State Review Draft

ARAPAHOE COUNTY

Sections highlighted in green are placeholders that will be addressed in the next draft

Arapahoe County Hazard Mitigation Plan

2025-2030

TABLE OF CONTENTS

1.0 Introduction 1-1
1.1 Executive Summary 1-1
1.2 Background and Scope 1-3
2.0 Planning Process 2-7
2.1 What's New in the Plan Update 2-7
2.2 Local Government Participation 2-8
2.3 The 2025 Planning Process 2-8
3.0 Community Profile 3-1
3.1 Geography and Land Use 3-1
3.2 Communities 3-8
3.3 Population 3-9
3.4 Economy 3-17
3.5 Growth and Development Trends 3-19
3.6 Capability Assessment 3-24
4.0 Risk Assessment 4-1
4.1 Hazard Identification and Prioritization 4-2
4.2 Asset Summary 4-9
4.3 Hazard Profiles 4-28
4.4 Active Threat 4-30
4.5 Cyber Threat 4-36
4.6 Dam Incident 4-42
4.7 Drought 4-58
4.8 Flooding 4-71
4.9 Hazardous Materials Release 4-108
4.10 Pandemic 4-122
4.11 Severe Summer Weather 4-132
4.12 Severe Wind/Tornado 4-150
4.13 Severe Winter Weather 4-163
4.14 Wildfire 4-175
4.15 Urban Conflagration 4-206
5.0 Mitigation Strategy 5-1
5.1 Goals and Objectives 5-2
5.2 Progress on Previous Mitigation Plan Actions 5-2
5.3 Identification and Analysis of Mitigation Actions 5-4
5.4 Mitigation Action Plan 5-7
6.0 Plan Implementation and Maintenance 1
6.1 Plan Adoption & Implementation 1
6.2 Plan Maintenance 3
6.3 Incorporation Into Other Planning Mechanisms 5
6.4 Continued Public Involvement 8

APPENDICES

Appendix A: Adoption Resolutions and Follow-Up Participation Letters

Appendix B: Planning Team

Appendix C: Planning Process Documentation

Appendix D: Public Input

Appendix E: References

Appendix F: Glossary

Appendix G: Sample Annual Progress Meeting Agenda and Report

Appendix H: Expansive Soil and Subsidence

Appendix I: Past Hazard Events

Appendix J: Dam Inundation Data – NOT FOR PUBLIC RELEASE

LIST OF FIGURES

Figure 1-1 Billion-Dollar Disasters in the U.S. 1980-2024 1-3
Figure 1-2 Mitigation Return On Investment 1-4
Figure 2-1 Mitigation Planning Process 2-9
Figure 2-2 Public Survey: Hazard Significance Rankings 2-12
Figure 2-3 Public Survey: Mitigation Action Priorities 2-13
Figure 2-4 Public Survey: Experience With Hazards In The Community 2-13
Figure 2-5 Online Public Engagement Space 2-14
Figure 3-1 Western Arapahoe County 3-2
Figure 3-2 Eastern Arapahoe County 3-3
Figure 3-3 South Metro Fire Rescue 3-4
Figure 3-4 Arapahoe County Fire Districts 3-5
Figure 3-5 West Arapahoe County Tree Equity Score 3-7
Figure 3-6 Map of Population Density in Western Arapahoe County 3-14
Figure 3-7 Map of Population Density in Eastern Arapahoe 3-15
Figure 3-8 2023 Share of Jobs in Arapahoe County by Industry 3-17
Figure 3-9 Population Growth in Western Arapahoe County 2010-2020 3-20
Figure 3-10 Population Growth in Eastern Arapahoe County, 2010-2020 3-21
Figure 3-11 Arapahoe County Population Forecast, 2000 to 2050 3-22
Figure 3-12 Arapahoe County Planning Reserve Areas 3-23
Figure 4-1 Risk Graphic 4-3
Figure 4-2 Projected Temperature Increases in Southwest Region 4-5
Figure 4-3 West Arapahoe County Critical Facilities- Category A Critical Sectors 4-18
Figure 4-4 West Arapahoe County Critical Facilities- Category B Critical Sectors 4-19
Figure 4-5 East Arapahoe County Critical Facilities- Category A Critical Sectors 4-20
Figure 4-6 East Arapahoe County Critical Facilities- Category B Critical Sectors 4-21
Figure 4-7 South Metro Fire Rescue Facilities 4-23
Figure 4-8 Locations of 333 Active Shooter Incidents in the U.S., 2000-2019 4-31
Figure 4-9 Dams of Concern in Western Arapahoe County 4-47

Figure 4-10 Low Head Dams in Western Arapahoe County 4-48
Figure 4-11 U.S. Drought Monitor....4-59
Figure 4-12 Arapahoe County Drought Monitor – Water Year 4-60
Figure 4-13 U.S. Drought Monitor Categories....4-61
Figure 4-14 Colorado Drought Impacts by U.S. Drought Monitor Category....4-62
Figure 4-15 Arapahoe County Percent Area in US Drought Categories, 2000-2025....4-63
Figure 4-16 Floodplain Terminology....4-72
Figure 4-17 FEMA Flood Hazard Areas in Western Arapahoe County....4-75
Figure 4-18 FEMA Flood Hazard Areas in Eastern Arapahoe County....4-76
Figure 4-19 South Metro Fire Rescue FEMA Flood Hazard Areas....4-77
Figure 4-20 Colorado Water Conservation Board Flood Mapping for Western Arapahoe County ...4-78
Figure 4-21 Colorado Water Conservation Board Flood Mapping for Eastern Arapahoe County 4-79
Figure 4-22 Colorado Water Conservation Board Flood Mapping for South Metro Fire Rescue 4-80
Figure 4-23 West Arapahoe County Mile High Flood District Flood Hazards 4-81
Figure 4-24 West Arapahoe County FEMA 1% Flood Hazard Areas & Flooded Parcels....4-93
Figure 4-25 East Arapahoe County FEMA 1% Flood Hazard Areas & Flooded Parcels....4-94
Figure 4-26 West Arapahoe County Hazardous Materials Routes and Facilities....4-110
Figure 4-27 East Arapahoe County Hazardous Materials Routes and Facilities....4-111
Figure 4-28 South Metro Fire Rescue Hazardous Materials Routes and Facilities....4-112
Figure 4-29 Arapahoe County Oil and Gas Wells....4-113
Figure 4-30 Hazardous Materials Incidents Reported in Arapahoe County, 1990-2024....4-115
Figure 4-31 Hazardous Materials Incidents in Arapahoe County by Type, 1990-2024 4-115
Figure 4-32 COVID-19 Cases in Arapahoe County (as of 5/22/2025)....4-126
Figure 4-33 COVID-19 Deaths Arapahoe County (as of 5/22/2025)....4-126
Figure 4-34 Cloud to Ground Lightning....4-133
Figure 4-35 Colorado Lightning Density, 1996-2023 4-134
Figure 4-36 Urban Heat Island Vulnerability in Western Arapahoe County 4-136
Figure 4-37 Hail Size Comparison Chart 4-138
Figure 4-38 NWS Heat Index....4-140
Figure 4-39 Arapahoe County Hail Events, 1950-2024 4-143
Figure 4-40 Average Maximum Temperatures for July in Arapahoe County, 1895-2020....4-144
Figure 4-41 Tornado Events in Arapahoe County, 1950-2024 4-152
Figure 4-42 Damaging Wind Events in Arapahoe County, 1950-2024 4-153
Figure 4-43 Potential Impact and Damage from a Tornado 4-156
Figure 4-44 NWS Wind Chill Chart....4-165
Figure 4-45 West Arapahoe County Wildland Urban Interface (WUI) Areas 4-177

Figure 4-46 Eastern Arapahoe Wildland Urban Interface (WUI) Areas....4-178
Figure 4-47 South Metro Fire Rescue Wildland Urban Interface (WUI) Areas....4-179
Figure 4-48 Western Arapahoe Wildland Urban Interface Risk....4-181
Figure 4-49 Eastern Arapahoe Wildland Urban Interface Risk....4-182
Figure 4-50 South Metro Fire Rescue Wildland Urban Interface Risk....4-183
Figure 4-51 Arapahoe County Wildfire History (1995-2025)....4-187
Figure 4-52 Burn Probability in Arapahoe County....4-189
Figure 4-53 Burn Probability in the South Metro Fire Rescue....4-190
Figure 4-54 Wildfire Impacts....4-192
Figure 4-55 Wildfire Risk to Assets in Western Arapahoe County....4-195
Figure 4-56 Wildfire Risk to Assets in Eastern Arapahoe County....4-196
Figure 4-57 Defensible Space....4-210
Figure 4-58 Wildfire to Urban Conflagration Steps....4-211

