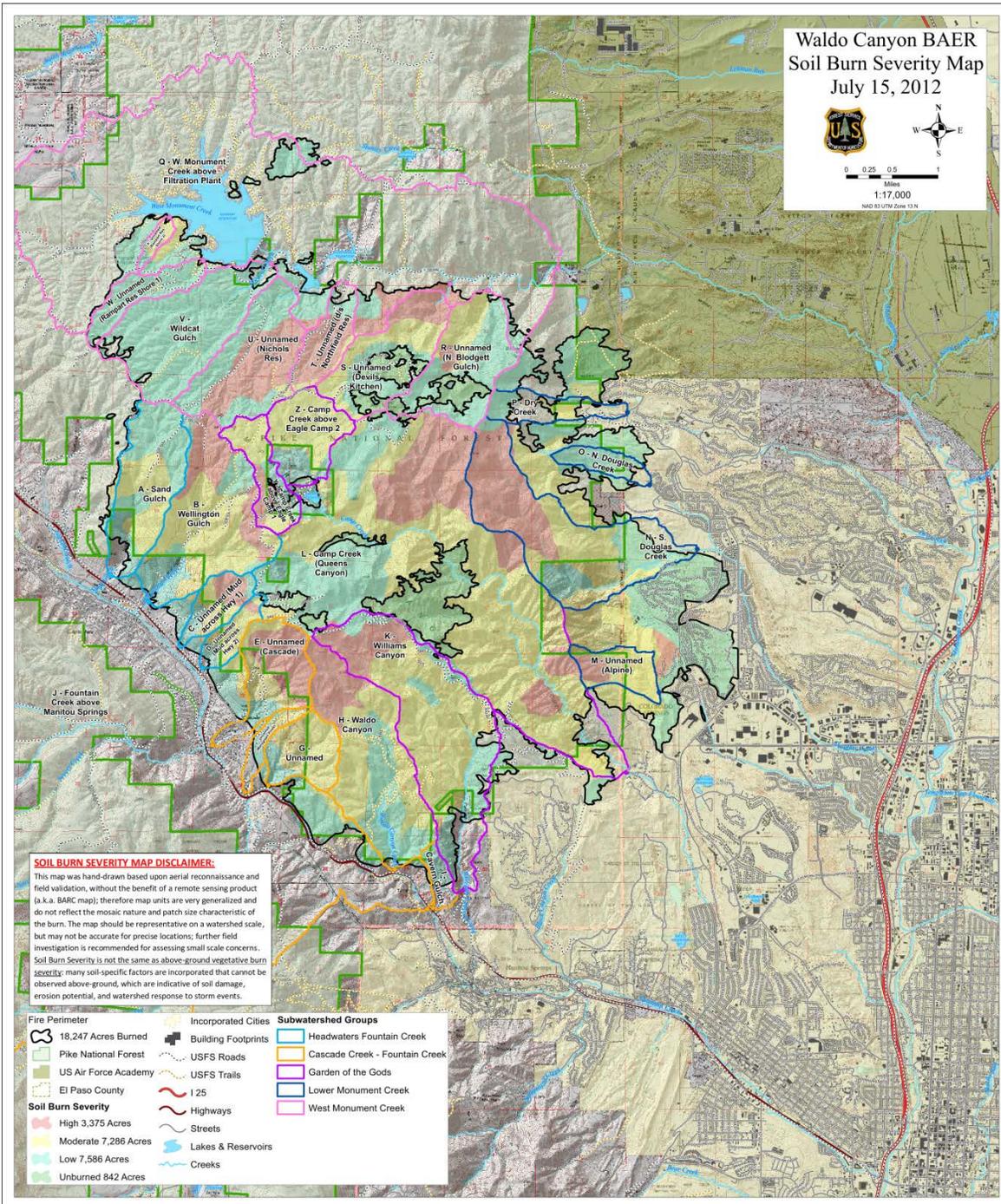


Figure 12-5. Soil Burn Severity after Waldo Canyon Fire, 2012

Soil Erosion Hazard Ratings (EHR) were also developed to assess the potential risk of a given soil to erode. According to the soil assessment report (Young and Rust, 2012):

Many interrelated factors are evaluated to determine whether land use activities would cause accelerated erosion. [The Waldo Canyon] rating system is based on soil texture, depth, clay content, infiltration, amount of rock fragments, surface cover (vegetative and surface rocks),

slope gradient, and climate. Risk ratings vary from low to very high, with low ratings meaning low probability of surface erosion occurring. Moderate ratings mean that accelerated erosion is likely to occur in most years and water quality impacts may occur for the upper part of the moderate numerical range. High to very high EHR ratings mean that accelerated erosion is likely to occur in most years and that erosion control measures should be evaluated.

The EHR ratings for the entire burn area were determined to be 19 percent low, 10 percent moderate, 56 percent high and 15 percent very high (Young and Rust, 2012). Several of the soil types rate as moderate to high even in less severely burned areas. In other words, several soils in the area are naturally erodible. The fire increases these already high erosion rates (Young and Rust, 2012). Hydrological soil groups are also a useful indicator of erosion potential. 92 percent of the soils in the Waldo Canyon burn perimeter are hydrological soil group D, which indicates a high potential for runoff and erosion (Young and Rust, 2012). Young and Rust estimate that “anticipated sediment production will be elevated 300 to 400 percent of pre-fire sediment movement” (Young and Rust, 2012). Figure 12-6 shows the geographic distribution of erosion hazard rating across the 2012 Waldo Canyon fire burn area.

Source: Young and Rust, 2012

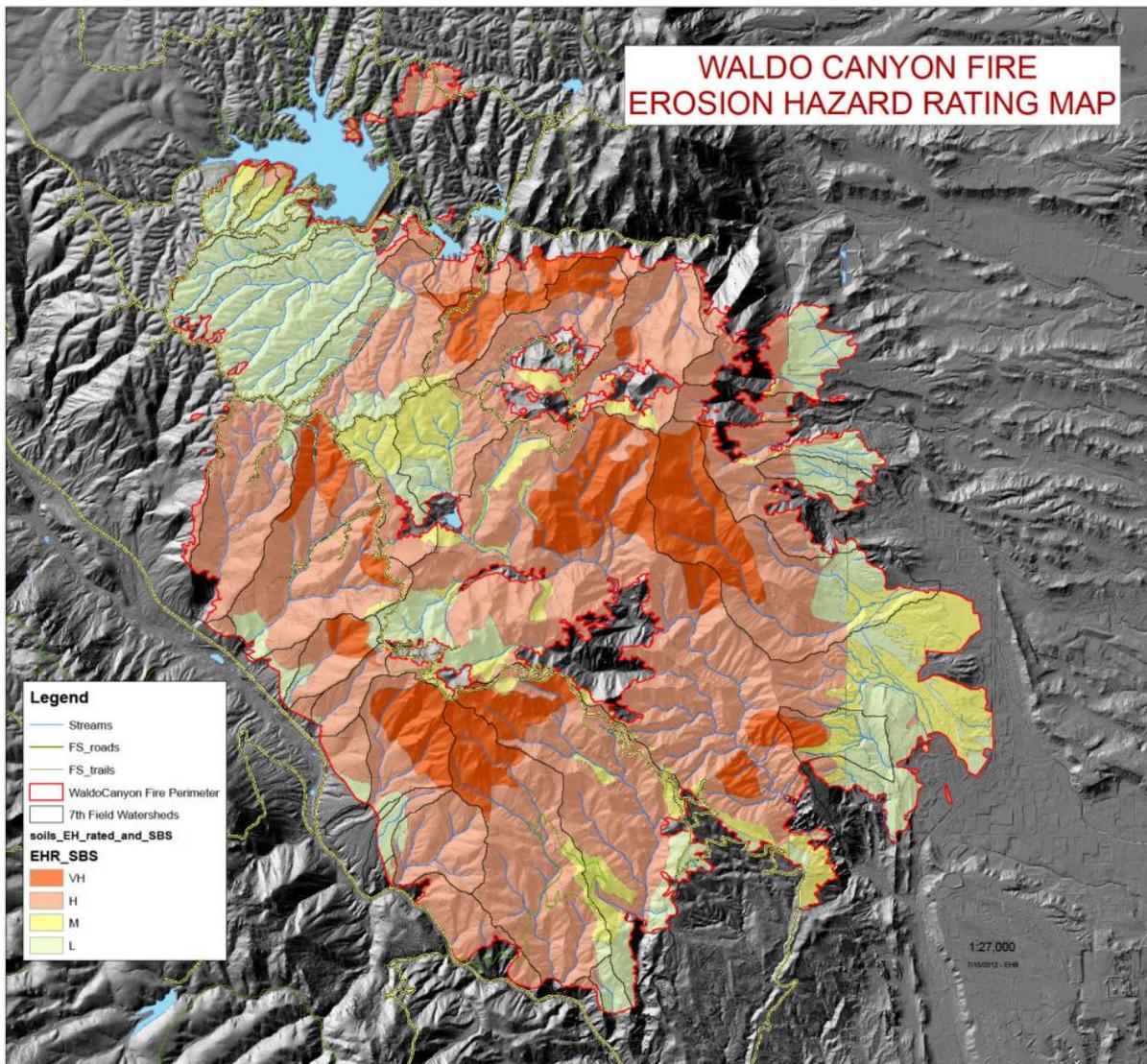


Figure 12-6. Waldo Canyon Fire Erosion Hazard Rating, 2012

12.2.3 Frequency

Erosion and deposition are occurring continuously throughout the County. Large precipitation events, wildfires, and human activity may influence the frequency or intensity of these events within the County.

12.2.4 Severity

The severity of soil erosion and deposition is 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 to people or property. These events can cause minor inconveniences or total destruction of property. The severity of erosion and deposition for the County is considered to be 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 24-72 hours.

12.2.5 Warning Time

Soil erosion and deposition generally occur gradually over time; however, these processes may be intensified as a result of natural or human-induced activities. Warnings for other hazard events, such as flooding, may provide advanced notice when severe erosion and deposition events are likely to occur.

12.3 SECONDARY HAZARDS

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 if loose soil is picked up by winds. Deposition can have impacts that aggravate flooding, bury crops, or reduce capacities of water reservoirs. Sedimentation from erosion and deposition can reduce channel capacity, which can increase the risk of flooding. Water quality can be impacted by erosion and deposition that can have detrimental impacts for both aquatic species and human consumption.

12.4 CLIMATE CHANGE IMPACTS

Changes in precipitation events and the hydrological cycle may result in changes in the rate of erosion and deposition. According to a 2003 paper published by the Soil and Water Conservation Society (Soil and Water Conservation, 2003):

The potential for climate change—as expressed in changed precipitation regimes—to increase the risk of soil erosion, surface runoff, and related environmental consequences is clear. The actual damage that would result from such a change is unclear. Regional, seasonal, and temporal variability in precipitation is large, both in simulated climate regimes and in the existing climate record. Different landscapes vary greatly in their vulnerability to soil erosion and runoff. Timing of agricultural production practices creates even greater vulnerabilities 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 particular change in precipitation regime will be complex.

Additionally, changes in wildfire occurrences and behavior resulting from climate change may also impact the occurrence of soil erosion and deposition within the County.

12.5 EXPOSURE

A quantitative assessment of population, property and critical facilities exposed to erosion and deposition is not available with currently available data. However, this hazard is directly related to flood and wildfire

risk and exposure. Please refer to Chapter 13 and Chapter 22 for more information about exposure to these hazards.

12.5.1 Population

Residents of the County living or travelling in areas prone to erosion and deposition are exposed to the hazard. Population exposure estimates are unavailable; however, they may correspond to some extent to those populations within flood hazard areas and those in, near, or downstream from recent wildfire burn perimeters.

12.5.2 Property

Structures and other improvements located in areas prone to erosion are exposed to risk from these hazards, such as bridges and structures located near stream channels. Additionally, property located in, near or downstream from recent wildfire burn scars are likely exposed to erosion and deposition hazards.

12.5.3 Critical Facilities and Infrastructure

Any critical facilities or infrastructure that are located on or near areas prone to soil erosion are exposed to risk from the hazard. Those facilities that are exposed to flood-hazard areas may also be exposed to erosion and deposition. Additionally, facilities and infrastructure located in, near or downstream from recent wildfire burn scars are likely exposed to erosion and deposition hazards.

12.5.4 Environment

Erosion and deposition are naturally occurring processes, but can still cause damage to the natural environment. Areas in, near or downstream from recent wildfire burns may have increased exposure to negative effects of erosion and deposition.

12.6 VULNERABILITY

12.6.1 Population

The risk of injury or fatalities as a result of these hazards are limited, but possible. Erosion can adversely impact populations who have respiratory issues by reducing air quality if particles become airborne, so those with existing respiratory issues are likely to be more vulnerable. Additionally, populations may become isolated if transportation routes are cut off as a result of erosion or undercutting. Populations in or on structures experiencing severe undercutting are also vulnerable.

12.6.2 Property

Property exposed to erosion can sustain minor damages or can result in complete destruction. Structures exposed to erosion hazard areas may be undermined, resulting in damages or may be more likely to be impacted by debris-flow events. Either of these situations may result in the condemnation of a structure. Additionally, physical loss of land area may occur as a result of erosion. Loss estimations for the erosion hazards are not based on damage functions, because no such damage functions have been generated.

12.6.3 Critical Facilities and Infrastructure

Erosion can result in serious structural damage to critical facilities and infrastructure such as, roads, bridges, irrigation ditches, underground utilities, and pipelines. Structures and underground utilities found in areas prone to soil erosion can suffer distress and undermined foundations may result.

12.6.4 Environment

Increased sedimentation as a result of erosion and deposition often degrades habitat. However, some erosion and disposition is required for healthful ecosystem functioning. Ecosystems that are already

exposed to other pressures, such as encroaching development or a recent wildfire may be more vulnerable to impacts from these hazards.

12.7 FUTURE TRENDS IN DEVELOPMENT

Typically, erosion issues generally do not impact land use except along river channels. Issues pertaining to land use in these areas are likely addressed through jurisdictional floodplain ordinances and regulations. Current floodplain regulations state that structures in the floodplain must be built with appropriate considerations from erosion and scour. Additionally, communities may consider implementing low impact development regulations to reduce impacts of future development in the County.

12.8 SCENARIO

A worst-case scenario for erosion would be that severe bank erosion would undermine a number of facilities and structures. This undermining may result in closed transportation routes or the condemnation of structures. If flood warnings were not issued or heeded before this severe scour, loss of life could occur.

12.9 ISSUES

The major issues for erosion and deposition are the following:

- Human activities greatly influence the rate and extent of erosion and deposition. Activities should be evaluated before proceeding with them.
- Riverine erosion can reduce water quality and impact aquatic habitat as well as impacting private property and critical infrastructure.
- 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.
- The impacts of climate change on erosion and deposition are uncertain.
- Wildfires can greatly increase the rate and severity of erosion and deposition events.

CHAPTER 13. FLOODING

FLOODING RANKING						
El Paso County	Calhan/Ramah	Fountain	Green Mountain Falls	Manitou Springs	Monument	Palmer Lake
High	Medium	Medium	Medium	High	Low	High

13.1 GENERAL BACKGROUND

13.1.1 Flood

The following description of flooding is excerpted from the 2013 State of Colorado Flood Mitigation Plan.

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

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

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

The causes of floods relate directly to the accumulation of water from precipitation, rapid snowmelt, or the failure of manmade structures, such as dams or levees. Floods caused by precipitation are further classified as coming from: rain in a general storm system, rain in a localized intense thunderstorm, melting snow, rain on melting snow, and ice jams. Floods may also be caused by structural or hydrologic failures of dams or levees. A hydrologic failure occurs when the volume of water behind the dam or levee exceeds the structure’s capacity resulting in overtopping. Structural failure arises when the physical stability of the dam or levee is compromised because of age, poor construction and maintenance, seismic activity, rodent tunneling, or myriad other causes. For more information on floods resulting from dam and levee failure refer to Chapter 9 of this plan.

DEFINITIONS

Flood—The inundation of normally dry land resulting from the rising and overflowing of a body of water.

Floodplain—The land area along the sides of a river that becomes inundated with water during a flood.

100-Year Floodplain—The area flooded by a flood that has a 1-percent chance of being equaled or exceeded each year. This is a statistical average only; a 100-year flood can occur more than once in a short period of time. The 1-percent annual chance flood is the standard used by most federal and state agencies.

Return Period—The average number of years between occurrences of a hazard (equal to the inverse of the annual likelihood of occurrence).

Riparian Zone—The area along the banks of a natural watercourse.

General Rain Floods

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

Thunderstorm Floods

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

Snowmelt Floods

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

Rain on Snowmelt Floods

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

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

Ice Jam Floods

Ice jam floods can occur by two phenomena. In the mountain floodplains during extended cold periods of 20 to 40 degrees F below zero, the streams ice over. The channels are frozen solid and overbank flow occurs, which results in ice inundation in the floodplains. Ice jam floods also can occur when frozen water in the upper reaches of a stream abruptly begins to melt from warm Chinook winds. Blocks of ice floating

downstream can become lodged at constrictions and form a jam. The jam can force water to be diverted from the stream channel causing a flood or an ice jam can break up, suddenly causing a surge of water as the “reservoir” that was formed behind it is suddenly released. Ice jamming occurs in slow moving streams where prolonged periods of cold weather are experienced. Sometimes the ice jams are dislodged by explosives, allowing a controlled release of the backed up water.

13.1.2 Floodplains

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

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

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

13.1.3 Measuring Floods and Floodplains

The frequency and severity of flooding are measured using a discharge probability, which is the probability that a certain river discharge (flow) level will be equaled or exceeded in a given year. Flood studies use historical records to estimate the probability of occurrence for the different discharge levels. The flood frequency equals 100 divided by the discharge probability. For example, the 100-year discharge has a 1-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 period. The same flood can have different recurrence intervals at different points on a river.

The extent of flooding 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.

13.1.4 Floodplain Ecosystems

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

13.1.5 Effects of Human Activities

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

13.1.6 Federal Flood Programs

National Flood Insurance Program

The NFIP makes federally backed flood insurance available to homeowners, renters, and business owners in participating communities. For most participating communities, FEMA has prepared a detailed Flood Insurance Study (FIS). The study presents water surface elevations for floods of various magnitudes, including the 1-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 (except for the Town of Ramah) 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 FIRM is August 23, 1999. 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.

The Community Rating System

The 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.

Figure 13-1 shows the nationwide number of CRS communities by class as of May 2012, when there were 1,211 communities receiving flood insurance premium discounts under the CRS program.

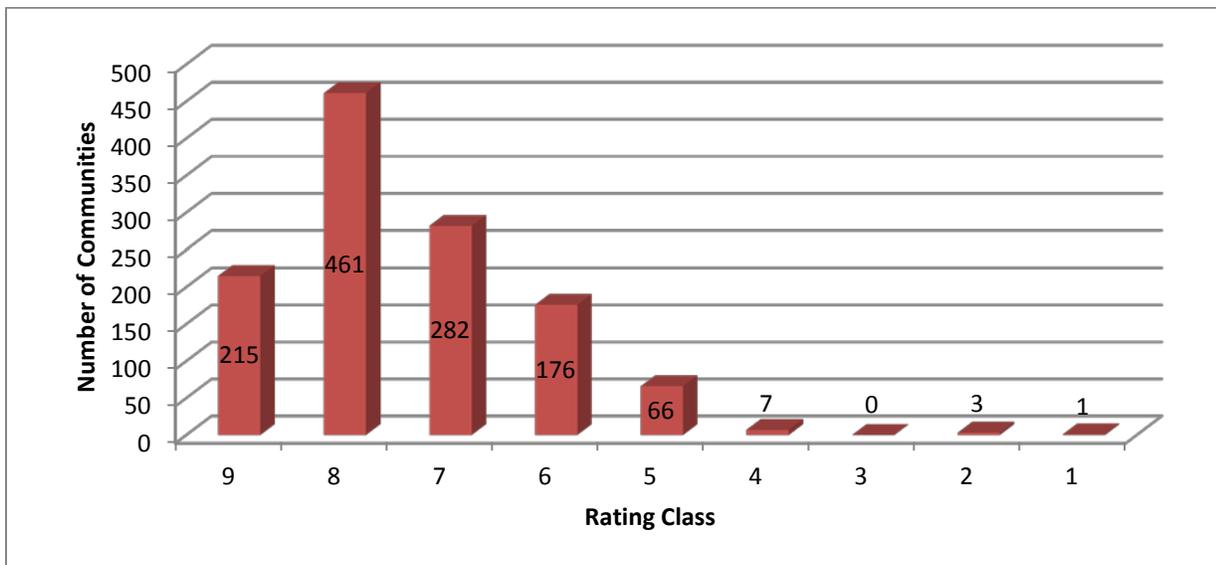


Figure 13-1. CRS Communities by Class Nationwide as of May 2012

CRS activities can help to 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 located in these communities. Communities receiving premium discounts through the CRS range from small to large and represent a broad mixture of flood risks. Table 13-1 below summarizes the number of policies, premiums and CRS savings for CRS communities in Colorado and El Paso County. Table 13-2 summarizes the participation of El Paso County and its municipalities in the CRS program.

	Policies in Force	Premium	CRS Savings
Colorado	15136	\$ 11,454,269	\$ 1,524,479
El Paso County	705	\$ 499,454	\$ 57,674
Town of Calhan	1	No Data Available	No Data Available
City of Colorado Springs	2366	\$ 1,443,266	\$ 142,697
City of Fountain	78	\$ 59,683	\$ 7,457

TABLE 13-1. POLICIES, PREMIUMS AND CRS SAVINGS FOR CRS COMMUNITIES			
	Policies in Force	Premium	CRS Savings
Town of Green Mountain Falls	22	\$ 24,002	\$ 3,734
City of Manitou Springs	178	\$ 239,868	\$ 39,102
Town of Monument	No Data Available		
Town of Palmer Lake	23	\$ 16,725	\$ 2,148
Town of Ramah	NP	NP	NP

Source: State CRS Summary: Colorado 01/2014

TABLE 13-2. CRS DATE OF PARTICIPATION AND CURRENT CLASS OF COMMUNITIES IN EL PASO COUNTY			
	CRS Entry Date	Current Effective Date	Current CRS Classification
Town of Calhan	NA	NA	NA
City of Colorado Springs	10/1/1992	5/1/2014	6
El Paso County	10/1/1992	10/1/2010	7
City of Fountain	10/1/1992	10/1/2010	7
Town of Green Mountain Falls	10/1/2003	10/1/2010	7
City of Manitou Springs	10/1/1992	10/1/2010	7
Town of Monument	10/1/2003	10/1/2010	7
Town of Palmer Lake	10/1/2003	10/1/2010	7
Town of Ramah	Not Participating		

13.2 HAZARD PROFILE

El Paso County is at greatest risk from large rain events that produce severe flash flooding. These rain events are most often microbursts, which produce a large amount of rainfall in a short amount of time. Flash floods, by their nature, occur suddenly but usually dissipate within hours. Despite their sudden nature, the National Weather Service is usually able to issue advisories, watches, and warnings in advance of a flood. In mountainous, rugged terrain, runoff can damage drainage systems or cause them to fail.

According to the National Weather Service’s hydrological guidance for El Paso County (NWS, 2010):

The plains and high valleys are generally sheltered from precipitation by the surrounding mountains. Wintertime extratropical systems moving in from the Pacific drop most of their moisture over the mountains with very little making it to the valley floors and plains.

Consequently, the wet season for the mountains occurs during the winter months, while the valleys and plains experience their dry season. The wet season for the valleys and plains comes during the spring and summer months in the form of afternoon and evening thunderstorms. In the spring and early summer, scattered thunderstorms generally form along the mountains in the afternoon and drift east over the valleys and plains through the evening. These storms can

produce locally heavy rainfall but are generally not flash flood producers. Occasionally, an extratropical disturbance will move through, triggering more intense activity that can result in flash flooding. Later in the summer, a seasonal wind shift known locally as the “monsoon” occurs. During this time of year, prevailing winds become more southerly, allowing increased moisture transport from subtropical latitudes. This usually occurs in the latter part of July and continues through August. It is at this time of year that the risk of flash flooding is probably greatest across southeast and south central Colorado. The flow of air from the subtropics during the “monsoon” is moisture laden and steering winds are very light. This makes for slow moving “heavy rainers.” In addition, the regularity of the monsoon can lead to repeated heavy rains over the same area day after day. This leads to saturated soils and an increased risk of flash flooding.

The potential for flooding can change and increase through various land use changes and changes to the land surface. A change in environment can create localized flooding problems inside and outside of natural floodplains by altering or confining watersheds or natural drainage channels. These changes are commonly created by human activities (e.g., development). These changes can also be created by other events such as wildfires.

Wildfires create hydrophobic soils, a hardening or “glazing” of the earth’s surface that prevents rainfall from being absorbed into the ground, thereby increasing runoff, erosion, and downstream sedimentation of channels. The effects of wildfires on flood are described in the hydrologist report following the 2012 Waldo Canyon fire as follows (Moore and Park, 2012):

The hydrologic cycle represents the process and pathways by which water is circulated from land and water bodies to the atmosphere and back again. Precipitation inputs (rain and snow, etc.) to a watershed are affected little by a wildfire. However, interception, infiltration, evapotranspiration, soil moisture storage, and the overland flow of water can be significantly affected by fire. Interception is the hydrologic process by which vegetative canopies and accumulation of litter and other decomposed organic matter on the soil surface interrupt the fall of precipitation from the atmosphere to the soil surface. After a wildfire, there often is a minor to significant loss of vegetation and the duff layer. Therefore, the soil surface is no longer protected from the energy of falling raindrops. The mineral surface can become compacted or dislodged by raindrop splash.

Precipitation that reaches the soil surface moves slowly down through the soils and then laterally to the stream channels. If more water is supplied to the site than can be infiltrated, the excess water flows on the surface as overland flow. Infiltration properties of the soil are altered when fire destroys vegetation and litter cover on a watershed. The soils can be affected by varying degrees, often resulting in decreased infiltration, and increased overland flows. Overland flow is a major contributor to many stream flow systems and the main contributor to most intermittent channels. This increase in overland flows is a major factor in increased stream flows and flood peakflows post wildfire. Changes in the hydrologic cycle caused by fires can affect the rate of soil erosion and the subsequent transport and deposition of eroded soil as sediment into streams, lakes, and reservoirs.

Potential flood impacts include loss of life, injuries, and property damage. Floods can also affect infrastructure (water, gas, sewer, and power utilities), transportation, jobs, tourism, the environment, and ultimately, local and regional economies.

13.2.1 Past Events

The National Climatic Data Center Storm Events Database and the Spatial Hazards Events and Loss Database for the United States list 23 flood events in El Paso County between 1979 and August 2014 for which estimated property damage costs were recorded. These events are listed in Table 13-3.

**TABLE 13-3.
EL PASO COUNTY FLOOD EVENTS WITH RECORDED PROPERTY DAMAGE, 1979 - 2014**

Location	Date	Estimated Property Damage
El Paso County	6/9/1979	\$794
El Paso County	6/19/1980	\$2,000,000
El Paso County	8/6/1981	\$80,000
El Paso County	6/3/1995	\$1,000,000
Manitou Springs	4/29/1999	\$28,000,000
Northern El Paso County/Monument Ridge	4/30/1999	\$2,000,000
Southern El Paso County/Colorado Springs and Vicinity	4/30/1999	\$14,000,000
Calhan	8/5/2004	\$200,000
Colorado Springs	6/21/2005	\$100,000
Peterson Air Force Base	9/12/2008	\$20,000
Green Mountain Falls	7/4/2010	\$5,000
Chipita Park	7/30/2012	\$15,000,000
Manitou Springs	7/30/2012	\$100,000
Colorado Springs	7/30/2012	\$20,000
Manitou Springs	7/1/2013	\$1,000,000
Manitou Springs	7/10/2013	\$100,000
Black Forest	8/4/2013	\$20,000
Cascade	8/9/2013	\$2,000,000
Green Mountain Falls	8/22/2013	\$40,000
Green Mountain Falls	8/22/2013	\$10,000
Manitou Springs	9/12/2013	\$100,000
Fountain	9/12/2013	\$3,000,000
Security	9/12/2013	\$7,000,000

Source: National Climatic Data Center and SHELDUS. Events before 1999 do not have jurisdiction-specific information available.

Notable incidents from the Storm Events Database and other resources are described below:

- April 1999**— Heavy rain, with amounts between 3 and 6 inches, swelled the Monument Creek and Fountain Creek watersheds to overflowing on April 29. The fast-moving waters caused much bank erosion and flooded many areas adjacent to Fountain Creek from Manitou Springs through Colorado Springs to Fountain. Damage to agricultural lands, irrigation systems, trails, roads, sewer treatment plants, and other public and private property was estimated at near \$30 million. The bridge at 21st Street over Fountain Creek in western Colorado Springs on Highway 24, the major east-west highway heading up into the mountains, was deemed unsafe, and was closed for three weeks. On April 30, power went out for about 24 hours in Fountain and surrounding area when power lines over Fountain Creek were brought down by floodwaters. Many sewer lines in southern Colorado Springs backed up into scores of residences and businesses, causing damage. The flooding in Manitou Springs is shown in Figure 13-2.

Source: U.S. Army Corps of Engineers



Figure 13-2. 1999 Flooding in Manitou Springs

- **July 2012**— Slow moving thunderstorms produced heavy rainfall of 1 to 3 inches across Black Forest and northern Colorado Springs. A drainage channel was heavily damaged by the fast-flowing high water. Heavy rain caused flash flooding and debris flows off of the Waldo Canyon burn scar. Debris flowed across US Highway 24 northwest of Cascade, closing the westbound lanes for a few hours. At Ute Pass Elementary School, playground equipment was destroyed and covered in mud, but the school building was undamaged. The rapid rise of flood waters during this event can be seen in Figure 13-3 and Figure 13-4 below. The images were taken approximately 35 minutes apart.

Source: Photos courtesy of Tom Gill and Steve Reed



Figure 13-3. Monument Creek Flooding 5:15pm, 2012

Source: Photos courtesy of Tom Gill and Steve Reed



Figure 13-4. Monument Creek Flooding 5:50pm, 2012

- **August 2013**— Very heavy rainfall of around 1.5 inches (with rainfall rates up to 5 inches per hour) occurred across the Waldo and Williams Canyon watersheds, producing flooding on U.S. Highway 24 and in Manitou Springs. Flash flooding occurred from Cascade to Waldo Canyon along U.S. Highway 24. Water and debris over 3 feet deep from Waldo Canyon stranded 40 vehicles in the westbound lanes, with several cars sent racing down a drainage onto the westbound entrance ramp from Manitou Springs. Business Route 24 out of Manitou Springs was severely damaged and closed. One man drowned in the debris flow near the mouth of Waldo Canyon. In Manitou Springs there was major flooding from Williams Creek. Several structures near and on Canon Avenue and Manitou Avenue, including the Spa Building and Arcade, experienced deep water, mud and debris flows. Fountain Creek overflowed, flooding many businesses. Forty vehicles were damaged or destroyed. There were no fatalities in Manitou Springs, although there were two water rescues along Fountain Creek. Woodland Park in Teller County reported around 3 inches of rain in an hour, causing a wave of floodwaters to move down Fountain Creek. The flood wave took over 3 hours to reach Manitou Springs. Houses were flooded in the Crystola area, along with two restaurants in Green Mountain Falls and Cascade. There was minor flooding from Cascade to near Manitou Springs, where an exit road to Manitou Springs was flooded for a time. Flash flooding was widespread from Monument into the north side of Colorado Springs, where over 4 inches of rain fell in a few spots. Interstate 25 was closed for a time on the north side of Colorado Springs. Numerous other rural roads and streets were flooded. Flash flooding occurred from Security to Ellicott to southeast El Paso County. Many county roads were flooded, and a few had minor washouts. The storms produced flash flooding with rainfall amounts of over 5 inches along State Highway 115 southwest of Colorado Springs.
- **September 2013**—Storms produced heavy rain across western El Paso County and the Waldo Canyon burn scar. There was flooding on U.S. Highway 24 and numerous streets on the west side of Colorado Springs. A man drowned in Fountain Creek near Nevada Avenue. Rock Creek, Cheyenne Creek, and Fountain Creek experienced flash flooding and general flooding. Rock and Cheyenne Creek watersheds experienced significant damage to infrastructure. Eighty-nine houses were flooded along Cheyenne Creek. Fountain Creek was in flood for several hours from southern Colorado Springs to the El Paso County - Pueblo County line. A loss of life occurred in Sand Creek because of fast-flowing water in the channel.

13.2.2 Location

El Paso County is predominantly located in the Arkansas river basin (Figure 13-5).

Source: Colorado Division of Water Resources, No date



Figure 13-5. Arkansas River Basin

A flood analysis was performed as part of the planning process based on the current DFIRM. The countywide flood hazard areas are shown on Figure 13-6 and the flood hazard areas for each participating partner are shown on Figure 13-7 through Figure 13-12. However, the region in and around the Black Forest and Waldo Canyon burn areas are now more susceptible to flash flooding and will remain prone to flooding until vegetation and topsoil are regenerated through natural and human assisted reforestation efforts. For more information refer to the Wildfire and Erosion and Deposition sections of this plan.

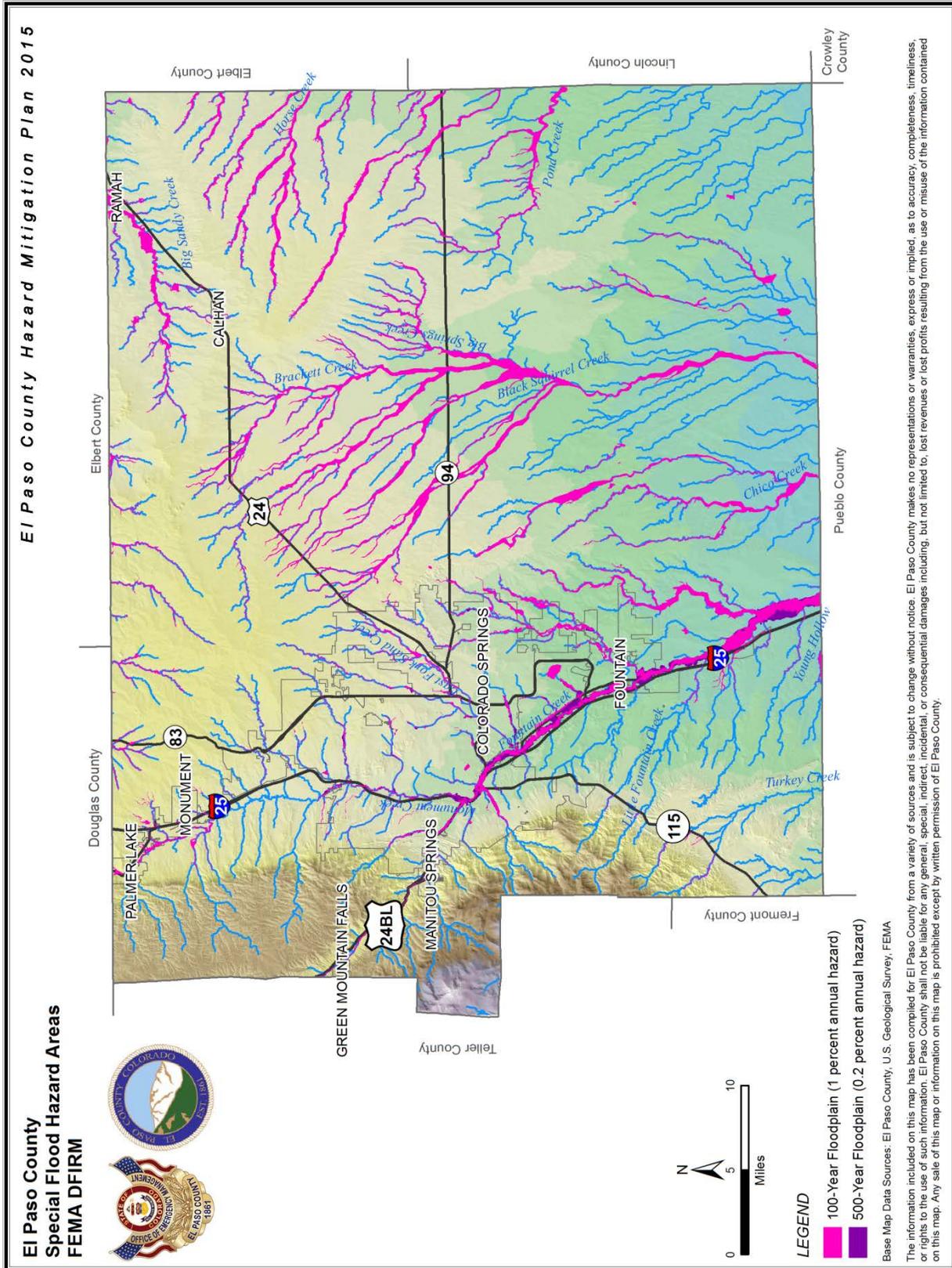


Figure 13-6. Special Flood Hazard Areas in El Paso County

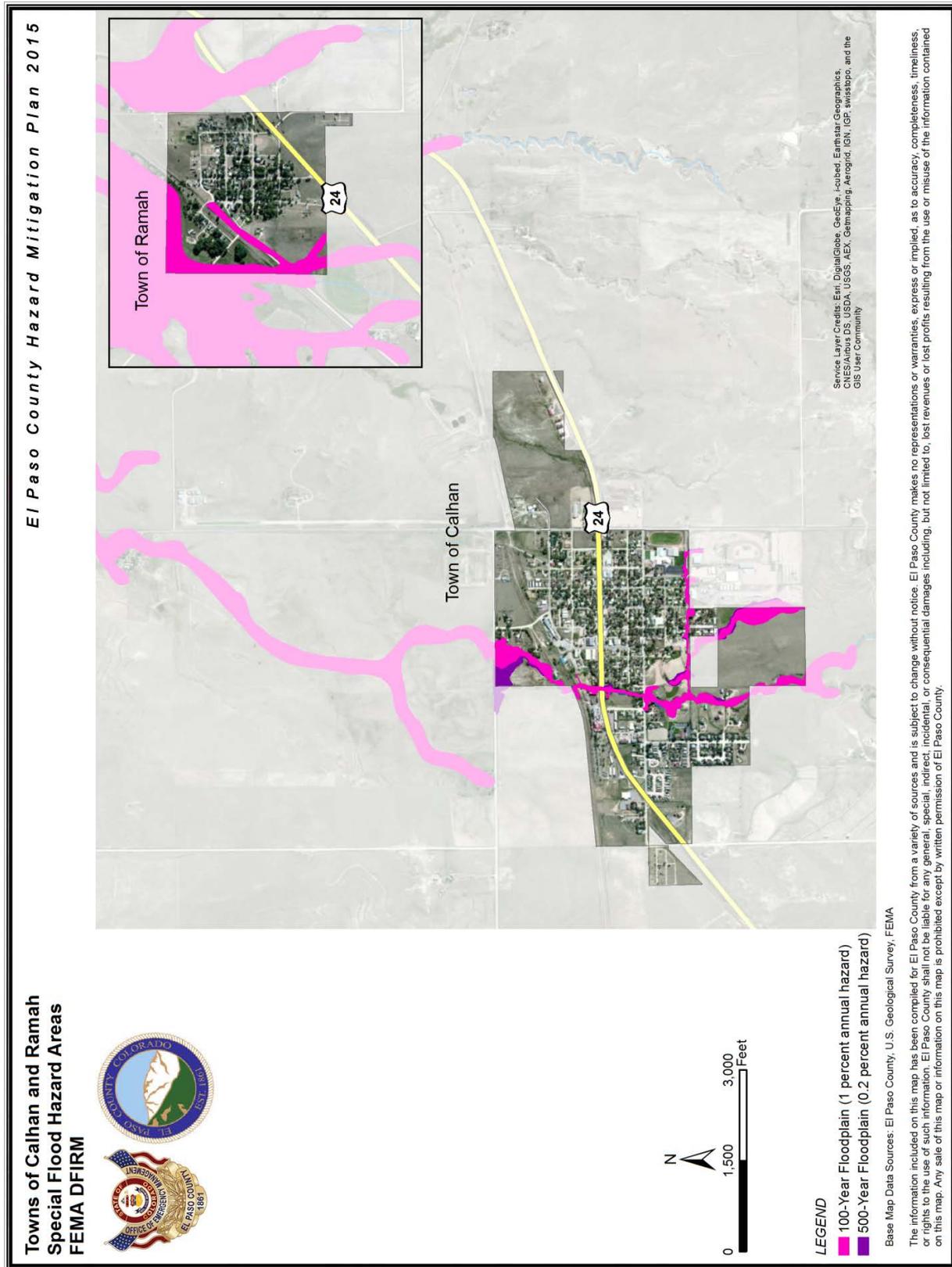


Figure 13-7. Special Flood Hazard Areas in the Towns of Calhan and Ramah

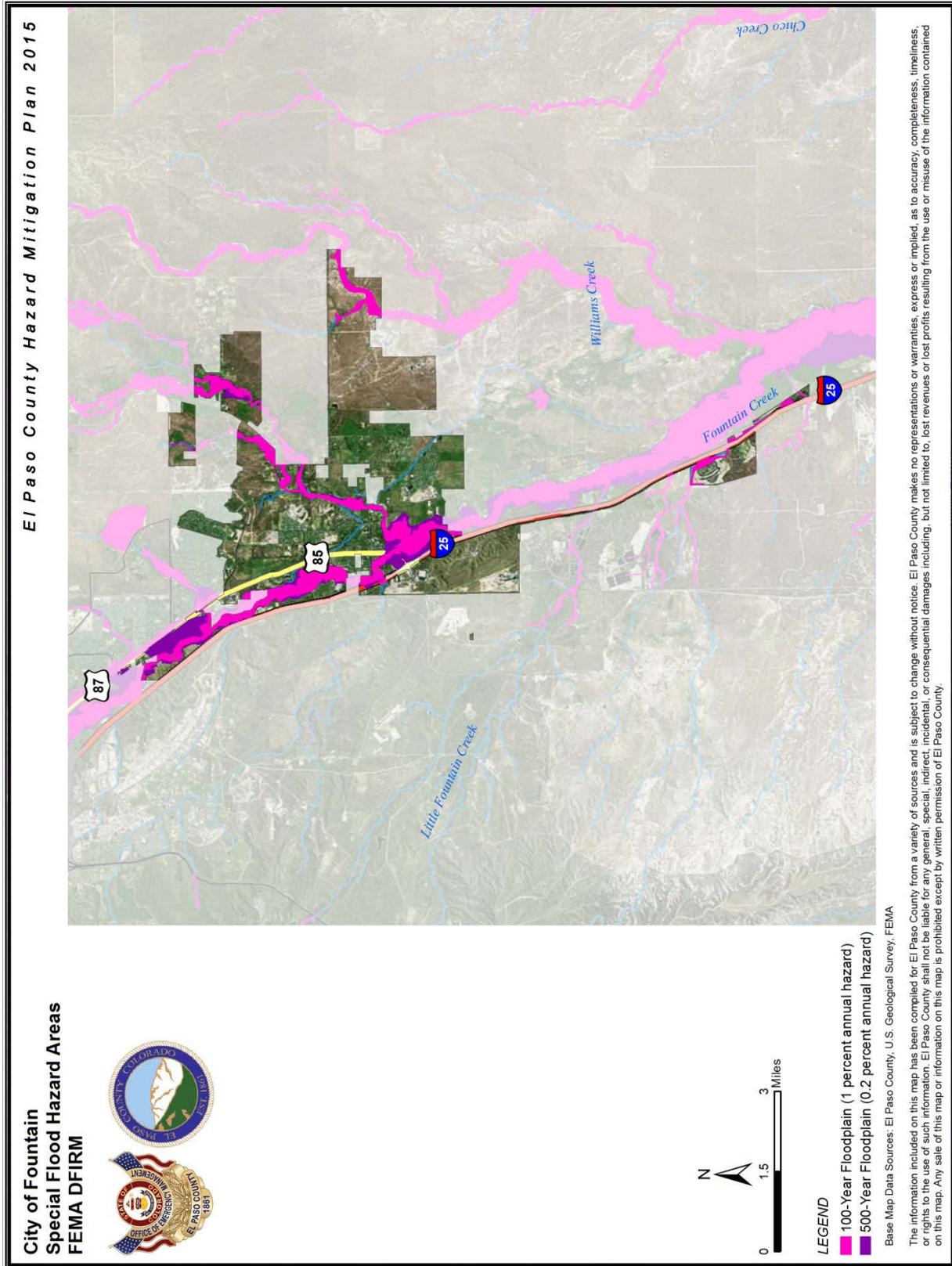


Figure 13-8. Special Flood Hazard Areas in the City of Fountain

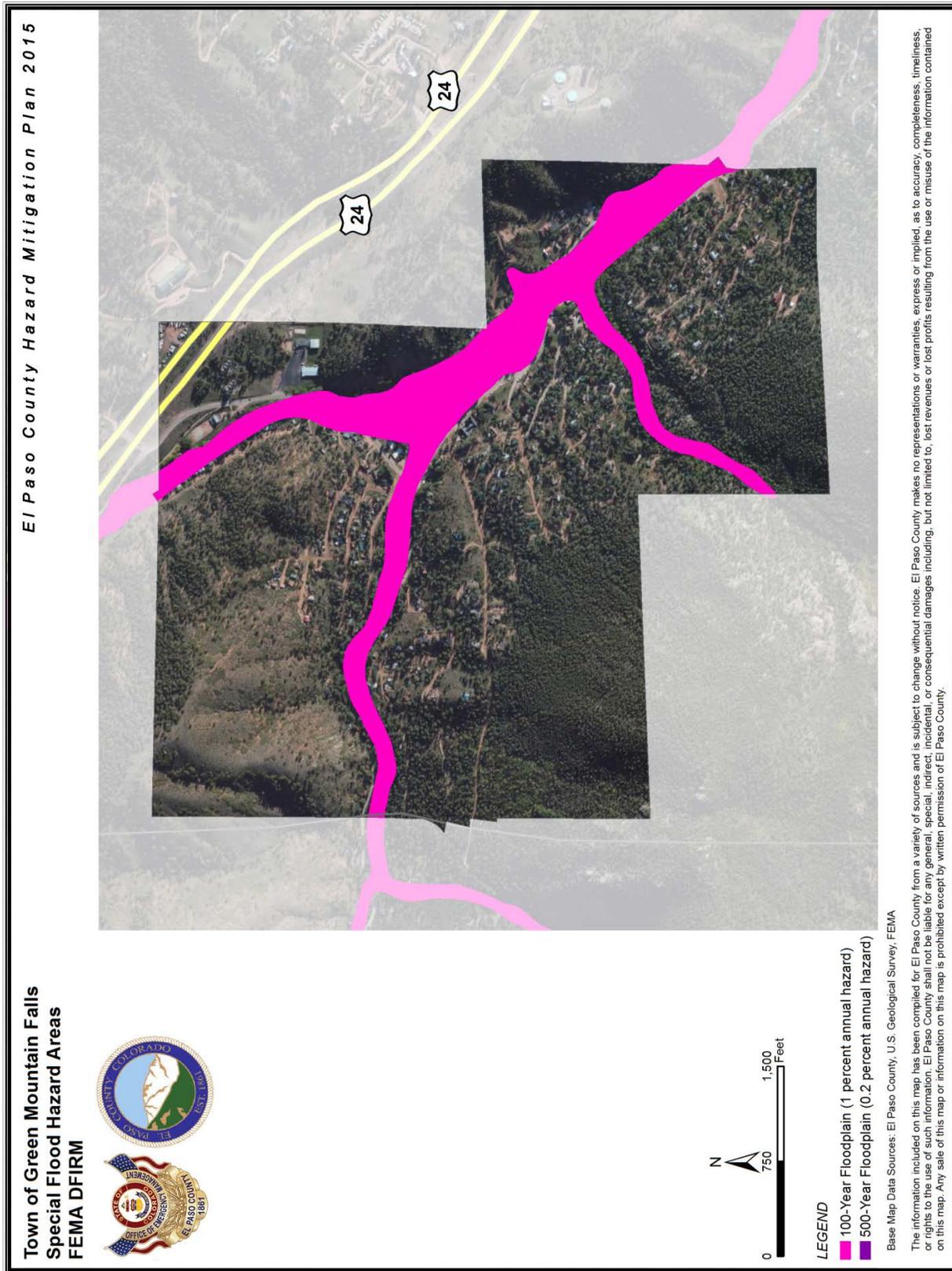


Figure 13-9. Special Flood Hazard Areas in the Town of Green Mountain Falls

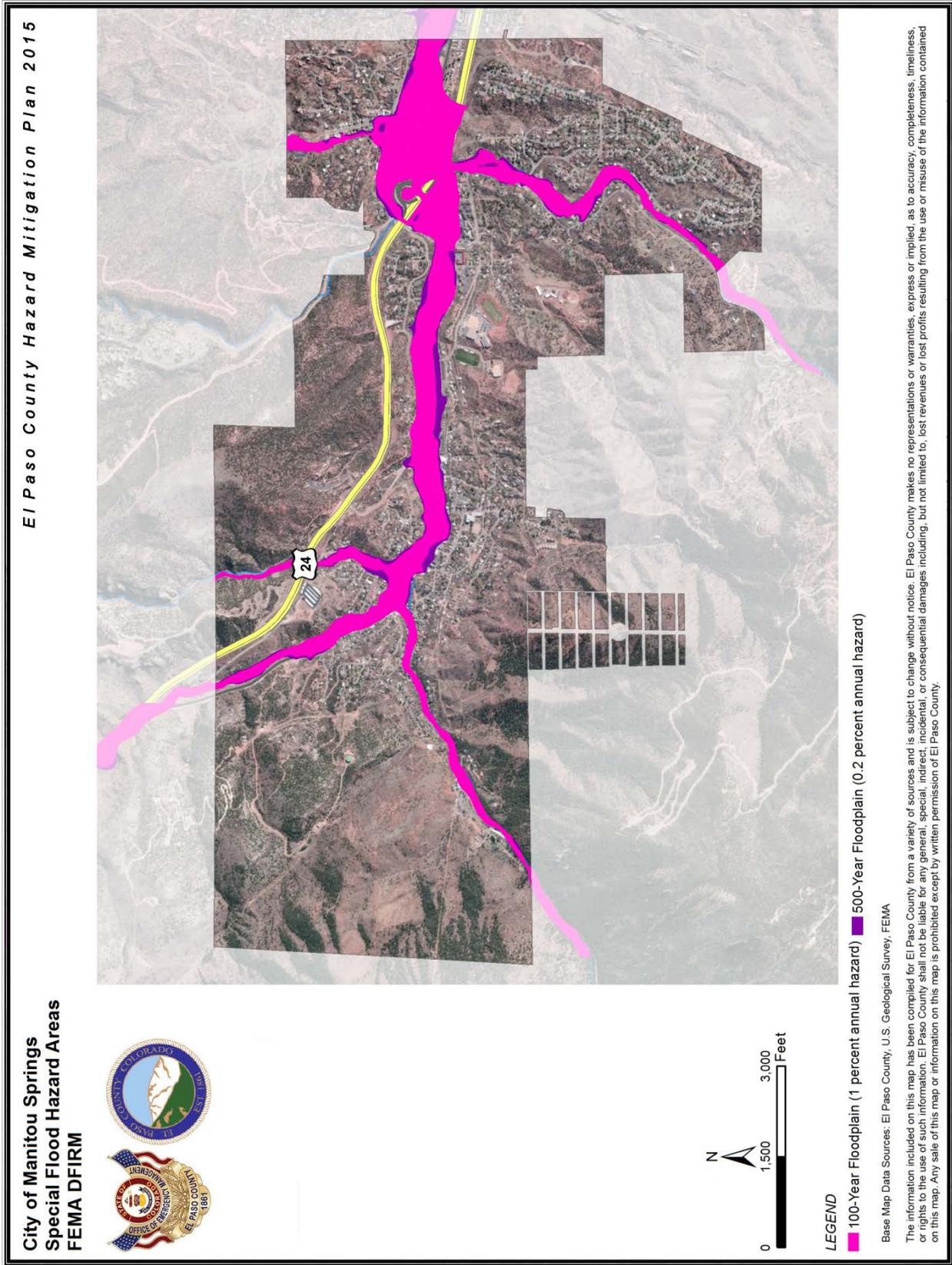


Figure 13-10. Special Flood Hazard Areas in the City of Manitou Springs

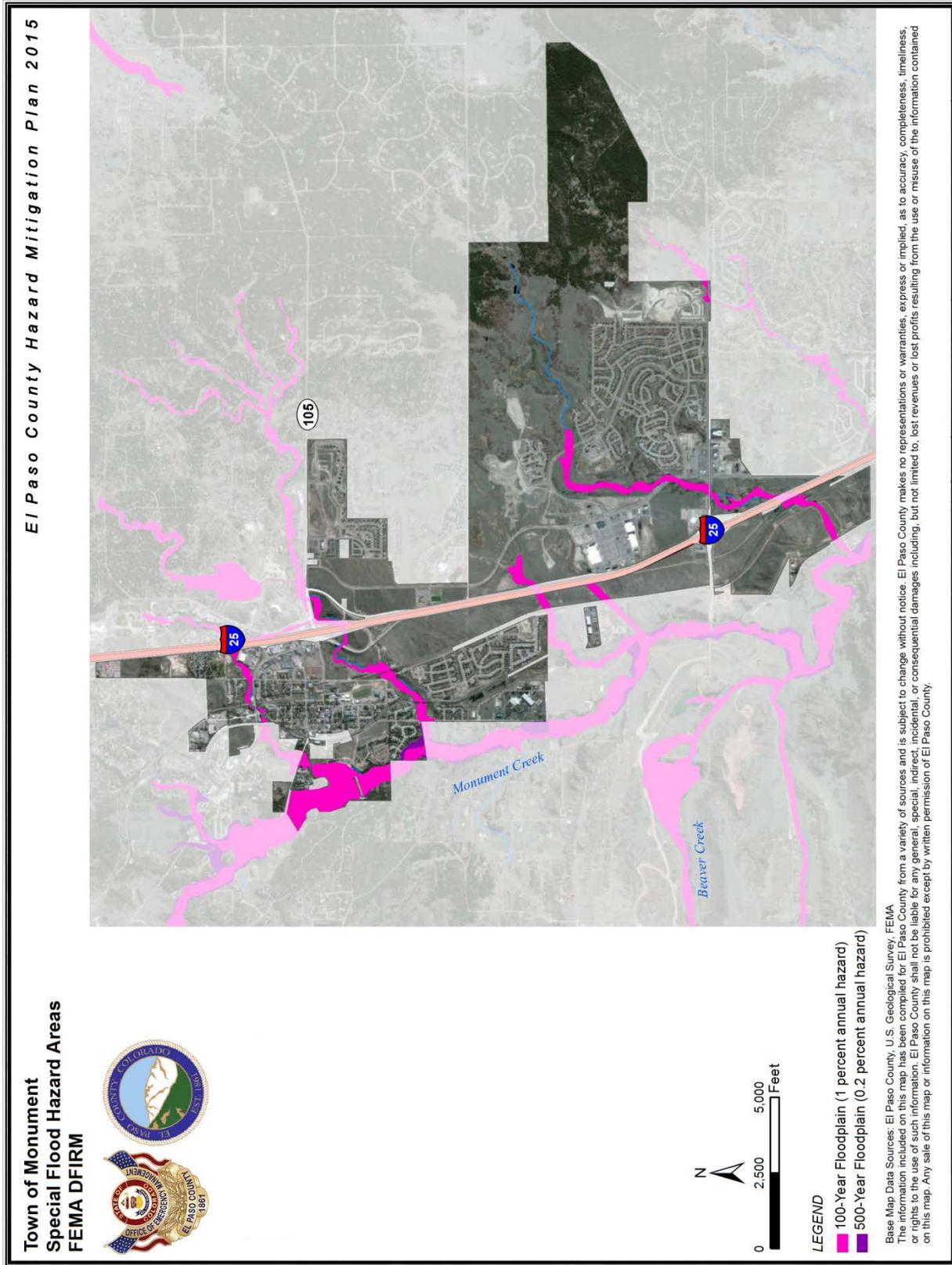


Figure 13-11. Special Flood Hazard Areas in the Town of Monument

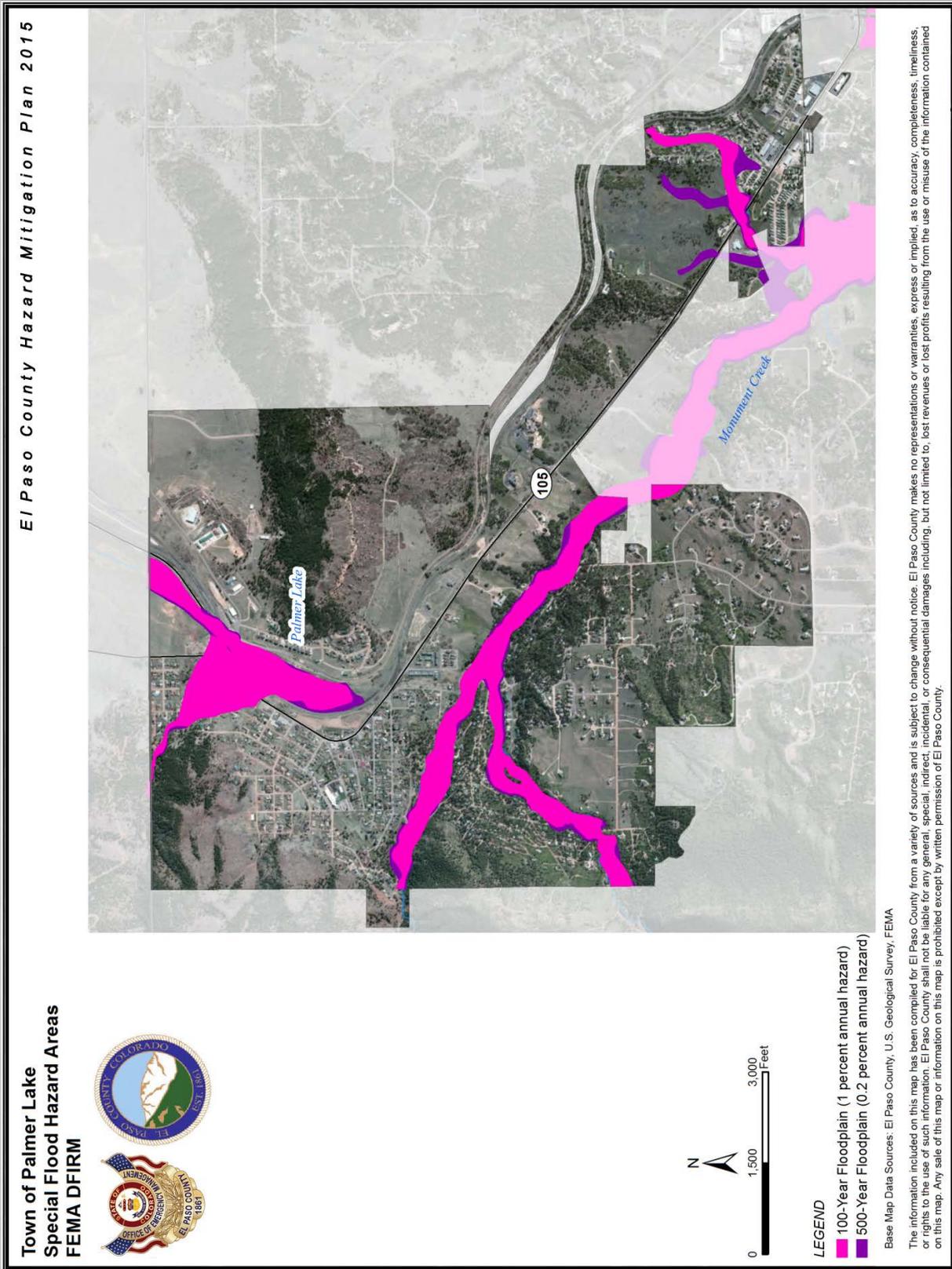


Figure 13-12. Special Flood Hazard Areas in the Town of Palmer Lake

El Paso County has 66,467 acres in the 100-year floodplain and 70,193 acres in 500-year floodplain. Table 13-4 shows the distribution of the acreage across the jurisdictions of the planning area.

TABLE 13-4. ACREAGE IN 100-YEAR AND 500-YEAR FLOODPLAIN BY JURISDICTION		
Jurisdiction	Area (acres)	
	100-Year	500-Year
Calhan	25.1	29.3
Colorado Springs	4,627.6	5,844.7
Fountain	1,635.7	2,272.2
Green Mountain Falls	56.3	56.3
Manitou Springs	190.3	210.7
Monument	195.3	200.4
Palmer Lake	164.6	193.6
Ramah	22.8	22.8
Unincorporated	59,549.4	61,363.3
Total	66,467.1	70,193.4

The following information regarding flood problem areas in the County was extracted from the National Weather Service’s hydrological guidance for El Paso County (National Weather Service, 2010).

Fountain Creek

Fountain Creek is one of the greatest flood threat areas in southern Colorado. It is estimated that more than 25,000 people are at risk in the Fountain Creek Drainage. Fountain Creek runs southeast from Ute Pass, through Manitou Springs, Colorado Springs, Security, Fountain and Pueblo before meeting up with the Arkansas River. The channel is composed of a sediment, making it very unstable and subject to debris flow. Compounding matters further, urbanization along the river has been rapid, which has had a negative impact on drainage. In Manitou Springs, some homes and businesses are actually built right over the river, with water flowing freely underneath. This is certainly a high risk area for flooding. Urbanization has also been appreciable along several of the major tributaries to Fountain Creek, including Cheyenne Creek, Sutherland Creek, Monument Creek, Jimmy Camp Creek, and Cottonwood Creek. These areas are also subject to flooding with property and populations at risk. The Fountain Creek Drainage experiences its greatest threat of flooding during prolonged periods of moist, easterly flow when the atmosphere is unstable, precipitable water values are high, and steering winds are light. In these instances, convection that develops over the drainage can become anchored to the terrain, firing over the same location for several hours. The moist easterly flow at low levels serves to feed the storm, allowing it to maintain its intensity. A rain of great enough duration and intensity could result in a devastating flash flood.

Burn Scars

Burn scars are at an increased risk of flash flooding. This is especially true for those scars that have a high percentage of moderate to high burn intensity like the Waldo Canyon scar. Much of the vegetation in these areas has been completely removed with soils left highly hydrophobic. This means rainfall runoff rates are much higher than normal, resulting in a much greater risk of flash flooding. Consequently, these areas need special attention with regard to flash flood potential. Rainfall thresholds expected to produce high water and flash flooding have been established to aid in the warning decision process for burn scars.

These thresholds are reassessed at least once a year and more often as necessary, depending on the rate of burn scar rehabilitation. The most recently established thresholds are available from the National Weather Service in Pueblo.

13.2.3 Frequency

Floods are considered to be highly likely to recur, with a 70-percent chance of occurrence in any given year. The County has experienced 24 flood events with recorded damage over the last 34 years as indicated in Table 13-3 with a recurrence rate of 1.4 years on average. This is a 70-percent chance of occurrence in any given year. However, many of these events are related to the Hayman and Waldo Canyon fires that have impacted the area in recent years. Hydrologists from the U.S. Army Corps of Engineers, the Burned Area Emergency Response (BAER) Team, and the National Weather Service have cautioned that areas downstream of the Waldo Canyon Fire burn scar may experience a 100-year flood every 10 years until the burned vegetation and soils regenerate. As conditions slowly improve over time, this probability may go down, but new fires in the area will again increase the frequency of damaging flood events.

13.2.4 Severity

Based on the information in this hazard profile, the magnitude/severity of typical flooding is limited—10 to 25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses that are treatable and do not result in permanent disability. Overall significance is considered medium: moderate potential impact.

However, 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. 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 (U.S. Army Corps of Engineers, 2012). Given these considerations, the flood hazard is considered to be 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.

13.2.5 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, 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 (National Weather Service, 2010):

- If 1 inch or more of rain falls in an urban or mountain area in 1 hour, a flood statement should be issued. In mountain areas, a flash flood warning may be necessary.
- If 2 or more inches of rain falls in an urban or mountain area in 1 hour, a flash flood warning should be issued.

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

13.3 SECONDARY HAZARDS

The most problematic secondary hazard for flooding is bank erosion, which in some cases can be more harmful than actual flooding. This is especially true in the upper courses of rivers with steep gradients, where floodwaters may pass quickly and without much damage, but scour the banks, edging properties closer to the floodplain or causing them to fall in. Flooding is also responsible for hazards such as landslides when high flows over-saturate soils on steep slopes, causing them to fail. Hazardous materials spills are also a secondary hazard of flooding if storage tanks rupture and spill into streams, rivers or storm sewers. Flooding can also impact water distribution systems through washing sediments and debris into streams and rivers that clog reservoirs, pipelines, and treatment facilities.

13.4 CLIMATE CHANGE IMPACTS

Use of historical hydrologic data has long been the standard of practice for designing and operating water supply and flood protection projects. For example, historical data are used for flood forecasting models and to forecast snowmelt runoff for water supply. This method of forecasting assumes that the climate of the future will be similar to that of the period of historical record. However, the hydrologic record cannot be used to predict changes in frequency and severity of extreme climate events such as floods. Going forward, model calibration or statistical relation development must happen more frequently, new forecast-based tools must be developed, and a standard of practice that explicitly considers climate change must be adopted. Climate change is already impacting water resources, and resource managers have observed the following:

- Historical hydrologic patterns can no longer be solely relied upon to forecast the water future.
- Precipitation and runoff patterns are changing, increasing the uncertainty for water supply and quality, flood management and ecosystem functions.
- Extreme climatic events will become more frequent, necessitating improvement in flood protection, drought preparedness, and emergency response.

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

As hydrology changes, what is currently considered a 100-year flood may strike more often, leaving many communities at greater risk. Planners will need to factor a new level of safety into the design, operation, and regulation of flood protection facilities such as dams, floodways, bypass channels, and levees, as well as the design of local sewers and storm drains.

13.5 EXPOSURE

The Level 2 HAZUS-MH protocol was used to assess the risk and vulnerability to flooding in the planning area. The model used census data at the block level and FEMA floodplain data, which has a level of accuracy acceptable for planning purposes. Where possible, the HAZUS-MH default data were enhanced using local GIS data from county, state, and federal sources.

13.5.1 Population

Population counts of those living in the floodplain in the planning area were generated by multiplying the estimated percentage of residential structures that are located in the floodplain by the El Paso County population. Using this approach, it was estimated that the exposed population for the entire county is 15,287 within the 100-year floodplain (2.4 percent of the total county population). For the unincorporated portions of the county, it is estimated that the exposed population is 7,198 within the 100-year floodplain (4.2 percent of the total unincorporated county population). For the 500-year floodplain it is estimated that 22,086 persons reside within the floodplain (3.4 percent of the total county population).

13.5.2 Property

Present Land Use

Table 13-5 shows the present land uses in the 100-year floodplain for the entire planning area. Approximately 53 percent of the floodplain is uncategorized land and 37 percent is residential.

Present Use Classification	Area (acres)	% of total
Agriculture	3,026	4.66
Commercial	1,293	1.99
Education	1	0.00
Government	1,597	2.46
Industrial	29	0.04
Religion/Non-Profit	206	0.32
Residential	24,091	37.08
Uncategorized	34,726	53.45
Total	64,969	100.00

Note: Acreage covers only mapped parcels and may exclude many rights of way and major water features.

Structures in the Floodplain

Table 13-6 and Table 13-7 summarize the total area and number of structures in the floodplain by municipality. The HAZUS-MH model determined that there are 5,556 structures within the 100-year floodplain and 8,027 structures within the 500-year floodplain. In the 100-year floodplain, about 51

percent of these structures are in unincorporated areas. Seventy-eight percent are residential, and 18 percent are commercial, industrial or agricultural.

**TABLE 13-6.
AREA AND STRUCTURES IN THE 100-YEAR FLOODPLAIN**

	Area in Floodplain (Acres)	Number of Structures in Floodplain							Total
		Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	
Calhan	25	2	1	0	0	0	0	0	3
Colorado Springs	4,628	1,453	287	5	4	44	44	0	1,837
Fountain	1,636	210	16	0	7	0	11	0	244
Green Mt. Falls	56	67	13	0	0	2	2	0	84
Manitou Springs	190	350	110	2	1	5	12	0	480
Monument	195	1	0	0	0	0	3	0	4
Palmer Lake	165	33	7	0	0	0	0	0	40
Ramah	23	0	0	0	4	0	0	0	4
Unincorporated	59,549	2,219	287	3	316	7	28	0	2,860
Total	66,467	4,335	721	10	332	58	100	0	5,556

**TABLE 13-7.
AREA AND STRUCTURES IN THE 500-YEAR FLOODPLAIN**

	Area in Floodplain (Acres)	Number of Structures in Floodplain							Total
		Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	
Calhan	29	2	1	0	0	0	0	0	3
Colorado Springs	5,845	2,271	494	12	11	65	87	1	2,941
Fountain	2,272	714	120	1	11	7	24	0	877
Green Mt. Falls	56	67	13	0	0	2	2	0	84
Manitou Springs	211	402	129	2	1	5	13	0	552
Monument	200	1	0	0	0	0	3	0	4
Palmer Lake	194	68	7	0	0	0	0	0	75
Ramah	23	0	0	0	4	0	0	0	4
Unincorporated	61,363	2,768	327	4	336	10	41	1	3,487
Total	70,193	6,293	1,091	19	363	89	170	2	8,027

Exposed Value

Table 13-8 and Table 13-9 summarizes the estimated value of exposed buildings in the planning area. This methodology estimated \$2.33 billion worth of building-and-contents exposure to the 100-year flood, representing 1.99 percent of the total assessed value of the planning area. An estimated \$4.39 billion worth of building and contents would be exposed to the 500-year flood, representing 3.74 percent of the total assessed value of the planning area.

**TABLE 13-8.
VALUE OF STRUCTURES IN 100-YEAR FLOODPLAIN**

	Value Exposed			% of Total Assessed Value
	Structure	Contents	Total	
Calhan	\$350,056	\$324,068	\$674,123	0.34
Colorado Springs	\$692,206,867	\$510,572,004	\$1,202,778,870	1.38
Fountain	\$33,602,013	\$23,412,271	\$57,014,284	1.85
Green Mt. Falls	\$18,804,625	\$12,541,157	\$31,345,783	18.70
Manitou Springs	\$195,835,534	\$128,075,802	\$323,911,336	29.82
Monument	\$758,556	\$604,704	\$1,363,259	0.09
Palmer Lake	\$5,754,566	\$3,063,239	\$8,817,805	1.93
Ramah	\$452,187	\$452,187	\$904,375	4.02
Unincorporated	\$413,604,559	\$287,869,533	\$701,474,093	2.95
Total	\$1,361,368,963	\$966,914,965	\$2,328,283,928	1.99

**TABLE 13-9.
VALUE OF STRUCTURES IN 500-YEAR FLOODPLAIN**

	Value Exposed			% of Total Assessed Value
	Structure	Contents	Total	
Calhan	\$350,056	\$324,068	\$674,123	0.34
Colorado Springs	\$1,452,409,755	\$1,055,555,238	\$2,507,964,993	2.89
Fountain	\$239,931,364	\$178,836,989	\$418,768,353	13.59
Green Mt. Falls	\$18,804,625	\$12,541,157	\$31,345,783	18.70
Manitou Springs	\$218,890,788	\$143,993,359	\$362,884,147	33.41
Monument	\$758,556	\$604,704	\$1,363,259	0.09
Palmer Lake	\$7,810,392	\$4,091,152	\$11,901,544	2.61
Ramah	\$452,187	\$452,187	\$904,375	4.02
Unincorporated	\$633,639,324	\$417,566,649	\$1,051,205,973	4.42
Total	\$2,573,047,048	\$1,813,965,503	\$4,387,012,550	3.74

13.5.3 Critical Facilities and Infrastructure

Table 13-10 through Table 13-13 summarize the critical facilities and infrastructure in the 100-year and 500-year floodplain of the planning area. Details are provided in the following sections.

TABLE 13-10. CRITICAL FACILITIES IN THE 100 YEAR FLOODPLAIN						
	Medical & Health	Government Functions	Protective Functions	Schools	Hazardous Materials	Total
Calhan	0	0	0	0	0	0
Colorado Springs	0	0	1	2	4	7
Fountain	0	0	0	0	0	0
Green Mountain Falls	0	0	1	0	0	1
Manitou Springs	0	0	2	0	0	2
Monument	0	0	0	0	0	0
Palmer Lake	0	0	0	0	0	0
Ramah	0	0	0	0	0	0
Unincorporated	0	0	1	0	0	1
Total	0	0	5	2	4	11

TABLE 13-11. CRITICAL INFRASTRUCTURE IN THE 100-YEAR FLOODPLAIN								
	Bridges	Water Storage	Waste Water	Power	Communications	Transportation	Dams	Total
Calhan	0	0	0	0	0	0	0	0
Colorado Springs	34	0	0	0	3	0	1	38
Fountain	11	1	1	0	0	0	0	13
Green Mountain Falls	0	0	0	0	0	0	0	0
Manitou Springs	2	0	0	0	0	0	0	2
Monument	0	0	0	0	0	0	1	1
Palmer Lake	1	0	0	0	0	0	0	1
Ramah	1	0	0	0	0	0	0	1
Unincorporated	29	0	1	0	0	0	17	47
Total	78	1	2	0	3	0	19	103

TABLE 13-12. CRITICAL FACILITIES IN THE 500 YEAR FLOODPLAIN						
	Medical & Health	Government Functions	Protective Functions	Schools	Hazardous Materials	Total
Calhan	0	0	0	0	0	0
Colorado Springs	0	0	1	3	17	21
Fountain	0	0	1	0	0	1
Green Mountain Falls	0	0	1	0	0	1

**TABLE 13-12.
CRITICAL FACILITIES IN THE 500 YEAR FLOODPLAIN**

	Medical & Health	Government Functions	Protective Functions	Schools	Hazardous Materials	Total
Manitou Springs	0	0	2	0	0	2
Monument	0	0	0	0	0	0
Palmer Lake	0	0	0	0	0	0
Ramah	0	0	0	0	0	0
Unincorporated	0	0	1	0	0	1
Total	0	0	6	3	17	26

**TABLE 13-13.
CRITICAL INFRASTRUCTURE IN THE 500-YEAR FLOODPLAIN**

	Bridges	Water Storage	Waste Water	Power	Communications	Transportation	Dams	Total
Calhan	0	0	0	0	0	0	0	0
Colorado Springs	52	0	0	0	3	1	1	57
Fountain	11	1	2	1	1	1	0	17
Green Mountain Falls	0	0	0	0	0	0	0	0
Manitou Springs	2	0	0	0	0	0	0	2
Monument	0	0	0	0	0	0	1	1
Palmer Lake	1	0	0	0	0	0	0	1
Ramah	1	0	0	0	0	0	0	1
Unincorporated	34	0	1	0	0	0	17	52
Total	101	1	3	1	4	2	19	131

Utilities and Infrastructure

It is important to determine who may be at risk if infrastructure is damaged by flooding. 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.

Roads

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

- U.S. Interstate 25
- State Highway 83
- State Highway 115
- State Highway 16
- State Highway 94
- U.S. Highway 24
- State Highway 21
- State Highway 105
- U.S. Highway 85.

In severe flood events, these roads can be blocked or damaged, preventing access to some areas.

Bridges

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 78 bridges that are in or cross over the 100-year floodplain.

Water and Sewer Infrastructure

Water and sewer systems can be affected by flooding. Floodwaters can back up drainage systems, causing localized flooding. Culverts can be blocked by debris from flood events, also causing localized urban flooding. Floodwaters can get into drinking water supplies, causing contamination. Sewer systems can be backed up, causing wastewater to spill into homes, neighborhoods, rivers, and streams.

Source: U.S. Army Corps of Engineers



Figure 13-13. Flood Damage to Local Infrastructure in Palmer Lake

Levees

Levees have historically been used to control flooding in portions of the planning area. The U.S. Army Corps of Engineers lists two levees in the National Levee Database. Both of these levees are 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.

13.5.4 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. Human development such as bridge abutments and levees, and logjams from timber harvesting can increase stream bank erosion, causing rivers and streams to migrate into non-natural courses.

13.6 VULNERABILITY

Many of the areas exposed to flooding may not experience serious flooding or flood damage. This section describes vulnerabilities in terms of population, property, infrastructure and environment.

13.6.1 Population

A geographic analysis of demographics using the HAZUS-MH model identified populations vulnerable to the flood hazard. These estimates assume that the population is evenly distributed across each census block and is as follows:

- **Economically Disadvantaged Populations**—It is estimated that 20.8 percent of the households within the 100-year floodplain are economically disadvantaged, defined as having household incomes of \$20,000 or less.
- **Population over 65 Years Old**—It is estimated that 10.1 percent of the population in the census blocks that intersect the 100-year floodplain are over 65 years old.
- **Population under 16 Years Old**—It is estimated that 24.1 percent of the population within census blocks located in or near the 100-year floodplain are under 16 years of age.

The following impacts on persons and households in the planning area were estimated for the 100-year and 500-year flood events through the Level 2 HAZUS-MH analysis:

- 100-year flood event:
 - Number of displaced households = 16,635
 - Number of persons requiring short-term shelter = 11,623
- 500-year flood event:
 - Number of displaced households = 24,149
 - Number of persons requiring short-term shelter = 18,562

13.6.2 Property

HAZUS-MH calculates losses to structures from flooding by looking at depth of flooding and type of structure. Using historical flood insurance claim data, HAZUS-MH estimates the percentage of damage to structures and their contents by applying established damage functions to an inventory. For this analysis, local data on facilities was used instead of the default inventory data provided with HAZUS-MH. The analysis is summarized in Table 13-14 for the 100-year flood event and in Table 13-15 for the 500-year flood event. It is estimated that there would be up to \$1.69 billion of flood loss from a 100-year flood event in the planning area. This represents 72 percent of the total exposure to the 100-year flood and 1.44 percent of the total replacement value for the county. It is estimated that there would be up to \$2.51

billion of flood loss from a 500-year flood event in the planning area. This represents 57 percent of the total exposure to the 500-year flood and 2.12 percent of the total replacement value for the county.

TABLE 13-14. LOSS ESTIMATES FOR 100-YEAR FLOOD EVENT				
	Estimated Loss Associated with Flood			% of Total Assessed Value
	Structure	Contents	Total	
Calhan	\$727,000	\$1,116,000	\$1,843,000	0.93
Colorado Springs	\$413,814,000	\$541,001,000	\$954,815,000	1.10
Fountain	\$27,279,000	\$34,884,000	\$62,163,000	2.02
Green Mt. Falls	\$6,768,000	\$6,318,000	\$13,086,000	7.80
Manitou Springs	\$104,085,000	\$87,966,000	\$192,051,000	17.68
Monument	\$10,603,000	\$8,978,000	\$19,581,000	1.28
Palmer Lake	\$7,680,000	\$5,761,000	\$13,441,000	2.95
Ramah	\$168,000	\$292,000	\$460,000	2.05
Unincorporated	\$197,430,000	\$227,143,000	\$424,573,000	1.79
Total	\$768,554,000	\$913,459,000	\$1,692,013,000	1.44

TABLE 13-15. LOSS ESTIMATES FOR 500-YEAR FLOOD EVENT				
	Estimated Loss Associated with Flood			% of Total Assessed Value
	Structure	Contents	Total	
Calhan	\$846,000	\$1,380,000	\$2,226,000	1.13
Colorado Springs	\$666,035,000	\$905,913,000	\$1,571,948,000	1.81
Fountain	\$70,802,000	\$101,292,000	\$172,094,000	5.58
Green Mt. Falls	\$6,768,000	\$6,318,000	\$13,086,000	7.80
Manitou Springs	\$114,985,000	\$96,406,000	\$211,391,000	19.46
Monument	\$11,022,000	\$9,288,000	\$20,310,000	1.32
Palmer Lake	\$9,038,000	\$6,838,000	\$15,876,000	3.48
Ramah	\$168,000	\$292,000	\$460,000	2.05
Unincorporated	\$234,523,000	\$270,212,000	\$504,735,000	2.12
Total	\$1,114,187,000	\$1,397,939,000	\$2,512,126,000	2.14

National Flood Insurance Program

Table 13-16 lists flood insurance statistics that help identify vulnerability in the planning area. The County and its incorporated communities (except for the Town of Ramah) participate in the National Flood Insurance Program.

**TABLE 13-16.
NATIONAL FLOOD INSURANCE PROGRAM STATISTICS**

	Date of Entry	Date of Current FIRM	Claims, through 12/31/2013	Value of Claims paid, through 12/31/2013
Calhan	1/17/1975	8/23/1999	1	0
Fountain	6/28/1974	3/17/1997	13	\$655
Green Mountain Falls	8/3/1974	3/17/1997	5	0
Manitou Springs	3/29/1974	3/17/1997	93	\$2,117,735
Monument	5/24/1974	3/17/1997	1	0
Palmer Lake	11/16/1973	3/17/1997	2	0
Ramah	9/13/1974	3/17/1997	0	0
El Paso County	12/27/1974	8/23/1999	120	\$465,411
Total			235	\$2,583,801

Properties constructed after a FIRM has been adopted are eligible for reduced flood insurance rates. Such structures are less vulnerable to flooding since they were constructed after regulations and codes were adopted to decrease vulnerability. Properties built before a FIRM is adopted are more vulnerable to flooding because they do not meet code or are located in hazardous areas. The first FIRM for El Paso County was available in 1986.

The following information from flood insurance statistics is relevant to reducing flood risk as documented in the :

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

Repetitive Loss

A repetitive loss property is defined by FEMA as an NFIP-insured property that has experienced any of the following since 1978, regardless of any changes in ownership:

- Four or more paid losses in excess of \$1,000
- Two paid losses in excess of \$1,000 within any rolling 10-year period
- Three or more paid losses that equal or exceed the current value of the insured property.

Repetitive loss properties make up only 1 to 2 percent of flood insurance policies in force nationally, yet they account for 40 percent of the nation's flood insurance claim payments. In 1998, FEMA reported that the NFIP's 75,000 repetitive loss structures have already cost \$2.8 billion in flood insurance payments and that numerous other flood-prone structures remain in the floodplain at high risk. The government has instituted programs encouraging communities to identify and mitigate the causes of repetitive losses. A recent report on repetitive losses by the National Wildlife Federation found that 20 percent of these properties are outside any mapped 100-year floodplain. The key identifiers for repetitive loss properties are the existence of flood insurance policies and claims paid by the policies.

FEMA-sponsored programs, such as the CRS, require participating communities to identify repetitive loss areas. A repetitive loss area is the portion of a floodplain holding structures that FEMA has identified as meeting the definition of repetitive loss. Identifying repetitive loss areas helps to identify structures that

are at risk but are not on FEMA's list of repetitive loss structures because no flood insurance policy was in force at the time of loss.

In El Paso County there are 18 repetitive loss properties. Thirteen of the properties are located in the 100-year floodplain and five are located outside of the mapped 100-year and 500-year flood zones. The locations of these properties are shown on Figure 13-14.

13.6.3 Critical Facilities and Infrastructure

HAZUS-MH was used to estimate the flood loss potential to critical facilities exposed to the flood risk. Using depth/damage function curves to estimate the percent of damage to the building and contents of critical facilities, HAZUS-MH correlates these estimates into an estimate of functional down-time (the estimated time it will take to restore a facility to 100 percent of its functionality). This helps to gauge how long the planning area could have limited usage of facilities deemed critical to flood response and recovery.

The HAZUS critical facility analysis found that, on average, critical facilities would receive 26 percent damage to the structure and 83 percent damage to the contents during a 100-year flood event. The estimated time to restore these facilities to 100 percent of their functionality is 776 days. For a 500-year flood event critical facilities, on average, would receive 24 percent damage to the structure and 72 percent damage to the contents.

13.6.4 Environment

The environment vulnerable to flood hazard is the same as the environment exposed to the hazard. Loss estimation platforms such as HAZUS-MH are not currently equipped to measure environmental impacts of flood hazards. The best gauge of vulnerability of the environment would be a review of damage from past flood events. Loss data that segregates damage to the environment was not available at the time of this plan. Capturing this data from future events could be beneficial in measuring the vulnerability of the environment for future updates.

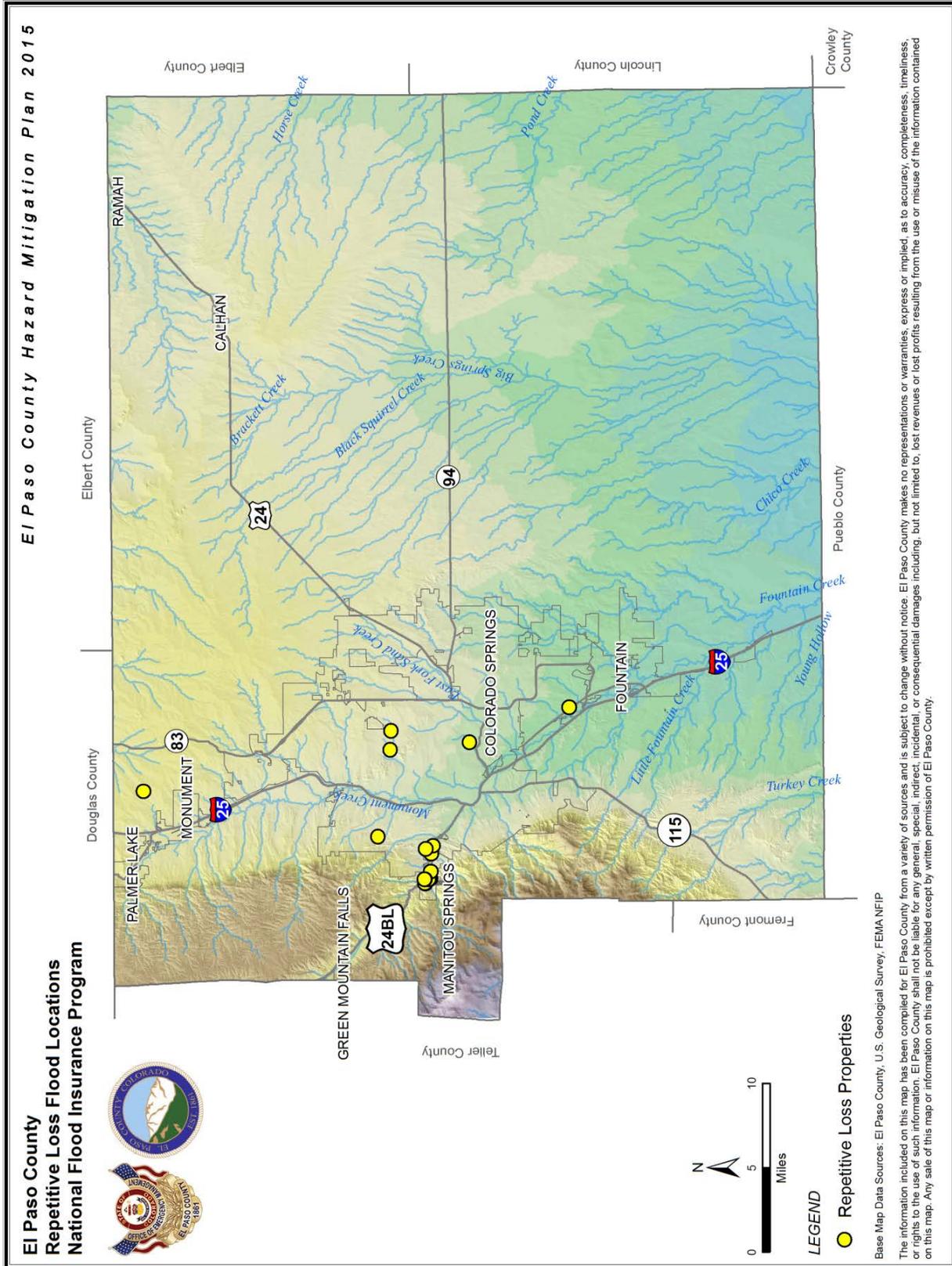


Figure 13-14. Repetitive Loss Flood Locations in El Paso County

13.7 FUTURE TRENDS

The county has experienced moderate growth over the past 10 years. The County and its planning partners are equipped to handle future growth within flood hazard areas. Additionally, all municipal planning partners, except the Town of Ramah, are participants in the NFIP and have adopted flood damage prevention ordinances in response to its requirements. With communities in the county participating in the CRS program, there is incentive to adopt consistent, appropriate, higher regulatory standards in communities with the highest degree of flood risk. Municipal planning partners have committed to maintaining their good standing under the NFIP through initiatives identified in this plan. Communities participating or considering participation in the CRS program will be able to refine this commitment using CRS programs and templates as a guide.