LIST OF TABLES

Table 1-1 Arapahoe County Hazard Significance....1-2
Table 2-1 Schedule of Planning Team Meetings....2-10
Table 2-2 Summary of Review of Key Plans, Studies and Reports....2-15
Table 3-1 Population in Arapahoe County, 2020 – 2023....3-9
Table 3-2 Select Demographic and Social Characteristics Compared to the State and Nation....3-9
Table 3-3 Demographic Characteristics in Arapahoe County by Jurisdiction....3-11
Table 3-4 Comparison of Housing Tenure in Arapahoe County....3-12
Table 3-5 Types and Total Amounts of Housing Units in Arapahoe County....3-12
Table 3-6 Jurisdictions with High Percentage of Individuals 65 years and Older....3-16
Table 3-7 Jurisdictions with High Percentage of Individuals with Disabilities....3-16
Table 3-8 Select Economic Characteristics in Arapahoe County by Jurisdiction....3-18
Table 3-9 New Residential Building Permits Issued in Arapahoe County....3-19
Table 3-10 Planning and Regulatory Capabilities....3-24
Table 3-11 Administrative and Technical Capabilities....3-27
Table 3-12 Financial Capabilities That Have Been Used to Fund Mitigation Activities....3-28
Table 3-13 Education and Outreach Capabilities....3-29
Table 3-14 Arapahoe County Potential CRS Savings....3-32
Table 4-1 Arapahoe County Hazard Significance....4-1
Table 4-2 Federal Disaster and Emergency Declarations in Arapahoe County....4-4
Table 4-3 Updates and Changes to Arapahoe County Hazards....4-6
Table 4-4 Hazard Significance by Jurisdiction....4-8

Table 4-5 Arapahoe County Total Exposure by Jurisdiction 4-10
Table 4-6 Arapahoe County Total Exposure by Jurisdiction and Property Types....4-10
Table 4-7 Improved Parcel Exposure Values by Parcel Type....4-13
Table 4-8 Average Population per Residential Parcel....4-13
Table 4-9 Category A Critical Facilities....4-15
Table 4-10 Category B Critical Facilities....4-15
Table 4-11 Arapahoe County Category A Critical Sector Facilities 4-16
Table 4-12 Arapahoe County Category B Critical Sector Facilities 4-17
Table 4-13 South Metro Fire Facilities 4-22
Table 4-14 Historic and Cultural Resources Noted by the NRHP and CSRHP....4-24
Table 4-15 Endangered Species in Arapahoe County 4-27
Table 4-16 Active Shooter Incidents in Colorado, 1999-2025....4-32
Table 4-17 Active Threat Rankings by Jurisdiction....4-35
Table 4-18 Major Cyber Attacks Impacting Colorado, 2005-2025....4-38
Table 4-19 Cyber Threat Rankings by Jurisdiction....4-41
Table 4-20 Dam Hazard Classification Definitions 4-43
Table 4-21 High and Significant Hazard Dams in Arapahoe County 4-44
Table 4-22 High and Significant Hazard Dams Upstream of Arapahoe County....4-45
Table 4-23 Outlet Release Impact Rankings for High Hazard Dams in Arapahoe County 4-50
Table 4-24 Arapahoe County Dams at Risk to Other Hazards 4-51
Table 4-25 Arapahoe County Risk Summary to All Dam Inundation by Jurisdiction....4-52
Table 4-26 Dam Inundation Risk by Dam Name....4-53
Table 4-27 Category A Critical Sectors at Risk to Dam Inundation by Jurisdiction....4-54
Table 4-28 Category B Critical Sectors at Risk to Dam Inundation by Jurisdiction....4-55
Table 4-29 Dam Incident Hazard Rankings by Jurisdiction 4-57
Table 4-30 U.S. Drought Monitor Weeks in Drought by Intensity, 2000-2025 4-62
Table 4-31 NDMC Drought Impact Reporter, 2000-2025 4-64
Table 4-32 Indemnity Amounts for Drought Related Incidents in Arapahoe County (2019-2022).4-68
Table 4-33 Potential Future Economic Losses from Drought in Araphoe County 4-69
Table 4-34 Drought Hazard Rankings by Jurisdiction....4-70
Table 4-35 Arapahoe County Historical Flood Events (1979-2023) 4-83
Table 4-36 Annual Probability of Flooding Based on Recurrence Intervals 4-85
Table 4-37 FEMA Special Flood Hazard Zones Present in Arapahoe County 4-86
Table 4-38 Arapahoe County Risk to FEMA 1% Annual Chance Flood Hazards....4-89
Table 4-39 Arapahoe County Risk to FEMA Future Conditions Flood Hazards....4-90
Table 4-40 Arapahoe County Risk to FEMA 0.2% Annual Chance Flood Hazards....4-91

Table 4-41 Category B Critical Facilities in 1% Flood Hazard Area, by Jurisdiction 4-95
Table 4-42 Category A Critical Facilities in 0.2% Flood Hazard Area, by Jurisdiction 4-96
Table 4-43 Category B Critical Facilities in 0.2% Flood Hazard Area, by Jurisdiction 4-96
Table 4-44 Arapahoe County Risk to CWCB 1% Annual Chance Flood Hazards....4-97
Table 4-45 Arapahoe County Risk to CWCB 0.2% Annual Chance Flood Hazards....4-98
Table 4-46 Category B Critical Sectors at Risk to CWCB BLE 1% Flood Hazards 4-100
Table 4-47 Category B Critical Sectors at Risk to CWCB BLE 0.2% Flood Hazards 4-100
Table 4-48 Community Participation in the NFIP and Summary Information 4-101
Table 4-49 Arapahoe County NFIP Compliance 4-102
Table 4-50 Repetitive Loss Properties 4-104
Table 4-51 CRS Participating Communities in Arapahoe County....4-104
Table 4-52 Potential Future Economic Losses from Flooding in Arapahoe County....4-106
Table 4-53 Flooding Hazard Rankings by Jurisdiction....4-107
Table 4-54 Risk Management Plan (RMP) Facilities in Arapahoe County 4-109
Table 4-55 Risk Within 1,000' Buffers of a RMP Facility....4-117
Table 4-56 Risk Within 3,000' Buffers of a RMP Facility....4-118
Table 4-57 Risk Within 150' Buffers of Designated Highway 4-118
Table 4-58 Risk Within 1,000' Buffers of Designated Highway 4-118
Table 4-59 Risk within 150' Buffer of Designated Railroads....4-118
Table 4-60 Risk within Half Mile Buffers of Designated Railroads....4-119
Table 4-61 Hazardous Materials Incidents in Arapahoe County by Closest City, 1990-2024....4-121
Table 4-62 Hazardous Materials Release Hazard Rankings by Jurisdiction....4-121
Table 4-63 Reportable Disease Diagnosis, Arapahoe County 2020-2023 4-124
Table 4-64 Pandemic Rankings by Jurisdiction....4-131
Table 4-65 NWS Lightning Activity Level Scale 4-137
Table 4-66 Tornado and Storm Research Organization Hailstorm Intensity Scale....4-138
Table 4-67 NWS Heat Danger Categories 4-140
Table 4-68 Lightning Strikes Causing Damage Reported in Arapahoe County, 1996-2024....4-141
Table 4-69 Hail Events Causing Damage Reported in Arapahoe County, 1996-2024....4-144
Table 4-70 Severe Summer Weather Hazard Rankings by Jurisdiction....4-149
Table 4-71 Fujita Tornado Damage Scale....4-154
Table 4-72 Enhanced Fujita (EF) Scale 4-155
Table 4-73 Tornado History in Arapahoe County by Magnitude, 1964– 2024....4-155
Table 4-74 Damage to Institutional Buildings from High Wind....4-156
Table 4-75 Damage to Educational Institutions from High Wind....4-157
Table 4-76 Damage to Metal Building Systems from High Wind....4-157