13.8 SCENARIO

An intense, short-duration storm could move slowly across the planning area creating significant flash floods with little or no warning. If intense rain fell on one or more of the recent burn scars in the area, there could be significant mud or debris flows, higher rates of flow and significant sedimentation. Injuries or fatalities may result if residents are caught off guard by the flood event. Stormwater systems could be overwhelmed and significant flooding could impact a substantial portion of structures within the planning area. Transportation routes could be cut off due to floodwaters, isolating portions of the planning area. These impacts may last after the floodwater recede as flash floods in the area have been known to cause extensive damage to roadway and other infrastructure in the County.

13.9 ISSUES

The major issues for the flood hazard in the County 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 damages in areas not typically considered special flood hazard areas.
- Damages resulting from flood 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.

CHAPTER 14. HAILSTORM

HAILSTORM RANKING						
El Paso County	Calhan/Ramah	Fountain	Green Mountain Falls	Manitou Springs	Monument	Palmer Lake
Medium	High	Medium	Low	Medium	High	High

14.1 GENERAL BACKGROUND

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

Hailstones grow two ways: by wet growth or dry growth. In wet growth, a tiny piece of ice is in an area where the air temperature is below freezing, but not super cold. When the tiny piece of ice collides with a super-cooled drop, the water does not freeze on the ice immediately. Instead, liquid water spreads across tumbling hailstones and slowly freezes. Since the process is slow, air bubbles can escape, resulting in a layer of clear ice. Dry growth hailstones grow when the air temperature is well below freezing and the water droplet freezes immediately as it collides with the ice particle. The air bubbles are “frozen” in place, leaving cloudy ice.

Hailstones can have layers like an onion if they travel up and down in an updraft, or they can have few or no layers if they are “balanced” in an updraft. One can tell how many times a hailstone traveled to the top of the storm by counting its layers. Hailstones can begin to melt and then re-freeze together, forming large and very irregularly shaped hail.

DEFINITIONS

Hail—Raindrops that have been carried upward into extremely cold areas of the atmosphere where they freeze into ice.

Thunderstorm—A storm featuring heavy rains, strong winds, thunder, and lightning, typically about 15 miles in diameter and lasting about 30 minutes. Hail and tornadoes are also dangers associated with thunderstorms. Lightning is a serious threat to human life. Heavy rains over a small area in a short time can lead to flash flooding.

14.2 HAZARD PROFILE

14.2.1 Past Events

The National Climatic Data Center’s Storm Events Database lists 94 hail events in El Paso County between 1996 and 2014 with hail measured larger than 1.5 inches in diameter. These events are noted in Table 14-1. The locations of hail events from 1955 through 2012 are shown on Figure 14-1.

**TABLE 14-1.
EL PASO COUNTY HAIL EVENTS WITH HAIL DIAMETER GREATER THAN 1.5 INCHES, 1996 - 2014**

Location	Date	Maximum Hail Size (inches)	Location	Date	Maximum Hail Size (inches)
Ramah	8/9/2004	4.5	Chipita Park	5/28/2003	1.75
Calhan	6/20/2001	4	Colorado Springs	6/15/2004	1.75
Falcon	8/10/2004	3	Rush	6/15/2004	1.75
USAF Academy	8/21/2004	3	USAF Academy	7/9/2004	1.75
Peyton	7/23/1996	2.75	Colorado Springs	7/9/2004	1.75
Colorado Springs	8/29/1996	2.75	Colorado Springs	8/10/2004	1.75
Calhan	5/10/2004	2.75	Falcon	7/14/2005	1.75
Rush	8/9/2004	2.75	USAF Academy	5/31/2006	1.75
Falcon	8/10/2004	2.75	USAF Academy	6/11/2006	1.75
Black Forest	6/11/1999	2.5	Falcon	8/22/2007	1.75
Ramah	8/17/2009	2.5	Falcon	6/3/2008	1.75
Peterson AFB	6/7/2012	2.5	Truckton	6/14/2009	1.75
Peterson AFB	6/7/2012	2.5	Peyton	7/6/2009	1.75
Peterson AFB	6/7/2012	2.5	Peyton	7/11/2009	1.75
Truckton	6/4/2001	2.25	Peyton	7/11/2009	1.75
Calhan	7/26/1996	2	Truckton	8/10/2009	1.75
Ellicott	8/1/1996	2	Monument	8/17/2009	1.75
Colorado Springs	8/14/1996	2	Peyton	8/17/2009	1.75
Peyton	6/1/1997	2	Calhan	8/17/2009	1.75
Truckton	5/17/2004	2	Calhan	8/17/2009	1.75
Black Forest	6/20/2004	2	Calhan	8/17/2009	1.75
Black Forest	6/20/2004	2	Calhan	8/17/2009	1.75
Rush	6/20/2004	2	Colorado Springs	7/4/2010	1.75
Colorado Springs	7/9/2004	2	Peterson AFB	7/6/2010	1.75
Colorado Springs	7/9/2004	2	Peterson AFB	7/6/2010	1.75
Monument	8/10/2004	2	Falcon	7/6/2010	1.75
Black Forest	8/10/2004	2	Black Forest	7/6/2010	1.75
USAF Academy	8/21/2004	2	Black Forest	7/6/2010	1.75
USAF Academy	8/23/2007	2	Peyton	6/17/2011	1.75
Black Forest	7/4/2010	2	Green Mtn Falls	7/2/2011	1.75
Peterson AFB	6/7/2012	2	USAF Academy	7/13/2011	1.75
Colorado Springs	6/7/2012	2	Peterson AFB	6/6/2012	1.75
Peterson AFB	6/7/2012	2	Colorado Springs	6/6/2012	1.75
Rush	5/9/1996	1.75	Colorado Springs	6/6/2012	1.75

**TABLE 14-1.
EL PASO COUNTY HAIL EVENTS WITH HAIL DIAMETER GREATER THAN 1.5 INCHES, 1996 - 2014**

Location	Date	Maximum Hail Size (inches)	Location	Date	Maximum Hail Size (inches)
Colorado Springs	7/9/1996	1.75	Security	6/6/2012	1.75
Fountain	7/24/1996	1.75	Ellicott	6/7/2012	1.75
Ellicott	8/1/1996	1.75	Peterson AFB	6/7/2012	1.75
Colorado Springs	6/6/1997	1.75	Monument	6/7/2012	1.75
Monument	6/24/1997	1.75	Peterson AFB	6/7/2012	1.75
Ramah	8/26/1997	1.75	Calhan	6/7/2012	1.75
Colorado Springs	5/24/1998	1.75	Peterson AFB	6/7/2012	1.75
Rush	6/29/1998	1.75	Peterson AFB	6/7/2012	1.75
Ellicott	5/28/2001	1.75	Ramah	6/8/2012	1.75
Colorado Springs	5/30/2001	1.75	Ft Carson	6/18/2013	1.75
Yoder	9/15/2001	1.75	Security	6/18/2013	1.75
Calhan	6/3/2002	1.75	Ellicott	8/18/2013	1.75
Ramah	7/10/2002	1.75	Colorado Springs	5/21/2014	1.75

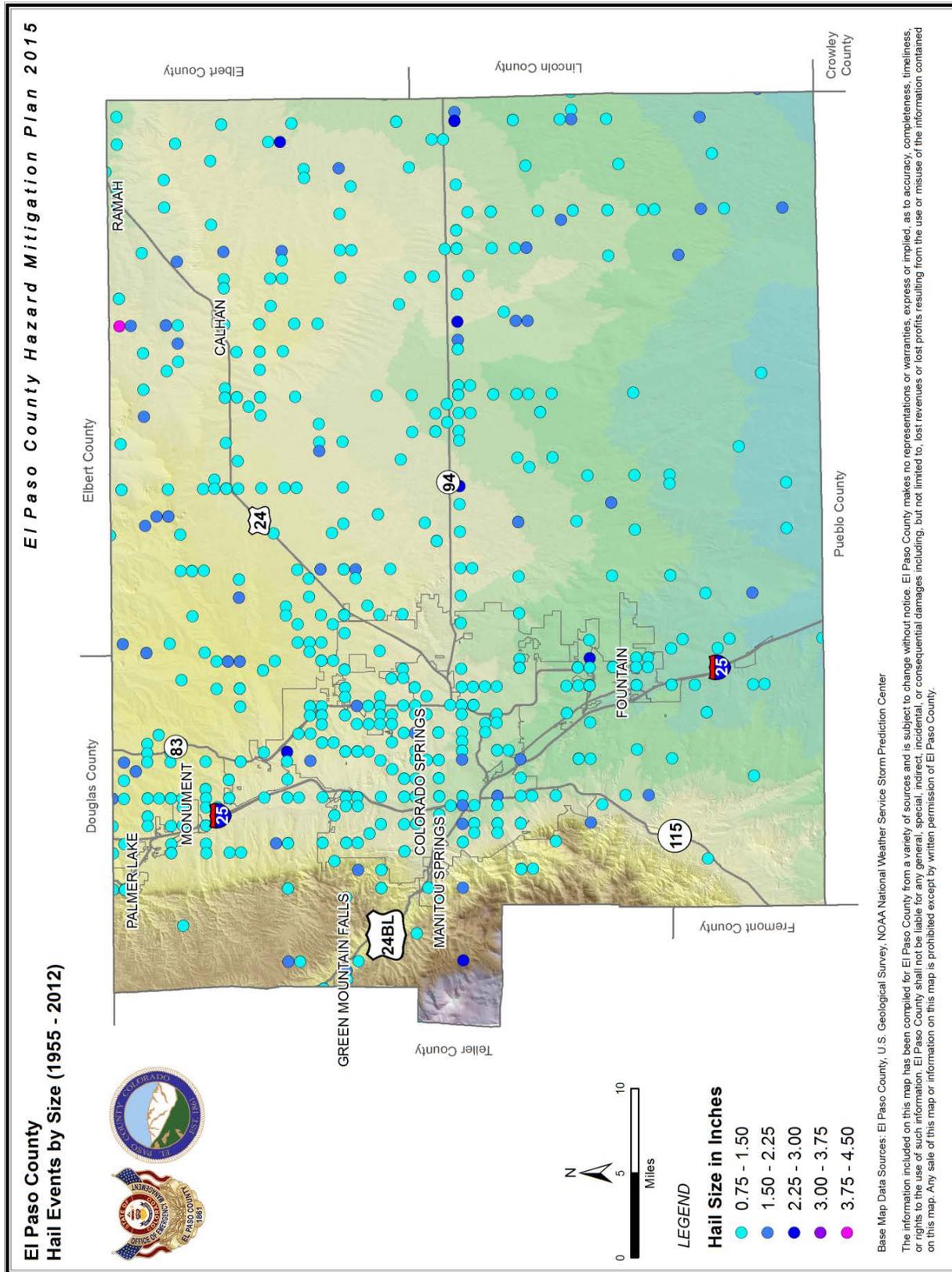


Figure 14-1. El Paso County Hail Events by Size (1955 – 2012)

14.2.2 Location

Severe weather events have the potential to happen anywhere in the planning area. The entire extent of El Paso County is exposed to the hailstorm hazard.

14.2.3 Frequency

Based on a record of 94 significant hailstorm events over an 18-year period, significant hail occurs more than five times per year on average and is considered highly likely.

14.2.4 Severity

Severe hailstorms can be quite destructive. In recent years in the United States, hail causes more than \$1.3 billion in damage to property and crops each year representing between 1 and 2 percent of the annual crop value.

Insurance claims resulting from hailstorm damage increased 84 percent in 2012 from their 2010 level according to the National Insurance Crime Bureau. In 2010, there were 467,602 hail damage claims filed in the U.S. That number increased to 689,267 in 2011 and to 861,597 in 2012—an overall increase of 84 percent from 2010 to 2012.

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

Over 2 million hail damage claims were processed from January 1, 2010, to December 31, 2012. During this period with Colorado ranking number 4 in overall claims. The top five states generating hail damage claims were Texas (320,823); Missouri (138,857); Kansas (126,490); Colorado (118,118) and Oklahoma (114,168). Much of the damage inflicted by hail is to crops. Even relatively small hail can shred plants to ribbons in a matter of minutes. Vehicles, roofs of buildings and homes, and landscaping are the other things most commonly damaged by hail. Hail has been known to cause injury to humans and occasionally has been fatal.

With the exception of the May 22, 2008, event and the hailstorm that hit Pueblo on July 29, 2009, Colorado's 10 most costly hailstorms were centered in the Denver Metro area (see Table 14-2).

Based on the information in this hazard profile the severity of hailstorms is limited—10 to 25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability. Overall significance is considered medium: moderate potential impact.

**TABLE 14-2
DAMAGE FROM 10 MOST COSTLY HAIL EVENTS IN COLORADO**

Date	Location	Cost When Occurred (Millions)	2013 Dollars (Millions) ^a
July 20, 2009	Denver Metro	\$767.6	\$833.5
July 11, 1990	Denver Metro	\$625.0	\$1.1 Billion
June 6-15, 2009	Denver Metro	\$353.3	\$381.2
June 6-7, 2012	CO Front Range	\$321.1	\$325.8
June 13-14, 1984	Denver Metro	\$276.7	\$620.3
July 29, 2009	Pueblo	\$232.8	\$252.7

**TABLE 14-2
DAMAGE FROM 10 MOST COSTLY HAIL EVENTS IN COLORADO**

Date	Location	Cost When Occurred (Millions)	2013 Dollars (Millions) ^a
October 1, 1994	Denver Metro	\$225.0	\$353.6
May 22, 2008	Windsor	\$193.5	\$209.3
July 13, 2011	CO Front Range	\$164.8	\$170.6
June 8-9, 2004	Denver Metro	\$146.5	\$180.6
August 11, 1997	Denver Metro	\$128.0	\$185.7
May 22, 1996	Denver Metro	\$122.0	\$181.1

*2013 estimated cost calculations based on the Consumer Price Index.
Source: Rocky Mountain Insurance Information Association

14.2.5 Warning Time

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.

14.3 SECONDARY HAZARDS

The most significant secondary hazards associated with hail storms are floods resulting from storm drains that have been clogged with hail.

14.4 CLIMATE CHANGE IMPACTS

Climate change presents a significant challenge for risk management associated with severe weather. The frequency of severe weather events has increased steadily over the last century. The number of weather-related disasters during the 1990s was four times that of the 1950s, and cost 14 times as much in economic losses. Historical data shows that the probability for severe weather events increases in a warmer climate (see Figure 14-2). The changing hydrograph caused by climate change could have a significant impact on the intensity, duration and frequency of storm events. All of these impacts could have significant economic consequences.

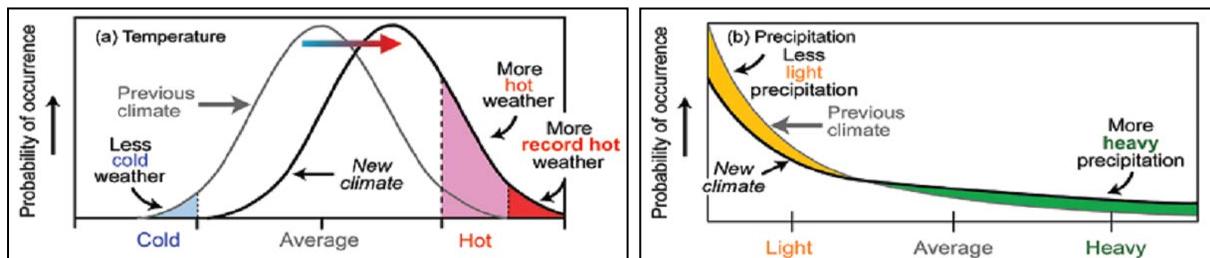


Figure 14-2. Severe Weather Probabilities in Warmer Climates

14.5 EXPOSURE

14.5.1 Population

It can be assumed that the entire planning area is exposed to some extent to hail events, although death or injury as a direct result of a hailstorm is unlikely.

14.5.2 Property

According to the El Paso County Assessor, there are 234,843 buildings within the census tracts that define the planning area. Most of these buildings are residential. All of these buildings are considered to be exposed to the hail hazard, but structures in poor condition or in particularly vulnerable locations (located on hilltops or exposed open areas) may risk the most damage. Roofs, landscaping, crops and vehicles are the property most commonly damaged by hail. The frequency and degree of damage will depend on specific locations.

14.5.3 Critical Facilities and Infrastructure

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 natural hazards, such as thunderstorms, that may result in damage or loss of function to facilities and infrastructure.

14.5.4 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.

14.6 VULNERABILITY

14.6.1 Population

It can be assumed that the entire planning area is vulnerable to some extent to hail events, although death or injury as a direct result of a hailstorm is unlikely. Vulnerable populations are the elderly, low income or linguistically isolated populations, people with life-threatening illnesses, and residents living in areas that are isolated from major roads. Power outages can be life threatening to those dependent on electricity for life support. Isolation of these populations is a significant concern. These populations face isolation and exposure during hail events and could suffer more secondary effects of the hazard.

14.6.2 Property

All property is vulnerable during hail events, but properties in poor condition or in particularly vulnerable locations may risk the most damage.

Loss estimations for the hail 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 and 50 percent of the assessed value of exposed structures. This allows emergency managers to select a range of potential economic impact based on an estimate of the percent of damage to the general building stock. Damage in excess of 50 percent is considered to be substantial by most building codes and typically requires total reconstruction of the structure. Table 14-3 lists the loss estimates.

TABLE 14-3. LOSS ESTIMATES FOR HAIL				
	Exposed Value	Estimated Loss Potential from Hail		
		10% Damage	30% Damage	50% Damage
Calhan	\$197,690,642	\$19,769,064	\$59,307,193	\$98,845,321
Fountain	\$86,846,494,924	\$8,684,649,492	\$26,053,948,477	\$43,423,247,462
Green Mt. Falls	\$3,082,347,521	\$308,234,752	\$924,704,256	\$1,541,173,760

**TABLE 14-3.
LOSS ESTIMATES FOR HAIL**

	Exposed Value	Estimated Loss Potential from Hail		
		10% Damage	30% Damage	50% Damage
Manitou Springs	\$167,664,615	\$16,766,462	\$50,299,385	\$83,832,308
Monument	\$1,086,073,858	\$108,607,386	\$325,822,157	\$543,036,929
Palmer Lake	\$1,534,339,852	\$456,099,791	\$136,829,937	\$228,049,896
Ramah	\$22,491,593	\$22,491,593	\$6,747,478	\$11,245,796
Unincorporated	\$23,761,150,586	\$23,761,150,586	\$7,128,345,176	\$11,880,575,293
Total	\$117,154,353,382	\$11,715,435,338	\$35,146,306,015	\$58,577,176,691

14.6.3 Critical Facilities and Infrastructure

Incapacity and loss of roads are the primary transportation failures resulting from thunderstorms, wind and hail, mostly associated with secondary hazards. 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 would leave certain populations isolated because residents would be unable to call for assistance.

14.6.4 Environment

The vulnerability of the environment to hailstorms is the same as the exposure.

14.7 FUTURE TRENDS IN DEVELOPMENT

All future development 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 construction. The planning partners have adopted 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. With these tools, the planning partnership is well equipped to deal with future growth and the associated impacts of severe weather, including hail.

14.8 SCENARIO

A worst-case scenario for a hail event would occur if large diameter hail fell during a severe storm event that also involved heavy precipitation, lightning, and severe winds. Large diameter hail could cause damage to structures and may result in injuries. Hail could clog storm drainage infrastructure, thus exacerbating flooding in the area.

14.9 ISSUES

Important issues associated with a severe weather 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.

CHAPTER 15. LANDSLIDE OR ROCKFALL

LANDSLIDE OR ROCKFALL RANKING						
El Paso County	Calhan/Ramah	Fountain	Green Mountain Falls	Manitou Springs	Monument	Palmer Lake
Low	Low	Low	Low	High	Low	Low

15.1 GENERAL BACKGROUND

15.1.1 Landslide

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

DEFINITIONS

Landslide—The sliding movement of masses of loosened rock and soil down a hillside or slope. Such failures occur when the strength of the soils forming the slope is exceeded by the pressure, such as weight or saturation, acting upon them.

Mass Movement—A collective term for landslides, debris flows, falls, and sinkholes.

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.

Flows and slides are commonly categorized by the form of initial ground failure. Figure 15-1 through Figure 15-4 show common types of slides. The most common is the shallow colluvial slide, occurring particularly in response to intense, short-duration storms. The largest and most destructive are deep-seated slides, although they are less common than other types.

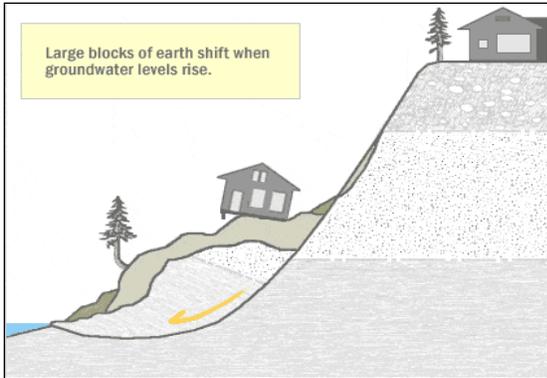


Figure 15-1. Deep Seated Slide

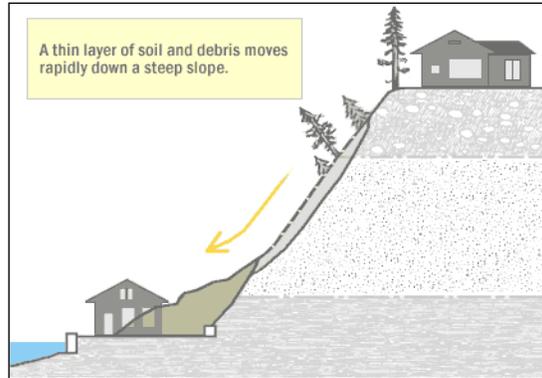


Figure 15-2. Shallow Colluvial Slide

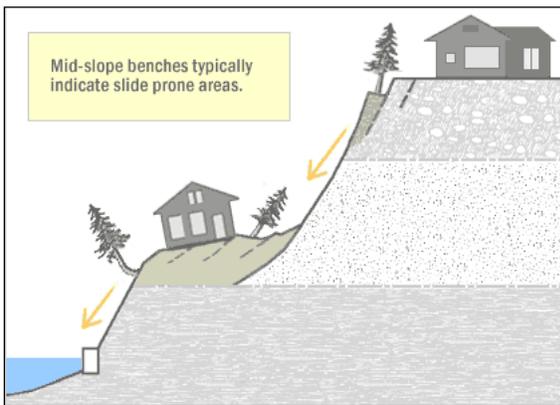


Figure 15-3. Bench Slide

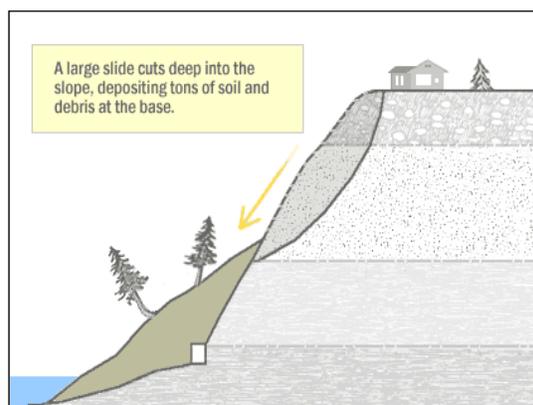


Figure 15-4. Large Slide

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

15.1.2 Rockfall

A rockfall is the falling of a detached mass of rock from a cliff or down a very steep slope. Weathering and decomposition of geological materials produce conditions favorable to 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 a rockfall. Rocks in a rockfall can be of any dimension, from the size of baseballs to houses. Rockfalls can threaten human life, impact transportation corridors and communication systems, and result in other property damage. Spring is typically the landslide/rockfall season in Colorado as snow melts and saturates soils, and temperatures enter into freeze/thaw cycles. Rockfalls and landslides are influenced by seasonal patterns, precipitation and temperature patterns. Earthquakes could trigger rockfalls and landslides too.

15.2 HAZARD PROFILE

15.2.1 Past Events

There were no landslide events listed in the National Climatic Data Center Storm Events Database or the Spatial Hazards Events and Losses Database; however, there have been some recorded landslide or rockfall events within or near El Paso County. In the 2010 update of the City of Colorado Springs' hazard mitigation plan the City notes that at least 37 landslide events occurred within a 50 year time period and at least some of these slides destroyed structures. Some of these landslide and rockfall events are discussed below:

- May 15, 1949—Heavy afternoon thunderstorms and rainfall caused a landslide in Ute Pass, sending about 400 tons of rock and mud down on Highway 24.
- May, 1995—Residents in Manitou Springs observed the movements of a large, dangerous block of rock before it could fall (Figure 15-5). This set into motion an emergency declaration by the town, which resulted in the compulsory evacuation of homes that were located below the rocky slope, the closing of the road in the area, and an immediate rock stabilization project (Colorado Geological Society, 1998).

Source: Photo Jon White, Colorado Geological Society



Figure 15-5. Potential Rock Fall in Manitou Springs, 1995

- May 18, 1995—Heavy rain caused a landslide and closed Highway 24 along Ute Pass. Two homes were condemned as a result of the slide and this incident prompted the City of Colorado Springs to request the Colorado Geological Survey to review developments within the city limits (Colorado Geological Society, 1998).
- June 27, 2007—A large rock fall occurred on U.S. 24. The largest of three sandstone slabs that fell June 27 from the crown of the slope on the north side of the highway measured 20 feet high, 15 feet wide and 40 feet long. It was estimated to weigh about 30 tons. Another

crossed into the highway and slammed into the freeway divider, damaging a 3-foot-wide chunk of concrete. Approximately 100 tons of boulders and debris were removed from the area below the slope (Johnson, 2007).

- April 23, 2013—U.S. Highway 24 was closed in both directions after a rockfall event that left 150 tons of debris on the highway (Figure 15-6).
- Summer 2013—Thunderstorms with heavy rain and hail caused four mud/rockslides that closed Highway 24 along Ute Pass. There were several rock and mudslides on other roads.



Figure 15-6. Rockfall at US 24 at MP 296 Westbound (April 23, 2013)

15.2.2 Location

Landslide

The best available predictor of where movement of slides and earth flows might occur is the location of past movements. Past landslides can be recognized by their distinctive topographic shapes, which can remain in place for thousands of years. Most landslides recognizable in this fashion range from a few acres to several square miles. Most show no evidence of recent movement and are not currently active. A small proportion of them may become active in any given year, with movements concentrated within all or part of the landslide masses or around their edges.

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.

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. The cost to maintain, cleanup, monitor, and repair roads and highways from landslide activity is difficult to assess, but the best records come from CDOT, which is responsible for maintaining Colorado roads and highways” (Colorado Division of Emergency Management, 2011).

The areas of documented landslides in El Paso County are shown on Figure 15-7 and in Figure 15-8 through Figure 15-13 for each participating municipality.

Rockfall

A newsletter published by the Colorado Geological Society describes source areas for rock falls as follows (Colorado Geological Society, 2008):

Typically, source areas of rockfall are topographically high, hard-rock formations; and to a lesser extent, unconsolidated deposits (soil) containing large fragments of solid rock. Discontinuities (cracks) in the rockmass, such as joints, fractures, faults, and bedding planes, are exposed to weathering processes that weaken the rockmass. The vast majority of rock units have discontinuities, or cracks. The orientation, length (persistence), spacing, and general condition of these cracks make a big difference as to the overall stability of the rockmass.

A rockmass like a granite or hard sandstone is more resistant to erosion than soil or softer rock, such as mudstones, claystones, and shales. When softer materials are weathered and eroded away over time, these remaining resistant rocks create topographically high landforms such as mountains, ridges, and mesas. In the alpine areas of Colorado, glaciers created oversteepened valley walls by carving U-shaped valleys, cirques, and arêtes. These steep slopes are also now potential source areas for rockfall. Rockfall initiates from high outcrops of more resistant rock that becomes unstable for a variety of reasons. The size of the falling rock depends on the source area geology (bedding thickness, bedding dip and dip direction, hardness, joint/fracture orientation), weathering, position, and steepness of the slope.

Additionally, transportation networks are common places for rockfalls to occur. A 2007 news article notes that “more than 750 high-risk sites around the state are evaluated every five years for their risk of fall, taking geological, slope, and traffic data into account. One portion of Highway 24 in Manitou Springs is on the state’s checklist” (Johnson, 2007).

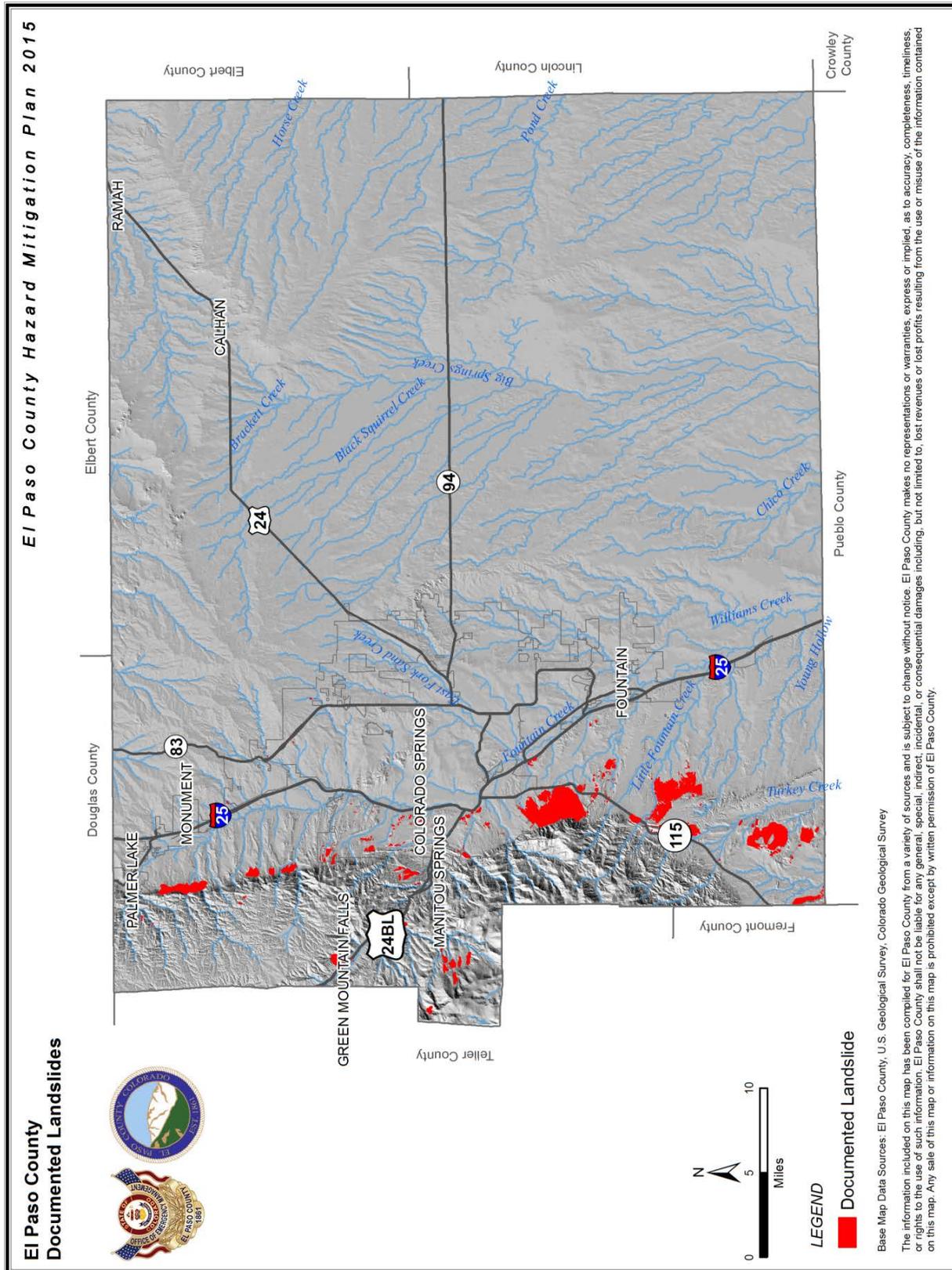


Figure 15-7. Areas of Documented Landslides in El Paso County

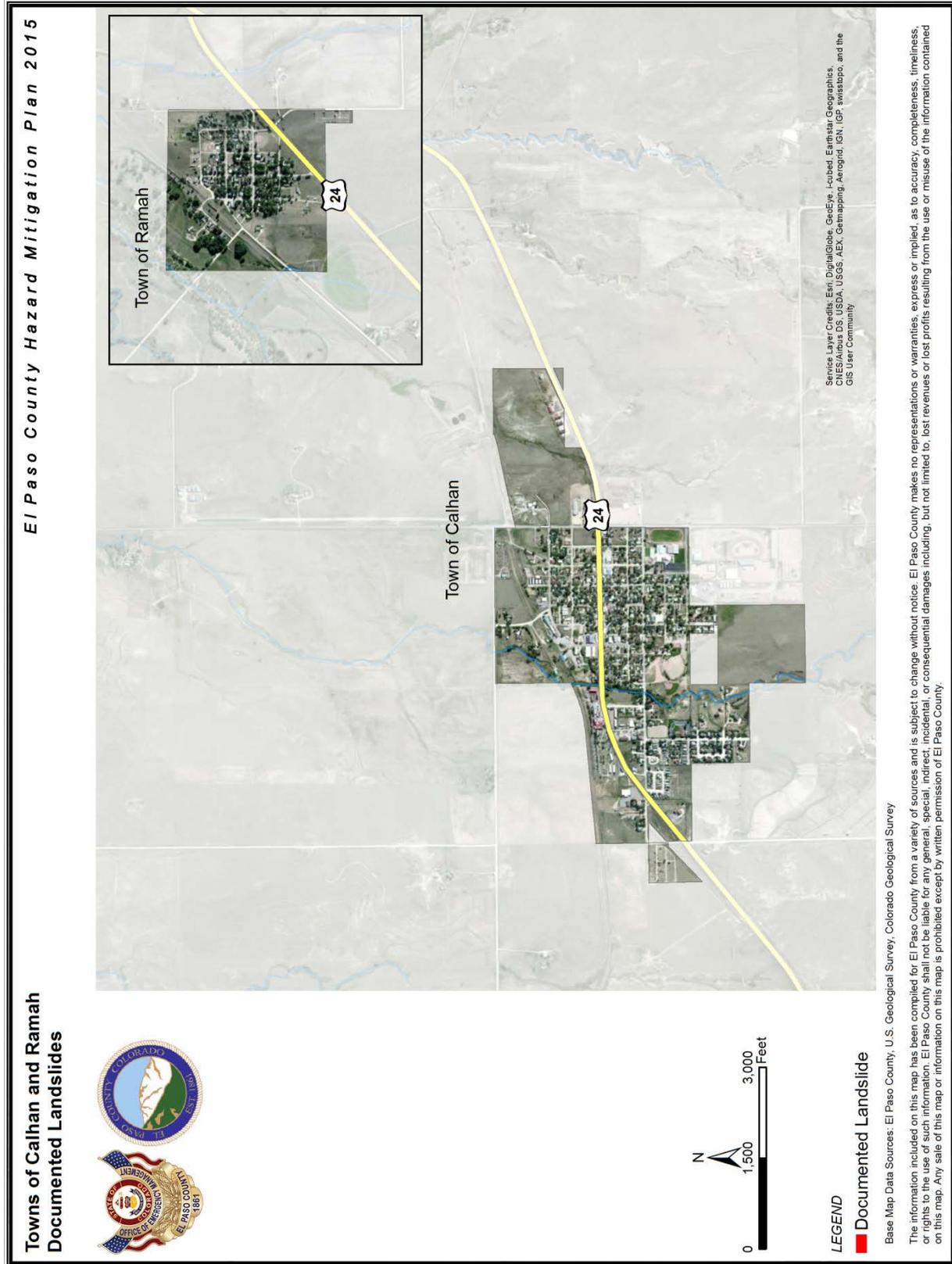


Figure 15-8. Areas of Documented Landslides in the Towns of Calhan and Ramah

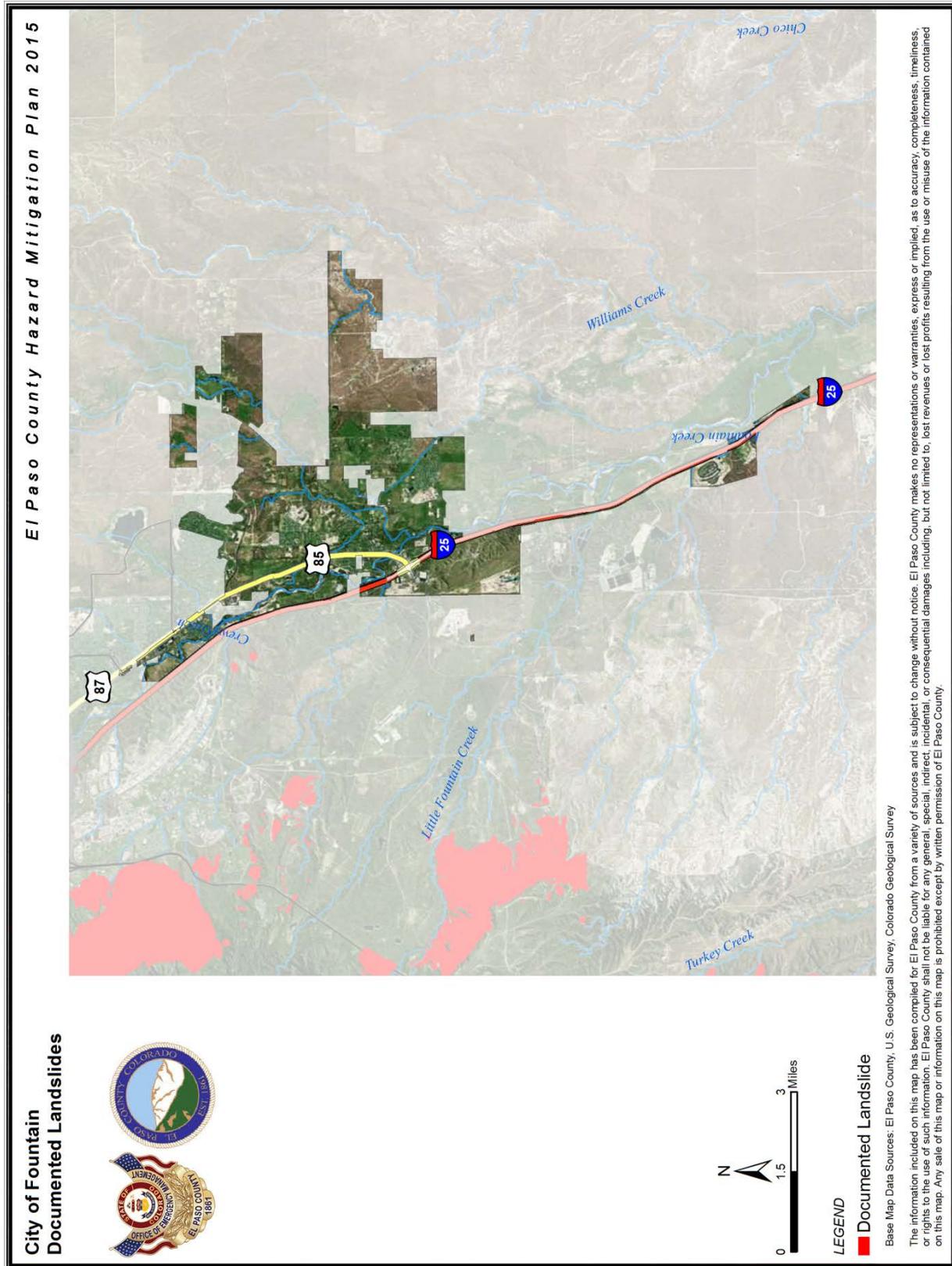


Figure 15-9. Areas of Documented Landslides in the City of Fountain

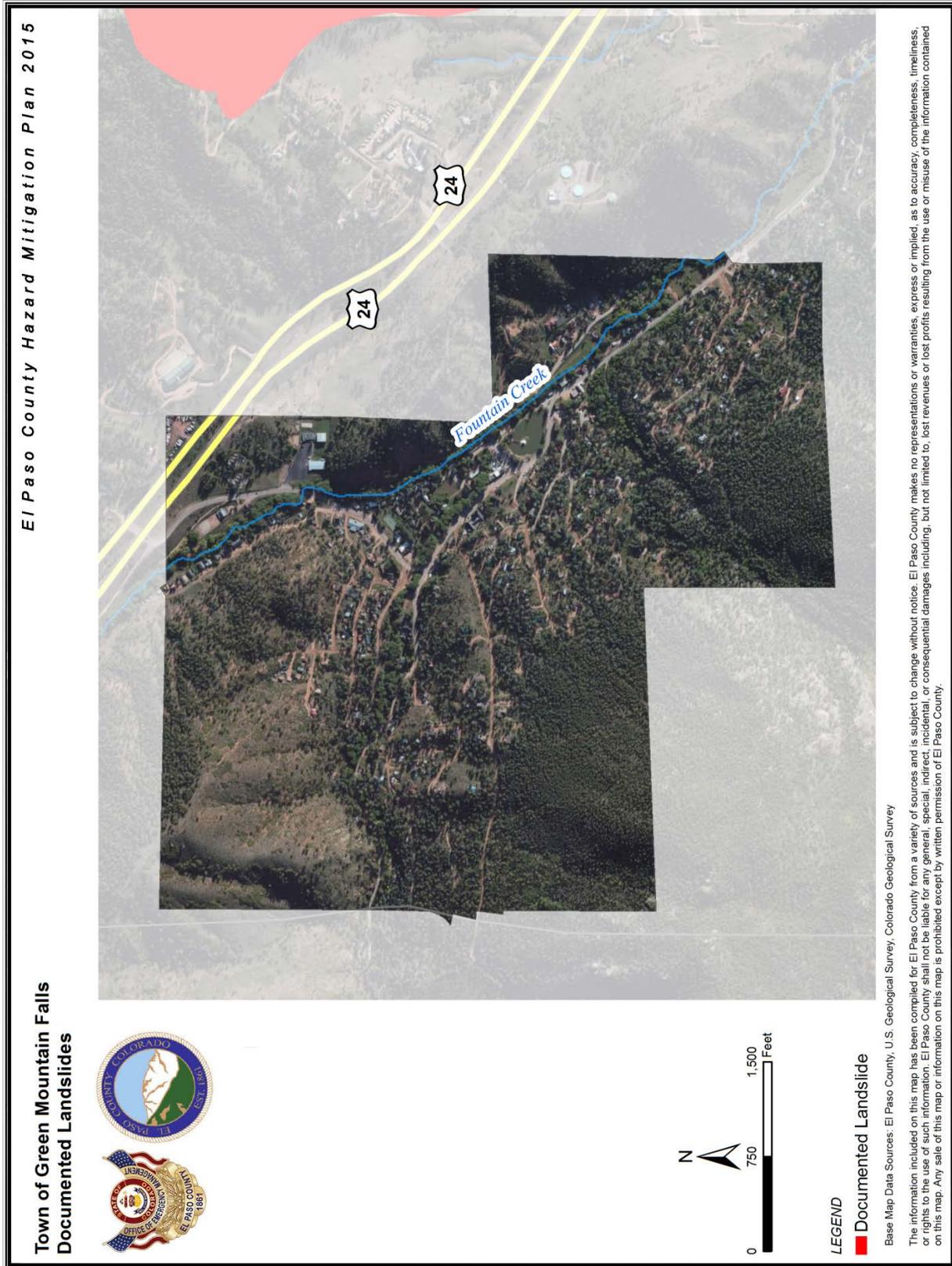


Figure 15-10. Areas of Documented Landslides in the Town of Green Mountain Falls

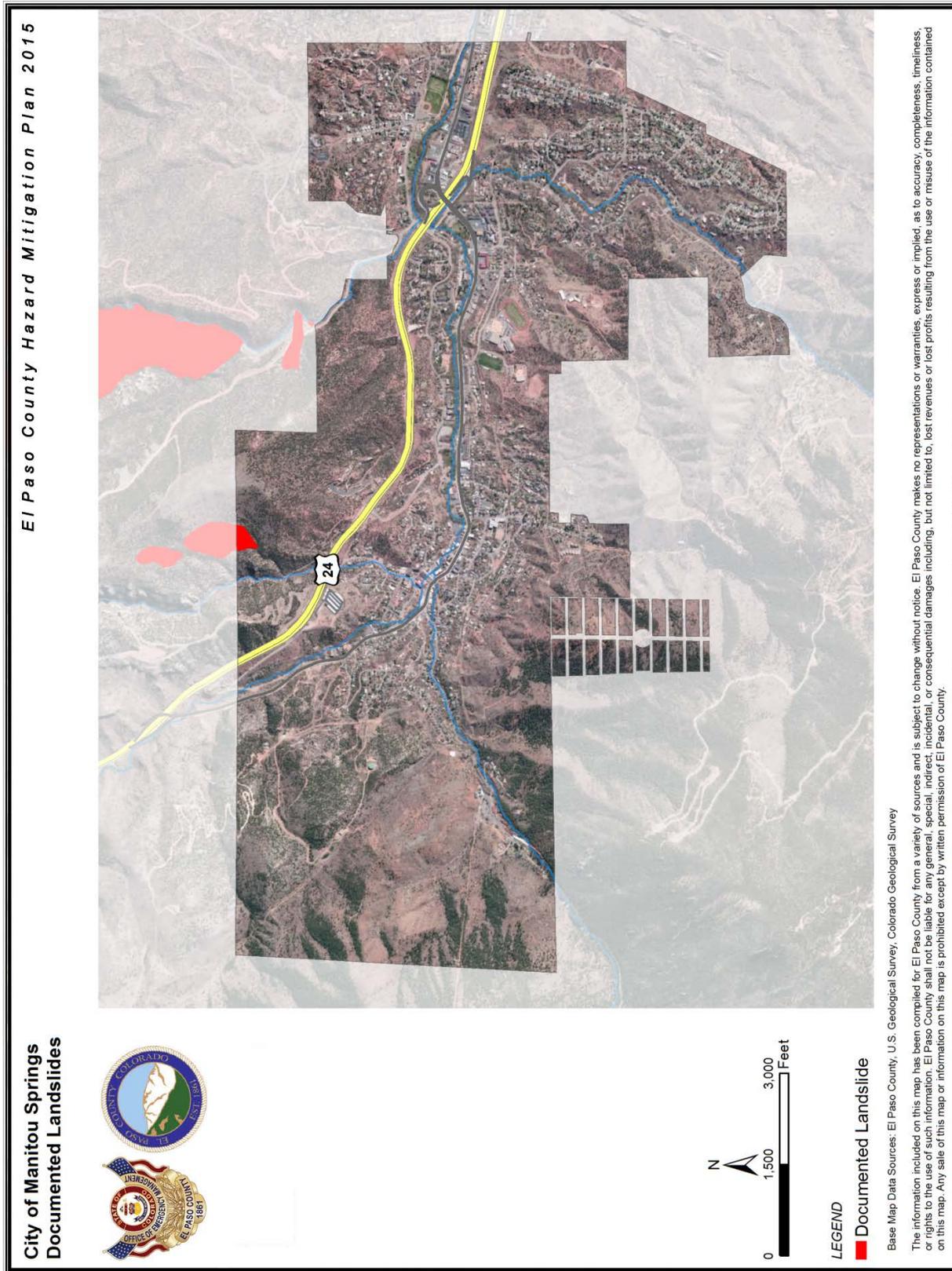


Figure 15-11. Areas of Documented Landslides in the City of Manitou Springs

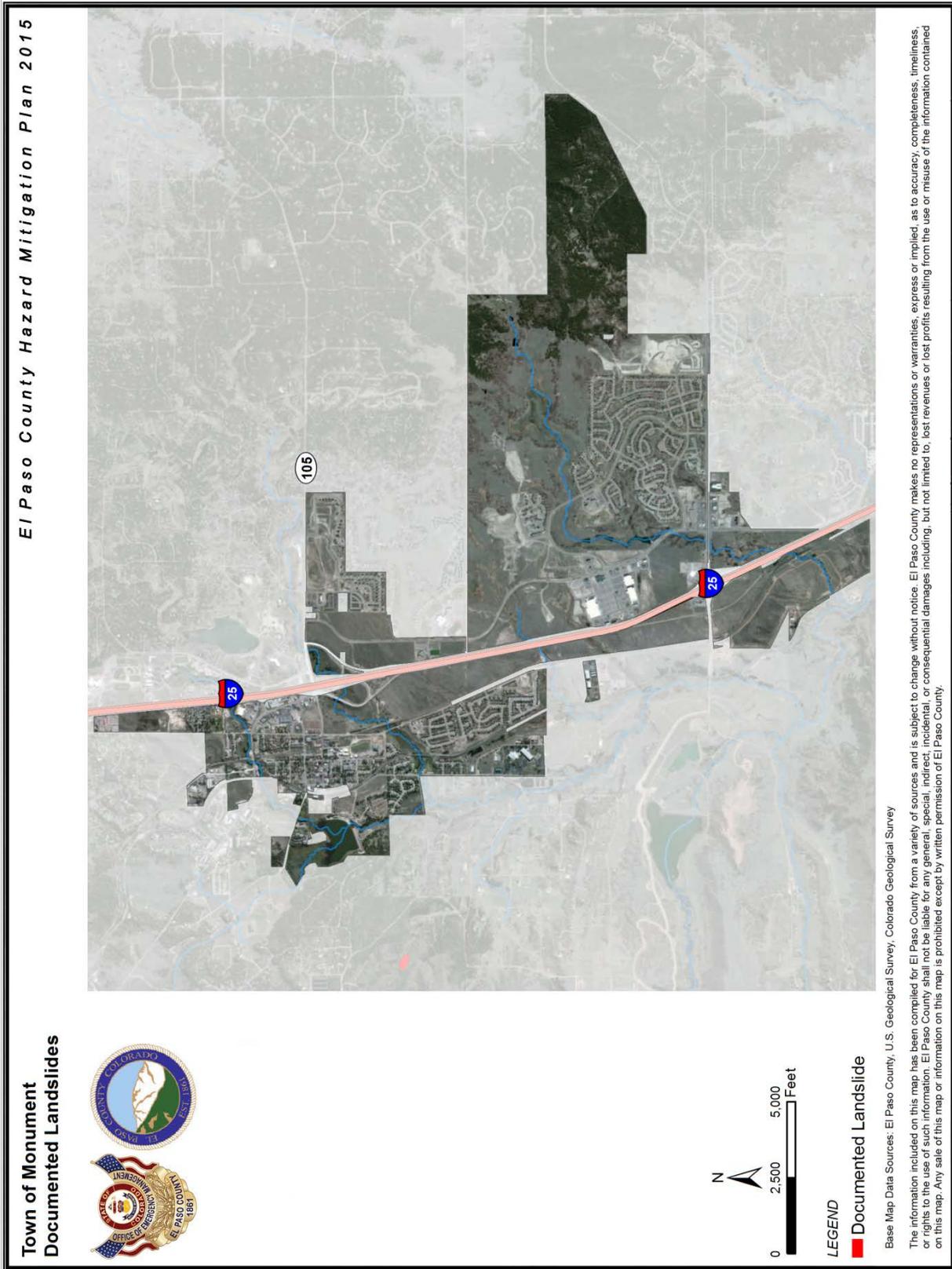


Figure 15-12. Areas of Documented Landslides in the Town of Monument

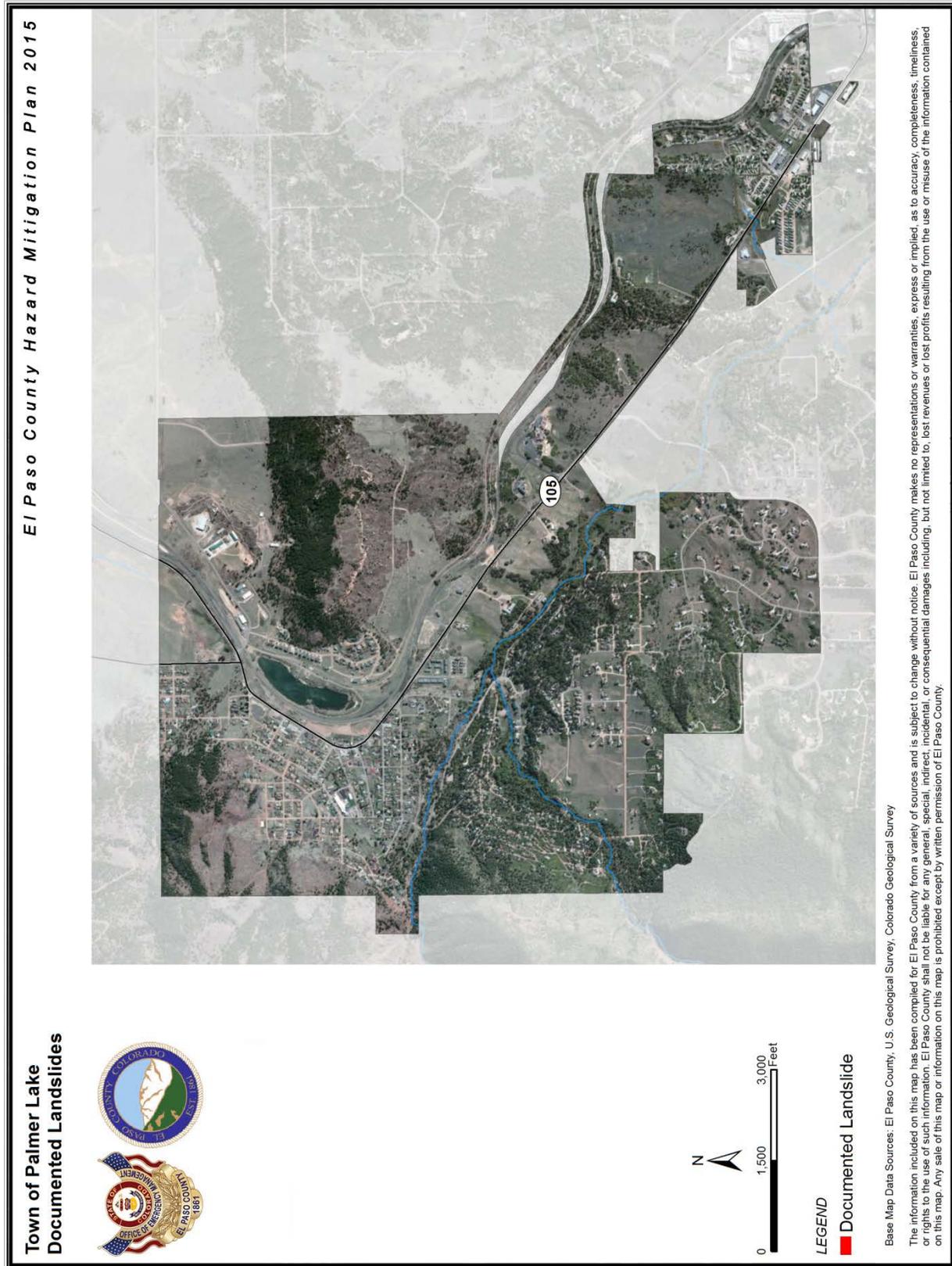


Figure 15-13. Areas of Documented Landslides in the Town of Palmer Lake

15.2.3 Frequency

Based on the previous occurrences noted above, the probability of landslide/rockfall events are likely, with a 10- to 100-percent chance of occurrence in any given year, or a recurrence interval of 10 years or less.

15.2.4 Severity

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 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 Society, 2008). The magnitude/severity of a landslide/rockfall event in El Paso County is Critical. It is likely that past events have resulted 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 24-72 hours. However, these impacts are highly localized, so the overall significance to the County and to the participating partners that are not near landslide-prone areas (for example the towns of Calhan and Ramah) is considered limited: low potential impact.

15.2.5 Warning Time

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 the geology, vegetation and amount of predicted precipitation for an area can help in these predictions. However, there is no practical warning system for individual landslides. The current standard operating procedure is to monitor situations on a case-by-case basis, and respond after the event has occurred. Generally accepted warning signs for landslide activity include:

- Springs, seeps, or saturated ground in areas that have not typically been wet before
- New cracks or unusual bulges in the ground, street pavements or sidewalks
- Soil moving away from foundations
- Ancillary structures such as decks and patios tilting 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 road beds
- Rapid increase in creek water levels, possibly accompanied by increased soil content
- Sudden decrease in creek water levels though rain is still falling or just recently stopped
- Sticking doors and windows and visible gaps indicating jambs and frames out of plumb
- A faint rumbling sound that increases in volume as the landslide nears
- Unusual sounds, such as trees cracking or boulders knocking together.

15.3 SECONDARY HAZARDS

Landslides 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 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.

15.4 CLIMATE CHANGE IMPACTS

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 landslide occurrences.

15.5 EXPOSURE

A qualitative assessment of exposure and vulnerability for the landslide and rockfall hazard follows.

15.5.1 Population

People living or working near steep slopes are exposed to landslide 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.

15.5.2 Property

Property located near steep slopes or downslope from wildfire burn scars is exposed to landslide and rock fall hazards.

15.5.3 Critical Facilities and Infrastructure

A significant amount of infrastructure can be exposed to mass movements:

- **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.

15.5.4 Environment

Environmental problems as a result 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.

15.6 VULNERABILITY

15.6.1 Population

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.

15.6.2 Property

All property exposed to the landslide and rockfall hazard is vulnerable. Structural damage can range from minor damage to total destruction. Damage to structures in excess of 50 percent is considered to be substantial by most building codes and typically requires total reconstruction.

15.6.3 Critical Facilities and Infrastructure

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. A more in depth analysis should be performed on critical facility and infrastructure as more data becomes available.

15.6.4 Environment

The environment vulnerable to landslide hazard is the same as the environment exposed to the hazard.

15.7 FUTURE TRENDS IN DEVELOPMENT

The County is experiencing moderate 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. 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.

The Colorado Geological Society notes that land use planning is an important component of addressing risk from landslide and rockfall hazards in Colorado (Colorado Geological Society, 2008):

By studying rockfall events and understanding the terrain where they occur, geologists, engineers, and local decision makers can work to improve development planning by avoiding high risk rockfall areas, and providing rockfall protection and mitigation in lower risk areas.

Because steep slopes are more difficult to develop, many areas with rock-fall hazards have historically been avoided except by road construction; however, as growth continues throughout the mountains and other steep slope areas in Colorado, more areas are being developed within potential rockfall hazard zones. Many mountain towns of Colorado are exposed to rockfall hazards, some of which are high risk and potentially very dangerous. Planning for avoidance or mitigation of the rockfall hazard is crucial in these areas.

15.8 SCENARIO

Major landslides in the planning area occur as a result of soil conditions that have been affected by wildfire, natural erosion, severe storms, groundwater, or human development. The worst-case scenario for landslide hazards in the planning area would generally correspond to a severe storm that had heavy rain and caused flooding in burn scar areas. Landslides are most likely during late spring and summer months. After heavy spring and summer rains, soils become saturated with water. As water seeps downward through upper soils that may consist of permeable sands and gravels and accumulates on impermeable silt, it will cause weakness and destabilization in the slope. A short intense storm could cause saturated soil to move, resulting in landslides. As rains continue, the groundwater table rises, adding to the

weakening of the slope. Burn scars, gravity, poor drainage, a rising groundwater table, and poor soil exacerbate hazardous conditions.

Mass movements are becoming more of a concern as development moves outside of city centers and into areas less developed in terms of infrastructure. Most mass movements would be isolated events affecting specific areas. It is probable that private and public property, including infrastructure, will be affected. Mass movements could affect bridges that pass over landslide prone ravines and knock out rail service through the county. Road obstructions caused by mass movements would create isolation problems for residents and businesses in sparsely developed areas. Property owners exposed to steep slopes may suffer damage to property or structures. Landslides carrying vegetation such as shrubs and trees may cause a break in utility lines, cutting off power and communication access to residents.

15.9 ISSUES

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 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 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.
- The impact of climate change on landslides/rockfall is uncertain. If climate change impacts atmospheric conditions, then exposure to these risks is likely to increase.
- 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.
- The greatest risk is to Highway 24 through Ute Pass. Any closure of Highway 24 has large economic impacts.

CHAPTER 16. LIGHTNING

LIGHTNING RANKING						
El Paso County	Calhan/Ramah	Fountain	Green Mountain Falls	Manitou Springs	Monument	Palmer Lake
Medium	Medium	Medium	Low	Medium	Medium	Medium

16.1 GENERAL BACKGROUND

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 we hear as thunder. Thunderstorms have three stages (see Figure 16-1):

DEFINITIONS

Lightning – A sudden, powerful flow of electricity between electrically charged regions within a thundercloud. Lightning can occur intra-cloud, cloud-to-cloud, or cloud-to-ground.

Thunderstorm—A storm featuring heavy rains, strong winds, thunder and lightning, typically about 15 miles in diameter and lasting about 30 minutes. Hail and tornadoes are also dangers associated with thunderstorms. Lightning is a serious threat to human life. Heavy rains over a small area in a short time can lead to flash flooding.

Thunder – The sound caused by lightning, due to the sudden increase in pressure and temperature produced by the rapid expansion of air surrounding and within a bolt of lightning.

- The *developing stage* of a thunderstorm is marked by a cumulus cloud that is being pushed upward by a rising column of air (updraft). The cumulus cloud soon looks like a tower (called towering cumulus) as the updraft continues to develop. There is little to no rain during this stage but occasional lightning. The developing stage lasts about 10 minutes.
- The thunderstorm enters the *mature stage* when the updraft continues to feed the storm, but precipitation begins to fall out of the storm, and a downdraft begins (a column of air pushing downward). When the downdraft and rain-cooled air spread out along the ground, they form a gust front, or a line of gusty winds. The mature stage is the most likely time for hail, heavy rain, frequent lightning, strong winds, and tornadoes. The storm occasionally has a black or dark green appearance.

- Eventually, a large amount of precipitation is produced and the updraft is overcome by the downdraft beginning the *dissipating stage*. At the ground, the gust front moves out a long distance from the storm and cuts off the warm moist air that was feeding the thunderstorm. Rainfall decreases in intensity, but lightning remains a danger.

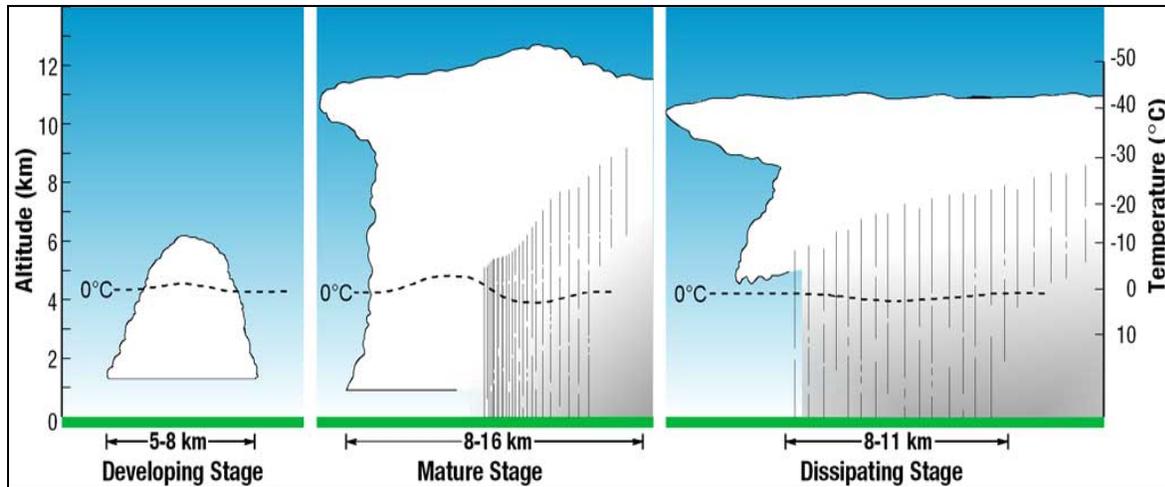


Figure 16-1. The Thunderstorm Life Cycle

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 5 or 10 miles from the storm in areas that most people do not consider to be a threat. Positive lightning also has a longer duration, so fires are more easily ignited. And, when positive lightning strikes, it usually carries a high peak electrical current, potentially resulting in greater damage.

The ratio of cloud-to-ground and intra-cloud lightning can vary significantly from storm to storm. Depending upon cloud height above ground and changes in electric field strength between cloud and earth, the discharge stays within the cloud or makes direct contact with the earth. If the field strength is highest in the lower regions of the cloud, a downward flash may occur from cloud to earth. Using a

network of lightning detection systems, 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.

16.2 HAZARD PROFILE

16.2.1 Past Events

Historical severe weather data from the National Climatic Data Center Storm Events Database includes 40 lightning strike events with death, injury or property damage in El Paso County between 1996 and May 2014, as shown in Table 16-1.

Location	Date	Deaths	Injuries	Property Damage
Black Forest	6/12/1996	0	0	\$70,000
Colorado Springs	7/10/1996	0	1	\$0
Colorado Springs	7/20/1996	1	0	\$0
Colorado Springs	8/29/1996	0	0	\$200,000
Colorado Springs	9/10/1996	0	1	\$0
Colorado Springs	6/6/1997	0	1	\$0
Monument	7/6/1997	1	0	\$0
Colorado Springs	7/6/1998	0	0	\$50,000
Colorado Springs	7/10/1998	0	0	\$85,000
Fountain	8/19/1998	0	1	\$0
Colorado Springs	5/24/1999	0	3	\$0
Colorado Springs	5/24/1999	0	1	\$0
Colorado Springs	8/19/1999	0	8	\$0
Monument	7/20/2000	0	0	\$5,000
Colorado Springs	7/25/2000	1	0	\$0
Green Mountain Falls	7/28/2000	0	1	\$0
Colorado Springs	8/2/2000	0	0	\$75,000
Ft Carson	5/30/2001	1	3	\$0
Colorado Springs	7/12/2001	0	0	\$20,000
Colorado Springs	7/13/2001	0	0	\$100,000
Colorado Springs	8/5/2001	0	1	\$0
Chipita Park	7/13/2003	0	1	\$0
Monument	7/25/2003	0	1	\$0
Monument	8/5/2003	1	0	\$0
Colorado Springs	8/23/2003	0	3	\$0

**TABLE 16-1.
EL PASO COUNTY LIGHTNING EVENTS WITH DEATH, INJURY OR PROPERTY DAMAGE,
1996 - 2014**

Location	Date	Deaths	Injuries	Property Damage
Black Forest	6/26/2004	0	0	\$3,000
Colorado Springs	7/19/2006	0	1	\$0
Colorado Springs	5/22/2007	0	1	\$0
Manitou Springs	6/2/2007	0	1	\$0
Colorado Springs	6/4/2007	0	0	\$3,000
Colorado Springs	7/10/2007	0	0	\$30,000
Colorado Springs	9/2/2007	1	3	\$0
Colorado Springs Airport	6/24/2008	0	2	\$0
U.S. Air Force Academy	7/1/2009	0	0	\$3,000
Falcon	7/27/2009	0	0	\$200,000
Colorado Springs	8/6/2009	0	0	\$20,000
Schriever Air Force Base	7/10/2010	0	1	\$0
Schriever Air Force Base	7/24/2011	0	5	\$0
Peyton	7/30/2012	0	0	\$30,000
Fountain	7/31/2013	0	12	\$0

Data from the National Lightning Detection Network ranks Colorado 26th in the nation (excluding Alaska and Hawaii) with respect to the number of cloud-to-ground lightning flashes with an average number of more than 500,000 cloud-to-ground lightning strikes per year. El Paso County has an average of 2 to 5 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 16-2.

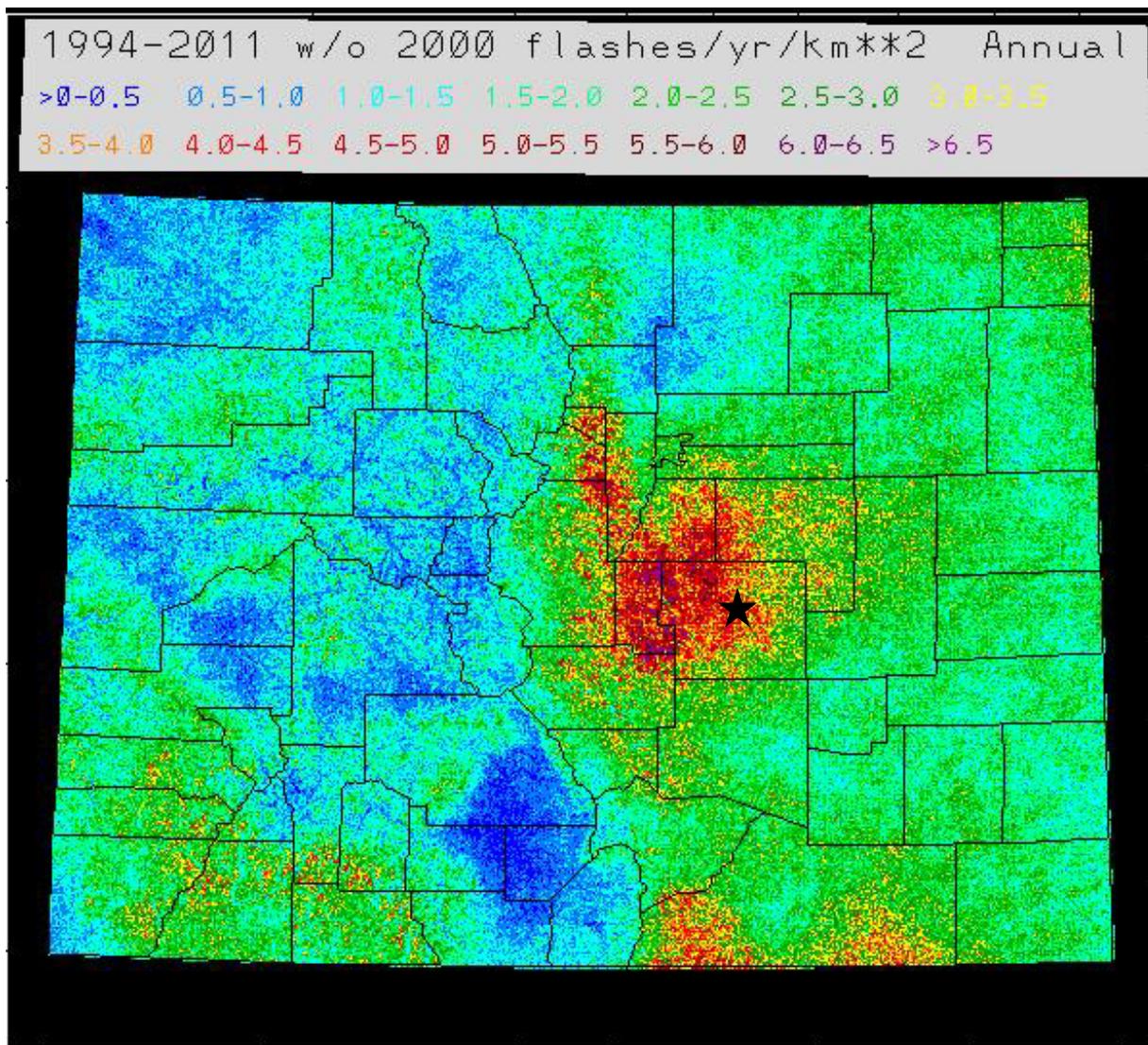


Figure 16-2. Colorado Annual Lightning Flash Density, 1994-2011

Figure 16-3 shows state-by-state lightning deaths between 2004-2013. Colorado ranks third for the number of deaths at 18, behind Florida (46 deaths) and Texas (22 deaths). In 2006, there were 5 lightning deaths and 15 reported lightning injuries in Colorado. In an average year in Colorado, 3 people are killed and 13 are injured. In July 2014, there were two lightning fatalities in Colorado, both in Rocky Mountain National Park.

Source: National Weather Service, www.lightningsafety.noaa.gov/

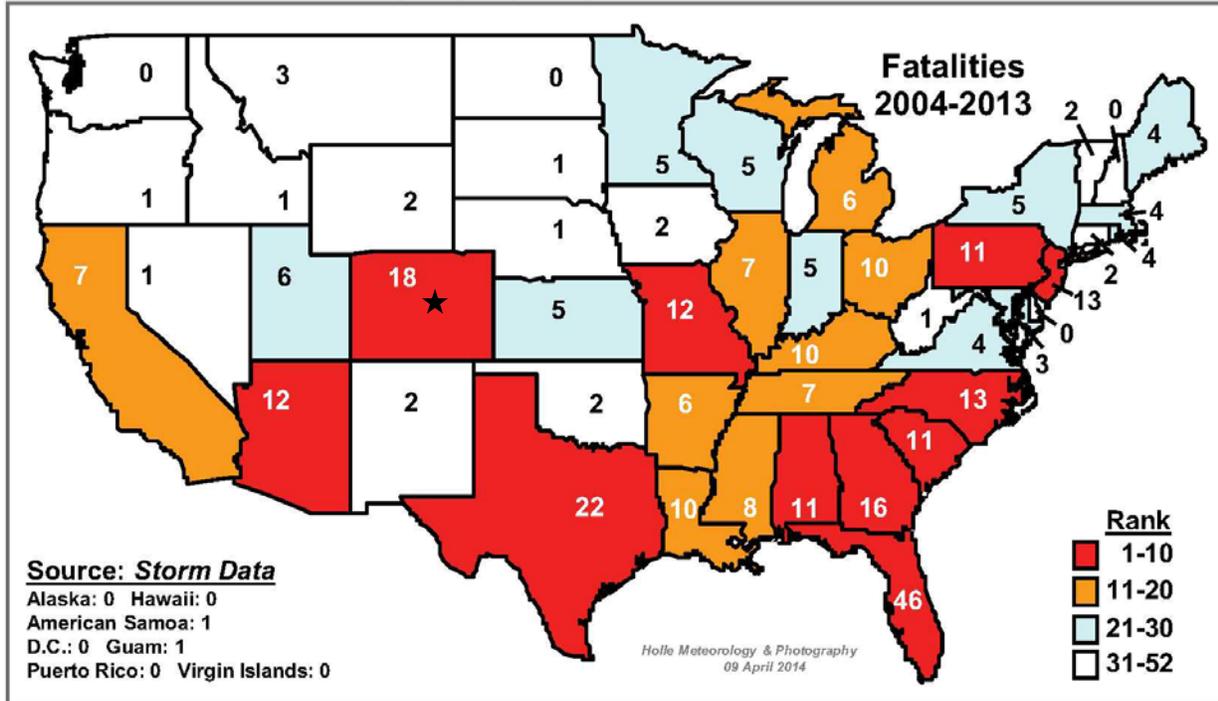


Figure 16-3. Lightning Fatalities in the United States, 2004-2013

Table 16 1 lists lightning events recorded in the NCDC Storm Event database for El Paso County that caused death, injury or property damage between 1996 and 2013. In Colorado, the largest number of fatalities due to lightning strike occur in July (Figure 16 2) and most fatalities in the State, annually, occur in the early afternoon (Figure 16 7).

Source: National Weather Service, 2014

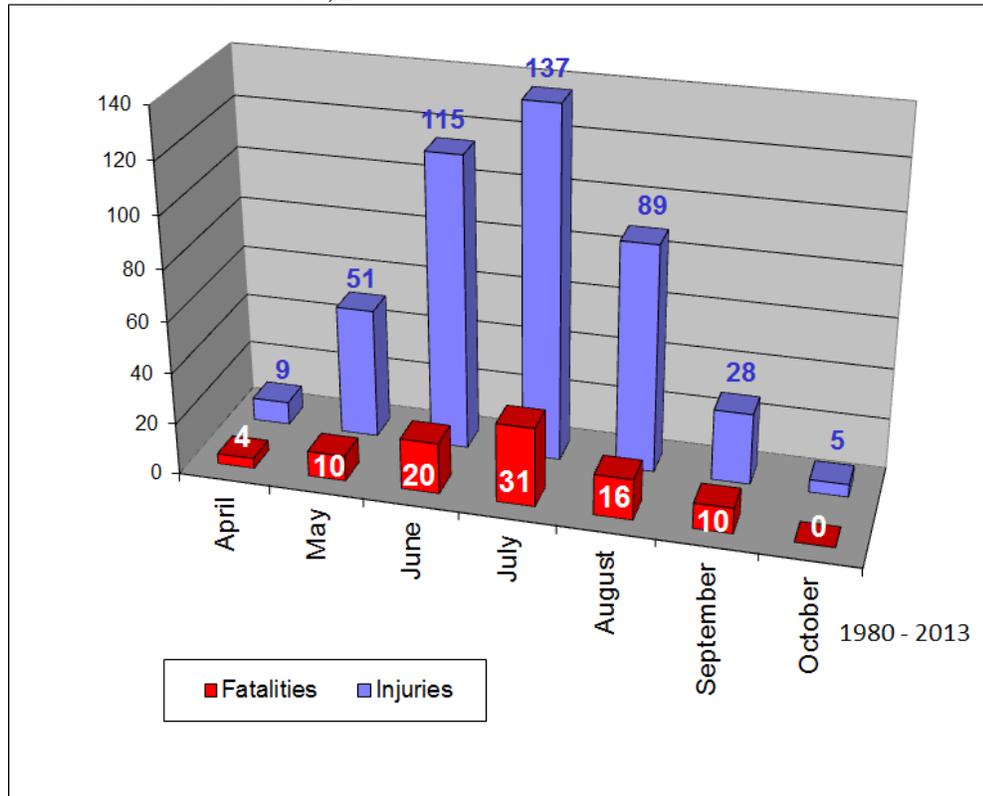


Figure 16-4. Lightning Fatalities and Injuries in Colorado by Month, 1980-2013

Source: National Weather Service, 2014

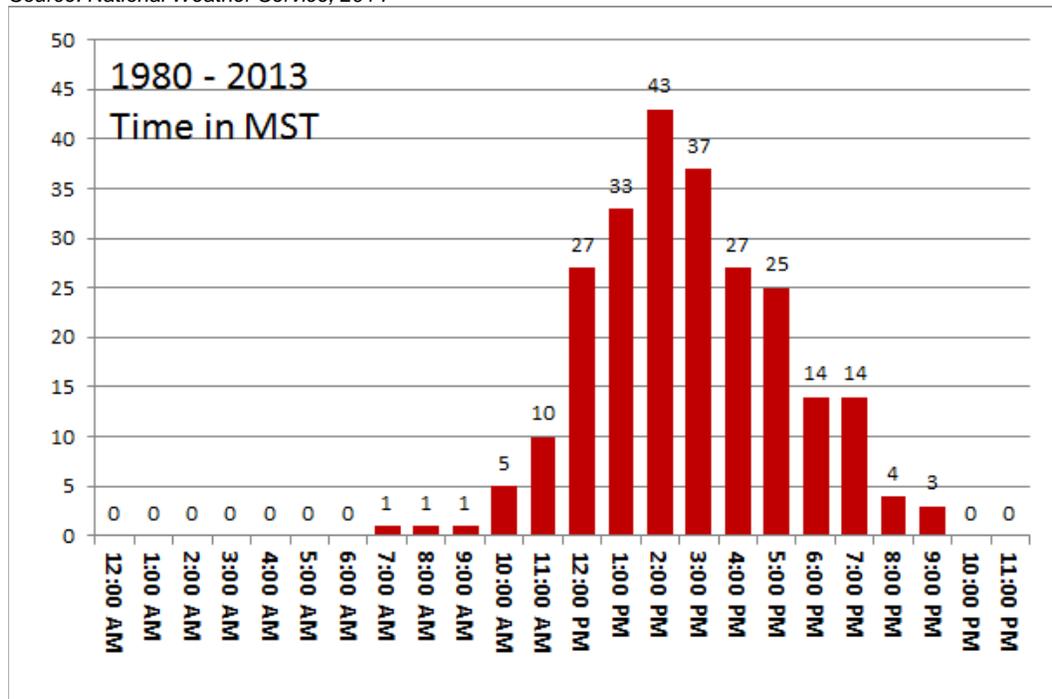


Figure 16-5. Lightning Fatalities in Colorado by Time of Day, 1980-2013

16.2.2 Location

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.

16.2.3 Frequency

Based on 40 events in 18 years, a damaging lightning strike more than twice per year on average in El Paso County and is considered likely, with a recurrence interval of 10 years or less.

16.2.4 Severity

Based on the information in this hazard profile, the magnitude/severity of lightning is limited in regard to property damage and critical in regard to fatalities. Overall significance is considered medium (moderate potential impact) due to risk to life safety, power outages, and fire ignitions.

The number of reported injuries from lightning is likely to be low, and County infrastructure losses equate to tens of thousands of dollars each year. The relationship of lightning to wildfire ignitions in the County increases the significance of this hazard.

16.2.5 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.

16.3 SECONDARY HAZARDS

The most significant secondary hazards associated with lightning strikes are wildfire and power outages.

16.4 CLIMATE CHANGE IMPACTS

Climate change presents a significant challenge for risk management associated with severe weather. The frequency of severe weather events has increased steadily over the last century. The number of weather-related disasters during the 1990s was four times that of the 1950s, and cost 14 times as much in economic losses. Historical data shows that the probability for severe weather events increases in a warmer climate (see Figure 14-2). The changing hydrograph caused by climate change could have a significant impact on the intensity, duration and frequency of storm events. All of these impacts could have significant economic consequences. A recent 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 we may have fewer, but more violent thunderstorms, “which may increase the amount of lightning by 10 percent for every one degree global warming” (Price, 2009).

16.5 EXPOSURE

16.5.1 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 person recreating or working outside are at an increased risk from lightning.

16.5.2 Property

According to the El Paso County Assessor, there are 234,843 buildings within the planning area. Most of these buildings are residential. All of these buildings are considered to be exposed to the lightning hazard, but structures 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.

16.5.3 Critical Facilities and Infrastructure

All critical facilities are likely exposed to risks associated with lightning strikes. The most common problems associated with lightning is loss of power. Phone, water and sewer systems may not function.

16.5.4 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.

16.6 VULNERABILITY

16.6.1 Population

All populations are vulnerable to lightning strikes; however, those working or recreating outdoors are more vulnerable.

16.6.2 Property

Loss estimations for the lightning 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 and 50 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. Damage in excess of 50 percent is considered to be substantial by most building codes and typically requires total reconstruction of the structure. Table 16-2 lists the loss estimates for the general building stock with exposure to the lightning hazard.

	Exposed Value	Estimated Loss Potential from Lightning		
		10% Damage	30% Damage	50% Damage
Calhan	\$197,690,642	\$19,769,064	\$59,307,193	\$98,845,321
Fountain	\$86,846,494,924	\$8,684,649,492	\$26,053,948,477	\$43,423,247,462
Green Mt. Falls	\$3,082,347,521	\$308,234,752	\$924,704,256	\$1,541,173,760
Manitou Springs	\$167,664,615	\$16,766,462	\$50,299,385	\$83,832,308
Monument	\$1,086,073,858	\$108,607,386	\$325,822,157	\$543,036,929
Palmer Lake	\$1,534,339,852	\$456,099,791	\$136,829,937	\$228,049,896
Ramah	\$22,491,593	\$22,491,593	\$6,747,478	\$11,245,796
Unincorporated	\$23,761,150,586	\$23,761,150,586	\$7,128,345,176	\$11,880,575,293
Total	\$117,154,353,382	\$11,715,435,338	\$35,146,306,015	\$58,577,176,691

16.6.3 Critical Facilities and Infrastructure

Lightning strikes can create serious impacts on power infrastructure. Loss of electricity and phone connection would leave certain populations isolated because residents would be unable to call for assistance.

16.6.4 Environment

The vulnerability of the environment to lightning is the same as the exposure.

16.7 FUTURE TRENDS IN DEVELOPMENT

All future development 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. The planning partners have adopted the International Building Code. Land use policies identified in general plans within the planning area also address many of the secondary impacts (wildfire) of the lightning hazard.

16.8 SCENARIO

Lightning strikes are a regular occurrence within the County. A worst case scenario for lightning would be a strike that injures or kills a person, or one that occurs during a drought and sparks a wildfire. If wind conditions are unfavorable the fire could spread rapidly destroying homes and property and threatening lives.

16.9 ISSUES

Important issues associated with the lightning hazard in the planning area include the following:

- Public education campaigns can help reduce injuries and fatalities resulting from lightning strikes.
- Lightning strikes are common in El Paso County and cause limited property damage on a regular basis.

CHAPTER 17. MUD OR DEBRIS FLOW

MUD OR DEBRIS FLOW RANKING						
El Paso County	Calhan/Ramah	Fountain	Green Mountain Falls	Manitou Springs	Monument	Palmer Lake
High	Low	Low	Medium	High	Low	Low

17.1 GENERAL BACKGROUND

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. 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, 2000). 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 considered to be particularly hazardous (USGS, 2000). Additional areas susceptible to debris flows include roadcuts or other slope areas that have been altered and areas where surface runoff is channeled (USGS, 2000). Flows in areas that have been modified, such as roadways, may occur during less intense rainfall situations than those required for undisturbed areas (USGS, 2000).

DEFINITIONS

Mud Flow—A mass of water and fine-grained earth that flows down a stream, ravine, canyon, arroyo, or gulch.

Debris Flow—A mud flow where more than half of the solids in the mass are larger than sand grains.

Debris Fan—A conical landform produced by successive mud and debris flow deposits, and the likely spot for future events.

17.2 HAZARD PROFILE

17.2.1 Past Events

Mud and debris flows are a naturally occurring process and occur throughout Colorado. The largest recorded debris flow in Colorado history is a 175-foot thick mass of debris a mile long and 1,000 feet wide that occurred in 1985 in Garfield County. El Paso county has also experienced several instances of mud or debris flows.

- 1999-Flood, mud flow and landslide events in El Paso County caused over \$30 million in infrastructure and property damage, including road repairs and twisted utility lines. Several residences were condemned as a result and a Presidential Disaster Declaration was issued (Colorado Division of Emergency Management, 2013).
- July, 2013-A debris flow occurred on U.S. Highway 24 after a thunderstorm dropped 0.32 to 1.06 inches of rainfall on the Waldo Canyon burn scar. No injuries were reported; however, a four mile stretch of Highway 24 was closed (Associated Press, 2013).

- July, 2012- A large mud flow on July 30, 2012 blocked U.S. Highway 24 at Wellington Gulch (Figure 17-1). The flow occurred after approximately 1.75 inches of rain fell on the Waldo Canyon burn scar. The highway was closed all night as crews from the Colorado Department of Transportation removed hundreds of truckloads of mud.