Table 4-77 Damage to Electric Transmission Lines from High Wind 4-157
Table 4-78 Tornado History in the Last Seven Years, Arapahoe County, 2017– 2024 4-158
Table 4-79 Severe Wind Events in Arapahoe County, 1950-2024 4-159
Table 4-80 Severe Wind/Tornado Hazard Rankings by Jurisdiction 4-162
Table 4-81 Severe Weather Events in Arapahoe County, 1996-February 2025 4-167
Table 4-82 Severe Weather Events in Arapahoe County, 1996-2025 4-168
Table 4-83 Populations Vulnerable to Extreme Temperatures 4-171
Table 4-84 Severe Winter Weather Hazard Rankings by Jurisdiction 4-173
Table 4-85 Fire Department Yearly Incident Counts 4-184
Table 4-86 Arapahoe County Wildfire Incidents 2020-2025 4-185
Table 4-87 Population at Risk to WUI Hazard within Arapahoe County 4-192
Table 4-88 Improved Properties in Highest WUI Hazard Areas in Arapahoe County 4-197
Table 4-89 Improved Properties in High WUI Hazard Areas in Arapahoe County 4-198
Table 4-90 Improved Properties in Moderate WUI Hazard Areas in Arapahoe County 4-199
Table 4-91 Category A Critical Facilities at Highest WUI Risk by Jurisdiction 4-201
Table 4-92 Category B Critical Facilities at Highest WUI Risk by Jurisdiction 4-201
Table 4-93 Category A Critical Facilities at High WUI Risk by Jurisdiction 4-201
Table 4-94 Category B Critical Facilities at High WUI Risk by Jurisdiction 4-202
Table 4-95 Category A Critical Facilities at Moderate WUI Risk by Jurisdiction 4-202
Table 4-96 Category B Critical Facilities at Moderate WUI Risk by Jurisdiction 4-202
Table 4-97 Potential Future Economic Losses from Wildfire in Arapahoe County 4-204
Table 4-98 Wildfire Hazard Rankings by Jurisdiction 4-205
Table 4-99 Urban Conflagration Hazard Rankings by Jurisdiction 4-213
Table 5-1 Completed and Deleted Mitigation Actions from the 2020 HMP 5-2
Table 5-2 Mitigation Actions Summary by Jurisdiction 5-5
Table 5-3 Arapahoe County Hazard Mitigation Actions 5-8
Table 5-4 City of Centennial Mitigation Actions 5-13
Table 5-5 City of Cherry Hills Village Mitigation Actions 5-17
Table 5-6 City of Englewood Mitigation Actions 5-21
Table 5-7 Town of Foxfield Mitigation Actions 5-25
Table 5-8 City of Glendale Mitigation Actions 5-26
Table 5-9 City of Greenwood Village Mitigation Actions 5-29
Table 5-10 City of Littleton Mitigation Actions 5-31
Table 5-11 City of Sheridan Mitigation Actions 5-34
Table 5-12 Denver Water Mitigation Actions 5-36
Table 5-13 South Metro Fire Rescue Mitigation Actions 5-37

1.0 INTRODUCTION

1.1 Executive Summary

The impacts of hazards can often be lessened or even avoided if appropriate actions are taken beforehand. The purpose of hazard mitigation is to reduce or eliminate long-term risk to people and property from disasters or hazardous events. To that end, the following jurisdictions have prepared this 2025 update of the Arapahoe County Hazard Mitigation Plan (HMP).

- Arapahoe County
- City of Centennial
- City of Cherry Hills Village
- City of Englewood
- Town of Foxfield
- City of Glendale
- City of Greenwood Village
- City of Littleton
- City of Sheridan
- Denver Water
- South Metro Fire Rescue

The City of Aurora, part of which is located in Arapahoe County, has developed and maintains its own HMP. Similarly, the Town of Bennett is covered by the Adams County HMP since the majority of the Town lies in that County. And the Towns of Bow Mar, Columbine Valley, and Deer Trail were unable to participate in this plan update due to limited staffing and other priorities. These municipalities took part in the planning process as stakeholders, and this plan includes their data for completeness, but they are not seeking to adopt this plan.

The goals of the 2025 Arapahoe County Hazard Mitigation Plan are:

- Prevent the loss of lives and injuries from hazards.
- Prevent and/or reduce damages to public and private property from hazards.
- Reduce the adverse economic and natural resource impacts of hazards.
- Reduce the vulnerability of critical infrastructure and key facilities to the impacts of hazards.

Arapahoe County is vulnerable to a wide range of natural and human-caused hazards, such as flooding, severe summer and winter weather, wildfire, severe wind and tornadoes, hazardous materials incidents, cyberattacks, and other hazards. Working through the cycle of hazard mitigation can help ensure that those vulnerabilities will not increase over time. Encouraging acquisition, relocation, or retrofitting of existing vulnerable structures, along with the protection of valuable natural resources, are steps that can be taken to further decrease those vulnerabilities.

Chapter 1 Introduction contains this Executive Summery and background information on the Plan.

Chapter 2 Planning Process describes the process followed to update the Plan. A broad range of public and private stakeholders, including agencies, local businesses, nonprofits, and other interested parties were invited to participate. Public input was sought throughout the planning process including online surveys and public review of the draft Plan.

Chapter 3 Community Profile describes the planning area, consisting of Arapahoe County and the jurisdictions listed above, with updated information on demographics and changes in development. It includes an assessment of programs and policies currently in place across the County to reduce hazard

impacts or that could be used to implement hazard mitigation activities, and identifies opportunities to enhance those capabilities.

Chapter 4 Risk Assessment identifies the natural and human-caused hazards of greatest concern to the County and describes the risk from those hazards. The information generated through the risk assessment helps communities to prioritize and focus their efforts on those hazards of greatest concern and those assets or areas facing the greatest risk(s). The best available information on changing future conditions, including future development and the impacts of climate change, was considered for each hazard. Table 1-1 shows the hazards profiled in the 2025 Plan and their overall significance for the County as a whole.

Table 1-1 Arapahoe County Hazard Significance

Hazard	Frequency	Spatial Extent	Severity	Overall Significance
Active Threat	Occasional	Limited	Limited	**Low**
Cyber Threat	Likely	Significant	Critical	**Medium**
Dam Failure	Unlikely	Significant	Critical	**Medium**
Drought	Likely	Extensive	Limited	**Medium**
Flooding	Likely	Significant	Limited	**Medium**
Hazmat Release	Likely	Significant	Critical	**Medium**
Pandemic	Occasional	Extensive	Critical	**High**
Severe Summer Weather	Highly Likely	Significant	Critical	**High**
Severe Wind/Tornado	Likely	Significant	Limited	**Medium**
Severe Winter Weather	Highly Likely	Extensive	Limited	**High**
Wildfire	Highly Likely	Extensive	Limited	**Medium**
Urban Conflagration	Occasional	Extensive	Catastrophic	**High**

Chapter 5 Mitigation Strategy describes what the County and participating jurisdictions will do to reduce their vulnerability to the hazards identified in Chapter 4. This strategy presents the goals and objectives of the mitigation program and details a broad range of targeted mitigation actions to reduce losses from hazard events. The Plan identifies 124 mitigation actions for implementation by the participating jurisdictions and stakeholders.

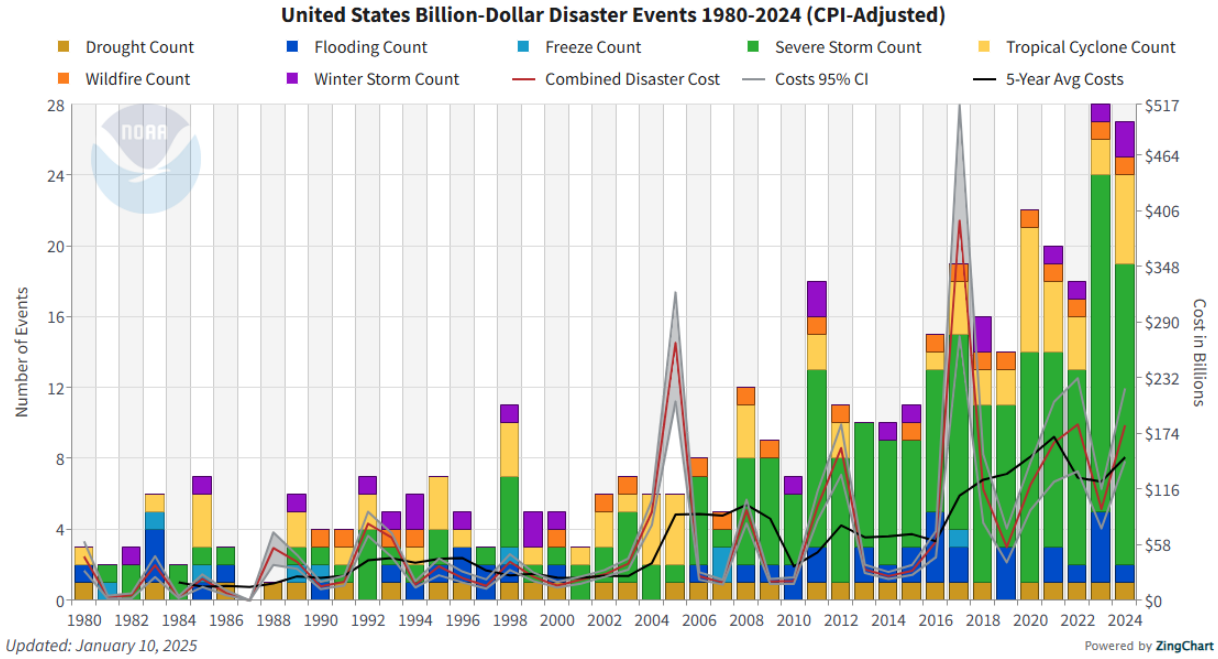
Chapter 6 Plan Implementation and Maintenance details how the Plan will be implemented, monitored, evaluated, and updated, and how the mitigation program will be integrated into other planning mechanisms.

Full implementation of this Plan will take time and resources. Coordination and communication within the planning partnership will be key to increasing the community's disaster resilience. It is also important that local decision-makers and the public stay involved in mitigation planning to provide new ideas and insight for future updates to the HMP. Arapahoe County and the participating jurisdictions remain committed to a long-term strategy for reducing the risks of hazards.

1.2 Background and Scope

FEMA defines hazard mitigation as "any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event." Each year in the United States, natural disasters take the lives of hundreds of people and injure thousands more. Nationwide, taxpayers pay billions of dollars annually to help communities, organizations, businesses, and individuals recover from disasters. These monies only partially reflect the true cost of disasters because additional expenses to insurance companies and nongovernmental organizations are not reimbursed by tax dollars. Additional expenses to insurance companies and non-governmental organizations are not reimbursed by tax dollars, making the costs of disasters several times higher than calculated amounts. Figure 1-1 shows the number and type of natural disasters in the U.S. that have resulted in more than one billion dollars in damage, demonstrating how the frequency and cost of major disasters have risen over the past several decades.

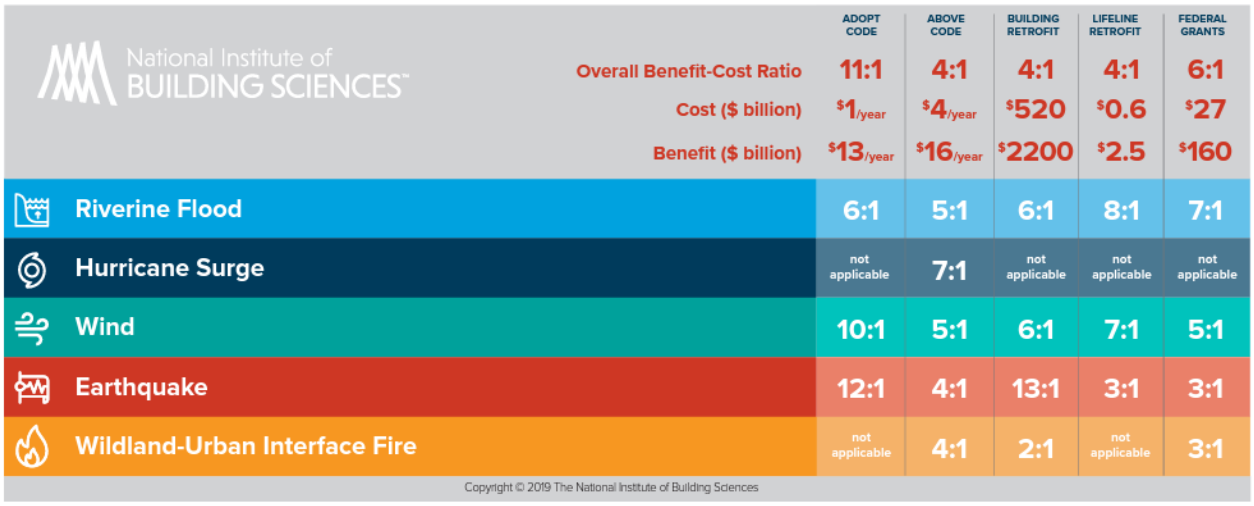
Figure 1-1 Billion-Dollar Disasters in the U.S. 1980-2024



Source: National Oceanic and Atmospheric Administration

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

Figure 1-2 Mitigation Return On Investment



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

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TABLE 1. Nationwide average benefit-cost ratio by hazard and mitigation measure. BCRs can vary geographically and can be much higher in some places. Find more details in the report.

Source: National Institute of Building Sciences, nibs.org/mitigationsaves

Recognizing the importance of mitigation planning, in 2003 Arapahoe County participated in a regional planning process led by the Denver Regional Council of Governments (DRCOG) along with 18 other local jurisdictions. The Denver Regional Natural Hazard Mitigation Plan was adopted in 2004, and updated in 2010. In 2014, Arapahoe County decided to produce its own Hazard Mitigation Plan focused specifically on the County and its jurisdictions. The resulting Arapahoe County Hazard Mitigation Plan was approved by FEMA and adopted in 2015. That plan underwent a comprehensive update in 2020, and is now being updated for 2025 as described in Section 2.

This plan will serve as a blueprint for coordinating and implementing hazard mitigation policies, programs, and projects in Arapahoe County. It provides a list of mitigation goals and related actions that may assist Arapahoe County and its municipalities in reducing risk and preventing loss from future hazardous events. The impacts of hazards can be lessened and sometimes avoided altogether if appropriate actions are taken before hazardous events occur. By avoiding unnecessary exposure to known hazard risks, communities will save lives and property and minimize the social, economic, and environmental disruptions that commonly follow hazardous events.

It is our long-term goal that the Hazard Mitigation Plan and the mitigation strategies identified within will be fully integrated into daily decisions and routines of local government. This will continue to require dedication and hard work, and to this end, this Plan update continues efforts to further strengthen the sustainability of Arapahoe County.

This plan was also developed and updated to maintain Arapahoe County's and participating jurisdictions' eligibility for federal disaster assistance, specifically the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Assistance (HMA) grants such as the Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance (FMA), and Building Resilient Infrastructure and Communities (BRIC) grant program, as well as the Rehabilitation of High Hazard Potential Dam (HHPD) grant program. The County will continue to monitor changes in grant funding opportunities and may revise this plan to meet new grant requirements as needed.

2.0 PLANNING PROCESS

DMA Requirements §201.6(b), §201.6(c)(1)m, and §201.6(d)(3)
A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within 5 years in order to continue to be eligible for mitigation project grant funding. *[The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.* *An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:* • *An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;* • *An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and non-profit interests to be involved in the planning process; and* • *Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.*

This section of the Plan describes the mitigation planning process undertaken by Arapahoe County and the participating municipalities in the preparation of this Hazard Mitigation Plan. This chapter consists of the following subsections:

- What's New in the Plan Update
- Local Government Participation
- The 2025 Planning Process

2.1 What's New in the Plan Update

This multi-jurisdictional, multi-hazard mitigation plan update involved a comprehensive review and update of each section of the 2020 plan and an assessment of Arapahoe County's success in evaluating, monitoring, and implementing the mitigation strategy outlined in that plan.