Photo by Gerhard Heller, Colorado Department of Transportation



Figure 17-1. U.S. Highway 24 Covered by a Mud Flow, 2012

- August, 2013- A large mudflow occurred along U.S. Highway 24 between Cascade and Manitou Springs after approximately 1.3 inches of rain fell in about half an hour on the Waldo Canyon fire burn scar (Figure 17-2). The event resulted in at least one fatality (Lackey, 2013). Water, debris and mud also entered the downtown area of Manitou Springs causing significant damage to 6 buildings and some damage to eleven additional structures. Approximately 40 vehicles were swept away by the floodwater and mud flow (Coffman, 2013).



Figure 17-2. Debris Flow in the Waldo Canyon Burn Scar, 2013

17.2.2 Location

Mud and debris flows occur across Colorado on an on-going basis. Most flows occur on areas with steep slopes and generally occurs more frequently in the more mountainous areas of the County. 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, 2000).

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. Figure 17-3 shows the estimated probability of a post-wildfire debris flow for the Waldo Canyon fire burn scar and Figure 17-4 shows the estimated potential volume of a debris flow occurring in the same area. According to the 2012 report published by USGS (Verdin and others, 2012):

Wildfires can denude hillslopes of vegetation and change soil properties that affect watershed hydrology and sediment-transport processes. Even small post-wildfire rainstorms can increase overland runoff that erodes soil, rock, ash, and vegetative debris from hillslopes (Cannon and others, 2008). This increased runoff concentrates in stream channels and entrains the sediment that can lead to the generation of destructive debris flows. Debris flow hazards are most significant up to 3 years following wildfires (Susan Cannon, U.S. Geological Survey, written commun., 2010) Basins and drainage networks with the highest probabilities tended to be those on the southern and southeastern edge of the burn area where soils have relatively high clay contents and gradients are steep. Nine of the 22 drainage basins of interest have greater than a 40-percent probability of producing a debris flow in response to the 10-year storm. Estimated debris-flow volumes for all rainfalls modeled range from a low of 1,500 cubic meters to a high of greater than 100,000 cubic meters. Estimated debris-flow volumes increase with basin size and distance along the drainage network, but some smaller drainages were also predicted to produce substantial volumes of material. The

predicted probabilities and some of the volumes predicted for the modeled storms indicate a potential for substantial debris-flow impacts on structures, reservoirs, roads, bridges, and culverts located both within and immediately downstream from the burned area. U.S. Highway 24, on the southern edge of the burn area, is also susceptible to impacts from debris flows.

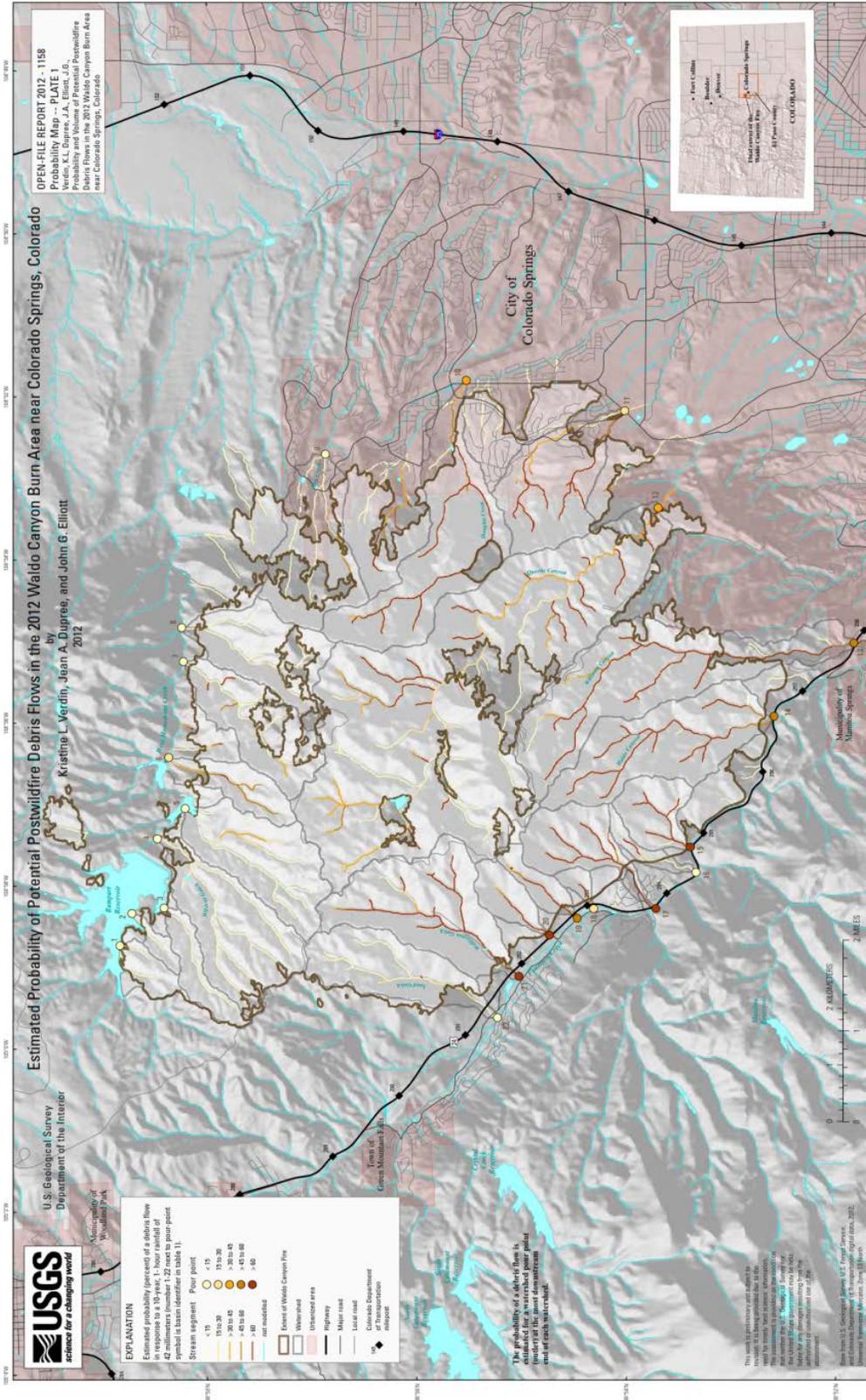


Figure 17-3. Estimated Probability of Potential Post-Wildfire Debris Flows in the 2012 Waldo Canyon Burn Area near Colorado Springs, Colorado

17.2.3 Frequency

Based on the previous occurrences noted above, the probability of mud or debris flow events are likely, with a 10- to 100-percent chance of occurrence in any given year, or a recurrence interval of 10 years or less. It is very likely that there will continue to be an increased frequency of mud and debris flow events in the areas downslope from the Waldo Canyon fire and Black Forest fire burn scars and any additional wildfires that may occur. As the USGS notes, the debris flow hazard is most significant up to three years following wildfires.

17.2.4 Severity

Mud and debris flows destroy property and infrastructure and can take the lives of people. Slope failures in the United States result in an average of 25 lives lost per year and an annual cost to society of about \$1.5 billion. Based on the information in this hazard profile the magnitude/severity of mud or debris flow 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 24-72 hours. Overall significance is considered high.

17.2.5 Warning Time

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. According to the USGS, many mud and debris flow fatalities occur when people are sleeping. Residents should listen for unusual sounds such as trees cracking or boulders knocking together, know that small debris flows may proceed larger ones, watch for an increase or decrease in stream flow or a change from clear to muddy water (USGS, 2000). These signs may indicate debris flow activity and individuals should be prepared to move quickly.

17.3 SECONDARY 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.

17.4 CLIMATE CHANGE IMPACTS

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.

17.5 EXPOSURE

Data that would allow for a GIS-based analysis of mud and debris flow hazard areas was not available, so the exposure and vulnerability assessment for the mud and debris flow hazard will be a qualitative assessment.

17.5.1 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.

17.5.2 Property

Property located near steep slopes or downslope from wildfire burn scars is exposed to mud and debris flow hazards.

17.5.3 Critical Facilities and Infrastructure

A significant amount 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.

17.5.4 Environment

Environmental problems as a result 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.

17.6 VULNERABILITY

17.6.1 Population

All persons exposed to mud and debris flow 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 flow.

17.6.2 Property

All property exposed to the mud and debris flow hazard is vulnerable. Structural damage can range from minor damage to total destruction. Damage to structures in excess of 50 percent is considered to be substantial by most building codes and typically requires total reconstruction.

17.6.3 Critical Facilities and Infrastructure

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. A more in depth analysis should be performed on critical facility and infrastructure as more data becomes available.

17.6.4 Environment

The environment vulnerable to mud and debris flow hazards is the same as the environment exposed to the hazard.

17.6.5 Future Trends in Development

The County is experiencing moderate 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 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.

17.7 SCENARIO

Mud and debris flows in the planning area occur as a result of soil conditions that have been affected by wildfire, natural erosion, severe storms, groundwater, or human development. The worst-case scenario for mud or debris flow hazards in the planning area would generally correspond to a severe storm that had heavy rain and caused flooding in burn scar areas. A flow could occur without warning and could impact transportation infrastructure and communities downslope of the scar. Significant impacts to property and loss of lives could occur.

Mud and debris flows are becoming more of a concern as development moves outside of city centers and into areas less developed in terms of infrastructure. Most flow events would be isolated events affecting specific areas. It is probable that private and public property, including infrastructure, will be affected. Road obstructions caused by debris flows would create isolation problems for residents and businesses in sparsely developed areas. Property owners exposed to steep slopes may suffer damage to property or structures. Flows carrying vegetation such as shrubs and trees may cause a break in utility lines, cutting off power and communication access to residents.

17.8 ISSUES

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 to. 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.

CHAPTER 18. PANDEMIC DISEASE

PANDEMIC DISEASE RANKING						
El Paso County	Calhan/Ramah	Fountain	Green Mountain Falls	Manitou Springs	Monument	Palmer Lake
Medium	Medium	Medium	Low	Medium	Medium	High

18.1 GENERAL BACKGROUND

The U.S. Center for Disease Control 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 of time. There are a number of State and local regulations that require immediate reporting of any known or suspected outbreaks by health care providers, health care facilities, laboratories, veterinarians, schools, child day care facilities, and food service establishments. An epidemic is a localized outbreak that spreads rapidly and affects a large number of people or animals in a community. A pandemic is an epidemic that occurs worldwide or over a very large area and affects a large number of people or animals. The following sections discuss some human health hazards of concern for El Paso County.

18.1.1 Influenza

Epidemics of influenza (flu) typically occur during the winter and have been responsible for an average of approximately 36,000 deaths per year in the US from 1990 through 1999. Although rates of infection are highest among children, rates of serious illness and death are highest among persons aged 65 and over, and among persons who have medical conditions that place them at an increased risk for complications from influenza.

Influenza vaccination is the primary method for preventing influenza and its severe complications. The ability of the vaccine to protect against flu depends on (1) the match between the strains in the vaccine and the strains in the community, and (2) the ability of the individual's system to use the vaccine to fend off the virus. An influenza pandemic occurs when the virus strain shifts dramatically, making the match and individual's system less effective, leading to more rapid spread and more severe cases, including deaths.

In recent years there have been several concerns over pandemic flu including H1N1 and Avian flu.

DEFINITIONS

Epidemic/Pandemic—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. Several factors determine whether an outbreak will explode into an epidemic or pandemic: the ease with which a microbe moves from person to person, and the behavior of individuals and societies.

Influenza—Influenza is a viral infection that attacks the respiratory system (nose, throat and lungs). Influenza, commonly called the flu, is not the same as the stomach viruses that cause diarrhea and vomiting.

Smallpox—Smallpox is an illness caused by the variola virus. Smallpox gets its name from the pus-filled blisters (or pocks) that form during the illness.

Plague—Plague is a disease caused by *Yersinia pestis*, a bacterium found in rodents and their fleas in many areas around the world.

SARS—Severe acute respiratory syndrome (SARS) is a contagious febrile lower respiratory infection cause by the SARS-CoV novel corona virus, which has been a potential hazard to port cities (for travelers arriving by ship or aircraft).

18.1.2 Smallpox

Smallpox is believed to have emerged in human populations about 10,000 BC. The earliest physical evidence of smallpox is a rash on the mummified body of Pharaoh Ramses V of Egypt, who died in 1157 BC. The disease killed an estimated 400,000 Europeans per year during the closing years of the 18th century, and was responsible for a third of all blindness. Twenty to 60 percent of all those infected—and over 80 percent of infected children—died from the disease.

Smallpox was responsible for an estimated 300 to 500 million deaths during the 20th century. As recently as 1967, the World Health Organization (WHO) estimated that 15 million people contracted the disease and that two million died in that year.

After successful vaccination campaigns throughout the 19th and 20th centuries, the WHO certified the eradication of smallpox in December 1979. However, according to the U.S. Centers for Disease Control and Prevention (CDC), the U.S. government is taking precautions to be ready to deal with a bioterrorist attack using smallpox as a weapon. There is a detailed nationwide smallpox response plan designed to quickly vaccinate people and contain a smallpox outbreak. This plan includes the creation of smallpox health care teams that would respond to a smallpox emergency and the vaccination of members of these teams. There is enough smallpox vaccine to vaccinate everyone who would need it in the event of an emergency (bt.cdc.gov/agent/smallpox/faq/smallpox_disease.asp)

18.1.3 Plague

Plague is one of three epidemic diseases still subject to the International Health Regulations. The deadly infectious disease is caused by the bacteria *Yersinia pestis*. There are two types of plague—bubonic plague and pneumonic plague. Transmission occurs when the bacterium infects the lungs, which can occur if someone breathes *Y. pestis* in particles, which could happen in an aerosol release during a bioterrorism attack, or by breathing droplets from a person or animal with pneumonic plague. Primarily carried by rodents (most notably rats) and spread to humans via fleas, the disease is notorious throughout history, due to the scale of death and devastation it has brought. Plague is still endemic in some parts of the world.

Contrary to popular belief, rats did not directly start the spread of the bubonic plague. It is mainly a disease in the fleas that infested the rats, making the rats themselves the first victims of the plague. Infection in a human occurs when a person is bitten by a flea that has been infected by biting a rodent that itself has been infected by the bite of another flea carrying the disease. The bacteria multiply inside the flea, sticking together to form a plug that blocks its stomach. The flea then bites a host and attempts to feed, and subsequently vomits blood tainted with the bacteria back into the bite wound. The bubonic plague bacterium then infects a new victim, and the flea eventually dies from starvation. Serious outbreaks of plague are usually started by other disease outbreaks in rodents, or a rise in the rodent population.

The World Health Organization reports 1,000 to 3,000 cases of plague each year. An average of five to 15 cases occurs each year in the western United States. These cases are scattered and occur in rural to semi-rural areas. Most cases are the bubonic form of the disease. Treatment includes doses of antibiotics that should be administered within 24 hours of the first symptoms to reduce the risk of death.

18.1.4 Mosquito-Borne Disease

There are four viruses transmitted by mosquitos in Colorado. All are transmitted by the same mosquito species called *Culex tarsalis*, which feeds in a few areas around dawn and dusk (Communicable Disease Epidemiology Program, no date).

Source: USGS, 2012

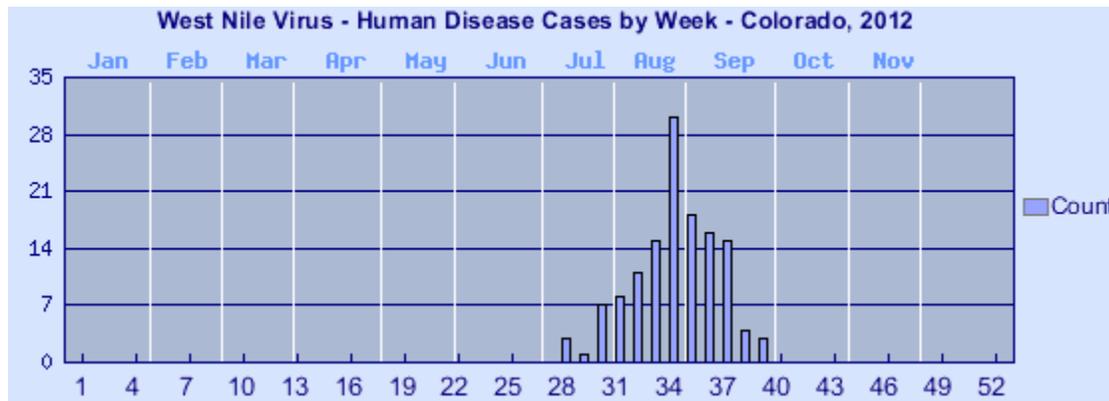


Figure 18-2. Final 2012 West Nile Virus Activity in Colorado by Month

18.1.5 Tick-Borne Diseases

There are three commonly occurring diseases in Colorado that are transmitted by ticks: Colorado Tick Fever, Rocky Mountain Spotted Fever, and Relapsing Fever. The following information is excerpted from the Colorado Department of Public Health and Environment’s website on tick-borne diseases (Colorado Department of Public Health and Environment, no date).

Colorado Tick Fever

Colorado tick fever is the most common tick-borne disease in Colorado, although most cases probably go unrecognized. Colorado tick fever is an acute viral illness characterized by fever, headache, body aches, nausea, abdominal pain, and lethargy. Typically, the illness lasts four to five days, followed by an apparent recovery, then a relapse of symptoms for two or three more days. Complete recovery may take two to three weeks. the disease is not life-threatening and infection results in life-long immunity. There is currently no preventative vaccine or effective treatment, except to let the disease run its course.

Colorado tick fever is caused by a virus maintained in the environment in a rodent-tick-rodent cycle. The virus is transmitted to humans by the bite of an infected Rocky Mountain wood tick. Ticks begin to emerge in late February and March and seek for an animal host to take a blood meal which is necessary for their growth and reproduction. The virus is transmitted to humans while an infected tick is obtaining a blood meal. Studies have shown that a tick must usually be attached for several hours to transmit enough virus to cause illness. If infected, a person will become ill in four to five days.

Rocky Mountain Spotted Fever

Rocky Mountain Spotted Fever is a serious disease that is transmitted by infected Rocky Mountain wood ticks. The initial symptoms, which follow an incubation period of 3 to 14 days, are "flu-like": there may be sudden onset of high fever, headache, chills, and muscle aches. A rash often appears a few days later. This rash spreads rapidly over the entire body and may even be seen on the palms of the hands and soles of the feet. Prompt medical attention is extremely important because Rocky Mountain Spotted Fever can be fatal if treatment is delayed. The illness can be cured with antibiotics.

Ticks can carry spotted fever organisms (rickettsia). Hungry ticks usually position themselves on grass or small bushes and wait for a potential host to pass by. If the tick drops onto a human's legs, it often crawls upward toward the head looking for a place to attach. Ordinarily infection takes place when disease-causing rickettsia are inoculated into the skin via the bite of a feeding tick. Quick removal of ticks is important because they often must be attached several hours before there is disease transmission. People who remove ticks from domestic animals can also become infected if they crush ticks between their

fingers, causing rickettsia to penetrate the skin. Thus, whenever ticks are handled, it is important to wash hands immediately. The disease can occur year around.

Relapsing Fever

Tree squirrels, chipmunks, and other wild rodents found in coniferous forests in the higher elevations of the Western United States serve as the primary reservoirs for the relapsing fever spirochete. The soft-bodied ticks (*Ornithodoros* sp.) that associate with these rodents can remain alive and infectious for years without feeding.

People with tick-borne relapsing fever suffer cyclical high fevers and other symptoms such as headaches and pain in the joints or muscles that easily can be mistaken for a severe flu. These episodes usually last several days, alternating with periods when the symptoms cease. In most patients, the infection responds to treatment with antibiotics. The disease is under recognized and underreported, and often mistaken for Lyme disease.

Human cases of illness tend to peak in the warmer months, but they can occur year-round. A tick population often becomes established with rodents that inhabit rustic mountain cabins. If the rodents die off, leave, or hibernate, the ticks look for other hosts. In winter, people will stay in these cabins and warm them up for a week. The rodents are not active, the ticks get warmed up, and they become hungry and start moving around looking for a food source. A person who's breathing is basically a carbon dioxide generator. The ticks actually orient to a carbon dioxide gradient, and this is one of the ways they find their hosts.

18.1.6 Hantavirus Pulmonary Syndrome

In May of 1993 an outbreak of hantavirus pulmonary syndrome (HPS) occurred in the southwestern United States that affected young adults who had previously been healthy and suddenly developed acute respiratory syndrome. About half of those infected died. According to the Colorado Department of Public Health and Environment, hantavirus is present in the saliva, urine, and feces of infected mice. People are infected by breathing the virus during direct contact with rodents or from disturbing dust and feces from mice or surfaces contaminated with mice droppings or urine (Colorado Department of Public Health and Environment, no date).

18.1.7 SARS

Severe acute respiratory syndrome (SARS) is a respiratory illness caused by a virus. SARS can be life-threatening. Symptoms include a high fever, headache, body aches, a dry cough and, later on, pneumonia.

SARS seems to spread mainly by close person-to-person contact. When an infected person coughs or sneezes, they send droplets of mucus or saliva that contain the virus through the air. Humans can get SARS if the droplets land on their mouth, nose, or eyes. Kissing, touching, sharing utensils for eating and drinking, or talking with an infected person can also put humans at risk.

A worldwide outbreak of SARS between November 2002 and July 2003 began in China and then spread as infected travelers returned to their home countries. As of May 2005, according to the CDC, there was no remaining SARS transmission anywhere in the world.

18.1.8 MERS

According to the Centers for Disease Control and Prevention, Middle East Respiratory Syndrome (MERS) is a viral respiratory illness first reported in Saudi Arabia in 2012. It is called by a coronavirus called MERS-CoV. Most people who have been confirmed to have MERS-CoV infection developed severe acute respiratory illness. They had fever, cough, and shortness of breath. More than 30 percent of these people died (CDC, 2014). The first case of MERS in the United States was confirmed in May of 2014.

18.2 PANDEMIC DISEASE PROFILE

18.2.1 Past Events

The following are reported cases of outbreaks in El Paso County or Colorado:

- During the 1918 influenza outbreak 7,783 Coloradans died in 10 months, mostly in the months of October, November, and December. There were 44,803 cases of flu reported in Colorado in 1918 (Leonard, 2009).
- There have been 54 human plague cases in Colorado from 1975-2005. There were a reported nine deaths resulting from the disease during this time period (Colorado Department of Public Health and Environment, no date).
- Human cases of West Nile have been reported in the County since 2002 and cases continue to be reported.
- There were 50 cases of HPS reported in Colorado between January 2003 and November 2013. One of these cases was reported in El Paso County. Of the 50 cases, 18 of those infected (36 percent) died (Colorado Department of Public Health and Environment, no date).
- As of April 26, 2014 there have been 1,698 reported cases of influenza in Colorado during the 2013-2014 flu season. Twelve percent (209) of those cases occurred in El Paso County. Over 75 percent of reported cases in the County were the H1N1 flu strain (Colorado Department of Public Health and Environment, 2014).

18.2.2 Location

All of the planning area is susceptible to human health hazards discussed in this chapter. While some hazards such as West Nile Virus and Rocky Mountain Spotted Fever disease can have a geographic presence within the planning area, other diseases can cause exposure to the planning area from outside the geographic area of the County, that is, El Paso County residents who travel extensively can become exposed to these hazards while abroad and bring the hazard back with them. This makes it difficult to map the extent and location of these hazards in comparison to other hazards such as flooding, dam failure, or wildfire.

18.2.3 Frequency

Due to the increase in air travel, growing populations, and the country's aging population, the probability of a communicable disease epidemic or pandemic is increasing. The winter 2005 influenza vaccine shortage caused by a flaw in a European manufacturer's supply raised concerns about the protection of at-risk populations; a nationwide public outreach campaign was launched to ensure that at-risk populations received vaccines before additional vaccine was made available to the general public.

The impact of SARS on health workers attempting to diagnose and treat those stricken with the disease also highlighted how vulnerable populations may be if the health care community is one of the first groups in an area to become sick with a communicable disease.

18.3 SEVERITY

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

18.4 SECONDARY HAZARDS

Human health hazards are not like natural hazards that have measurable secondary impacts, such as earthquakes, floods, or fires. This is due primarily to that 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. Hospitals and health care providers could be overwhelmed.

18.5 CLIMATE CHANGE IMPACTS

The World Health Organization estimates that the warming and precipitation trends due to anthropogenic climate change of the past 30 years already claim over 150,000 lives annually. Many prevalent human diseases are linked to climate fluctuations, from cardiovascular mortality and respiratory illnesses due to heat waves, to altered transmission of infectious diseases and malnutrition from crop failures. Uncertainty remains in attributing the expansion or resurgence of diseases to climate change, owing to lack of long-term, high-quality data sets as well as the large influence of socio-economic factors and changes in immunity and drug resistance.

There is growing evidence that climate–health relationships pose increasing health risks under future projections of climate change and that the warming trend over recent decades has already contributed to increased morbidity and mortality in many regions of the world. Potentially vulnerable regions include the temperate latitudes, which are projected to warm disproportionately, the regions around the Pacific and Indian oceans that are currently subjected to large rainfall variability due to the El Niño/Southern Oscillation, sub-Saharan Africa, and sprawling cities where the urban heat island effect could intensify extreme climatic events.

18.6 EXPOSURE

18.6.1 Population

All citizens in the El Paso County planning area could be susceptible to the human health hazards discussed in this chapter. A large outbreak or epidemic of a communicable disease or West Nile virus could have devastating effects on the population. Approximately 17 percent of the planning area population is less than 5 years of age or greater than 65 years of age. The introduction of a disease such as the plague or influenza could rapidly impact those most at-risk.

18.6.2 Property

None of the health hazards addressed in this chapter are considered to have any measurable impact on the built environment in the planning area.

18.6.3 Critical Facilities and Infrastructure

None of the health hazards addressed in this chapter are considered to have any measurable impact on critical facilities in the planning area. However, healthcare facilities (and veterinary clinics) have prepared for all of the afore-mentioned 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.

18.6.4 Environment

None of the environment in the planning area is considered to be exposed to the human health hazards discussed in this chapter.

18.7 VULNERABILITY

18.7.1 Population

While all of the population in the planning area is considered to be exposed to the human health hazards discussed in this chapter, the young, the elderly, and those with diminished immune system function are the most vulnerable. According to U.S. Census ACS data estimates, 10 percent of El Paso's population is 65 or older, and 7 percent is under the age of 5.

18.7.2 Property

None of the built environment in the planning area would be impacted by the human health hazards discussed in this chapter.

18.7.3 Critical Facilities/Infrastructure

None of the identified critical facilities and critical infrastructure elements have vulnerability to the human health hazards discussed in this chapter.

18.7.4 Environment

While many of the sources of the human health hazards discussed in this chapter (mosquitoes, rodents, fleas, etc.) rely on sound environments for their survival, the human health hazard that they carry or transmit would have no impact on these environments.

18.8 FUTURE TRENDS IN DEVELOPMENT

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.

18.9 SCENARIO

A true worst-case scenario for the planning area would be an epidemic infestation of any of the human health hazards discussed in this chapter, within the planning area or outside it. Medical treatment facilities in the planning area would be taxed beyond their capabilities as patient's needs would begin to escalate. The impacts on an epidemic on the workforce within the planning area could have significant economic impacts on primary employers within the planning area. First responders would be exposed to infected patients, which could deplete the medical workforce and could have a profound impact on the potential escalation of the scenario.

18.10 ISSUES

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.
- Having adequately trained and supplied medical personnel
- Contingency planning for multiple scenarios
- Informing the public about exposure to and prevention of human health hazards.

CHAPTER 19. TORNADO

TORNADO RANKING						
El Paso County	Calhan/Ramah	Fountain	Green Mountain Falls	Manitou Springs	Monument	Palmer Lake
Medium	Medium	Medium	Low	Medium	Medium	Medium

19.1 GENERAL BACKGROUND

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

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

DEFINITIONS

Tornado—A narrow, violently rotating column of air that extends from the base of a cumulonimbus cloud to the ground.

Enhanced Fujita-scale—A tornado rating system that is a set of wind estimates based on damage.

Tornadoes can form from individual cells within severe thunderstorm squall lines or from an isolated super-cell thunderstorm. Weak tornadoes can sometimes occur from air that is converging and spinning upward, with little more than a rain shower occurring in the vicinity. Tornadoes in Colorado are sometimes referred to as ‘landspouts’ because they are not attached to a major thunderstorm. These tornadoes are generally smaller in scale.

In 2007, the National Weather Service began rating tornadoes using the Enhanced Fujita-scale (EF-scale). The EF-scale is a set of wind estimates (not measurements) based on damage. It uses three-second gusts estimated at the point of damage based on a judgment of eight levels of damage to the 28 indicators listed in Table 19-1. These estimates vary with height and exposure. Standard measurements are taken by weather stations in open exposures. Table 19-2 describes the EF-scale ratings (NOAA, 2007).

TABLE 19-1. ENHANCED FUJITA SCALE DAMAGE INDICATORS			
No.	Damage Indicator	No.	Damage Indicator
1	Small barns, frames outbuildings	15	School – 1-story elementary (interior or exterior halls)
2	One or two-family residences	16	School – junior or senior high school
3	Single-wide mobile home	17	Low-rise (1-4 story) building
4	Double-wide mobile home	18	Mid-rise (5-20) building

**TABLE 19-1.
ENHANCED FUJITA SCALE DAMAGE INDICATORS**

No.	Damage Indicator	No.	Damage Indicator
5	Apt, Condo, townhouse (3 stories or less)	19	High-rise (over 20 stories)
6	Motel	20	Institutional bldg. (hospital, govt. or university)
7	Masonry Apt. or motel	21	Metal building system
8	Small retail building (fast food)	22	Service station canopy
9	Small professional (Doctor office, Bank)	23	Warehouse (tilt-up walls or heavy timber)
10	Strip Mall	24	Transmission line tower
11	Large shopping mall	25	Free-standing tower
12	Large, isolated (big box) retail building	26	Free standing pole (light, flag, luminary)
13	Automobile showroom	27	Tree – hardwood
14	Automobile service building	28	Tree – softwood

**TABLE 19-2.
THE ENHANCED F-SCALE**

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

The U.S. experiences more tornadoes than any other country. In a typical year, approximately 1,000 tornadoes affect the U.S. The peak of the tornado season is April through June, with the highest concentration of tornadoes in the central U.S. Figure 19-1 shows the annual average number of tornadoes between 1991 and 2010. Colorado experienced an average of 53 tornado events annually in that period. Colorado ranks 9th among the 50 states in frequency of tornadoes, but 38th for the number of deaths. Colorado ranks 31st for injuries and 30th for the cost of repairing the damages due to tornadoes. When these statistics are compared to other states by the frequency per square mile, Colorado ranks 28th and 37th for both injuries per area and costs per area.

A study from NOAA’s National Severe Storms Laboratory used historical data to estimate the daily probability of tornado occurrences across the U.S., regardless of tornado magnitude. Figure 19-2 shows the estimates. The density per 25 square miles in the map’s legend indicates the probable number of tornadoes for each 25 square mile cell within the contoured zone that can be expected over a similar period of record. It should be noted that the density number does NOT indicate the number of events that can be expected across the entire zone on the map.

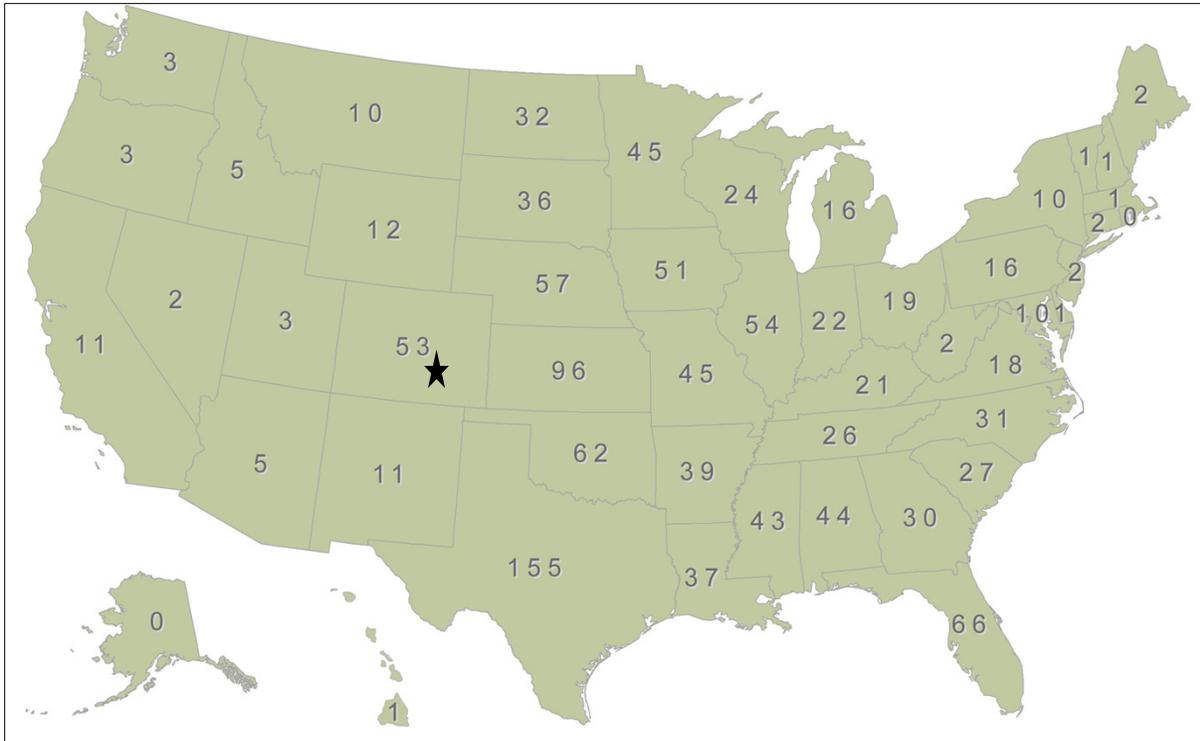


Figure 19-1. Annual Average Number of Tornadoes in the U.S., 1991 to 2010

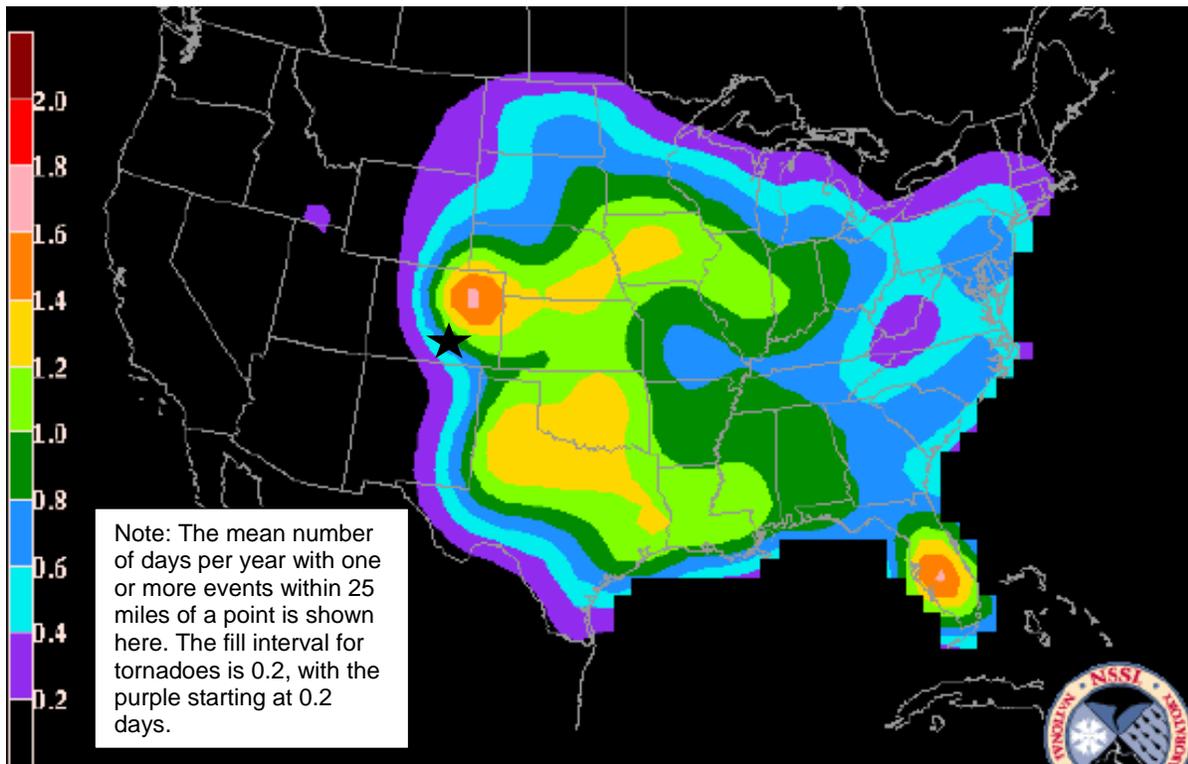


Figure 19-2. Total Annual Threat of Tornado Events in the U.S., 1980-1999

19.2 HAZARD PROFILE

19.2.1 Past Events

Table 19-3 lists tornadoes recorded by the tornado project for El Paso County from 1996 to 2013. The paths and ratings of previous tornadoes in El Paso County are shown on Figure 19-3.

TABLE 19-3. TORNADOES IN EL PASO COUNTY, 1951 – 2013						
Date	Location	Tornado Rating	Injuries	Property Damage	Tornado Length (miles)	Tornado Width (yards)
6/14/1951	Unavailable	F1	0	\$500-\$5,000	0.1	10
7/2/1953	Unavailable	unknown	0	\$0	0.1	10
8/5/1957	Unavailable	unknown	0	\$50-\$500	0.1	10
6/3/1962	Unavailable	F1	0	\$50-\$500	0.1	10
7/18/1962	Unavailable	F0	0	\$0	0.1	10
6/14/1965	Unavailable	F1	1	\$5,000-\$50,000	0.1	10
6/17/1965	Unavailable	F1	0	\$5,000-\$500,000	0.1	10
6/17/1965	Unavailable	F1	0	\$5,000-\$500,000	0.1	10
5/28/1967	Unavailable	F0	0	\$0	0.1	10
5/28/1972	Unavailable	F1	0	\$50-\$500	0.1	10
5/12/1975	Unavailable	F1	0	\$0	0.3	100
4/11/1977	Unavailable	F2	0	\$50,000-\$500,000	1	100
6/1/1977	Unavailable	F1	0	\$0	2	20
6/13/1977	Unavailable	F3	0	\$0	4.9	100
6/13/1977	Unavailable	F2	0	\$0	1	50
6/13/1977	Unavailable	F2	2	\$50,000-\$500,000	1	50
6/13/1977	Unavailable	F0	0	\$0	0.5	20
6/13/1977	Unavailable	F2	0	\$50,000-\$500,000	1	50
8/10/1977	Unavailable	F1	0	\$0	1	60
6/24/1979	Unavailable	F3	1	\$50,000-\$500,000	4.3	50
7/18/1979	Unavailable	F0	0	\$0	0.5	27
7/27/1979	Unavailable	F0	0	\$0	1	27
7/29/1979	Unavailable	F0	0	\$50-\$500	0.5	27
7/27/1981	Unavailable	F0	0	\$0	0.5	30
8/2/1981	Unavailable	F0	0	\$0	0.5	17
8/10/1982	Unavailable	F1	0	less than \$50	1	60

**TABLE 19-3.
TORNADOES IN EL PASO COUNTY, 1951 – 2013**

Date	Location	Tornado Rating	Injuries	Property Damage	Tornado Length (miles)	Tornado Width (yards)
6/10/1984	Unavailable	F1	0	\$0	2	50
6/3/1985	Unavailable	F1	0	\$0	0.5	50
6/9/1985	Unavailable	F1	0	\$5,000-\$50,000	2	50
6/6/1990	Unavailable	F0	0	\$0	0.1	10
6/6/1990	Unavailable	F0	0	\$0	0.2	10
6/6/1990	Unavailable	F2	2	\$50,000-\$500,000	2	100
6/7/1990	Unavailable	F0	0	\$0	0.1	10
6/9/1990	Unavailable	F0	0	\$0	0.2	30
6/9/1990	Unavailable	F0	0	\$0	20	50
6/9/1990	Unavailable	F0	0	\$500-\$5000	0.1	13
7/9/1990	Unavailable	F0	0	\$0	0.1	10
7/20/1990	Unavailable	F0	0	\$0	4	23
7/20/1990	Unavailable	F0	0	\$0	1	13
7/20/1990	Unavailable	F0	0	\$0	0.1	13
7/20/1990	Unavailable	F0	0	\$0	0.1	10
5/22/1991	Unavailable	F0	0	\$0	0.2	10
5/22/1991	Unavailable	F0	0	\$0	0.2	10
5/22/1991	Unavailable	F0	0	\$0	0.2	10
5/22/1991	Unavailable	F0	0	\$0	3	50
5/22/1991	Unavailable	F0	0	\$0	0.2	10
6/21/1991	Unavailable	F0	0	\$0	0.1	10
6/21/1991	Unavailable	F0	0	\$0	0.1	10
6/21/1991	Unavailable	F0	0	\$0	0.1	10
6/21/1991	Unavailable	F0	0	\$0	0.1	10
6/21/1991	Unavailable	F0	0	\$0	0.1	10
6/21/1991	Unavailable	F0	0	\$0	0.1	10
6/21/1991	Unavailable	F0	0	\$0	0.1	10
6/21/1991	Unavailable	F0	0	\$0	0.1	10
6/20/1992	Unavailable	F0	0	\$0	0.1	10
6/20/1992	Unavailable	F0	0	\$0	0.1	10
6/20/1992	Unavailable	F0	0	\$0	1	50
6/24/1992	Unavailable	F0	0	\$0	0.1	10
6/26/1992	Unavailable	F0	0	\$0	0.1	10
6/29/1992	Unavailable	F1	0	\$0	3	100
7/8/1992	Unavailable	F0	0	\$0	0.1	10
4/25/1994	Unavailable	F0	0	\$0	0.1	10

**TABLE 19-3.
TORNADOES IN EL PASO COUNTY, 1951 – 2013**

Date	Location	Tornado Rating	Injuries	Property Damage	Tornado Length (miles)	Tornado Width (yards)
4/25/1994	Unavailable	F0	0	\$0	0.1	10
6/22/1995	Unavailable	F1	0	\$50,000-	2	50
8/4/1995	Unavailable	F0	0	\$0	0.1	10
7/3/1998	Colorado Springs	F0	0	\$0	0.1	50
5/25/2000	Rush	F0	0	\$5,000	0.5	30
7/20/2000	Colorado Springs	F0	0	\$0	0.1	25
5/28/2001	Ellicott	F2	4	\$8,000,000	0.5	200
5/28/2001	Rush	F0	0	\$0	0.1	50
5/28/2001	Peyton	F0	0	\$0	0.1	50
5/28/2001	Ellicott	F1	4	\$20,000	0.1	50
5/28/2001	Ellicott	F2	5	\$100,000	0.3	30
5/28/2001	Ellicott	F0	0	\$0	0.1	25
5/29/2001	Yoder	F0	0	\$0	0.2	50
6/20/2004	Black Forest	F1	0	\$0	1	75
6/20/2004	Truckton	F0	0	\$0	0.5	50
8/9/2004	Calhan	F0	0	\$0	0.5	50
9/30/2004	Black Forest	F0	0	\$0	1	100
8/21/2005	Falcon	F0	0	\$0	0.1	50
8/13/2008	Ramah	EF1	0	\$10,000	1.3	100
5/19/2011	Fountain	EF0	0	\$20,000	1	75
8/26/2011	Ft Carson	EF0	0	\$0	0.11	50
4/26/2012	Yoder	EF0	0	\$10,000	0.35	20
6/7/2012	Ramah	EF0	0	\$0	0.48	75
6/7/2012	Ramah	EF1	0	\$50,000	2.21	100
7/9/2012	Fort Carson	EF0	0	\$0	0.52	50

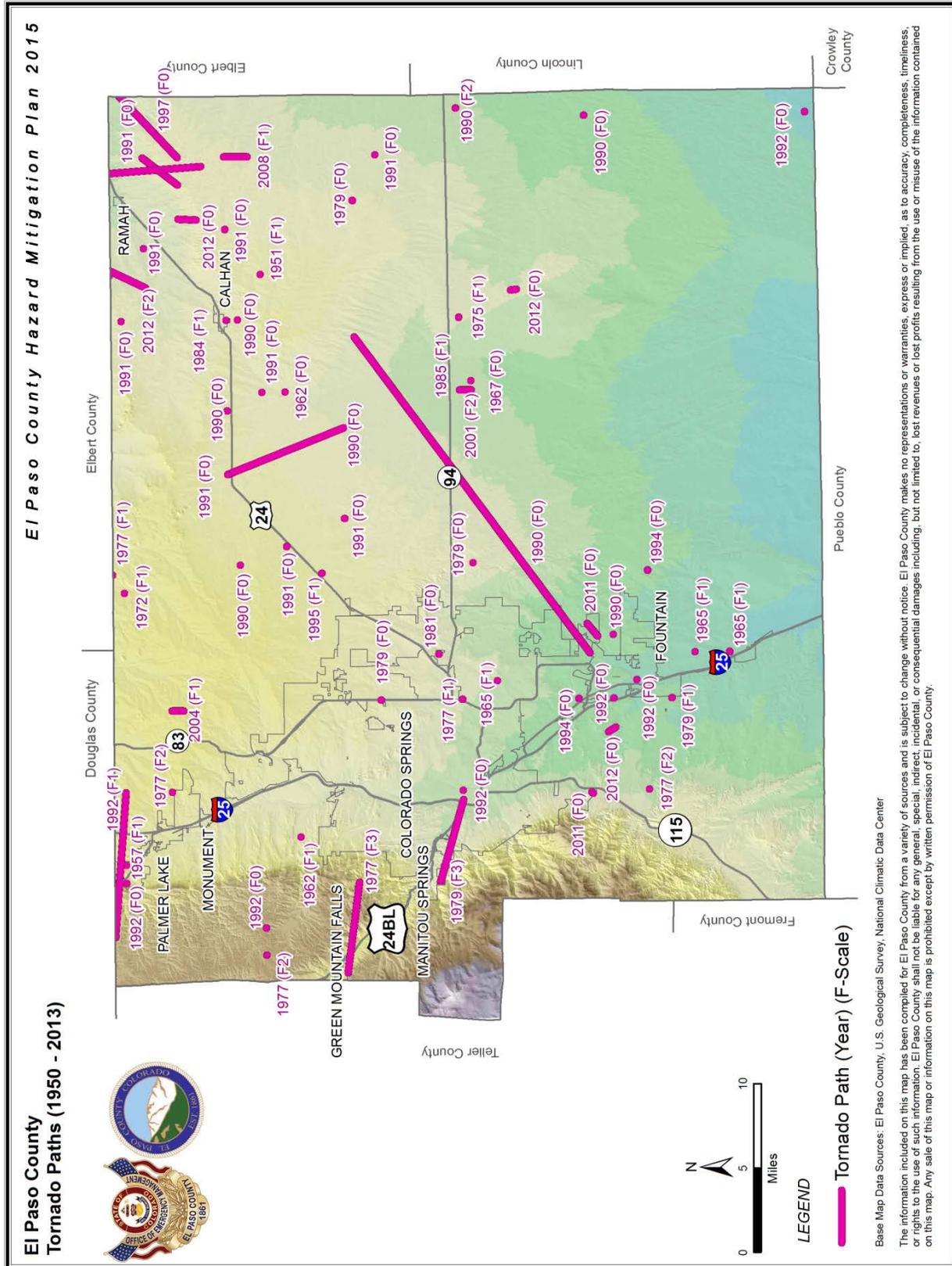


Figure 19-3. Tornado Paths in El Paso County (1950 – 2013)

Significant tornadoes that caused damage in El Paso County include:

- On May 28, 2001, an F2 tornado touched down near Ellicott, destroying over 30 homes, damaging another 70, and severely damaging the Ellicott High School. Had the tornado occurred during a school day, there would have been a significantly higher number of injuries or deaths.
- On June 7, 2012, a tornado passed through eastern El Paso County just after dark and with almost no warning. The tornado caused significant damage to at least one house west of Ramah (Steiner, 2013).

19.2.2 Location

The topography of El Paso County limits the occurrence of most tornadoes to the central and eastern portion of the county, but they can occur countywide. As an example, a tornado occurred on the western edge of the County in the mountains north of Green Mountain Falls during the summer of 2007 (outside El Paso County in Teller County). Damage consisted solely to forested areas. The majority of tornados occur to the east of Colorado Springs in the vicinity of Ellicott, Peyton, Calhan, and Yoder. According to a news article published in The Gazette “roughly 95 percent of [tornados] occur along Interstate 25 to the east on the plains where there is more moisture and heat.” (Wells, 2013).

19.2.3 Frequency

Table 19-3 lists 86 recorded tornadoes between 1951 and 2013, but many of those are multiple tornadoes during a single weather event. Tornadoes occurred in El Paso County on only 54 separate dates during that 62-year time period. This makes the average probability of tornadoes in El Paso County less than one event per year.

Tornadoes have been reported nine months of the year in Colorado, with peak occurrences between mid-May through mid-August. June is by far the month with the most recorded tornadoes. 21 of the 54 dates with recorded tornados for El Paso County, 39 percent, occurred in June. Tornadoes occur at all times of the day, with more than half occurring between 3 pm and 6 pm, and about 88 percent occurring between 1 pm and 9 pm.

19.2.4 Severity

Tornadoes are potentially the most dangerous of local storms. If a major tornado were to strike within the populated areas of El Paso County, damage could be widespread. Businesses could be forced to close for an extended period or permanently, fatalities could be high, many people could be homeless for an extended period, and routine services such as telephone or power could be disrupted. Buildings may be damaged or destroyed. The overall impact for the tornado hazard is medium.

19.2.5 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 a matter of seconds or minutes to seek shelter.

19.3 SECONDARY HAZARDS

Tornadoes may cause loss of power if utility service is disrupted. Additionally, fires may result from damages to natural gas infrastructure. Hazardous materials may be released if a structure is damaged that houses such materials or if such a material is in transport.

19.4 CLIMATE CHANGE IMPACTS

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, no date).

19.5 EXPOSURE

19.5.1 Population

It can be assumed that the entire planning area 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 Ellicott, Peyton, Calhan, and Yoder, are more exposed due to geographic location and local weather patterns.

19.5.2 Property

According to the El Paso County Assessor, there are 234,843 buildings within the census tracts that define the planning area. Most of these buildings are residential. It is estimated that 59 percent of the residential structures were built without the influence of a structure building code with provisions for wind loads.

19.5.3 Critical Facilities and Infrastructure

All critical facilities (see Table 6-3) are likely exposed to tornados. The most common problems associated with this hazard are utility losses. Downed power lines can cause blackouts, leaving large areas isolated. Phone, water and sewer systems may not function. Roads may become impassable due to downed trees or other debris.

19.5.4 Environment

Environmental features are exposed to tornado risk, although damages are generally localized to the path of the tornado.

19.6 VULNERABILITY

19.6.1 Population

Vulnerable populations are the elderly, low income, or linguistically isolated populations, people with life-threatening illnesses, and residents living in areas that are isolated from major roads. Power outages can be life threatening to those dependent on electricity for life support. Isolation of these populations is a significant concern. These populations face isolation and exposure after tornado events and could suffer more secondary effects of the hazard.

Individuals caught in the path of a tornado who are unable to seek appropriate shelter are especially vulnerable. This may include individuals who are out in the open, in cars, have mobility issues, or who do not have access to basements, cellars, or safe rooms.

19.6.2 Property

All property is vulnerable during tornado events, but properties in poor condition or in particularly vulnerable locations may risk the most damage.

Loss estimations for tornados are not based on damage functions, because no such damage functions have been generated. Instead, loss estimates were developed representing 10 percent, 30 percent and 50 percent of the assessed value of exposed structures. This allows emergency managers to select a range of potential economic impact based on an estimate of the percent of damage to the general building stock. Damage in excess of 50 percent is considered to be substantial by most building codes and typically requires total reconstruction of the structure. Table 19-4 lists the loss estimates.

	Exposed Value	Estimated Loss Potential from Tornado		
		10% Damage	30% Damage	50% Damage
Calhan	\$197,690,642	\$19,769,064	\$59,307,193	\$98,845,321
Fountain	\$86,846,494,924	\$8,684,649,492	\$26,053,948,477	\$43,423,247,462
Green Mt. Falls	\$3,082,347,521	\$308,234,752	\$924,704,256	\$1,541,173,760
Manitou Springs	\$167,664,615	\$16,766,462	\$50,299,385	\$83,832,308
Monument	\$1,086,073,858	\$108,607,386	\$325,822,157	\$543,036,929
Palmer Lake	\$1,534,339,852	\$456,099,791	\$136,829,937	\$228,049,896
Ramah	\$22,491,593	\$22,491,593	\$6,747,478	\$11,245,796
Unincorporated	\$23,761,150,586	\$23,761,150,586	\$7,128,345,176	\$11,880,575,293
Total	\$117,154,353,382	\$11,715,435,338	\$35,146,306,015	\$58,577,176,691

19.6.3 Critical Facilities and Infrastructure

Tornados 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.

19.6.4 Environment

Environmental vulnerability will typically be the same as exposure; however, if tornados impact facilities that store hazardous materials, areas impacted by material releases may be especially vulnerable.

19.7 FUTURE TRENDS IN DEVELOPMENT

All future development will be affected by tornados, particularly development that occurs at lower elevations. Development regulations that require safe rooms, basements, or other structures that reduce risk to people would decrease vulnerability. Tornados that cause significant damage are uncommon in the County, so mandatory regulations may not be cost-effective.

19.8 SCENARIO

If an EF3 or higher tornado were to hit populated areas of the County, such as Colorado Springs, substantial damage to property and loss of life could result. Likelihood of injuries and fatalities would

increase if warning time was limited before the event or if residents were unable to find adequate shelter. Damage to critical facilities and infrastructure would likely include loss of power, water, sewer, gas, and communications. Roads and bridges could be blocked by debris or otherwise damaged. The most serious damage would be seen in the direct path of the tornado, but secondary effects could impact the rest of the County through loss of government services and interruptions in the transportation network. Debris from the tornado would need to be collected and properly disposed. Such an event would likely have substantial negative effects on the local economy.

19.9 ISSUES

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 tornados.
- 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 tornados are not well understood.

CHAPTER 20. SUBSIDENCE AND SINKHOLES

SUBSIDENCE AND SINKHOLES RANKING						
El Paso County	Calhan/Ramah	Fountain	Green Mountain Falls	Manitou Springs	Monument	Palmer Lake
Low	Medium	Low	Low	Medium	Low	Low

20.1 GENERAL BACKGROUND

According to the Colorado State Hazard Mitigation Plan, “ground subsidence is the sinking of land over human caused or natural underground voids and the settlement of native low density soils” (Colorado Division of Emergency Management, 2011). Subsidence can occur gradually over time or virtually instantaneously. There are many different types of subsidence; however, in Colorado there are three types of subsidence that warrant the most concern: settlement related to collapsing soils, sinkholes in karst areas, and the ground subsidence over abandoned mine workings.

DEFINITIONS

Ground Subsidence— Ground subsidence if the sinking of land over human caused or natural underground voids and the settlement of native low density soils.

Collapsible Soils

Collapsible soils are a group of soils that can rapidly settle or collapse the ground. The most common type of collapsible soil is hydrocompactive soil. According to the CGS, “hydrocompactive soils form in semi-arid to arid climates in the western U.S. and large parts of Colorado in specific depositional environments” (CGS, 2014). These soils are low in density and in moisture content and are loosely packed together. Agents that bind these loosely packed particles together, such as clay and silk buttresses, are water sensitive. When water is introduced to these soils, the binding agents may quickly break down, soften, disperse, or dissolve. This results in a reorganization of the soil particles in a more dense arrangement, which in turn results in a net volume loss indicated by resettlement or subsidence at the surface (CGS, 2014). Volume loss can be between 10 to 15 percent, which can result in several feet of surface-level displacement.

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 (CGS, 2014). 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 a 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 (Colorado Geological Survey, 2001).

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, 2014).

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, 2014). 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, 2001). There are some mapped, known mine hazard areas in Colorado; however, it is likely that there are additional hazard areas for which no records exist.

20.2 HAZARD PROFILE

20.2.1 Past Events

The occurrence of subsidence is an on-going process resulting from natural and human induced causes. There is no known database of subsidence and sinkhole events that have occurred within El Paso County. One recent event impacting the County occurred in September of 2013. During a flooding event impacting El Paso County, sinkholes destroyed roads, including a 40-foot wide and 25-foot deep sinkhole that opened underneath a driveway, exposing a gas line (Heilman and Sinclair, 2013).

20.2.2 Location

According to the Colorado Geological Survey, “Most catalogued sinkholes of Colorado lie on surficial deposits such as flat-lying glacial outwash terraces, recent valley side sediments, or older deposits on pediment slopes overlying the evaporative bedrock. The highest density of sinkholes that are manifested at the surface in Colorado occur in the Garfield County, Eagle County, Rio Blanco County, and Park County” (Colorado Geological Survey, 2001). In El Paso County there is one mapped area of evaporative bedrock as well as several areas where it is known that gypsum mining has occurred.

20.2.3 Frequency

Subsidence and sinkholes as well as soil and erosion and deposition are occurring continuously throughout the County. Large precipitation events as well as human activity may influence the frequency of these events within the County.

20.2.4 Severity

The severity of subsidence and sinkholes as well as soil erosion and deposition is 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 to people or property. According to the CGS, “In general, the type and severity of surface subsidence 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, 2014).

Based on the information in this hazard profile, the magnitude/severity of subsidence and sinkholes is considered limited, with a low potential impact.

20.2.5 Warning Time

Subsidence can happen suddenly and without warning or can occur gradually over time. The rate of subsidence may be intensified as a result 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 as a result of mining activities (Colorado Geological Survey, 2001):

Where longwall mining is active and subsidence is a well-documented and predictable action, surface response to ongoing mining can be accurately estimated. However, in the case of room and pillar mines, 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 feature at the surface;*
- *The shallower the mine below ground, the more noticeable the surface subsidence evidence; however, in Colorado, pits have been found over mines as deep as 350 feet;*
- *The strength of the rock above the coal seam influences whether subsidence will reach the surface and the kind of features that can appear.*

20.3 SECONDARY 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, and potential failures of reservoir dams. Additionally, these events may occur simultaneously with other natural 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.

20.4 CLIMATE CHANGE IMPACTS

Changes in precipitation events and the hydrological cycle may result in changes in the rate of subsidence and soil erosion. According to a 2003 paper published by the Soil and Water Conservation Society (Soil and Water Conservation, 2003):

The potential for climate change—as expressed in changed precipitation regimes—to increase the risk of soil erosion, surface runoff, and related environmental consequences is clear. The actual damage that would result from such a change is unclear. Regional, seasonal, and temporal variability in precipitation is large both in simulated climate regimes and in the existing climate record. Different landscapes vary greatly in their vulnerability to soil erosion and runoff. Timing of agricultural production practices creates even greater vulnerabilities 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 particular change in precipitation regime will be complex.

20.5 EXPOSURE

20.5.1 Population

Residents of the County living or travelling in areas prone to subsidence and erosion are exposed to the hazard.

20.5.2 Property

Structures and other improvements located in areas prone to subsidence or soil erosion are exposed to risk from these hazards.

20.5.3 Critical Facilities and Infrastructure

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.

20.5.4 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.

20.6 VULNERABILITY

20.6.1 Population

The risk of injury or fatalities as a result 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.

20.6.2 Property

Property exposed to subsidence can sustain minor damages 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 as a result of this damage resulting in large losses. FEMA estimates that there are over \$125 million in losses in the U.S. annually as a result of subsidence. Structures exposed to erosion hazard areas may be undermined, resulting in damages. This may also result in the condemnation of a structure.

20.6.3 Critical Facilities and Infrastructure

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 totally 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 a number of ways

- 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 (CGS, 2001).

20.6.4 Environment

The vulnerability for environment is the same as exposure.

20.7 FUTURE TRENDS IN DEVELOPMENT

According to the State of Colorado Hazard Mitigation Plan (Colorado Division of Emergency Management, 2011):

Future development will continue to intersect subsidence hazard areas based on past and project population growth. Important identification and mitigation strategies are necessary in engineering geology and geotechnical investigations within the evaporite terrain mapped. Avoidance is generally the best mitigation solution where subsidence features are exposed at the surface and properly identified. Many older sinkholes may be hidden. Only subsurface inspections, either by investigative trenching, a series of investigative borings, geophysical means, and/or observations made during overlot grading or utility installation, can ascertain whether sinkholes exist within a development area. Ground-modification and structural solutions can help mitigate the threat of localized subsidence. Drainage issues and proper water management are also important. In Colorado's semi-arid climate, additional increases of fresh water may accelerate dissolution and further destabilize certain subsidence areas.

Jurisdictions in the planning area should ensure that known hazard areas are regulated under their planning and zoning programs. In areas where hazards may be present, permitting processes should require geotechnical investigations to assess risk and vulnerability to hazard areas.

20.8 SCENARIO

A worst case scenario would occur if a rapidly occurring sink hole opened up beneath a structure where many individuals lived or worked. This situation could result in a number of injuries or fatalities and would cause extensive damage to the area directly impacted.

20.9 ISSUES

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.

CHAPTER 21. SEVERE WIND

SEVERE WIND RANKING						
El Paso County	Calhan/Ramah	Fountain	Green Mountain Falls	Manitou Springs	Monument	Palmer Lake
Low	High	Medium	Low	Medium	High	High

21.1 GENERAL BACKGROUND

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

DEFINITIONS

Windstorm—A storm featuring violent winds. Windstorms tend to damage ridgelines that face into the winds.

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

- **Bow Echo**—A bow echo is a linear wind front bent outward in a bow shape. Damaging straight-line winds often occur near the center of a bow echo. Bow echoes can be 200 miles long, last for several hours, and produce extensive wind damage at the ground.

There are two additional types of winds common in some parts of El Paso County called Bora and Chinook winds:

- **Bora**—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.
- **Chinook Winds**—Chinook winds are dry, warm winds that rush down the slopes of the eastern mountains. Wind speeds have been known to exceed 100 miles per hour (Figure 21-1).

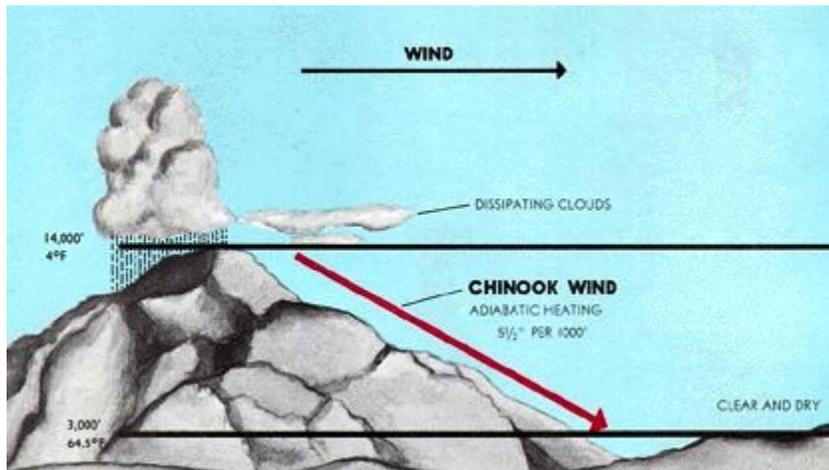


Figure 21-1. Illustration of Chinook Winds

21.2 HAZARD PROFILE

21.2.1 Past Events

Historical severe weather data from the National Climatic Data Center Storm Events Database includes 12 high wind events and seven thunderstorm wind events that caused property damage in El Paso County between 1996 and May 2014, as shown in Table 21-1. These events had wind speeds ranging from 52 to 105 knots. The Beaufort Scale below (Table 21-2) indicates commonly occurring conditions experienced at a range of wind speeds. Areas within the County with damaging wind events are shown on Figure 21-2.

**TABLE 21-1.
EL PASO COUNTY HIGH-WIND EVENTS THAT CAUSED PROPERTY DAMAGE, 1996 - 2014**

Location	Date	Event Type	Peak Wind Speed (knots)	Property Damage
Southern El Paso County/Colorado Springs Vicinity	2/3/1999	High Wind	68	\$30,000
Northern El Paso County/Monument Ridge	2/10/1999	High Wind	66	\$40,000
Southern El Paso County/Colorado Springs Vicinity	2/10/1999	High Wind	54	\$20,000
Southern El Paso County/Colorado Springs Vicinity	2/22/1999	High Wind	52	\$2,000
Southern El Paso County/Colorado Springs Vicinity	4/8/1999	High Wind	65	\$33,000
Southern El Paso County/Colorado Springs Vicinity	4/18/2000	High Wind	56	\$10,000
Southern El Paso County/Colorado Springs Vicinity	5/17/2000	High Wind	50	\$20,000
Colorado Springs Vicinity / Southern El Paso County	1/2/2004	High Wind	86	\$50,000
Colorado Springs Vicinity / Southern El Paso County	11/3/2005	High Wind	74	\$200,000
Colorado Springs Vicinity / Southern El Paso County	6/7/2007	High Wind	52	\$200,000
Northern El Paso County/Monument Ridge	12/30/2008	High Wind	70	\$2,000,000
Colorado Springs Vicinity / Southern El Paso County	5/24/2010	High Wind	64	\$30,000
Ellicott	4/29/2000	Thunderstorm Wind	58	\$10,000
Colorado Springs	7/7/2000	Thunderstorm Wind	52	\$1,000
Ellicott	5/28/2001	Thunderstorm Wind	105	\$400,000
Truckton	8/18/2002	Thunderstorm Wind	78	\$30,000
Yoder	6/20/2004	Thunderstorm Wind	60	\$6,000
Ellicott	5/22/2006	Thunderstorm Wind	87	\$1,250,000
Fountain	8/11/2007	Thunderstorm Wind	61	\$30,000

**TABLE 21-2.
BEAUFORT WIND SCALE**

Force	Wind Speed (knots)	Classification	Conditions on Land
0	Less than 1	Calm	Smoke rises vertically.
1	1-3	Light air	Smoke drifts and leaves rustle.
2	4-6	Light breeze	Wind felt on face.
3	7-10	Gentle breeze	Flags extended, leaves move.
4	11-16	Moderate breeze	Dust and small branches move.
5	17-21	Fresh breeze	Small trees begin to sway.

**TABLE 21-2.
BEAUFORT WIND SCALE**

Force	Wind Speed (knots)	Classification	Conditions on Land
6	22-27	Strong breeze	Large branches move, wires whistle, umbrellas are difficult to control.
7	28-33	Near gale	Whole trees in motion, inconvenience in walking.
8	34-40	Gale	Difficult to walk against wind. Twigs and small branches blown off trees.
9	41-47	Strong gale	Minor structural damage may occur (shingles blown off roofs).
10	48-55	Storm	Trees uprooted, structural damage likely.
11	56-63	Violent storm	Widespread damage to structures.
12	64+	Hurricane	Severe structural damage to buildings, wide spread devastation.

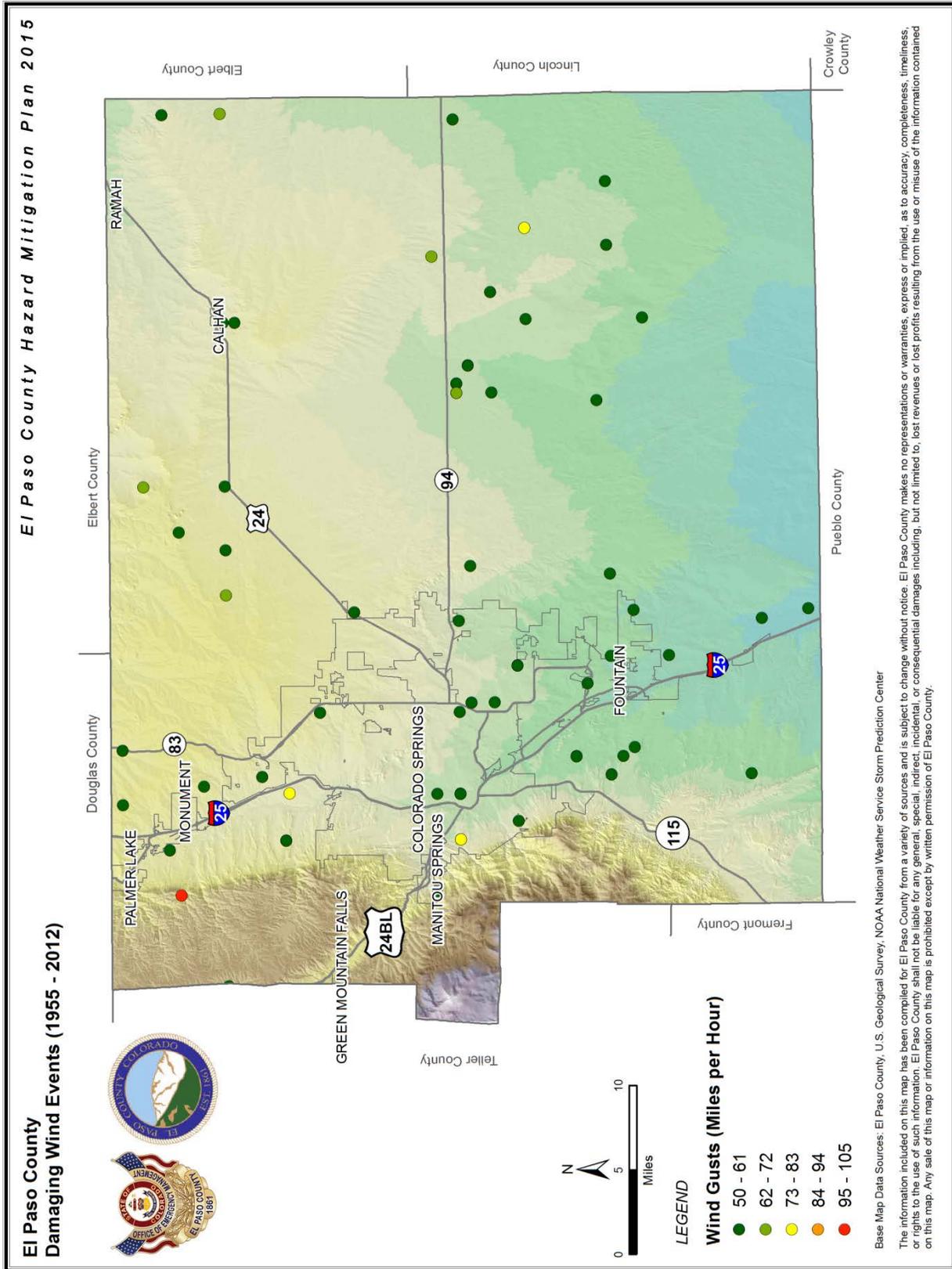


Figure 21-2. Damaging Wind Events in El Paso County

Wind resource information is shown in Table 21-3 as a proxy for typical wind speeds. Wind resource information is estimated by NREL to identify areas that are suitable for wind energy applications. The wind resource is expressed in terms of wind power classes, ranging from class 1 (lowest) to class 7 (highest). Each class represents a range of mean wind power density or approximate mean wind speed at specified heights above the ground (in this case, 50 meters above the ground surface). Table 21-3 identifies the mean wind power density and speed associated with each classification. Figure 21-3 shows the wind power class potential density for Fremont County classified as “Poor” to “Superb”.

TABLE 21-3. WIND POWER CLASS AND SPEED			
	Wind Power Class	Wind Power Density at 50 meters (W/m ²)	Wind Speed at 50 meters (mph)
Poor	1	0-200	0-12.5
Marginal	2	200-300	12.5-14.3
Fair	3	300-400	14.3-15.7
Good	4	400-500	15.7-16.8
Excellent	5	500-600	16.8-17.9
Outstanding	6	600-800	17.9-19.7
Superb	7	800-2000	19.7-26.6
Source: National Renewable Energy Laboratory Wind Energy Resource Atlas of the United States			
mph miles per hour			
W/m ² Watts per square meter			

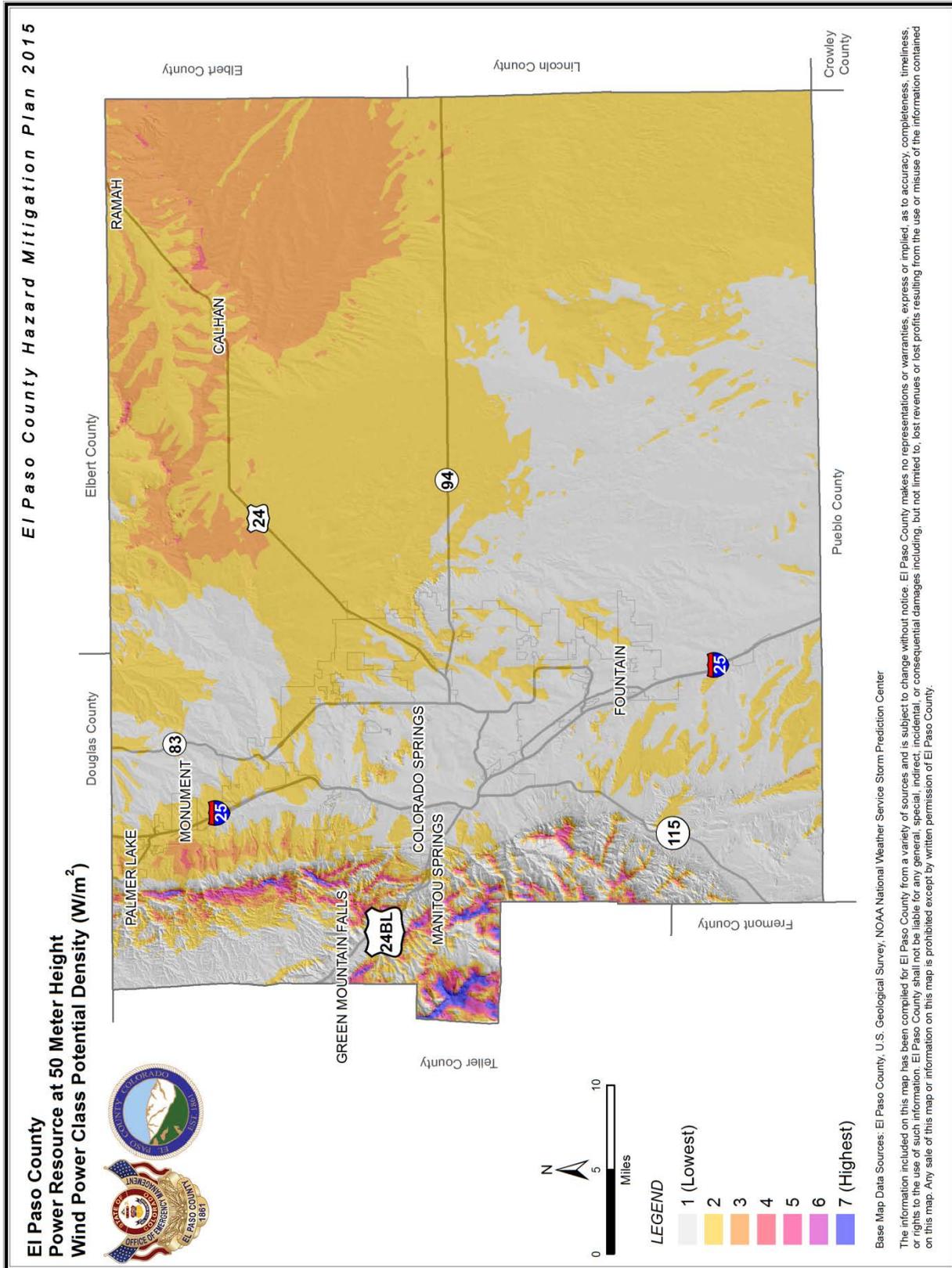


Figure 21-3. Power Resource at 50 Meter Height, Wind Power Class Potential Density for El Paso County

21.2.2 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.

21.2.3 Frequency

Based on 19 events in 18 years, El Paso County experiences a damaging high-wind event more than once per year on average; therefore, the frequency is considered highly likely.

21.2.4 Severity

High winds, often accompanying severe thunderstorms, can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. Wind storms in El Paso County are rarely life threatening, but do disrupt daily activities, cause damage to buildings, and structures, and increase the potential for other hazards, such as wildfire. Winter winds can also cause damage, close highways (blowing snow), and induce avalanches. Winds can also cause trees to fall, particularly those killed by pine beetles or wildfire, creating a hazard to property or those outdoors. 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 21-4), 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.

Based on the information in this hazard profile the magnitude/severity of severe winter storms considered limited. Overall significance of the hazard is considered low: minimal potential impact.

Source: FEMA

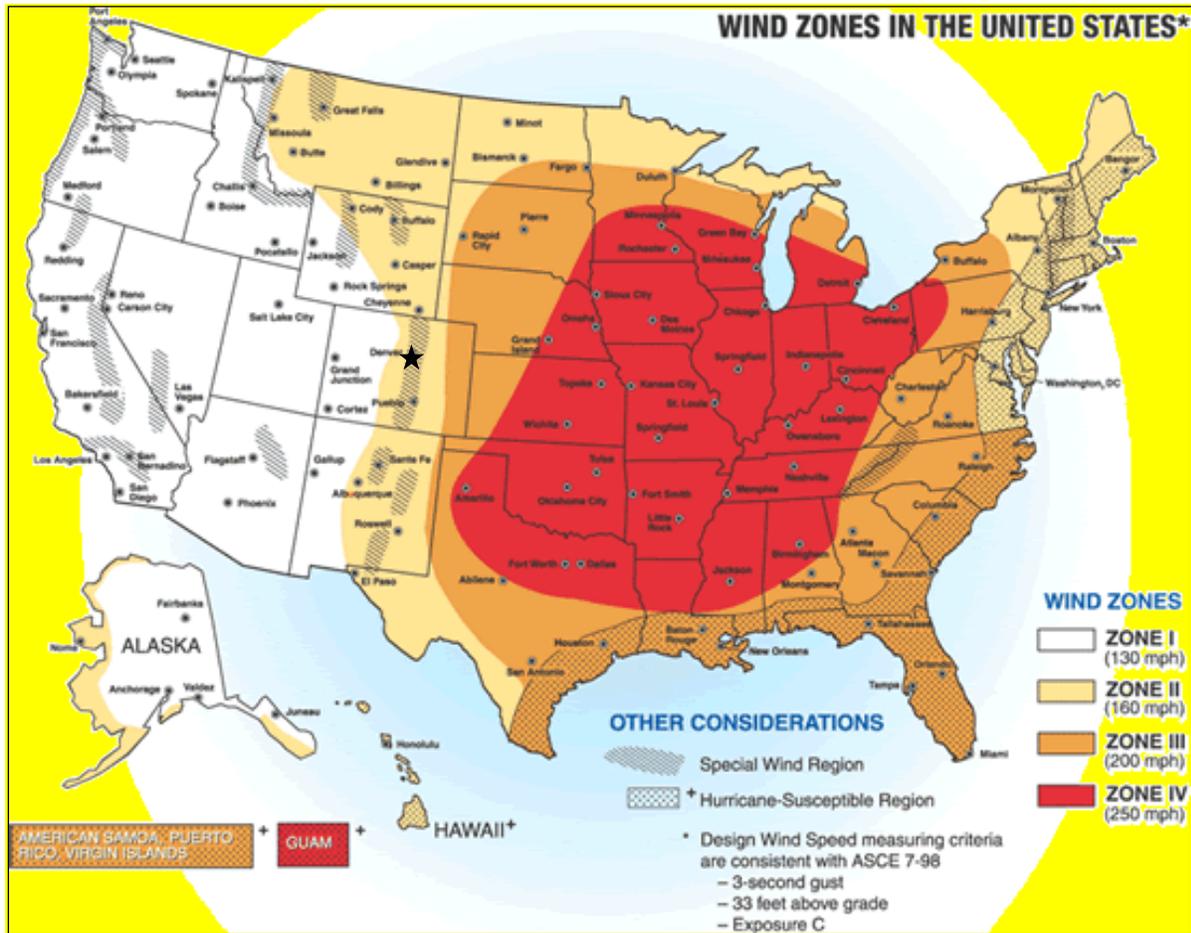


Figure 21-4. Wind Zones in the United States

21.2.5 Warning Time

Meteorologists can often predict the likelihood of a high wind event. 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.

21.2.6 Secondary 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.

21.3 CLIMATE CHANGE IMPACTS

There is little research on how climate change will impact local wind events. Such impacts are likely to depend on how cloud cover and wind patterns change (EPA, no date).

21.4 EXPOSURE

21.4.1 Population

It can be assumed that the entire planning area is exposed to some extent 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 black out. Residents may be exposed to danger from flying debris, collapsed structures, and overturned vehicles during severe wind events.

21.4.2 Property

According to the El Paso County Assessor, there are 234,843 buildings within the census tracts that define the planning area. Most of these buildings are residential. It is estimated that 59 percent of the residential structures were built without the influence of a structure building code with provisions for wind loads. All of these buildings are considered to be exposed to the severe wind hazard, but structures in poor condition or in particularly vulnerable locations (located on hilltops or exposed open areas) may risk the most damage. The frequency and degree of damage will depend on specific locations. Severe wind damage can include damage to siding, roof damage, and broken windows. Falling trees may crush or damage structures. Tractor-trailers may be overturned causing damage to their contents and other vehicles.

21.4.3 Critical Facilities and Infrastructure

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. Roads may become impassable due to secondary hazards such as landslides.

21.4.4 Environment

The environment is highly exposed to severe winds. Most damage results from falling trees or secondary hazards of severe winds, such as wildfires.

21.5 VULNERABILITY

21.5.1 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.

21.5.2 Property

All property is vulnerable during severe wind events, but properties in poor condition or in particularly vulnerable locations may risk the most damage. Those properties located in higher elevations and on ridges may be more prone to wind damage. Those that are located under or near overhead lines or near large trees may be damaged in the event of a collapse.

Loss estimations for the severe wind 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 and 50 percent of the assessed value of exposed structures. This allows emergency managers to select a range of potential economic impact based on an estimate of the percent of damage to the general building

stock. Damage in excess of 50 percent is considered to be substantial by most building codes and typically requires total reconstruction of the structure. Table 21-4 lists the loss estimates.

	Exposed Value	Estimated Loss Potential from Severe Wind		
		10% Damage	30% Damage	50% Damage
Calhan	\$197,690,642	\$19,769,064	\$59,307,193	\$98,845,321
Fountain	\$86,846,494,924	\$8,684,649,492	\$26,053,948,477	\$43,423,247,462
Green Mt. Falls	\$3,082,347,521	\$308,234,752	\$924,704,256	\$1,541,173,760
Manitou Springs	\$167,664,615	\$16,766,462	\$50,299,385	\$83,832,308
Monument	\$1,086,073,858	\$108,607,386	\$325,822,157	\$543,036,929
Palmer Lake	\$1,534,339,852	\$456,099,791	\$136,829,937	\$228,049,896
Ramah	\$22,491,593	\$22,491,593	\$6,747,478	\$11,245,796
Unincorporated	\$23,761,150,586	\$23,761,150,586	\$7,128,345,176	\$11,880,575,293
Total	\$117,154,353,382	\$11,715,435,338	\$35,146,306,015	\$58,577,176,691

21.5.3 Critical Facilities and Infrastructure

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 wind 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 would leave certain populations isolated because residents would be unable to call for assistance.

21.5.4 Environment

The vulnerability of the environment to severe wind is the same as the exposure.

21.6 FUTURE TRENDS IN DEVELOPMENT

All future development 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 construction. The planning partners have adopted the International Building Code. This code is equipped to deal with the impacts of severe wind events. The planning partnership is well equipped to deal with future growth and the associated impacts of severe weather.

21.7 SCENARIO

A worst-case event would involve prolonged high winds during a winter storm, accompanied by thunderstorms. Such an event would have both short-term and longer-term effects. Initially, schools and roads would be closed due to power outages caused by high winds and downed tree obstructions. In more rural areas, some subdivisions could experience limited ingress and egress. Prolonged rain could produce flooding, overtopped culverts with ponded water on roads, and landslides on steep slopes. Flooding, drifting snow, and landslides could further obstruct roads and bridges, further isolating residents.

21.8 ISSUES

Important issues associated with a 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.

CHAPTER 22. WILDFIRE

WILDFIRE RANKING						
El Paso County	Calhan/Ramah	Fountain	Green Mountain Falls	Manitou Springs	Monument	Palmer Lake
High	High	Medium	High	High	High	High

22.1 GENERAL BACKGROUND

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

Fire hazards present a considerable risk to vegetation and wildlife habitats. Short-term 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

DEFINITIONS

Conflagration—A fire that grows beyond its original source area to engulf adjoining regions. Wind, extremely dry or hazardous weather conditions, excessive fuel buildup and explosions are usually the elements behind a wildfire conflagration.

Firestorm—A fire that expands to cover a large area, often more than a square mile. A firestorm usually occurs when many individual fires grow together into one. The involved area becomes so hot that all combustible materials ignite, even if they are not exposed to direct flame. Temperatures may exceed 1000°C. Superheated air and hot gases of combustion rise over the fire zone, drawing surface winds in from all sides, often at velocities approaching 50 miles per hour. Although firestorms seldom spread because of the inward direction of the winds, once started there is no known way of stopping them. Within the area of the fire, lethal concentrations of carbon monoxide are present; combined with the intense heat, this poses a serious life threat to responding fire forces. In very large events, the rising column of heated air and combustion gases carries enough soot and particulate matter into the upper atmosphere to cause cloud nucleation, creating a locally intense thunderstorm and the hazard of lightning strikes.

Interface Area—An area susceptible to wildfires and where wildland vegetation and urban or suburban development occur together. An example would be smaller urban areas and dispersed rural housing in forested areas.

Wildfire—Fires that 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.

standing trees killed by pine bark beetles, which have been affecting the forests of Colorado since 2002, becoming more widespread and a serious concern. According to the El Paso County Hazard Mitigation Community Survey conducted in 2013 (see Appendix B), El Paso County residents believe that wildfire is the greatest threat to their safety.

Wildfire losses are typically not covered by basic homeowner's insurance. Additional coverage must be purchased in order to insure against such damages. The ISO and the National Fire Protection Association have developed a methodology for insurance companies to identify wildfire exposure. Property ratings are developed based on the following:

- **Fuel** — Grass, trees, or dense brush can feed a wildfire.
- **Slope** — Steeper slopes can increase the speed and intensity of wildfire and affect reconstruction costs.
- **Access** — Dead-end roads can impede fire-fighting equipment.

Prescribed Burns

Prescribed burns are fires that are set intentionally to clear fuels from an area, so that the area is less likely to burn in the event of a wildfire. These burns are used on forest lands to prepare sites for forest regeneration, improve wildlife habitat, control insects and disease, and perpetuate fire-dependent ecosystems (Colorado Legislative Council, 2012). In general, prescribed burns are not equated with wildfire hazard as they are intentional and controlled; however, it is possible for a prescribed burn to become uncontrolled and result in a wildfire.