A significant change from 2020 was the addition of South Metro Fire Rescue as a participating jurisdiction; they had been a stakeholder in the 2020 Plan but elected to seek adoption of the 2025 Plan. Conversely the Town of Bennett decided not to participate as a jurisdiction in 2025, since the entirety of the Town is covered by the Adams County HMP.

Urban Conflagration was added as a hazard, reflecting an increased national focus on that hazard.

All sections of the plan were reviewed and updated to reflect new data and methodologies on hazards and risk, risk analysis processes, capabilities. Only the information and data still valid from the 2020 plan was carried forward as applicable to this plan update. The Planning Team discussed jurisdictional priorities and concluded there had been no significant changes to priorities that would affect this mitigation plan. The plan was also revised to reflect changes in development, including using the latest version of the assessor's office data as the basis for identifying overall and hazard exposure for developed parcels by Arapahoe County and jurisdictions. The jurisdictions provided updated statuses for mitigation actions identified in the 2020 Plan, and identified new mitigation activities where appropriate.

2.2 Local Government Participation

Arapahoe County invited every incorporated city, town, and special district in the County to participate in the 2025 Hazard Mitigation Plan update. The Disaster Mitigation Act requires that jurisdictions participate in the planning process and officially adopt the multi-jurisdictional hazard mitigation plan to be eligible for FEMA Hazard Mitigation Assistance grants. The jurisdictions that chose to participate in the planning process and development of the plan or its update were required to meet strict plan participation requirements defined at the beginning of the process, which included:

- Designate a representative to serve on the Planning Team
- Participate in Planning Team meetings
- Update and fill out Plan Update Guides
- Complete and return updates on mitigation actions since 2020
- Identify new mitigation actions for the plan
- Review and comment on plan drafts
- Inform the public, local officials, and other interested parties about the planning process and provide opportunities for them to comment on the plan
- Formally adopt the mitigation plan and re-adopt every 5 years

As noted previously, the City of Aurora and the Town of Bennett declined to participate as jurisdictions because they are covered under other HMPs. And the Towns of Bow Mar, Columbine Valley, and Deer Trail were unable to participate due to limited staffing and other priorities. These municipalities took part in the planning process as stakeholders, and this plan includes their data for completeness, but they are not seeking to adopt this plan. All other incorporated municipalities in Arapahoe County participated in the 2025 plan update. Denver Water joined the 2020 planning process as a water provider, and continued participation for the 2025 plan update. South Metro Fire Rescue joined the 2025 update as a special district, providing input on the services they provide to Arapahoe and surrounding counties. The following jurisdictions met all the participation requirements described above:

- Arapahoe County
- City of Centennial
- City of Cherry Hills Village
- City of Englewood
- Town of Foxfield
- City of Glendale
- City of Greenwood Village
- City of Littleton
- City of Sheridan
- Denver Water
- South Metro Fire Rescue

Appendix B lists the attendance of representatives at each Planning Team meeting.

2.3 The 2025 Planning Process

The Arapahoe County Office of Emergency Management (OEM) worked with the consultant team to establish the framework and process for this planning effort using FEMA's Local Multi-Hazard Mitigation Planning Guidance (2025). The guidance and this plan are structured around FEMA's original four-phase process:

1. Organize resources
2. Assess risks
3. Develop the mitigation plan
4. Implement the plan and monitor progress

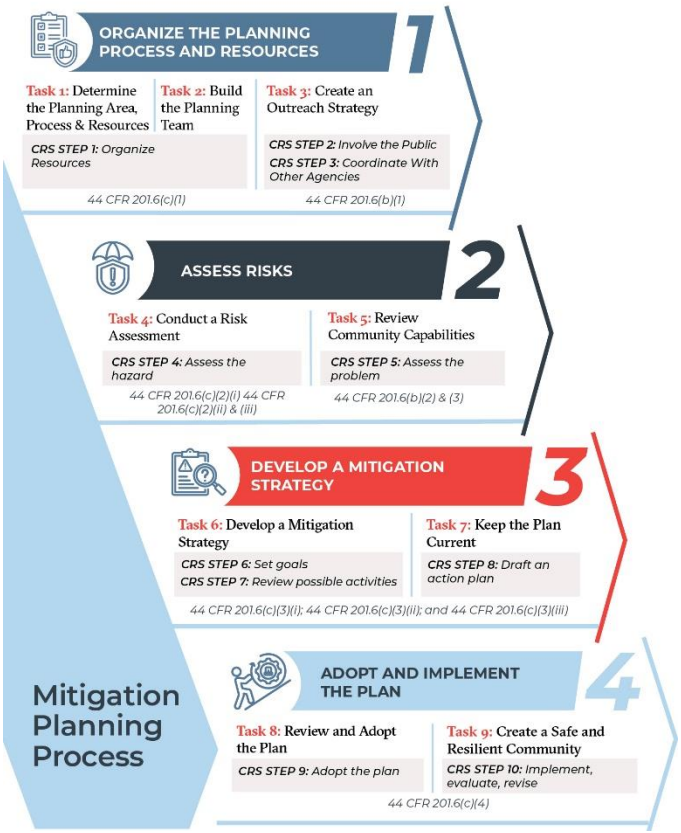
Into this four-phase process, WSP integrated the 10-step planning process used for FEMA's Community Rating System (CRS) and Flood Mitigation Assistance programs. Thus, the modified 10-step process used for this plan meets the funding eligibility requirements of the Hazard Mitigation Assistance grants Community Rating System, and the flood control projects authorized by the U.S. Army Corps of Engineers (USACE).

Figure 2-1 shows how the process followed meets all the requirements for those programs.

2.3.1 Phase 1 Organize Resources

Step 1: Organize the Planning Effort

Figure 2-1 Mitigation Planning Process



This section describes the planning process used during the 2025 update. The previous planning processes for the 2010, 2015, and 2020 planning efforts are documented in those plans. The Arapahoe County Emergency Management Coordinator took the lead on coordinating and reconvening the Planning Team and identifying the key county, municipal, and other local government and initial stakeholder representatives. Representatives from all jurisdictions listed in Section 2.2 above participated in the Planning Team and the update of the plan.

The Arapahoe County Planning Team that was formed during the 2020 Planning Process has met annually since then to update the status of mitigation actions, share lessons learned, discuss ongoing and completed projects, or present case studies applicable to the plan. Arapahoe County OEM emailed invitations to each meeting to county, municipal, district, state, and other stakeholder representatives. This list is included in Appendix B. Stakeholder participation was significant during the 2025 update as described below in Step 3: Coordinate with Other Departments and Agencies.

The Disaster Mitigation Act requires that each jurisdiction participate in the planning process and officially adopt the multi-jurisdictional hazard mitigation plan. A Planning Team was created that includes representatives from each participating jurisdiction, departments of the County, and other local, state, and federal organizations responsible for making decisions in the plan and agreeing upon the final contents. Kickoff meeting attendees discussed potential participants and made decisions about additional stakeholders to be invited to participate.

The Planning Team contributed to this planning process by:

- Providing facilities for meetings
- Attending meetings
- Collecting data
- Managing administrative details
- Filling out and submitting Plan Update Guides
- Making decisions on plan process and content
- Submitting mitigation action implementation worksheets
- Reviewing and editing drafts
- Coordinating and assisting with public involvement and plan adoptions

During the plan update process, the Planning Team communicated with a combination of online webinars, phone interviews, and email correspondence. Three planning meetings with the Planning Team were held during the plan's development between March 2025 and June 2025. The meeting schedule and topics are listed in the following table; all 10 planning process steps were covered in these three meetings. The kickoff meeting was conducted virtually, but all subsequent meetings were held in person. Agendas and meeting summaries for each meeting are included in Appendix C.

Table 2-1 Schedule of Planning Team Meetings

Meeting	Topic	Date
Kickoff Meeting	Introduction to DMA and the planning process. Identification of hazards impacting Arapahoe County	March 18, 2025
Risk Assessment Meeting	Review of updated hazard identification and risk assessment	May 28, 2025
Mitigation Strategy Meeting	Review of goals and objectives. Review of status updates of 2014 mitigation actions. Development of new mitigation actions.	June 26, 2025

Kickoff Meeting

The plan update process officially began with a virtual kickoff meeting on March 18th, 2025. A total of 69 Planning Team members and stakeholders attended. During the kickoff meeting, the Arapahoe County Emergency Manager and Coordinators presented information on the scope and purpose of the plan update, participation requirements of Planning Team members, and the proposed project work plan and schedule. A representative from the Colorado Division of Homeland Security and Emergency Management (DHSEM) gave an overview of hazard mitigation planning and financial opportunities to fund mitigation projects. Coordinators also introduced the hazard identification requirements and data. The Planning Team reviewed the hazards list from the 2020 plan as well as the hazards listed in the Colorado State Hazard Mitigation Plan. The Planning Team decided to add urban conflagration to the risk assessment as a hazard. The Planning Team discussed jurisdictional priorities and concluded that there had been no significant changes to priorities that would affect this mitigation plan. The Planning Team discussed hazard events since the 2020 plan. Each jurisdiction provided updates on existing capabilities and ongoing mitigation efforts through a data collection spreadsheet created for incorporation into the plan update.

Risk Assessment Meeting

On May 28th, 2025, the Planning Team convened at the Arapahoe County Sheriff's Office to review and discuss the results of the risk and vulnerability assessment update. Thirty-one members of the Planning Team and stakeholders were present for the discussion. WSP presented results from a public survey sent out to county residents, which received 400 responses. This survey had the public rank the hazards from the 2020 plan as well as provide input on potential mitigation actions the county could implement. More information on the public input survey can be found in the next section.

The hazards identified for the 2025 plan were then presented along with updated parcel and critical facilities analysis. The group went through each hazard together and discussed the results as well as shared any local insight to inform the HIRA update. The group decided the high overall significance rating for urban conflagration is an appropriate rating as well as decided to keep the other hazard significance ratings the same as the previous plan. The group then went over next steps and discussed the Mitigation Action Tracker that would be sent out prior to the next meeting. The Planning Team was expected to provide an updated status on all mitigation actions for their jurisdiction.

Mitigation Strategy Meeting

The Planning Team convened in person on June 26th, 2025, with 26 people participating to update the plan's mitigation strategy. The group finalized the plan's goals and discussed the criteria for mitigation action selection and prioritization using a worksheet provided by WSP (refer to Section 5.3). The group reviewed each possible new mitigation action and additional details were provided by the Planning Team. The meeting ended with a review of the next steps and planning process schedule. WSP provided the Planning Team with a link to an online form to submit new mitigation actions.

Step 2: Involve the Public

An important component of the success of Arapahoe County's community-based mitigation planning process involves ongoing public, stakeholder, and jurisdiction participation. Individual citizen involvement provides the Planning Team with a greater understanding of local concerns and ensures a higher degree of mitigation success by developing community buy-in from those directly affected by the planning decisions of public officials.

Public input was sought throughout the planning process by advertising an open public survey through social media networks (including agency and municipal Twitter and Facebook accounts) and agency websites.

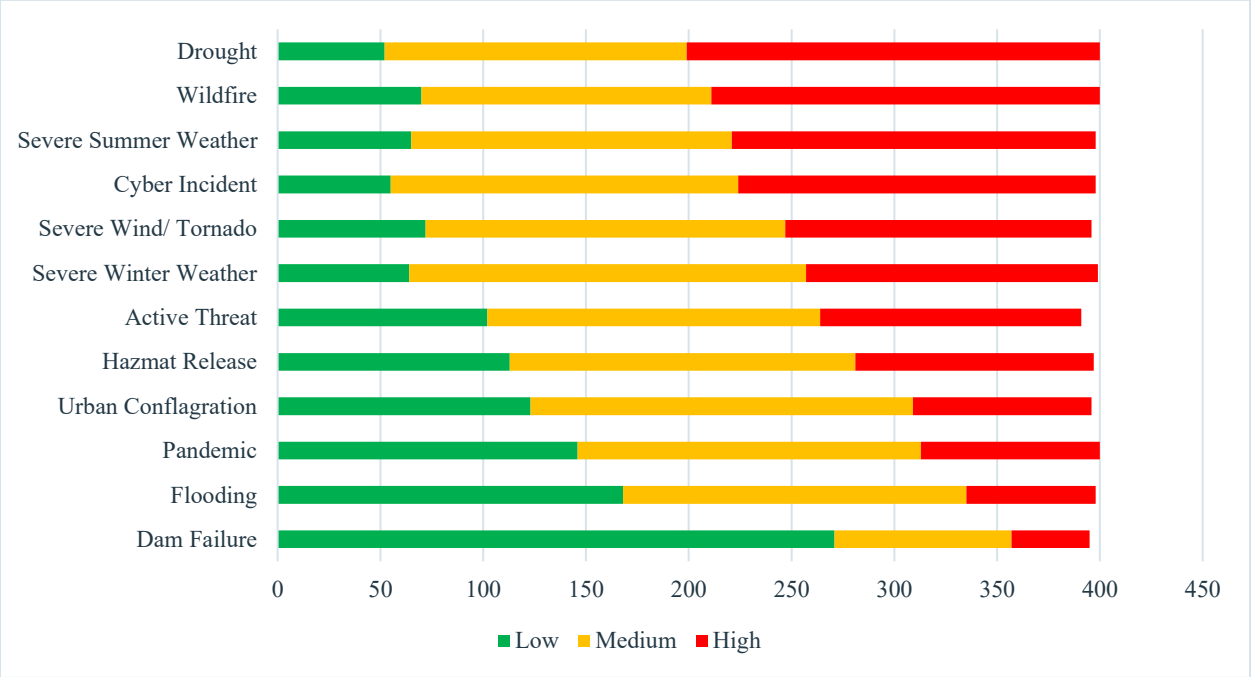
Multiple media platforms were used to reach and engage the maximum number of local and regional stakeholders. Communication pathways included social media outlets including Twitter and Facebook, and County and local jurisdiction websites and email lists.

Online Public Survey

During the plan update's initial drafting stage, an online public survey was used to gather public input to the Planning Team. The nine-question survey gathered public feedback on concerns about hazards and suggestions on mitigation activities. The survey was released on March 14th, 2025 and closed on June 30th, 2025. The Planning Team distributed links to the public survey through social media, email, and posting the link on websites.

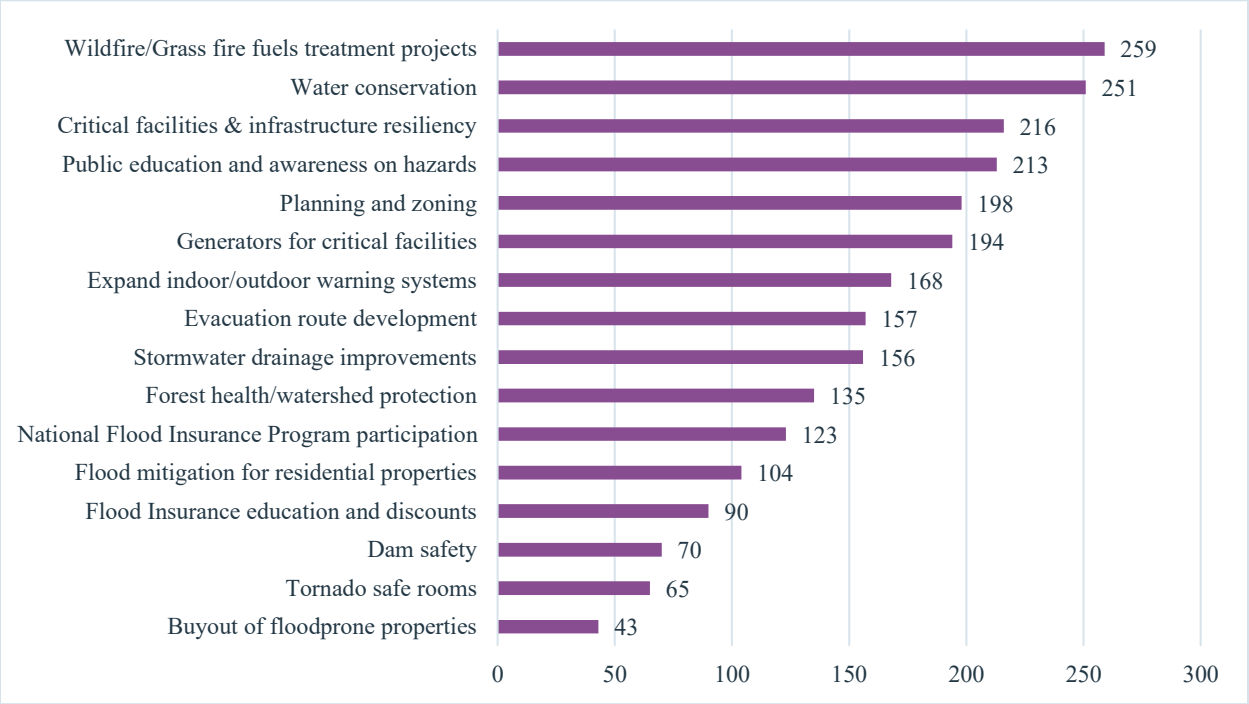
A total of 400 people took the survey; participation from the City of Centennial was particularly good, representing 66% of all responses. Results showed that 74% of respondents had lived in the planning area for over 10 years. The public perceives the most significant hazards to be drought, cyber incident, severe summer weather, and severe wind/tornado. The mitigation actions with the highest priority were wildfire/grass fire fuels treatment projects, water conservation, and critical facilities & infrastructure resiliency. This information was shared with the Planning Team, who were encouraged to refer to the survey results when ranking hazards or thinking of new mitigation actions. Some of the questions asked in the public survey are shown in the following figures. Complete survey data and documentation of public feedback can be found in Appendix D.