Community Wildfire Protection Plans

Community Wildfire Protection Plans (CWPP) are authorized and defined as part of the Healthy Forests Restoration Act passed by Congress and signed into law in 2003. These plans are intended to bring together diverse local interests to discuss mutual concerns for public safety, community sustainability and natural resources (Colorado State University, no date). Colorado Senate Bill 09-001 requires each county in the state to prepare a CWPP for the unincorporated portion of the county. CWPPs should include the following components (Colorado State University, no date):

- A description of the community's WUI problem areas, preferably with a map and narrative.
- Information on the community's preparedness to respond to a wildland fire.
- A community risk analysis that considers, at a minimum, fuel hazards, risk of wildfire occurrence and community values to be protected both in the immediate vicinity and the surrounding zone where potential fire spread poses a realistic threat.
- Identification of fuels treatment priorities on the ground and methods of treatment.
- Ways to reduce structural ignitability.
- An implementation plan.

According to the list maintained by Colorado State University, there are eleven communities in El Paso County who have developed Community Wildfire Protection Plans (these plans are available for download at <http://csfs.colostate.edu/pages/CommunityWildfireProtectionPlans.html#e>):

- El Paso County (2011)
- Black Forest (2007)
- Carroll Lakes (2007)
- City of Colorado Springs (2011)

- Crystal Park (2013)
- Donald Wescott Fire Protection District (2011)
- Palmer Lake (2008)
- Southwestern Highway 115 Fire Protection District (2007)
- Ute Pass (2007)
- Wissler Ranch (2010)
- Woodmoor (2006).

Vegetation Classes

General vegetation for El Paso County is described in Table 22-1. The most common vegetation classes in the County are Grassland and Shrubland comprising 76 percent of the acreage in the County.

TABLE 22-1. VEGETATION CLASSES IN EL PASO COUNTY		
Class	Acres	Percent (%)
Grassland	826,217	65.2
Shrubland	137,441	10.8
Aspen	19,376	1.5
Lodgepole Pine	2,437	0.2
Ponderosa Pine	104,792	8.3
Spruce-Fir	4,448	0.4
Mixed Conifer	53,224	4.2
Oak Shrubland	34,647	2.7
Pinyon-Juniper	18,663	1.5
Riparian	13,355	1.1
Introduced Riparian	3	0.0
Agriculture	31,587	2.5
Open Water	2,067	0.2
Urban & Community	18,739	1.5
Total	1,266,997	100.0
Source: El Paso County Wildfire Risk Summary Report		

22.2 HAZARD PROFILE

Much of the information in the wildfire hazard profile is from the El Paso County Risk Summary Report. At the writing of this report, this data source had not yet been updated to reflect changes and incidents that occurred during the 2013 wildfire season.

22.2.1 Past Events

Figure 22-1 shows the locations of El Paso County federally reported wildfires that burned 10 acres or more from 1980 through 2012. The fires are listed in Table 22-2.

**TABLE 22-2.
WILDFIRES IN EL PASO COUNTY, 1980-2012 (GREATER THAN 10 ACRES)**

Forest Service Fire ID	Fire Name	Cause	Start Date	Area Burned (acres)
24557	Unnamed	Human	5/25/1980	10
25073	Unnamed	Human	6/29/1985	45
200319	Unnamed	Natural	4/21/1989	910
258571	Unnamed	Natural	4/30/1992	11
258566	Unnamed	Natural	4/30/1992	20
278937	Unnamed	Human	7/3/1993	10
328000	Stanley	Human	1/1/1997	35
335372	Mays Peak	Human	5/16/1998	16
383235	Thunder Ridge	Human	5/5/2002	36
1457836	Incline	Human	9/28/2007	30
1499014	Beaver Creek	Human	8/18/2011	100
1510293	Waldo Canyon	Human	6/22/2012	18,947
N/A	Black Forest Fire	Unconfirmed	6/11/13	14,280

Source: Federal Wildland Fire Occurrence Data, <http://wildfire.cr.usgs.gov/firehistory/data.html>

Source: <http://wildfire.cr.usgs.gov/firehistory/viewer/viewer.htm>

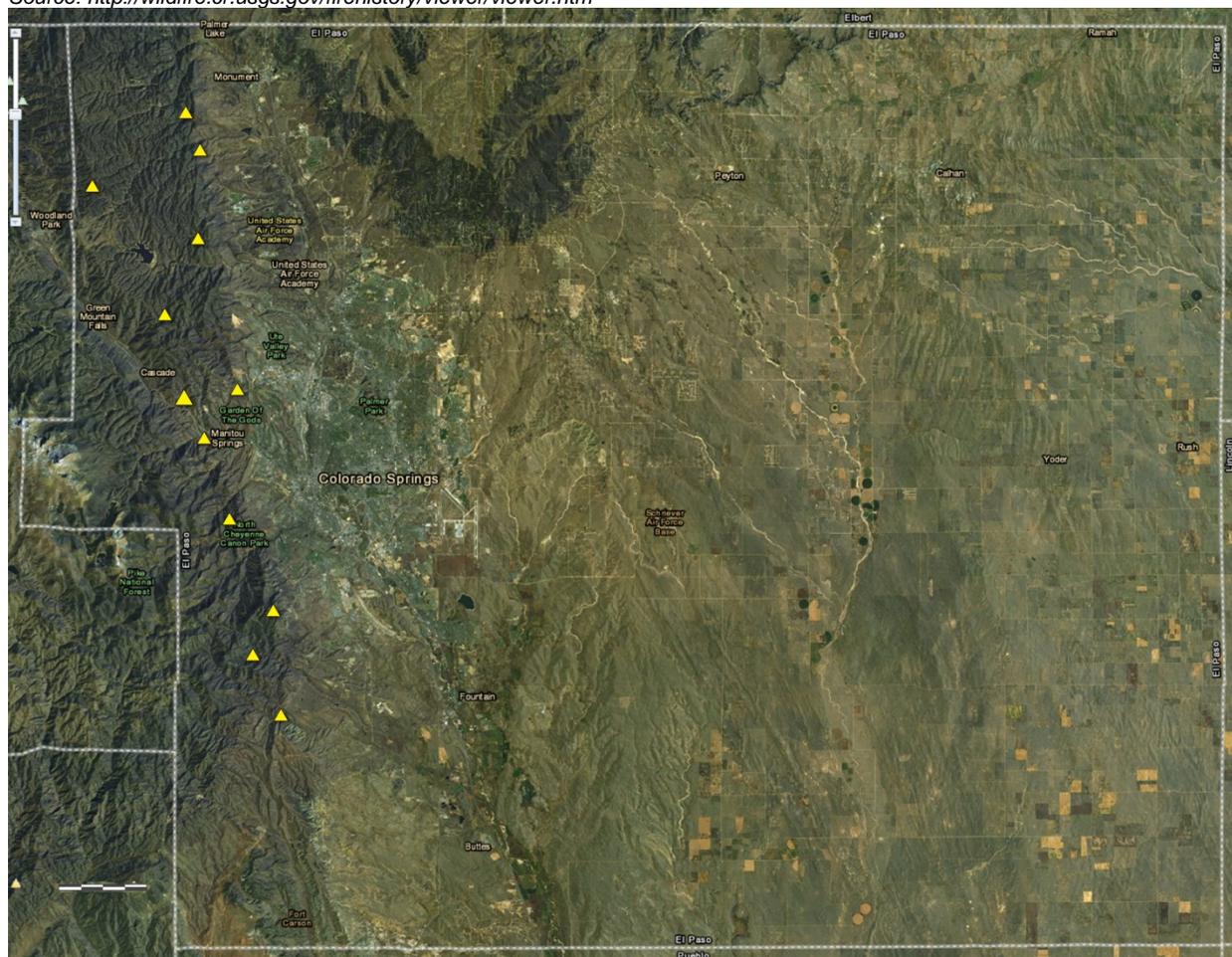


Figure 22-1. El Paso County Wildfires of 10 Acres or Larger, 1980 – 2012

Two major wildfires have recently affected El Paso County: the Waldo Canyon fire in 2012 and the Black Forest fire in 2013. Both of these fires were the most destructive fires in Colorado State history at the time of their occurrence and both affected the Colorado Springs area:

- The Waldo Canyon fire (see Figure 22-2) started approximately 4 miles northwest of Colorado Springs on June 23, 2012. It was declared 100-percent contained on July 10, 2012 after no smoke plumes were visible on a small portion of the containment line on Blodgett Peak. The fire was active in the Pike National Forest and adjoining areas, covering a total of 18,247 acres (approximately 29 square miles). The fire caused the evacuation of over 32,000 residents of Colorado Springs, Manitou Springs, and Woodland Park, several small mountain communities along the southwestern side of Highway 24, and partial evacuation of the United States Air Force Academy. Approximately 346 homes were destroyed by the fire. U.S. Highway 24, a major east-west road, was closed in both directions. The Waldo Canyon fire resulted in insurance claims totaling more than \$453.7 million. At the time it was the most destructive fire in Colorado state history, as measured by the number of homes destroyed, until the Black Forest fire surpassed it almost a year later.
- The Black Forest fire began on June 11, 2013 at approximately 2:30 p.m. Windy conditions on the first day caused the fire to spread rapidly (see Figure 22-3). Several thousand residents were evacuated and the fire consumed 511 homes and damaged 28 others. There were two fatalities as a result of the fire. Both fatalities and the loss of most of the structures occurred

during the first 48 hours of the fire. The fire was fully contained on June 20, 2013 after burning more than 14,000 acres.

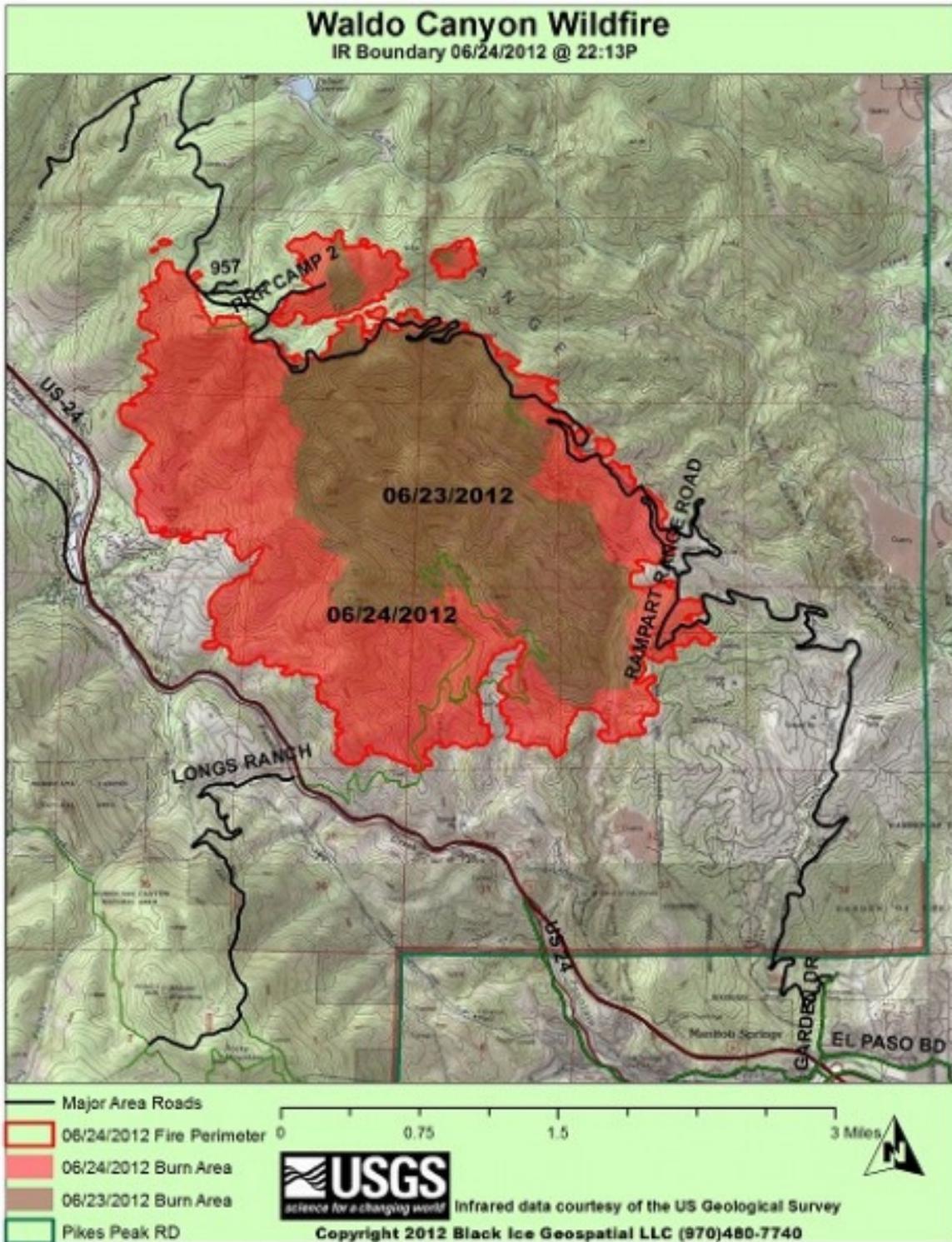


Figure 22-2. Waldo Canyon Wildfire Boundaries

Source: Posted to Wikimedia Commons by User U8oL0



Figure 22-3. View of Smoke Coming from the Black Forest Area from W. Woodmen Rd. on June 11, 2013

22.2.2 Location

Colorado overall is one of the fastest growing states in the nation. Much of this growth is occurring in the WUI area, where structures and other human improvements meet and mix with undeveloped wildland or vegetative fuels. Population growth within the WUI substantially increases the risk from wildfires. For El Paso County, the Colorado – Wildfire Risk Assessment Portal (CO-WRAP) estimates that 53 percent of the County population lives within the WUI and is at risk from wildfire. Figure 22-4 shows the El Paso County housing density within the WUI.

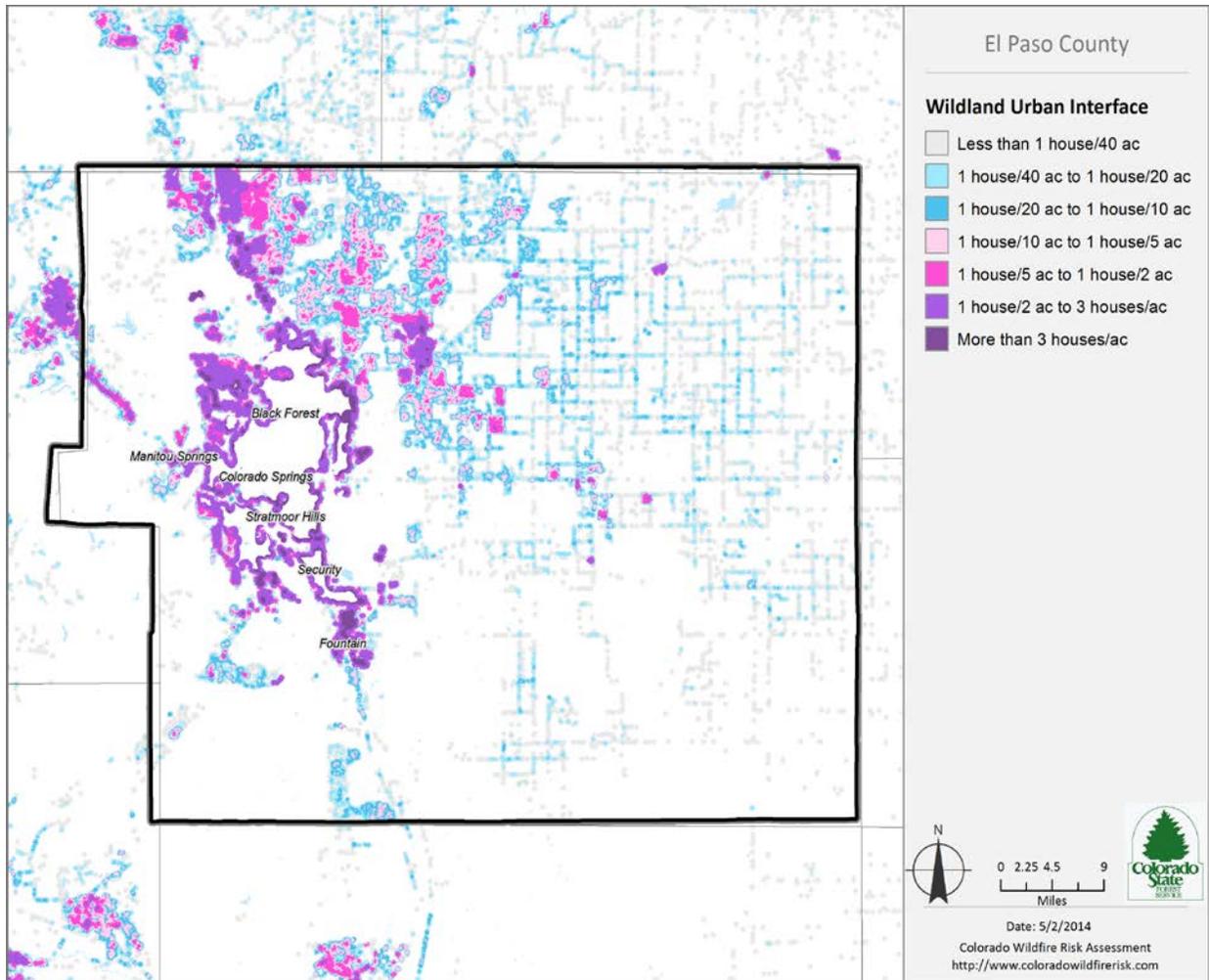


Figure 22-4. El Paso County Housing Density Within the Wildland Urban Interface

In a white paper following the Waldo Canyon fire, a long-term fire analyst with the U.S. Forest Service, Rick Stratton, published lessons and observations from the event: fires on the Front Range are often large, fast-moving, and an inevitable part of the landscape, and WUI fire disasters can be avoided with an understanding and application of the home ignition zone (HIZ, the area that includes a home and its immediate surroundings that determines a home’s ignition resistance during a severe wildfire) (Stratton, 2012). The HIZ is determined by two factors, the quality of defensible space and a structure’s ignitability. Defensible space is the natural and landscaped area around a home or other structure that has been modified to reduce fire hazard. The key elements for preventing WUI fire disasters, according to a report published by the U.S. Forest Service after the Fourmile Canyon fire, are as follows (Graham and others, 2012):

- Home ignition potential is principally determined by the HIZ and has profound implications for preventing future WUI fire disasters. Moreover, minimizing home ignition potential enhances life safety and firefighter effectiveness, especially during extreme burning conditions. Given the inevitability of future wildfires and extreme burning conditions that overwhelm fire protection, focusing on reducing home ignition potential is the key to preventing WUI fire disasters. Reducing the availability of home fuels in relation to potential firebrand exposures and reducing the surrounding heat sources in the HIZ can significantly reduce home ignition potential.

- Residential fire protection effectiveness and enhanced life safety during extreme burning conditions depend on the HIZ conditions producing low home ignition potential.
- The HIZ is largely owned by the homeowner or homeowners in higher density residential development. That means the responsibility for reducing vulnerability to wildfire rests with the homeowner(s). Thus, WUI fire disasters cannot be prevented without homeowners actively creating and maintaining HIZs with low home ignition potential.
- Given the inevitability of wildfires on the Colorado Front Range, we have the opportunity to significantly reduce the potential for WUI fire disasters during extreme burning conditions. However, this opportunity requires a change of approach—an approach focused on reducing home ignition potential within the HIZ rather than increasing expensive fire protection capabilities that have proven to strategically fail during extreme wildfire burning conditions.

Additional information on fire-resistant design is available in *Fire Wise Construction: Site Design and Building Materials* available at www.csfs.colorado.edu.

The CO-WRAP report for El Paso County maps the Wildland-Urban Interface Risk Index, which is a rating of the potential impact of a wildfire on people and their homes. The key input reflects housing density (Figure 22-4). 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. Figure 22-5 shows the Wildland Urban Interface Risk Index for El Paso County. According to data calculated by the Rocky Mountain I-News Network, El Paso County has more people living in this dangerous “red zone” than any other county in the State (Handy, 2012).

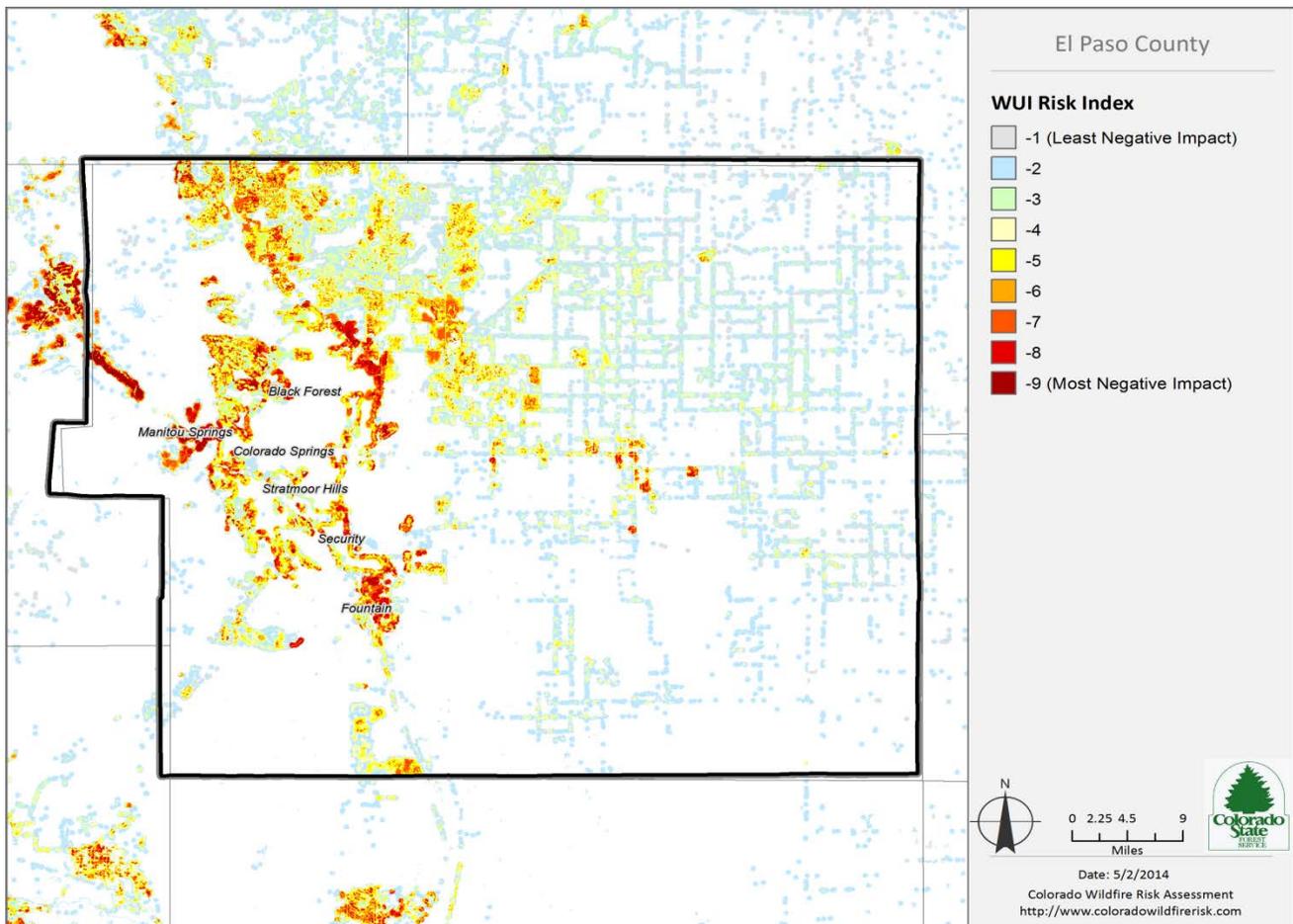


Figure 22-5. Wildland Urban Interface Risk Index for El Paso County

According to the CO-WRAP report for El Paso County, wildfire risk represents the possibility of loss or harm occurring from a wildfire. Risk is derived by combining the Wildfire Threat and the Fire Effects Assessment outputs. It identifies areas with the greatest potential impacts from a wildfire. Wildfire risk combines the likelihood of a fire occurring (threat) with those areas of most concern that are adversely impacted by fire to derive a single overall measure of wildfire risk. Figure 22-6 shows the wildfire risks for areas within El Paso County. The wildfire risks for each participating partner are shown on Figure 22-7 through Figure 22-12.

Finally, as stated in the CO-WRAP report, wildfire threat is the likelihood of an acre burning. Threat is calculated by combining multiple landscape characteristics including surface and canopy fuels, fire behavior, historical fire occurrences, weather observations, terrain conditions, and other factors. The measure of wildfire threat used in CO-WRAP is called the Threat Index. Figure 22-13 maps the threat index for El Paso County as identified in the CO-WRAP report.

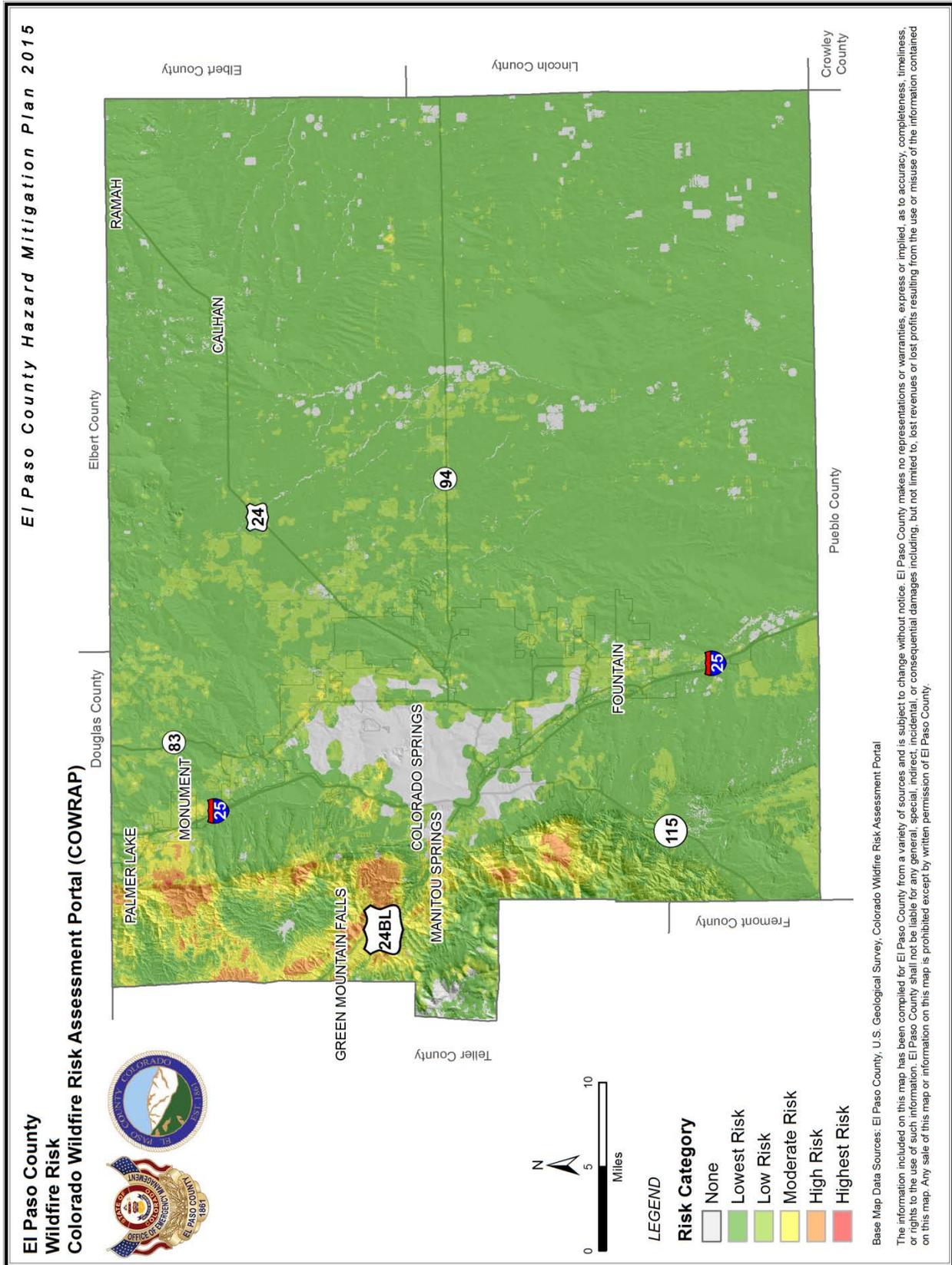


Figure 22-6. Wildfire Risk in El Paso County

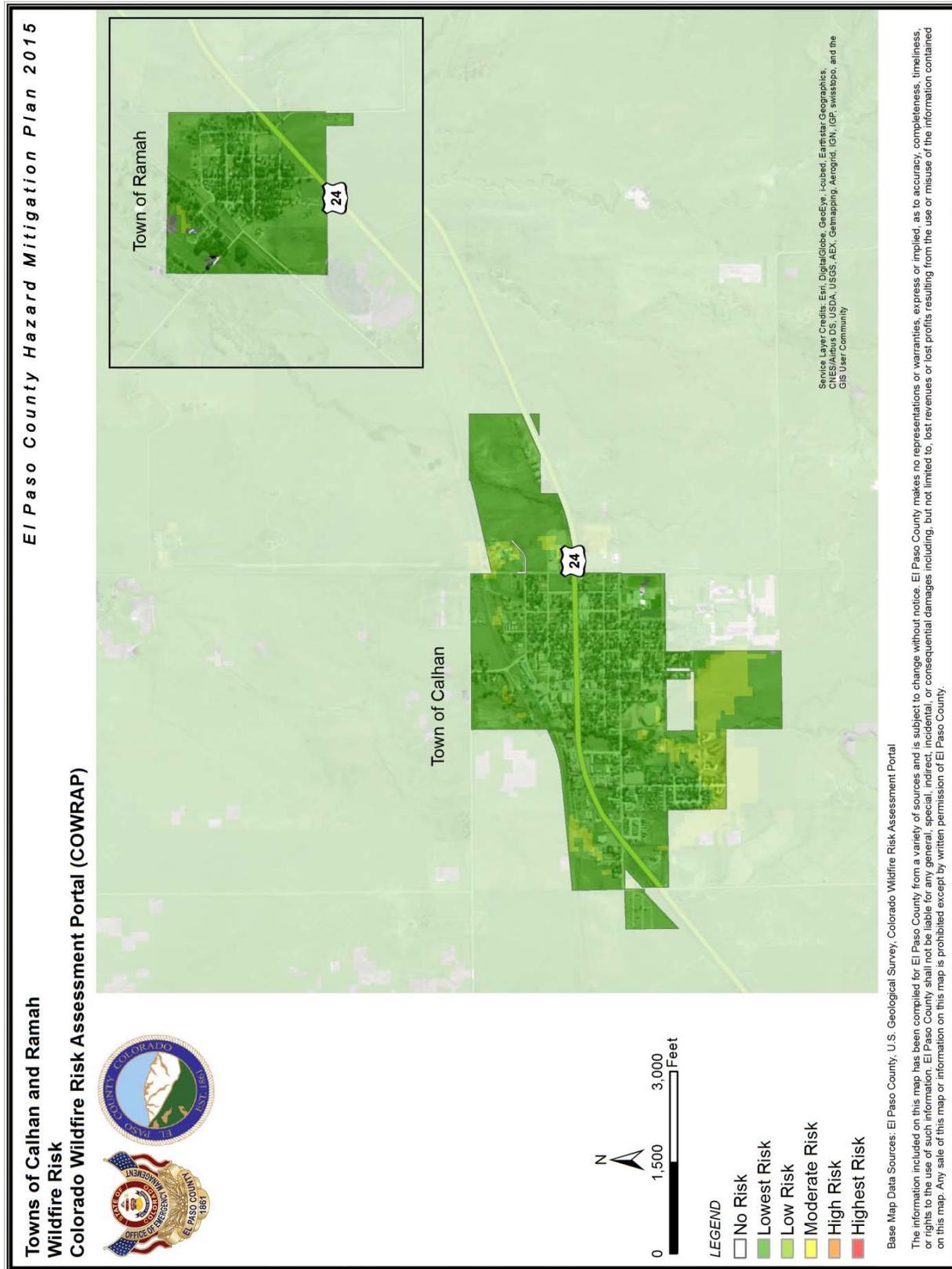


Figure 22-7. Wildfire Risk in the Towns of Calhan and Ramah

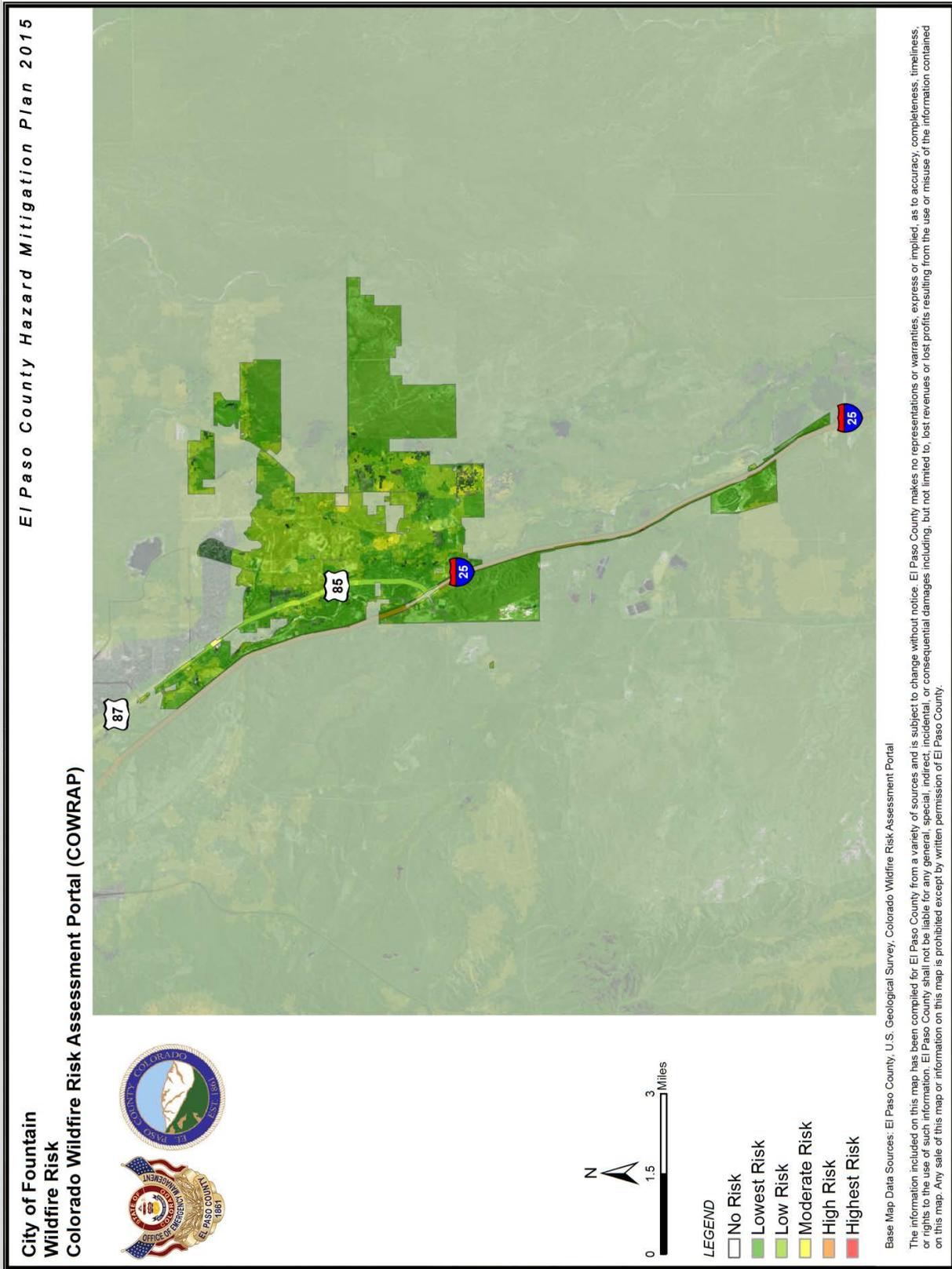


Figure 22-8. Wildfire Risk in the City of Fountain

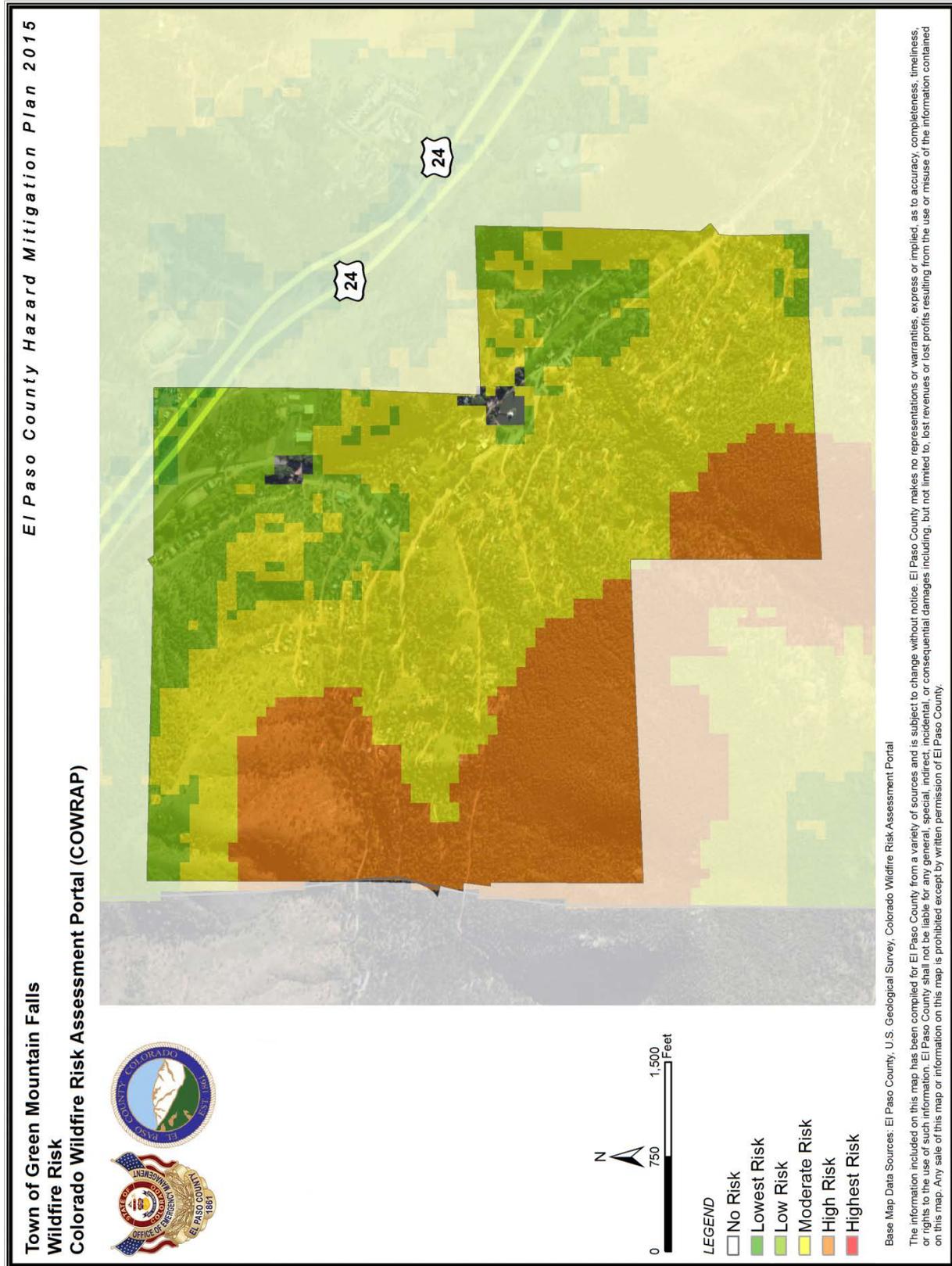


Figure 22-9. Wildfire Risk in the Town of Green Mountain Falls

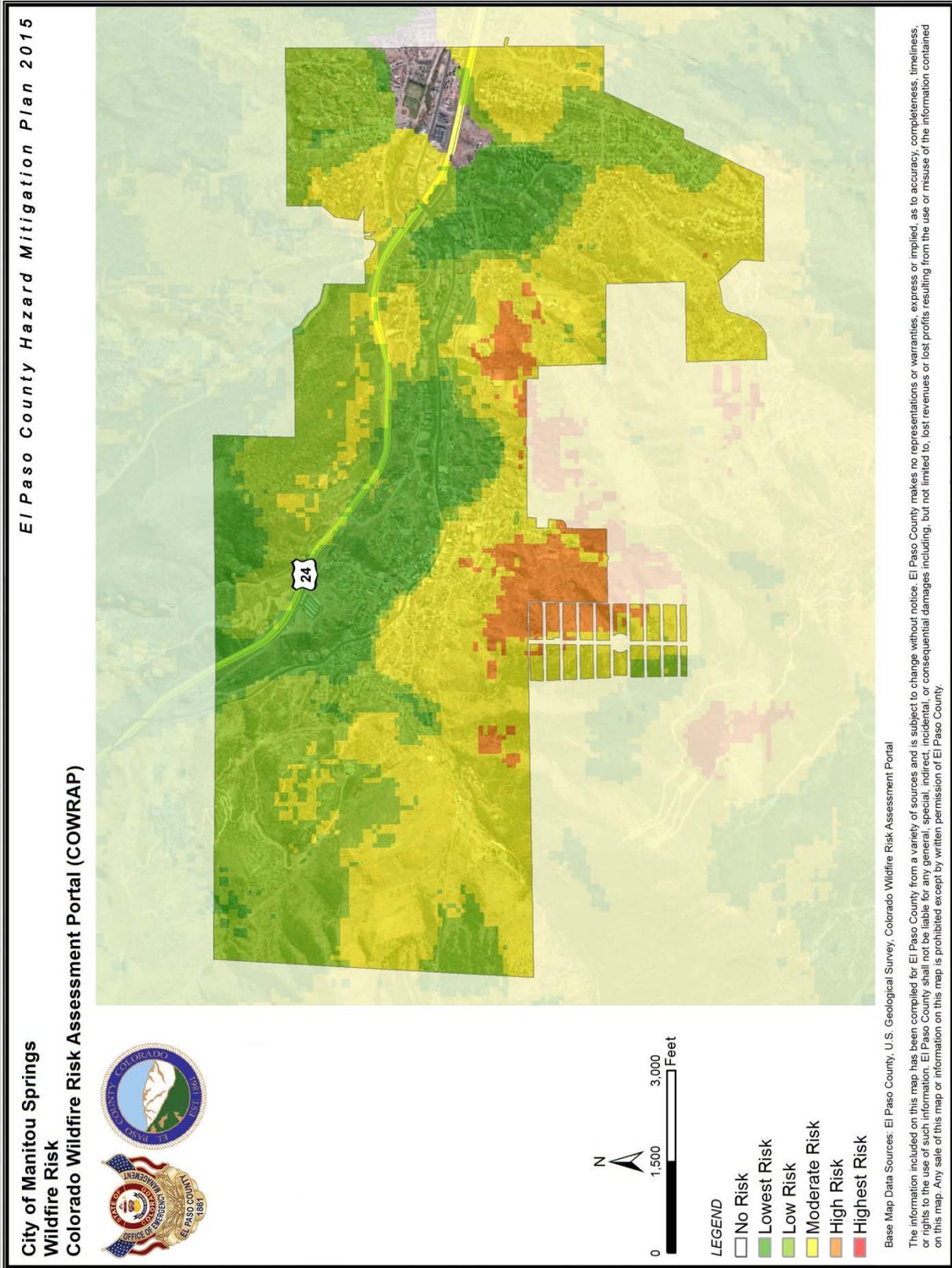


Figure 22-10. Wildfire Risk in the City of Manitou Springs

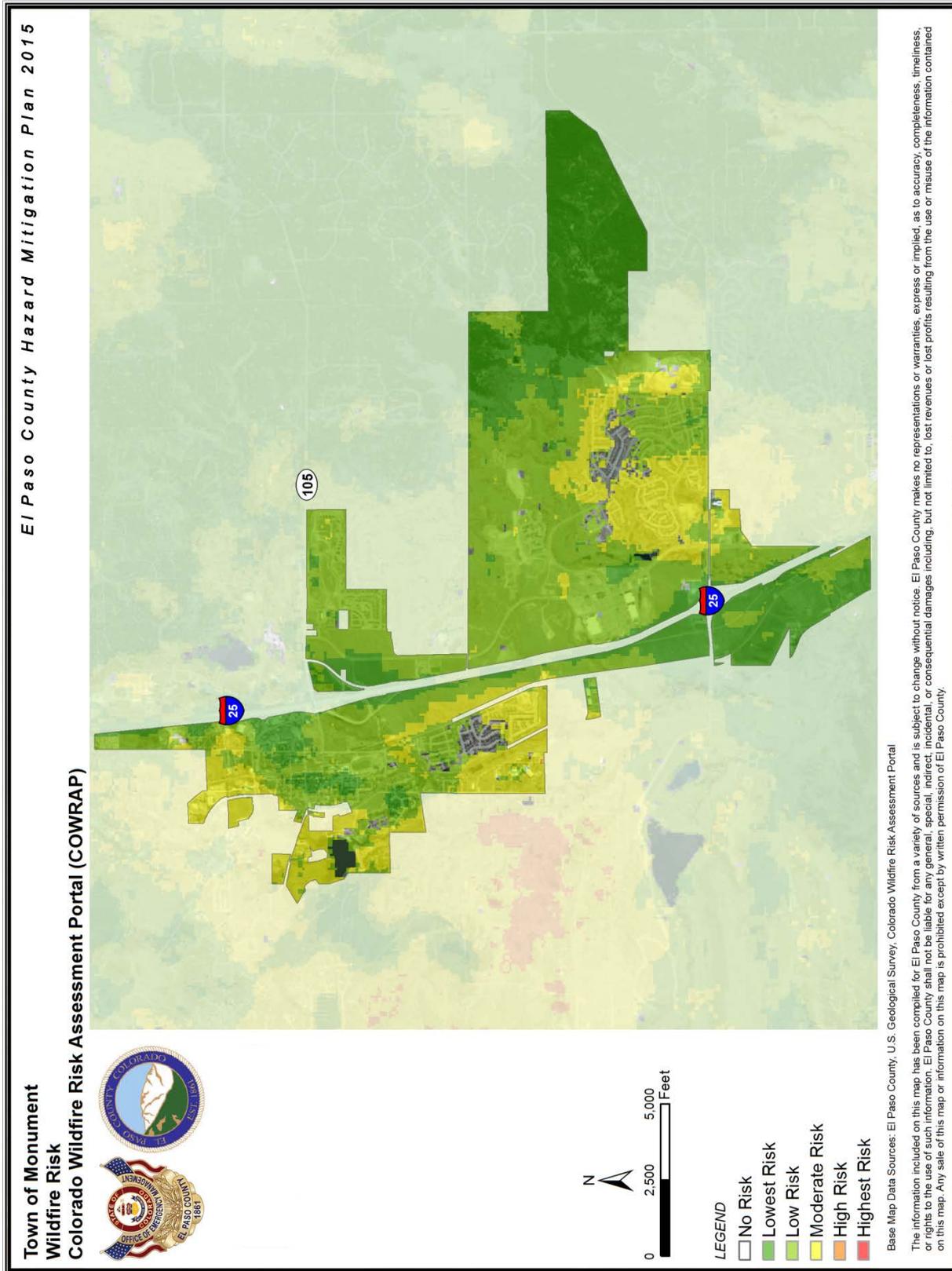


Figure 22-11. Wildfire Risk in the Town of Monument

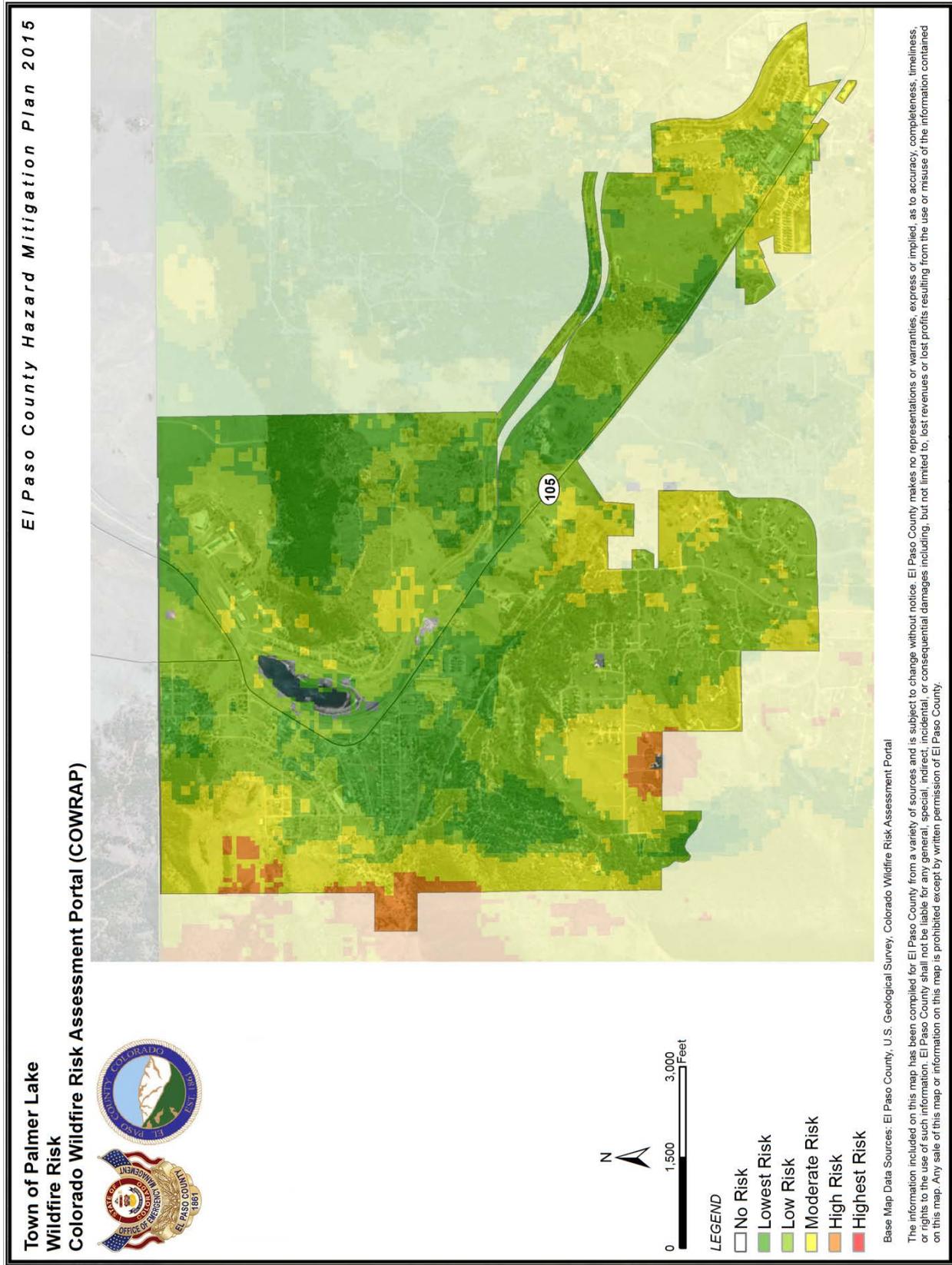


Figure 22-12. Wildfire Risk in the Town of Palmer Lake

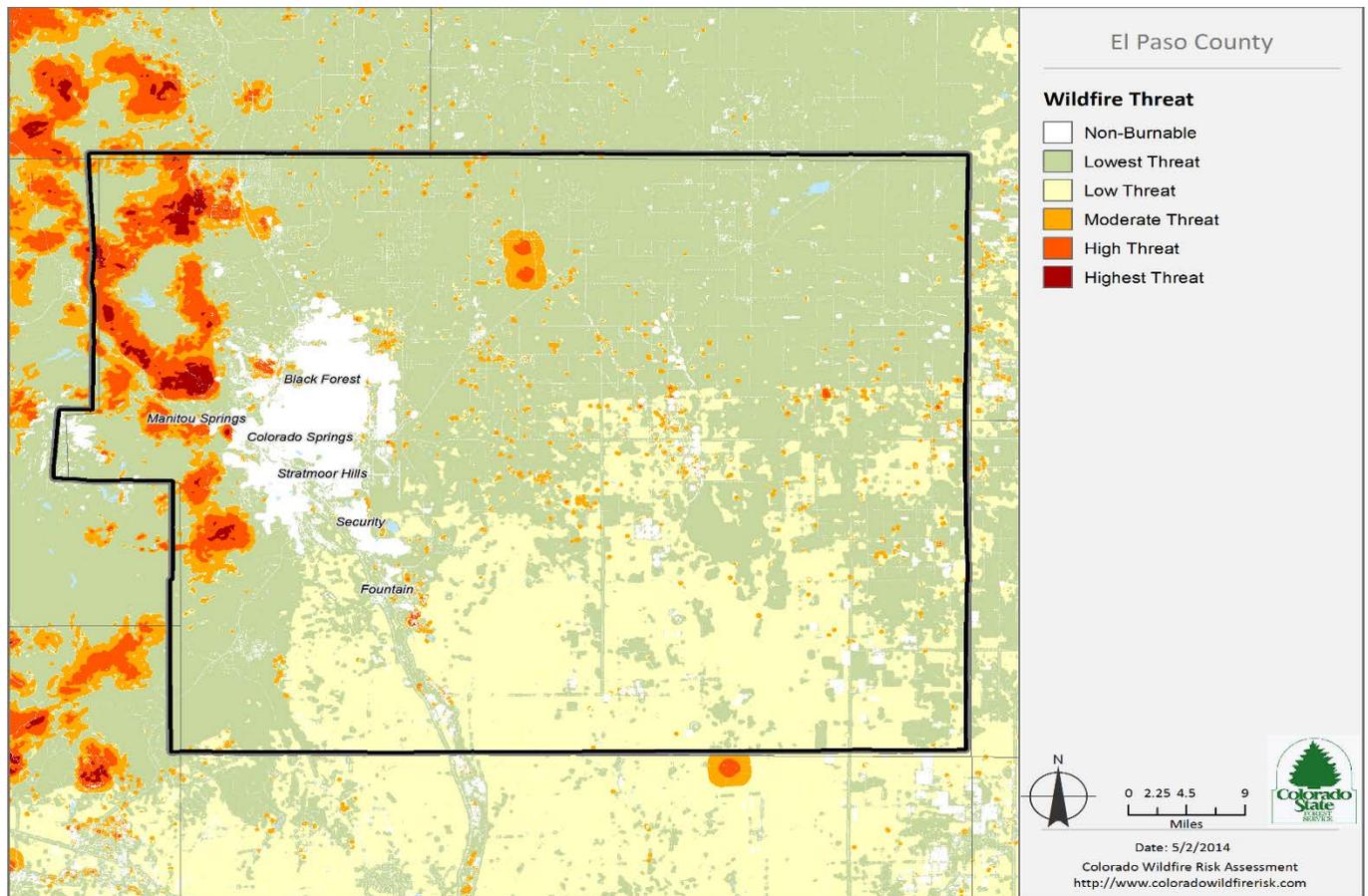


Figure 22-13. Threat Index for El Paso County

22.2.3 Frequency

According to the Colorado State Wildfire Risk Assessment Report for El Paso County, there is a 100-percent chance that at least one wildfire will occur each year in El Paso County. Many of these fires will be 5 acres and less.

22.2.4 Severity

The wildfire hazard for the County is considered to be critical: isolated deaths or multiple injuries and illnesses; major or long-term property damage that threatens structural stability; and interruption of essential facilities and services for 24 to 72 hours. It is possible that a wildfire event in the County could be catastrophic: extraordinary levels of mass casualties, damage or disruption severely affecting the population, infrastructure, environment, economy, and government functions, which includes sustained city and regional impacts; overwhelms the existing response strategies and state and local resources; and requires significant out-of-state and federal resources.

22.2.5 Warning Time

Wildfires are often caused by humans, intentionally or accidentally. There is no way to predict when one might break out. Since fireworks often cause brush fires, extra diligence is warranted around the Fourth of July when the use of fireworks is highest. Dry seasons and droughts are factors that greatly increase fire likelihood. Dry lightning may trigger wildfires. Severe weather can be predicted, so special attention can be paid during weather events that may include lightning. Reliable National Weather Service lightning warnings are available on average 24 to 48 hours prior to a significant electrical storm.

If a fire does break out and spread rapidly, residents may need to evacuate within days or hours. A fire's peak burning period generally is between 1 p.m. and 6 p.m. Once a fire has started, fire alerting is reasonably rapid in most cases. The rapid spread of cellular and two-way radio communications in recent years has further contributed to a significant improvement in warning time.

22.3 SECONDARY 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.

22.4 CLIMATE CHANGE IMPACTS

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.

Historically, drought patterns in the West are related to large-scale climate patterns in the Pacific and Atlantic oceans. The El Niño–Southern Oscillation in the Pacific varies on a 5- to 7-year cycle, the Pacific Decadal Oscillation varies on a 20- to 30-year cycle, and the Atlantic Multidecadal Oscillation varies on a 65- to 80-year cycle. As these large-scale ocean climate patterns vary in relation to each other, drought conditions in the U.S. shift from region to region.

Climate scenarios project summer temperature increases between 2°C and 5°C and precipitation decreases of up to 15 percent. Such conditions would exacerbate summer drought and further promote high-elevation wildfires, releasing stores of carbon and further contributing to the buildup of greenhouse gases. Forest response to increased atmospheric carbon dioxide—the so-called “fertilization effect”—could also contribute to more tree growth and thus more fuel for fires, but the effects of carbon dioxide on mature forests are still largely unknown. High carbon dioxide levels should enhance tree recovery after fire and young forest regrowth, as long as sufficient nutrients and soil moisture are available, although the latter may be in question for many parts of the western United States because of climate change.

22.5 EXPOSURE

Information for the exposure analyses provided in the sections below was downloaded from the CO-WRAP Wildfire Risk theme from CO-WRAP website in April 2014. The distribution of risk areas in the planning are shown in Figure 22-6 through Figure 22-12.

22.5.1 Population

Population could not be examined by WUI area because census block group areas do not coincide with the fire risk areas. However, population counts of those living in wildfire risk areas were generated by multiplying the estimated percentage of residential structures that are located in each risk area by the total El Paso County population. These estimates are shown in Table 22-3.

TABLE 22-3. POPULATION WITHIN WILDFIRE RISK AREAS						
	Lowest and Low Risk		Moderate Risk		High Risk	
	Population	% of Total	Population	% of Total	Population	% of total
Calhan	807	100.0	0	0.0	0	0.0
Colorado Springs	162,191	37.6	7,281	1.7	693	0.0
Fountain	24,739	91.6	304	1.1	0	0.0
Green Mt. Falls	127	15.8	580	72.0	94	0.1
Manitou Springs	2,861	54.9	2,027	38.9	127	0.0
Monument	3,401	58.0	1,886	32.2	0	0.0
Palmer Lake	1,879	74.3	632	25.0	16	0.0
Ramah	127	100.0	0	0.0	0	0.0
Unincorporated*	137,271	79.8	5,235	3.0	5	0.3
Total	333,403	51.6	17,945	2.8	523	0.2

Note: Exposure estimates are based of El Paso County assessor data received April 2014. Population estimated are based on the 2012 Colorado State Demography Office Estimated Populations.

*High risk category includes 13 persons in the highest risk category.

22.5.2 Property

Property damage from wildfires can be severe and can significantly alter entire communities. Table 22-4 through Table 22-8 display the number of homes in the various wildfire hazard zones within the planning area and their values.

TABLE 22-4. EXPOSURE AND VALUE OF STRUCTURES IN HIGHEST WILDFIRE RISK AREAS					
	Buildings Exposed	Value Exposed			% of Total Assessed Value
		Structure	Contents	Total	
Calhan	0	\$0	\$0	\$0	0.00
Colorado Springs	0	\$0	\$0	\$0	0.00
Fountain	0	\$0	\$0	\$0	0.00
Green Mt. Falls	0	\$0	\$0	\$0	0.00
Manitou Springs	0	\$0	\$0	\$0	0.00
Monument	0	\$0	\$0	\$0	0.00
Palmer Lake	0	\$0	\$0	\$0	0.00
Ramah	0	\$0	\$0	\$0	0.00
Unincorporated	5	\$1,465,941	\$911,352	\$2,377,293	0.01
Total	5	\$1,465,941	\$911,352	\$2,377,293	0.00

Note: Exposure estimates are based of El Paso County assessor data received April 2014.

**TABLE 22-5.
EXPOSURE AND VALUE OF STRUCTURES IN HIGH WILDFIRE RISK AREAS**

	Buildings Exposed	Value Exposed			% of Total Assessed Value
		Structure	Contents	Total	
Calhan	0	\$0	\$0	\$0	0.00
Colorado Springs	240	\$83,702,219	\$54,239,522	\$137,941,741	0.16
Fountain	0	\$0	\$0	\$0	0.00
Green Mt. Falls	67	\$6,976,026	\$3,488,013	\$10,464,039	6.24
Manitou Springs	65	\$7,520,402	\$3,786,233	\$11,306,635	1.04
Monument	0	\$0	\$0	\$0	0.00
Palmer Lake	8	\$2,151,051	\$1,287,261	\$3,438,312	0.75
Ramah	0	\$0	\$0	\$0	0.00
Unincorporated	203	\$49,913,706	\$27,152,040	\$77,065,746	0.32
Total	583	\$150,263,403	\$89,953,070	\$240,216,473	0.21

Note: Exposure estimates are based of El Paso County assessor data received April 2014.

**TABLE 22-6.
EXPOSURE AND VALUE OF STRUCTURES IN MODERATE WILDFIRE RISK AREAS**

	Buildings Exposed	Value Exposed			% of Total Assessed Value
		Structure	Contents	Total	
Calhan	0	\$0	\$0	\$0	0.00
Colorado Springs	2,521	\$765,253,852	\$440,491,509	\$1,205,745,361	1.39
Fountain	103	\$18,389,408	\$10,306,373	\$28,695,781	0.93
Green Mt. Falls	414	\$77,478,055	\$44,099,462	\$121,577,517	72.51
Manitou Springs	1,041	\$223,690,385	\$135,444,436	\$359,134,820	33.07
Monument	858	\$229,439,200	\$129,641,511	\$359,080,711	23.40
Palmer Lake	320	\$45,885,075	\$26,179,646	\$72,064,721	15.80
Ramah	0	\$0	\$0	\$0	0.00
Unincorporated	2,080	\$484,175,156	\$287,415,295	\$771,590,451	3.25
Total	7,337	\$1,844,311,130	\$1,073,578,232	\$2,917,889,362	2.49

Note: Exposure estimates are based of El Paso County assessor data received April 2014.

**TABLE 22-7.
EXPOSURE AND VALUE OF STRUCTURES IN LOW WILDFIRE RISK AREAS**

	Buildings Exposed	Value Exposed			% of Total Assessed Value
		Structure	Contents	Total	
Calhan	16	\$5,177,734	\$3,790,301	\$8,968,035	4.54
Colorado Springs	27,890	\$8,598,018,449	\$5,014,573,618	\$13,612,592,067	15.67
Fountain	5,328	\$1,057,886,915	\$578,326,071	\$1,636,212,986	53.08

**TABLE 22-7.
EXPOSURE AND VALUE OF STRUCTURES IN LOW WILDFIRE RISK AREAS**

	Buildings Exposed	Value Exposed			% of Total Assessed Value
		Structure	Contents	Total	
Green Mt. Falls	91	\$21,258,111	\$13,763,870	\$35,021,981	20.89
Manitou Springs	672	\$164,003,399	\$97,059,562	\$261,062,960	24.04
Monument	1,215	\$490,280,143	\$311,097,444	\$801,377,587	52.23
Palmer Lake	598	\$159,410,076	\$101,381,705	\$260,791,780	57.18
Ramah	0	0	0	0	0.00
Unincorporated	23,531	\$4,958,737,041	\$2,891,738,941	\$7,850,475,981	33.04
Total	59,341	\$15,454,771,867	\$9,011,731,511	\$24,466,503,377	20.88

Note: Exposure estimates are based of El Paso County assessor data received April 2014.

**TABLE 22-8.
EXPOSURE AND VALUE OF STRUCTURES IN LOWEST WILDFIRE RISK AREAS**

	Buildings Exposed	Value Exposed			% of Total Assessed Value
		Structure	Contents	Total	
Calhan	513	\$106,187,804	\$82,534,803	\$188,722,607	95.46
Colorado Springs	28,264	\$12,942,292,758	\$9,320,814,048	\$22,263,106,807	25.64
Fountain	3,041	\$703,522,682	\$496,489,555	\$1,200,012,238	38.93
Green Mt. Falls	0	\$0	\$0	\$0	0.00
Manitou Springs	797	\$241,685,694	\$156,133,052	\$397,818,746	36.63
Monument	332	\$141,002,932	\$117,159,596	\$258,162,528	16.83
Palmer Lake	354	\$73,447,025	\$45,916,477	\$119,363,502	26.17
Ramah	126	\$13,271,711	\$9,219,882	\$22,491,593	100.0
Unincorporated	31,015	\$7,142,316,961	\$4,516,739,825	\$11,659,056,785	49.07
Total	64,442	\$21,363,727,569	\$14,745,007,237	\$36,108,734,806	30.82

Note: Exposure estimates are based of El Paso County assessor data received April 2014.

Present Land Use

Present land use for each wildfire risk area is described in Table 22-9 and Table 22-10.

**TABLE 22-9.
PRESENT LAND USE IN HIGHEST AND HIGH WILDFIRE RISK AREAS**

Present Use Classification	Highest		High	
	Area (acres)	% of total	Area (acres)	% of total
Agriculture	0.0	0.00	0.3	0.00
Commercial	0.0	0.00	113.8	0.68

**TABLE 22-9.
PRESENT LAND USE IN HIGHEST AND HIGH WILDFIRE RISK AREAS**

Present Use Classification	Highest		High	
	Area (acres)	% of total	Area (acres)	% of total
Education	0.0	0.00	0.0	0.00
Government	0.0	0.00	326.0	1.94
Industrial	0.0	0.00	0.0	0.00
Religion/Non-Profit	0.0	0.00	6.7	6.7
Residential	15.8	20.31	1,372.1	8.16
Uncategorized	62.1	79.69	15,000.9	89.19
Total	77.9	100.00	16,819.9	100.00

Note: Acreage covers only mapped parcels and thus excludes many rights of way and major water features.

**TABLE 22-10.
PRESENT LAND USE IN MODERATE, LOW, AND LOWEST WILDFIRE RISK AREAS**

Present Use Classification	Moderate		Low		Lowest	
	Area (acres)	% of total	Area (acres)	% of total	Area (acres)	% of total
Agriculture	31.10	0.07	1,931.8	1.24	38,153.3	3.63
Commercial	486.11	1.04	3,531.3	2.26	13,746.4	1.31
Education	0.00	0.00	16.7	0.01	106.7	0.01
Government	2677.9	5.71	17,641.7	11.30	128,890.6	12.27
Industrial	36.7	0.08	136.4	0.09	982.7	0.09
Religion/Non-Profit	94.7	0.20	825.8	0.53	1,977.3	0.19
Residential	6,292.8	13.42	58,371.6	37.40	308,271.3	29.35
Uncategorized	37,285.8	79.49	73,630.8	47.17	558,336.5	53.15
Total	46,905.1	100.00	156,086.0	100.00	1,050,466.7	100.00

Note: Acreage covers only mapped parcels and thus excludes many rights of way and major water features.

22.5.3 Critical Facilities and Infrastructure

Table 22-11 identifies critical facilities exposed to the wildfire hazard in the county.

TABLE 22-11. CRITICAL FACILITIES AND INFRASTRUCTURE IN WILDFIRE RISK AREAS				
	Number of Critical Facilities in Hazard Zone			
	Lowest Risk	Low Risk	Moderate Risk	High Risk
Medical and Health	2	3	0	0
Government Functions	2	0	0	0
Protective Functions	37	7	1	0
Schools	81	47	6	2
Bridges	264	58	17	0
Water Supply	4	0	0	0
Wastewater	8	0	1	0
Power	7	1	0	0
Communications	8	3	22	0
Transportation	14	1	0	0
Dams	43	20	4	1
Hazardous Materials	50	8	3	0
Total	520	148	54	3

In the event of a 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.

22.5.4 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.

22.6 VULNERABILITY

Structures, above-ground infrastructure, critical facilities, and natural environments are all vulnerable to the wildfire hazard. There is currently no validated damage function available to support wildfire mitigation planning. Except as discussed in this section, vulnerable populations, property, infrastructure, and environment are assumed to be the same as described in the earlier section on exposure.

22.6.1 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 consists of visible and invisible emissions that contain particulate matter (soot, tar, water vapor, and minerals), gases (carbon monoxide, carbon dioxide, and nitrogen oxides), and toxic substances (formaldehyde, benzene, and others). Emissions from wildfires depend on the type of fuel, the moisture content of the fuel, the efficiency (or temperature) of combustion, and the weather. Public health impacts associated with wildfires include difficulty in breathing, odor, and reduction in visibility.

Wildfires may also threaten the health and safety of those fighting the fires. First responders are exposed to the dangers from the initial incident and after-effects from smoke inhalation and heat stroke.

22.6.2 Property

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 and 50 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. Damage in excess of 50 percent is considered to be substantial by most building codes and typically requires total reconstruction of the structure. Table 22-12 lists the loss estimates for the general building stock for jurisdictions that have an exposure to a fire hazard severity zone.

	Exposed Value	Estimated Loss Potential from Wildfire		
		10% Damage	30% Damage	50% Damage
Calhan	\$197,690,642	\$19,769,064	\$59,307,193	\$98,845,321
Colorado Springs	\$37,081,444,235	\$3,708,144,424	\$11,124,433,271	\$18,540,722,118
Fountain	\$2,864,921,004	\$286,492,100	\$859,476,301	\$1,432,460,502
Green Mt. Falls	\$156,599,498	\$15,659,950	\$46,979,850	\$78,299,749
Manitou Springs	\$1,018,016,526	\$101,801,653	\$305,404,958	\$509,008,263
Monument	\$1,418,620,826	\$141,862,083	\$425,586,248	\$709,310,413

TABLE 22-12. LOSS ESTIMATES FOR WILDFIRE				
	Exposed Value	Estimated Loss Potential from Wildfire		
		10% Damage	30% Damage	50% Damage
Palmer Lake	\$452,220,003	\$45,222,000	\$135,666,001	\$226,110,002
Ramah	\$22,491,593	\$2,249,159	\$6,747,478	\$11,245,796
Unincorporated	\$20,283,500,511	\$2,028,350,051	\$6,085,050,153	\$10,141,750,255
Total	\$63,495,504,838	\$6,349,550,484	\$19,048,651,452	\$31,747,752,419

22.6.3 Critical Facilities and Infrastructure

Critical facilities of wood frame construction are especially vulnerable during wildfire events. In the event of a wildfire, there would likely be little damage to most infrastructure. Most roads and railroads would be without damage except in the worst scenarios. Power lines are the most at risk from wildfire because most poles are made of wood and susceptible to burning. Fires can create conditions that block or prevent access and can isolate residents and emergency service providers. 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.

22.7 FUTURE TRENDS IN DEVELOPMENT

The County has experienced moderate growth over the last decade and is likely to continue this trend. 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 Emergency Services Division, 2011). 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 Emergency Services Division, 2011).

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 Emergency Services Division, 2011).

22.8 SCENARIO

A major conflagration in the planning area might begin with a wet spring that promotes vegetation growth, adding to fuels already present on the forest floor. Flashy fuels would build throughout the spring. The summer could see the onset of insect infestation. A dry summer could follow the wet spring, exacerbated by dry hot winds. Carelessness with combustible materials, a tossed lit cigarette, or a sudden lightning storm could trigger a multitude of small isolated fires.

The embers from these smaller fires could be carried miles by hot, dry winds. The deposition zone for these embers would be deep in the forests and interface zones. Fires that start in flat areas move slower,

but wind still pushes them. It is not unusual for a wildfire pushed by wind to burn the ground fuel and later climb into the crown and reverse its track. This is one of many ways that fires can escape containment, typically during periods when response capabilities are overwhelmed. These new small fires would most likely merge. Suppression resources would be redirected from protecting the natural resources to saving more remote subdivisions.

The worst-case scenario would include an active fire season throughout the West, spreading resources thin. Firefighting teams would be exhausted or unavailable. Many federal assets would be responding to other fires that started earlier in the season. While local fire districts would be extremely useful in the urban interface areas, they have limited wildfire capabilities or experience, and they would have a difficult time responding to the ignition zones. Even though the existence and spread of the fire is known, it may not be possible to respond to it adequately, so an initially manageable fire can become out of control before resources are dispatched.

To further complicate the problem, heavy rains could follow, causing flooding and landslides and releasing tons of sediment into rivers, permanently changing floodplains and damaging sensitive habitat and riparian areas. Such a fire followed by rain could release millions of cubic yards of sediment into streams for years, creating new floodplains and changing existing ones. With the forests removed from the watershed, stream flows could easily double. Floods that could be expected every 50 years may occur every couple of years. With the streambeds unable to carry the increased discharge because of increased sediment, the floodplains and floodplain elevations would increase.

22.9 ISSUES

The major issues for 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 evacuation routes and safe zones.
- Wildfires could cause landslides as a secondary natural hazard.
- Climate change could affect the wildfire hazard.
- Future growth into interface areas should continue to be managed.
- Area fire districts need to continue to train on WUI events.
- 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.

CHAPTER 23. WINTER STORM

WINTER STORM RANKING						
El Paso County	Calhan/Ramah	Fountain	Green Mountain Falls	Manitou Springs	Monument	Palmer Lake
High	Medium	High	High	Medium	High	High

23.1 GENERAL BACKGROUND

Winter storms can include heavy snow, ice, and blizzard conditions. Heavy snow can immobilize a region, stranding commuters, stopping the flow of supplies, and disrupting emergency and medical services. Accumulations of snow can collapse roofs and knock down trees and power lines. In rural areas, homes and farms may be isolated for days, and unprotected livestock may be lost. The cost of snow removal, damage repair, and business losses can have a tremendous impact on cities and towns.

Heavy accumulations of ice can bring down trees, electrical wires, telephone poles and lines, and communication towers. Communications and power can be disrupted for days until damage can be repaired. Even small accumulations of ice may cause extreme hazards to motorists and pedestrians.

Some winter storms are accompanied by strong winds, creating blizzard conditions with blinding wind-driven snow, severe drifting, and dangerous wind chills. Strong winds with these intense storms and cold fronts can knock down trees, utility poles, and power lines. Blowing snow can reduce visibilities to only a few feet in areas where there are no trees or buildings. Serious vehicle accidents can result with injuries and deaths.

Winter storms in El Paso County, including strong winds and blizzard conditions, can result in property damage, localized power and telephone outages, and closures of streets, highways, schools, businesses, and nonessential government operations. People can also become isolated from essential services in their homes and vehicles. A winter storm can escalate, creating life-threatening situations when emergency response is limited by severe winter conditions. Other issues associated with severe winter weather include hypothermia and the threat of physical overexertion that may lead to heart attacks or strokes. Snow removal costs can also impact budgets significantly. Heavy snowfall during winter can also lead to flooding or landslides during the spring if the area snowpack melts too quickly.

DEFINITIONS

Freezing Rain—The result of rain occurring when the temperature is below the freezing point. The rain freezes on impact, resulting in a layer of glaze ice up to an inch thick. In a severe ice storm, an evergreen tree 60 feet high and 30 feet wide can be burdened with up to six tons of ice, creating a threat to power and telephone lines and transportation routes.

Severe Local Storm—Small-scale atmospheric systems, including tornadoes, thunderstorms, windstorms, ice storms, and snowstorms. These storms may cause a great deal of destruction and even death, but their impact is generally confined to a small area. Typical impacts are on transportation infrastructure and utilities.

Winter Storm—A storm having significant snowfall, ice, and/or freezing rain; the quantity of precipitation varies by elevation.

23.1.1 Extreme Cold

Extreme cold often accompanies a winter storm or is left in its wake. It is most likely to occur in the winter months of December, January, and February. Prolonged exposure to the cold can cause frostbite or hypothermia and can become life-threatening. Infants and the elderly are most susceptible. Pipes may freeze and burst in homes or buildings that are poorly insulated or without heat. Extreme cold can disrupt or impair communications facilities.

In 2001, the NWS implemented an updated wind chill temperature index (see Figure 23-1). 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.

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

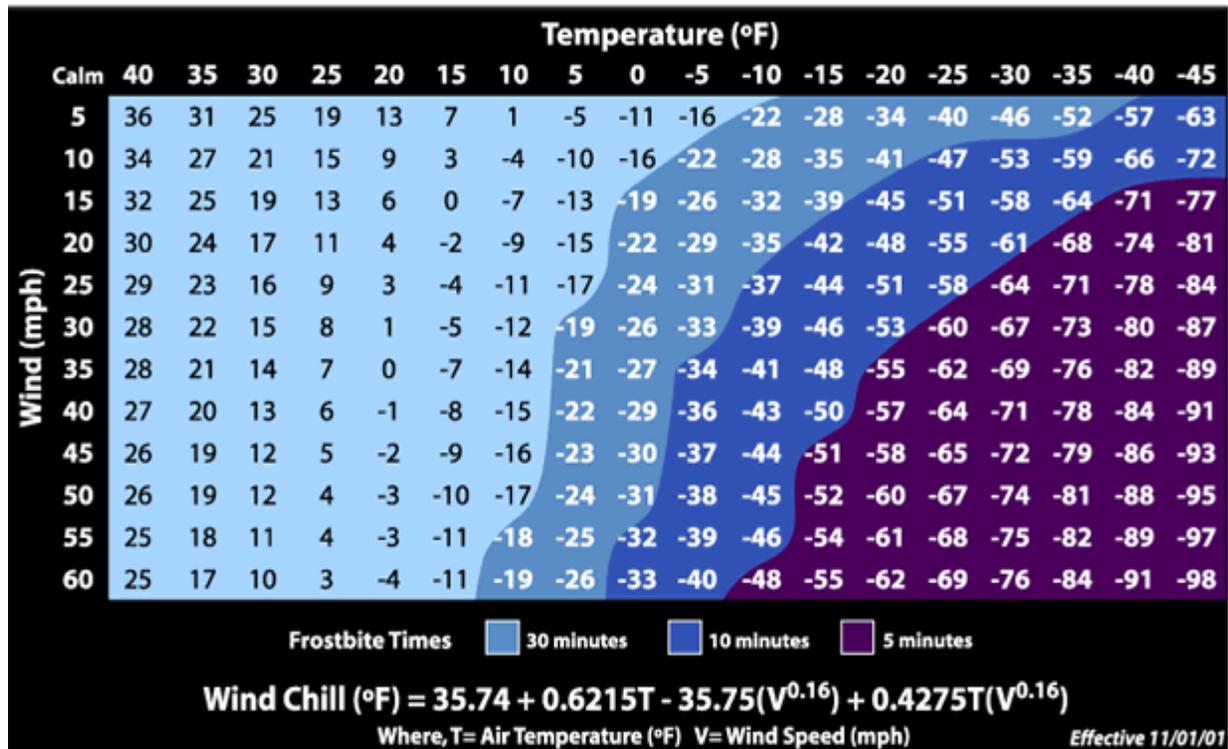


Figure 23-1. National Weather Service Wind Chill Chart

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.

The Western Regional Climate Center reports data from a station in Colorado Springs (Colorado Springs Municipal AP [KCOS]). Table 23-1 contains temperature summaries related to extreme cold for the station.

**TABLE 23-1.
TEMPERATURE DATA FROM COLORADO SPRINGS MUNICIPAL AIRPORT (1996-2008)**

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Temperature (degrees Fahrenheit)												
Average Maximum Temperature	43.6	45.4	53.1	59.9	70.7	79.4	86.2	81.8	75.0	63.9	52.0	43.6
Average Minimum Temperature	17.8	19.5	25.9	33.0	42.6	51.0	57.8	55.8	47.1	36.1	25.5	17.9
Average Temperature	30.7	32.4	39.5	46.4	56.6	65.2	72.0	68.8	61.1	50.0	38.7	30.8
Extreme Temperatures (degrees Fahrenheit)												
Extreme Minimum Temperature	-13	-8	-2	7	22	37	47	42	26	15	-3	-15
Average Number of Days												
Minimum Temperature below 32	29.5	27.3	24.4	14.3	2.5	0.0	0.0	0.0	0.9	9.7	23.5	29.7
Minimum Temperature below 20	18.2	14.8	7.2	1.2	0.0	0.0	0.0	0.0	0.0	0.8	8.1	19.0
Minimum Temperature below 0	1.5	0.8	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.3

23.2 HAZARD PROFILE

23.2.1 Past Events

Table 23-2 lists the 118 El Paso County severe winter weather events recorded by the National Climatic Data Center from 1997 to May 2014. The NCDC records show property damage, injury or death during three of these events. The sections below provide descriptions of these events taken from NCDC records.

**TABLE 23-2.
EL PASO COUNTY WINTER WEATHER EVENTS, 1996 – 2014**

Beginning Date	Event Type	Beginning Date	Event Type	Beginning Date	Event Type
10/24/1997	Blizzard	12/21/2004	Heavy Snow	3/20/2006	Winter Storm
4/11/2001	Blizzard	11/14/2005	Heavy Snow	11/28/2006	Winter Storm
4/5/2005	Blizzard	12/3/2005	Heavy Snow	12/19/2006	Winter Storm
4/10/2005	Blizzard	1/16/2006	Heavy Snow	12/20/2006	Winter Storm
12/20/2006	Blizzard	5/6/2007	Heavy Snow	12/28/2006	Winter Storm
2/24/2007	Blizzard	4/1/1997	Winter Storm	4/12/2007	Winter Storm
3/26/2009	Blizzard	4/24/1997	Winter Storm	4/24/2007	Winter Storm
12/19/2012	Blizzard	11/27/1997	Winter Storm	3/2/2008	Winter Storm
3/9/2013	Blizzard	2/15/1998	Winter Storm	4/16/2008	Winter Storm
10/12/1997	Heavy Snow	3/18/1998	Winter Storm	11/29/2008	Winter Storm
11/13/1997	Heavy Snow	3/30/1998	Winter Storm	3/26/2009	Winter Storm
12/10/1997	Heavy Snow	11/9/1998	Winter Storm	4/17/2009	Winter Storm
1/6/1998	Heavy Snow	4/1/1999	Winter Storm	10/28/2009	Winter Storm
1/31/1998	Heavy Snow	4/4/1999	Winter Storm	3/19/2010	Winter Storm
2/18/1998	Heavy Snow	4/21/1999	Winter Storm	3/23/2010	Winter Storm
4/2/1998	Heavy Snow	4/22/1999	Winter Storm	3/26/2010	Winter Storm
4/15/1998	Heavy Snow	10/16/1999	Winter Storm	4/23/2010	Winter Storm
4/17/1998	Heavy Snow	11/21/1999	Winter Storm	12/30/2010	Winter Storm
4/26/1998	Heavy Snow	12/3/1999	Winter Storm	10/25/2011	Winter Storm
12/9/1998	Heavy Snow	12/8/1999	Winter Storm	12/21/2011	Winter Storm
2/10/1999	Heavy Snow	1/1/2000	Winter Storm	2/2/2012	Winter Storm
3/4/1999	Heavy Snow	1/2/2000	Winter Storm	4/2/2012	Winter Storm
4/14/1999	Heavy Snow	1/26/2000	Winter Storm	12/18/2012	Winter Storm
2/17/2000	Heavy Snow	1/27/2000	Winter Storm	2/20/2013	Winter Storm
9/23/2000	Heavy Snow	3/15/2000	Winter Storm	2/24/2013	Winter Storm
3/29/2001	Heavy Snow	3/30/2000	Winter Storm	5/11/2014	Winter Storm
11/8/2001	Heavy Snow	1/15/2001	Winter Storm	1/21/2007	Winter Weather
11/23/2001	Heavy Snow	2/8/2001	Winter Storm	2/16/2007	Winter Weather
1/10/2002	Heavy Snow	3/10/2001	Winter Storm	3/24/2007	Winter Weather
1/23/2002	Heavy Snow	4/2/2001	Winter Storm	4/6/2007	Winter Weather
3/24/2002	Heavy Snow	5/4/2001	Winter Storm	4/8/2007	Winter Weather
11/1/2002	Heavy Snow	3/17/2003	Winter Storm	5/23/2007	Winter Weather
2/5/2003	Heavy Snow	12/8/2003	Winter Storm	1/3/2009	Winter Weather
2/18/2003	Heavy Snow	4/22/2004	Winter Storm	1/12/2009	Winter Weather
3/1/2003	Heavy Snow	11/1/2004	Winter Storm	11/9/2010	Winter Weather
4/23/2003	Heavy Snow	11/27/2004	Winter Storm	1/31/2011	Winter Weather
1/20/2004	Heavy Snow	1/28/2005	Winter Storm	12/9/2012	Winter Weather
2/19/2004	Heavy Snow	3/30/2005	Winter Storm	1/4/2014	Winter Weather
3/4/2004	Heavy Snow	10/10/2005	Winter Storm		
4/25/2004	Heavy Snow	1/19/2006	Winter Storm		

October 1997 Blizzard

While blizzards are not uncommon in Colorado, the widespread extent of this blizzard made it an estimated 50-year event. A powerful low pressure system from the northwest settled into northern New Mexico, as arctic air invaded eastern Colorado. Heavy snow began in the southwest mountains early on the morning of Friday, October 24. Snow began spreading across the eastern plains by midday Friday. By Friday evening, the arctic high pressure and low pressure to the south intensified, and blizzard conditions began in the eastern mountains and across the plains. Blizzard conditions persisted through Saturday night into the extreme eastern plains.

Snowfall totals along the Urban Corridor and adjacent plains generally ranged from 14 to 30 inches. The heaviest snowfall occurred in the foothills west and southwest of Denver where 2 to 4 feet of snow was reported. Sustained winds to 40 mph, with gusts as high as 60 mph, caused zero visibilities and wind chill temperatures between 25 and 40 degrees below zero. The blizzard formed snowdrifts 4 to 10 feet deep. Several major highways and interstates were closed as conditions became life threatening and travel impossible. Red Cross shelters were set up for hundreds of travelers who were forced to abandon their vehicles.

Three people in El Paso county perished from carbon monoxide poisoning after waiting for help to come in their snowbound vehicles for over 24 hours. Another person froze to death in a vehicle on post at Fort Carson in the Colorado Springs area. Two people were injured in Colorado Springs when a canopy at a gas station collapsed under the weight of deep snow on top.

The combination of high wind and heavy snow caused power lines to come down. Power outages occurred (and lasted up to two days) in many parts of the area, most notably in parts of Colorado Springs, in and around Pueblo, and in southeast Colorado. Hundreds of businesses and stores were closed throughout much of the weekend, and temporary sales and production losses were in the millions of dollars. Many school districts were closed for a part, or all of the following week.

There was a widespread die-off of range cattle with an estimated 20,000 dead cattle statewide. Snow amounts with the blizzard were impressive. Generally between 1 and 2 feet fell from the Rampart Range and southern Colorado Springs through Pueblo, Trinidad, and the southeast Plains.

April 2001 Blizzard

An intense low pressure system over southeast Colorado produced blizzard conditions over northern El Paso County. Heavy snow of 6 to 18 inches combined with winds in excess of 80 mph to produce snow drifts up to 10 feet deep in some locations. Snowfall totaled 5 inches from Calhan to Ramah and 8 to 18 inches from Peyton to Monument and Black Forest. Hundreds of power poles were knocked down, leaving thousands of people without power for days in eastern El Paso County. Many motorists had to be rescued by El Paso County search and rescue and Fort Carson personnel. Around 200 people in two busses on I-25 had to be rescued. Property damage of \$4 million was estimated.