Figure 2-2 Public Survey: Hazard Significance Rankings



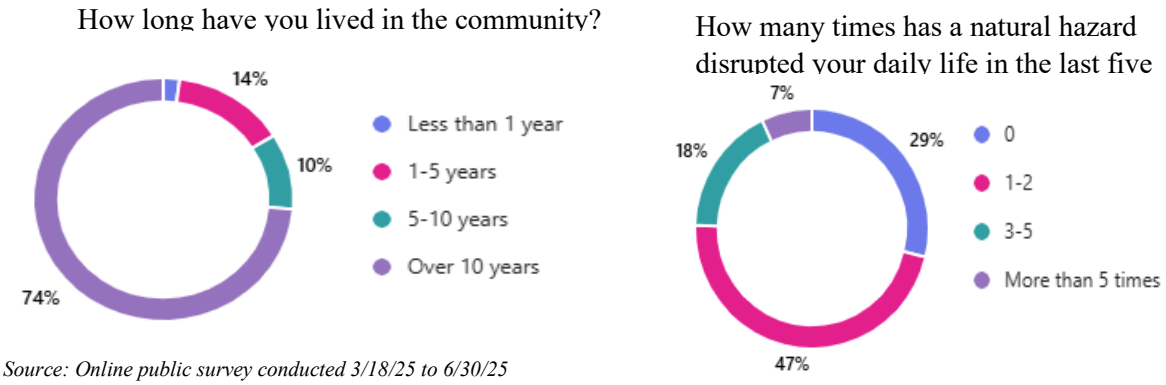
Source: Online public survey conducted 3/18/25 to 6/30/25

Figure 2-3 Public Survey: Mitigation Action Priorities



Source: Online public survey conducted 3/18/25 to 6/30/25

Figure 2-4 Public Survey: Experience With Hazards In The Community



Source: Online public survey conducted 3/18/25 to 6/30/25

Public Review Period

The public was also given an opportunity to provide input on a draft of the complete plan prior to its submittal to the State and FEMA. Arapahoe County provided the draft plan for review and comment on the County website and via an online engagement room from October 30th to November 10th, 2025. The jurisdictions announced the availability of the draft plan and the public comment period through social and traditional media announcements. Copies of these notices are provided in Appendix C. An online form to collect comments was posted with the plan. No public comments were received.

Figure 2-5 Online Public Engagement Space

Source: WSP

Step 3: Coordinate with Other Departments and Agencies

There are numerous organizations whose goals and interests interface with hazard mitigation in Arapahoe County. Coordination with these organizations and other community planning efforts is vital to the success of this plan update. The Arapahoe County Office of Emergency Management invited other local, state, and federal agencies to the kickoff meeting to learn about and participate in the hazard mitigation planning initiative. Many of the agencies participated throughout the planning process in meetings described in Step 1: Organize the Planning Effort. In addition, the Planning Team developed a list of neighboring communities and local and regional agencies involved in hazard mitigation activities, as well as other interested parties to keep informed on the plan update process.

Stakeholders included local and regional agencies involved in hazard mitigation activities and those with the authority to regulate development. The neighboring jurisdictions of Adams, Denver, Elbert, Douglas and Jefferson Counties and the City of Aurora were invited to participate, either by attending meetings or reviewing draft documents. Stakeholders could participate in various ways, either by contributing input at Planning Team meetings, being aware of planning activities through an email group, providing information to support the effort, or reviewing and commenting on the draft plan. A list of stakeholders and agencies invited to participate is included in Appendix B.

As part of the public review and comment period for the draft plan, key agencies were again specifically solicited and the incorporated jurisdictions not participating in this HMP update, to provide any final input to the draft plan document. This input was solicited by direct emails to key groups and associations to review and comment on the plan. As part of this targeted outreach, these key stakeholders were also specifically invited to attend the Planning Team meetings to discuss any outstanding issues and to provide input on the draft document and final mitigation strategies.

Incorporation of Existing Plans and Other Information

Coordination and synchronization with other community planning mechanisms and efforts is vital to the success of this plan. To have a thorough evaluation of hazard mitigation practices already in place,

appropriate planning procedures should also involve identifying and reviewing existing plans, policies, regulations, codes, tools, and other actions that help to reduce a community's risk and vulnerability from hazards. Arapahoe County uses a variety of mechanisms to guide growth and development. Integrating existing planning efforts, mitigation policies, and action strategies into this plan establishes a credible, comprehensive document that weaves the common threads of a community's values together. The development and update of this plan involved a comprehensive review of existing plans, studies, reports, and initiatives from Arapahoe County and each participating municipality that relate to hazards or hazard mitigation. A high-level summary of the key plans, studies and reports is summarized in the table below, with notes on how they informed the update process.

Table 2-2 Summary of Review of Key Plans, Studies and Reports

Plan, Study, Report Name	How Plan Informed HMP
Colorado Enhanced State Hazard Mitigation Plan (2023)	Informed the HIRA (Chapter 4) with risk information specific to Arapahoe County and hazard profile information for each of the hazards. Used as a reference in the development and review of mitigation goals.
State Demography Office Colorado Demographic Profiles	Informed the demographic trends in the County and in each incorporated jurisdiction. Chapter 2 Community Profile, Chapter 4 Risk Assessment.
Colorado State Drought Response and Mitigation Plan (2018)	Informed the drought hazard and dam incident profiles and vulnerability assessments in Chapter 4 risk assessment.
Arapahoe Forward: Strategic Plan (2025)	The strategic plan provided information about the local economy, housing diversity, and infrastructure
Arapahoe County Emergency Operations Plan (EOP) 2022	Provided information on the county transportation systems,
Arapahoe County Comprehensive Plan (2018)	Provided background information on the county including some information related to jurisdictions. Informed the Community Profile in Chapter 2 and Chapter 4 Risk Assessment.
Arapahoe County 2035 Transportation Plan (2010)	Provided background information on County transportation systems and future development of transportation.
Arapahoe County Flood Insurance Study – Preliminary (2018)	Reviewed for information on past floods and flood problems to inform risk assessment (Chapter 4)
Eastern Arapahoe County Community Wildfire Protection Plan (CWPP) (2012)	Informed the wildfire profile in Chapter 4 Risk Assessment.
Open Spaces Master Plan (2021)	Provided information about geography, land use, and historical and future developments in the County.
Town of Bow Mar Water and Sanitation District Capital Master Plan (2023)	Provided information for the flood section (Section 4.7)
City of Centennial Comprehensive Plan (2023)	Provided information for the community profile as well as the land development, historic growth and development, and future growth and development sections.
Cherry Hills Village Master Plan (2022)	Provided information for the community profile and growth and development trends for Cherry Hills Village.
City of Englewood Comprehensive Plan (2017) (Updating in 2025)	Provided information for the community profile, growth and development trends, and the planning and regulatory mitigation capabilities for the City of Englewood
Town of Foxfield Master Plan (2008)	Informed the Administrative and Technical capabilities section for the Town of Foxfield
City of Glendale Master Plan (Currently being updated)	Provided information regarding demographics, existing and prospective development.