April 2007 Winter Storm

An intense low pressure system moving along the Colorado/New Mexico border generated significant snow accumulations over the region. The heavy wet snow combined with high winds, caused numerous power outages, downed power lines, and road closures. Some of the heavier snow amounts included 16 to 20 inches of snow in Monument. Snow drifts to around 4 feet were noted in northern El Paso County. Nearly 2 feet of snow covered Black Forest. In El Paso County, over 200 people were stranded, including 60 students who were on a bus. Thousands of people in eastern El Paso County were without power, some for several weeks. Hundreds of electrical transmission lines were downed. Property damage of \$250,000 was estimated.

Typical Snowfall Records

The Western Regional Climate Center reports data from a weather station in El Paso County: Colorado Springs WSO AP. Figure 23-2 and Figure 23-3 show daily snowfall and snow depth averages and extremes. Table 23-3 contains snowfall and snow depth summaries for the station.

Source: Western Regional Climate Center, www.wrcc.dri.edu/

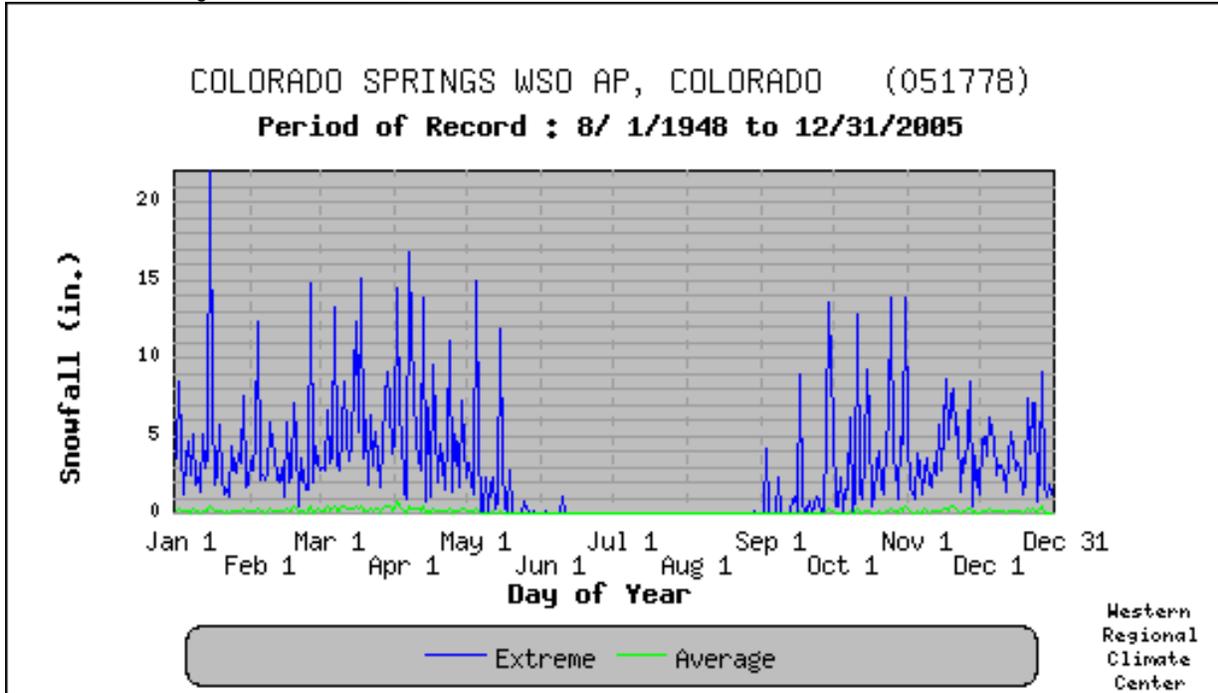


Figure 23-2. Colorado Springs Airport Station Snowfall Average and Extreme

Source: Western Regional Climate Center, www.wrcc.dri.edu/

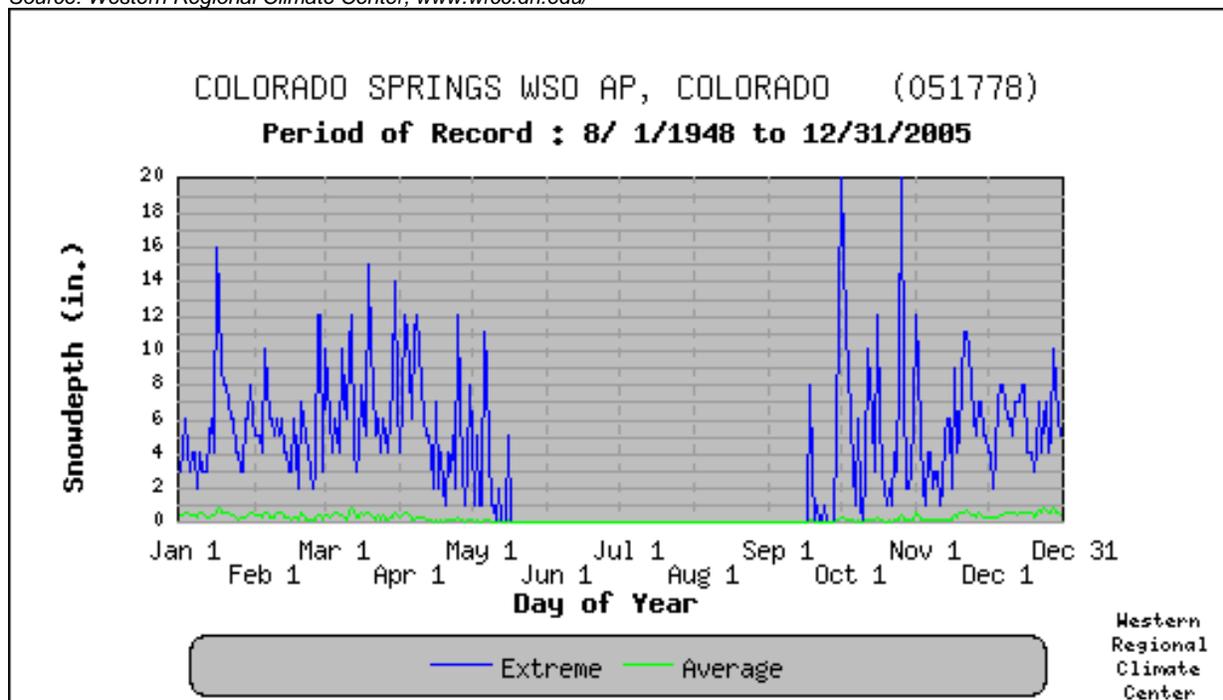


Figure 23-3. Colorado Springs Airport Station Snow Depth Average and Extreme

TABLE 23-3. EL PASO COUNTY SNOWFALL AND SNOW DEPTH SUMMARIES, COLORADO SPRINGS AIRPORT STATION	
Period of record	1948 to 2006
Average Annual Snowfall	40.7 inches
Snowiest Month/Average Snowfall	March/8.7 inches
Highest Monthly Snowfall	42.7 inches, April 1957
Highest Seasonal Snowfall	96.4 inches, 1957
Source: Western Regional Climate Center, www.wrcc.dri.edu/	

23.2.2 Location

The entire County is susceptible to severe winter storms.

23.2.3 Frequency

Severe winter storms happen nearly every year in El Paso County and are thus considered highly likely, with nearly 100 percent chance of occurrence in any given year.

23.2.4 Severity

Most snowstorms that occur in the County are of limited severity; however large-scale events can have large economic impacts. In rural parts of El Paso County, homes and ranches may be isolated for days,

and unprotected livestock may be lost. Heavy snow creates deadly conditions for stranded motorists, travelers can experience carbon monoxide poisoning if stranded in a car covered by snow. Based on the information in this hazard profile and the widespread impacts, the severity of severe winter storms is considered critical. Overall significance of the hazard is considered high with widespread potential impact.

23.2.5 Warning Time

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.

23.3 SECONDARY HAZARDS

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.

23.4 CLIMATE CHANGE IMPACTS

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. Nationally, the number of weather-related disasters during the 1990s was four times that of the 1950s, and cost 14 times as much in economic losses. Historical data shows that the probability for severe weather events increases in a warmer climate (see Figure 14-2). The changing hydrograph caused by climate change could have a significant impact on the intensity, duration and frequency of storm events. All of these impacts could have significant economic consequences.

23.5 EXPOSURE

23.5.1 Population

It can be assumed that the entire planning area is exposed to some extent to severe winter weather events. Certain areas are more exposed because of geographic location and local weather patterns.

23.5.2 Property

According to the El Paso County Assessor, there are 234,843 buildings within the planning area. Most of these buildings are residential. It is estimated that 59 percent of the residential structures were built without the influence of a structure building code with provisions for wind loads. All of these buildings are considered to be 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. The frequency and degree of damage will depend on specific locations.

23.5.3 Critical Facilities and Infrastructure

All critical facilities (see Table 6-3) 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.

23.5.4 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.

23.6 VULNERABILITY

23.6.1 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 winter weather events and could suffer more secondary effects of the hazard.

23.6.2 Property

All property is vulnerable during severe winter weather events, but properties in poor condition or in particularly vulnerable locations may risk the most damage. Those that are located under or near overhead lines or near large trees may be vulnerable to falling ice or may be damaged in the event of a collapse.

Loss estimations for the severe winter weather 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, and 50 percent of the assessed value of exposed structures. This allows emergency managers to select a range of potential economic impact based on an estimate of the percent of damage to the general building stock. Damage in excess of 50 percent is considered to be substantial by most building codes and typically requires total reconstruction of the structure. Table 23-4 lists the loss estimates.

	Exposed Value	Estimated Loss Potential from Severe Winter Weather		
		10% Damage	30% Damage	50% Damage
Calhan	\$197,690,642	\$19,769,064	\$59,307,193	\$98,845,321
Fountain	\$86,846,494,924	\$8,684,649,492	\$26,053,948,477	\$43,423,247,462
Green Mt. Falls	\$3,082,347,521	\$308,234,752	\$924,704,256	\$1,541,173,760
Manitou Springs	\$167,664,615	\$16,766,462	\$50,299,385	\$83,832,308
Monument	\$1,086,073,858	\$108,607,386	\$325,822,157	\$543,036,929
Palmer Lake	\$1,534,339,852	\$456,099,791	\$136,829,937	\$228,049,896
Ramah	\$22,491,593	\$22,491,593	\$6,747,478	\$11,245,796
Unincorporated	\$23,761,150,586	\$23,761,150,586	\$7,128,345,176	\$11,880,575,293
Total	\$117,154,353,382	\$11,715,435,338	\$35,146,306,015	\$58,577,176,691

23.6.3 Critical Facilities and Infrastructure

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 of 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.

23.6.4 Environment

The vulnerability of the environment to winter storms is the same as the exposure.

23.7 FUTURE TRENDS IN DEVELOPMENT

All future development 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 construction. The planning partners have adopted the International Building Code. This code is equipped to deal with the impacts of severe weather events. Land use policies identified in general plans within the planning area also address many of the secondary impacts (flood and landslide) of the severe weather hazard. With these tools, the planning partnership is well equipped to deal with future growth and the associated impacts of severe weather.

23.8 SCENARIO

Although severe local storms are infrequent, impacts can be significant, particularly when secondary hazards of flood and landslide occur. A worst-case event would involve prolonged high winds during a winter storm. Such an event would have both short-term and longer-term effects. Initially, schools and roads would be closed because of power outages caused by high winds and downed tree obstructions. In more rural areas, some subdivisions could experience limited ingress and egress. Prolonged precipitation could produce flooding, overtopped culverts with ponded water on roads, and landslides on steep slopes. Flooding and landslides could further obstruct roads and bridges, further isolating residents.

23.9 ISSUES

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.

CHAPTER 24. AIRCRAFT ACCIDENTS

AIRCRAFT ACCIDENTS RANKING						
El Paso County	Calhan/Ramah	Fountain	Green Mountain Falls	Manitou Springs	Monument	Palmer Lake
Medium	Low	Medium	Low	Medium	Low	Low

24.1 GENERAL BACKGROUND

Periodic plane crashes are an unfortunate fact of life 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 a number of 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 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 sub-division. Since that time, the area over which aircraft make their final approach and initial take off is becoming more and more highly populated, especially to the north of the airport. Any aircraft taking off to the north or landing from the north has the potential to cause serious harm and mass casualties on the ground. Although the south side of the airport contains fewer residents, this area is also being rapidly developed over the next 5-10 years.

DEFINITIONS

Aircraft Accident—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.

Aircraft Incident—An occurrence other than an accident with the operation of an aircraft, which affects or could affect the safety of operations

Accident Potential Zones—Rectangular zones extending outward from the ends of active runways that delineate those areas recognized as having the greatest risk of aircraft mishaps.

Part 77 Surfaces—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 accident. The largest zone surrounds the runways shared by the Colorado Springs Municipal Airport and Peterson Air Force Base, both of which support large instrument-guided airliners, cargo planes, and military jets.

24.2 HAZARD PROFILE

24.2.1 Past Events

Based on historical numbers, the greatest danger for aviation in El Paso County is from small airplanes including those that are privately owned, as well as those that are contracted by the US Air Force Academy and Peterson Air Force Base as part of their Aero Clubs. Weather patterns in the Front Range can change rapidly and in many cases can exceed the competency of many pilots. According to the Federal Aviation Administration database there have been 335 reported accidents/incidents, of which 41 were fatal, within El Paso County. Table 24-1 shows a summary of accidents/incidents since 1990, and Table 24-2 shows all reported fatality accidents/incidents.

TABLE 24-1. AIRCRAFT ACCIDENTS SINCE 1990				
Event Date	Location	Registration. Number	NTSB No.	Event Severity
3/9/1990	CALHAN, CO	N6025S	DEN90LA073	Nonfatal
3/24/1990	COLORADO SPRINGS, CO	N19948	DEN90LA079	Nonfatal
5/20/1990	PEYTON, CO	N87212	DEN90LA111	Nonfatal
9/24/1990	COLORADO SPRINGS, CO	N3132L	DEN90LA193	Nonfatal
3/3/1991	COLORADO SPRINGS, CO	N999UA	DCA91MA023	Fatal(25)
3/18/1991	COLORADO SPRINGS, CO	N1950Q	DEN91LA052	Nonfatal
7/4/1991	COLORADO SPRINGS, CO	N40DP	DEN91LA096	Nonfatal
7/17/1991	COLORADO SPRINGS, CO	N768RA	DEN91LA101	Nonfatal
7/24/1991	FOUNTAIN, CO	N24204	DEN91LA104	Nonfatal
8/10/1991	COLORADO SPRINGS, CO	N49BP	DEN91LA112	Nonfatal
8/10/1991	COLORADO SPRINGS, CO	N44641	DEN91FA111	Nonfatal
9/2/1991	CALHAN, CO	N939PC	DEN91DTE02	Fatal(1)
10/30/1991	COLORADO SPRINGS, CO	N1808U	DEN92IA007	Incident
10/30/1991	ELLCOTT, CO	N6815P	DEN92LA006	Nonfatal
1/4/1992	FALCON, CO	N774WS	DEN92LA023	Nonfatal
5/18/1992	COLORADO SPRINGS, CO	N146AC	DEN92LA053	Nonfatal
6/19/1992	FALCON, CO	N9151K	DEN92LA061	Nonfatal
10/18/1992	COLORADO SPRINGS, CO	N1450U	DEN93LA019	Nonfatal
12/27/1992	RAMAH, CO	N3196F	DEN93LA018	Nonfatal
4/16/1993	FALCON, CO	N7536R	DEN93FA042	Fatal(1)
5/14/1993	FOUNTAIN, CO	N29RP	DEN93LA058	Nonfatal
5/15/1993	PEYTON, CO	N555AB	DEN93LA062	Nonfatal
7/24/1993	COLORADO SPRINGS, CO	N9067Y	DEN93LA086	Nonfatal
10/15/1993	COLORADO SPRINGS, CO	N5191F	FTW94LA011	Nonfatal
1/13/1994	COLORADO SPRINGS, CO	N2974W	FTW94LA064	Nonfatal

**TABLE 24-1.
AIRCRAFT ACCIDENTS SINCE 1990**

Event Date	Location	Registration. Number	NTSB No.	Event Severity
1/20/1994	CASCADE, CO	N3211K	FTW94LA071	Nonfatal
1/28/1994	USAF ACADEMY, CO	N7634S	FTW94GA076	Fatal(2)
5/14/1994	PEYTON, CO	N631E	FTW94FA156	Fatal(2)
9/4/1994	FOUNTAIN, CO	N3578D	FTW94FA287	Nonfatal
9/8/1994	CASCADE, CO	N99TV	FTW94FA293	Nonfatal
10/29/1994	COLORADO SPRINGS, CO	N52521	FTW95LA036	Nonfatal
7/3/1995	COLORADO SPRINGS, CO	N55365	FTW95LA274	Nonfatal
7/9/1995	RAMAH, CO	N28TP	FTW95FA278	Fatal(2)
9/1/1995	COLORADO SPRINGS, CO	N4814F	FTW95LA374	Nonfatal
9/2/1995	COLORADO SPRINGS, CO	N90555	FTW95LA376	Nonfatal
4/23/1996	COLORADO SPRINGS, CO	N55126	FTW96LA179	Nonfatal
5/1/1996	PEYTON, CO	N175WW	FTW96LA197	Nonfatal
5/14/1996	CALHAN, CO	N1690B	FTW96LA213	Nonfatal
6/15/1996	MONUMENT, CO	N111BF	FTW96FA250	Fatal(1)
7/14/1996	FALCON, CO	N6708A	FTW96LA304	Nonfatal
9/24/1996	FALCON, CO	N41369	FTW96LA401	Nonfatal
10/4/1996	COLORADO SPRINGS, CO	N25772	FTW97LA005	Nonfatal
12/22/1996	PEYTON, CO	N6680X	FTW97LA071	Nonfatal
4/16/1997	COLORADO SPRINGS, CO	N962WP	FTW97IA160	Incident
6/26/1997	PEYTON, CO	N9417T	FTW97LA239	Nonfatal
8/5/1997	COLORADO SPRINGS, CO	N258W	FTW97FA299	Fatal(2)
12/21/1997	COLORADO SPRINGS, CO	N100BE	FTW98FA074	Fatal(2)
5/2/1998	USAF ACADEMY, CO	N5043N	FTW98LA209	Nonfatal
5/9/1998	FALCON, CO	N194EC	FTW98LA211	Nonfatal
9/12/1998	YODER, CO	N6288L	FTW98FA394	Fatal(2)
2/28/1999	COLORADO SPRINGS, CO	N740GP	DEN99LA044	Nonfatal
7/22/1999	PEYTON, CO	N5696T	DEN99LA125	Nonfatal
8/31/1999	PEYTON, CO	N5172L	DEN99LA156	Nonfatal
12/15/1999	PEYTON, CO	N5190C	DEN00FA028	Nonfatal
2/17/2000	FORT CARSON, CO	N155HC	DEN00IA052	Incident
7/2/2000	PEYTON, CO	N42915	DEN00LA122	Fatal(1)
1/30/2001	COLORADO SPRINGS, CO	N7905N	DEN01LA046	Nonfatal
7/21/2001	CALHAN, CO	N6276W	DEN01LA127	Nonfatal
8/7/2001	FALCON, CO	N3338P	DEN01LA139	Nonfatal

**TABLE 24-1.
AIRCRAFT ACCIDENTS SINCE 1990**

Event Date	Location	Registration. Number	NTSB No.	Event Severity
8/15/2001	PEYTON, CO	N733BW	DEN01LA147	Nonfatal
9/2/2001	COLORADO SPRINGS, CO	N2575P	DEN01LA158	Nonfatal
10/8/2001	COLORADO SPRINGS, CO	N2364E	DEN02LA001	Nonfatal
4/26/2002	USAF ACADEMY, CO	N990CC	DEN02GA039	Fatal(1)
6/30/2002	FALCON, CO	N6968M	DEN02LA062	Nonfatal
7/26/2002	PEYTON, CO	N6887F	DEN02LA082	Nonfatal
3/9/2003	COLORADO SPRINGS, CO	N9313V	DEN03LA047	Nonfatal
4/26/2003	COLORADO SPRINGS, CO	N6884E	DEN03LA073	Nonfatal
4/26/2003	COLORADO SPRINGS, CO	N54202	DEN03LA072	Nonfatal
5/23/2003	COLORADO SPRINGS, CO	N231JM	DEN03LA086	Nonfatal
6/14/2003	COLORADO SPRINGS, CO	N5751K	DEN03LA107	Nonfatal
6/28/2003	ELLICOTT, CO	N80T	DEN03FA113	Fatal(1)
4/17/2004	COLORADO SPRINGS, CO	N17231	DEN04IA063	Incident
5/5/2004	FALCON, CO	N94405	DEN04CA068	Nonfatal
5/26/2004	PEYTON, CO	N4173Y	DEN04LA081	Nonfatal
5/28/2004	CALHAN, CO	N6617	DEN04LA082	Nonfatal
9/4/2004	COLORADO SPRINGS, CO	N47MR	DEN04LA138	Nonfatal
4/7/2005	COLORADO SPRINGS, CO	N198PD	DEN05TA072	Nonfatal
6/9/2005	COLORADO SPRINGS, CO	CGJAZ	DCA05IA072	Incident
6/11/2005	COLORADO SPRINGS, CO	N2FY	DEN05LA088	Nonfatal
6/12/2005	CASCADE, CO	N81EA	DEN05LA089	Nonfatal
8/25/2005	FALCON, CO	N777UH	DEN05LA130	Nonfatal
11/21/2005	CALHAN, CO	N70MT	DEN06FA018	Fatal(1)
12/21/2005	PEYTON, CO	N9318W	DEN06LA024	Nonfatal
6/10/2006	PEYTON, CO	N299TL	DEN06CA084	Nonfatal
6/22/2006	COLORADO SPRINGS, CO	N350SJ	DEN06LA090	Nonfatal
9/13/2006	COLORADO SPRINGS, CO	N71DH	DEN06CA127	Nonfatal
12/7/2006	FALCON, CO	N6487J	DEN07CA035	Nonfatal
12/15/2006	COLORADO SPRINGS, CO	N24202	DEN07IA037	Incident
7/4/2007	PEYTON, CO	N108EM	DEN07CA120	Nonfatal
10/4/2007	CALHAN, CO	N2263E	DEN08CA002	Nonfatal
3/21/2008	PEYTON, CO	N1386V	DFW08CA085	Nonfatal
4/8/2008	COLORADO SPRINGS, CO	N483BA	DEN08FA072	Nonfatal
4/15/2008	FORT CARSON, CO	N602AA	DEN08GA076	Fatal(1)

**TABLE 24-1.
AIRCRAFT ACCIDENTS SINCE 1990**

Event Date	Location	Registration. Number	NTSB No.	Event Severity
7/4/2008	PEYTON, CO	N1264C	DFW08CA181	Nonfatal
7/28/2008	COLORADO SPRINGS, CO	N601RN	DEN08IA130	Incident
11/2/2008	COLORADO SPRINGS, CO	N18338	CEN09CA079	Nonfatal
11/18/2008	COLORADO SPRINGS, CO	N905CC	CEN09CA069	Nonfatal
2/22/2009	FALCON, CO	N9487W	CEN09LA171	Nonfatal
5/4/2009	MEADOW LAKE AIRPORT, CO	N17TD	CEN09LA278	Nonfatal
6/27/2009	USAF ACADEMY, CO	N52298	CEN09CA459	Nonfatal
7/23/2009	COLORADO SPRINGS, CO	N301RT	CEN09CA465	Nonfatal
8/8/2009	COLORADO SPRINGS, CO	N54804	CEN09CA505	Nonfatal
5/17/2010	PEYTON, CO	N512SR	CEN10LA255	Nonfatal
8/23/2010	CALHAN, CO	N896H	CEN10FA493	Fatal(2)
9/4/2010	COLORADO SPRINGS, CO	N16LH	CEN10CA540	Nonfatal
12/8/2010	COLORADO SPRINGS, CO	N326AF	CEN11IA114	Incident
12/22/2010	COLORADO SPRINGS, CO	N79869	CEN11FA124	Fatal(2)
4/3/2011	COLORADO SPRINGS, CO	N3484E	CEN11CA261	Nonfatal
4/13/2011	PEYTON, CO	N107WC	CEN11CA284	Nonfatal
5/20/2011	COLORADO SPRINGS, CO	N566RL	CEN11CA360	Nonfatal
5/22/2011	COLORADO SPRINGS, CO	N457CF	CEN11LA361	Nonfatal
7/13/2011	PEYTON, CO	N61262	CEN11LA490	Nonfatal
7/26/2011	COLORADO SPRINGS, CO	N1277K	CEN11CA519	Nonfatal
8/5/2011	COLORADO SPRINGS, CO	N675RE	CEN11CA550	Nonfatal
8/6/2011	FALCON, CO	N2515E	CEN11FA572	Nonfatal
2/4/2012	COLORADO SPRINGS, CO	N2696C	CEN12CA157	Nonfatal
3/24/2012	CALHAN, CO	N605RV	CEN12CA206	Nonfatal
3/24/2012	COLORADO SPRINGS, CO	N97LP	CEN12CA200	Nonfatal
7/19/2012	COLORADO SPRINGS, CO	N311TM	CEN12LA420	Nonfatal
8/1/2012	PEYTON, CO	N7808Z	CEN12LA522	Nonfatal
8/2/2012	COLORADO SPRINGS, CO	N5316Q	CEN12CA511	Nonfatal
10/5/2012	COLORADO SPRINGS, CO	N6661P	CEN13CA005	Nonfatal
4/21/2013	COLORADO SPRINGS, CO	N538MA	CEN13CA236	Nonfatal
6/9/2013	PEYTON, CO	N1854P	CEN13CA334	Nonfatal
9/4/2013	COLORADO SPRINGS, CO	N211AS	CEN13LA539	Nonfatal
1/29/2014	FORT CARSON, CO	N959DA	CEN14TA126	Nonfatal
4/19/2014	SECURITY, CO	N15095	CEN14CA215	Nonfatal

**TABLE 24-1.
AIRCRAFT ACCIDENTS SINCE 1990**

Event Date	Location	Registration Number	NTSB No.	Event Severity
4/21/2014	PEYTON, CO	N481HY	CEN14LA221	Nonfatal

**TABLE 24-2.
PAST AIRCRAFT ACCIDENTS WITH FATALITIES**

Event Date	Location	Registration Number	NTSB No.	Fatalities
8/25/1966	COLORADO SPRINGS, CO	N6506D	DEN67A0018	1
11/7/1968	COLORADO SPRINGS, CO	N699K	DEN69A0022	1
4/18/1969	COLORADO SPRINGS, CO	N9697M	DEN69A0043	2
8/13/1969	COLORADO SPRINGS, CO	N2349J	DEN70A0011	3
3/26/1970	COLORADO SPRINGS, CO	N6259U	DEN70AD051	1
5/17/1970	COLORADO SPRINGS, CO	N7549F	DEN70AD055	1
5/10/1971	MONUMENT, CO	N1933Y	DEN71AD041	4
6/10/1971	COLORADO SPRINGS, CO	N5332W	DEN71AD047	3
8/22/1971	COLORADO SPRINGS, CO	N9862E	DEN72AD007	2
7/15/1972	MONUMENT, CO	N8269M	DEN73AD002	1
1/21/1973	PEYTON, CO	N6647P	DEN73AD032	4
7/12/1975	MONUMENT, CO	N19449	DEN76AD002	2
5/30/1977	COLORADO SPRINGS, CO	N7457F	DEN78FA017	1
2/25/1978	YODER, CO	N5205U	DEN78FA026	5
5/30/1980	COLORADO SPRINGS, CO	N8144	DEN80FTE46	2
5/13/1981	RAMAH, CO	N11710	DEN81FTE44	1
11/12/1982	FOUNTAIN, CO	N3641T	DEN83AA019	2
5/20/1984	PEYTON, CO	NONE	DEN84FU005	1
6/9/1984	CASCADE, CO	N2676Q	DEN84FA172	2
3/28/1985	CALHAN, CO	N772CB	DEN85FA103	1
8/31/1985	PEYTON, CO	N14331	DEN85FA229	2
4/18/1987	ELLICOTT, CO	N64415	DEN87FA103	1
4/3/1988	COLORADO SPRINGS, CO	N5WW	DEN88FA090	4
11/24/1989	COLORADO CITY, CO	N18FL	DEN90DTE01	1
3/3/1991	COLORADO SPRINGS, CO	N999UA	DCA91MA023	25
9/2/1991	CALHAN, CO	N939PC	DEN91DTE02	1
4/16/1993	FALCON, CO	N7536R	DEN93FA042	1

**TABLE 24-2.
PAST AIRCRAFT ACCIDENTS WITH FATALITIES**

Event Date	Location	Registration Number	NTSB No.	Fatalities
1/28/1994	USAF ACADEMY, CO	N7634S	FTW94GA076	2
5/14/1994	PEYTON, CO	N631E	FTW94FA156	2
7/9/1995	RAMAH, CO	N28TP	FTW95FA278	2
6/15/1996	MONUMENT, CO	N111BF	FTW96FA250	1
8/5/1997	COLORADO SPRINGS, CO	N258W	FTW97FA299	2
12/21/1997	COLORADO SPRINGS, CO	N100BE	FTW98FA074	2
9/12/1998	YODER, CO	N6288L	FTW98FA394	2
7/2/2000	PEYTON, CO	N42915	DEN00LA122	1
4/26/2002	USAF ACADEMY, CO	N990CC	DEN02GA039	1
6/28/2003	ELLCOTT, CO	N80T	DEN03FA113	1
11/21/2005	CALHAN, CO	N70MT	DEN06FA018	1
4/15/2008	FORT CARSON, CO	N602AA	DEN08GA076	1
8/23/2010	CALHAN, CO	N896H	CEN10FA493	1
12/22/2010	COLORADO SPRINGS, CO	N79869	CEN11FA124	1

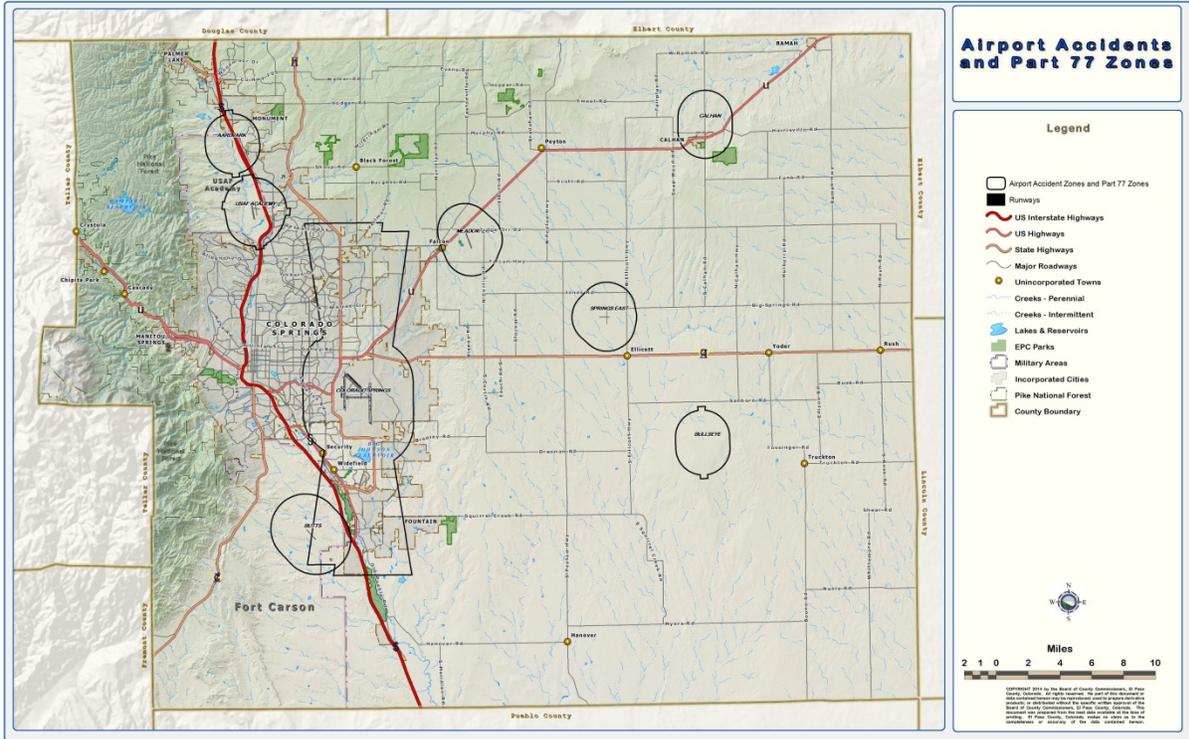
24.2.2 Location

El Paso County contains eight airports or small air fields:

- **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 the 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.
- **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. Airport locations within El Paso County and the corresponding Part 77 surface areas are depicted in Figure 24-1.

Airport Accidents and Part 77 Zones



Pre-Disaster Mitigation Plan

Figure 24-1. Airport Accidents and Part 77 Zones

24.2.3 Frequency

In the past decade (2004-2013), there have been 52 reported incidents within El Paso County. This is slightly more than five per year; therefore, the probability of the typical light airplane crash is highly likely to happen every year. Aircraft accidents have and will continue to be a danger to residents in the County. The great danger would be a commercial aircraft crash in a highly populated area. Considering the increasing number of flights into and out of the Colorado Springs Municipal Airport, the probability of an aircraft crashing either accidentally or intentionally is continually increasing. The impact of a crash is increasing as well due to number of residents and businesses being built in the departure and approach path for flights.

24.2.4 Severity

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. Table 24-3 shows fatal and nonfatal aircraft accidents within the participating jurisdictions. It should be noted that any aircraft accident that occurred within the boundaries of Colorado Springs was included with the unincorporated county numbers.

**TABLE 24-3.
SEVERITY OF AIRCRAFT ACCIDENTS**

	El Paso	Calhan/Ramah	Fountain	Green Mountain Falls	Manitou Springs	Monument	Palmer Lake
Fatal (total fatalities)	41(97)	4(5)/2(3)	1(2)	0	0	4(8)	0
Non-fatal	294	9/1	14	0	1	1	0
Total	335	17/3	15	0	1	5	0

Typical aircraft accident

The number of fatalities associated with light airplane crashes is low, compared to the 200 deaths from automobile crashes in the County between 2006 and 2010. Thus, from the perspective of community risk, the severity of the County’s “typical” airplane crash is limited to 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. Of the 52 aircraft accidents from 2004-2013, only four were fatal, accounting for six deaths.



Figure 24-2. Private Aircraft Crash December 2006, Non-fatal

Significant aircraft accident

The County has experienced one severe commercial aviation accident. On March 3, 1991, United Airlines Flight 585 crashed into Widefield, an unincorporated area, while making its final approach to the Colorado Springs Municipal Airport. The Boeing 737 went down four miles short of the runway, killing all 25 people on board. The loss of life was limited to those on the aircraft because the plane came down in Widefield Park, missing a nearby apartment complex and subdivision. With an expanding community

and the associated increase of aircraft activity, the corresponding potential for a significant incident cannot be overlooked, while keeping in mind that commercial carrier accidents are infrequent.



Figure 24-3. United Flight 585 Crash, March 1991, 25 Fatalities

Military aircraft accident

One incident that occurred in the nearby area and received nationwide attention happened in April, 1997 when an A10 Warthog, flown by Captain Craig Button and carrying four 500-pound bombs, veered off course from a training mission in Arizona and was tracked by radar and visual sightings to the vicinity of New York Mountain. Events such as these are spectacular and command headlines for a time, but are rare in the planning area. The impact of a military accident varies depending on the type of incident but in most cases the impact is moderate to low. Even though the Fort Carson workforce is expected to be increased by over 20,000, including an Aviation Brigade, the risk from the additional activity will not likely see a significant increase in aircraft accidents.

24.2.5 Warning Time

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 some warning, it is possible to significantly change the outcome in most occasions by diverting flight paths to less populated areas or staging rescue equipment.

24.3 SECONDARY HAZARDS

The most significant secondary hazards associated with aircraft accidents are structure fire, wildfire, and hazardous materials releases.

24.4 EXPOSURE

24.4.1 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 the vast majority of incident occurrences near active airport facilities. According to the 2010 census data there are 245,775 people living within the Accident Potential Zones and the Part 77 Areas (Table 24-4 and Figure 24-4).

TABLE 24-4. POPULATION EXPOSED TO POTENTIAL AIRCRAFT ACCIDENTS								
	Aardvark	BullsEye	Butts	Calhan	Colorado Springs	Meadowlark	Spgs East	USAFA
2000	3,464	0	66	808	167,803	1,872	417	4,600
2010	7,400	0	68	808	228,039	6,183	485	2,772
2017 (est)	7,749	0	75	814	256,861	7,802	490	3,133

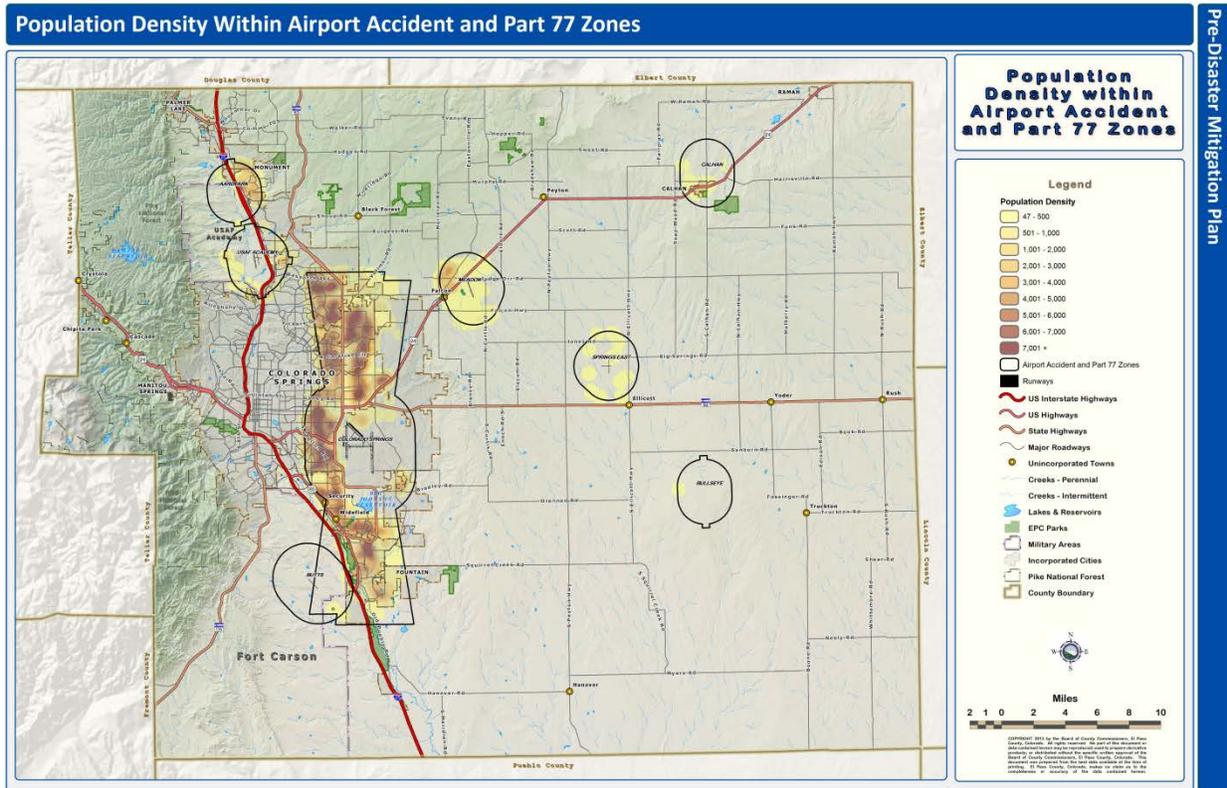


Figure 24-4. Population Density Within Airport Accident and Part 77 Zones

24.4.2 Property

According to the El Paso County Assessor, there are 85,652 buildings within the census tracts that define the planning area. Most of these buildings are residential (81,691); however, commercial properties account for more than \$4 billion (Table 24-5).

**TABLE 24-5.
PROPERTY EXPOSED TO POTENTIAL AIRCRAFT ACCIDENTS**

	Total Residential Improvement Value	Total Residential Improvement Count	Total Commercial Improvement Value	Total Commercial Improvement Count	Total Mobile Home Value	Total Mobile Home Count
Aardvark	\$615,500,024	2,631	\$666,876,065	145	\$0	0
BullsEye	\$76,341	1	\$3,364	2	\$478	1
Butts	\$3,516,842	23	\$29,377,371	35	\$1,543,336	132
Calhan	\$28,930,613	417	\$17,302,828	274	\$997,571	82
Colorado Springs	\$10,835,220,295	75,528	\$1,679,521,164	3,042	\$49,250,928	2,971
Meadowlark	\$358,859,254	2,798	\$27,351,851	336	\$689,544	47
Spgs East	\$14,882,376	293	\$1,260,766	127	\$663,070	55
USAFA	\$231,766,359	746	\$1,726,048,829	208	\$15,884	1

24.4.3 Critical Facilities and Infrastructure

The most likely critical facilities (see Table 6-3) 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.

24.4.4 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.

24.5 VULNERABILITY

24.5.1 Population

Table 24-4 depicts the population residing within the Accident Potential Zones and the Part 77 Areas. Risk for direct impact of an aircraft accident increases within these zones due to the increased aircraft operations. The second group of persons at risk is the operators and passengers. While pinpointing a location of an accident is difficult, those onboard at the time of the incident are the only persons guaranteed to be directly impacted.

24.5.2 Property

Due to the relatively contained nature of a typical aircraft accident in El Paso County, significant property damage or loss is not likely. There are some major aerospace facilities located on, or in close proximity to the Colorado Springs Municipal Airport that could incur significant economic loss.

24.6 FUTURE TRENDS IN DEVELOPMENT

As shown in Table 24-4, it is expected that the population residing within the Accident Potential Zones and the Part 77 Areas will continue to grow due to development within these areas, especially in the areas

surrounding the Colorado Springs Municipal Airport and lands adjacent to the U.S. Air Force Academy. Land use and development will continue to be scrutinized within the building permit process.

24.7 SCENARIO

A commercial passenger carrier could experience mechanical failure during takeoff to the north of the Colorado Springs Municipal Airport. This aircraft could be unable to maintain flight and crash into a heavily populated area. There would be the potential for several hundred casualties, including a significant number of fatalities from both the aircraft, as well as individuals in the immediate area. Many other residents could be displaced by immediate impact of fire and response efforts, and the need for local evacuations due to hazardous materials release.

24.8 ISSUES

Important issues associated with an aircraft accident in the planning area include the following:

- It is difficult to predict the next accident location.
- Only three of the eight airports have staffed crash rescue.
- Small aircraft operating under Visual Flight Rules will continue to increase.
- Military flights in the planning area will increase.
- Populations within the Accident Potential Zones and the Part 77 Areas will continue to grow.

CHAPTER 25. EXTREME ACTS OF VIOLENCE

EXTREME ACTS OF VIOLENCE RANKING						
El Paso County	Calhan/Ramah	Fountain	Green Mountain Falls	Manitou Springs	Monument	Palmer Lake
Low	Medium	Medium	Low	Medium	Low	Low

25.1 GENERAL BACKGROUND

The 2008 Pre-Disaster Mitigation Plan included “Extreme Acts of Violence in Schools” as one of the hazards to consider. In this update of the plan, the Steering Committee agreed that this hazard definition should be changed to “Acts of Extreme Violence,” to include incidents outside the school setting. However, expanding the scope of the hazard has not made it any easier to define.

The FBI defines mass murder as “Four or more murders occurring during the same incident, with no distinctive time period between the murders. These events typically involve a single location, where the killer murdered a number of victims in an ongoing incident

Because casualty figures don’t tell the whole story, some researchers have crafted definitions that consider the intent of the perpetrator to kill as many people as possible, and to exclude other motivations. Dr. J. Pete Blair defines an active shooter event as “one or more persons engaged in killing or attempting to kill multiple people in an area (or areas) occupied by multiple unrelated individuals. At least one of the victims must be unrelated to the shooter. The primary motive appears to be mass murder; that is the shooting is not a by-product of an attempt to commit another crime. However, even this definition may miss the mark, as it identifies the criminal as a “shooter,” and assumes the weapon is a firearm.

Because this category of crime is still not clearly defined by subject matter experts, this plan will not attempt to create a definition. As the Steering Committee comments below make clear, each community has its own interpretation of what extreme violence means. Thus, each community will use a different set of assumptions to consider what goals might be appropriate to mitigate this hazard.

DEFINITIONS

Domestic Terrorism—Appear intended (i) to intimidate or coerce a civilian population; (ii) to influence the policy of a government by intimidation or coercion; or (iii) to affect the conduct of a government by mass destruction, assassination, or kidnapping; and occur primarily within the territorial jurisdiction of the U.S.

International Terrorism—Occur primarily outside the territorial jurisdiction of the U.S., or transcend national boundaries in terms of the means by which they are accomplished, the persons they appear intended to intimidate or coerce, or the locale in which their perpetrators operate or seek asylum .

Active Shooter—an individual actively engaged in killing or attempting to kill people in a confined and populated area.

Mass Killing—a single incident in which a perpetrator kills four or more people, not including himself or herself.

25.2 HAZARD PROFILE

25.2.1 Past Events

Based on the previously stated definition, the 2012 Aurora theatre shooting (12 deaths, 70 injuries), and the 1999 Columbine massacre (12 deaths, 24 injuries), both outside of El Paso County, were classic mass murders; however, the 2007 shooting at New Life Church (two deaths, two injuries) would not be considered a mass murder. The heavily armed shooter was killed by a church security officer shortly after entering the main building; it was reasonable to assume that he had intended to commit mass murder.

El Paso County has only experienced one incident that can be defined as an extreme act of violence (active shooter): the 2007 shooting at New Life Church. Nevertheless, unlike natural disasters, the pattern of previous occurrences (or lack) of a human-caused hazard is not a reliable way to predict possible future occurrences. Although El Paso County has only seen one incident of this type, there have been several incidents throughout Colorado. Some of these are shown below:



New Life Church (2007)



United 629 (1955)



Aurora Theater Shooting (2012)



Columbine High School (1999)

Figure 25-1. Past Events of Extreme Violence in Colorado

As the most likely threat of an extreme act of violence remains an active shooter related incident within El Paso County, this type of incident will be the focus of the rest of this chapter.

25.2.2 Location

Between 2000 and 2013, business locations were the most frequently attacked in active shooter events in the U.S. (45%), followed by educational facilities (24%), and governmental facilities (10%). The remaining 21% occurred at churches, military bases, or other locations including homes and open spaces.

A Study of 160 Active Shooter Incidents in the United States Between 2000 - 2013:
Location Categories

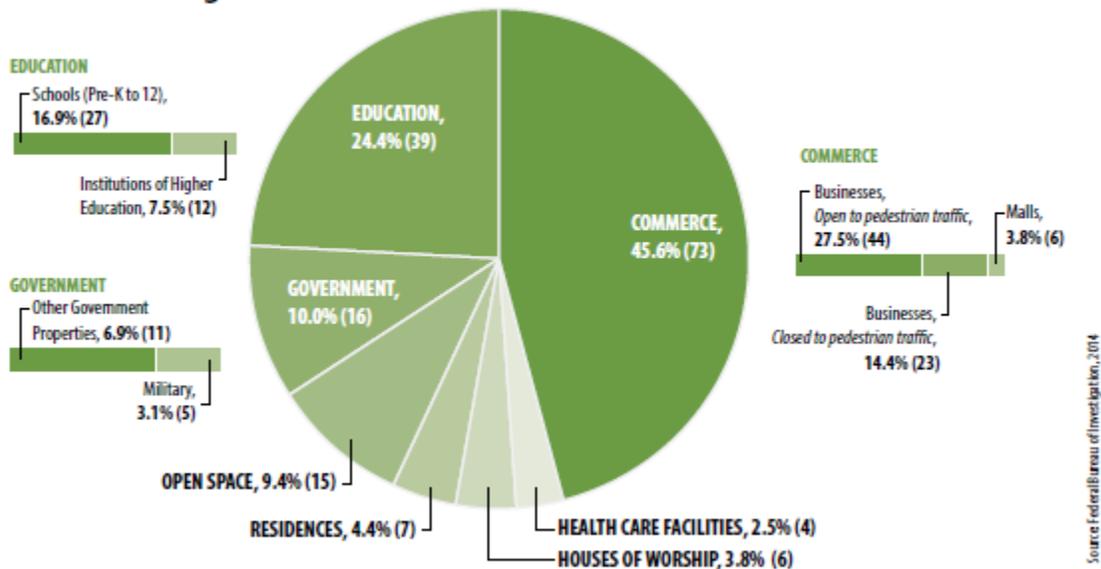


Figure 25-2. Location Categories for Active Shooter Incidents in the U.S.

25.2.3 Frequency

The general trend of active shooter events has continued to climb over the past decade. Over the past three years, this number has fallen due to higher awareness across the general public and law enforcement efforts (Figure 25-3). This is in contrast to the increase in severity in several of the incidents that have that has kept numbers of casualties relatively unchanged (Figure 25-4 and Figure 25-5).

**A Study of 160 Active Shooter Incidents in the United States Between 2000 - 2013:
Incidents Annually**

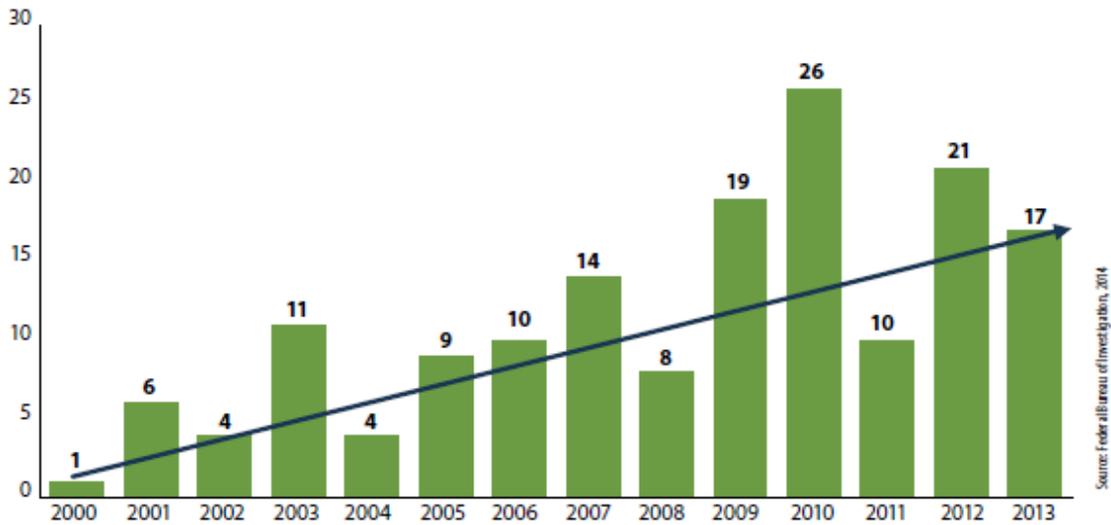


Figure 25-3. Number of Active Shooter Incidents in the U.S. Between 2000 and 2013

**A Study of 160 Active Shooter Incidents in the United States Between 2000 - 2013:
Annual Totals of 1,043 Casualties**

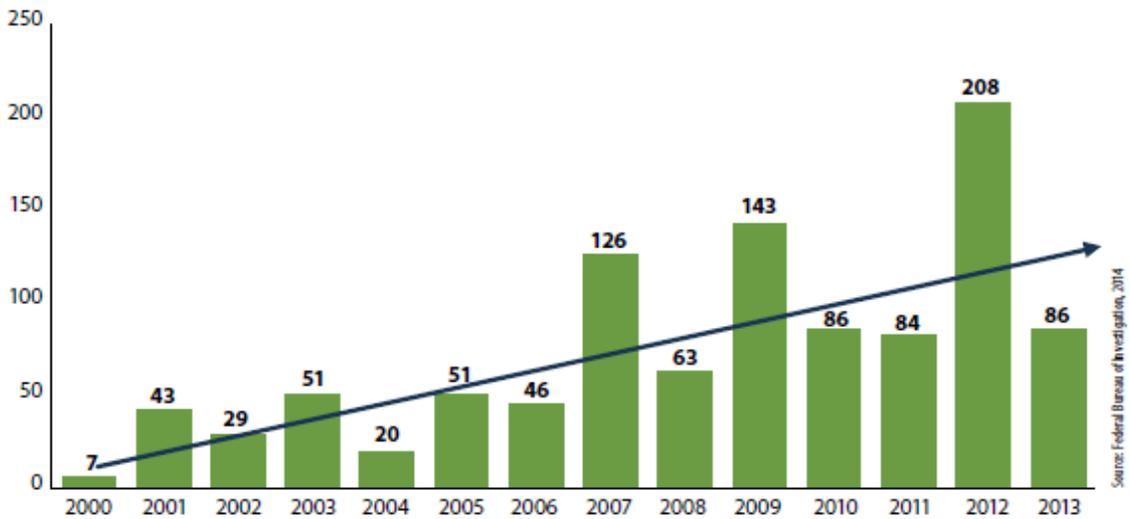


Figure 25-4. Annual Casualties of Active Shooter Incidents

**A Study of 160 Active Shooter Incidents in the United States Between 2000 - 2013:
Broken Down by Casualty Type; Killed or Wounded**

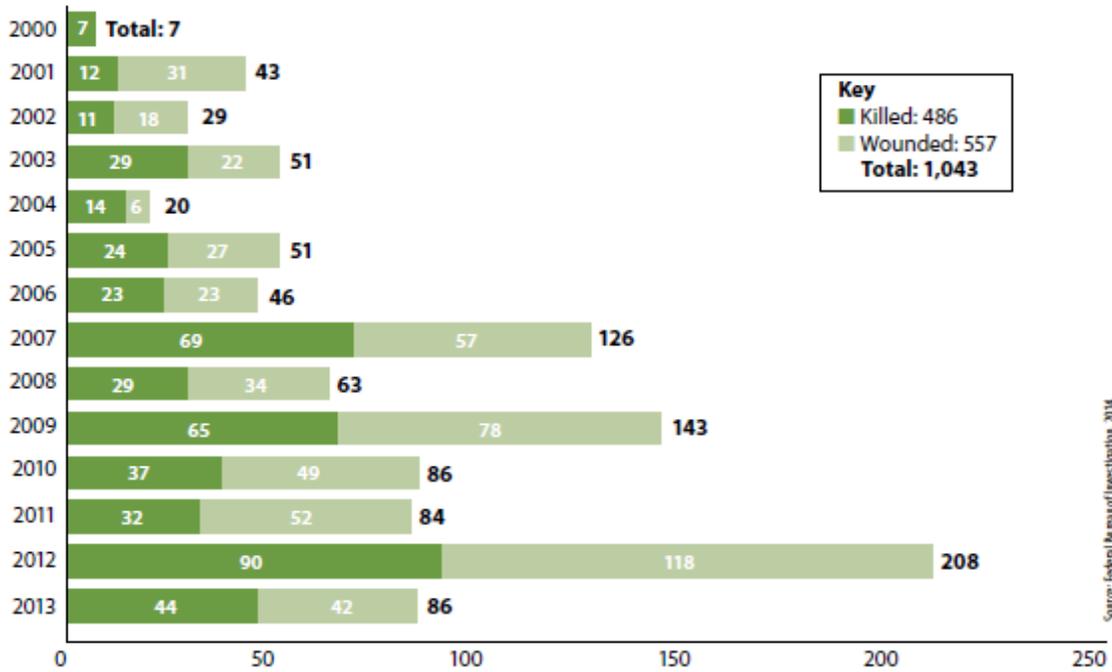


Figure 25-5. Casualty Type, Active Shooter Incidents

25.2.4 Severity

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.

25.2.5 Warning Time

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 situations in which mitigation actions can be executed.

25.3 SECONDARY HAZARDS

The most significant secondary hazards associated with acts of extreme violence are injuries obtained in an attempt to flee, structure fires, and hazardous materials releases.

25.4 EXPOSURE

25.4.1 Population

Figure 25-6 depicts some of the highly populated areas and significant community locations that could provide a target for an incident to occur. This is in no way an indication that an incident could take place anywhere within the planning area. While identifying locations for a potential incident is difficult, it provides a planning mechanism for some of the historically targeted locations nationally.

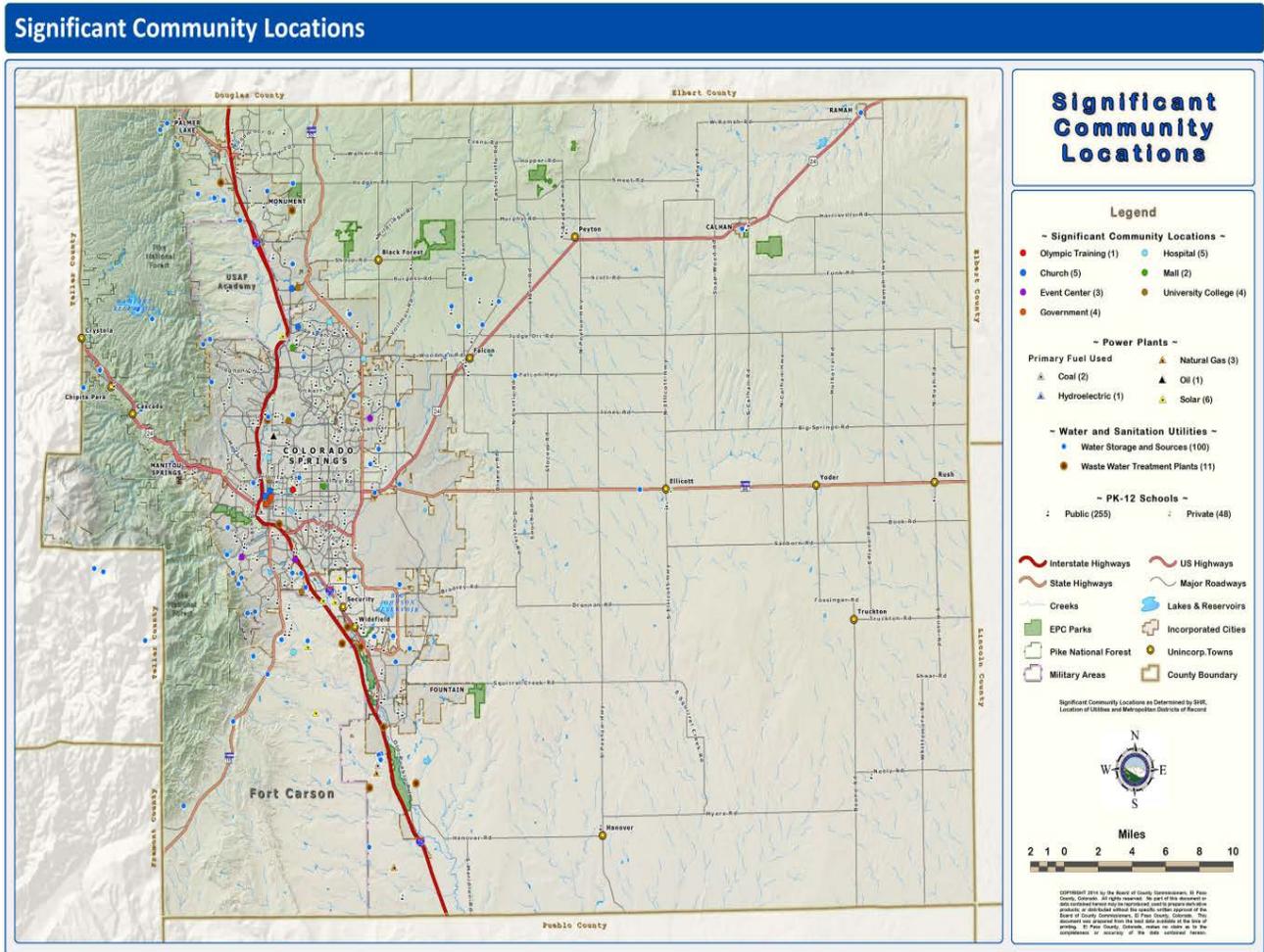


Figure 25-6. Significant Community Locations

25.4.2 Property

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.

25.4.3 Critical Facilities and Infrastructure

Attacks directed at utility facilities and infrastructure may cause disruption in services, or lead to potential cascading events that may impact a much larger proportionate population than actual damage.

25.4.4 Environment

Acts of extreme violence tend to have minimal impact on the environment with the exception of a potential hazardous materials release.

25.5 VULNERABILITY

The immediate community impact of extreme violence takes many forms, aside from the immediate injuries and loss of lives.

- 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

Vulnerable populations are at greater risk in any situation in which safety depends on prompt action and rapid movement. Conversely, persons who belong to vulnerable populations have not been disproportionately targeted by extreme violence.

25.5.1 Population

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. Historical statistics show that there is far less than a 0.1% chance of being involved in an active shooter incident.

25.5.2 Property

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.

25.5.3 Critical Facilities and Infrastructure

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.

25.6 FUTURE TRENDS IN DEVELOPMENT

Future trends in development will not have a significant impact on this hazard other than population density increases.

25.7 SCENARIO

A potential act of extreme violence may include a disgruntled individual who brings a firearm to a population dense location (school, theater, mall, church...) in a rural area with the intent of killing as many people as possible. Due to the lower volume of law enforcement in rural areas of the county, response will be limited in the first minutes of an attack. Large amounts of casualties could be possible, requiring significant mutual aid resources to respond. The time required to transport casualties to trauma centers will be longer.

25.8 ISSUES

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

CHAPTER 26. HAZARDOUS MATERIALS

HAZARDOUS MATERIALS RANKING						
El Paso County	Calhan/Ramah	Fountain	Green Mountain Falls	Manitou Springs	Monument	Palmer Lake
High	Medium	High	Medium	High	Medium	Medium

26.1 GENERAL BACKGROUND

Incidents involving hazardous materials (HAZMAT) 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) list of Extremely Hazardous Substance List. 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. 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 Designated Emergency Response Authority (DERA). The reporting method is via the Tier II report established by EPA; 3) makes the Tier II reports available to the public upon request; and 4) the local government (DERA) must establish a method of emergency notification should a life threatening HAZMAT spill occur.

There are three recognized sources for HAZMAT incidents within the jurisdiction: delivery lines, fixed facilities storage and use locations, and identified transportation routes.

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

DEFINITIONS

Hazardous Materials— FEMA defines Hazardous Materials as chemical substances that, if released or misused, can pose a threat to the environment or health.

Tier II Report— Known officially as Emergency and Hazardous Chemical Inventory Forms, forms that organizations and businesses in the United States with hazardous chemicals above certain quantities, are required to fill out by the EPA.

Local Emergency Planning Committee— Committee that meets quarterly and consists of government, first responders, and local businesses that respond to or maintain Hazardous Materials

Impact Location—Identified roadways, railways, waterways, delivery lines, and Tier II facilities within the planning area.

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.

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 Local Emergency Planning Committee and maintain detection and suppression systems to mitigate the increased risks. County HAZMAT Specialists also inspect facilities containing hazardous materials and review processes to ensure code compliance.

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 through 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 HAZMAT Team and/or other regional resources. Data for transporting hazardous materials via aircraft is not available; however, given that there have been no incidents involving this mode of transport releasing hazardous materials within the jurisdiction, it represents the least frequent mechanism for a HAZMAT related incident.

26.2 HAZARD PROFILE

26.2.1 Past Events

20 April, 2011:

The incident occurred during the early morning hours. A freight train traveling north near the Monument area was notified by a south bound train that one of its cars was possibly leaking. The north bound train stopped to investigate and confirmed a small leak from a hydrochloric acid car. Responders were notified by the train company. Responders from BNSF, Tri Lakes Monument and El Paso County Hazmat responded to the scene. The leaking car was located on the main line adjacent to a subdivision. Due to concerns over a product release as the result of a catastrophic failure of the tank car and predicted weather, the decision was made to order an evacuation of the subdivision adjacent to the rail line and all rail traffic was stopped on that segment of the rail line. The rail company acquired a replacement tank car and flew in a team of specialists and equipment to offload the contents of the damaged car into an empty car. The evacuation was lifted and rail traffic resumed after a majority of the product was off loaded. El Paso County HAZMAT personnel and Fort Carson HAZMAT personnel remained on scene to support the team off loading the contents of the car. The contamination was confined to the railroad right of way and the rail car was removed by BNSF.

06 April, 2010:

The incident occurred during the late morning hours. The driver stated he swerved to avoid another vehicle on the roadway and lost control. The truck went off the west side of the roadway and rolled coming to rest in the ditch on the west side of the southbound lanes. The trailer of the vehicle was a multi compartmented MC406/DOT306 tanker hauling gasoline. During the rollover the front compartment of the trailer was compromised spilling a portion of the gasoline in that compartment. The remaining fuel was removed from the trailer and the vehicle was up righted and removed. HAZMAT teams from El Paso County and Colorado State Patrol performed the fuel transfer with support from Tri-Lakes Monument Fire Protection District. The interstate was closed for several hours due to safety concerns and to accommodate incident operations.

There are numerous incidents each year of smaller scale Hazardous materials cleanup operations. These range from vehicle fuel spills, to leaking containers, to support of law enforcement agencies. Although small in scale, the complexity of crime scene preservation or location of incidents can make these responses just as challenging.



Rail tanker car leak (2011)



Tanker overturn on I25 (2010)

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 the 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 maps the line diameters, as well as the types of commodities that flow through specific lines. Major transmission lines are depicted in Figure 26-2.

Fixed Facility

El Paso County uses a variety of methods to determine facilities that store, use and handle hazardous materials. These include the use of: incident history, institutional knowledge, plan review, on-going business contacts, and hazardous materials reporting databases.

For the purposes of this risk assessment, the El Paso County Hazardous Materials SARA Title III database was queried to determine all facilities that have reported hazardous materials (TIER II). There are approximately 180 businesses that contain hazardous materials of varying quantities and dangers. In order to determine the facilities with the highest risks, those with extremely hazardous substances were extracted; as well as those that have had significant past incidents, have hazardous materials in locations that may not be obvious to emergency responders, or process the materials in a manner that would pose a greater threat (see Figure 26-2).

Transportation Routes

Aircraft:

Aircraft transit the jurisdiction frequently with the majority of commercial traffic existing within 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 on within the airport grounds and are generally focused on fuel spills. There was no data available for analysis indicating the number, types, and quantities of hazardous materials transported by aircraft into and out of the airport that would indicate a definitive risk determination was made to the community.

Rail:

Freight rail line runs north and south throughout the jurisdiction in proximity to the I-25 corridor. In 2010, BNSF and Union Pacific Railroads reported that 19,566 cars containing a hazardous material were transported through El Paso County. The majority fell into three HAZMAT code classifications: Class 9 (Miscellaneous), Class 3 (Flammable Liquids), and Class 2.1 (Flammable Gases). The major rail routes and significant spurs are depicted in Figure 26-2.

Over-the-Road:

According to the Colorado Department of Transportation, a commodity flow study that was analyzed in 2009 for I-25, C-470, and 1225 is similar to most of the state's other interstate highways. Therefore, the data provided in Table 26-1 will be considered representative of hazardous materials transiting the jurisdiction. The average commodity flow of hazardous materials transported by over-the-road commercial carriers is approximately 0.03% – 0.05% of total traffic.

TABLE 26-1. AVERAGE DAILY INTERSTATE HAZMAT COMMODITY FLOWS				
HAZMAT Class Code	Highway			Totals
	I-25	C-470	I-225	
Class 1	1.5	2	1.5	5
Class 2	12	14	11	37
Class 3	19	21	18	58
Class 4	1	1	1	3
Class 5	1	1	1	3
Class 6	0	0	0	0
Class 7	0	0	0	0
Class 8	2	3	2	7
Class 9	0	0	0	0
Unknown	0	0	0	0
Average Total Vehicles (07:00-19:00 hours)	89,400	100,000	83,700	273,100
Average Percent Transporting HAZMAT	0.04%	0.04%	0.04%	0.04%
Average Daily Carriers Transporting HAZMAT	35.5	41	33.5	110

26.2.3 Frequency

In 2013, the El Paso County HAZMAT Team was paged on 248 incidents, 15 of which required a response with 313 man hours expended. The following is a summary of those callouts:

- 3-Meth Labs
 - 1-City of Colorado Springs
 - 1-Manitou Springs
 - 1-Monument
- 1- Lab Dump Site
 - Cave of the Winds
- 2-Chemical release/Medical response
 - 1-Falcon
 - 1-Manitou Springs
- 3-Fuel/Fluid Transfers from traffic accidents
 - 1-Cascade
 - 1-Stratmoor Hills
 - 1-Falcon
- 1-Hazmat Investigation
 - 1-SW HWY 115
- 2-Acid Bomb Investigation
 - 1-Monument
 - 1-Palmer Lake
- 3-Pressurized Cylinder Recovery Missions
 - 2- Black Forest-Post Fire
- 1-Cimarron Hills

Delivery Lines

Highly Likely (90-100%)

El Paso County experiences a delivery line rupture or cut several times a year. The overwhelming majority of the leaks are not in major delivery lines and are contained quickly without any major disruption. It is not likely that a major transmission line will rupture; however, as the area continues to grow, additional supply will continue to stress aging infrastructure.

Fixed Facility

Highly Likely (90-100%)

El Paso County experiences a HAZMAT release within or on a fixed facility site every year. These incidents are typically small in nature and require limited response that is focused on cleanup. With the increase of Tier II reporting facilities, the probability that additional incidents will occur also rises. It is also reasonable to assume that with population growth and facility incursion, the typical response may also become more complex in nature requiring additional evacuations.

Transportation**Aircraft:**

Highly Unlikely (0-9%)

El Paso County has not experience a major HAZMAT release related to an aircraft accident. Much of the HAZMAT related to this type of incident is a result of a limited quantity of aviation fuel spilled and not related to the transportation of cargo.

Rail:

Occasional (10-49%)

El Paso County has experienced a significant HAZMAT release due to a freight train incident; however, within the region, there have been several releases due to freight train incidents. One incident of a rail car leaking hazardous materials caused an evacuation of nearby residents while the leak could be contained but was not due to an accident, but rather found on inspection. The probability of a release within the jurisdiction is determined to be less probable due to a limited number of vehicle crossing points, and the restricted number of freight yards where hazardous materials are loaded or off loaded.

Over-the-Road:

Highly Likely (90-100%)

El Paso County experiences an annual HAZMAT release due to an over-the-road transport accident every year. Given that the majority of hazardous materials transported through the jurisdiction occurs using over-the-road commercial carriers, and that motor vehicles accidents account for the highest percentage of incidents, this will continue to be the biggest threat for HAZMAT-related incidents to occur. Due to the volume of over-the-road traffic and the unpredictability of when or where an incident may transpire, it is difficult to predict higher risk areas outside of higher trafficked locations.

26.2.4 Severity

The severity of a HAZMAT-related incident ranges from extremely limited and contained within a localized area, to catastrophic incidents effecting 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.

Delivery Lines

Limited

The rupture or cutting of delivery lines typically occurs in El Paso County's more urban and suburban areas. This exposes more people to the risk of potential life loss, injuries, and loss of property; however, these incidents are normally localized and do not affect large areas. The potential for a major delivery line rupture is significantly less, but could require large scale sheltering or evacuation efforts.

Fixed Facility

Limited

The release of fixed facility HAZMAT is typically confined to a limited and enclosed area. Additionally, these facilities are required to regularly report their onsite quantities under SARA Title III, subject to regular inspections.

Transportation

Aircraft:

Limited

The data is not available to indicate the amount of hazardous materials transported via this mode of transportation. Given the lack of historical data, there is limited exposure of life loss, injuries, economic loss, or environmental damage resulting from a HAZMAT release due to an aircraft accident.

Rail:

Critical

The impact of a freight rail accident is most associated with the potential release of hazardous materials contained in the cars. As urban density increases, the population living or working within one mile of the rail lines will grow, increasing the potential for exposure. The quantity of HAZMAT being transported, as well as the nature and complexity of rail accidents, make the potential for higher impact and long term disruption greater.

Over-the-Road:

Limited

At any given time, HAZMAT may be transported off of the major designated roadways within the county for local delivery. This brings HAZMAT in close proximity to more of the population and increases the risk of exposure. Although this mode of transportation is the highest frequency, the limited quantities of hazardous materials will greatly reduce the affected area.

26.2.5 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.

26.3 SECONDARY 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.

26.4 EXPOSURE

26.4.1 Population

The following tables and figures outline the potential exposure based on a one mile buffer from delivery lines, fixed facilities storage and use locations, and identified transportation routes aggregated with data from the county assessor and census data. This data suggests that a much greater number of El Paso County’s population, as well as the transient population, is at greater exposure to a transportation related incident than an incident occurring at a fixed site.

TABLE 26-2. POPULATION EXPOSED TO POTENTIAL HAZARDOUS MATERIAL INCIDENTS				
	Routes	Rail	Pipeline	Tier II
2000	180,372	146,883	15,336	15,446
2010	197,325	154,979	40,002	16,263
2017 (est)	220,757	169,394	56,745	17,254

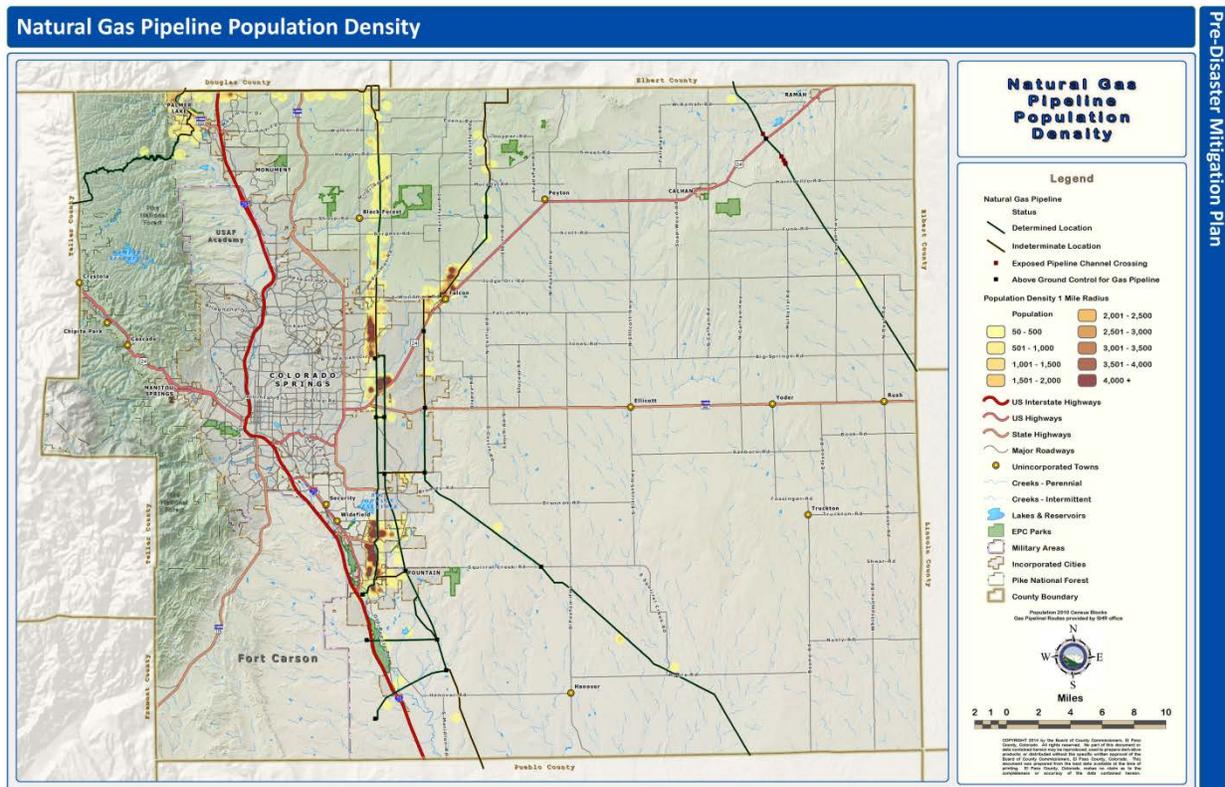
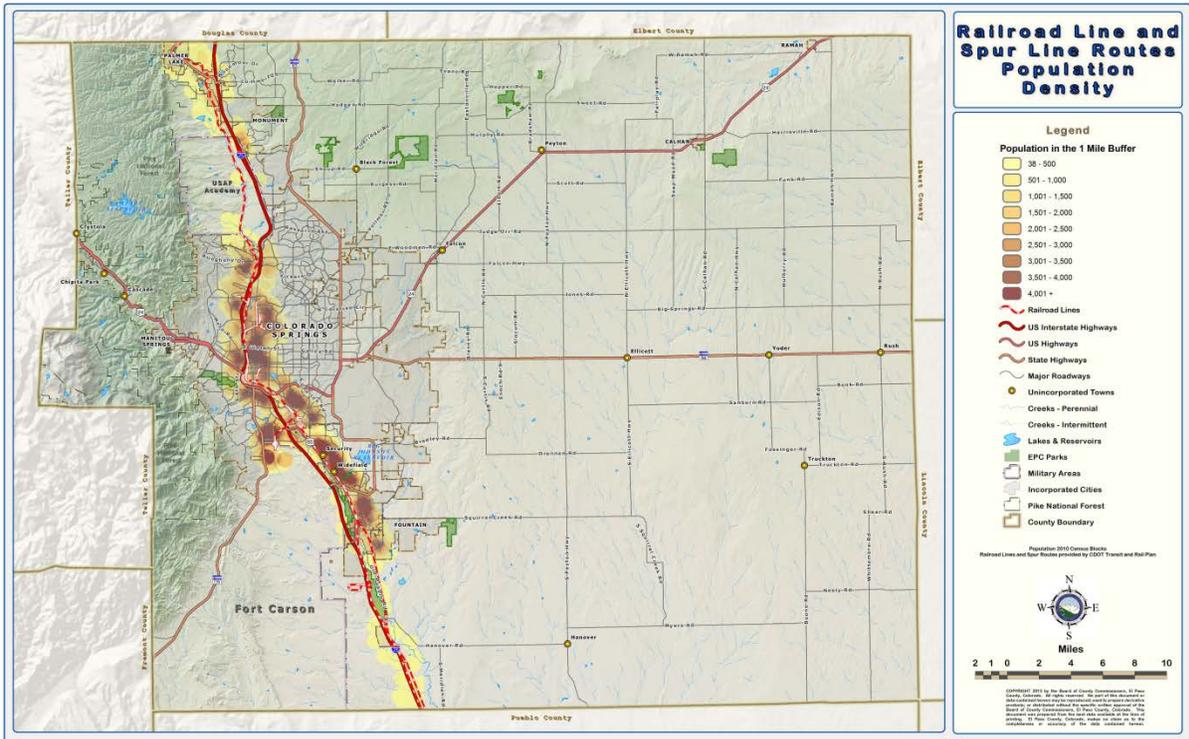


Figure 26-3. Natural Gas Pipeline Population Density

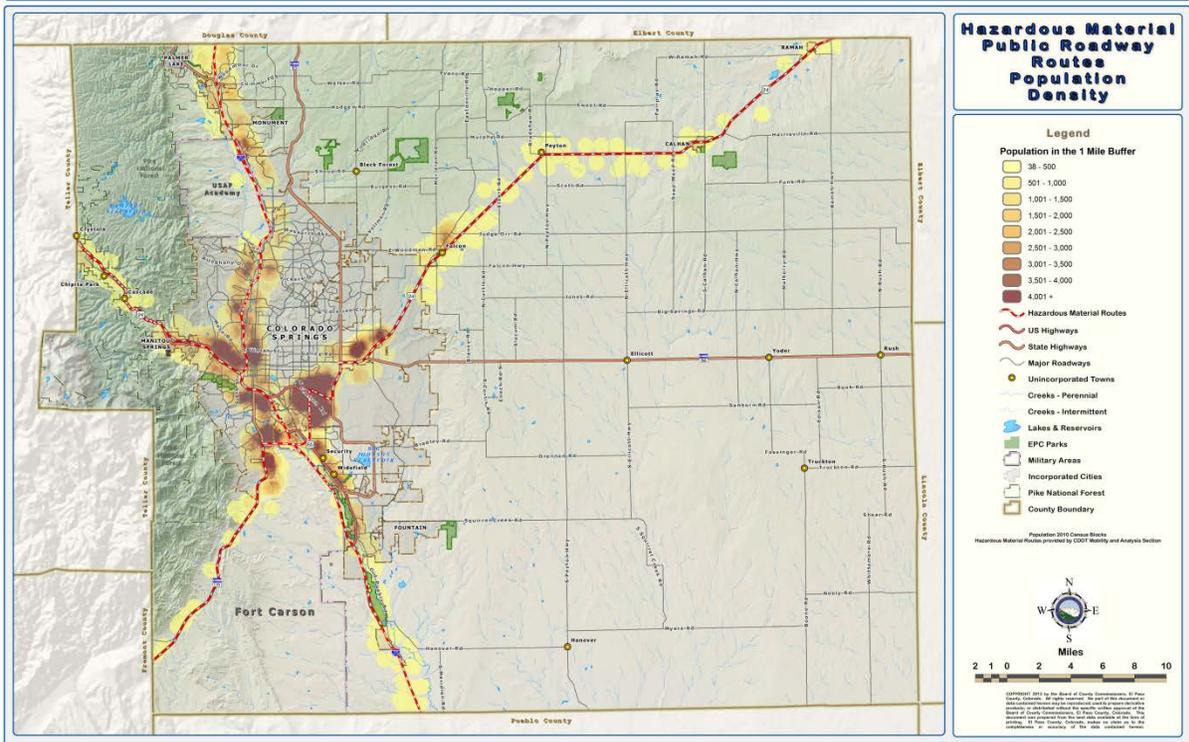
Railroad Lines and Spur Routes Population Density



Pre-Disaster Mitigation Plan

Figure 26-4. Railroad Lines and Spur Routes Population Density

Hazardous Material Public Roadway Routes Population Density



Pre-Disaster Mitigation Plan

Figure 26-5. Hazardous Materials Public Roadway Routes Population Density

26.4.2 Property

**TABLE 26-3.
PROPERTY EXPOSED TO POTENTIAL HAZARDOUS MATERIAL INCIDENTS**

	Total Residential Improvement Value	Total Residential Improvement Count	Total Commercial Improvement Value	Total Commercial Improvement Count	Total Mobile Home Value	Total Mobile Home Count
Routes	\$10,137,671,509	67,846	\$5,457,868,847	8,913	\$75,645,816	5,450
Rail	\$7,552,700,654	52,100	\$4,364,444,919	5,992	\$33,248,749	2,903
Pipeline	\$2,545,443,629	15,822	\$123,327,341	867	\$5,628,910	289
Tier II	\$814,519,389	5,041	\$3,988,670,236	3,318	\$28,281,080	2,224

26.4.3 Critical Facilities and Infrastructure

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.

26.4.4 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.

26.5 VULNERABILITY

26.5.1 Population/Property/Critical Infrastructure by Source

Data Limitations:

The limitations of the data varied by the source for a potential HAZMAT incident. Generally, for those agencies responsible for the direct movement of HAZMAT (e.g., freight train) or for those agencies required to report directly to a state or county agency, the data was more detailed and sufficient for extrapolating potential risks. For other sources such as aircraft and over-the-road carriers, some data was unavailable or lacked detail (e.g., the number and types of vehicles, quantities, and categories of HAZMAT transiting the jurisdiction, etc.). However, despite these limitations, historical data as well as information provided by internal and external stakeholder input provided sufficient information to assess each mode's potential risk factor.

When hazardous materials are not controlled due to improper use or accidents, they can quickly create a dangerous and/or life threatening situation. Because of the extensive amount of HAZMAT that is

transported in El Paso County the potential for accidents involving materials is very real and the consequence could be very devastating. The probability of a HAZMAT spill continues to increase each year. This is due to the increasing number of facilities that maintain HAZMAT and the increasing number of trucks hauling HAZMAT on roads in the county. The greatest risk for a transportation related hazardous materials spill is to residents and businesses along the I-25 corridor, paralleling the railroad lines, and in designated truck routes. The majority of HAZMAT related accidents have a minor impact to lives, property or the environment and. A community's, facility's, or individual's vulnerability of a given incident is determined by many of the same factors previously discussed in determining incident severity. The following provides an overview of each source and the vulnerability it poses to El Paso County communities and citizens:

Delivery Lines

Releases of hazardous gases or petroleum-based products from major supply pipelines account for less than 1% of all HAZMAT related incident.. These incidents are typically isolated to close proximity of the location of the material's release. There have been no recorded incidents of serious injuries or fatalities as a result of a hazardous materials release due to a rupture, cut, or failure in a delivery line. There are only two areas of significant population density in immediate proximity to major delivery pipelines within the jurisdiction accounting for approximately 60% of the 40,000 individuals living within one mile (see Table 26-2 and Figure 26-3). A significant incident involving a major delivery line could cause lengthy outage time for the area which is heavily dependent on natural gas. This is mitigated through a robust system redundancy which should allow utility providers to isolate delivery outage to a localized area. By definition the infrastructure itself is considered to be critical infrastructure and a concerted effort to harden facilities and develop redundant systems is continuing.

Fixed Facility

Annually, over 90% of all HAZMAT incidents that occur at a fixed facility are typically contained inside the structure. As most Tier II facilities are located within more industrialized areas, the population exposed to any type of incident is relatively small when compared to other potential incident types (see Table 26-2) with the immediate occupants are the most vulnerable to these sources of HAZMAT releases. As with all other HAZMAT incidents, vulnerability is affected by the type, amount, and location of the substance released. As most Tier II facilities are privately owned businesses, economic losses associated with cleanup and recovery, as well as business loss during an incident could be sizeable. Some Tier II facilities are considered critical infrastructure, while others may be affected within an evacuation zone or through loss of service as a cascading effect. Future HAZMAT planning will examine individual facilities and adjacent communities to detail the vulnerability associated with the risks.

Transportation

Aircraft:

Although aircraft incidents account for less than 2% of all transportation-related incidents nation-wide, they have never led to a large-scale HAZMAT incident within the El Paso County area. Decontamination of passengers and any individuals in the close proximity that may have come in contact with jet fuel, and respiratory issues of those downwind of an incident are the most likely to be effected. Although an aircraft accident may happen anywhere within the jurisdiction, it is much more likely to occur within close proximity to airfields. For additional analysis on Aircraft Accidents refer to Chapter 24.

Rail:

Although the majority of the railway is outside of heavily populated areas, there are still more than 150,000 people living within the one mile planning zone (See Table 26-2 and Figure 26-4). Although the probability for an incident to occur over-the-road, a rail incident would likely affect a much larger area due to the quantities of hazardous materials that may be released. The impact of such an event will

depend on factors such as location, weather conditions and the release of specific hazardous materials. Three factors are likely to continue to increase the vulnerability of citizens to a freight rail accident; the increase of volume of materials being moved, increasing population densities along railways, and aging infrastructure.

Over-the-Road:

Given that the majority of hazardous materials transported through the jurisdiction occurs using over-the-road commercial carriers, and that motor vehicles accidents account for the highest percentage of incidents, it is reasonable to assume that the population living in the immediate area adjacent to HAZMAT transportation routes is at most risk. The proximity of the rail lines to the I-25 corridor compounds the vulnerability of this population as well (See Table 26-2 and Figure 26-5). Approximately one third of the county's population lives within one mile of a designated HAZMAT transportation route. This does not include exposure to inter jurisdictional movement of items such as gasoline to local distribution sites. With the greatly variable and unknown nature of this mode of transport, it is very difficult to determine the at risk population at any given moment. Property and critical infrastructure vulnerabilities to this mode of transport are limited to proximity to routes and at times of delivery or transfer of hazardous materials.

Hazardous materials in transport are especially vulnerable to transportation related accidents, sabotage or misuse and, in the wrong hands, pose a significant security threat. The security of facilities because of the changing environment surrounding a moving vehicle. Most hazardous materials are frequently transported in large quantities, and once mobile, they are particularly susceptible to theft, interception, detonation or release. When transported in proximity to large population centers, accidental or intentional acts could have serious consequences.

26.6 FUTURE TRENDS IN 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. HAZMAT spills within El Paso County have continued to increase each year for the last four years. This is directly attributed to the increase in population and number of businesses that maintain reportable levels of HAZMAT. Additionally, the State Of Colorado Highway Patrol has a mutual aid agreement with the El Paso County and City of Colorado Springs HAZMAT Teams to respond to all spills on I-25.

26.7 SCENARIO

El Paso County also contains a major north-south railroad line (BNSF and Union Pacific) that transport large quantities of toxic material. These trains travel through the County numerous times each day with many trains containing several cars of hazardous material. Most railcars carry approximately 45,000 gallons of hazardous material that could create devastating effects on County residents if any one of them should breach. The most dangerous situation would be the accidental release of an airborne toxic material such as chlorine or anhydrous ammonia that would require the potential evacuation of up to 5 miles from the release point.

26.8 ISSUES

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 insure all locations are identified.
- It is impossible to know where HAZMAT is being transported at any given time.

CHAPTER 27.

PLANNING AREA RISK RANKING

A risk ranking was performed for the hazards of concern described in this plan. This risk ranking assesses the probability of each hazard's occurrence as well as its likely impact on the people, property, and economy of the planning area. The risk ranking was conducted via facilitated brainstorming sessions with the Steering Committee. Estimates of risk were generated with data from HAZUS-MH using methodologies promoted by FEMA. The results are used in establishing mitigation priorities. This section discusses the factors that the Steering Committee considered when ranking the hazards for their communities.

27.1 PROBABILITY OF OCCURRENCE

The probability of occurrence of a hazard is indicated by a probability factor based on likelihood of annual occurrence:

- High—Hazard event is likely to occur within 25 years
- Medium—Hazard event is likely to occur within 100 years
- Low—Hazard event is not likely to occur within 100 years
- No exposure—There is no probability of occurrence

The assessment of hazard frequency is generally based on past hazard events in the area.

27.2 IMPACT

Hazard impacts were assessed in three categories: impacts on people, impacts on property and impacts on the local economy. These categories are described below:

- **People**—Hazard impacts were assessed based on the percentage of the total *population exposed* to the hazard event. The degree of impact on individuals will vary and is not measurable, so the Steering Committee assumed for simplicity and consistency that all people exposed to a hazard because they live in a hazard zone will be equally impacted when a hazard event occurs. Impact factors were assessed as follows:
 - High—50 percent or more of the population is exposed to a hazard
 - Medium—25 percent to 49 percent of the population is exposed to a hazard
 - Low—25 percent or less of the population is exposed to the hazard
 - No impact—None of the population is exposed to a hazard
- **Property**—Impacts to property were assessed based on the percentage of the total *property value exposed* to the hazard event:
 - High—30 percent or more of the total assessed property value is exposed to a hazard
 - Medium—15 percent to 29 percent of the total assessed property value is exposed to a hazard
 - Low—14 percent or less of the total assessed property value is exposed to the hazard
 - No impact—None of the total assessed property value is exposed to a hazard
- **Economy**—The economic impacts assessed were based on the percentage of the total *property value vulnerable* to the hazard event. Values represent estimates of the loss from a major event of each hazard in comparison to the total assessed value of the property exposed to the hazard. For some hazards, such as wildfire, landslide, and severe winter storms,

vulnerability was considered to be the same as exposure because of the lack of loss estimation tools specific to those hazards. Loss estimates separate from the exposure estimates were generated for some hazards, such as earthquake and flood hazards, using HAZUS-MH.

- High—Estimated loss from the hazard is 20 percent or more of the total assessed property value
- Medium—Estimated loss from the hazard is 10 percent to 19 percent of the total assessed property value
- Low—Estimated loss from the hazard is 9 percent or less of the total assessed property value
- No impact—No loss is estimated from the hazard

27.3 RISK RATING AND RANKING

The Steering Committee ranked each hazard by considering the probability of the hazard occurring and the impact factors for people, property, and the economy. Based on this assessment, a ranking of high, medium, or low was assigned to each hazard. The hazard rankings vary by jurisdiction. Table 27-1 shows the hazard risk ranking.

**TABLE 27-1.
HAZARD RISK RANKING**

Jurisdiction	El Paso County (Unincorporated)	Calhan / Ramah	Fountain	Green Mountain Falls	Manitou Springs	Monument	Palmer Lake
Natural Hazards	Erosion & Deposition	Hailstorm	Winter Storm	Wildfire	Dam failure	Earthquake	Dam Failure
	Flooding	Severe Wind	Dam Failure	Winter Storm	Flooding	Hailstorm	Earthquake
	Mud or Debris Flow	Wildfire	Drought	Dam Failure	Landslide or Rockfall	Severe Wind	Flooding
	Wildfire	Dam Failure	Earthquake	Earthquake	Mud or Debris Flow	Wildfire	Hailstorm
	Winter Storm	Drought	Flooding	Erosion & Deposition	Wildfire	Winter Storm	Pandemic Disease
	Drought	Earthquake	Hailstorm	Flooding	Drought	Drought	Severe Wind
	Hailstorm	Erosion & Deposition	Severe Wind	Mud or Debris Flow	Earthquake	Lightning	Wildfire
	Lightning	Flooding	Wildfire	Avalanche	Hailstorm	Pandemic Disease	Winter Storm
	Pandemic Disease	Lightning	Lightning	Drought	Lightning	Tornado	Drought
	Tornado	Pandemic Disease	Pandemic Disease	Hailstorm	Pandemic Disease	Avalanche	Erosion & Deposition
	Avalanche	Subsidence & Sinkholes	Tornado	Landslide or Rockfall	Severe Wind	Dam Failure	Lightning
	Dam Failure	Tornado	Avalanche	Lightning	Subsidence & Sinkholes	Erosion and Deposition	Tornado
	Earthquake	Winter Storm	Erosion & Deposition	Pandemic Disease	Tornado	Flooding	Avalanche
	Landslide or Rockfall	Avalanche	Landslide or Rockfall	Severe Wind	Winter Storm	Landslide or Rockfall	Landslide or Rockfall
	Severe Wind	Landslide or Rockfall	Mud or Debris Flow	Subsidence & Sinkholes	Avalanche	Mud or Debris Flow	Mud or Debris Flow
	Subsidence & Sinkholes	Mud or Debris Flow	Subsidence & Sinkholes	Tornado	Erosion & Deposition	Subsidence & Sinkholes	Subsidence & Sinkholes
	Man Made	HAZMAT	Extreme Acts of Violence	HAZMAT	HAZMAT	HAZMAT	HAZMAT
Aircraft Accidents		HAZMAT	Aircraft Accidents	Aircraft Accidents	Aircraft Accidents	Extreme Acts of Violence	Extreme Acts of Violence
Extreme Acts of Violence		Aircraft Accidents	Extreme Acts of Violence	Extreme Acts of Violence	Extreme Acts of Violence	Aircraft Accidents	Aircraft Accidents

TABLE 27-1. HAZARD RISK RANKING							
Jurisdiction	El Paso County (Unincorporated)	Calhan / Ramah	Fountain	Green Mountain Falls	Manitou Springs	Monument	Palmer Lake
LOW			MEDIUM				

PART 3
MITIGATION STRATEGY

CHAPTER 28. MITIGATION ALTERNATIVES

A menu of hazard mitigation alternatives was reviewed that presents a broad range of alternatives to be considered for use in the planning area, in compliance with 44 CFR (Section 201.6(c)(3)(ii)). The menu of mitigation initiatives was presented by hazard that is addressed by each initiative. The Steering Committee reviewed the full range of initiatives as well as the County's ability to implement the variety of mitigation initiatives.

Hazard mitigation initiatives recommended in this plan were selected from among the alternatives presented in the menu as well as other projects known to be a necessity. The menu provided a baseline of mitigation alternatives that are backed by a planning process, are consistent with the planning partners' goals and objectives, and are within the capabilities of the partners to implement. However, not all the alternatives meet all the planning partners' selection criteria. Thus, the baseline was amended to fit El Paso County's specific needs. The menu reviewed for this plan is presented in Appendix C.

CHAPTER 29.

MITIGATION INITIATIVES AND IMPLEMENTATION

29.1 SELECTED COUNTY-WIDE MITIGATION INITIATIVES

The planning partners and the Steering Committee determined that some initiatives could be implemented to provide hazard mitigation benefits countywide. Table 29-1 lists the recommended countywide initiatives, the lead agency for each, and the proposed timeline. Individual worksheets for each recommended initiative are provided in Appendix D.

Each planning partner reviewed its recommended initiatives to classify them based on the hazard addressed and the type of mitigation involved. Mitigation types used for this categorization are as follows:

- Local Plans and Regulations (LPR) – These initiatives include government authorities, policies or codes that influence the way land and buildings are being developed and built.
- Structure and Infrastructure Projects (SIP)- These initiatives involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of initiative also involves projects to construct manmade structures to reduce the impact of hazards.
- Natural Systems Protection (NSP) – These are initiatives that minimize damage and losses, and also preserve or restore the functions of natural systems.
- Education and Awareness Programs (EAP) – These are initiatives to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These initiatives may also include participation in national programs, such as StormReady and Firewise Communities.

The parameters for the timeline are as follows:

- Short Term = to be completed in 1 to 5 years
- Long Term = to be completed in greater than 5 years
- Ongoing = currently being funded and implemented under existing programs.

29.2 BENEFIT/COST REVIEW AND PRIORITIZATION

The action plan must be prioritized according to a benefit/cost analysis of the proposed projects and their associated costs (44 CFR, Section 201.6(c)(3)(iii)). The benefits of proposed projects were weighed against estimated costs as part of the project prioritization process. The benefit/cost analysis was not of the detailed variety required by FEMA for project grant eligibility under the Hazard Mitigation Grant Program (HMGP) and Pre-Disaster Mitigation (PDM) grant program. A less formal approach was used because some projects may not be implemented for up to 10 years, and associated costs and benefits could change dramatically in that time. The projects were prioritized and evaluated as shown on the individual worksheets for each recommended mitigation initiative, provided in Appendix D, and summarized on Table 29-1.

The estimated costs for the mitigation initiatives were identified as high, medium, or low, using the following ranges:

- Low – less than \$10,000
- Medium – from \$10,000 to \$100,000
- High – greater than \$100,000.

Fourteen criteria were used to assist in evaluating and prioritizing the mitigation initiatives. For each initiative, a numeric rank (-1, 0, or 1) was assigned for each of the 14 evaluation criterion. The numeric ranking was defined as:

- 1 – Highly effective or feasible
- 0 – Neutral
- -1 – Ineffective or not feasible

The 14 evaluation and prioritization criteria are:

1. Life Safety – How effective will the initiative be at protecting lives and preventing injuries?
2. Property Protection – How significant will the initiative be at eliminating or reducing damage to structures and infrastructure?
3. Cost-Effectiveness – Are the costs to implement the project or initiative commensurate with the benefits achieved?
4. Technical – Is the mitigation initiative technically feasible? Is it a long-term solution? Eliminate actions that, from a technical standpoint, will not meet the goals.
5. Political – Is there overall public support for the mitigation initiative? Is there the political will to support it?
6. Legal – Does the municipality have the authority to implement the initiative?
7. Fiscal - Can the project be funded under existing program budgets (i.e., is this initiative currently budgeted for)? Or would it require a new budget authorization or funding from another source such as grants?
8. Environmental – What are the potential environmental impacts of the initiative? Will it comply with environmental regulations?
9. Social – Will the proposed action adversely affect one segment of the population? Will the initiative disrupt established neighborhoods, break up voting districts, or cause the relocation of lower income people?
10. Administrative – Does the jurisdiction have the personnel and administrative capabilities to implement the initiative and maintain it or will outside help be necessary?
11. Multi-hazard – Does the action reduce the risk to multiple hazards?
12. Timeline - Can the initiative be completed in less than 5 years (within our planning horizon)?
13. Local Champion – Is there a strong advocate for the initiative or project among the jurisdiction’s staff, governing body, or committees that will support the initiative’s implementation?
14. Other Local Objectives – Does the initiative 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?

The numeric results of this exercise were used to prioritize the mitigation initiatives as low, medium, or high priority. Table 29-1 shows the priority of each initiative.

**TABLE 29-1.
RECOMMENDED MITIGATION INITIATIVES**

Priority	Project Status	Benefit To County	Hazards Mitigated (<i>see hazard ID codes at end of table</i>)																		Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal/Obj.	
			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS	AA	EV					HZ
EL PASO COUNTYWIDE MITIGATION INITIATIVES																									
Initiative #1—Improve Multi-Jurisdictional Hazard Mitigation Plan																									
Description: Continue to improve the El Paso County Multi-Jurisdictional Hazard Mitigation Plan through annual reviews and incorporation of incident lessons learned																									
Lead & Support Agency: El Paso County Sheriff Office- Emergency Service Division																									
High	New	High			X		X	X	X	X	X	X	X	X			X	X	X		X	Low	Local Budgets	Ongoing	Goals 1, 2, 3, 4, & 5 Objectives 1.2,1.3,1.4,2.1, 2.2,3.3,4.1,4.2,5.1,5.3
Initiative #2— Review and Update EOP																									
Description: Conduct annual review and tri-annual update of the El Paso County Emergency Operations Plan																									
Lead & Support Agency: El Paso County Sheriff Office – Emergency Service Division																									
High	New/ Modified from Previous Plan (16.3)	High			X		X	X	X	X	X	X	X	X			X	X	X		X	Low	Local Budgets	Ongoing	Goals 1, 2, 3, 4, & 5 Objectives 1.2,1.3,1.4,2.1, 2.2,3.3,4.2,5.1
Initiative #3— Perform Continuity of Operations Planning																									
Description: Perform Continuity of Operations planning to identify critical functions, essential personnel, vital resources, and critical infrastructure within the county that is necessary to maintain public safety and services																									
Lead & Support Agency: El Paso County Sheriff Office –Emergency Service Division, Municipalities and County Agencies																									
Low	Carried Over from Previous Plan (16.3)	Medium			X		X	X	X	X	X	X	X	X			X	X	X		X	Medium	Local Budgets, Grant	Short-term	Goals 1, 2, 4, & 6 Objectives 1.3, 2.2, 2.3, 4.1, 4.2, 6.1, 6.2, & 6.3

**TABLE 29-1.
RECOMMENDED MITIGATION INITIATIVES**

Priority	Project Status	Benefit To County	Hazards Mitigated (<i>see hazard ID codes at end of table</i>)																		Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal/Obj.
			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS	AA	EV				
Initiative #8 — Multi-faceted Public Awareness Campaign to Increase Enrollment in Emergency Notification System Description: Develop a multi-faceted public awareness campaign to increase citizen enrollment in the El Paso County Emergency Notification System. Lead & Support Agency: El Paso Sheriff Office –Emergency Service Division/Public Information Office, El Paso County Public Information Office, El Paso/Teller 911																								
High	Modified from Previous Plan (15.1)	High			X		X	X	X	X	X	X	X			X	X	X		X	Medium	Local Budgets, Grant	Ongoing	Goals 1, 2, & 3 Objectives 1.1, 2.2, & 3.1
Initiative #9 — Create an All-Hazard Zoning Plan Description: Create an all-hazard zoning plan to facilitate a more rapid evacuation capability within El Paso County. Lead & Support Agency: El Paso County Sheriff Office-Emergency Service Division/Dispatch																								
Low	New/ Modified from Previous Plan (2.4, 5.3, 7.3, 9.1, 13.3)	Medium			X		X	X	X	X	X	X	X			X	X	X		X	Medium	Local Budgets	Short-term	Goals 1 & 2 Objectives 1.2, 1.3, & 2.2
Initiative #10 — Encourage Communities to Adopt Fire Adaptive Community Standards Description: Work with individual communities within the county, such as HOAs and municipalities, to adopt Fire Adaptive Community standards and practices. Lead & Support Agency: HOAs/ Municipalities																								
Medium	New/ Modified from Previous Plan (1.3)	Medium									X					X					Medium	To Be Determined	Long-term	Goals 2, 3, & 4 Objectives 2.1, 2.2, 3.1, 3.3, & 4.2
Initiative #11 — Identify Areas for Cisterns or Hydrants Description: Conduct an analysis identifying areas in the county that may benefit from the installation of cisterns or hydrants to provide water delivery during firefighting operations in concurrence with the El Paso County Land Development Code. Lead & Support Agency: Fire Protection Districts, Pikes Peak Regional Building Division																								
Low	Carried Over from Previous Plan (2.2)	Medium			X											X					High	Local Budgets, Grant	Long-term	Goals 1, 2, & 5 Objectives 1.3, 2.1, 2.2, & 5.1

**TABLE 29-1.
RECOMMENDED MITIGATION INITIATIVES**

Priority	Project Status	Benefit To County	Hazards Mitigated (<i>see hazard ID codes at end of table</i>)																	Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal/Obj.					
			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS	AA					EV	HZ			
Initiative #12— Mitigation Efforts on Publicly Owned Properties Based on Fire Adaptive Community Standards Description: Perform mitigation efforts within publicly owned properties based on Fire Adaptive Community standards. Lead & Support Agency: El Paso County Sheriff Office- Emergency Service Division/Wildland																												
High	Modified from Previous Plan (1.2, 1.3)	High										X	X											Medium	Local Budgets, Grant	Ongoing	Goals 2 & 4 Objectives 2.1, 2.2, 4.1, 4.2, & 4.3	
Initiative #13— Conduct Hazardous Materials Flow Study Description: Conduct a hazardous materials flow study for high volume road and rail ways within the county. Lead & Support Agency: El Paso County Department of Transportation/ El Paso County GIS																												
Medium	Carried Over from Previous Plan (4.1)	Medium																						X	Medium	Grant	Short-term	Goals 1, 2, & 5 Objectives 1.4, 2.1, 2.2, & 5.1
Initiative #14— Increase Number of Personnel Trained as HAZMAT Technicians and Specialists Description: Increase the number of personnel trained as HAZMAT technicians and specialists to elevate regional response capability. Lead & Support Agency: El Paso County Sheriff Office- Emergency Service Division/HAZMAT																												
Medium	Modified from Previous Plan (4.2)	Medium																						X	Medium	Local Budget, Grant	Short-term	Goals 1, 2, & 4 Objectives 1.2, 2.1, 4.2, & 4.3
Initiative #15— Acquire Software for Facility Tracking and Multi-Jurisdictional Response Description: Acquire common software to aid in Tier II facility tracking and multi-jurisdictional response, improving interoperability between Colorado Springs and El Paso County HAZMAT teams. Lead & Support Agency: El Paso County Information Technology, El Paso County Sheriff Office-Emergency Services Division																												
Medium	New	High																						X	Medium	Grant	Short-term	Goals 2, 4, & 6 Objectives 2.1, 2.2, 2.3, 4.3, & 6.3

**TABLE 29-1.
RECOMMENDED MITIGATION INITIATIVES**

Priority	Project Status	Benefit To County	Hazards Mitigated (<i>see hazard ID codes at end of table</i>)																	Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal/Obj.
			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS	AA				
Initiative #16— Expand Local Emergency Planning Committee Description: Expand the community cross-section and membership of the Local Emergency Planning Committee and research methods to increase its role within the county emergency management program. Lead & Support Agency: El Paso County Sheriff Office- Emergency Service Division, Local Emergency Planning Committee Chairman																							
Medium	New	Medium																	X	Low	Local Budget	Short-term	Goals 1, 4, 5, & 6 Objectives 1.4, 4.1, 4.2, 4.3, 5.3, & 6.3
Initiative #17— Enhance Communication Network Related to Delay or Closure of County Facilities and Roadways Description: Continue to enhance the communication network related to the delay or closure of county facilities and roadways. Lead & Support Agency: El Paso County Public Information Officer, El Paso County Sheriff Office- Emergency Service Division/Public Information Officer																							
High	New/ Modified from Previous Plan (9.2)	High					X	X			X						X	X		Medium	Local Budget, Grant	Short-term	Goals 1, 3, & 4 Objectives 1.1, 1.4, 3.1, 3.2, 3.3, & 4.2
Initiative #18— Identify Critical Roads and Emergency Routes Description: Identify critical roads and emergency routes within El Paso County and coordinate inter-jurisdictional plans to insure they remain clear. Lead & Support Agency: El Paso County Department of Transportation																							
High	Modified from Previous Plan (9.2)	High						X		X	X					X	X		High	Local Budget	Short- to Long-term	Goals 1, 2, & 4 Objectives 1.2, 1.3, 2.1, 2.2, 4.1, & 4.2	
Initiative #19— Reduce Roadway Hazards Description: Reduce roadway hazards to maintain safe ingress/egress for El Paso County residents and first responders. Lead & Support Agency: El Paso County Department of Transportation																							
Medium	Modified from Previous Plan (9.1)	Medium					X	X		X						X	X		High	Local Budget	Short- to Long-term	Goals 1, 2, & 4 Objectives 1.3, 2.1, 2.2, 4.1, & 4.2	

**TABLE 29-1.
RECOMMENDED MITIGATION INITIATIVES**

Priority	Project Status	Benefit To County	Hazards Mitigated (<i>see hazard ID codes at end of table</i>)																	Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal/Obj.		
			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS	AA					EV	HZ
Initiative #20— Develop Strategic Flood Warning Plan Description: Develop an integrated strategic flood warning plan that addresses the repair, repositioning, or upgrade of existing flood warning systems. Lead & Support Agency: El Paso County Sheriff Office, Emergency Service Division, Local Jurisdictions																									
Medium	Carried Over from Previous Plan (6.1)	High						X				X										High	Local Budget	Short- to Long-term	Goals 1, 2, 3, & 4 Objectives 1.1, 1.4, 2.1, 3.1, 3.3, & 4.3
Initiative #21— Identify Drainage Basins that Require Flood Warning Systems and Explore Early Warning Systems for Flash Floods Description: Identify drainage basins that require installation of a flood warning system, and explore technology solutions to improve threat recognition to provide early warning of potential flash flood and debris flow incidents. Lead & Support Agency: El Paso County Office of Emergency management-Public Services Department, Local Jurisdictions																									
High	Carried Over from Previous Plan (6.3)	High						X				X										Medium	Grant	Short- to Long-term	Goals 1 & 2 Objectives 1.1, 1.4, & 2.1
Initiative #22— Install Electronic Warning Signs and Road Closure Barriers on Highway 24 Description: Install electronic warning signage and permanent road closure barriers on Highway 24 in the Ute Pass area. Lead & Support Agency: Colorado Department of Transportation, El Paso County Department of Transportation																									
Low	New	Medium					X	X				X					X	X				High	Grant	Short-term	Goals 1 & 4 Objectives 1.1, 1.4, 4.1, & 4.2
Initiative #23— Maintain Catch Basins and Debris Fences in Critical Areas Description: Continue to maintain catch basins and debris fences in critical areas to reduce the threat to population centers. Lead & Support Agency: Public Works																									
High	New/ Modified from Previous Plan (7.2)	High					X	X				X										High	Local Budget, Grant	Ongoing	Goals 1, 2, 4, 5, & 6 Objectives 1.3, 2.1, 2.2, 4.2, 5.2, 5.3, & 6.1

**TABLE 29-1.
RECOMMENDED MITIGATION INITIATIVES**

Priority	Project Status	Benefit To County	Hazards Mitigated (<i>see hazard ID codes at end of table</i>)																Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal/Obj.					
			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS					AA	EV	HZ		
Initiative #24 — Identify High-Threat Properties that may be Relocated or Purchased Description: Identify high threat properties within potential hazard areas that may be relocated or purchased to reduce risk to persons or property. Lead & Support Agency: El Paso County Flood Plain Manager																											
Medium	Carried Over from Previous Plan (7.4)	High					X	X					X					X						High	Grant	Short-term	Goals 1, 2, & 5 Objectives 1.4, 2.1, & 5.2
Initiative #25 — Channel Stabilization, Improvement, and Restoration in Fountain Creek Description: Conduct channel stabilization, improvement, and restoration in Fountain Creek to allow greater drainage and water flow capacity. Lead & Support Agency: Colorado Department of Transportation, El Paso County Department Of Transportation, Flood Plain Manager																											
Medium	Modified from Previous Plan (7.1, 7.5)	High					X	X																High	To Be Determined	Ongoing	Goals 1, 2, 4, & 5 Objectives 1.3, 2.1, 2.2, 4.2, & 5.2
Initiative #26 — Stabilize or Remove Rocks Along County Roadways Description: Stabilize or remove rocks that pose a hazard along county roadways. Lead & Support Agency: Colorado Department Transportation, El Paso County Department of Transportation																											
Low	Carried Over from Previous Plan (10.2)	Medium					X			X														High	Local Budget	Ongoing	Goals 1 & 4 Objectives 2.1, 2.2, & 4.2
Initiative #27 — Increase Use of Weather Radio Announcements Description: Increase use of weather radio announcements to enhance the redundancy of public information delivery in severe weather situations throughout the county. Lead & Support Agency: National Weather Service, El Paso County OEM, El Paso Teller 911, Local Jurisdictions																											
Medium	New/ Modified from Previous Plan (8.1)	High					X	X		X			X		X		X							Low	Local Budget	Short-term	Goals 1, 3, & 4 Objectives 1.1, 3.1, 3.2, 3.3, 4.1, & 4.2

**TABLE 29-1.
RECOMMENDED MITIGATION INITIATIVES**

Priority	Project Status	Benefit To County	Hazards Mitigated (<i>see hazard ID codes at end of table</i>)																	Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal/Obj.	
			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS	AA					EV
Initiative #28 — Increase Municipalities That Meet Criteria of Storm Ready or Weather Ambassador Programs																								
Description: Increase the number of municipalities within the county that meet the Storm Ready and/or Weather Ambassador program criteria.																								
Lead & Support Agency: National Weather Service, Local Jurisdictions																								
Low	New	High							X	X		X								Low	Local Budget, Grant	Short-term	Goals 1, 3, & 4 Objectives 1.1, 1.3, 3.1, 3.2, 3.3, 4.1, & 4.2	
Initiative #29 — Ensure Runway Safety Zones are Considered During Community Planning																								
Description: Continue to ensure runway safety zones are considered during community planning for new construction/development applications.																								
Lead & Support Agency: Pikes Peak Regional Building Department/ Colorado Springs Airport																								
Low	New	Medium																	X	X	Low	Local Budget	Ongoing	Goals 1, 2, 3, 4, & 5 Objectives 1.4, 2.2, 2.3, 3.2, 4.1, 4.2, & 5.1
Initiative #30 — Establish Severe Weather Protective Areas																								
Description: Establish severe weather protective areas within county parks and open space.																								
Lead & Support Agency: El Paso County Parks Department/Public Works																								
Low	New	Medium							X	X		X								Medium	Grant, Volunteers	Short- to Long-term	Goals 1, 4, & 5 Objectives 1.3, 4.1, 4.2, & 5.3	
Initiative #31 — Provide Education to First Responders to Minimize Effects of Disease on Response Capability																								
Description: Provide education to first responders to minimize the effects of disease on response capability.																								
Lead & Support Agency: El Paso County Public Health																								
Low	Carried Over from Previous Plan (16.2)	Medium										X								Medium	Local Budget	Ongoing	Goals 3, 4, & 6 Objectives 3.1, 3.3, 4.2, & 6.1	
Initiative #32 — Establish More Robust Vaccination Program																								
Description: Establish a more robust county employee vaccination program to maximize available workforce during a potential outbreak.																								
Lead & Support Agency: El Paso County Public Health																								
Low	New	Medium										X								Medium	Local Budget	Ongoing	Goals 1, 4, & 6 Objectives 1.3, 4.1, 4.2, & 6.1	

**TABLE 29-1.
RECOMMENDED MITIGATION INITIATIVES**

Priority	Project Status	Benefit To County	Hazards Mitigated (<i>see hazard ID codes at end of table</i>)																Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal/Obj.				
			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS					AA	EV	HZ	
CALHAN/RAMAH INITIATIVES																										
Initiative #33— Identify At-Risk Residents and Potential Safe Shelters																										
Description: Identify at risk residents – those without basements, limited mobility and find them safe spots to take shelter in case of emergency.																										
Lead & Support Agency: Town of Ramah/Calhan																										
Medium	New	Medium							X	X				X			X						Low	Town Budget	Short-term	Goals 1, 3, & 4 Objectives 1.1, 3.1, 3.2, 3.3, & 4.1
Initiative #34— Utilize Water Bills to Disseminate Emergency Response Information																										
Description: Develop season-specific fliers to address hazards and ways each resident can mitigate their own risks and mail to residents with their water bill.																										
Lead & Support Agency: Town of Ramah/Calhan																										
High	New	High		X	X	X			X	X					X	X	X						Low	Town Budget	Short-term	Goals 1, 2, & 3 Objectives 1.4, 2.2, 3.1, & 3.3
Initiative #35— Plant Vegetation Along Roadways to Mitigate Erosion																										
Description: Develop a drainage or erosion control plan to incorporate plants and natural resources to mitigate erosion along roadways.																										
Lead & Support Agency: Town of Ramah/Calhan																										
Low	New	Medium						X	X														Medium	Grants, Town Budget	Short- to Long-term	Goals 2, 3, & 5 Objectives 2.1, 2.2, 3.2, 3.3, & 5.2
Initiative #36— Develop Decision Tree Outlining Roles and Responsibilities During Emergencies																										
Description: Develop a decision tree fully outlining the roles and responsibilities of local, regional, and state response teams, including HAZMAT teams and other specialized response teams. Coordinate with the county to develop a plan and point person to contact immediately.																										
Lead & Support Agency: Town of Ramah/Calhan and El Paso County																										
Medium	New	Medium		X		X		X					X	X			X			X	X		Low	Town Budget	Short-term	Goals 1, 2, & 4 Objectives 1.2, 2.4, 4.1, 4.2, & 4.3

**TABLE 29-1.
RECOMMENDED MITIGATION INITIATIVES**

Priority	Project Status	Benefit To County	Hazards Mitigated (<i>see hazard ID codes at end of table</i>)																	Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal/Obj.					
			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS	AA					EV	HZ			
Initiative #37— Obtain GIS Data																												
Description: Work with county, regional, and state organizations to obtain GIS data for the town. Use existing GIS data to identify areas at risk for natural or man-made hazards, to aid responders during emergencies (locations of critical facilities, infrastructure, alternative access routes, etc), and to incorporate the areas at risk for hazards into local planning and land use document.																												
Lead & Support Agency: Town of Ramah/Calhan																												
Low	New	Medium		X				X	X									X		X				Medium	Grants, Town Budget	Short-term	Goals 1 & 5 Objectives 1.2, 1.4, 5.1, & 5.2	
Initiative #38— Identify Temporary Source of Water																												
Description: Identify a temporary supply of water in case of contamination or any other hazard that would affect the treatment or transportation of water to the towns. Coordinate with local, county, or regional governments (IGA or MOA) to supply water temporarily during or immediately following a hazard event																												
Lead & Support Agency: Town of Ramah/Calhan																												
High	New/ Modified from Previous Plan (2.2)	Medium			X				X											X			X		Low	Town Budget	Short-term	Goals 2, 4, 5, & 6 Objectives 2.1, 4.1, 4.2, 4.3, 5.2, 6.1, 6.2, & 6.3
FOUNTAIN INITIATIVES																												
Initiative #39— Put Flood Information on the City Website																												
Description: Put flood information on City website to educate the community about flood risk and emergency actions																												
Lead & Support Agency: City of Fountain Office of Emergency Management																												
High	Modified from Previous Plan (7.6)	High		X																				Low	City Budget	Short-term	Goals 1 & 3 Objectives 1.2, 3.1, 3.2, & 3.3	
Initiative #40— Flood Information Handouts at City Hall																												
Description: Put flood information handouts at City Hall to educate the community about flood risk and emergency actions																												
Lead & Support Agency: City of Fountain Office of Emergency Management																												
Medium	Modified from Previous Plan (7.6)	High		X					X															Low	City Budget	Short-term	Goals 1 & 3 Objectives 1.2, 3.1, 3.2, & 3.3	

**TABLE 29-1.
RECOMMENDED MITIGATION INITIATIVES**

Priority	Project Status	Benefit To County	Hazards Mitigated (<i>see hazard ID codes at end of table</i>)																	Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal/Obj.	
			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS	AA					EV
Initiative #46— Coordinate Flood Mitigation with City Drainage Plans Description: Coordinate flood mitigation planning and activities with City Drainage Plans Lead & Support Agency: City of Fountain Department of Public Works																								
High	New	High	X					X													Low	City Budget	Long-term	Goals 1, 2, 4, & 5 Objectives 1.2, 1.3, 1.4, 2.1, 2.2, 4.1, 4.2, & 5.2
Initiative #47— Tornado Plans and Drills for Public Buildings Description: Develop tornado plans and implement drills for public buildings to protect citizens Lead & Support Agency: City of Fountain Emergency Management																								
Low	New/ Modified from Previous Plan (8.1)	Medium												X							Low	City Budget	Short-term	Goals 1, 2, & 3 Objectives 1.2, 1.3, 2.1, & 3.1
Initiative #48— Develop Community Wildland Fire Protection Plan Description: Develop protection plans for Wildland Fire in the Interface Zone to identify specific areas and mitigation technologies by areas that have a potential to be affected by wildland fires Lead & Support Agency: City of Fountain Emergency Management																								
High	New/ Modified from Previous Plan (2.3, 17.1)	High														X					Low	City Budget	Short- to Long-term	Goals 1, 3, 4, & 5 Objectives 1.2, 1.3, 1.4, 3.1, 4.2, & 5.1
Initiative #49— Develop Wildland Fire Interface Code Description: Develop a Wildland Fire Interface Code to ensure defensible space from open space and wildland areas from built up areas to protect structures Lead & Support Agency: City of Fountain Fire Prevention Division																								
High	New/ Modified from Previous Plan (2.3, 3.1, 17.1)	High														X					Low	City Budget	Short- to Long-term	Goals 1, 3, 4, & 5 Objectives 1.2, 1.3, 1.4, 3.1, 4.2, & 5.1

**TABLE 29-1.
RECOMMENDED MITIGATION INITIATIVES**

Priority	Project Status	Benefit To County	Hazards Mitigated (<i>see hazard ID codes at end of table</i>)																Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal/Obj.						
			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS					AA	EV	HZ			
Initiative #50 — Participate in Local Emergency Planning Committee Description: Include the city in the LEPC and increased awareness and response planning Lead & Support Agency: City of Fountain Office of Fire Department																												
Low	New	Medium																	X	Low	Not Applicable	Short- to Long-term	Goals 1, 4, 5, & 6 Objectives 1.4, 4.1, 4.2, 4.3, 5.3, & 6.3					
Initiative #51 — Expand Vaccination Program Description: Expand vaccination program to include all first responders and emergency management staff who may have an emergency role such as EOC personnel and the emergency communications personnel to help ensure emergency personnel are available to assist in an incident. Lead & Support Agency: City of Fountain Office of Human Resources Department																												
Medium	New	High																	X	Medium	City Budget, Grants	Short- to Long-term	Goals 3, 4, & 6 Objectives 3.1, 3.3, 4.2, & 6.1					
Initiative #52 — Meet Criteria for Storm Ready Community Description: Meet the criteria for a Storm Ready Community to prepare the community to be storm ready and resistant. Lead & Support Agency: City of Fountain Office of Emergency Management																												
Medium	New	High																	X	X		X	X	X	Low	City Budget, Grants	Short- to Long-term	Goals 1, 3, & 4 Objectives 1.1, 3.1, 3.2, 4.1, & 4.2
Initiative #53 — Develop a Coordinated Response Plan for Acts of Violence Description: Develop coordinated rapid response for extreme acts of violence by coordinating with the police department, fire department, school district, city hall and emergency management. Lead & Support Agency: City of Fountain Office of Emergency Management																												
Low	New/ Modified from Previous Plan (13.2, 13.4)	Medium																		X	Low	City Budget, Grants	Short- to Long-term	Goals 1, 3, & 4 Objectives 1.1, 3.1, 3.2, 4.1, & 4.2				

**TABLE 29-1.
RECOMMENDED MITIGATION INITIATIVES**

Priority	Project Status	Benefit To County	Hazards Mitigated (<i>see hazard ID codes at end of table</i>)																	Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal/Obj.					
			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS	AA					EV	HZ			
Initiative #58 — Update Town Website with Emergency Information Description: Update town website with emergency information; create “Emergency Information” tab on Town website. Lead & Support Agency: Town of Green Mountain Falls																												
Low	Modified from Previous Plan (15.1)	High		X						X															Low	County Budget	Short-term	Goals 1 & 3 Objectives 1.1, 3.1, 3.2, & 3.3
Initiative #59 — Review and Update Current Disaster Plan Description: Review and update current emergency disaster plan for town. Lead & Support Agency: Town of Green Mountain Falls																												
Low	New	High	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Low	Volunteers	Short-term	Goals 1, 2, & 3 Objectives 1.2,1.3,1.4,2.1, & 3.3	
Initiative #60 — Install Early Warning System in Town Hall Description: Install early warning system in our new Town Hall to inform citizens of immediate danger and educate community on siren sounds. Lead & Support Agency: Fire Protection District																												
High	Modified from Previous Plan (6.1, 8.1)	High		X						X														High	Grants, Donations	Short-term	Goals 1, 3, & 6 Objectives 1.1, 1.4, 3.3, 3.1, & 6.1	
Initiative #61 — Mitigating Flood Debris on Green Mountain Falls Property Description: Pre flood mitigation efforts to remove debris and restore the creeks to prevent flooding concerns, coordinated by town Public Works Department. Lead & Support Agency: Town of Green Mountain Falls																												
Medium	New	High						X	X						X									Medium	Grants, Volunteers	Short-term	Goals 1, 4, & 6 Objectives 2.1, 2.2, 4.2, & 6.1	

**TABLE 29-1.
RECOMMENDED MITIGATION INITIATIVES**

Priority	Project Status	Benefit To County	Hazards Mitigated (<i>see hazard ID codes at end of table</i>)																	Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal/Obj.
			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS	AA				
MONUMENT INITIATIVES																							
Initiative #62— MOU with D38 for Use of Their Facilities if needed																							
Description: Develop MOU with school district D38 for the use of their facilities to assist in restoring the function of natural systems in the event Town of Monument facilities are compromised.																							
Lead & Support Agency: Town of Monument																							
High	Modified from Previous Plan (17.2)	High			X	X			X	X			X	X	X				X	Low	Not Applicable	Short-term	Goals 1, 2, 3, 4, 5, & 6 Objectives 1.2, 2.3, 3.3, 4.1, 4.2, 4.3, 5.1, 5.3, 6.1, 6.2, & 6.3
Initiative #63— Obtain Generators for Critical Infrastructure																							
Description: Obtain generators to provide backup power for critical infrastructure during emergencies.																							
Lead & Support Agency: Town of Monument																							
Medium	New	High	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	High	Budget Restate	Short-term	Goals 2, 5, & 6 Objectives 2.1, 2.2, 5.1, & 6.1
Initiative #64— Add a Link to the Town Website "Emergency Preparedness"																							
Description: Create an "Emergency Preparedness" link on the Town website with emergency prevention/preparedness information.																							
Lead & Support Agency: Town of Monument																							
Medium	Modified from Previous Plan (15.1)	High	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Low	Town Budget	Short-term	Goals 1 & 3 Objectives 1.1, 3.1, 3.2, & 3.3
Initiative #65— Ensure Water Tanks/Water Sheds Have Adequate Fire Protection																							
Description: Ensure water tanks/water sheds have adequate fire protection, for example, protected with concrete walls/roofs; 30-foot mitigation zones.																							
Lead & Support Agency: Town of Monument																							
Low	Modified from Previous Plan (2.2)	Medium																X		Medium	Town Budget	Short-term	Goals 1, 2, 3, 4, 5, & 6 Objectives 1.3, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, 4.3, 5.1, 5.2, 5.3, & 6.1

**TABLE 29-1.
RECOMMENDED MITIGATION INITIATIVES**

Priority	Project Status	Benefit To County	Hazards Mitigated (<i>see hazard ID codes at end of table</i>)																		Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal/Obj.
			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS	AA	EV				
Initiative #66 — Adopt Water Mitigation Plan, Water Conservation Plan and Reusable/Renewable Water Plan Description: Adopt water mitigation plan, water conservation plan, and reusable/renewable water plan, including ordinances limiting landscape/types of grasses and trees grown; water restrictions; and mitigation program offered by the Town (free disposal of shrubs/brush tress for mitigating property). Lead & Support Agency: Town of Monument																								
High	New	High			X																Medium	Town Budget	Short-term	Goals 1, 2, 3, 4, & 5 Objectives 1.3, 2.1, 2.2, 2.4, 3.1, 3.2, 3.3, 4.1, 4.2, 5.1, 5.2, & 5.3
Initiative #67 — Adopt Emergency Operations Plan and Pre-Disaster Mitigation Plan Description: Adopt Emergency Operations Plan and Pre-Disaster Mitigation Plan. Lead & Support Agency: Town of Monument																								
High	New	High	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Medium	Town Budget	Short-term	Goals 1, 2, 3, 4, & 5 Objectives 1.3, 2.1, 2.2, 2.4, 3.1, 3.2, 3.3, 4.1, 4.2, 5.1, 5.2, & 5.3
Initiative #68 — Enhance Use of Emergency Notification System within the Town Description: Enhance use of emergency notification system within the Town. Lead & Support Agency: Town of Monument																								
Low	New/ Modified from Previous Plan (8.1)	Medium	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	High	Grant	Long-term	Goals 1, 3, 5, & 6 Objectives 1.1, 1.2, 3.1, 5.1, 6.1, 6.2, & 6.3

**TABLE 29-1.
RECOMMENDED MITIGATION INITIATIVES**

Priority	Project Status	Benefit To County	Hazards Mitigated (<i>see hazard ID codes at end of table</i>)																		Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal/Obj.	
			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS	AA	EV					HZ
Initiative #69 — Coordinate with County GIS to Develop Layer for High Risk Areas/Hazards Description: Coordinate with County GIS to develop layer for high risk areas/hazards to educate citizens. Lead & Support Agency: Town of Monument																						Medium	Town Budget	Long-term	Goals 1, 2, 3, 4, 5, & 6 Objectives 1.4, 2.1, 2.2, 3.1, 3.2, 4.3, 5.1, 5.3, & 6.1
Low	New	High	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Medium	Town Budget	Long-term	Goals 1, 2, 3, 4, 5, & 6 Objectives 1.4, 2.1, 2.2, 3.1, 3.2, 4.3, 5.1, 5.3, & 6.1	
Initiative #70 — Install Lightning/Ground Protection on Critical Infrastructure Description: Install lightning/ground protection on critical infrastructure. Lead & Support Agency: Town of Monument																						Medium	Budget Restate	Short-term	Goals 2, 5, & 6 Objectives 2.1, 2.2, 5.1, & 6.1
Medium	New	High									X			X							Medium	Budget Restate	Short-term	Goals 2, 5, & 6 Objectives 2.1, 2.2, 5.1, & 6.1	
PALMER LAKE INITIATIVES																									
Initiative #71 — Adopt Emergency Operations Plan and Pre-Disaster Mitigation Plan Description: Adopt Emergency Operations Plan, Pre-Disaster Mitigation Plan, water mitigation plan, water conservation plan and reusable/renewable water plan, including ordinances limiting landscape/types of grasses and trees grown; water restrictions; mitigation program offered by the Town (free disposal of shrubs/brush tress for mitigating property). Lead & Support Agency: Town of Palmer Lake																						Medium	Town Budget	Short-term	Goals 1, 2, 3, 4, &5 Objectives 1.3, 2.1, 2.2, 2.4, 3.1, 3.2, 3.3, 4.1, 4.2, 5.1, 5.2, & 5.3
High	New	High	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Medium	Town Budget	Short-term	Goals 1, 2, 3, 4, &5 Objectives 1.3, 2.1, 2.2, 2.4, 3.1, 3.2, 3.3, 4.1, 4.2, 5.1, 5.2, & 5.3	
Initiative #72 — Install Lightning/Ground Protection on Critical Infrastructure Description: Obtain/maintain generators for critical infrastructure Lead & Support Agency: Town of Palmer Lake																						High	Town Budget	Short-term	Goals 2, 5, & 6 Objectives 2.1, 2.2, 5.1, & 6.1
High	New	High									X		X	X							High	Town Budget	Short-term	Goals 2, 5, & 6 Objectives 2.1, 2.2, 5.1, & 6.1	

**TABLE 29-1.
RECOMMENDED MITIGATION INITIATIVES**

Priority	Project Status	Benefit To County	Hazards Mitigated (<i>see hazard ID codes at end of table</i>)																	Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal/Obj.	
			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS	AA					EV
Initiative #77 — Ensure Water Sheds have Adequate Fire Protection																								
Description: Ensure water tanks/water sheds have adequate fire protection by developing adequate alternative storage facilities via installation of water tanks, holding ponds etc.																								
Lead & Support Agency: Town of Palmer Lake																								
Low	Modified from Previous Plan (2.2)	Medium																	X	Medium	Town Budget	Short-term	Goals 1, 2, 3, 4, 5, & 6 Objectives 1.3, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, 4.3, 5.1, 5.2, 5.3, & 6.1	
MANITOU SPRINGS INITIATIVES																								
Initiative #78 — Conduct Annual Review and Update of the City of Manitou Springs Emergency Operations Plan																								
Description: Conduct annual review and updates to the City of Manitou Springs EOP.																								
Lead & Support Agency: Manitou Springs Police Department																								
High	New	High		X	X	X		X	X	X	X	X	X	X		X	X	X		X	Low	City Budget	Ongoing	Goals 1, 2, 3, 4, & 5 Objectives 1.2, 1.3, 1.4, 2.1, 2.2, 3.3, 4.2, & 5.1
Initiative #79 — Perform Continuity of Operations Planning																								
Description: Perform Continuity of Operations planning to identify critical functions, essential personnel, vital resources, and critical infrastructure within the county that is necessary to maintain public safety and services.																								
Lead & Support Agency: Manitou Springs Police Department																								
High	Carried Over from Previous Plan (16.3)	High		X	X	X		X	X	X	X	X	X	X		X	X	X		X	Medium	City Budget, Grant	Short-term	Goals 1, 2, 4, & 6 Objectives 1.3, 2.2, 2.3, 4.1, 4.2, 6.1, 6.2, & 6.3
Initiative #80 — Conduct Training to Certify Fire Department Personnel in Wildland Operations																								
Description: Conduct training to certify fire department personnel in Wildland operations.																								
Lead & Support Agency: Manitou Springs Police Department																								
Low	New	Medium																	X	Medium	City Budget, Grant	Short- to Long-term	Goals 2, 4, & 6 Objectives 2.1, 4.1, & 6.2	

**TABLE 29-1.
RECOMMENDED MITIGATION INITIATIVES**

Priority	Project Status	Benefit To County	Hazards Mitigated (<i>see hazard ID codes at end of table</i>)																	Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal/Obj.		
			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W	WS	AA					EV	HZ
Initiative #81 — Adopt Fire Adaptive Community Standards and Practices Description: Encourage communities within the county to adopt Fire Adaptive Community Standards and Practices. Lead & Support Agency: HOAs/ Municipality/Fire Department																									
Medium	New/ Modified from Previous Plan (1.3)	High									X											Medium	To Be Determined	Long-term	Goals 2, 3, & 4 Objectives 2.1, 2.2, 3.1, 3.3, & 4.2
Initiative #82 — Fund and Execute Phase II and Phase III of Fountain Creek Structural Mitigation Projects Description: Fund and execute Phase II and Phase III of Fountain Creek Structural mitigation projects. Lead & Support Agency: Manitou Springs Recovery Manager																									
Medium	Carried Over from Previous Plan (7.1, 7.2, 7.5)	High		X					X			X										High	City Budget, Grants	Short-term	Goals 2 & 5 Objectives 2.2 & 5.2
Initiative #83 — Dredging of Fountain Creek within Manitou Springs Description: Dredging of Fountain Creek within Manitou Springs. Lead & Support Agency: Manitou Springs Recovery Manager																									
Medium	Carried Over from Previous Plan (7.1, 7.2, 7.5)	High		X					X			X										High	City Budget, Grants	Short-term	Goals 2 & 5 Objectives 2.2 & 5.2
Initiative #84 — Expand the Local Early Warning System to Encompass All Hazards Description: Expand the local early warning system to encompass all-hazards. Lead & Support Agency: City of Manitou Springs																									
High	Modified from Previous Plan (15.1)	High	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Low	City Budget, Grants	Short-term	Goals 1 & 3 Objectives 1.1, 1.4, 3.1, 3.2, & 3.3

**TABLE 29-1.
RECOMMENDED MITIGATION INITIATIVES**

Priority	Project Status	Benefit To County	Hazards Mitigated (<i>see hazard ID codes at end of table</i>)															Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal/Obj.			
			A	DF	D	E	ED	F	H	LR	L	MD	PD	T	SS	SW	W					WS	AA	EV
Initiative #85 — Increase Number of Local Responders Trained as HAZMAT Technicians Description: Increase the number of local responders trained as HAZMAT technicians. Lead & Support Agency: Manitou Springs Fire Department																								
Low	Carried Over from Previous Plan (4.3)	Medium																X		X	Medium	City Budget, Grants	Short-term	Goals 1, 4, & 6 Objectives 1.2, 4.2, 4.3, & 6.1
Hazard ID Codes: A = Avalanche; DF = Dam Failure; D = Drought; E = Earthquake; ED = Erosion and Deposition; F = Flood; H= Hailstorm; LR = Landslide or Rockfall; L = Lightning; MD = Mud or Debris Flow; PD = Pandemic Disease; T= Tornado; SS = Subsidence and Sinkholes; SW = Severe Wind; W = Wildfire; WS = Winter Storm; AA = Aircraft Accident; EV = Acts of Extreme Violence; HZ = Hazardous Material Release																								

29.3 PLAN ADOPTION

A hazard mitigation plan must document that it has been formally adopted by the governing body of the jurisdiction requesting federal approval of the plan (44 CFR Section 201.6(c)(5)). For multi-jurisdictional plans, each jurisdiction requesting approval must document that it has been formally adopted. All planning partners fully met the participation requirements specified by the Steering Committee and will seek DMA compliance under this plan. The plan will be submitted for a pre-adoption review to Colorado Office of Emergency Management and the Federal Emergency Management Agency Region VIII prior to adoption. Once pre-adoption approval has been provided, all planning partners will formally adopt the plan. All partners understand that DMA compliance and its benefits cannot be achieved until the plan is adopted. Copies of the resolutions adopting this plan for all planning partners can be found in Appendix E.

29.4 PLAN MAINTENANCE STRATEGY

A hazard mitigation plan must present a plan maintenance process that includes the following (44 CFR Section 201.6(c)(4)):

- A section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan over a 5-year cycle
- A process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate
- A discussion on how the community will continue public participation in the plan maintenance process.

This chapter details the formal process that will ensure that the El Paso County Hazard Mitigation Plan remains an active and relevant document and that the planning partners maintain their 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. This chapter also describes how public participation will be integrated throughout the plan maintenance and implementation process. It explains how the mitigation strategies outlined in this plan 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. The Plan's format allows sections to be reviewed and updated when new data become available, resulting in a plan that will remain current and relevant.

29.4.1 Plan Implementation

The effectiveness of the hazard mitigation plan depends on its implementation and incorporation of its action items into partner jurisdictions' existing plans, policies, and programs. Together, the initiatives in the plan provide a framework for activities that the Partnership can implement over the next 5 years. The planning team and the Steering Committee have established goals and objectives and have prioritized mitigation initiatives that will be implemented through existing plans, policies, and programs.

The El Paso County Office of Emergency Management will have lead responsibility for overseeing the plan implementation and maintenance strategy. Plan implementation and evaluation will be a shared responsibility among all planning partnership members and agencies identified as lead agencies in the mitigation initiative plans.

29.4.2 Steering Committee

The Steering Committee is a total volunteer body that oversaw the development of the plan and made recommendations on key elements of the plan, including the maintenance strategy. It was the Steering

Committee's position that an implementation committee with representation similar to the initial Steering Committee should have an active role in the plan maintenance strategy. Therefore, it is recommended that a steering committee remain a viable body involved in key elements of the plan maintenance strategy. The new steering committee should strive to include representation from the planning partners, as well as other stakeholders in the planning area.

The principal role of the new implementation committee in this plan maintenance strategy will be to review the annual progress report and provide input to the El Paso County Office of Emergency Management on possible enhancements to be considered at the next update. Future plan updates will be overseen by a steering committee similar to the one that participated in this plan development process, so keeping an interim steering committee intact will provide a head start on future updates. Completion of the progress report is the responsibility of each planning partner, not the responsibility of the steering committee. It will simply be the steering committee's role to review the progress report in an effort to identify issues needing to be addressed by future plan updates.

29.4.3 Annual Progress Report

The minimum task of each planning partner will be the evaluation of the progress of its individual initiative plan during a 12-month performance period. This review will include the following:

- Summary of any hazard events that occurred during the performance period and the impact these events had on the planning area
- Review of mitigation success stories
- Review of continuing public involvement
- Brief discussion about why targeted strategies were not completed
- Re-evaluation of the action plan to determine if the timeline for identified projects needs to be amended (such as changing a long-term project to a short-term one because of new funding)
- Recommendations for new projects
- Changes in or potential for new funding options (grant opportunities)
- Impact of any other planning programs or initiatives that involve hazard mitigation.

The planning team has created a template to guide the planning partners in preparing a progress report (see Appendix F). The plan maintenance steering committee will provide feedback to the planning team on items included in the template. The planning team will then prepare a formal annual report on the progress of the plan. This report should be used as follows:

- Posted on the El Paso County Office of Emergency Management website page dedicated to the hazard mitigation plan
- Provided to the local media through a press release
- Presented to planning partner governing bodies to inform them of the progress of initiatives implemented during the reporting period
- For those planning partners that participate in the Community Rating System, the report can be provided as part of the CRS annual re-certification package. The CRS requires an annual recertification to be submitted by October 1 of every calendar year for which the community has not received a formal audit. To meet this recertification timeline, the planning team will strive to complete progress reports between June and September each year.

Uses of the progress report will be at the discretion of each planning partner. Annual progress reporting is not a requirement specified under 44 CFR. However, it may enhance the planning partnership's

opportunities for funding. While failure to implement this component of the plan maintenance strategy will not jeopardize a planning partner's compliance under the DMA, it may jeopardize its opportunity to partner and leverage funding opportunities with the other partners.

29.4.4 Plan Update

Local hazard mitigation plans must be reviewed, revised if appropriate, and resubmitted for approval in order to remain eligible for benefits under the DMA (44 CFR, Section 201.6(d)(3)). The El Paso County partnership intends to update the hazard mitigation plan on a 5-year cycle from the date of initial plan adoption. This cycle may be accelerated to less than 5 years based on the following triggers:

- A Presidential Disaster Declaration that impacts the planning area
- A hazard event that causes loss of life
- A comprehensive update of the County or participating city's comprehensive plan

It will not be the intent of future updates to develop a complete new hazard mitigation plan for the planning area. The update will, at a minimum, include the following elements:

- The update process will be convened through a steering committee.
- The hazard risk assessment will be reviewed and, if necessary, updated using best available information and technologies.
- The initiatives will be reviewed and revised to account for any initiatives completed, dropped, or changed and to account for changes in the risk assessment or new partnership policies identified under other planning mechanisms (such as the comprehensive plan).
- The draft update will be sent to appropriate agencies and organizations for comment.
- The public will be given an opportunity to comment on the update prior to adoption.
- The partnership governing bodies will adopt their respective portions of the updated plan.

29.4.5 Continuing Public Involvement

The public will continue to be apprised of the plan's progress through the El Paso County Office of Emergency Management website. This site will not only house the final plan, it will become the one-stop shop for information regarding the plan, the partnership and plan implementation. Copies of the plan will be distributed to the El Paso County Library. Upon initiation of future update processes, a new public involvement strategy will be initiated based on guidance from a new steering committee. This strategy will be based on the needs and capabilities of the planning partnership at the time of the update. At a minimum, this strategy will include the use of local media outlets within the planning area.

29.4.6 Incorporation into Other Planning Mechanisms

The information on hazard, risk, vulnerability, and mitigation contained in this plan is based on the best science and technology available at the time this plan was prepared. The El Paso County Master Plan and the comprehensive plans of the partner cities are considered to be integral parts of this plan. The County and partner municipalities, through adoption of comprehensive plans and zoning ordinances, have planned for the impact of natural hazards. The plan development process provided the County and the planning partners with the opportunity to review and expand on policies contained within these planning mechanisms. The planning partners used their comprehensive plans and the hazard mitigation plan as complementary documents that work together to achieve the goal of reducing risk exposure to the citizens of the planning area. An update to a comprehensive plan may trigger an update to the hazard mitigation plan.

All municipal planning partners are committed to creating a linkage between the hazard mitigation plan and their individual comprehensive plans by identifying a mitigation initiative as such and giving that initiative a high priority. Other planning processes and programs to be coordinated with the recommendations of the hazard mitigation plan include the following:

- Partners' emergency response plans
- Capital improvement programs
- Municipal codes
- Community design guidelines
- Water-efficient landscape design guidelines
- Stormwater management programs
- Water system vulnerability assessments
- Master fire protection plans.

Some initiatives do not need to be implemented through regulation. Instead, these items can be implemented through the creation of new educational programs, continued interagency coordination, or improved public participation. As information becomes available from other planning mechanisms that can enhance this plan, that information will be incorporated via the update process.

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El Paso County
Hazard Mitigation Plan Update

APPENDIX A.
ACRONYMS AND DEFINITIONS

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ACRONYMS

CCR—Code of Colorado Regulations
CFR—Code of Federal Regulations
CIP—Capital Improvement Plan
CRS—Community Rating System
CWCB—Colorado Water Conservation Board
CWPP—Community Wildfire Protection Plan
DFIRM—Digital Flood Insurance Rate Maps
DMA—Disaster Mitigation Act
EPA—U.S. Environmental Protection Agency
ESA—Endangered Species Act
FEMA—Federal Emergency Management Agency
FERC—Federal Energy Regulatory Commission
FIRM—Flood Insurance Rate Map
FIS—Flood Insurance Study
GIS—Geographic Information System
HAZUS-MH—Hazards, United States-Multi Hazard
HMGP—Hazard Mitigation Grant Program
IBC—International Building Code
IRC—International Residential Code
NEHRP—National Earthquake Hazards Reduction Program
NFIP—National Flood Insurance Program
NOAA—National Oceanic and Atmospheric Administration
NSSA—National Storm Shelter Association
NWS—National Weather Service
PDM—Pre-Disaster Mitigation Grant Program
PDI—Palmer Drought Index
PGA—Peak Ground Acceleration
PHDI—Palmer Hydrological Drought Index
PPACG—Pikes Peak Area Council of Governments
PPRBD—Pikes Peak Regional Building Department

SFHA—Special Flood Hazard Area

SHELDUS—Special Hazard Events and Losses Database for the US

SPI—Standardized Precipitation Index

USFS—U.S. Forest Service

USGS—U.S. Geological Survey

WRAP—Wildfire Risk Assessment Portal

WUI—Wildland Urban Interface

DEFINITIONS

100-Year Flood: The term “100-year flood” can be misleading. The 100-year flood does not necessarily occur once every 100 years. Rather, it is the flood that has a 1 percent chance of being equaled or exceeded in any given year. Thus, the 100-year flood could occur more than once in a relatively short period of time. The Federal Emergency Management Agency (FEMA) defines it as the 1 percent annual chance flood, which is now the standard definition used by most federal and state agencies and by the National Flood Insurance Program (NFIP).

Acres-Foot: An acre-foot is the amount of water it takes to cover 1 acre to a depth of 1 foot. This measure is used to describe the quantity of storage in a water reservoir. An acre-foot is a unit of volume. One acre foot equals 7,758 barrels; 325,829 gallons; or 43,560 cubic feet. An average household of four will use approximately 1 acre-foot of water per year.

Asset: An asset is any man-made or natural feature that has value, including, but not limited to, people; buildings; infrastructure, such as bridges, roads, sewers, and water systems; lifelines, such as electricity and communication resources; and environmental, cultural, or recreational features such as parks, wetlands, and landmarks.

Base Flood: The flood having a 1% chance of being equaled or exceeded in any given year, also known as the “100-year” or “1% chance” flood. The base flood is a statistical concept used to ensure that all properties subject to NFIP are protected to the same degree against flooding.

Basin: A basin is the area within which all surface water—whether from rainfall, snowmelt, springs, or other sources—flows to a single water body or watercourse. The boundary of a river basin is defined by natural topography, such as hills, mountains, and ridges. Basins are also referred to as “watersheds” and “drainage basins.”

Benefit: A benefit is a net project outcome and is usually defined in monetary terms. Benefits may include direct and indirect effects. For the purposes of benefit-cost analysis of proposed mitigation measures, benefits are limited to specific, measurable, risk reduction factors, including reduction in expected property losses (buildings, contents, and functions) and protection of human life.

Benefit/Cost Analysis: A benefit/cost analysis is a systematic, quantitative method of comparing projected benefits to projected costs of a project or policy. It is used as a measure of cost effectiveness.

Building: A building is defined as a structure that is walled and roofed, principally aboveground, and permanently fixed to a site. The term includes manufactured homes on permanent foundations on which the wheels and axles carry no weight.

Capability Assessment: A capability assessment provides a description and analysis of a community’s current capacity to address threats associated with hazards. The assessment includes two components: an inventory of an agency’s mission, programs, and policies, and an analysis of its capacity to carry them

out. A capability assessment is an integral part of the planning process in which a community's actions to reduce losses are identified, reviewed, and analyzed, and the framework for implementation is identified. The following capabilities were reviewed under this assessment:

- Legal and regulatory capability
- Administrative and technical capability
- Fiscal capability

Community Rating System (CRS): The CRS is a voluntary program under the NFIP that rewards participating communities (provides incentives) for exceeding the minimum requirements of the NFIP and completing activities that reduce flood hazard risk by providing flood insurance premium discounts.

Critical Area: An area defined by state or local regulations as deserving special protection because of unique natural features or its value as habitat for a wide range of species of flora and fauna. A sensitive/critical area is usually subject to more restrictive development regulations.

Critical Facility: Facilities and infrastructure that are critical to the health and welfare of the population. These become especially important after any hazard event occurs. For the purposes of this plan, critical facilities include:

- Structures or facilities that produce, use, or store highly volatile, flammable, explosive, toxic and/or water reactive materials;
- Hospitals, nursing homes, and housing likely to contain occupants who may not be sufficiently mobile to avoid death or injury during a hazard event.
- Police stations, fire stations, vehicle and equipment storage facilities, and emergency operations centers that are needed for disaster response before, during, and after hazard events, and
- Public and private utilities, facilities and infrastructure that are vital to maintaining or restoring normal services to areas damaged by hazard events.
- Government facilities.

Dam: Any artificial barrier or controlling mechanism that can or does impound 10 acre-feet or more of water.

Dam Failure: Dam failure refers to a partial or complete breach in a dam (or levee) that impacts its integrity. Dam failures occur for a number of reasons, such as flash flooding, inadequate spillway size, mechanical failure of valves or other equipment, freezing and thawing cycles, earthquakes, and intentional destruction.

Debris Avalanche: Volcanoes are prone to debris and mountain rock avalanches that can approach speeds of 100 mph.

Debris Flow: Dense mixtures of water-saturated debris that move down-valley; looking and behaving much like flowing concrete. They form when loose masses of unconsolidated material are saturated, become unstable, and move down slope. The source of water varies but includes rainfall, melting snow or ice, and glacial outburst floods.

Debris Slide: Debris slides consist of unconsolidated rock or soil that has moved rapidly down slope. They occur on slopes greater than 65 percent.

Disaster Mitigation Act of 2000 (DMA); The DMA is Public Law 106-390 and is the latest federal legislation enacted to encourage and promote proactive, pre-disaster planning as a condition of receiving financial assistance under the Robert T. Stafford Act. The DMA emphasizes planning for disasters before

they occur. Under the DMA, a pre-disaster hazard mitigation program and new requirements for the national post-disaster hazard mitigation grant program (HMGP) were established.

Drainage Basin: A basin is the area within which all surface water- whether from rainfall, snowmelt, springs or other sources- flows to a single water body or watercourse. The boundary of a river basin is defined by natural topography, such as hills, mountains and ridges. Drainage basins are also referred to as **watersheds** or **basins**.

Drought: Drought is a period of time without substantial rainfall or snowfall from one year to the next. Drought can also be defined as the cumulative impacts of several dry years or a deficiency of precipitation over an extended period of time, which in turn results in water shortages for some activity, group, or environmental function. A hydrological drought is caused by deficiencies in surface and subsurface water supplies. A socioeconomic drought impacts the health, well-being, and quality of life or starts to have an adverse impact on a region. Drought is a normal, recurrent feature of climate and occurs almost everywhere.

Earthquake: An earthquake is defined as a sudden slip on a fault, volcanic or magmatic activity, and sudden stress changes in the earth that result in ground shaking and radiated seismic energy. Earthquakes can last from a few seconds to over 5 minutes, and have been known to occur as a series of tremors over a period of several days. The actual movement of the ground in an earthquake is seldom the direct cause of injury or death. Casualties may result from falling objects and debris as shocks shake, damage, or demolish buildings and other structures.

Exposure: Exposure is defined as the number and dollar value of assets considered to be at risk during the occurrence of a specific hazard.

Extent: The extent is the size of an area affected by a hazard.

Fire Behavior: Fire behavior refers to the physical characteristics of a fire and is a function of the interaction between the fuel characteristics (such as type of vegetation and structures that could burn), topography, and weather. Variables that affect fire behavior include the rate of spread, intensity, fuel consumption, and fire type (such as underbrush versus crown fire).

Fire Frequency: Fire frequency is the broad measure of the rate of fire occurrence in a particular area. An estimate of the areas most likely to burn is based on past fire history or fire rotation in the area, fuel conditions, weather, ignition sources (such as human or lightning), fire suppression response, and other factors.

Flash Flood: A flash flood occurs with little or no warning when water levels rise at an extremely fast rate

Flood Insurance Rate Map (FIRM): FIRMs are the official maps on which the Federal Emergency Management Agency (FEMA) has delineated the Special Flood Hazard Area (SFHA).

Flood Insurance Study: A report published by the Federal Insurance and Mitigation Administration for a community in conjunction with the community's Flood Insurance rate Map. The study contains such background data as the base flood discharges and water surface elevations that were used to prepare the FIRM. In most cases, a community FIRM with detailed mapping will have a corresponding flood insurance study.

Floodplain: Any land area susceptible to being inundated by flood waters from any source. A flood insurance rate map identifies most, but not necessarily all, of a community's floodplain as the Special Flood Hazard Area (SFHA).

Floodway: Floodways are areas within a floodplain that are reserved for the purpose of conveying flood discharge without increasing the base flood elevation more than 1 foot. Generally speaking, no

development is allowed in floodways, as any structures located there would block the flow of floodwaters.

Floodway Fringe: Floodway fringe areas are located in the floodplain but outside of the floodway. Some development is generally allowed in these areas, with a variety of restrictions. On maps that have identified and delineated a floodway, this would be the area beyond the floodway boundary that can be subject to different regulations.

Fog: Fog refers to a cloud (or condensed water droplets) near the ground. Fog forms when air close to the ground can no longer hold all the moisture it contains. Fog occurs either when air is cooled to its dew point or the amount of moisture in the air increases. Heavy fog is particularly hazardous because it can restrict surface visibility. Severe fog incidents can close roads, cause vehicle accidents, cause airport delays, and impair the effectiveness of emergency response. Financial losses associated with transportation delays caused by fog have not been calculated in the United States but are known to be substantial.

Freeboard: Freeboard is the margin of safety added to the base flood elevation.

Frequency: For the purposes of this plan, frequency refers to how often a hazard of specific magnitude, duration, and/or extent is expected to occur on average. Statistically, a hazard with a 100-year frequency is expected to occur about once every 100 years on average and has a 1 percent chance of occurring any given year. Frequency reliability varies depending on the type of hazard considered.

Fujita Scale of Tornado Intensity: Tornado wind speeds are sometimes estimated on the basis of wind speed and damage sustained using the Fujita Scale. The scale rates the intensity or severity of tornado events using numeric values from F0 to F5 based on tornado wind speed and damage. An F0 tornado (wind speed less than 73 miles per hour (mph)) indicates minimal damage (such as broken tree limbs), and an F5 tornado (wind speeds of 261 to 318 mph) indicates severe damage.

Goal: A goal is a general guideline that explains what is to be achieved. Goals are usually broad-based, long-term, policy-type statements and represent global visions. Goals help define the benefits that a plan is trying to achieve. The success of a hazard mitigation plan is measured by the degree to which its goals have been met (that is, by the actual benefits in terms of actual hazard mitigation).

Geographic Information System (GIS): GIS is a computer software application that relates data regarding physical and other features on the earth to a database for mapping and analysis.

Hazard: A hazard is a source of potential danger or adverse condition that could harm people and/or cause property damage.

Hazard Mitigation Grant Program (HMGP): Authorized under Section 202 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, the HMGP is administered by FEMA and provides grants to states, tribes, and local governments to implement hazard mitigation actions after a major disaster declaration. The purpose of the program is to reduce the loss of life and property due to disasters and to enable mitigation activities to be implemented as a community recovers from a disaster

Hazards U.S. Multi-Hazard (HAZUS-MH) Loss Estimation Program: HAZUS-MH is a GIS-based program used to support the development of risk assessments as required under the DMA. The HAZUS-MH software program assesses risk in a quantitative manner to estimate damages and losses associated with natural hazards. HAZUS-MH is FEMA's nationally applicable, standardized methodology and software program and contains modules for estimating potential losses from earthquakes, floods, and wind hazards. HAZUS-MH has also been used to assess vulnerability (exposure) for other hazards.

Hydraulics: Hydraulics is the branch of science or engineering that addresses fluids (especially water) in motion in rivers or canals, works and machinery for conducting or raising water, the use of water as a prime mover, and other fluid-related areas.

Hydrology: Hydrology is the analysis of waters of the earth. For example, a flood discharge estimate is developed by conducting a hydrologic study.

Intensity: For the purposes of this plan, intensity refers to the measure of the effects of a hazard.

Inventory: The assets identified in a study region comprise an inventory. Inventories include assets that could be lost when a disaster occurs and community resources are at risk. Assets include people, buildings, transportation, and other valued community resources.

Landslide: Landslides can be described as the sliding movement of masses of loosened rock and soil down a hillside or slope. Fundamentally, slope failures occur when the strength of the soils forming the slope exceeds the pressure, such as weight or saturation, acting upon them.

Lightning: Lightning is an electrical discharge resulting from the buildup of positive and negative charges within a thunderstorm. When the buildup becomes strong enough, lightning appears as a “bolt,” usually within or between clouds and the ground. A bolt of lightning instantaneously reaches temperatures approaching 50,000°F. The rapid heating and cooling of air near lightning causes thunder. Lightning is a major threat during thunderstorms. In the United States, 75 to 100 Americans are struck and killed by lightning each year (see <http://www.fema.gov/hazard/thunderstorms/thunder.shtm>).

Liquefaction: Liquefaction is the complete failure of soils, occurring when soils lose shear strength and flow horizontally. It is most likely to occur in fine grain sands and silts, which behave like viscous fluids when liquefaction occurs. This situation is extremely hazardous to development on the soils that liquefy, and generally results in extreme property damage and threats to life and safety.

Local Government: Any county, municipality, city, town, township, public authority, school district, special district, intrastate district, council of governments (regardless of whether the council of governments is incorporated as a nonprofit corporation under State law), regional or interstate government entity, or agency or instrumentality of a local government; any Indian tribe or authorized tribal organization, or Alaska Native village or organization; and any rural community, unincorporated town or village, or other public entity.

Magnitude: Magnitude is the measure of the strength of an earthquake, and is typically measured by the Richter scale. As an estimate of energy, each whole number step in the magnitude scale corresponds to the release of about 31 times more energy than the amount associated with the preceding whole number value.

Mass movement: A collective term for landslides, mudflows, debris flows, sinkholes and lahars.

Mitigation: A preventive action that can be taken in advance of an event that will reduce or eliminate the risk to life or property.

Mitigation Initiatives: Mitigation initiatives are specific actions to achieve goals and objectives that minimize the effects from a disaster and reduce the loss of life and property.

Objective: For the purposes of this plan, an objective is defined as a short-term aim that, when combined with other objectives, forms a strategy or course of action to meet a goal. Unlike goals, objectives are specific and measurable.

Peak Ground Acceleration: Peak Ground Acceleration (PGA) is a measure of the highest amplitude of ground shaking that accompanies an earthquake, based on a percentage of the force of gravity.

Preparedness: Preparedness refers to actions that strengthen the capability of government, citizens, and communities to respond to disasters.

Presidential Disaster Declaration: These declarations are typically made for events that cause more damage than state and local governments and resources can handle without federal government assistance. Generally, no specific dollar loss threshold has been established for such declarations. A

Presidential Disaster Declaration puts into motion long-term federal recovery programs, some of which are matched by state programs, designed to help disaster victims, businesses, and public entities.

Probability of Occurrence: The probability of occurrence is a statistical measure or estimate of the likelihood that a hazard will occur. This probability is generally based on past hazard events in the area and a forecast of events that could occur in the future. A probability factor based on yearly values of occurrence is used to estimate probability of occurrence.

Repetitive Loss Property: Any NFIP-insured property that, since 1978 and regardless of any changes of ownership during that period, has experienced:

- Four or more paid flood losses in excess of \$1000.00; or
- Two paid flood losses in excess of \$1000.00 within any 10-year period since 1978 or
- Three or more paid losses that equal or exceed the current value of the insured property.

Return Period (or Mean Return Period): This term refers to the average period of time in years between occurrences of a particular hazard (equal to the inverse of the annual frequency of occurrence).

Riverine: Of or produced by a river. Riverine floodplains have readily identifiable channels. Floodway maps can only be prepared for riverine floodplains.

Risk: Risk is the estimated impact that a hazard would have on people, services, facilities, and structures in a community. Risk measures the likelihood of a hazard occurring and resulting in an adverse condition that causes injury or damage. Risk is often expressed in relative terms such as a high, moderate, or low likelihood of sustaining damage above a particular threshold due to occurrence of a specific type of hazard. Risk also can be expressed in terms of potential monetary losses associated with the intensity of the hazard.

Risk Assessment: Risk assessment is the process of measuring potential loss of life, personal injury, economic injury, and property damage resulting from hazards. This process assesses the vulnerability of people, buildings, and infrastructure to hazards and focuses on (1) hazard identification; (2) impacts of hazards on physical, social, and economic assets; (3) vulnerability identification; and (4) estimates of the cost of damage or costs that could be avoided through mitigation.

Risk Ranking: This ranking serves two purposes, first to describe the probability that a hazard will occur, and second to describe the impact a hazard will have on people, property, and the economy. Risk estimates for the City are based on the methodology that the City used to prepare the risk assessment for this plan. The following equation shows the risk ranking calculation:

$$\text{Risk Ranking} = \text{Probability} + \text{Impact (people + property + economy)}$$

Robert T. Stafford Act: The Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 100-107, was signed into law on November 23, 1988. This law amended the Disaster Relief Act of 1974, Public Law 93-288. The Stafford Act is the statutory authority for most federal disaster response activities, especially as they pertain to FEMA and its programs.

Sinkhole: A collapse depression in the ground with no visible outlet. Its drainage is subterranean. It is commonly vertical-sided or funnel-shaped.

Special Flood Hazard Area: The base floodplain delineated on a Flood Insurance Rate Map. The SFHA is mapped as a Zone A in riverine situations. The SFHA may or may not encompass all of a community's flood problems

Stakeholder: Business leaders, civic groups, academia, non-profit organizations, major employers, managers of critical facilities, farmers, developers, special purpose districts, and others whose actions could impact hazard mitigation.

Stream Bank Erosion: Stream bank erosion is common along rivers, streams and drains where banks have been eroded, sloughed or undercut. However, it is important to remember that a stream is a dynamic and constantly changing system. It is natural for a stream to want to meander, so not all eroding banks are “bad” and in need of repair. Generally, stream bank erosion becomes a problem where development has limited the meandering nature of streams, where streams have been channelized, or where stream bank structures (like bridges, culverts, etc.) are located in places where they can actually cause damage to downstream areas. Stabilizing these areas can help protect watercourses from continued sedimentation, damage to adjacent land uses, control unwanted meander, and improvement of habitat for fish and wildlife.

Steep Slope: Different communities and agencies define it differently, depending on what it is being applied to, but generally a steep slope is a slope in which the percent slope equals or exceeds 25%. For this study, steep slope is defined as slopes greater than 33%.

Sustainable Hazard Mitigation: This concept includes the sound management of natural resources, local economic and social resiliency, and the recognition that hazards and mitigation must be understood in the largest possible social and economic context.

Thunderstorm: A thunderstorm is a storm with lightning and thunder produced by cumulonimbus clouds. Thunderstorms usually produce gusty winds, heavy rains, and sometimes hail. Thunderstorms are usually short in duration (seldom more than 2 hours). Heavy rains associated with thunderstorms can lead to flash flooding during the wet or dry seasons.

Tornado: A tornado is a violently rotating column of air extending between and in contact with a cloud and the surface of the earth. Tornadoes are often (but not always) visible as funnel clouds. On a local scale, tornadoes are the most intense of all atmospheric circulations, and winds can reach destructive speeds of more than 300 mph. A tornado’s vortex is typically a few hundred meters in diameter, and damage paths can be up to 1 mile wide and 50 miles long.

Vulnerability: Vulnerability describes how exposed or susceptible an asset is to damage. Vulnerability depends on an asset’s construction, contents, and the economic value of its functions. Like indirect damages, the vulnerability of one element of the community is often related to the vulnerability of another. For example, many businesses depend on uninterrupted electrical power. Flooding of an electric substation would affect not only the substation itself but businesses as well. Often, indirect effects can be much more widespread and damaging than direct effects.

Watershed: A watershed is an area that drains down gradient from areas of higher land to areas of lower land to the lowest point, a common drainage basin.

Wildfire: These terms refer to any uncontrolled fire occurring on undeveloped land that requires fire suppression. The potential for wildfire is influenced by three factors: the presence of fuel, topography, and air mass. Fuel can include living and dead vegetation on the ground, along the surface as brush and small trees, and in the air such as tree canopies. Topography includes both slope and elevation. Air mass includes temperature, relative humidity, wind speed and direction, cloud cover, precipitation amount, duration, and the stability of the atmosphere at the time of the fire. Wildfires can be ignited by lightning and, most frequently, by human activity including smoking, campfires, equipment use, and arson.

Windstorm: Windstorms are generally short-duration events involving straight-line winds or gusts exceeding 50 mph. These gusts can produce winds of sufficient strength to cause property damage. Windstorms are especially dangerous in areas with significant tree stands, exposed property, poorly constructed buildings, mobile homes (manufactured housing units), major infrastructure, and aboveground utility lines. A windstorm can topple trees and power lines; cause damage to residential, commercial, critical facilities; and leave tons of debris in its wake.

Zoning Ordinance: The zoning ordinance designates allowable land use and intensities for a local jurisdiction. Zoning ordinances consist of two components: a zoning text and a zoning map.

El Paso County
Hazard Mitigation Plan Update

APPENDIX B.
PUBLIC OUTREACH

APPENDIX B. PUBLIC OUTREACH

STEERING COMMITTEE MEETINGS

El Paso County opened this planning effort to all eligible local governments in the County. A steering committee was formed to oversee all phases of the plan. The members of this committee included key planning partner staff, citizens, and other stakeholders from within the planning area.

Steering Committee meetings were all open to the public, as well as one meeting before the Board of County Commissioners. Steering Committee meetings were held on March 27, 2014, May 28, 2014, and July 18, 2014 in the Pikes Peak Regional Building Division. The consultant and El Paso County Emergency Preparedness Program Specialist facilitated each Steering Committee meeting, which addressed a set of objectives based on the work plan established for the plan. Meeting agendas, notes and attendance logs can be found in this appendix.

In addition to the Steering Committee meetings, the El Paso County Emergency Preparedness Program Specialist met with representatives from individual participating jurisdictions to coordinate their involvement in the hazard mitigation plan update. These meetings are summarized in the following table:

DATE	JURISDICTION	TOPIC	PARTICIPANTS
04/09/2014	Fountain	PDMP Overview	Mark Boley Luchia Tingley Mark Stanwood
04/11/2014	Green Mountain Falls	PDMP Overview	Mark Boley Lorrie Worthey
05/06/2014	Green Mountain Falls	PDMP Overview	Mark Boley Lorrie Worthey
06/05/2014	Manitou Springs	Mitigation Initiatives	Mark Boley Joe Ribeiro
06/06/2014	Green Mountain Falls	Mitigation Initiatives	Mark Boley Lorrie Worthey Tim Bradley Steve Murphy
06/16/2014	Monument	Capabilities Assessment	Mark Boley Cynthia Sirochman
07/18/2014	Fountain	Mitigation Initiatives	Mark Boley Luchia Tingley Mark Stanwood

DATE	JURISDICTION	TOPIC	PARTICIPANTS
07/25/2014	Manitou Springs	Capabilities Assessment	Mark Boley Joe Ribeiro
07/30/2014	Calhan/Ramah	Mitigation Initiatives	Mark Boley Cindy Tompkins
08/27/2014	Green Mountain Falls	Capabilities Assessment	Mark Boley Lorrie Worthey

The draft plan (FEMA Pending Approval Plan) was presented and reviewed before the El Paso County Board of County Commissioners on XXXXXX XX, 2015. The agenda, attendance log, and meeting notes are attached to this appendix.

HAZARD MITIGATION PLAN QUESTIONNAIRE

A hazard mitigation plan questionnaire was developed to gauge household preparedness for natural hazards and the level of knowledge of tools and techniques that assist in reducing risk and loss from natural hazards as well as to assess the perceived impact of natural hazards on El Paso County residents and businesses. This on-line questionnaire was designed to help identify areas vulnerable to one or more natural hazards. The answers to its questions helped guide the Steering Committee in prioritizing hazards of impact and in selecting goals, objectives and mitigation strategies. Seventy three questionnaires were completed during the course of this planning process. The complete questionnaire and a summary of its findings can be found in this appendix.

El Paso County
Hazard Mitigation Plan Update

APPENDIX C.
MENU OF MITIGATION ALTERNATIVES

APPENDIX C. MENU OF MITIGATION ALTERNATIVES

Mitigation Categories

The measures that communities and individuals can use to protect themselves from, or mitigate the impacts of, natural and man-made hazards fall into six categories:

1. Public Information and Education
2. Preventive Measures
3. Structural Projects
4. Property Protection
5. Emergency Services, and
6. Natural Resources Protection

SAMPLE MITIGATION INITIATIVES:

Hazard: All Hazards

- Incorporate an Emergency Telephone Notification System into the County/Community Emergency Communications Center
- Construct a new Emergency Operations Center
- Develop a Master Generator Plan for the Lake County
- Public Education & Information Program Development
- Develop a Special Needs registry through the 9-1-1 databases to assist with educating, alerting, evacuating, or responding to vulnerable populations during disaster
- Provide for back-up power sources for County essential services facilities to avoid water shortages during extended power outages
- Provide backup power generators to fueling facilities
- Develop enhanced Emergency Planning for Special Needs populations in the County/Community Emergency Operations Plan and other planning documents
- Work with County Businesses to Develop a disaster Resistant Business Program
- Develop a comprehensive public education program on the dangers of carbon monoxide during extended power outages
- Develop multi-lingual Disaster Education public service announcements and educational videos
- Develop a separate “public safety” information area in all public libraries and public recreation facilities to disseminate disaster safety information appropriate to the area and the season
- Train/Educate builders, developers, architects and engineers in techniques of disaster-resistant homebuilding

- Develop and begin to implement a systematic process to evaluate and upgrade aging infrastructure such as transportation, drainage, utilities, and others that could be affected during a major natural disaster.
- Collaborate with other stakeholders (public, businesses, non-profit organizations, government and regulatory agencies, and others) for public outreach efforts.
- Continue the public outreach strategy to share responsibilities amongst the citizens, federal, state, and local governments.
- Develop and maintain the County's Office of Emergency Management natural hazards website.
- Continue to pursue additional grants to implement risk reduction projects.
- Develop preparedness guides for County/Community residents and businesses.
- Continue to improve the communication of severe weather warnings, flood warning, and related information.
- Distribute NOAA weather radios to residents that are most vulnerable to severe weather.
- Determine which critical facilities currently have weather radios and feasibility of hard-wiring.
- Develop an improved critical facilities dataset to use in emergency planning efforts and in the 2018 mitigation plan update.
- Promote structural mitigation to assure redundancy of critical facilities, to include but not limited to roof structure improvement, to meet or exceed building code standards, upgrade of electrical panels to accept generators, etc.
- Pursue "Storm Ready" designation
- Adopt Continuity of Operations Plans for all applicable hazards
- Enforce and/or initiate triggers guiding improvements to structures such as: (< 50% substantial damage/improvements)
- Provide redundancy for critical facilities

Hazard: Floods, Dam/Levee Failure

- Evaluate repetitive loss properties and potential solutions to mitigate existing conditions.
- Continue National Flood Insurance Program (NFIP) and improve the county's Community Rating System (CRS) classification. Examine criteria and establish roles and responsibilities for completion.
- Acquire and remove Repetitive Loss Properties and repeatedly flooded properties where the County's Repetitive Loss and master drainage plans identify acquisition to be the most cost effective and desirable mitigation measure
- Implement structural and non-structural flood mitigation measures for flood-prone properties, as recommended in the basin-wide master drainage plans
- Develop a Dam/Levee Public Education and Evacuation Plan for targeted areas of the community
- Continue to update and revise Basin-wide Master Drainage Plans where changed conditions warrant

- Develop an outreach program aimed at identifying and assisting private dam owners with repairing or decommissioning at risk dams.
- Provide stricter floodplain regulations along the Arkansas River corridor.
- Consider establishing an administrative procedure or change in County/City codes for requiring builders to develop a site drainage plan ensuring “no adverse impact” when they apply for permits for new residential construction.
- Complete GIS and other automated inventories for stormwater, problem drainage areas, DFIRM and other City assets.
- Review compliance with the National Flood Insurance Program with an annual review of the Floodplain Ordinances and any newly permitted activities in the 100-year floodplain.

Hazard: Tornadoes, High Winds

- Develop a model SafeRoom project for a Mobile Home Park in the Lake County
- Develop a SafeRoom plan for County/Community facilities
- Individual SafeRoom rebate program
- Educate residents, building professionals and SafeRoom vendors on the ICC/NSSA “Standard for the Design and Construction of Storm Shelters” and consider incorporating into current regulatory measures
- Develop a program which encourages residents to trim or remove trees that could affect power lines
- Develop a program which encourages residents to obtain a NOAA weather radio.
- Secure emergency generators (or alternative power sources) for all critical and vital facilities
- Develop a program which encourages residents to be prepared including generators, 72-hour self-sufficiency kits, NOAA radios, etc.
- Support programs such as "Tree Watch" that proactively manage problem areas by use of selective removal of hazardous trees, tree replacement, etc.
- Establish and enforce building codes that require all roofs to withstand high wind loads
- Modify land use and environmental regulations to support vegetation management activities that improve reliability in utility corridors
- Modify landscape and other ordinances to encourage appropriate planting near overhead power, cable, and phone lines

Hazard: Lightning

- Install Lightning Warning & Alert Systems in public recreation areas
- Install lightning rods on public structures

Hazard: Expansive Soils

- Research the applicability of establishing an administrative procedure or change in County codes for requiring builders to check for expansive soils when they apply for permits for new residential construction and for using foundations that mitigate expansive soil damages when in a moderate or high-risk area.

Hazard: Extreme Heat

- Review the safety of Playground materials during extreme heat events

Hazard: Wildfire

- Implement a Firewise Community Education and Information Program
- Research the availability of use of possible weapons of mass destruction funds available to enhance fire capability in High Risk areas.
- Create and maintain defensible space around structures and infrastructure
- Update building codes to require the use of fire-retardant building materials in high fire hazard areas
- Require Higher regulatory standards - such as a prohibition on combustible roof materials
- Continue to develop partnerships with other organizations to implement wildfire mitigation plans and other hazard reduction programs.
- Complete and maintain a Community Wildfire Protection Plan including the assessment of parcels identified in the Wildland Urban Interface.
- Work with Colorado Forestry Association and Department of Natural Resources to review zoning and ordinances to identify areas to include wildfire mitigation principles.
- Investigate the status of and need to create additional emergency vehicle access in high hazard areas
- Seek alternative water supplies in urban wildland interface areas.

Hazard: Earthquake

- Incorporate earthquakes in the Office of Emergency Management public outreach strategy.
- Work with Colorado Geological to continue the study and analyze earthquakes related to appropriate levels of seismic safety in building codes and practices.
- Further enhance seismic risk assessment to target high hazard buildings for mitigation opportunities.
- Develop a post disaster action plan that includes a grant funding and debris removal components.

Hazard: Avalanche

- Ensure hazard maps are current and updated on a regular basis
- Enact tools to help manage development in hazard areas: better land controls, tax incentives, information
- Develop strategy to take advantage of post-disaster opportunities as they arise
- Continue to educate the public on the avalanche hazard and appropriate risk reduction alternatives.

Hazard: Drought

- Develop a public education on drought resistance
- Identify alternative water supplies for time of drought. Mutual aid agreements with alternative suppliers.
- Consider providing incentives to property owners that utilize drought resistant landscapes in the design of their homes.

- Develop standards that require drought resistant landscapes on County and community owned facilities
- Implement storm water retention in regions ideally suited for groundwater recharges.
- Develop a residential and local business program to modify plumbing systems - i.e. water saving kits

APPENDIX D.
WORKSHEETS FOR RECOMMENDED MITIGATION
INITIATIVES

El Paso County
Hazard Mitigation Plan Update

APPENDIX E.
PLAN ADOPTION RESOLUTIONS FROM PLANNING PARTNERS

**APPENDIX E.
PLAN ADOPTION RESOLUTIONS FROM PLANNING PARTNERS**

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

To Be Provided With Final Release

**RESOLUTION NO. 15-333****BOARD OF COUNTY COMMISSIONERS
COUNTY OF EL PASO, STATE OF COLORADO****RESOLUTION TO ADOPT THE EL PASO COUNTY
MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN**

WHEREAS, pursuant to C.R.S. §§ 30-11-101(1)(d), 30-11-103, and 30-11-107(1)(a), the Board of County Commissioners of El Paso County, Colorado (“Board” or “County”), has the legislative authority to manage the business and concerns of the County to ensure the welfare and interests of the County and its inhabitants; and

WHEREAS, the County recognizes the threat natural hazards pose to the citizens of the County and that undertaking hazard mitigation actions will reduce the potential for harm to citizens and property in the County; and

WHEREAS, in order to participate in funding for mitigation projects under pre and post disaster grant programs authorized by the Federal Emergency Management Agency (“FEMA”), it is necessary for the County to adopt a hazard mitigation plan; and

WHEREAS, staff from the El Paso County Public Services Department, Office of Emergency Management, the El Paso County Sheriff’s Office, as well as agency and municipal partners from other local jurisdictions participating in the hazard mitigation plan, participated and contributed to the planning and development of the final document submitted for approval to FEMA; and

WHEREAS, the Colorado Division of Homeland Security and Emergency Management and FEMA, Region VIII, officials have reviewed the El Paso County Multi-Jurisdictional Hazard Mitigation Plan (“Plan”), attached hereto as Exhibit 1, and have designated the Plan “approvable pending adoption,” and affirmed said Plan meets the requirements of the Stafford Act and 44 C.F.R. § 201.6, for a local hazard mitigation plan, pending adoption by participating jurisdictions in the County; and

WHEREAS, jurisdictions participating in the El Paso County Multi-Jurisdictional Hazard Mitigation Plan, which jurisdictions must approve the Plan prior to final approval by FEMA, are: the City of Fountain, the City of Manitou Springs, the Town of Calhan, the Town of Green Mountain Falls, the Town of Monument, the Town of Palmer Lake, and the Town of Ramah; and

WHEREAS, the proposed El Paso County Multi-Jurisdictional Hazard Mitigation Plan has been posted on the County’s website for a period of 12 days, providing an opportunity for citizens of the County to provide comment and input into the Plan prior to adoption; and

WHEREAS, staff from the El Paso County Public Services Department, Office of Emergency Management, have participated in the mitigation planning process and recommend approval by the Board of the El Paso County Multi-Jurisdictional Hazard Mitigation Plan.

NOW THEREFORE, BE IT RESOLVED that the Board of County Commissioners hereby adopts the El Paso County Multi-Jurisdictional Hazard Mitigation Plan as the multi-hazard

mitigation plan for El Paso County, Colorado, at a public hearing on this 11th day of August, 2015.

BE IT FURTHER RESOLVED that the El Paso County Public Services Department, Office of Emergency Management, is authorized to submit this resolution and related documents to the Colorado Division of Homeland Security and Emergency Management and the Federal Emergency Management Agency, Region VIII, officials to enable the final approval of the El Paso County Multi-Jurisdictional Hazard Mitigation Plan once officials have received resolutions for adoption from all the aforementioned participating jurisdictions.

BE IT FURTHER RESOLVED that Amy Lathen, duly elected, qualified member and Chair of the Board of County Commissioners, or Dennis Hisey, duly elected, qualified member and Vice Chair of the Board of County Commissioners, be and is hereby authorized and appointed on behalf of the Board to execute any and all documents necessary to carry out the intent of the Board as described herein.

DONE THIS 11th day of August, 2015, at Colorado Springs, Colorado.

ATTEST:

BOARD OF COUNTY COMMISSIONERS
EL PASO COUNTY, COLORADO

By: _____



Chuck Hagerman
El Paso County Clerk and Recorder

By: _____



Amy Lathen, Chair

RESOLUTION NO. 2015-04

A RESOLUTION ADOPTING THE EL PASO COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

WHEREAS, The Town of Calhan, with the assistance from El Paso County, has gathered information and prepared the El Paso County Multi-Jurisdictional Hazard Mitigation Plan; and

WHEREAS, The Hazard Mitigation Plan has been prepared in accordance with FEMA requirements at 44 C.F.R. 201.6; and

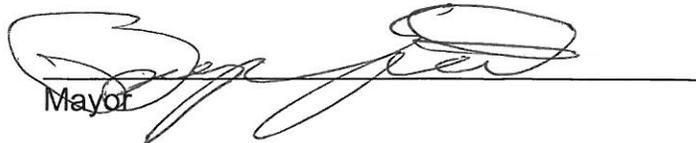
WHEREAS, undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and

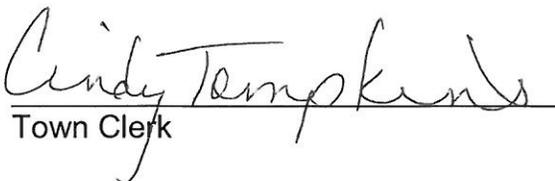
WHEREAS, an adopted Multi-Hazard Mitigation Plan is required as a condition for future funding of mitigation projects under FEMA's pre- and post-mitigation grant programs; and

NOW THEREFORE BE IT RESOLVED by the Board of Trustees of the Town of Calhan:

The Town of Calhan adopts the El Paso County Multi-Jurisdictional Hazard Mitigation Plan as this jurisdiction's Multi-Hazard Mitigation Plan, and resolves to execute the actions in the Plan.

Adopted this 10th day of August, 2015 at the meeting of the Town of Calhan.


Mayor

ATTEST: 
Town Clerk



RESOLUTION NO.15-029

A RESOLUTION OF THE CITY OF FOUNTAIN ADOPTING THE COMPREHENSIVE UPDATE TO THE EL PASO COUNTY MULTI-HAZARD MITIGATION PLAN FORMERLY KNOWN AS THE PRE-DISASTER MITIGATION PLAN.

WHEREAS, *City of Fountain* with the assistance from *El Paso County Office of Emergency Management*, has gathered information and prepared the *El Paso County Multi-Hazard Mitigation Plan*; and,

WHEREAS, the *El Paso County Multi-Hazard Mitigation Plan* has been prepared in accordance with FEMA requirements at 44 C.F.R. 201.6; and,

WHEREAS, *City of Fountain* is a local unit of government that has afforded the citizens an opportunity to comment and provide input in the Plan and the actions in the Plan; and,

NOW THEREFORE, BE IT RESOLVED by the City Council of the City of Fountain that the City of Fountain adopts the *El Paso County Multi-Hazard Mitigation Plan* consisting of approximately 550 pages that was placed on file in the Office of the City Clerk on August 18, 2015 and which is incorporated by reference into this Resolution, as this jurisdiction's Multi-Hazard Mitigation Plan, and resolves to execute the actions in the Plan.

ADOPTED this 25th day of August, 2015 at the meeting of the *City Council of the City of Fountain, Colorado*, and signed by the Mayor.



Silvia Huffman
Silvia Huffman, City Clerk

Gabriel P. Ortega

Gabriel P. Ortega, Mayor

TOWN OF GREEN MOUNTAIN FALLS, COLORADO

RESOLUTION NO. 2015-8-4A

**A RESOLUTION ADOPTING THE COMPREHENSIVE EL PASO COUNTY
MULTI-HAZARD MITIGATION PLAN**

WHEREAS, the Board of Trustees of the Town of Green Mountain Falls, Colorado, pursuant to Colorado statute and the Town of Green Mountain Falls Municipal Code, is vested with the authority of administering the affairs of the Town of Green Mountain Falls, Colorado;

WHEREAS, the City of Green Mountain falls in conjunction with the County of El Paso is recognizing the FEMA approval of the El Paso County Multi-Hazard Mitigation Plan, which inventories the threat that natural hazards pose to people and property within our community; and

WHEREAS, undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and

WHEREAS, The United States Congress passed the Disaster Mitigation Act of 2000 (Disaster Mitigation Act) emphasizing the need for pre-disaster mitigation of potential hazards; and

WHEREAS, the Disaster Mitigation Act made available hazard mitigation grants to state and local governments; and

WHEREAS, an adopted Multi-Hazard Mitigation Plan is required as a condition for future funding of mitigation projects under FEMA's pre- and post-mitigation grant programs; and

WHEREAS, the Town of Green Mountain Falls desires to comply with the requirements set forth in the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the El Paso County Multi-Hazard Mitigation Plan; and

WHEREAS, adoption of the El Paso County Multi-Hazard Mitigation Plan demonstrates the Town of Green Mountain Falls' commitment to fulfilling the mitigation goals outlined in the Multi-Hazard Mitigation Plan.

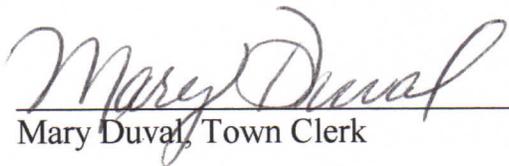
NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF TRUSTEES OF THE TOWN OF GREEN MOUNTAIN FALLS, COLORADO AS FOLLOWS:

1. The Town of Green Mountain Falls hereby adopts the 2015 El Paso County Multi-Hazard Mitigation Plan as the multi-hazard mitigation plan for the Town of Green Mountain Falls, Colorado.
2. The Town of Green Mountain Falls will submit this Resolution and any related documents to the Colorado Division of Emergency Management and Federal Emergency Management Agency, Region VIII to enable the plan's final approval.
3. Severability. If any article, section, paragraph, sentence, clause, or phrase of this Resolution is held to be unconstitutional or invalid for any reason such decision shall not affect the validity or constitutionality of the remaining portions of this Resolution. The Board of Trustees hereby declares that it would have passed this resolution and each part or parts thereof irrespective of the fact that any one part or parts be declared unconstitutional or invalid.
4. Repeal. Existing resolutions or parts of resolutions covering the same matters embraced in this Resolution are hereby repealed and all resolutions or parts of resolutions inconsistent with the provisions of this Resolution are hereby repealed.

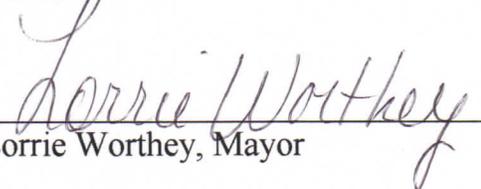
INTRODUCED, RESOLVED, AND PASSED AT A REGULAR MEETING OF THE BOARD OF TRUSTEES OF THE TOWN OF GREEN MOUNTAIN FALLS ON THIS 4TH DAY OF AUGUST, 2015.

ATTEST:

TOWN OF GREEN MOUNTAIN FALLS,
COLORADO



Mary Duval, Town Clerk

BY: 

Lorrie Worthey, Mayor

RESOLUTION

A RESOLUTION ADOPTING THE COUNTY-WIDE PRE-DISASTER MITIGATION PLAN

WHEREAS, the City of Manitou Springs, with the assistance from El Paso County, Office of Emergency Management, has gathered information and prepared the El Paso County Multi-Jurisdictional, Hazard Mitigation Plan – Update June 2015; and,

WHEREAS, the El Paso County Multi-Jurisdictional, Hazard Mitigation Plan – Update June 2015 has been prepared in accordance with FEMA requirements at 44 C.F.R. 201.6; and,

WHEREAS, the City of Manitou Springs, a Home-Rule Municipality has afforded the citizens an opportunity to comment and provide input in the Plan and the actions in the Plan; and

WHEREAS, the City of Manitou Springs has reviewed the Plan and affirms that the Plan will be updated no less than every five years.

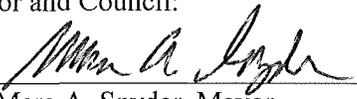
NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF MANITOU SPRINGS, COLORADO, THAT:

Section 1. The City of Manitou Springs adopts the El Paso County Multi-Jurisdictional, Hazard Mitigation Plan – Update June 2015 as this jurisdiction’s Multi-Hazard Mitigation Plan, and resolves to execute the actions in the Plan.

Section 2. This Resolution shall become effective immediately upon adoption by City Council.

Adopted at the regular meeting of the City Council of the City of Manitou Springs, Colorado on this 4th day of August 2015.

Mayor and Council:

By: 
Marc A. Snyder, Mayor

Attest:

Donna J. Kast, City Clerk

TOWN OF MONUMENT
RESOLUTION NO. 22 - 2015

**A RESOLUTION ADOPTING THE EL PASO COUNTY MULTI-JURISDICTIONAL,
HAZARD MITIGATION PLAN**

WHEREAS, the Town of Monument, with the assistance from the El Paso County Office of Emergency Management, has gathered information and prepared the El Paso County Multi-Jurisdictional, Hazard Mitigation Plan; and,

WHEREAS, the El Paso County Multi-Jurisdictional, Hazard Mitigation Plan has been prepared in accordance with FEMA requirements at 44 C.F.R. 201.6; and,

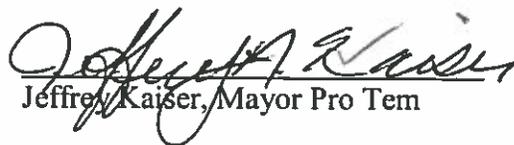
WHEREAS, the Town of Monument is a local unit of government that has afforded the citizens an opportunity to comment and provide input in the Plan and the actions in the Plan; and

WHEREAS, the Town of Monument has reviewed the Plan and affirms that the Plan will be updated no less than every five years;

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF TRUSTEES OF THE TOWN OF MONUMENT, COLORADO adopts the El Paso County Multi-Jurisdictional, Hazard Mitigation Plan and resolves to execute the actions in the Plan.

PASSED AND RESOLVED by the Board of Trustees of the Town of Monument, El Paso County, Colorado, this 3rd day of August, 2015 by a vote of 5 for and 0 against.

TOWN OF MONUMENT


Jeffrey Kaiser, Mayor Pro Tem

ATTEST:



Cynthia Sirochman, CMC
Town Clerk

RESOLUTION 6, 2015
TOWN OF PALMER LAKE

A Resolution of the Town of Palmer Lake Adopting the Comprehensive Update to the El Paso Multi-Jurisdictional, All Hazard Pre-Disaster Mitigation Plan.

WHEREAS, the Town of Palmer Lake in conjunction with the County of EL Paso is recognizing the FEMA approval of the El Paso Multi-Jurisdictional, All Hazard Pre-Disaster Mitigation Plan update, which inventories the threat that natural hazards pose to people and property within our community; and

WHEREAS, undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and

WHEREAS, The United States Congress passed the Disaster Mitigation Act of 2000 (Disaster Mitigation Act) emphasizing the need for pre-disaster mitigation of potential hazards; and

WHEREAS, the Disaster Mitigation Act made available hazard mitigation grants to state and local governments; and

WHEREAS, an adopted the El Paso Multi-Jurisdictional, All Hazard Pre-Disaster Mitigation Plan is required as a condition for future funding of mitigation projects under FEMA's pre- and post-mitigation grant programs; and

WHEREAS, The Town of Palmer Lake desires to comply with the requirements set forth in the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the the El Paso Multi-Jurisdictional, All Hazard Pre-Disaster Mitigation Plan; and

WHEREAS, adoption of the the El Paso Multi-Jurisdictional, All Hazard Pre-Disaster Mitigation Plan demonstrates the Town of Palmer Lake commitment to fulfilling the mitigation goals outlined in the the El Paso Multi-Jurisdictional, All Hazard Pre-Disaster Mitigation Plan; and

NOW, THEREFORE, BE IT RESOLVED BY THE TOWN COUNCIL OF THE TOWN OF PALMER LAKE, COLORADO, as follows:

1. That the Town of Palmer Lake hereby adopts the 2014 updated the El Paso Multi-Jurisdictional, All Hazard Pre-Disaster Mitigation Plan for the Town of Palmer Lake, Colorado.
2. The Town of Palmer Lake will submit this Resolution and any related documents to the Colorado Division of Emergency Management and Federal Emergency Management Agency, Region VIII to enable the plan's final approval.

ADOPTED this 10th day of September, 2015, by the Town of Palmer Lake Town Council.

Town of Palmer Lake


Nikki McDonald/ Mayor

ATTEST:


Tara Berreth/Town Clerk

RESOLUTION 2015-05

A RESOLUTION ADOPTING THE EL PASO COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

WHEREAS, the Town of Ramah, with the assistance from El Paso County, has gathered information and prepared the El Paso County Multi-Jurisdictional Hazard Mitigation Plan; and

WHEREAS, the Hazard Mitigation Plan has been prepared in accordance with FEMA requirements at 44 C.F.R. 201.6; and

WHEREAS, undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and

WHEREAS, an adopted Multi-Hazard Mitigation Plan is required as a condition for future funding of mitigation projects under FEMA's pre- and post-mitigation grant programs.

NOW THEREFORE, be it resolved by the Board of Trustees of the Town of Ramah:

The Town of Ramah adopts the El Paso County Multi-Jurisdictional Hazard Mitigation Plan as this jurisdiction's Multi-Hazard Mitigation Plan, and resolves to execute the actions in the Plan.

READ AND ADOPTED THIS 11TH DAY OF NOVEMBER, 2015.


Dennis Carpenter, Mayor

Attest:


Cindy Tompkins, Town Clerk

El Paso County
Hazard Mitigation Plan Update

APPENDIX F.
EXAMPLE PROGRESS REPORT

APPENDIX F. EXAMPLE PROGRESS REPORT

El Paso County Hazard Mitigation Plan Update Annual Progress Report

Reporting Period: 2014-2015

Background: El Paso County and participating cities and special purpose districts in the county developed a hazard mitigation plan to reduce risk from all hazards by identifying resources, information, and strategies for risk reduction. The federal Disaster Mitigation Act of 2000 requires state and local governments to develop hazard mitigation plans as a condition for federal disaster grant assistance. To prepare the plan, the participating partners organized resources, assessed risks from natural hazards within the county, developed planning goals and objectives, reviewed mitigation alternatives, and developed an action plan to address probable impacts from natural hazards. By completing this process, these jurisdictions maintained compliance with the Disaster Mitigation Act, achieving eligibility for mitigation grant funding opportunities afforded under the Robert T. Stafford Act. The plan can be viewed on-line at:

<http://www.co.ElPaso.co.us/OEM/default.aspx>

Summary Overview of the Plan's Progress: The performance period for the Hazard Mitigation Plan became effective on ____, 2015, with the final approval of the plan by FEMA. The initial performance period for this plan will be 5 years, with an anticipated update to the plan to occur before ____, 2019. As of this reporting period, the performance period for this plan is considered to be __% complete. The Hazard Mitigation Plan has targeted 85 hazard mitigation initiatives to be pursued during the 5-year performance period. As of the reporting period, the following overall progress can be reported:

- __ out of __ initiatives (__%) reported ongoing action toward completion.
- __ out of __ initiatives (__%) were reported as being complete.
- __ out of __ initiatives (__%) reported no action taken.

Purpose: The purpose of this report is to provide an annual update on the implementation of the action plan identified in the El Paso County Hazard Mitigation Plan Update. The objective is to ensure that there is a continuing and responsive planning process that will keep the Hazard Mitigation Plan dynamic and responsive to the needs and capabilities of the partner jurisdictions. This report discusses the following:

- Natural hazard events that have occurred within the last year
- Changes in risk exposure within the planning area (all of El Paso County)
- Mitigation success stories
- Review of the action plan
- Changes in capabilities that could impact plan implementation
- Recommendations for changes/enhancement.

The Hazard Mitigation Plan Steering Committee: The Hazard Mitigation Plan Steering Committee, made up of planning partners and stakeholders within the planning area, reviewed and approved this progress report at its annual meeting held on ____, 201__. It was determined through the

Address the following in the “status” column of the following table:

- Was any element of the initiative carried out during the reporting period?
- If no action was completed, why?
- Is the timeline for implementation for the initiative still appropriate?
- If the initiative was completed, does it need to be changed or removed from the action plan?

TABLE 2. ACTION PLAN MATRIX				
Action Taken? (Yes or No)	Time Line	Priority	Status	Status (X, O,✓)
Initiative #1 Improve Multi-Jurisdictional Hazard Mitigation Plan				
Initiative #2 Review and Update EOP				
Initiative #3 Perform Continuity of Operations Planning				
Initiative #4 Partner with Local Businesses, CoC, NGOs to provide critical services				
Initiative #5 Enhance Awareness and Preparedness of Residents				
Initiative #6 Enhance Emergency Preparedness Information and Community Outreach				
Initiative #7 Develop Emergency Preparedness Public Service Announcements and Educational Content				
Initiative #8 Multi-faceted Public Awareness Campaign to Increase Enrollment in Emergency Notification System				
Initiative #9 Create an All-Hazard Zoning Plan				
Initiative #10 Encourage Communities to Adopt Fire Adaptive Community Standards				
Initiative #11 Identify Areas for Cisterns or Hydrants				
Initiative #12 Mitigation Efforts on Publicly Owned Properties Based on Fire Adaptive Community Standards				
Initiative #13 Conduct Hazardous Materials Flow Study				
Initiative #14 Increase Number of Personnel Trained as HAZMAT Technicians and Specialists				

**TABLE 2.
ACTION PLAN MATRIX**

Action Taken? (Yes or No)	Time Line	Priority	Status	Status (X, O,✓)
Initiative #15 Acquire Software for Facility Tracking and Multi-Jurisdictional Response				
Initiative #16 Expand Local Emergency Planning Committee				
Initiative #17 Enhance Communication Network Related to Delay or Closure of County Facilities and Roadways				
Initiative #18 Identify Critical Roads and Emergency Routes				
Initiative #19 Reduce Roadway Hazards				
Initiative #20 Develop Strategic Flood Warning Plan				
Initiative #21 Identify Drainage Basins that Require Flood Warning Systems and Explore Early Warning Systems for Flash Floods				
Initiative #22 Install Electronic Warning Signs and Road Closure Barriers on Highway 24				
Initiative #23 Maintain Catch Basins and Debris Fences in Critical Areas				
Initiative #24 Identify High-Threat Properties that may be Relocated or Purchased				
Initiative #25 Channel Stabilization, Improvement, and Restoration in Fountain Creek				
Initiative #26 Stabilize or Remove Rocks Along County Roadways				
Initiative #27 Increase Use of Weather Radio Announcements				
Initiative #28 Increase Municipalities That Meet Criteria of Storm Ready or Weather Ambassador Programs				
Initiative #29 Ensure Runway Safety Zones are Considered During Community Planning				
Initiative #30 Establish Severe Weather Protective Areas				
Initiative #31 Provide Education to First Responders to Minimize Effects of Disease on Response Capability				

TABLE 2. ACTION PLAN MATRIX				
Action Taken? (Yes or No)	Time Line	Priority	Status	Status (X, O,✓)
Initiative #32 Establish More Robust Vaccination Program				
CALHAN/RAMAH INITIATIVES				
Initiative #33: Identify At-Risk Residents and Potential Safe Shelters				
Initiative #34: Utilize Water Bills to Disseminate Emergency Response Information				
Initiative #35: Plant Vegetation Along Roadways to Mitigate Erosion				
Initiative #36	Develop Decision Tree Outlining Roles and Responsibilities During Emergencies			
Initiative #37	Obtain GIS Data			
Initiative #38	Identify Temporary Source of Water			
FOUNTAIN INITIATIVES				
Initiative #39	Put Flood Information on the City Website			
Initiative #40	Flood Information Handouts at City Hall			
Initiative #41	Put Flood Information in the Local Paper			
Initiative #42	Map and Assess Community Vulnerability to Seismic Hazards			
Initiative #43	Coordinate Conservation and Mitigation Actions with the Water Department			
Initiative #44	Conduct Lightning Awareness			

**TABLE 2.
ACTION PLAN MATRIX**

Action Taken? (Yes or No)	Time Line	Priority	Status	Status (X, O,✓)
Initiative #45	Protect Critical infrastructure			
Initiative #46	Coordinate Flood Mitigation with City Drainage Plans			
Initiative #47:	Tornado Plans and Drills for Public Buildings			
Initiative #48	Develop Community Wildland Fire Protection Plan			
Initiative #49	Develop Wildland Fire Interface Code			
Initiative #50	Participate in Local Emergency Planning Committee			
Initiative #51	Expand Vaccination Program			
Initiative #52	Meet Criteria for Storm Ready Community			
Initiative #53	Develop a Coordinated Response Plan for Acts of Violence			
Initiative #54	Develop Coordinated Rapid Response to Aircraft Incidents			
Initiative #55	Conduct Annual Review and Tri-annual Update of the Fountain EOP			
GREEN MOUNTAIN FALLS INITIATIVES				
Initiative #56	Install Cell Phone Tower Within Town			
Initiative #57	Work with Property Owners to Mitigate Wildfire Risks to Property			
Initiative #58	Update Town Website with Emergency Information			
Initiative #59	Review and Update Current Disaster Plan			
Initiative #60	Install Early Warning System in Town Hall			

TABLE 2. ACTION PLAN MATRIX				
Action Taken? (Yes or No)	Time Line	Priority	Status	Status (X, O,✓)
Initiative #61 Mitigating Flood Debris on Green Mountain Falls Property				
MONUMENT INITIATIVES				
Initiative #62 MOU with D38 for Use of Their Facilities if needed				
Initiative #63 Obtain Generators for Critical Infrastructure				
Initiative #64 Add a Link to the Town Website "Emergency Preparedness"				
Initiative #65 Ensure Water Tanks/Water Sheds Have Adequate Fire Protection				
Initiative #66 Adopt Water Mitigation Plan, Water Conservation Plan and Reusable/Renewable Water Plan				
Initiative #67 Adopt Emergency Operations Plan and Pre-Disaster Mitigation Plan				
Initiative #68 Enhance Use of Emergency Notification System within the Town				
Initiative #69 Coordinate with County GIS to Develop Layer for High Risk Areas/Hazards				
Initiative #70 Install Lightning/Ground Protection on Critical Infrastructure				
PALMER LAKE INITIATIVES				
Initiative #71 Adopt Emergency Operations Plan and Pre-Disaster Mitigation Plan				
Initiative #72 Install Lightning/Ground Protection on Critical Infrastructure				
Initiative #73 Implement Emergency Notification System Within the Town				
Initiative #74 Develop MOU with D38 for Use of Their Facilities if Needed				
Initiative #75 Procure and Implement GIS Layer for High Risk Areas				

TABLE 2. ACTION PLAN MATRIX				
Action Taken? (Yes or No)	Time Line	Priority	Status	Status (X, O,✓)
Initiative #76	Add a Link to the Town Website "Emergency Preparedness"			
Initiative #77	Ensure Water Sheds have Adequate Fire Protection			
MANITOU SPRINGS INIATIVES				
Initiative #78	Conduct Annual Review and Update of the City of Manitou Springs Emergency Operations Plan			
Initiative #79	Perform Continuity of Operations Planning			
Initiative #80	Conduct Training to Certify Fire Department Personnel in Wildland Operations			
Initiative #81	Adopt Fire Adaptive Community Standards and Practices			
Initiative #82	Fund and Execute Phase II and Phase III of Fountain Creek Structural Mitigation Projects			
Initiative #83	Dredging of Fountain Creek within Manitou Springs			
Initiative #84	Expand the Local Early Warning System to Encompass All Hazards			
Initiative #85	Increase Number of Local Responders Trained as HAZMAT Technicians			
Completion status legend: ✓ = Project Completed O = Action ongoing toward completion X = No progress at this time				

Changes That May Impact Implementation of the Plan: *(Insert brief overview of any significant changes in the planning area that would have a profound impact on the implementation of the plan. Specify any changes in technical, regulatory and financial capabilities identified during the plan’s development)*

Recommendations for Changes or Enhancements: Based on the review of this report by the Hazard Mitigation Plan Steering Committee, the following recommendations will be noted for future updates or revisions to the plan:

- _____
- _____
- _____
- _____
- _____
- _____

Public review notice: *The contents of this report are considered to be public knowledge and have been prepared for total public disclosure. Copies of the report have been provided to the governing boards of all planning partners and to local media outlets and the report is posted on the El Paso County Hazard Mitigation Plan website. Any questions or comments regarding the contents of this report should be directed to:*

Insert Contact Info Here



APPENDIX D. WORKSHEETS FOR RECOMMENDED MITIGATION INITIATIVES

The planning partners and the Steering Committee determined that some initiatives could be implemented to provide hazard mitigation benefits countywide. The individual worksheets for each recommended initiative are provided in this appendix.



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El Paso County Mitigation Action Worksheet

Name of Jurisdiction: El Paso County

Number: 1

Mitigation Action/Initiative: Continue to improve the El Paso County Multi-Jurisdictional Hazard Mitigation Plan through annual reviews and incorporation of incident lessons learned

Assessing the Risk	
Hazard(s) addressed:	Wildfire, HAZMAT Transportations, Winter Storm, Flooding, Mud or Debris Flow, Erosion or Deposition, HAZMAT Fixed Site, Tornado, Drought, Hailstorm, Aircraft Accident, Lighting, Pandemic Disease, Landslide or Rockfall
Specific problem being mitigated:	Improve mitigation planning and coordination
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	<ol style="list-style-type: none"> 1. Continue to improve the El Paso County Multi-Jurisdictional Hazard Mitigation Plan through annual reviews and incorporation of incident lessons learned 2. No action, keep current Multi-Jurisdictional Hazard Mitigation Plan in place with no updates or reviews 3. Rely on each jurisdiction to respond to incidents individually
Action/Project Intended for Implementation	
Description of Selected Action/Project	Continue to improve the El Paso County Multi-Jurisdictional Hazard Mitigation Plan through annual reviews and incorporation of incident lessons learned
Action/Project Category	Local Plans and Regulations (LPR)
Goals/Objectives Met	Goals 1, 2, 3, 4, & 5 Objectives 1.2,1.3,1.4,2.1,2.2,3.3,4.1,4.2,5.1,5.3
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Life, Property, and Economic
Estimated Cost	Low
Priority*	High
Plan for Implementation	
Responsible Organization	El Paso County Sheriff Office- Emergency Service Division
Local Planning Mechanism	El Paso County Sheriff Office- Emergency Service Division Municipalities and County Agencies
Potential Funding Sources	Local Budgets
Timeline for Completion	Ongoing

* Refer to results of Prioritization (page 2)



Prioritization

Number: 1

Mitigation Action/Initiative: Continue to improve the El Paso County Multi-Jurisdictional Hazard Mitigation Plan through annual reviews and incorporation of incident lessons learned

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	
Property Protection	0	
Cost-Effectiveness	1	
Technical	0	
Political	1	
Legal	1	
Fiscal	1	
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	0	
Agency Champion	1	
Other Community Objectives	1	
Total	9	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: El Paso County

Number: 2

Mitigation Action/Initiative: Conduct annual review and tri-annual update of the El Paso County Emergency Operations Plan

Assessing the Risk	
Hazard(s) addressed:	Wildfire, HAZMAT Transportations, Winter Storm, Flooding, Mud or Debris Flow, Erosion or Deposition, HAZMAT Fixed Site, Tornado, Drought, Hailstorm, Aircraft Accident, Lighting, Pandemic Disease, Landslide or Rockfall
Specific problem being mitigated:	Improve Emergency Response/Support activities
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Conduct annual review and tri-annual update of the El Paso County Emergency Operations Plan
	2. No action, keep current Plan in place with no updates or reviews
	3. Rely on local municipalities or departments to respond to incidents individually
Action/Project Intended for Implementation	
Description of Selected Action/Project	Conduct annual review and tri-annual update of the El Paso County Emergency Operations Plan
Action/Project Category	Local Plans and Regulations (LPR)
Goals/Objectives Met	Goals 1, 2, 3, 4, & 5 Objectives 1.2,1.3,1.4,2.1,2.2,3.3,4.2,5.1
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Life, Property, and Economic
Estimated Cost	Low
Priority*	High
Plan for Implementation	
Responsible Organization	El Paso County Sheriff Office – Emergency Service Division
Local Planning Mechanism	El Paso County Sheriff Office – Emergency Service Division Municipalities, and County Agencies
Potential Funding Sources	Local Budgets
Timeline for Completion	Ongoing

* Refer to results of Prioritization (page 2)



Prioritization

Number: 2

Mitigation Action/Initiative: Conduct annual review and tri-annual update of the El Paso County Emergency Operations Plan

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	
Property Protection	0	
Cost-Effectiveness	1	
Technical	0	
Political	1	
Legal	1	
Fiscal	1	
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	0	
Agency Champion	1	
Other Community Objectives	1	
Total	9	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: El Paso County

Number: 3

Mitigation Action/Initiative: Perform Continuity of Operations planning to identify critical functions, essential personnel, vital resources, and critical infrastructure within the county that is necessary to maintain public safety and services

Assessing the Risk	
Hazard(s) addressed:	Wildfire, HAZMAT Transportations, Winter Storm, Flooding, Mud or Debris Flow, Erosion or Deposition, HAZMAT Fixed Site, Tornado, Drought, Hailstorm, Aircraft Accident, Lighting, Pandemic Disease, Landslide or Rockfall
Specific problem being mitigated:	Insure critical service can be maintained
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Perform Continuity of Operations planning to identify critical functions, essential personnel, vital resources, and critical infrastructure within the county that is necessary to maintain public safety and services
	2. Hire contractor to develop COOP plans purchase software to template COOP plans throughout county
	3. No action
Action/Project Intended for Implementation	
Description of Selected Action/Project	Perform Continuity of Operations planning to identify critical functions, essential personnel, vital resources, and critical infrastructure within the county that is necessary to maintain public safety and services
Action/Project Category	Local Plans and Regulations (LPR)
Goals/Objectives Met	Goals 1, 2, 4, & 6 Objectives 1.3, 2.2, 2.3, 4.1, 4.2, 6.1, 6.2, & 6.3
Applies to existing, future, or not applicable	N/A
Benefits (losses avoided)	Loss of Government Services
Estimated Cost	Medium
Priority*	Medium
Plan for Implementation	
Responsible Organization	El Paso County Sheriff Office –Emergency Service Division Municipalities and County Agencies
Local Planning Mechanism	Develop County COOP committee
Potential Funding Sources	Local Budgets, Grant
Timeline for Completion	Short

* Refer to results of Prioritization (page 2)



Prioritization

Number: 3

Mitigation Action/Initiative: Perform Continuity of Operations planning to identify critical functions, essential personnel, vital resources, and critical infrastructure within the county that is necessary to maintain public safety and services

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	
Property Protection	0	
Cost-Effectiveness	1	
Technical	0	
Political	0	
Legal	1	
Fiscal	0	
Environmental	0	
Social	0	
Administrative	1	
Multi-Hazard	1	
Timeline	0	
Agency Champion	0	
Other Community Objectives	0	
Total	4	
Priority (High/Med/Low)	Medium	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: El Paso County
Number: 4
Mitigation Action/Initiative: Partner with local businesses, Chamber of Commerce, and Non-Governmental Organizations (NGOs) that provide critical services to citizens to ensure continuity of services and a coordinated response

Assessing the Risk	
Hazard(s) addressed:	Wildfire, HAZMAT Transportations, Winter Storm, Flooding, Mud or Debris Flow, Erosion or Deposition, HAZMAT Fixed Site, Tornado, Drought, Hailstorm, Aircraft Accident, Lighting, Pandemic Disease, Landslide or Rockfall
Specific problem being mitigated:	Sustain critical services and resource availability in an emergency response
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Develop MOU's and partnerships with local businesses, and Non-Governmental Organizations (NGOs) that provide critical services to citizens to ensure continuity of services and a coordinated response
	2. Establish stockpiles of critical resources required in a response
	3. Rely on local jurisdictions for provision of response resources
Action/Project Intended for Implementation	
Description of Selected Action/Project	Partner with local businesses, Chamber of Commerce, and NGOs that provide critical services to citizens to ensure continuity of services and a coordinated response
Action/Project Category	Local Plans and Regulations (LPR)
Goals/Objectives Met	Goals 2, 4, & 6 Objectives 2.2, 2.3, 4.1, 4.2, & 6.3
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Life and Property
Estimated Cost	Medium
Priority*	Medium
Plan for Implementation	
Responsible Organization	El Paso County Sheriff Office – Emergency Service Division Municipalities and County Agencies
Local Planning Mechanism	VOAD Workgroups
Potential Funding Sources	Local Budgets
Timeline for Completion	Ongoing

* Refer to results of Prioritization (page 2)



Prioritization

Number: 4

Mitigation Action/Initiative: Partner with local businesses, Chamber of Commerce, and Non-Governmental Organizations (NGOs) that provide critical services to citizens to ensure continuity of services and a coordinated response

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	0	
Cost-Effectiveness	1	
Technical	0	
Political	1	
Legal	1	
Fiscal	1	
Environmental	-1	
Social	1	
Administrative	-1	
Multi-Hazard	1	
Timeline	0	
Agency Champion	0	
Other Community Objectives	0	
Total	5	
Priority (High/Med/Low)	Medium	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: El Paso County

Number: 5

Mitigation Action/Initiative: Enhance awareness and preparedness of residents through quarterly Citizen Emergency Response Training and facilitate community training requests for emergency preparedness education

Assessing the Risk	
Hazard(s) addressed:	Wildfire, HAZMAT Transportations, Winter Storm, Flooding, Mud or Debris Flow, Erosion or Deposition, HAZMAT Fixed Site, Tornado, Drought, Hailstorm, Aircraft Accident, Lighting, Pandemic Disease, Landslide or Rockfall
Specific problem being mitigated:	Increase citizen awareness
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Enhance awareness and preparedness of residents through quarterly Citizen Emergency Response Training and facilitate community training requests for emergency preparedness education
	2. Use Red Cross and other NGO trainings in place of county program
	3. Develop online modules for self-paced learning CERT program
Action/Project Intended for Implementation	
Description of Selected Action/Project	Enhance awareness and preparedness of residents through quarterly Citizen Emergency Response Training and facilitate community training requests for emergency preparedness education
Action/Project Category	Education and Awareness program (EAP)
Goals/Objectives Met	Goal 3 Objectives 3.1, 3.2, & 3.3
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Life and Property
Estimated Cost	Low
Priority*	High
Plan for Implementation	
Responsible Organization	El Paso County Sheriff Office –Emergency Service Division
Local Planning Mechanism	VOAD Workgroups
Potential Funding Sources	Local Budget and Volunteers
Timeline for Completion	Short

* Refer to results of Prioritization (page 2)



Prioritization

Number: 5

Mitigation Action/Initiative: Enhance awareness and preparedness of residents through quarterly Citizen Emergency Response Training and facilitate community training requests for emergency preparedness education

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	0	
Cost-Effectiveness	1	
Technical	0	
Political	1	
Legal	1	
Fiscal	1	
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	10	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: El Paso County
Number: 6
Mitigation Action/Initiative: Continue to enhance emergency preparedness information available to citizens and visitors through the county website, and community outreach opportunities

Assessing the Risk	
Hazard(s) addressed:	Wildfire, HAZMAT Transportations, Winter Storm, Flooding, Mud or Debris Flow, Erosion or Deposition, HAZMAT Fixed Site, Tornado, Drought, Hailstorm, Aircraft Accident, Lighting, Pandemic Disease, Landslide or Rockfall
Specific problem being mitigated:	Increase citizen and visitor hazard awareness
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Continue to enhance emergency preparedness information available to citizens and visitors through the county website and community outreach opportunities
	2. Hire web designer to update site for seasonal threats
	3. Links to external web sites for hazard information
Action/Project Intended for Implementation	
Description of Selected Action/Project	Continue to enhance emergency preparedness information available to citizens and visitors through the county website and community outreach opportunities
Action/Project Category	Education and Awareness Programs (EAP)
Goals/Objectives Met	Goal 3 Objectives 3.1, 3.2, & 3.3
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Life and Property
Estimated Cost	Medium
Priority*	High
Plan for Implementation	
Responsible Organization	El Paso County Sheriff Office Information Technology/Public Information Officer El Paso County Information Technology/ Public Information Officer
Local Planning Mechanism	
Potential Funding Sources	Local Budgets
Timeline for Completion	Short

* Refer to results of Prioritization (page 2)



Prioritization

Number: 6

Mitigation Action/Initiative: Continue to enhance emergency preparedness information available to citizens and visitors through the county website and community outreach opportunities

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	0	
Political	0	
Legal	1	
Fiscal	1	
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	0	
Other Community Objectives	0	
Total	9	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: El Paso County

Number: 7

Mitigation Action/Initiative: Work with the county PIO and Information Technology to develop emergency preparedness public service announcements and educational content to be televised on the El Paso County broadcast station

Assessing the Risk	
Hazard(s) addressed:	Wildfire, HAZMAT Transportations, Winter Storm, Flooding, Mud or Debris Flow, Erosion or Deposition, HAZMAT Fixed Site, Tornado, Drought, Hailstorm, Aircraft Accident, Lighting, Pandemic Disease, Landslide or Rockfall
Specific problem being mitigated:	Deliver emergency management training to more people using technology
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Work with the county PIO and Information Technology to develop emergency preparedness public service announcements and educational content to be televised on the El Paso County broadcast station
	2. Develop Public Service Announcements for local broadcast media
	3. Use Facebook/Twitter to disseminate information
Action/Project Intended for Implementation	
Description of Selected Action/Project	Work with the county PIO and Information Technology to develop emergency preparedness public service announcements and educational content to be televised on the El Paso County broadcast station
Action/Project Category	Education and Awareness Programs (EAP)
Goals/Objectives Met	Goal 3 Objectives 3.1, 3.2, & 3.3
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Life and Property
Estimated Cost	High
Priority*	Medium
Plan for Implementation	
Responsible Organization	El Paso County Sheriff Office Information Technology/Public Information Officer El Paso County Information Technology/ Public Information Officer
Local Planning Mechanism	
Potential Funding Sources	Unknown
Timeline for Completion	Short

* Refer to results of Prioritization (page 2)



Prioritization

Number: 7

Mitigation Action/Initiative: Work with the county PIO and Information Technology to develop emergency preparedness public service announcements and educational content to be televised on the El Paso County broadcast station

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	0	
Cost-Effectiveness	0	
Technical	0	
Political	0	
Legal	1	
Fiscal	0	
Environmental	0	
Social	1	
Administrative	0	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	6	
Priority (High/Med/Low)	Medium	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: El Paso County
Number: 8
Mitigation Action/Initiative: Develop a multi-faceted public awareness campaign to increase citizen enrollment in the El Paso County Emergency Notification System.

Assessing the Risk	
Hazard(s) addressed:	Wildfire, HAZMAT Transportations, Winter Storm, Flooding, Mud or Debris Flow, Erosion or Deposition, HAZMAT Fixed Site, Tornado, Drought, Hailstorm, Aircraft Accident, Lighting, Pandemic Disease, Landslide or Rockfall
Specific problem being mitigated:	Speed information to citizens on potential threats
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	<ol style="list-style-type: none"> 1. Develop a multi-faceted public awareness campaign to increase citizen enrollment in the El Paso County Emergency Notification System. 2. Place notice of Emergency Notification System in local newspaper 3. No action
Action/Project Intended for Implementation	
Description of Selected Action/Project	Develop a multi-faceted public awareness campaign to increase citizen enrollment in the El Paso County Emergency Notification System.
Action/Project Category	Education and Awareness Program (EAP), Local Plans and Regulations (LPR)
Goals/Objectives Met	Goals 1, 2, & 3 Objectives 1.1, 2.2, & 3.1
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Life, Property, and Economic
Estimated Cost	Medium
Priority*	High
Plan for Implementation	
Responsible Organization	El Paso Sheriff Office –Emergency Service Division/Public Information Office El Paso County Public Information Office, El Paso/Teller 911
Local Planning Mechanism	
Potential Funding Sources	Local Budgets, Grant
Timeline for Completion	Ongoing

* Refer to results of Prioritization (page 2)



Prioritization

Number: 8

Mitigation Action/Initiative: Develop a multi-faceted public awareness campaign to increase citizen enrollment in the El Paso County Emergency Notification System.

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	0	
Political	1	
Legal	1	
Fiscal	1	
Environmental	0	
Social	1	
Administrative	0	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	10	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: El Paso County

Number: 9

Mitigation Action/Initiative: Create an all-hazard zoning plan to facilitate a more rapid evacuation capability within El Paso County

Assessing the Risk	
Hazard(s) addressed:	Wildfire, HAZMAT Transportations, Winter Storm, Flooding, Mud or Debris Flow, Erosion or Deposition, HAZMAT Fixed Site, Tornado, Drought, Hailstorm, Aircraft Accident, Lighting, Pandemic Disease, Landslide or Rockfall
Specific problem being mitigated:	Provide for expedited evacuation and response
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Create an all-hazard zoning plan to facilitate a more rapid evacuation capability within El Paso County
	2. Adopt Wildland fire grid system for reference
	3. Establish "On-The-Fly" evaluation zones as incident/disaster develops
Action/Project Intended for Implementation	
Description of Selected Action/Project	Create an all-hazard zoning plan to facilitate a more rapid evacuation capability within El Paso County
Action/Project Category	Local Plans and Regulations (LPR)
Goals/Objectives Met	Goals 1 & 2 Objectives 1.2, 1.3, & 2.2
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Life and Property
Estimated Cost	Medium
Priority*	Medium
Plan for Implementation	
Responsible Organization	El Paso County Sheriff Office-Emergency Service Division/Dispatch
Local Planning Mechanism	Fire Protection Districts
Potential Funding Sources	Local Budgets
Timeline for Completion	Short

* Refer to results of Prioritization (page 2)



Prioritization

Number: 9

Mitigation Action/Initiative: Create an all-hazard zoning plan to facilitate a more rapid evacuation capability within El Paso County

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	0	
Cost-Effectiveness	0	
Technical	0	
Political	0	
Legal	1	
Fiscal	1	
Environmental	0	
Social	0	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	0	
Other Community Objectives	0	
Total	6	
Priority (High/Med/Low)	Medium	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: El Paso County

Number: 10

Mitigation Action/Initiative: Encourage communities within the county to adopt Fire Adaptive Community standards and practices

Assessing the Risk	
Hazard(s) addressed:	Wildfire, Lighting
Specific problem being mitigated:	Protect individual communities from effects of wildfire
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Work with individual communities within the county, such as HOAs and municipalities, to adopt Fire Adaptive Community standards and practices
	2. Adopt new building code for area within Wildland Urban Interface
	3. No action
Action/Project Intended for Implementation	
Description of Selected Action/Project	Encourage communities within the county to adopt Fire Adaptive Community standards and practices
Action/Project Category	Structure and Infrastructure Project (SIP), Natural System Protection (NRP)
Goals/Objectives Met	Goals 2, 3, & 4 Objectives 2.1, 2.2, 3.1, 3.3, & 4.2
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Life, Property, and Economic
Estimated Cost	Medium
Priority*	Medium
Plan for Implementation	
Responsible Organization	HOAs/ Municipalities
Local Planning Mechanism	Fire Protection Districts
Potential Funding Sources	Unknown
Timeline for Completion	Long
Reporting on Progress	

* Refer to results of Prioritization (page 2)



Prioritization

Number: 10

Mitigation Action/Initiative: Encourage communities within the county to adopt Fire Adaptive Community standards and practices

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	0	
Political	1	
Legal	0	
Fiscal	0	
Environmental	0	
Social	1	
Administrative	0	
Multi-Hazard	0	
Timeline	1	
Agency Champion	0	
Other Community Objectives	0	
Total	6	
Priority (High/Med/Low)	Medium	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: El Paso County

Number: 11

Mitigation Action/Initiative: Conduct an analysis identifying areas in the county that may benefit from the installation of cisterns or hydrants to provide water delivery during firefighting operations in concurrence with the El Paso County Land Development Code

Assessing the Risk	
Hazard(s) addressed:	Wildfire, Drought
Specific problem being mitigated:	Insufficient water delivery during firefighting operations
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Identify areas in the county that may benefit from improved water delivery during firefighting operations
	2. Adopt new building code for area within Wildland Urban Interface
	3. Perform mitigation efforts within publicly owned properties based on Fire Adaptive Community standards
Action/Project Intended for Implementation	
Description of Selected Action/Project	Conduct an analysis identifying areas in the county that may benefit from the installation of cisterns or hydrants to provide water delivery during firefighting operations in concurrence with the El Paso County Land Development Code
Action/Project Category	Structure and Infrastructure Project (SIP) Natural Systems Protection (NRP)
Goals/Objectives Met	Goals 1, 2, & 5 Objectives 1.3, 2.1, 2.2, & 5.1
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Property
Estimated Cost	High
Priority*	Medium
Plan for Implementation	
Responsible Organization	Fire Protection Districts, Pikes Peak Regional Building Division
Local Planning Mechanism	Building Codes
Potential Funding Sources	Local Budgets, Grant
Timeline for Completion	Long

* Refer to results of Prioritization (page 2)



Prioritization

Number: 11

Mitigation Action/Initiative: Conduct an analysis identifying areas in the county that may benefit from the installation of cisterns or hydrants to provide water delivery during firefighting operations in concurrence with the El Paso County Land Development Code

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	0	
Technical	0	
Political	0	
Legal	0	
Fiscal	0	
Environmental	1	
Social	0	
Administrative	0	
Multi-Hazard	0	
Timeline	0	
Agency Champion	0	
Other Community Objectives	0	
Total	3	
Priority (High/Med/Low)	Medium	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: El Paso County
Number: 12
Mitigation Action/Initiative: Perform mitigation efforts within publicly owned properties based on Fire Adaptive Community standards

Assessing the Risk	
Hazard(s) addressed:	Wildfire, Mud or Debris Flow, Lighting
Specific problem being mitigated:	Defensible space
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	<ol style="list-style-type: none"> 1. Perform mitigation efforts within publicly owned properties based on Fire Adaptive Community standards 2. Conduct an analysis identifying areas in the county that may benefit from the installation of cisterns or hydrants to provide water delivery during firefighting operations in concurrence with the El Paso County Land Development Code 3. Work with HOA to mitigate open space
Action/Project Intended for Implementation	
Description of Selected Action/Project	Perform mitigation efforts within publicly owned properties based on Fire Adaptive Community standards
Action/Project Category	Structure and Infrastructure Project (SIP) Natural Systems Protection (NRP)
Goals/Objectives Met	Goals 2 & 4 Objectives 2.1, 2.2, 4.1, 4.2, & 4.3
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Life and Property
Estimated Cost	Medium
Priority*	High
Plan for Implementation	
Responsible Organization	El Paso County Sheriff Office- Emergency Service Division/Wildland
Local Planning Mechanism	Fire Protection Districts
Potential Funding Sources	Local Budgets, Grant
Timeline for Completion	Ongoing

* Refer to results of Prioritization (page 2)



Prioritization

Number: 12

Mitigation Action/Initiative: Perform mitigation efforts within publicly owned properties based on Fire Adaptive Community standards

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	0	
Political	1	
Legal	1	
Fiscal	1	
Environmental	1	
Social	1	
Administrative	0	
Multi-Hazard	1	
Timeline	1	
Agency Champion	0	
Other Community Objectives	0	
Total	10	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: El Paso County

Number: 13

Mitigation Action/Initiative: Conduct a hazardous materials flow study for high volume road and rail ways within the county

Assessing the Risk	
Hazard(s) addressed:	HAZMAT Transportation
Specific problem being mitigated:	Knowledge of hazard
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Conduct a hazardous materials flow study for high volume road and rail ways within the county
	2. Conduct random transportation safety inspections
	3. Develop mapping of potential hazard areas
Action/Project Intended for Implementation	
Description of Selected Action/Project	Conduct a hazardous materials flow study for high volume road and rail ways within the county
Action/Project Category	Local Plans and Regulations (LPR) Natural Systems Protection (NRP)
Goals/Objectives Met	Goals 1, 2, &5 Objectives 1.4, 2.1, 2.2, & 5.1
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Life
Estimated Cost	Medium
Priority*	Medium
Plan for Implementation	
Responsible Organization	El Paso County Department of Transportation/ El Paso County GIS
Local Planning Mechanism	Emergency Operation Plan, Pre-disaster mitigation plan, Local Emergency Planning Committee
Potential Funding Sources	Grant
Timeline for Completion	Short

* Refer to results of Prioritization (page 2)



Prioritization

Number: 13

Mitigation Action/Initiative: Conduct a hazardous materials flow study for high volume road and rail ways within the county

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	0	
Cost-Effectiveness	1	
Technical	0	
Political	0	
Legal	1	
Fiscal	0	
Environmental	1	
Social	0	
Administrative	1	
Multi-Hazard	-1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	6	
Priority (High/Med/Low)	Medium	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: El Paso County
Number: 14
Mitigation Action/Initiative: Increase the number of personnel trained as HAZMAT technicians and specialists to elevate regional response capability

Assessing the Risk	
Hazard(s) addressed:	HAZMAT Transportations, HAZMAT Fixed Site, Aircraft Accident
Specific problem being mitigated:	Increase response capability
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Increase the number of personnel trained as HAZMAT technicians and specialists to elevate regional response capability
	2. Hire additional HAZMAT personnel
	3. Contract for specialize training for local hazards
Action/Project Intended for Implementation	
Description of Selected Action/Project	Increase the number of personnel trained as HAZMAT technicians and specialists to elevate regional response capability
Action/Project Category	Structure and Infrastructure Project (SIP) Natural Systems Protection (NRP) Education and Awareness Program (EAP)
Goals/Objectives Met	Goals 1, 2, & 4 Objectives 1.2, 2.1, 4.2, & 4.3
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Life
Estimated Cost	Medium
Priority*	Medium
Plan for Implementation	
Responsible Organization	El Paso County Sheriff Office- Emergency Service Division/HAZMAT
Local Planning Mechanism	El Paso County Sheriff Office- Training Division
Potential Funding Sources	Local Budget, Grant
Timeline for Completion	Short

* Refer to results of Prioritization (page 2)



Prioritization

Number: 14

Mitigation Action/Initiative: Increase the number of personnel trained as HAZMAT technicians and specialists to elevate regional response capability

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	0	
Political	0	
Legal	1	
Fiscal	1	
Environmental	1	
Social	0	
Administrative	0	
Multi-Hazard	-1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	7	
Priority (High/Med/Low)	Medium	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: El Paso County

Number: 15

Mitigation Action/Initiative: Acquire common software to aid in Tier II facility tracking and multi-jurisdictional response, improving interoperability between Colorado Springs and El Paso County HAZMAT teams

Assessing the Risk	
Hazard(s) addressed:	HAZMAT Fixed Site
Specific problem being mitigated:	Improve documentation and interoperability between jurisdictions and HAZMAT teams
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Acquire common software to aid in Tier II facility tracking and multi-jurisdictional response, improving interoperability between Colorado Springs and El Paso County HAZMAT teams
	2. Have Information Technology department develop in house solution
	3. Continue to use paper filing
Action/Project Intended for Implementation	
Description of Selected Action/Project	Acquire common software to aid in Tier II facility tracking and multi-jurisdictional response, improving interoperability between Colorado Springs and El Paso County HAZMAT teams
Action/Project Category	Education and Awareness Program (EAP) Structure and Infrastructure Project (SIP) Natural System Protection (NRP)
Goals/Objectives Met	Goals 2, 4, & 6 Objectives 2.1, 2.2, 2.3, 4.3, & 6.3
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Life and Property
Estimated Cost	Medium
Priority*	High
Plan for Implementation	
Responsible Organization	El Paso County Information Technology El Paso County Sheriff Office-Emergency Services Division
Local Planning Mechanism	Local Emergency Planning Committee
Potential Funding Sources	Grant
Timeline for Completion	Short

* Refer to results of Prioritization (page 2)



Prioritization

Number: 15

Mitigation Action/Initiative: Acquire common software to aid in Tier II facility tracking and multi-jurisdictional response, improving interoperability between Colorado Springs and El Paso County HAZMAT teams

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	0	
Political	1	
Legal	1	
Fiscal	1	
Environmental	1	
Social	0	
Administrative	0	
Multi-Hazard	0	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	9	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: El Paso County
Number: 16
Mitigation Action/Initiative: Expand the community cross-section and membership of the Local Emergency Planning Committee and research methods to increase its role within the county emergency management program

Assessing the Risk	
Hazard(s) addressed:	HAZMAT Transportations, HAZMAT Fixed Site
Specific problem being mitigated:	Increase community involvement in the emergency management program
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	<ol style="list-style-type: none"> 1. Expand the community cross-section and membership of the Local Emergency Planning Committee and research methods to increase its role within the county emergency management program 2. Combine City and County Local Emergency Planning Committee 3. No action
Action/Project Intended for Implementation	
Description of Selected Action/Project	Expand the community cross-section and membership of the Local Emergency Planning Committee and research methods to increase its role within the county emergency management program
Action/Project Category	Education and Awareness Programs (EAP) Local Plans and Regulations (LPR)
Goals/Objectives Met	Goals 1, 4, 5, & 6 Objectives 1.4, 4.1, 4.2, 4.3, 5.3, & 6.3
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	
Estimated Cost	Low
Priority*	Medium
Plan for Implementation	
Responsible Organization	El Paso County Sheriff Office- Emergency Service Division Local Emergency Planning Committee Chairman
Local Planning Mechanism	Local Emergency Planning Committee
Potential Funding Sources	N/A
Timeline for Completion	Short

* Refer to results of Prioritization (page 2)



Prioritization

Number: 16

Mitigation Action/Initiative: Expand the community cross-section and membership of the Local Emergency Planning Committee and research methods to increase its role within the county emergency management program

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	
Property Protection	0	
Cost-Effectiveness	1	
Technical	1	
Political	0	
Legal	0	
Fiscal	1	
Environmental	0	
Social	0	
Administrative	1	
Multi-Hazard	0	
Timeline	1	
Agency Champion	0	
Other Community Objectives	0	
Total	5	
Priority (High/Med/Low)	Medium	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: El Paso County
Number: 17
Mitigation Action/Initiative: Continue to enhance the communication network related to the delay or closure of county facilities and roadways

Assessing the Risk	
Hazard(s) addressed:	Winter Storm, Erosion and Deposition, Flooding, Mud or Debris Flow, Wildfire
Specific problem being mitigated:	Expand emergency notification capability
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Continue to enhance the communication network related to the delay or closure of county facilities and roadways
	2. Establish county wide siren and public address
	3. Warning system
Action/Project Intended for Implementation	
Description of Selected Action/Project	Continue to enhance the communication network related to the delay or closure of county facilities and roadways
Action/Project Category	Education and Awareness Program (EAP) Local Plans and Regulations (LPR)
Goals/Objectives Met	Goals 1, 3, & 4 Objectives 1.1, 1.4, 3.1, 3.2, 3.3, & 4.2
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Life
Estimated Cost	Medium
Priority*	High
Plan for Implementation	
Responsible Organization	El Paso County Public Information Officer El Paso County Sheriff Office- Emergency Service Division/Public Information Officer
Local Planning Mechanism	
Potential Funding Sources	Local Budget, Grant
Timeline for Completion	Short

* Refer to results of Prioritization (page 2)



Prioritization

Number: 17

Mitigation Action/Initiative: Continue to enhance the communication network related to the delay or closure of county facilities and roadways

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	0	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	11	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: El Paso County

Number: 18

Mitigation Action/Initiative: Identify critical roads and emergency routes within El Paso County and coordinate inter-jurisdictional plans to insure they remain clear

Assessing the Risk	
Hazard(s) addressed:	Wildfire, Winter Strom, Mud or Debris Flow, Tornado, Hailstorm
Specific problem being mitigated:	Access during emergency response
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Identify critical roads and emergency routes within El Paso County and coordinate inter-jurisdictional plans to insure they remain clear
	2. Hire additional seasonal employees to man equipment for road clearing
	3. Reduce roadway hazards to maintain safe ingress/egress for El Paso County residents and first responders
Action/Project Intended for Implementation	
Description of Selected Action/Project	Identify critical roads and emergency routes within El Paso County and coordinate inter-jurisdictional plans to insure they remain clear
Action/Project Category	Structure and Infrastructure Project (SIP)
Goals/Objectives Met	Goals 1, 2, & 4 Objectives 1.2, 1.3, 2.1, 2.2, 4.1, & 4.2
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Life and Property
Estimated Cost	High
Priority*	High
Plan for Implementation	
Responsible Organization	El Paso County Department of Transportation
Local Planning Mechanism	
Potential Funding Sources	Local Budget
Timeline for Completion	Medium

* Refer to results of Prioritization (page 2)



Prioritization

Number: 18

Mitigation Action/Initiative: Identify critical roads and emergency routes within El Paso County and coordinate inter-jurisdictional plans to insure they remain clear

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	0	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	0	
Agency Champion	1	
Other Community Objectives	0	
Total	10	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: El Paso County

Number: 19

Mitigation Action/Initiative: Reduce roadway hazards to maintain safe ingress/egress for El Paso County residents and first responders

Assessing the Risk	
Hazard(s) addressed:	Wildfire, Winter Storm, Flooding, Mud or Debris Flow, Erosion or Deposition, Landslide or Rockfall
Specific problem being mitigated:	Access during emergency response
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Reduce roadway hazards to maintain safe ingress/egress for El Paso County residents and first responders
	2. Require new development to provide easements for emergency response
	3. Identify critical roads and emergency routes within El Paso County and coordinate inter-jurisdictional plans to insure they remain clear
Action/Project Intended for Implementation	
Description of Selected Action/Project	Reduce roadway hazards to maintain safe ingress/egress for El Paso County residents and first responders
Action/Project Category	Structure and Infrastructure Project (SIP) Local Plans and Regulations (LPR)
Goals/Objectives Met	Goals 1, 2, & 4 Objectives 1.3, 2.1, 2.2, 4.1, & 4.2
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Life and Property
Estimated Cost	High
Priority*	Medium
Plan for Implementation	
Responsible Organization	El Paso County Department of Transportation
Local Planning Mechanism	
Potential Funding Sources	Budget
Timeline for Completion	Medium

* Refer to results of Prioritization (page 2)



Prioritization

Number: 19

Mitigation Action/Initiative: Reduce roadway hazards to maintain safe ingress/egress for El Paso County residents and first responders

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	0	
Technical	0	
Political	1	
Legal	0	
Fiscal	0	
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	0	
Agency Champion	1	
Other Community Objectives	0	
Total	7	
Priority (High/Med/Low)	Medium	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: El Paso County

Number: 20

Mitigation Action/Initiative: Develop an integrated strategic flood warning plan that addresses the repair, repositioning, or upgrade of existing flood warning systems

Assessing the Risk	
Hazard(s) addressed:	Flooding, Mud or Debris Flow
Specific problem being mitigated:	Coordinated flood planning
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	<ol style="list-style-type: none"> 1. Develop an integrated strategic flood warning plan that addresses the repair, repositioning, or upgrade of existing flood warning systems 2. Identify drainage basins that require installation of a flood warning system, and explore technology solutions to improve threat recognition to provide early warning of potential flash flood and debris flow incidents 3. Train additional sky warn observers with NEWS
Action/Project Intended for Implementation	
Description of Selected Action/Project	Develop an integrated strategic flood warning plan that addresses the repair, repositioning, or upgrade of existing flood warning systems
Action/Project Category	Local Plans and Regulations (LPR)
Goals/Objectives Met	Goals 1, 2, 3, & 4 Objectives 1.1, 1.4, 2.1, 3.1, 3.3, & 4.3
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Loss of life, property
Estimated Cost	High
Priority*	High
Plan for Implementation	
Responsible Organization	El Paso County Sheriff Office, Emergency Service Division Local Jurisdictions
Local Planning Mechanism	Municipalities and Fire Protection Districts
Potential Funding Sources	Grant
Timeline for Completion	Medium

* Refer to results of Prioritization (page 2)



Prioritization

Number: 20

Mitigation Action/Initiative: Develop an integrated strategic flood warning plan that addresses the repair, repositioning, or upgrade of existing flood warning systems

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	0	
Political	1	
Legal	1	
Fiscal	0	
Environmental	0	
Social	1	
Administrative	0	
Multi-Hazard	0	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	8	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: El Paso County

Number: 21

Mitigation Action/Initiative: Identify drainage basins that require installation of a flood warning system, and explore technology solutions to improve threat recognition to provide early warning of potential flash flood and debris flow incidents

Assessing the Risk	
Hazard(s) addressed:	Flooding, Mud or Debris Flow
Specific problem being mitigated:	Coordinated flood warning
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Identify drainage basins that require installation of a flood warning system, and explore technology solutions to improve threat recognition to provide early warning of potential flash flood and debris flow incidents
	2. Install rain gauge across burn scar areas
	3. Develop an integrated strategic flood warning plan that addresses the repair, repositioning, or upgrade of existing flood warning systems
Action/Project Intended for Implementation	
Description of Selected Action/Project	Identify drainage basins that require installation of a flood warning system, and explore technology solutions to improve threat recognition to provide early warning of potential flash flood and debris flow incidents
Action/Project Category	Structure and Infrastructure Project(SIP) Natural Systems Protection (NPR)
Goals/Objectives Met	Goals 1 & 2 Objectives 1.1, 1.4, & 2.1
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Life and Property
Estimated Cost	Medium
Priority*	High
Plan for Implementation	
Responsible Organization	El Paso County Sheriff Office- Emergency Service Division Local Jurisdictions
Local Planning Mechanism	Recovery Committee
Potential Funding Sources	Grant
Timeline for Completion	Short/Medium

* Refer to results of Prioritization (page 2)



Prioritization

Number: 21

Mitigation Action/Initiative: Identify drainage basins that require installation of a flood warning system, and explore technology solutions to improve threat recognition to provide early warning of potential flash flood and debris flow incidents

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	0	
Political	1	
Legal	1	
Fiscal	0	
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	0	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	10	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: El Paso County
Number: 22
Mitigation Action/Initiative: Install electronic warning signage and permanent road closure barriers on Highway 24 in the Ute Pass area

Assessing the Risk	
Hazard(s) addressed:	Winter Storm, Flooding, Mud or Debris Flow, Erosion and Deposition, Wildfire
Specific problem being mitigated:	Threat warning and protection
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	<ol style="list-style-type: none"> 1. Install electronic warning signage and permanent road closure barriers on Highway 24 in the Ute Pass area 2. Install remote operated automated closure barriers 3. Deploy Department of Transportation mobile signal and barrier material during high risk periods
Action/Project Intended for Implementation	
Description of Selected Action/Project	Install electronic warning signage and permanent road closure barriers on Highway 24 in the Ute Pass area
Action/Project Category	Structure and Infrastructure Project (SIP) Education and Awareness Programs (EAP)
Goals/Objectives Met	Goals 1 & 4 Objectives 1.1, 1.4, 4.1, & 4.2
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Life
Estimated Cost	High
Priority*	Medium
Plan for Implementation	
Responsible Organization	Colorado Department of Transportation, El Paso County Department of Transportation
Local Planning Mechanism	Recovery Committee
Potential Funding Sources	Grant
Timeline for Completion	Short

* Refer to results of Prioritization (page 2)



Prioritization

Number: 22

Mitigation Action/Initiative: Install electronic warning signage and permanent road closure barriers on Highway 24 in the Ute Pass area

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	0	
Cost-Effectiveness	1	
Technical	0	
Political	1	
Legal	0	
Fiscal	0	
Environmental	0	
Social	0	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	0	
Other Community Objectives	0	
Total	6	
Priority (High/Med/Low)	Medium	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: El Paso County

Number: 23

Mitigation Action/Initiative: Continue to maintain catch basins and debris fences in critical areas to reduce the threat to population centers

Assessing the Risk	
Hazard(s) addressed:	Flooding, Mud or Debris Flow, Erosion or Deposition
Specific problem being mitigated:	Reduce potential flood damage
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Continue to maintain catch basins and debris fences in critical areas to reduce the threat to population centers
	2. Identify high threat properties within potential hazard areas that may be relocated or purchased to reduce risk to persons or property
	3. Develop future policies that encourage low impact development in the flood plain to minimize the amount of flooding, erosion, and sedimentation losses
Action/Project Intended for Implementation	
Description of Selected Action/Project	Continue to maintain catch basins and debris fences in critical areas to reduce the threat to population centers
Action/Project Category	Structure and Infrastructure Project (SIP) Natural Systems Protection (NRP)
Goals/Objectives Met	Goals 1, 2, 4, 5, & 6 Objectives 1.3, 2.1, 2.2, 4.2, 5.2, 5.3, & 6.1
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Life and Property
Estimated Cost	High
Priority*	High
Plan for Implementation	
Responsible Organization	Public Works
Local Planning Mechanism	Flood plan management/ Recovery Committee
Potential Funding Sources	Grant/ Budget
Timeline for Completion	Ongoing

* Refer to results of Prioritization (page 2)



Prioritization

Number: 23

Mitigation Action/Initiative: Continue to maintain catch basins and debris fences in critical areas to reduce the threat to population centers

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	0	
Technical	0	
Political	1	
Legal	1	
Fiscal	0	
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	10	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: El Paso County
Number: 24
Mitigation Action/Initiative: Identify high threat properties within potential hazard areas that may be relocated or purchased to reduce risk to persons or property

Assessing the Risk	
Hazard(s) addressed:	Flooding, Mud or Debris Flow, Erosion or Deposition, Wildfire
Specific problem being mitigated:	Exposure of people and structures within high hazard areas
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	<ol style="list-style-type: none"> 1. Identify high threat properties within potential hazard areas that may be relocated or purchased to reduce risk to persons or property 2. Continue to maintain catch basins and debris fences in critical areas to reduce the threat to population centers 3. Develop future policies that encourage low impact development in the flood plain to minimize the amount of flooding, erosion and sedimentation losses
Action/Project Intended for Implementation	
Description of Selected Action/Project	Identify high threat properties within potential hazard areas that may be relocated or purchased to reduce risk to persons or property
Action/Project Category	Structure and Infrastructure Project (SIP)
Goals/Objectives Met	Goals 1, 2, & 5 Objectives 1.4, 2.1, & 5.2
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Life and Property
Estimated Cost	High
Priority*	High
Plan for Implementation	
Responsible Organization	El Paso County Flood Plain Manager
Local Planning Mechanism	Flood Plain Management/Recovery Committee
Potential Funding Sources	Grant
Timeline for Completion	Short

* Refer to results of Prioritization (page 2)



Prioritization

Number: 24

Mitigation Action/Initiative: Identify high threat properties within potential hazard areas that may be relocated or purchased to reduce risk to persons or property

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	0	
Technical	1	
Political	1	
Legal	1	
Fiscal	0	
Environmental	0	
Social	0	
Administrative	1	
Multi-Hazard	0	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	8	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: El Paso County

Number: 25

Mitigation Action/Initiative: Conduct channel stabilization, improvement, and restoration in Fountain Creek to allow greater drainage and water flow capacity

Assessing the Risk	
Hazard(s) addressed:	Erosion or Deposition, Flooding
Specific problem being mitigated:	Flash Flooding
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Conduct channel stabilization, improvement, and restoration in Fountain Creek to allow greater drainage and water flow capacity
	2. Require minimum stand-off distance
	3. Relocate channel to divert around population centers
Action/Project Intended for Implementation	
Description of Selected Action/Project	Conduct channel stabilization, improvement, and restoration in Fountain Creek to allow greater drainage and water flow capacity
Action/Project Category	Structure and Infrastructure Project (SIP) Natural Systems Protection (NRP)
Goals/Objectives Met	Goals 1, 2, 4, & 5 Objectives 1.3, 2.1, 2.2, 4.2, & 5.2
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Life and Property
Estimated Cost	High
Priority*	High
Plan for Implementation	
Responsible Organization	Colorado Department of Transportation El Paso County Department Of Transportation Flood Plain Manager
Local Planning Mechanism	Recovery Group
Potential Funding Sources	Unknown
Timeline for Completion	Ongoing

* Refer to results of Prioritization (page 2)



Prioritization

Number: 25

Mitigation Action/Initiative: Conduct channel stabilization, improvement, and restoration in Fountain Creek to allow greater drainage and water flow capacity

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	0	
Technical	0	
Political	1	
Legal	1	
Fiscal	0	
Environmental	1	
Social	0	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	0	
Other Community Objectives	0	
Total	8	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: El Paso County

Number: 26

Mitigation Action/Initiative: Stabilize or remove rocks that pose a hazard along county roadways

Assessing the Risk	
Hazard(s) addressed:	Landslide or Rockslide, Mud or Debris Flow
Specific problem being mitigated:	Rocks or debris that may pose a hazard on roadways
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	<ol style="list-style-type: none"> 1. Stabilize or remove rocks that pose a hazard along county roadways 2. Identify areas that are prone to mudslides/landslides along the Ute Pass corridor 3. Construct additional rock fences along Highway 24
Action/Project Intended for Implementation	
Description of Selected Action/Project	Stabilize or remove rocks that pose a hazard along county roadways
Action/Project Category	Structure and Infrastructure Project (SIP) Natural Systems Protection (NPR)
Goals/Objectives Met	Goals 1 & 4 Objectives 2.1, 2.2, & 4.2
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Life
Estimated Cost	High
Priority*	Medium
Plan for Implementation	
Responsible Organization	Colorado Department Transportation El Paso County Department of Transportation
Local Planning Mechanism	
Potential Funding Sources	Local Budget
Timeline for Completion	Ongoing

* Refer to results of Prioritization (page 2)



Prioritization

Number: 26

Mitigation Action/Initiative: Stabilize or remove rocks that pose a hazard along county roadways

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	0	
Cost-Effectiveness	1	
Technical	1	
Political	0	
Legal	1	
Fiscal	0	
Environmental	1	
Social	0	
Administrative	1	
Multi-Hazard	0	
Timeline	1	
Agency Champion	0	
Other Community Objectives	0	
Total	7	
Priority (High/Med/Low)	Medium	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: El Paso County

Number: 27

Mitigation Action/Initiative: Increase use of weather radio announcements to enhance the redundancy of public information delivery in severe weather situations throughout the county

Assessing the Risk	
Hazard(s) addressed:	Tornado, Winter Storms, Lightning, Hailstorm, Severe Wind, Flooding
Specific problem being mitigated:	Increase community preparedness for severe weather
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Increase use of weather radio announcements to enhance the redundancy of public information delivery in severe weather situations throughout the county
	2. Increase the number of municipalities within the county who meet the Storm Ready and/or Weather Ambassador program criteria
	3. No action, rely on current notification systems
Action/Project Intended for Implementation	
Description of Selected Action/Project	Increase use of weather radio announcements to enhance the redundancy of public information delivery in severe weather situations throughout the county
Action/Project Category	Education Awareness Programs (EAP)
Goals/Objectives Met	Goals 1, 3, & 4 Objectives 1.1, 3.1, 3.2, 3.3, 4.1, & 4.2
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Life
Estimated Cost	Low
Priority*	High
Plan for Implementation	
Responsible Organization	National Weather Service
	El Paso County Sheriff Office – Emergency Service Division
	Local Jurisdictions
Local Planning Mechanism	Emergency Management Collaborative
Potential Funding Sources	Local Budgets
Timeline for Completion	Short

* Refer to results of Prioritization (page 2)



Prioritization

Number: 27

Mitigation Action/Initiative: Increase use of weather radio announcements to enhance the redundancy of public information delivery in severe weather situations throughout the county

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	0	
Cost-Effectiveness	1	
Technical	1	
Political	0	
Legal	1	
Fiscal	1	
Environmental	0	
Social	1	
Administrative	0	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	9	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: El Paso County

Number: 28

Mitigation Action/Initiative: Increase the number of municipalities within the county who meet the Storm Ready and/or Weather Ambassador program criteria

Assessing the Risk	
Hazard(s) addressed:	Tornado, Winter Storm, Hailstorm, Lightning, Severe Wind, Flooding
Specific problem being mitigated:	Increase community preparedness for severe weather
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	<ol style="list-style-type: none"> 1. Increase the number of municipalities within the county who meet the Storm Ready and/or Weather Ambassador program criteria 2. Increase use of weather radio announcements to enhance the redundancy of public information delivery in severe weather situations throughout the county 3. No action, rely on current notification systems
Action/Project Intended for Implementation	
Description of Selected Action/Project	Increase the number of municipalities within the county who meet the Storm Ready and/or Weather Ambassador program criteria
Action/Project Category	Education Awareness Program (EAP)
Goals/Objectives Met	Goals 1, 3, & 4 Objectives 1.1, 1.3, 3.1, 3.2, 3.3, 4.1, & 4.2
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Life and Property
Estimated Cost	Low
Priority*	High
Plan for Implementation	
Responsible Organization	National Weather Service Local Jurisdictions
Local Planning Mechanism	
Potential Funding Sources	Local Budgets, Grant
Timeline for Completion	Short

* Refer to results of Prioritization (page 2)



Prioritization

Number: 28

Mitigation Action/Initiative: Increase the number of municipalities within the county who meet the Storm Ready and/or Weather Ambassador program criteria

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	0	
Cost-Effectiveness	1	
Technical	1	
Political	0	
Legal	1	
Fiscal	1	
Environmental	0	
Social	0	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	0	
Other Community Objectives	0	
Total	8	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: El Paso County

Number: 29

Mitigation Action/Initiative: Continue to ensure runway safety zones are considered during community planning for new construction/development applications

Assessing the Risk	
Hazard(s) addressed:	HAZMAT Transportations, Aircraft Accident
Specific problem being mitigated:	Loss of life and property in Aircraft Accident
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Continue to ensure runway safety zones are considered during community planning for new construction/development applications
	2. Restrict or prohibit new construction inside safety zones
	3. Relocate homes and businesses inside safety zones
Action/Project Intended for Implementation	
Description of Selected Action/Project	Continue to ensure runway safety zones are considered during community planning for new construction/development applications
Action/Project Category	Structure and Infrastructure Project (SIP) Local Plans and Regulations (LRP)
Goals/Objectives Met	Goals 1, 2, 3, 4, & 5 Objectives 1.4, 2.2, 2.3, 3.2, 4.1, 4.2, & 5.1
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Life and Property
Estimated Cost	Low
Priority*	Medium
Plan for Implementation	
Responsible Organization	Pikes Peak Regional Building Department/ Colorado Springs Airport
Local Planning Mechanism	Building Codes, Zoning
Potential Funding Sources	Local Budget
Timeline for Completion	Ongoing

* Refer to results of Prioritization (page 2)



Prioritization

Number: 29

Mitigation Action/Initiative: Continue to ensure runway safety zones are considered during community planning for new construction/development applications

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	0	
Legal	1	
Fiscal	1	
Environmental	0	
Social	0	
Administrative	1	
Multi-Hazard	0	
Timeline	0	
Agency Champion	0	
Other Community Objectives	0	
Total	7	
Priority (High/Med/Low)	Medium	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: El Paso County

Number: 30

Mitigation Action/Initiative: Establish severe weather protective areas within county parks and open space

Assessing the Risk	
Hazard(s) addressed:	Hailstorm, Winter Storms, Lightning, Tornado, Severe Wind
Specific problem being mitigated:	Increase community preparedness for severe weather
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Establish severe weather protective areas within county parks and open space
	2. Establish requirement for storm shelters in public spaces
	3. No action
Action/Project Intended for Implementation	
Description of Selected Action/Project	Establish severe weather protective areas within county parks and open space
Action/Project Category	Structure and Infrastructure Project (SIP)
Goals/Objectives Met	Goals 1, 4, & 5 Objectives 1.3, 4.1, 4.2, & 5.3
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Life
Estimated Cost	Medium
Priority*	Medium
Plan for Implementation	
Responsible Organization	El Paso County Parks Department/Public Works
Local Planning Mechanism	
Potential Funding Sources	Grant, Volunteers
Timeline for Completion	Medium

* Refer to results of Prioritization (page 2)



Prioritization

Number: 30

Mitigation Action/Initiative: Establish severe weather protective areas within county parks and open space

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	0	
Cost-Effectiveness	1	
Technical	0	
Political	0	
Legal	1	
Fiscal	0	
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	0	
Agency Champion	0	
Other Community Objectives	0	
Total	6	
Priority (High/Med/Low)	Medium	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: El Paso County

Number: 31

Mitigation Action/Initiative: Provide education to first responders to minimize the effects of disease on response capability

Assessing the Risk	
Hazard(s) addressed:	Pandemic Disease
Specific problem being mitigated:	Maintain critical County Services
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	<ol style="list-style-type: none"> 1. Provide education to first responders to minimize the effects of disease on response capability 2. Establish a more robust county employee vaccination program to maximize available workforce during a potential outbreak 3. Expand tele-work for non-mission essential personnel
Action/Project Intended for Implementation	
Description of Selected Action/Project	Provide education to first responders to minimize the effects of disease on response capability
Action/Project Category	Education and Awareness Programs (EAP)
Goals/Objectives Met	Goals 3, 4, & 6 Objectives 3.1, 3.3, 4.2, & 6.1
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Government Service
Estimated Cost	Medium
Priority*	Medium
Plan for Implementation	
Responsible Organization	El Paso County Public Health
Local Planning Mechanism	
Potential Funding Sources	Local Budget
Timeline for Completion	Ongoing

* Refer to results of Prioritization (page 2)



Prioritization

Number: 31

Mitigation Action/Initiative: Provide education to first responders to minimize the effects of disease on response capability

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	-1	
Cost-Effectiveness	1	
Technical	1	
Political	0	
Legal	1	
Fiscal	1	
Environmental	0	
Social	0	
Administrative	1	
Multi-Hazard	-1	
Timeline	0	
Agency Champion	1	
Other Community Objectives	0	
Total	5	
Priority (High/Med/Low)	Medium	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: El Paso County

Number: 32

Mitigation Action/Initiative: Establish a more robust county employee vaccination program to maximize available workforce during a potential outbreak

Assessing the Risk	
Hazard(s) addressed:	Pandemic Disease
Specific problem being mitigated:	Maintain critical County services
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Establish a more robust county employee vaccination program to maximize available workforce during a potential outbreak
	2. Provide education to first responders to minimize the effects of disease on response capability
	3. Expand tele-work for non-mission essential personnel
Action/Project Intended for Implementation	
Description of Selected Action/Project	Establish a more robust county employee vaccination program to maximize available workforce during a potential outbreak
Action/Project Category	Natural Systems Protection (NRP) Education Awareness Programs (EAP)
Goals/Objectives Met	Goals 1, 4, & 6 Objectives 1.3, 4.1, 4.2, & 6.1
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Life and Government Services
Estimated Cost	Medium
Priority*	Medium
Plan for Implementation	
Responsible Organization	El Paso County Public Health
Local Planning Mechanism	
Potential Funding Sources	Local Budget
Timeline for Completion	Ongoing

* Refer to results of Prioritization (page 2)



Prioritization

Number: 32

Mitigation Action/Initiative: Establish a more robust county employee vaccination program to maximize available workforce during a potential outbreak

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	-1	
Cost-Effectiveness	1	
Technical	1	
Political	0	
Legal	1	
Fiscal	1	
Environmental	0	
Social	0	
Administrative	1	
Multi-Hazard	-1	
Timeline	0	
Agency Champion	1	
Other Community Objectives	0	
Total	5	
Priority (High/Med/Low)	Medium	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: Town of Calhan / Ramah

Number: 33

Mitigation Action/Initiative: Identify at-risk residents and potential safe shelters

Assessing the Risk	
Hazard(s) addressed:	Tornado, Severe Wind, Winter Storm, Hailstorm, Lightning
Specific problem being mitigated:	No central shelter
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Identify at-risk residents and potential safe shelters
	2. Identify and propose a central shelter – no safe option currently in Ramah
	3. No action
Action/Project Intended for Implementation	
Description of Selected Action/Project	Identify at risk residents – those without basements, limited mobility and find them safe spots to take shelter in case of emergency
Action/Project Category	Education and Awareness Programs (EAP)
Goals/Objectives Met	Goals 1, 3, & 4 Objectives 1.1, 3.1, 3.2, 3.3, & 4.1
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Life and safety
Estimated Cost	Low
Priority*	Medium
Plan for Implementation	
Responsible Organization	Town of Ramah / Calhan
Local Planning Mechanism	Administrative staff
Potential Funding Sources	Town funds
Timeline for Completion	Short

* Refer to results of Prioritization (page 2)



Prioritization

Number: 33

Mitigation Action/Initiative: Identify at-risk residents and potential safe shelters

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Improve life safety by knowing plans of safe havens
Property Protection	0	
Cost-Effectiveness	1	minimal cost
Technical	1	current personnel can develop this plan
Political	0	
Legal	0	
Fiscal	1	minimal funds will be needed
Environmental	0	
Social	0	
Administrative	1	able to handle with current staff
Multi-Hazard	0	
Timeline	1	can develop within 1 year
Agency Champion	0	
Other Community Objectives	0	
Total	6	
Priority (High/Med/Low)	Medium	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: Town of Calhan / Ramah

Number: 34

Mitigation Action/Initiative: Utilize water bills to disseminate emergency response information to residents

Assessing the Risk	
Hazard(s) addressed:	Drought, Hailstorm, Lightning, Severe Wind, Wildfire, Winter Storm, Dam Failure, Earthquake
Specific problem being mitigated:	Provide education and information to citizens for mitigation options
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Utilize water bills to disseminate emergency response information to residents
	2. Add link to town's website – not everyone utilizes the internet and power failure may be a possibility
	3. Send informational handouts in mail
Action/Project Intended for Implementation	
Description of Selected Action/Project	Develop season-specific fliers to address hazards and ways each resident can mitigate their own risks and mail to residents with their water bill
Action/Project Category	Education and Awareness Programs (EAP)
Goals/Objectives Met	Goals 1, 2, & 3 Objectives 1.4, 2.2, 3.1, & 3.3
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Avoid loss to property and life safety
Estimated Cost	Low
Priority*	High
Plan for Implementation	
Responsible Organization	Town of Ramah / Calhan
Local Planning Mechanism	Development of fliers by administrative department
Potential Funding Sources	Town budget
Timeline for Completion	Short

* Refer to results of Prioritization (page 2)



Prioritization

Number: 34

Mitigation Action/Initiative: Utilize water bills to disseminate emergency response information to residents

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Information to citizens will avoid unnecessary property loss, economic loss, and enhance life safety
Property Protection	1	Residents can mitigate areas to avoid extensive property loss
Cost-Effectiveness	1	This action could be incorporated into current budget
Technical	1	This action can be incorporated in future years with updated information
Political	0	
Legal	0	
Fiscal	1	Able to do in current budget
Environmental	0	
Social	0	
Administrative	1	Current staff can handle the implementation and on-going support
Multi-Hazard	1	Will incorporate many hazards
Timeline	1	Can be incorporated in 1 year
Agency Champion	0	
Other Community Objectives	0	
Total	8	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: Town of Calhan / Ramah

Number: 35

Mitigation Action/Initiative: Plant appropriate vegetation along roadways to mitigate erosion

Assessing the Risk	
Hazard(s) addressed:	Erosion and Deposition, Flooding
Specific problem being mitigated:	Edges of current roadways are inadequate to prevent erosion
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Plant appropriate vegetation along roadways to mitigate erosion
	2. Install sidewalks and gutters – not fiscally feasible
	3. Install culverts – not fiscally feasible
Action/Project Intended for Implementation	
Description of Selected Action/Project	Develop a drainage or erosion control plan to incorporate plants and natural resources to mitigate erosion along roadways
Action/Project Category	Natural Systems Protection (NRP)
Goals/Objectives Met	Goals 2, 3, & 5 Objectives 2.1, 2.2, 3.2, 3.3, & 5.2
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Loss of function/road closures, damage to property or natural resources
Estimated Cost	Medium
Priority*	Medium
Plan for Implementation	
Responsible Organization	Town of Ramah / Calhan
Local Planning Mechanism	Local emergency management coordinator and public works staff
Potential Funding Sources	Grants, Town Funds
Timeline for Completion	Short to Long-term

* Refer to results of Prioritization (page 2)

Prioritization

Number: 35

Mitigation Action/Initiative: Plant appropriate vegetation along roadways to mitigate erosion

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	
Property Protection	1	Will avoid washouts and soil erosion; minimize damage to other property
Cost-Effectiveness	0	
Technical	-1	May need personnel with more expertise in this process
Political	0	
Legal	0	
Fiscal	-1	No funds available in town budgets
Environmental	1	Will improve the environment
Social	0	
Administrative	-1	Unable to follow through with entire plan with current personnel
Multi-Hazard	1	
Timeline	0	Estimate 5 or more years
Agency Champion	0	
Other Community Objectives	0	
Total	0	
Priority (High/Med/Low)	Medium	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: Town of Calhan / Ramah

Number: 36

Mitigation Action/Initiative: Develop a decision tree outlining roles and responsibilities during emergencies

Assessing the Risk	
Hazard(s) addressed:	HAZMAT, Pandemic Disease, Wildfire, Dam Failure, Earthquake, Flooding, Tornado, Extreme Acts of Violence
Specific problem being mitigated:	Develop a plan for the town to respond to the hazard
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	<ol style="list-style-type: none"> 1. Develop a decision tree fully outlining the roles and responsibilities of local, regional, and state response teams, including HAZMAT teams and other specialized response teams 2. Develop hazard response plan specifically for Calhan/Ramah – not enough money/personnel/resources 3. No action
Action/Project Intended for Implementation	
Description of Selected Action/Project	Develop a decision tree fully outlining the roles and responsibilities of local, regional, and state response teams, including HAZMAT teams and other specialized response teams. Coordinate with the county to develop a plan and point person to contact immediately
Action/Project Category	Natural System Protection (NRP) Local Plans and Regulations (LPR)
Goals/Objectives Met	Goals 1, 2, & 4 Objectives 1.2, 2.4, 4.1, 4.2, & 4.3
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Avoid loss to property and life safety
Estimated Cost	Low
Priority*	Medium
Plan for Implementation	
Responsible Organization	Town of Ramah / Calhan and El Paso County
Local Planning Mechanism	Coordination with county representatives
Potential Funding Sources	Town budget
Timeline for Completion	Short

* Refer to results of Prioritization (page 2)



Prioritization

Number: 36

Mitigation Action/Initiative: Develop a decision tree outlining roles and responsibilities during emergencies

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	More experienced personnel can handle larger emergencies
Property Protection	1	More experienced individuals
Cost-Effectiveness	0	No immediate cost to the town
Technical	0	Utilize other resources
Political	0	
Legal	0	
Fiscal	0	No immediate cost to the town
Environmental	0	
Social	0	
Administrative	1	Town and county staff are able to handle the communication
Multi-Hazard	1	Will work to mitigate larger hazards that the small town does not have the expertise to handle
Timeline	1	Can be incorporated in 1 year
Agency Champion	0	
Other Community Objectives	0	
Total	5	
Priority (High/Med/Low)	Medium	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: Town of Calhan / Ramah
Number: 37
Mitigation Action/Initiative: Work with county, regional, and state organizations to obtain GIS data for the town

Assessing the Risk	
Hazard(s) addressed:	Subsidence and Sink Holes, Wildfire, Dam Failure, Erosion and Deposition, Flooding
Specific problem being mitigated:	GIS data would help identify areas at risk for hazards and aid emergency responders
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Work with county, regional, and state organizations to obtain GIS data for the town
	2. Develop map overlays – not enough existing information
	3. Hire contractor to provide GIS data for Calhan/Ramah and create map overlays – not financially feasible
Action/Project Intended for Implementation	
Description of Selected Action/Project	Work with county, regional, and state organizations to obtain GIS data for the town. Use existing GIS data to identify areas at risk for natural or man-made hazards, to aid responders during emergencies (locations of critical facilities, infrastructure, alternative access routes, etc), and to incorporate the areas at risk for hazards into local planning and land use document.
Action/Project Category	Structure and Infrastructure Project (SIP) Local Plans and Regulations (LPR)
Goals/Objectives Met	Goals 1 & 5 Objectives 1.2, 1.4, 5.1, & 5.2
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Avoid extensive losses to property, economic losses during emergencies, improve life and safety
Estimated Cost	Medium
Priority*	Medium
Plan for Implementation	
Responsible Organization	Town of Ramah/Calhan
Local Planning Mechanism	Administrative staff
Potential Funding Sources	Grants, town budget (minimal availability)
Timeline for Completion	Short

* Refer to results of Prioritization (page 2)



Prioritization

Number: 37

Mitigation Action/Initiative: Work with county, regional, and state organizations to obtain GIS data for the town

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Improve life safety by knowing where hazards are
Property Protection	1	Improve property protection by utilizing mapping to mitigate potential losses
Cost-Effectiveness	-1	Town funds are not sufficient, this will require grants
Technical	-1	no town personnel are currently experienced in GIS mapping or have the tools
Political	0	
Legal	0	
Fiscal	-1	Funds are not available currently
Environmental	0	
Social	0	
Administrative	0	
Multi-Hazard	0	
Timeline	0	
Agency Champion	0	
Other Community Objectives	0	
Total	-1	
Priority (High/Med/Low)	Medium	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: Town of Calhan/Ramah

Number: 38

Mitigation Action/Initiative: Identify temporary source of water for use during or after a hazard event

Assessing the Risk	
Hazard(s) addressed:	Extreme acts of violence, Flooding, Wildfire, Drought
Specific problem being mitigated:	Protection of water supply
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Identify a temporary source of water for use during or after a hazard event.
	2. Develop backup or alternative water supply for the town – not fiscally feasible
	3. No action
Action/Project Intended for Implementation	
Description of Selected Action/Project	Identify a temporary supply of water in case of contamination or any other hazard that would affect the treatment or transportation of water to the towns. Coordinate with local, county, or regional governments (IGA or MOA) to supply water temporarily during or immediately following a hazard event.
Action/Project Category	Natural System Protection (NRP)
Goals/Objectives Met	Goals 2, 4, 5, & 6 Objectives 2.1, 4.1, 4.2, 4.3, 5.2, 6.1, 6.2, & 6.3
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Avoid loss to property and life safety
Estimated Cost	Low
Priority*	Medium
Plan for Implementation	
Responsible Organization	Town of Ramah/Calhan
Local Planning Mechanism	Coordination with adjoining towns or County– develop IGA
Potential Funding Sources	Town budget
Timeline for Completion	Short

* Refer to results of Prioritization (page 2)



Prioritization

Number: 38

Mitigation Action/Initiative: Identify temporary source of water for use during or after a hazard event

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	This will enhance life safety with another source of healthy water
Property Protection	0	
Cost-Effectiveness	0	This may require attorney time and fees to develop IGA
Technical	0	
Political	0	
Legal	0	
Fiscal	1	
Environmental	0	
Social	0	
Administrative	1	Town staff and town attorneys can handle
Multi-Hazard	0	
Timeline	1	Can be incorporated in 1 year
Agency Champion	0	
Other Community Objectives	0	
Total	4	
Priority (High/Med/Low)	Medium	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: City of Fountain

Number: 39

Mitigation Action/Initiative: Put Flood Information on the City Website

Assessing the Risk	
Hazard(s) addressed:	Flood/Dam Failure
Specific problem being mitigated:	Awareness and preparation for flooding
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Put flood information on the City website
	2. Flood information handouts at City Hall
	3. Put flood information in the local paper
Action/Project Intended for Implementation	
Description of Selected Action/Project	Put flood information on City website to educate the community about flood risk and emergency actions
Action/Project Category	Education & Awareness Programs (EAP)
Goals/Objectives Met	Goals 1 & 3 Objectives 1.2, 3.1, 3.2, & 3.3
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Prepares citizens for potential flooding
Estimated Cost	Low
Priority*	High
Plan for Implementation	
Responsible Organization	City of Fountain Office of Emergency Management
Local Planning Mechanism	Communications Center & IT
Potential Funding Sources	Within Current City Funding
Timeline for Completion	Short-term

* Refer to results of Prioritization (page 2)



Prioritization

Number: 39

Mitigation Action/Initiative: Put Flood Information on the City Website

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Increases the life safety of citizens by preparedness
Property Protection	0	May have little effect on property protection
Cost-Effectiveness	1	Inexpensive and able to be accomplished with in the current budget
Technical	1	Easy to accomplish within current technology
Political	1	Political support for informing and empowering citizens
Legal	1	The city has the authority to implement this action
Fiscal	1	The project can exist under current budgets
Environmental	0	Little to no impact
Social	0	Little to no impact
Administrative	0	Increased work load however it is doable with current staff
Multi-Hazard	1	This hazard addresses Flooding, Dam Failure, Mud Flow and Debris
Timeline	1	Short Time Frame
Agency Champion	0	This action currently is the sole responsibility of emergency management
Other Community Objectives	0	None
Total	8	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: City of Fountain

Number: 40

Mitigation Action/Initiative: Flood Information Handouts at City Hall

Assessing the Risk	
Hazard(s) addressed:	Flood/Dam Failure
Specific problem being mitigated:	Awareness and preparation for flooding
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Flood information handouts at City Hall
	2. Put flood information on the City website
	3. Put flood information in the local paper
Action/Project Intended for Implementation	
Description of Selected Action/Project	Put flood information handouts at City Hall to educate the community about flood risk and emergency actions
Action/Project Category	Education & Awareness Programs (EAP)
Goals/Objectives Met	Goals 1 & 3 Objectives 1.2, 3.1, 3.2, & 3.3
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Prepares citizens for potential flooding
Estimated Cost	Low
Priority*	High
Plan for Implementation	
Responsible Organization	City of Fountain Office of Emergency Management
Local Planning Mechanism	Communications Center & IT
Potential Funding Sources	Within Current City Funding
Timeline for Completion	Short-term

* Refer to results of Prioritization (page 2)



Prioritization

Number: 40

Mitigation Action/Initiative: Flood Information Handouts at City Hall

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Increases the life safety of citizens by preparedness
Property Protection	0	May have little effect on property protection
Cost-Effectiveness	1	Inexpensive and able to be accomplished within the current budget
Technical	1	Easy to accomplish within current technology
Political	1	Political support for informing and empowering citizens
Legal	1	The city has the authority to implement this action
Fiscal	1	The project can exist under current budgets
Environmental	0	Little to no impact
Social	0	Little to no impact
Administrative	0	Increased work load however it is doable with current staff
Multi-Hazard	1	This hazard addresses Flooding, Dam Failure, Mud Flow and Debris
Timeline	1	Short Time Frame
Agency Champion	0	This action currently is the sole responsibility of emergency management
Other Community Objectives	0	None
Total	8	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: City of Fountain

Number: 41

Mitigation Action/Initiative: Put Flood Information in the Local Paper

Assessing the Risk	
Hazard(s) addressed:	Flood/Dam Failure
Specific problem being mitigated:	Awareness and preparation for flooding
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Put flood information in the local paper
	2. Put flood information on the City website
	3. Flood information handouts at City Hall
Action/Project Intended for Implementation	
Description of Selected Action/Project	Put flood information in the local paper to educate the community about flood risk and emergency actions
Action/Project Category	Education & awareness Programs (EAP)
Goals/Objectives Met	Goals 1 & 3 Objectives 1.2, 3.1, 3.2, & 3.3
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Prepares citizens for potential flooding
Estimated Cost	Low
Priority*	High
Plan for Implementation	
Responsible Organization	City of Fountain Office of Emergency Management
Local Planning Mechanism	Communications Center & IT
Potential Funding Sources	Within Current City Funding
Timeline for Completion	Short-term

* Refer to results of Prioritization (page 2)



Prioritization

Number: 41

Mitigation Action/Initiative: Put Flood Information in the Local Paper

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Increases the life safety of citizens by preparedness
Property Protection	0	May have little effect on property protection
Cost-Effectiveness	1	Inexpensive and able to be accomplished with in the current budget
Technical	1	Easy to accomplish within current technology
Political	1	Political support for informing and empowering citizens
Legal	1	The city has the authority to implement this action
Fiscal	1	The project can exist under current budgets
Environmental	0	Little to no impact
Social	0	Little to no impact
Administrative	0	Increased work load however it is doable with current staff
Multi-Hazard	1	This hazard addresses Flooding, Dam Failure, Mud Flow and Debris
Timeline	1	Short Time Frame
Agency Champion	0	This action currently is the sole responsibility of emergency management
Other Community Objectives	0	None
Total	8	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: City of Fountain

Number: 42

Mitigation Action/Initiative: Map and Assess Community Vulnerability to Seismic Hazards

Assessing the Risk	
Hazard(s) addressed:	Earthquake
Specific problem being mitigated:	Identify structures vulnerable to earthquake damage
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	<ol style="list-style-type: none"> 1. Map and assess community vulnerability to seismic hazards 2. Educate residents and business owners on seismic hazards and rely on individuals to reinforce structures 3. No action
Action/Project Intended for Implementation	
Description of Selected Action/Project	Map and assess community vulnerability to seismic hazards and implement the maps and assessments into local planning regulations and plans
Action/Project Category	Local Plans & Regulations (LRP)
Goals/Objectives Met	Goals 1 & 5 Objectives 1.3, 1.4, & 5.1
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Identify hazard areas to focus future planning and mitigation
Estimated Cost	Low
Priority*	High
Plan for Implementation	
Responsible Organization	City of Fountain Office of Emergency Management
Local Planning Mechanism	Assistance from Planning Department
Potential Funding Sources	Within Current City Funding
Timeline for Completion	Short to Long-term

* Refer to results of Prioritization (page 2)



Prioritization

Number: 42

Mitigation Action/Initiative: Map and Assess Community Vulnerability to Seismic Hazards

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Identifies danger areas
Property Protection	1	Identifies property that may be in need of protection
Cost-Effectiveness	1	Inexpensive and able to be accomplished with in the current budget
Technical	1	Easy to accomplish within current technology
Political	1	Political support for this step
Legal	1	The city has the authority to implement this action
Fiscal	1	The project can exist under current budgets
Environmental	0	Little to no impact
Social	0	Little to no impact
Administrative	0	Increased work load however it is doable with current staff
Multi-Hazard	0	Only focuses on one hazard
Timeline	1	Medium to Short Time Frame
Agency Champion	0	This action currently is the sole responsibility of emergency management
Other Community Objectives	1	Economic Development & Urban Development objectives may be similar
Total	9	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: City of Fountain

Number: 43

Mitigation Action/Initiative: Coordinate Conservation and Mitigation Actions with the Water Department

Assessing the Risk	
Hazard(s) addressed:	Drought
Specific problem being mitigated:	Awareness and preparation for drought
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	<ol style="list-style-type: none"> 1. Coordinate conservation and mitigation actions with the Water Department 2. Monitor water supply and plan for drought – may be currently done by Water Department 3. Water conservation plans and community education – may be currently done by Water Department
Action/Project Intended for Implementation	
Description of Selected Action/Project	Coordinate conservation and mitigation actions with the Water Department to reduce the impact of droughts
Action/Project Category	Education & Awareness Programs (EAP)/Local Plans & Regulations (LPR)
Goals/Objectives Met	Goals 1, 3, & 4 Objectives 1.3, 3.1, 4.1, & 4.2
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Prepares community to be drought resilient
Estimated Cost	Low
Priority*	High
Plan for Implementation	
Responsible Organization	City of Fountain Utilities Department
Local Planning Mechanism	City of Fountain Water Department
Potential Funding Sources	Within Current City Funding
Timeline for Completion	Short-term

* Refer to results of Prioritization (page 2)



Prioritization

Number: 43

Mitigation Action/Initiative: Coordinate Conservation and Mitigation Actions with the Water Department

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Ensure adequate drinking water supply
Property Protection	1	Protection of crops
Cost-Effectiveness	1	Inexpensive and able to be accomplished with in the current budget
Technical	1	Easy to accomplish within current technology
Political	1	Political & Public Support for sustainable water supply
Legal	1	The city has the authority to implement this action
Fiscal	1	The project can exist under current budgets
Environmental	1	Reduced environmental impact by water conservation
Social	0	Little to no impact
Administrative	0	Increased work load however it is doable with current staff
Multi-Hazard	1	Single Hazard
Timeline	1	Short Time Frame
Agency Champion	0	Water Department
Other Community Objectives	0	None
Total	11	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: City of Fountain

Number: 44

Mitigation Action/Initiative: Conduct Lightning Awareness

Assessing the Risk	
Hazard(s) addressed:	Lighting
Specific problem being mitigated:	Education of community members of awareness and preparation for lightning
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Conduct lightning awareness educational campaign
	2. Develop lightning warning system
	3. Protect critical infrastructure from lightning strikes
Action/Project Intended for Implementation	
Description of Selected Action/Project	Educate the community about Lightning Awareness
Action/Project Category	Education and Awareness Programs (EAP)
Goals/Objectives Met	Goal 3 Objectives 3.1, 3.2, & 3.3
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Prepares citizens for lightning
Estimated Cost	Low
Priority*	High
Plan for Implementation	
Responsible Organization	City of Fountain Office of Emergency Management
Local Planning Mechanism	Communications Center
Potential Funding Sources	Within Current City Funding
Timeline for Completion	Short-term

* Refer to results of Prioritization (page 2)



Prioritization

Number: 44

Mitigation Action/Initiative: Conduct Lightning Awareness

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Increases the life safety of citizens by preparedness
Property Protection	1	Gives citizens action to protect property
Cost-Effectiveness	1	Inexpensive and able to be accomplished with in the current budget
Technical	1	Easy to accomplish within current technology
Political	1	Political support for informing and empowering citizens
Legal	1	The city has the authority to implement this action
Fiscal	1	The project can exist under current budgets
Environmental	0	Little to no impact
Social	0	Little to no impact
Administrative	0	Increased work load however it is doable with current staff
Multi-Hazard	0	Single Hazard
Timeline	1	Short Time Frame
Agency Champion	0	This action currently is the sole responsibility of emergency management
Other Community Objectives	0	None
Total	8	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: City of Fountain

Number: 45

Mitigation Action/Initiative: Protect Critical Infrastructure from Lightning Strikes

Assessing the Risk	
Hazard(s) addressed:	Lighting
Specific problem being mitigated:	Critical Infrastructure protection
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Protect critical infrastructure from lightning strikes
	2. Develop lightning warning system
	3. Conduct lightning awareness education
Action/Project Intended for Implementation	
Description of Selected Action/Project	Protect critical Infrastructure from lightning strikes
Action/Project Category	Structure & Infrastructure Project (SIP)
Goals/Objectives Met	Goal 2 Objectives 2.1 & 2.2
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Protects loss of critical infrastructure
Estimated Cost	Medium
Priority*	Medium
Plan for Implementation	
Responsible Organization	City of Fountain Office of Emergency Management
Local Planning Mechanism	IT Department
Potential Funding Sources	May require some additional funding
Timeline for Completion	Short to Long-term

* Refer to results of Prioritization (page 2)



Prioritization

Number: 45

Mitigation Action/Initiative: Protect Critical Infrastructure from Lightning Strikes

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Increases the life safety of citizens by reducing loss of critical resources
Property Protection	1	Direct protection of property
Cost-Effectiveness	1	Inexpensive and may require some additional funding
Technical	1	Easy to accomplish within current technology
Political	0	Unknown
Legal	1	The city has the authority to implement this action
Fiscal	0	The project may require some additional funding
Environmental	0	Little to no impact
Social	0	Little to no impact
Administrative	-1	May require additional personnel or time to accomplish
Multi-Hazard	0	Single Hazard
Timeline	1	Medium to Short Time Frame
Agency Champion	0	This action currently is the sole responsibility of emergency management
Other Community Objectives	1	IT Infrastructure Protection Objectives/CIRSA loss reduction objectives
Total	6	
Priority (High/Med/Low)	Medium	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: City of Fountain

Number: 46

Mitigation Action/Initiative: Coordinate Flood Mitigation with City Drainage Plans

Assessing the Risk	
Hazard(s) addressed:	Flood/Dam Failure
Specific problem being mitigated:	Coordinated Flood Mitigation
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Coordinate flood mitigation with City drainage plans
	2. Put flood information on the City website
	3. No action
Action/Project Intended for Implementation	
Description of Selected Action/Project	Coordinate flood mitigation planning and activities with City Drainage Plans
Action/Project Category	Natural Systems Protection (NRP) & Infrastructure Protection (SIP)
Goals/Objectives Met	Goals 1, 2, 4, & 5 Objectives 1.2, 1.3, 1.4, 2.1, 2.2, 4.1, 4.2, & 5.2
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Coordinated flood mitigation planning with current drainage plans to reduce the risk of flooding
Estimated Cost	Low
Priority*	High
Plan for Implementation	
Responsible Organization	City of Fountain Department of Public Works
Local Planning Mechanism	Planning Department, City Engineer & Emergency Management
Potential Funding Sources	Within Current City Funding
Timeline for Completion	Long-term

* Refer to results of Prioritization (page 2)



Prioritization

Number: 46

Mitigation Action/Initiative: Coordinate Flood Mitigation with City Drainage Plans

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Increases the life safety by reducing flooding potential
Property Protection	1	Protects property by reducing flooding potential
Cost-Effectiveness	1	Able to be accomplished within the current budget
Technical	1	Easy to accomplish within current technology
Political	1	Current political support for drainage projects
Legal	1	The city has the authority to implement this action
Fiscal	1	The project can exist under current budgets
Environmental	1	Reduced impact on environment by better drainage and water return
Social	0	Little to no impact
Administrative	0	Increased work load however it is doable with current staff
Multi-Hazard	1	This hazard addresses Flooding, Dam Failure, Mud Flow and Debris
Timeline	0	Medium - long Time Frame
Agency Champion	0	Department of Public works
Other Community Objectives	1	Planning, & Public Works Objectives
Total	10	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: City of Fountain

Number: 47

Mitigation Action/Initiative: Tornado Plans & Drills for Public Buildings

Assessing the Risk	
Hazard(s) addressed:	Tornado
Specific problem being mitigated:	Prepare citizens for tornados
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Develop tornado plans and drills for public buildings
	2. Develop tornado warning systems – Cost Prohibitive – some warning systems existing
	3. Build tornado shelters in public buildings
Action/Project Intended for Implementation	
Description of Selected Action/Project	Develop tornado plans & implement drills for public buildings to protect citizens
Action/Project Category	Local Plans & Regulations (LPR) & Education & Awareness Programs (EAP)
Goals/Objectives Met	Goals 1, 2, & 3 Objectives 1.2, 1.3, 2.1, & 3.1
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Tornado response plans for government buildings & schools to include conducting drills, protection of life safety.
Estimated Cost	Low
Priority*	Medium
Plan for Implementation	
Responsible Organization	City of Fountain Emergency Management
Local Planning Mechanism	Fire Department & City Administration
Potential Funding Sources	Within Current City Funding
Timeline for Completion	Short Term

* Refer to results of Prioritization (page 2)



Prioritization

Number: 47

Mitigation Action/Initiative: Tornado Plans & Drills for Public Buildings

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Increases the life safety by having a plan to react to a tornado event
Property Protection	0	Does not necessarily protect property
Cost-Effectiveness	1	Inexpensive & able to be accomplished with in the current budget
Technical	1	Easy to accomplish within current technology
Political	1	Current Political support
Legal	1	The city has the authority to implement this action
Fiscal	1	The project can exist under current budgets
Environmental	0	Little or no Impact
Social	0	Little to no impact
Administrative	0	Increased work load however it is doable with current staff
Multi-Hazard	0	Single Hazard
Timeline	0	Short Time Frame
Agency Champion	0	Fire Department
Other Community Objectives	1	Administration & School District Objectives
Total	7	
Priority (High/Med/Low)	Medium	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: City of Fountain

Number: 48

Mitigation Action/Initiative: Develop Community Wildland Fire Protection Plan

Assessing the Risk	
Hazard(s) addressed:	Wildland Fire
Specific problem being mitigated:	Protection plans for wildland fire in the interface zone
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Develop Community Wildland Fire Protection Plan
	2. Develop a Wildland Fire Interface Code
	3. No action
Action/Project Intended for Implementation	
Description of Selected Action/Project	Develop protection plans for Wildland Fire in the Interface Zone to identify specific areas and mitigation technologies by areas that have a potential to be affected by wildland fires
Action/Project Category	Local Plans & Regulations (LPR)
Goals/Objectives Met	Goals 1, 3, 4, &5 Objectives 1.2, 1.3, 1.4, 3.1, 4.2, & 5.1
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Life, property, and economic loss
Estimated Cost	Low
Priority*	High
Plan for Implementation	
Responsible Organization	City of Fountain Emergency Management
Local Planning Mechanism	Fire Department Wildland Team
Potential Funding Sources	Within Current City Funding
Timeline for Completion	Short-to Long-term

* Refer to results of Prioritization (page 2)



Prioritization

Number: 48

Mitigation Action/Initiative: Develop Community Wildland Fire Protection Plan

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Increases the life safety by having a plan to reduce the impact of wildland fires
Property Protection	1	Decrease property loss from wildland fires
Cost-Effectiveness	1	Inexpensive & able to be accomplished with in the current budget
Technical	1	Easy to accomplish within current technology
Political	1	Current political support
Legal	1	The city has the authority to implement this action
Fiscal	1	The project can exist under current budgets
Environmental	0	Little or no Impact
Social	0	Little to no impact
Administrative	0	Increased work load however it is doable with current staff
Multi-Hazard	0	Single Hazard
Timeline	1	Short-Medium Time Frame
Agency Champion	1	Fire Department – Wildland Fire Team
Other Community Objectives	0	
Total	9	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: City of Fountain

Number: 49

Mitigation Action/Initiative: Develop Wildland Fire Interface Code

Assessing the Risk	
Hazard(s) addressed:	Wildland Fire
Specific problem being mitigated:	Develop a code to ensure areas are protected from wildland fires
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Develop a Wildland Fire Interface Code
	2. Develop Community Wildland Fire Protection Plan
	3. No action
Action/Project Intended for Implementation	
Description of Selected Action/Project	Develop a Wildland Fire Interface Code to ensure defensible space from open space and wildland areas from built up areas to protect structures
Action/Project Category	Local Plans & Regulations (LPR)
Goals/Objectives Met	Goals 1, 3, 4, & 5 Objectives 1.2, 1.3, 1.4, 3.1, 4.2, & 5.1
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Life, property, and economic losses
Estimated Cost	Low
Priority*	High
Plan for Implementation	
Responsible Organization	City of Fountain Fire Prevention Division
Local Planning Mechanism	Fire Department Wildland Team & Fire Prevention
Potential Funding Sources	Within Current City Funding
Timeline for Completion	Short- to Long-Term

* Refer to results of Prioritization (page 2)



Prioritization

Number: 49

Mitigation Action/Initiative: Develop Wildland Fire Interface Code

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Increases the life safety by ensuring defensible space from wildland fires
Property Protection	1	Decrease property loss from wildland fires
Cost-Effectiveness	1	Inexpensive & able to be accomplished with in the current budget
Technical	1	Easy to accomplish within current technology
Political	1	Current political support
Legal	1	The city has the authority to implement this action
Fiscal	1	The project can exist under current budgets
Environmental	0	Little or no impact
Social	0	Little to no impact
Administrative	0	Increased work load however it is doable with current staff
Multi-Hazard	0	Single hazard
Timeline	1	Short-Medium Time Frame
Agency Champion	1	Fire Department – Wildland Fire Team
Other Community Objectives	0	
Total	9	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: City of Fountain

Number: 50

Mitigation Action/Initiative: Participate in Local Emergency Planning Committee

Assessing the Risk	
Hazard(s) addressed:	Hazardous Materials
Specific problem being mitigated:	Increased involvement and awareness in the hazardous materials emergency management program
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Participate in the local emergency planning committee
	2. Develop unique emergency planning committee
	3. No action
Action/Project Intended for Implementation	
Description of Selected Action/Project	Include the city in the LEPC and increased awareness and response planning
Action/Project Category	Education and Awareness Programs (EAP) Local Plan and Regulations (LPR)
Goals/Objectives Met	Goals 1, 4, 5, & 6 Objectives 1.4, 4.1, 4.2, 4.3, 5.3, & 6.3
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Preparedness and prevention of HAZMAT incidents
Estimated Cost	Low
Priority*	Medium
Plan for Implementation	
Responsible Organization	City of Fountain Office of Fire Department
Local Planning Mechanism	City of Fountain Fire Department
Potential Funding Sources	No funding needed
Timeline for Completion	Short- to Long-term

* Refer to results of Prioritization (page 2)



Prioritization

Number: 50

Mitigation Action/Initiative: Participate in Local Emergency Planning Committee

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	
Property Protection	0	
Cost-Effectiveness	1	Inexpensive and able to be accomplished with in the current budget
Technical	1	Easy to accomplish within current technology
Political	-1	
Legal	0	
Fiscal	1	The project can exist under current budgets
Environmental	0	
Social	0	
Administrative	1	Increased work load however it is doable with current staff
Multi-Hazard	0	
Timeline	1	Short Time Frame
Agency Champion	0	
Other Community Objectives	0	None
Total	4	
Priority (High/Med/Low)	Medium	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: City of Fountain

Number: 51

Mitigation Action/Initiative: Expand Vaccination Program

Assessing the Risk	
Hazard(s) addressed:	Pandemic Disease
Specific problem being mitigated:	Provide vaccinations to the first responders and city staff who may have an emergency role
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Expand vaccination program to include All First responders and Emergency management staff.
	2. Educate first responders and emergency management staff and encourage them to obtain the recommended vaccinations
	3. No action
Action/Project Intended for Implementation	
Description of Selected Action/Project	Expand vaccination program to include all first responders and emergency management staff who may have an emergency role such as EOC personnel and the emergency communications personnel to help ensure emergency personnel are available to assist in an incident.
Action/Project Category	Natural Resources Protection (NRP)
Goals/Objectives Met	Goals 3, 4, & 6 Objectives 3.1, 3.3, 4.2, & 6.1
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Loss of life of necessary emergency personnel during a pandemic
Estimated Cost	Medium
Priority*	High
Plan for Implementation	
Responsible Organization	City of Fountain Office of Human Resources Department
Local Planning Mechanism	City of Fountain Fire Department
Potential Funding Sources	May need additional funding and/or grants
Timeline for Completion	Medium

* Refer to results of Prioritization (page 2)



Prioritization

Number: 51

Mitigation Action/Initiative: Expand Vaccination Program

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	0	
Technical	1	Easy to accomplish within current technology
Political	1	
Legal	1	
Fiscal	1	The project can exist under current budgets
Environmental	1	
Social	0	
Administrative	-1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	0	
Other Community Objectives	0	None
Total	8	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: City of Fountain

Number: 52

Mitigation Action/Initiative: Meet the Criteria for a Storm Ready Community

Assessing the Risk	
Hazard(s) addressed:	Winter Storm, Hail Storm, Lightning, Tornado, Severe Wind
Specific problem being mitigated:	Become a Storm Ready Community to enhance to community's resilience to storms
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Meet the criteria for a Storm Ready Community
	2. Provide storm warning siren system
	3. No action
Action/Project Intended for Implementation	
Description of Selected Action/Project	Meet the criteria for a Storm Ready Community to prepare the community to be storm ready and resistant
Action/Project Category	Education and Awareness Programs (EAP)
Goals/Objectives Met	Goals 1, 3, & 4 Objectives 1.1, 3.1, 3.2, 4.1, & 4.2
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Life, property, and economic losses
Estimated Cost	Low
Priority*	High
Plan for Implementation	
Responsible Organization	City of Fountain Office of emergency management
Local Planning Mechanism	City of Fountain communications Department
Potential Funding Sources	May need additional funding and/or grants
Timeline for Completion	Medium

* Refer to results of Prioritization (page 2)



Prioritization

Number: 52

Mitigation Action/Initiative: Meet the Criteria for a Storm Ready Community

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	0	Inexpensive and able to be accomplished with in the current budget
Technical	1	Easy to accomplish within current technology
Political	1	Political & Public Support
Legal	1	The city has the authority to implement this action
Fiscal	1	The project can exist under current budgets
Environmental	1	
Social	0	
Administrative	-1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	0	
Other Community Objectives	0	
Total	8	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: City of Fountain

Number: 53

Mitigation Action/Initiative: Develop a Coordinated Response Plan for Acts of Violence

Assessing the Risk	
Hazard(s) addressed:	Extreme Acts of Violence
Specific problem being mitigated:	Respond to extreme acts of violence
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	<ol style="list-style-type: none"> 1. Develop a coordinated response plan to respond to extreme acts of violence 2. Identify potential target hazards and provide protection measures 3. No action
Action/Project Intended for Implementation	
Description of Selected Action/Project	Develop coordinated rapid response for extreme acts of violence by coordinating with the police department, fire department, school district, city hall and emergency management
Action/Project Category	Structure and Infrastructure Project (SIP)
Goals/Objectives Met	Goals 1, 3, & 4 Objectives 1.1, 3.1, 3.2, 4.1, & 4.2
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Prevent loss of life
Estimated Cost	Low
Priority*	Medium
Plan for Implementation	
Responsible Organization	City of Fountain Office of Emergency Management
Local Planning Mechanism	City of Fountain Police Department
Potential Funding Sources	May need additional funding and/or grants
Timeline for Completion	Short- to Long-term

* Refer to results of Prioritization (page 2)



Prioritization

Number: 53

Mitigation Action/Initiative: Develop a Coordinated Response Plan for Acts of Violence

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	0	
Cost-Effectiveness	1	Inexpensive and able to be accomplished with in the current budget
Technical	1	Easy to accomplish within current technology
Political	1	Political & Public Support
Legal	1	The city has the authority to implement this action
Fiscal	0	
Environmental	0	
Social	1	
Administrative	-1	
Multi-Hazard	0	Single Hazard
Timeline	1	Short Time Frame
Agency Champion	1	
Other Community Objectives	0	None
Total	7	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: City of Fountain

Number: 54

Mitigation Action/Initiative: Develop Coordinated Rapid Response to Aircraft Incidents

Assessing the Risk	
Hazard(s) addressed:	Aircraft Accidents
Specific problem being mitigated:	Ability to rapidly respond to an aircraft incident and save lives and protect property.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Develop coordinated rapid response to be better prepared for aircraft incidents
	2. Identify potential flight path safety zones and consider during community planning
	3. No action
Action/Project Intended for Implementation	
Description of Selected Action/Project	Develop coordinated rapid response accidents by coordinating with the police department, fire department, airport, CSFD, El Paso County SO and emergency management
Action/Project Category	Structure and Infrastructure Project (SIP) Education Awareness Programs (EAP)
Goals/Objectives Met	Goals 1, 3, & 4 Objectives 1.1, 3.1, 3.2, 4.1, & 4.2
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Prevent loss of life
Estimated Cost	Low
Priority*	Medium
Plan for Implementation	
Responsible Organization	City of Fountain Office of Emergency Management
Local Planning Mechanism	City of Fountain Fire Department
Potential Funding Sources	May need additional funding and/or grants
Timeline for Completion	Short- to Long-term

* Refer to results of Prioritization (page 2)



Prioritization

Number: 54

Mitigation Action/Initiative: Develop Coordinated Rapid Response to Aircraft Incidents

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	Inexpensive and able to be accomplished with in the current budget
Technical	1	Easy to accomplish within current technology
Political	0	
Legal	1	The city has the authority to implement this action
Fiscal	0	
Environmental	0	
Social	1	Little to no impact
Administrative	-1	
Multi-Hazard	0	Single Hazard
Timeline	1	Short Time Frame
Agency Champion	1	
Other Community Objectives	0	None
Total	7	
Priority (High/Med/Low)	Medium	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: City of Fountain

Number: 55

Mitigation Action/Initiative: Conduct Annual Review & Tri-Annual Update of the Fountain EOP

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Improved Planning and Coordination
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Continue to improve and update the local EOP
	2. No action, keep current plan
	3. Rely on the departments and El Paso County to respond to and coordinate incidents
Action/Project Intended for Implementation	
Description of Selected Action/Project	Conduct annual review and tri-annual updates to the Fountain EOP
Action/Project Category	Local Plans and Regulations (LPR)
Goals/Objectives Met	Goals 1, 2, 3, 4, & 5 Objectives 1.2, 1.3, 1.4, 2.1, 2.2, 3.3, 4.2, & 5.1
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Life, Property, and Economic Losses
Estimated Cost	Low
Priority*	Medium
Plan for Implementation	
Responsible Organization	City of Fountain Office of Emergency Management
Local Planning Mechanism	City of Fountain Office of Emergency Management
Potential Funding Sources	No funding needed
Timeline for Completion	Ongoing

* Refer to results of Prioritization (page 2)



Prioritization

Number: 55

Mitigation Action/Initiative: Conduct Annual Review & Tri-Annual Update of the Fountain EOP

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	0	
Cost-Effectiveness	1	Inexpensive and able to be accomplished with in the current budget
Technical	0	Easy to accomplish within current technology
Political	0	
Legal	1	The city has the authority to implement this action
Fiscal	1	The project can exist under current budgets
Environmental	0	
Social	0	
Administrative	-1	Increased work load however it is doable with current staff
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	7	
Priority (High/Med/Low)	Medium	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: Green Mountain Falls

Number: 56

Mitigation Action/Initiative: Install Cell Phone Tower Within Town

Assessing the Risk	
Hazard(s) addressed:	Wildfire, Winter Storm, Flooding, Dam Failure, Earthquake, HAZMAT
Specific problem being mitigated:	Lack of cell service within town may hinder emergency response or notification of residents of emergencies and hazards
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	<ol style="list-style-type: none"> 1. Coordinate with cell phone companies to install cell phone tower within town 2. Rely on Landline ENS Warning 3. Install warning sirens and other audio emergency notification systems in town
Action/Project Intended for Implementation	
Description of Selected Action/Project	Coordinate with cell phone companies to increase cellular communication to provide notification to citizens
Action/Project Category	SIP
Goals/Objectives Met	Goals 1, 3, & 6 Objectives 1.1,3.1,3.3,& 6.1
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Loss of life and property
Estimated Cost	High
Priority*	Medium
Plan for Implementation	
Responsible Organization	Town of Green Mountain Falls
Local Planning Mechanism	Cell phone companies with Green Mountain Falls town government
Potential Funding Sources	To be determined/unknown
Timeline for Completion	Short-term

* Refer to results of Prioritization (page 2)



Prioritization

Number: 56

Mitigation Action/Initiative: Install Cell Phone Tower Within Town

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	0	
Technical	1	
Political	1	
Legal	-1	
Fiscal	-1	
Environmental	1	
Social	0	
Administrative	-1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	6	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: Green Mountain Falls

Number: 57

Mitigation Action/Initiative: Work with Property Owners to Mitigate Wildfire Risks to Property

Assessing the Risk	
Hazard(s) addressed:	Wildfire
Specific problem being mitigated:	Overgrown and unhealthy forest
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Work with property owners to help mitigate wildfire risks to property
	2. Develop handouts to distribute to property owners that explain how they can mitigate wildfire risks
	3. No action
Action/Project Intended for Implementation	
Description of Selected Action/Project	Work with property owners to mitigate risks to property by establishing clean-up/ mitigation days within town, and fuel reduction by thinning brush and removing disease and dead trees
Action/Project Category	NRP
Goals/Objectives Met	Goals 2, 4, & 6 Objectives 2.1,2.2,4.2, & 6.1
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Loss of life, and property, economic prevention
Estimated Cost	Medium
Priority*	Medium
Plan for Implementation	
Responsible Organization	Fire protection district, CWPP (Community Wildfire Protection Plan Committee)
Local Planning Mechanism	CWPP
Potential Funding Sources	Grants/Federal/State
Timeline for Completion	Ongoing

* Refer to results of Prioritization (page 2)



Prioritization

Number: 57

Mitigation Action/Initiative: Work with Property Owners to Mitigate Wildfire Risks to Property

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	0	
Political	1	
Legal	-1	
Fiscal	-1	
Environmental	1	
Social	0	
Administrative	0	
Multi-Hazard	0	
Timeline	-1	
Agency Champion	1	
Other Community Objectives	1	
Total	4	
Priority (High/Med/Low)	Medium	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: Green Mountain Falls

Number: 58

Mitigation Action/Initiative: Update Town Website with Emergency Information

Assessing the Risk	
Hazard(s) addressed:	Wildfire, Winter Storm, Flooding, Dam Failure
Specific problem being mitigated:	Provide a centralized place for citizen to obtain emergency preparedness information
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Update town website with emergency information
	2. Provide emergency preparedness information and town hall meetings
	3. Post information at bulletin board in the post office
Action/Project Intended for Implementation	
Description of Selected Action/Project	Update town website with emergency information; create "Emergency Information" tab on Town website
Action/Project Category	EAP
Goals/Objectives Met	Goals 1 & 3 Objectives 1.1, 3.1, 3.2, & 3.3
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Loss of life and property are avoided
Estimated Cost	Low
Priority*	High
Plan for Implementation	
Responsible Organization	Town of Green Mountain Falls
Local Planning Mechanism	Town with web masters from El Paso County
Potential Funding Sources	County currently runs website
Timeline for Completion	Short

* Refer to results of Prioritization (page 2)



Prioritization

Number: 58

Mitigation Action/Initiative: Update Town Website with Emergency Information

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	0	
Fiscal	0	
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	11	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: Green Mountain Falls

Number: 59

Mitigation Action/Initiative: Review and Update Current Disaster Plan

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Outdated Emergency disaster plan
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Review and update current disaster plan
	2. Hire contractor to develop plan
	3. Review and Adopt codes and restrictions for town
Action/Project Intended for Implementation	
Description of Selected Action/Project	Review and update current emergency disaster plan for town
Action/Project Category	EAP
Goals/Objectives Met	Goals 1, 2, & 3 Objectives 1.2,1.3,1.4,2.1, & 3.3
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Loss of life, and property, economic are avoided
Estimated Cost	Low
Priority*	High
Plan for Implementation	
Responsible Organization	Town of Green Mountain Falls
Local Planning Mechanism	Town of Green Mountain Falls and Fire Protection District
Potential Funding Sources	Time spent volunteers
Timeline for Completion	Short-term

* Refer to results of Prioritization (page 2)



Prioritization

Number: 59

Mitigation Action/Initiative: Review and Update Current Disaster Plan

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	0	
Social	0	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	12	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: Green Mountain Falls

Number: 60

Mitigation Action/Initiative: Install Early Warning System in Town Hall

Assessing the Risk	
Hazard(s) addressed:	Wildfire, Flooding, Dam failure
Specific problem being mitigated:	Lack of early warning system siren
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Install early warning system in our new Town Hall to inform citizens of immediate danger
	2. Notify citizens of hazards through reverse-911 calls
	3. No action
Action/Project Intended for Implementation	
Description of Selected Action/Project	Install early warning system in our new Town Hall to inform citizens of immediate danger and educate community on siren sounds
Action/Project Category	SIP
Goals/Objectives Met	Goals 1, 3, & 6 Objectives 1.1, 1.4, 3.3, 3.1, & 6.1
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Reduce loss of life, reduce economic loss
Estimated Cost	High
Priority*	High
Plan for Implementation	
Responsible Organization	Fire Protection District
Local Planning Mechanism	Town government entities
Potential Funding Sources	Grants, donations
Timeline for Completion	Short-term

* Refer to results of Prioritization (page 2)



Prioritization

Number: 60

Mitigation Action/Initiative: Install Early Warning System in Town Hall

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	0	
Political	-1	
Legal	-1	
Fiscal	0	
Environmental	0	
Social	-1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	-1	
Total	3	
Priority (High/Med/Low)	Medium	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: Green Mountain Falls

Number: 61

Mitigation Action/Initiative: Mitigating Flood Debris on Green Mountain Falls Property

Assessing the Risk	
Hazard(s) addressed:	Flooding, Erosion, Mud or Debris flow
Specific problem being mitigated:	Post flooding debris in Creek
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Mitigating debris on Green Mountain Falls Property
	2. Establish to mitigation days sponsored by town
	3. Widen creek beds
Action/Project Intended for Implementation	
Description of Selected Action/Project	Pre flood mitigation efforts to remove debris and restore the creeks to prevent flooding concerns, coordinated by town Public Works Department
Action/Project Category	NRP
Goals/Objectives Met	Goals 1, 4, & 6 Objectives 2.1, 2.2, 4.2, & 6.1
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Loss of Property and infrastructure
Estimated Cost	Medium
Priority*	High
Plan for Implementation	
Responsible Organization	Town of Green Mountain Falls
Local Planning Mechanism	Town of Green Mountain Falls and volunteers
Potential Funding Sources	Grants, Volunteers
Timeline for Completion	Short-term

* Refer to results of Prioritization (page 2)



Prioritization

Number: 61

Mitigation Action/Initiative: Mitigating Flood Debris on Green Mountain Falls Property

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	0	
Technical	0	
Political	1	
Legal	0	
Fiscal	0	
Environmental	1	
Social	0	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	9	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: Town of Monument

Number: 62

Mitigation Action/Initiative: MOU with D38 for use of their facilities if needed

Assessing the Risk	
Hazard(s) addressed:	Earthquake, Hailstorm, Severe Wind, Wildfire, Winter Storm, Drought, Lightning, Pandemic Disease, Tornado, Hazmat
Specific problem being mitigated:	Continuity of government services and business operations during an emergency
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. MOU with D38 for use of their facilities if needed
	2. Contract for purchase of alternate facility
	3. MOU with Palmer Lake for use of their facilities
Action/Project Intended for Implementation	
Description of Selected Action/Project	Develop MOU with school district D38 for the use of their facilities to assist in restoring the function of natural systems in the event Town of Monument facilities are compromised
Action/Project Category	NRP
Goals/Objectives Met	Goals 1, 2, 3, 4, 5, & 6 Objectives 1.2; 2.3; 3.3; 4.1; 4.2; 4.3; 5.1; 5.3; 6.1; 6.2; & 6.3
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Continuity of natural systems during an emergency; reduces economic loss; preservation of life
Estimated Cost	Low
Priority*	High
Plan for Implementation	
Responsible Organization	Town of Monument
Local Planning Mechanism	MOU with local school district
Potential Funding Sources	N/A
Timeline for Completion	Short-term

* Refer to results of Prioritization (page 2)



Prioritization

Number: 62

Mitigation Action/Initiative: MOU with D38 for use of their facilities if needed

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	-1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	0	
Social	0	May result in loss of school district to operate as school however; will allow Town to continue to support citizens during incident
Administrative	-1	Record keeping from the beginning to end of incident for FEMA - assistance needed
Multi-Hazard	1	MOU can benefit all incidents in loss of critical infrastructure
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	Support Emergency Operations Plan for TOM and EPC
Total	8	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: Town of Monument

Number: 63

Mitigation Action/Initiative: Obtain generators for critical infrastructure

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Loss of service and data; potential loss due to fire
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	<ol style="list-style-type: none"> 1. Obtain generators for backup power for critical infrastructure 2. Install lightning/ground protection on critical infrastructure 3. Install faraday cages for servers
Action/Project Intended for Implementation	
Description of Selected Action/Project	Obtain generators to provide backup power for critical infrastructure during emergencies
Action/Project Category	SIP
Goals/Objectives Met	Goals 2, 5, & 6 Objectives 2.1, 2.2, 5.1, & 6.1
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Prevent the loss / use critical facility infrastructure; reduces economic loss; preservation of life
Estimated Cost	High
Priority*	High
Plan for Implementation	
Responsible Organization	Town of Monument
Local Planning Mechanism	Obtain generators for critical infrastructure
Potential Funding Sources	Budget Restate
Timeline for Completion	Short-term (in process of obtaining generators/renting)

* Refer to results of Prioritization (page 2)



Prioritization

Number: 63

Mitigation Action/Initiative: Obtain generators for critical infrastructure

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Availability of critical infrastructure to continue operations
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	-1	Budget restate will need to occur
Environmental	0	
Social	0	
Administrative	0	Record keeping from the beginning to end / FEMA / Assistance needed
Multi-Hazard	1	
Timeline	0	Budget is approved by Board of Trustees - highly likely but not guaranteed
Agency Champion	1	
Other Community Objectives	1	Support Emergency Operations Plan for TOM and EPC
Total	8	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: Town of Monument

Number: 64

Mitigation Action/Initiative: Add a link to the Town website "Emergency Preparedness"

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Provide a centralized location for citizens to obtain emergency preparedness information
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	<ol style="list-style-type: none"> 1. Add a link to the Town website "Emergency Preparedness" 2. Provide Emergency Preparedness information at Town Hall meetings 3. Provide Emergency Preparedness information in the Town Newsletter
Action/Project Intended for Implementation	
Description of Selected Action/Project	Create an "Emergency Preparedness" link on the Town website with emergency prevention/preparedness information
Action/Project Category	EAP
Goals/Objectives Met	Goals 1 & 3 Objectives 1.1, 3.1, 3.2, & 3.3
Applies to existing, future, or not applicable	Existing and Future (Some wildfire information currently on the website)
Benefits (losses avoided)	Citizen preparedness for hazardous events equates to less after-action by local government; reduces economic loss; preservation of life
Estimated Cost	Low
Priority*	High
Plan for Implementation	
Responsible Organization	Town of Monument
Local Planning Mechanism	Website Link Development
Potential Funding Sources	Within Current Budget (HR Director/Town Clerk responsible for website - current salary covers website maintenance)
Timeline for Completion	Short-term

* Refer to results of Prioritization (page 2)



Prioritization

Number: 64

Mitigation Action/Initiative: Add a link to the Town website "Emergency Preparedness"

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Information to citizens pre-emergency is key to property loss, economic loss and preservation of life
Property Protection	1	Vehicles/Property can be moved into garages / Roofs can be inspected for hail damage etc. to prevent future leaks and property loss
Cost-Effectiveness	1	Current Salary of HR Director/Town Clerk includes website maintenance
Technical	1	
Political	1	
Legal	1	
Fiscal	1	Current Salary of HR Director/Town Clerk includes website maintenance
Environmental	0	
Social	0	Some citizens may not have internet access
Administrative	-1	Record keeping from the beginning to end / FEMA / Assistance needed
Multi-Hazard	0	Website admin covered; Record keeping from the beginning to end of incident for FEMA - assistance needed
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	Support Emergency Operations Plan for TOM and EPC
Total	9	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: Town of Monument

Number: 65

Mitigation Action/Initiative: Ensure water tanks/water sheds have adequate fire protection

Assessing the Risk	
Hazard(s) addressed:	Wildfire
Specific problem being mitigated:	Reduce property and economic losses
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	<ol style="list-style-type: none"> 1. Ensure water tanks/water sheds have adequate fire protection 2. Relocate facilities out of high fire danger areas 3. No action
Action/Project Intended for Implementation	
Description of Selected Action/Project	Ensure water tanks/water sheds have adequate fire protection, for example, protected with concrete walls/roofs; 30-foot mitigation zones
Action/Project Category	NRP, SIP
Goals/Objectives Met	Goals 1, 2, 3, 4, 5, & 6 Objectives 1.3, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, 4.3, 5.1, 5.2, 5.3, & 6.1
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Citizen preparedness for hazardous events equates to less after action by local government; Town preparedness equates to little impact of natural systems; reduces economic loss; preservation of life
Estimated Cost	Medium
Priority*	Medium
Plan for Implementation	
Responsible Organization	Town of Monument
Local Planning Mechanism	Mitigation of Town owned property; education of privately owned property surrounding water tanks/water sheds
Potential Funding Sources	Budgeted
Timeline for Completion	Short-term

* Refer to results of Prioritization (page 2)



Prioritization

Number: 65

Mitigation Action/Initiative: Ensure water tanks/water sheds have adequate fire protection

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	0	Private land owners may be against mitigation
Legal	-1	Land surrounding water tanks/sheds may be privately owned; cannot force mitigation
Fiscal	1	
Environmental	1	
Social	0	Private land owners may be against mitigation
Administrative	0	Education of private property owners
Multi-Hazard	1	Protection of water tanks / water sheds addressed multi-hazards such as severe wind, tornado, wildfire, hailstorm, lightning
Timeline	-1	Cannot force private property owners to mitigate
Agency Champion	1	
Other Community Objectives	1	Support Emergency Operations Plan for TOM and EPC
Total	7	
Priority (High/Med/Low)	Medium	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: Town of Monument

Number: 66

Mitigation Action/Initiative: Adopt water mitigation plan, water conservation plan, and reusable/renewable water plan

Assessing the Risk	
Hazard(s) addressed:	Drought
Specific problem being mitigated:	Incorporate hazard mitigation into future plans and policies
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	<ol style="list-style-type: none"> 1. Adopt water mitigation plan, water conservation plan and reusable/renewable water plan 2. Adopt Emergency Operations Plan and Pre-Disaster Mitigation Plan 3. Hire consultant to develop independent plan
Action/Project Intended for Implementation	
Description of Selected Action/Project	Adopt water mitigation plan, water conservation plan, and reusable/renewable water plan, including ordinances limiting landscape/types of grasses and trees grown; water restrictions; and mitigation program offered by the Town (free disposal of shrubs/brush tress for mitigating property)
Action/Project Category	LPR, NRP
Goals/Objectives Met	Goals 1, 2, 3, 4, & 5 Objectives 1.3, 2.1, 2.2, 2.4, 3.1, 3.2, 3.3, 4.1, 4.2, 5.1, 5.2, & 5.3
Applies to existing, future, or not applicable	Existing and Future (Adopted Water Conservation Plan; adopted new landscaping ordinances; consulting with Westwater Research to develop a reusable/renewable water solution)
Benefits (losses avoided)	Prevent the loss / use critical facility infrastructure; reduces economic loss (livestock); preservation of life
Estimated Cost	Medium
Priority*	High
Plan for Implementation	
Responsible Organization	Town of Monument
Local Planning Mechanism	Develop reusable/renewable water solution
Potential Funding Sources	Town Budget
Timeline for Completion	Short-term



Prioritization

Number: 66

Mitigation Action/Initiative: Adopt water mitigation plan, water conservation plan, and reusable/renewable water plan

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	Drought can cause fire; loss of livestock to feed citizens; lack of water
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	Current cost for Westwater Research budgeted
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	1	Addressing drought assists with other hazards such as fire due to lightning/man made; high wind devastation due to dry environment, etc.
Timeline	1	Currently on track with Westwater Research Plan development
Agency Champion	1	
Other Community Objectives	1	Support Emergency Operations Plan for TOM and EPC
Total	14	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: Town of Monument

Number: 67

Mitigation Action/Initiative: Adopt Emergency Operations Plan and Pre-Disaster Mitigation Plan

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Incorporate hazard mitigation into future plans and policies
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	<ol style="list-style-type: none"> 1. Adopt Emergency Operations Plan and Pre-Disaster Mitigation Plan 2. Adopt water mitigation plan, water conservation plan and reusable/renewable water plan 3. Hire consultant to develop independent plan
Action/Project Intended for Implementation	
Description of Selected Action/Project	Adopt Emergency Operations Plan and Pre-Disaster Mitigation Plan
Action/Project Category	LPR, NRP
Goals/Objectives Met	Goals 1, 2, 3, 4, & 5 Objectives 1.3, 2.1, 2.2, 2.4, 3.1, 3.2, 3.3, 4.1, 4.2, 5.1, 5.2, & 5.3
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Prevent the loss / use critical facility infrastructure; reduces economic loss (Livestock); preservation of life
Estimated Cost	Medium
Priority*	High
Plan for Implementation	
Responsible Organization	Town of Monument
Local Planning Mechanism	Coordinate with EPC in the design and implementation of an EOP
Potential Funding Sources	Town Budget
Timeline for Completion	Short-term



Prioritization

Number: 67

Mitigation Action/Initiative: Adopt Emergency Operations Plan and Pre-Disaster Mitigation Plan

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	Rough draft written and meetings with EPC have occurred
Agency Champion	1	
Other Community Objectives	1	Support Emergency Operations Plan for TOM and EPC
Total	14	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: Town of Monument

Number: 68

Mitigation Action/Initiative: Enhance use of Everbridge emergency notification system within the Town

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Reduce loss of life and injury; reduce loss of property/damage
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	<ol style="list-style-type: none"> 1. Enhance use of Everbridge emergency notification system within the Town 2. Install a more robust siren system 3. Conduct study of ENS contact success throughout the jurisdiction
Action/Project Intended for Implementation	
Description of Selected Action/Project	Enhance use of Everbridge emergency notification system within the Town
Action/Project Category	EAP
Goals/Objectives Met	Goals 1, 3, 5, & 6 Objectives 1.1, 1.2, 3.1, 5.1, 6.1, 6.2, & 6.3
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Reduces economic loss; preservation of life; reduces property loss/damage
Estimated Cost	High
Priority*	Medium
Plan for Implementation	
Responsible Organization	Town of Monument
Local Planning Mechanism	Emergency Notification System (ENS)
Potential Funding Sources	Grant
Timeline for Completion	Long Term



Prioritization

Number: 68

Mitigation Action/Initiative: Enhance use of Everbridge emergency notification system within the Town

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	-1	Not budgeted
Environmental	0	
Social	1	Must incorporate sound/visual ENS
Administrative	-1	Record keeping from the beginning to end of incident for FEMA - assistance needed
Multi-Hazard	1	ENS will address multi-hazards preparedness
Timeline	-1	
Agency Champion	1	
Other Community Objectives	1	Support Emergency Operations Plan for TOM and EPC
Total	7	
Priority (High/Med/Low)	Medium	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: Town of Monument

Number: 69

Mitigation Action/Initiative: Coordinate with County GIS to develop layer for high risk areas/hazards

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Reduce Loss of Life and Injury; Loss/Damage to property
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Coordinate with County GIS to develop layer for high risk areas/hazards
	2. Hire GIS specialist to map hazards
	3. No action
Action/Project Intended for Implementation	
Description of Selected Action/Project	Coordinate with County GIS to develop layer for high risk areas/hazards to educate citizens
Action/Project Category	EAP
Goals/Objectives Met	Goals 1, 2, 3, 4, 5, & 6 Objectives 1.4, 2.1, 2.2, 3.1, 3.2, 4.3, 5.1, 5.3, & 6.1
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Citizen preparedness for hazardous events equates to less after action by local government; Town preparedness equates to little impact of natural systems; reduces economic loss; preservation of life; GID layering identifies critical areas within the Town
Estimated Cost	Medium
Priority*	High
Plan for Implementation	
Responsible Organization	Town of Monument
Local Planning Mechanism	GIS Development
Potential Funding Sources	Current position in place as of July 21
Timeline for Completion	Long-term

* Refer to results of Prioritization (page 2)



Prioritization

Number: 69

Mitigation Action/Initiative: Coordinate with County GIS to develop layer for high risk areas/hazards

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	Education regarding high risk areas can results in better mitigation
Cost-Effectiveness	1	Current GIS position funded
Technical	1	
Political	1	
Legal	1	
Fiscal	0	GIS position in place however; No money currently in the budget to hire someone to identify high risk areas located within the Town once GIS is completed
Environmental	1	
Social	1	
Administrative	1	GIS admin hired effective 07/21/2014; Record keeping from the beginning to end of incident for FEMA - assistance needed
Multi-Hazard	1	GIS can address multi hazard
Timeline	-1	No existing GIS; will be starting from scratch
Agency Champion	1	
Other Community Objectives	1	Support Emergency Operations Plan for TOM and EPC
Total	11	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: Town of Monument

Number: 70

Mitigation Action/Initiative: Install lightning / ground protection on critical infrastructure

Assessing the Risk	
Hazard(s) addressed:	Lightning, Tornado
Specific problem being mitigated:	Loss of service and data; potential loss due to fire
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Install lightning / ground protection on critical infrastructure
	2. Obtain Generators
	3. Install faraday cages for servers
Action/Project Intended for Implementation	
Description of Selected Action/Project	Install lightning / ground protection on critical infrastructure
Action/Project Category	SIP
Goals/Objectives Met	Goals 2, 5, & 6 Objectives 2.1, 2.2, 5.1, & 6.1
Applies to existing, future, or not applicable	Existing and Future (Some lightning rods installed on critical facilities already)
Benefits (losses avoided)	Prevent the loss / use critical facility infrastructure; reduces economic loss; preservation of life
Estimated Cost	Medium
Priority*	High
Plan for Implementation	
Responsible Organization	Town of Monument
Local Planning Mechanism	Installation of lightning rods on critical infrastructure
Potential Funding Sources	Budget Restate
Timeline for Completion	Short-term

* Refer to results of Prioritization (page 2)



Prioritization

Number: 70

Mitigation Action/Initiative: Install lightning / ground protection on critical infrastructure

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Availability of critical infrastructure to continue operations
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	-1	Budget restate will need to occur
Environmental	0	
Social	0	
Administrative	0	Record keeping from the beginning to end / FEMA / Assistance needed
Multi-Hazard	1	
Timeline	0	Budget is approved by Board of Trustees - highly likely but not guaranteed
Agency Champion	1	
Other Community Objectives	1	Support Emergency Operations Plan for TOM and EPC
Total	8	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: Town of Palmer Lake

Number: 71

Mitigation Action/Initiative: Adopt Emergency Operations Plan and Pre-Disaster Mitigation Plan

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Incorporate hazard mitigation into future plans and policies
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	<ol style="list-style-type: none"> 1. Adopt Emergency Operations Plan, Pre-Disaster Mitigation Plan, water mitigation plan, water conservation plan and reusable/renewable water plan 2. Educate residents about disaster planning and water conservation and rely on individuals to mitigate hazards on their own properties 3. No action
Action/Project Intended for Implementation	
Description of Selected Action/Project	Adopt Emergency Operations Plan, Pre-Disaster Mitigation Plan, water mitigation plan, water conservation plan and reusable/renewable water plan, including ordinances limiting landscape/types of grasses and trees grown; water restrictions; mitigation program offered by the Town (free disposal of shrubs/brush tress for mitigating property)
Action/Project Category	LPR, NRP
Goals/Objectives Met	Goals 1, 2, 3, 4, &5 Objectives 1.3, 2.1, 2.2, 2.4, 3.1, 3.2, 3.3, 4.1, 4.2, 5.1, 5.2, & 5.3
Applies to existing, future, or not applicable	Existing and Future - Adopted Water Conservation Plan. Future adoption of Landscaping Ordinances
Benefits (losses avoided)	Prevent the loss / use critical facility infrastructure; reduces economic loss (livestock); preservation of life
Estimated Cost	Medium
Priority*	High
Plan for Implementation	
Responsible Organization	Town of Palmer Lake
Local Planning Mechanism	Continue protection of our water sheds and wells
Potential Funding Sources	Town Budget
Timeline for Completion	Short-term



Prioritization

Number: 71

Mitigation Action/Initiative: Adopt Emergency Operations Plan and Pre-Disaster Mitigation Plan

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	Drought can cause fire; loss of livestock to feed citizens; lack of water
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	1	Addressing drought assists with other hazards such as fire due to lightning/man made; high wind devastation due to dry environment, etc.
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	Support Emergency Operations Plan for TOPL, TOM and EPC
Total	14	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: Town of Palmer Lake

Number: 72

Mitigation Action/Initiative: Install lightning / ground protection on critical infrastructure

Assessing the Risk	
Hazard(s) addressed:	Severe Wind (Other than Tornado), Lightning, Tornado
Specific problem being mitigated:	Loss of service and data; potential loss due to fire
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Install lightning / ground protection on critical infrastructure
	2. Obtain/maintain Generators
	3. Install faraday cages for servers
Action/Project Intended for Implementation	
Description of Selected Action/Project	Obtain/maintain generators for critical infrastructure
Action/Project Category	(SIP): Obtain/maintain generators for critical infrastructure
Goals/Objectives Met	Goals 2, 5, & 6 Objectives 2.1, 2.2, 5.1, & 6.1
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Prevent the loss / use critical facility infrastructure; reduces economic loss; preservation of life
Estimated Cost	High
Priority*	High
Plan for Implementation	
Responsible Organization	Town of Palmer Lake
Local Planning Mechanism	Obtain/maintain generators for critical infrastructure
Potential Funding Sources	Budget
Timeline for Completion	Short-term

Prioritization



Number: 72

Mitigation Action/Initiative:

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Availability of critical infrastructure to continue operations
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	0	
Environmental	0	
Social	0	
Administrative	0	Record keeping from the beginning to end / FEMA / Assistance needed
Multi-Hazard	1	
Timeline	0	Budget approval by Board of Trustees - highly likely but not guaranteed
Agency Champion	1	
Other Community Objectives	1	Support Emergency Operations Plan for TOPL, TOM and EPC
Total	9	
Priority (High/Med/Low)	High	

El Paso County Mitigation Action Worksheet



Name of Jurisdiction: Town of Palmer Lake

Number: 73

Mitigation Action/Initiative: Implement Emergency Notification System within the Town

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Reduce loss of life and injury; reduce loss of property/damage
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Implement emergency notification system within the Town
	2. Utilize reverse 911 for callouts
	3. No action
Action/Project Intended for Implementation	
Description of Selected Action/Project	Implement emergency notification system within the Town
Action/Project Category	EAP
Goals/Objectives Met	Goals 1, 3, 5, & 6 Objectives 1.1, 1.2, 3.1, 5.1, 6.1, 6.2, & 6.3
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Reduces economic loss; preservation of life; reduces property loss/damage
Estimated Cost	High
Priority*	Medium
Plan for Implementation	
Responsible Organization	Town of Palmer Lake
Local Planning Mechanism	Future Emergency Notification System (ENS)
Potential Funding Sources	Grant
Timeline for Completion	Long-term

* Refer to results of Prioritization (page 2)



Prioritization

Number: 73

Mitigation Action/Initiative: Implement Emergency Notification System within the Town

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	-1	Not budgeted
Environmental	0	
Social	1	Must incorporate sound/visual ENS
Administrative	-1	Record keeping from the beginning to end of incident for FEMA - assistance needed
Multi-Hazard	1	ENS will address multi-hazards preparedness
Timeline	-1	
Agency Champion	1	
Other Community Objectives	1	Support Emergency Operations Plan for TOPL, TOM and EPC
Total	7	
Priority (High/Med/Low)	Medium	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: Town of Palmer Lake

Number: 74

Mitigation Action/Initiative: Develop MOU with D38 for use of their facilities if needed

Assessing the Risk	
Hazard(s) addressed:	Earthquake, Hailstorm, Severe Wind (other than tornado), Wildfire, Winter Storm, Drought, Lightning, Pandemic Disease, Tornado, Hazmat
Specific problem being mitigated:	Continuity of government services and business operations during an emergency and to assist in restoring the function of natural systems;
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. MOU with D38 for use of their facilities if needed
	2. Purchase another facility
	3. Lease a new facility
Action/Project Intended for Implementation	
Description of Selected Action/Project	Develop MOU with school district D38 and the Town of Monument for the use of their facilities in the event Town of Palmer Lake facilities are compromised
Action/Project Category	NRP
Goals/Objectives Met	Goals 1, 2, 3, 4, 5, & 6 Objectives 1.2, 2.3, 3.3, 4.1, 4.2, 4.3, 5.1, 5.3, 6.1, 6.2, & 6.3
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Continuity of natural systems during an emergency; reduces economic loss; preservation of life
Estimated Cost	Low
Priority*	High
Plan for Implementation	
Responsible Organization	Town of Palmer Lake
Local Planning Mechanism	MOU with local school district and the Town of Monument
Potential Funding Sources	N/A
Timeline for Completion	Short-term

* Refer to results of Prioritization (page 2)



Prioritization

Number: 74

Mitigation Action/Initiative: Develop MOU with D38 for use of their facilities if needed

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	-1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	0	
Social	0	May result in loss of school district to operate as school however; will allow Town to continue to support citizens during incident
Administrative	-1	Record keeping from the beginning to end of incident for FEMA - assistance needed
Multi-Hazard	1	MOU can benefit all incidents in loss of critical infrastructure
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	Support Emergency Operations Plan for TOPL, TOM and EPC
Total	8	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: Town of Palmer Lake

Number: 75

Mitigation Action/Initiative: Procure & implement GIS layer for high risk areas

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Reduction of potential Loss of Life and Injury; Loss/Damage to property thru mapping of high risk hazard areas
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Procure and implement GIS layer for high risk areas
	2. Rely on Countywide maps
	3. No action
Action/Project Intended for Implementation	
Description of Selected Action/Project	Procure and implement GIS layer for high risk areas to identify high risk areas and educate citizens
Action/Project Category	EAP
Goals/Objectives Met	Goals 1, 2, 3, 4, 5, & 6 Objectives 1.4, 2.1, 2.2, 3.1, 3.2, 4.3, 5.1, 5.3, & 6.1
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Citizen preparedness for hazardous events equates to less after action by local government; Town preparedness equates to little impact of natural systems; reduces economic loss; preservation of life; GID layering identifies critical areas within the Town
Estimated Cost	Medium
Priority*	High
Plan for Implementation	
Responsible Organization	Town of Palmer Lake
Local Planning Mechanism	GIS Development
Potential Funding Sources	Budget
Timeline for Completion	Long-term

* Refer to results of Prioritization (page 2)



Prioritization

Number: 75

Mitigation Action/Initiative: Procure & implement GIS layer for high risk areas

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	Education regarding high risk areas can results in better mitigation
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	0	No money currently in the budget to hire someone to identify high risk areas located within the Town once GIS is completed
Environmental	1	
Social	1	
Administrative	1	Record keeping from the beginning to end of incident for FEMA - assistance needed
Multi-Hazard	1	GIS can address multi hazard
Timeline	-1	No existing GIS; will be starting from scratch
Agency Champion	1	
Other Community Objectives	1	Support Emergency Operations Plan for TOPL, TOM and EPC
Total	11	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: Town of Palmer Lake

Number: 76

Mitigation Action/Initiative: Add a Link to the Town Website "Emergency Preparedness"

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Provide a centralized location for citizens to obtain emergency preparedness information
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	<ol style="list-style-type: none"> 1. Add a link to the Town website "Emergency Preparedness" 2. Provide Emergency Preparedness information at Town Hall meetings 3. No action
Action/Project Intended for Implementation	
Description of Selected Action/Project	Create an "Emergency Preparedness" link on the Town website with emergency prevention/preparedness information
Action/Project Category	EAP
Goals/Objectives Met	Goals 1 & 3 Objectives 1.1, 3.1, 3.2, & 3.3
Applies to existing, future, or not applicable	Existing and Future (Some wildfire information currently on the website)
Benefits (losses avoided)	Citizen preparedness for hazardous events equates to less after action by local government; reduces economic loss; preservation of life
Estimated Cost	Low
Priority*	High
Plan for Implementation	
Responsible Organization	Town of Palmer Lake
Local Planning Mechanism	Website Link Development
Potential Funding Sources	Within Current Budget (Town Clerk responsible for website - current salary covers website maintenance)
Timeline for Completion	Short-term

* Refer to results of Prioritization (page 2)



Prioritization

Number: 76

Mitigation Action/Initiative: Add a Link to the Town Website "Emergency Preparedness"

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Information to citizens pre-emergency is key to property loss, economic loss and preservation of life
Property Protection	1	Vehicles/Property can be moved into garages / Roofs can be inspected for hail damage etc. to prevent future leaks and property loss
Cost-Effectiveness	1	Current Salary of Town Clerk includes website maintenance
Technical	1	
Political	1	
Legal	1	
Fiscal	1	Current Salary of Town Clerk includes website maintenance
Environmental	0	
Social	0	Some citizens may not have internet access
Administrative	-1	Record keeping from the beginning to end / FEMA / Assistance needed
Multi-Hazard	0	Website admin covered; Record keeping from the beginning to end of incident for FEMA - assistance needed
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	Support Emergency Operations Plan for TOPL, TOM and EPC
Total	9	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: Town of Palmer Lake

Number: 77

Mitigation Action/Initiative: Ensure Water Sheds have Adequate Fire Protection

Assessing the Risk	
Hazard(s) addressed:	Wildfire
Specific problem being mitigated:	Reduce property and economic losses
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Ensure water tanks/water sheds have adequate fire protection by developing adequate alternative storage facilities
	2. Extend waterlines to remote areas of the County
	3. Rely on water tank trucks to provide water during fire events
Action/Project Intended for Implementation	
Description of Selected Action/Project	Ensure water tanks/water sheds have adequate fire protection by developing adequate alternative storage facilities via installation of water tanks, holding ponds etc.
Action/Project Category	NRP, SIP
Goals/Objectives Met	Goals 1, 2, 3, 4, 5, & 6 Objectives 1.3, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, 4.3, 5.1, 5.2, 5.3, & 6.1
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Citizen preparedness for hazardous events equates to less after action by local government; Town preparedness equates to little impact of natural systems; reduces economic loss; preservation of life
Estimated Cost	Medium
Priority*	Medium
Plan for Implementation	
Responsible Organization	Town of Palmer Lake
Local Planning Mechanism	Mitigation of Town owned property; education of privately owned property surrounding water tanks/water sheds
Potential Funding Sources	Budgeted
Timeline for Completion	Short-term

* Refer to results of Prioritization (page 2)



Prioritization

Number: 77

Mitigation Action/Initiative: Ensure Water Sheds have Adequate Fire Protection

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	0	Private land owners may be against mitigation
Legal	-1	Land surrounding water tanks/sheds may be privately owned; cannot force mitigation
Fiscal	1	
Environmental	1	
Social	0	Private land owners may be against mitigation
Administrative	0	Education of private property owners
Multi-Hazard	1	Protection of water tanks / water sheds addressed multi-hazards such as severe wind, tornado, wildfire, hailstorm, lightning
Timeline	-1	Cannot force private property owners to mitigate
Agency Champion	1	
Other Community Objectives	1	Support Emergency Operations Plan for TOPL, TOM and EPC
Total	7	
Priority (High/Med/Low)	Medium	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: City of Manitou Springs

Number: 78

Mitigation Action/Initiative: Conduct Annual Review and Update of the City of Manitou Springs Emergency Operations Plan

Assessing the Risk	
Hazard(s) addressed:	Wildfire, HAZMAT Transportations, Winter Storm, Flooding, Mud or Debris Flow, HAZMAT Fixed Site, Tornado, Drought, Hailstorm, Lighting, Pandemic Disease, Landslide or Rockfall, Earthquake, Dam Failure, Severe Wind
Specific problem being mitigated:	Improve Emergency Response/Support activities
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Conduct annual review and update of the City of Manitou Springs Emergency Operations Plan
	2. No action, keep current plan
	3. Rely on the departments and El Paso County to respond to and coordinate incidents
Action/Project Intended for Implementation	
Description of Selected Action/Project	Conduct annual review and updates to the City of Manitou Springs EOP
Action/Project Category	Local Plans and Regulations (LPR)
Goals/Objectives Met	Goals 1, 2, 3, 4, & 5 Objectives 1.2, 1.3, 1.4, 2.1, 2.2, 3.3, 4.2, & 5.1
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Life, Property, and Economic
Estimated Cost	Low
Priority*	High
Plan for Implementation	
Responsible Organization	Manitou Springs Police Department
Local Planning Mechanism	
Potential Funding Sources	Local Budget
Timeline for Completion	Ongoing

* Refer to results of Prioritization (page 2)



Prioritization

Number: 78

Mitigation Action/Initiative: Conduct Annual Review and Update of the City of Manitou Springs Emergency Operations Plan

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	0	
Political	0	
Legal	0	
Fiscal	1	
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	10	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: City of Manitou Springs

Number: 79

Mitigation Action/Initiative: Perform Continuity of Operations Planning

Assessing the Risk	
Hazard(s) addressed:	Wildfire, HAZMAT Transportations, Winter Storm, Flooding, Mud or Debris Flow, HAZMAT Fixed Site, Tornado, Drought, Hailstorm, Lighting, Pandemic Disease, Landslide or Rockfall, Earthquake, Dam Failure, Severe Wind
Specific problem being mitigated:	Ensure critical service can be maintained
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	<ol style="list-style-type: none"> 1. Perform Continuity of Operations planning to identify critical functions, essential personnel, vital resources, and critical infrastructure within the city that is necessary to maintain public safety and services 2. Hire contractor to develop COOP plans purchase software to template COOP plans throughout county 3. No action
Action/Project Intended for Implementation	
Description of Selected Action/Project	Perform Continuity of Operations planning to identify critical functions, essential personnel, vital resources, and critical infrastructure within the county that is necessary to maintain public safety and services
Action/Project Category	Local Plans and Regulations (LPR)
Goals/Objectives Met	Goals 1, 2, 4, & 6 Objectives 1.3, 2.2, 2.3, 4.1, 4.2, 6.1, 6.2, & 6.3
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Loss of Government Services
Estimated Cost	Medium
Priority*	High
Plan for Implementation	
Responsible Organization	Manitou Springs Police Department
Local Planning Mechanism	Develop COOP committee
Potential Funding Sources	Local Budget, Grant
Timeline for Completion	Short-term

* Refer to results of Prioritization (page 2)



Prioritization

Number: 79

Mitigation Action/Initiative: Perform Continuity of Operations Planning

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	0	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	0	
Agency Champion	1	
Other Community Objectives	0	
Total	10	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: City of Manitou Springs

Number: 80

Mitigation Action/Initiative: Conduct Training to Certify Fire Department Personnel in Wildland Operations

Assessing the Risk	
Hazard(s) addressed:	Wildfire
Specific problem being mitigated:	Need more certified Wildland firefighters
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Conduct training to certify fire department personnel in Wildland operations
	2. Hire additional Wildland specific crews
	3. Acquire additional Wildland firefighting equipment
Action/Project Intended for Implementation	
Description of Selected Action/Project	Conduct training to certify fire department personnel in Wildland operations
Action/Project Category	EAP, NRP
Goals/Objectives Met	Goals 2, 4, & 6 Objectives 2.1, 4.1, & 6.2
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Life and Property
Estimated Cost	Medium
Priority*	Medium
Plan for Implementation	
Responsible Organization	Manitou Springs Fire Department
Local Planning Mechanism	
Potential Funding Sources	Local Budget/Grant
Timeline for Completion	Medium



Prioritization

Number: 80

Mitigation Action/Initiative: Conduct Training to Certify Fire Department Personnel in Wildland Operations

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	0	
Legal	0	
Fiscal	0	
Environmental	1	
Social	0	
Administrative	0	
Multi-Hazard	0	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	7	
Priority (High/Med/Low)	Medium	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: City of Manitou Springs

Number: 81

Mitigation Action/Initiative: Adopt Fire Adaptive Community Standards and Practices

Assessing the Risk	
Hazard(s) addressed:	Wildfire, Lightning
Specific problem being mitigated:	Need to engage community to provide mitigation action
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Adopt Fire Adaptive Community standards and practices
	2. Adopt new building code for area within Wildland Urban Interface
	3. No action
Action/Project Intended for Implementation	
Description of Selected Action/Project	Encourage communities within the county to adopt Fire Adaptive Community Standards and Practices
Action/Project Category	LPR
Goals/Objectives Met	Goals 2, 3, & 4 Objectives 2.1, 2.2, 3.1, 3.3, & 4.2
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Life, Property, and Economic
Estimated Cost	Medium
Priority*	High
Plan for Implementation	
Responsible Organization	HOAs/ Municipality/Fire Department
Local Planning Mechanism	Fire Protection Districts
Potential Funding Sources	Unknown
Timeline for Completion	Long-term

* Refer to results of Prioritization (page 2)



Prioritization

Number: 81

Mitigation Action/Initiative: Adopt Fire Adaptive Community Standards and Practices

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	0	
Fiscal	0	
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	0	
Timeline	0	
Agency Champion	1	
Other Community Objectives	0	
Total	9	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: City of Manitou Springs

Number: 82

Mitigation Action/Initiative: Fund and Execute Phase II and Phase II of Fountain Creek Structural Mitigation Projects

Assessing the Risk	
Hazard(s) addressed:	Flooding, Mud or Debris Flow, Subsidence and Sink Holes, Dam Failure
Specific problem being mitigated:	Management of flood waters and debris
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Fund and execute Phase II and Phase III of Fountain Creek Structural mitigation projects
	2. Dredging of Fountain Creek within Manitou Springs
	3. Develop land use restrictions in flood prone areas
Action/Project Intended for Implementation	
Description of Selected Action/Project	Fund and execute Phase II and Phase III of Fountain Creek Structural mitigation projects
Action/Project Category	SIP, NRP
Goals/Objectives Met	Goals 2 & 5 Objectives 2.2 & 5.2
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Life and Property
Estimated Cost	High
Priority*	High
Plan for Implementation	
Responsible Organization	Manitou Springs (Recovery Manager)
Local Planning Mechanism	Waldo Recovery Group
Potential Funding Sources	Local Budget/Grants
Timeline for Completion	Short-term

* Refer to results of Prioritization (page 2)



Prioritization

Number: 82

Mitigation Action/Initiative: Fund and Execute Phase II and Phase II of Fountain Creek Structural Mitigation Projects

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	0	
Fiscal	1	
Environmental	-1	
Social	1	
Administrative	1	
Multi-Hazard	0	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	9	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: City of Manitou Springs

Number: 83

Mitigation Action/Initiative: Dredging of Fountain Creek within Manitou Springs

Assessing the Risk	
Hazard(s) addressed:	Flooding, Mud or Debris Flow, Subsidence and Sink Holes, Dam Failure
Specific problem being mitigated:	Management of flood waters and debris
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Dredging of Fountain Creek within Manitou Springs
	2. Fund and execute Phase II and Phase III of Fountain Creek Structural mitigation projects
	3. Develop land use restrictions in flood prone areas
Action/Project Intended for Implementation	
Description of Selected Action/Project	Dredging of Fountain Creek within Manitou Springs
Action/Project Category	SIP, NRP
Goals/Objectives Met	Goals 2 & 5 Objectives 2.2 & 5.2
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Life and Property
Estimated Cost	High
Priority*	High
Plan for Implementation	
Responsible Organization	Manitou Springs (Recovery Manager)
Local Planning Mechanism	Waldo Recovery Group
Potential Funding Sources	Local Budget/Grants
Timeline for Completion	Short-term

* Refer to results of Prioritization (page 2)



Prioritization

Number: 83

Mitigation Action/Initiative: Dredging of Fountain Creek within Manitou Springs

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	0	
Fiscal	1	
Environmental	-1	
Social	1	
Administrative	1	
Multi-Hazard	0	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	9	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: City of Manitou Springs

Number: 84

Mitigation Action/Initiative: Expand the Local Early Warning System to Encompass All Hazards

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Provide public notification for actions during an incident
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Expand the local early warning system to encompass all-hazards
	2. Provide Emergency Preparedness information at Town Hall meetings and in news papers
	3. Add a link to the City website "Emergency Preparedness" with instructions prior to incidents
Action/Project Intended for Implementation	
Description of Selected Action/Project	Expand the local early warning system to encompass all-hazards
Action/Project Category	SIP, EAP
Goals/Objectives Met	Goals 1 & 3 Objectives 1.1, 1.4, 3.1, 3.2, & 3.3
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Life
Estimated Cost	Low
Priority*	High
Plan for Implementation	
Responsible Organization	Town of Monument
Local Planning Mechanism	Contract
Potential Funding Sources	Local Budget/ Grant
Timeline for Completion	Short-term

* Refer to results of Prioritization (page 2)



Prioritization

Number: 84

Mitigation Action/Initiative: Expand the Local Early Warning System to Encompass All Hazards

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	0	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	0	
Social	0	
Administrative	0	
Multi-Hazard	1	
Timeline	0	
Agency Champion	1	
Other Community Objectives	1	
Total	9	
Priority (High/Med/Low)	High	



El Paso County Mitigation Action Worksheet

Name of Jurisdiction: City of Manitou Springs

Number: 85

Mitigation Action/Initiative: Increase Number of Local Responders Trained as HAZMAT Technicians

Assessing the Risk	
Hazard(s) addressed:	HAZMAT, Aircraft Accident
Specific problem being mitigated:	Increase response capability
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Increase the number of local responders trained as HAZMAT technicians
	2. Develop a local HAZMAT response unit
	3. Contract for specialize training for local hazards
Action/Project Intended for Implementation	
Description of Selected Action/Project	Increase the number of local responders trained as HAZMAT technicians
Action/Project Category	EAP
Goals/Objectives Met	Goals 1, 4, & 6 Objectives 1.2, 4.2, 4.3, & 6.1
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Life
Estimated Cost	Medium
Priority*	Medium
Plan for Implementation	
Responsible Organization	Manitou Springs Fire Department
Local Planning Mechanism	El Paso County Sheriff Office- Emergency Service Division/HAZMAT
Potential Funding Sources	Local Budget, Grant
Timeline for Completion	Short-term

* Refer to results of Prioritization (page 2)



Prioritization

Number: 85

Mitigation Action/Initiative: Increase Number of Local Responders Trained as HAZMAT Technicians

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	0	
Cost-Effectiveness	-1	
Technical	1	
Political	0	
Legal	0	
Fiscal	0	
Environmental	1	
Social	0	
Administrative	0	
Multi-Hazard	0	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	4	
Priority (High/Med/Low)	Medium	