Plan, Study, Report Name	How Plan Informed HMP
Greenwood Village Comprehensive Plan (2015)	Provided information about growth and development trends in Greenwood Village, the community profile, and historical data
Envision Littleton Comprehensive Plan (2019)	Provided information for the community profile, local economy, and historical growth and development in the town of Littleton.
Sheridan Comprehensive Plan (2015)	Provided information for the community profile and future growth and development.
South Metro Fire Rescue Strategic Plan (2021-2025)	Provided information for the community profile and capabilities of SMFR.
South Metro Fire Rescue Category 5 Criterion	Provided information for the community profile and capabilities of SMFR.

Other technical data, reports and studies were reviewed and considered during the collection of data to support Planning Steps 4 and 5, which included the hazard identification, vulnerability assessment, and capability assessment. Information from the following agencies and groups was reviewed in the development and update of this plan. Specific references relied on in the development of this plan are also sourced throughout the document as appropriate.

- State of Colorado Emergency Operations Plan
- State of Colorado EOP Supporting Annexes
- State of Colorado EOP Incident Annexes
- Colorado Division of Water Resources – Dam Safety
- Colorado Wildfire Risk Assessment Portal (CO-WRAP)
- Federal Wildland Fire Occurrence Database
- FEMA Community Information System
- National Drought Mitigation Center – Drought Impact Reporter
- National Oceanic and Atmospheric Administration (NOAA)
- National Register of Historic Places
- National Weather Service (NWS)
- U.S. Army Corps of Engineers' (USACE) – National Inventory of Dams (NID)
- U.S. Census Bureau
- U.S. Center for Disease Control and Prevention (CDC)
- U.S. Coast Guard's National Response Center (NRC)
- U.S. Drought Monitor
- U.S. Environmental Protection Agency (EPA)
- U.S. Geological Survey

2.3.2 Phase 2 Assess Risk

Step 4: Identify the Hazards

WSP and OEM staff led the Planning Team in a review of the hazards identified in the 2020 plan, and discussed all the hazards that have impacted or could impact the planning area, including documenting recent events. The profile of each of these hazards was then developed and updated with information from the Planning Team and additional sources. Web resources, existing reports and plans, and existing GIS layers were used to compile information about past hazard events and determine the location, magnitude/severity of each hazard, past occurrences, climate change considerations, probability of future

occurrences, vulnerability and consequence analysis, and jurisdictional differences. Information on the methodology and resources used to identify and profile hazards is provided in Chapter 4.0.

Step 5: Assess the Risks

After profiling the hazards that could affect Arapahoe County, the Planning Team collected information to describe the likely impacts of future hazard events on the participating jurisdictions. This step included two parts: a vulnerability assessment and a capability assessment.

Vulnerability Assessment— Participating jurisdictions inventoried their assets at risk to natural and human-caused hazards, both overall and in identified hazard areas. These assets included total number and value of structures; critical facilities and infrastructure; natural, historic, and cultural assets; and economic assets. The Planning Team also analyzed development trends in hazard areas. The County's DFIRM was used to refine the estimated flood losses during the update, where available for the NFIP participating communities.

Capability Assessment—This assessment consisted of identifying the existing mitigation capabilities of participating jurisdictions. This involved collecting information about existing government programs, policies, regulations, ordinances, and plans that mitigate or could be used to mitigate risk to disasters. Participating jurisdictions collected information on their regulatory, administrative, fiscal, and technical capabilities, as well as ongoing initiatives related to interagency coordination and public outreach. Refer to Section 3.6 for existing capabilities as well as identified opportunities to enhance those capabilities.

A more detailed description of the risk assessment process and the results are included in Chapter 4.0 Risk Assessment.

2.3.3 Phase 3 Develop the Mitigation Plan

Step 6: Set Goals

WSP facilitated a brainstorming and discussion session with the Planning Team during their third meeting to review and update the goals and objectives for the overall hazard mitigation plan update. 26 people on the planning team attended this final meeting. The Planning Team discussed definitions and examples of goals, objectives, and actions. The Planning Team was asked to provide any input or updates to the goals in the 2020 plan. The group decided that the four goals from the 2020 update were sufficient and decided to not add any objectives. The final goals for the 2025 update are further discussed in Chapter 5.0.

Step 7: Review Possible Activities

The Planning Team identified mitigation actions at their third meeting. The group was presented with different categories of mitigation actions and example actions for each identified hazard. Planning Team members were encouraged to brainstorm actions to address the plan's goals. The Planning Team then reviewed potential mitigation alternatives and identified new actions by hazard and jurisdiction to ensure that all the plan's high- and medium-significance hazards were addressed, and that all participating jurisdictions had at least one new mitigation action.

The Planning Team discussed criteria for narrowing down and prioritizing the identified actions. The group approved the STAPLEE criteria, which assess the Social, Technical, Administrative, Political, Legal, Economic, and Environmental implications of each action. Each member used these criteria to

present a new mitigation action. Projects were then discussed individually, with planning team members given the opportunity to expand more on the mitigation action they came up with. This process is described in more detail in Chapter 5.0 Mitigation Strategy.

Each participating jurisdiction was responsible for submitting at least one new mitigation action specific to their jurisdiction, in addition to providing input on the progress made on actions identified in the 2019 plan.

Step 8: Draft the Plan

A first draft of the HIRA section was completed in August 2025 and distributed to the Planning team for review and comment. The first complete draft of the plan update, including the revised HIRA, was developed and submitted to the Planning Team for review in September 2025. Once the Planning Team's comments were incorporated, a complete draft of the plan was made available online for public review and comment from October 30th to November 10th, 2025, as discussed above under Step 2 Involve the Public. Methods for inviting interested parties and the public to review and comment on the plan were discussed in Steps 2 and 3, and materials are provided in Appendix D.

2.3.4 Phase 4 Implement the Plan and Monitor Progress

Step 9: Adopt the Plan

To secure buy-in and officially implement the plan, the governing bodies of each participating jurisdiction adopted the plan and their jurisdictional annex. Scanned copies of resolutions of adoption are included in Appendix A.

Step 10: Implement, Evaluate and Revise the Plan

The true worth of any mitigation plan is in the effectiveness of its implementation. The Planning Team reviewed how the 2020 HMP was implemented and maintained since its adoption; this is described in Section 6.2.

The strategy for implementing and maintaining the 2025 plan, including a strategy for continued public involvement, was updated and is described in Chapter 6.0 Plan Implementation and Maintenance.

3.0 COMMUNITY PROFILE

Arapahoe County was named after the Arapaho Native American tribe and was one of the original 17 counties designated on November 1st, 1861, during the creation of the Colorado Territory. The County boundaries at that time extended further west and north than its present boundaries, including land that now forms Adams County and southern Washington and Yuma Counties. Adams County then broke off in 1901 and the eastern portions became Washington and Yuma counties in 1903. Denver was the original County seat until 1902 when Denver split off and became a separate county. The City of Littleton became the new Arapahoe County seat and remains the County seat today.

As of 2025, Arapahoe County is the third largest county for population size, following only El Paso County and Denver County.

3.1 Geography and Land Use

Arapahoe County, located in the South Denver Metro area, spans 805 square miles. A land of diverse ecosystems and communities, the western reaches of the county are primarily urban, with residential, retail, office, and industrial development. The eastern half of Arapahoe County consists of primarily agricultural and rural development.

Major state highways cross the county from east to west (I-70, US Highway 36, and US Highway 40). The Union Pacific Railroad also passes through the county at the west edge and runs parallel to I-70 before it exits at the eastern border of the county. Several petroleum lines intersect the county. This includes an interstate high pressure gas line that runs diagonally through the county. Eastern Arapahoe County is home to multiple high-pressure gas and gas by-product underground lines. The companies of ownership include:

- Colorado Interstate Gas
- ConocoPhillips Pipeline, Colorado
- NuStar Logistics
- DCP Midstream
- Rocky Mountain Pipeline System, LLC

Figure 3-1 and Figure 3-2 show maps of the County, including prominent features such as municipalities and major highways. Figure 3-3 shows South Metro Fire Rescue's district and stations.

Figure 3-1 Western Arapahoe County

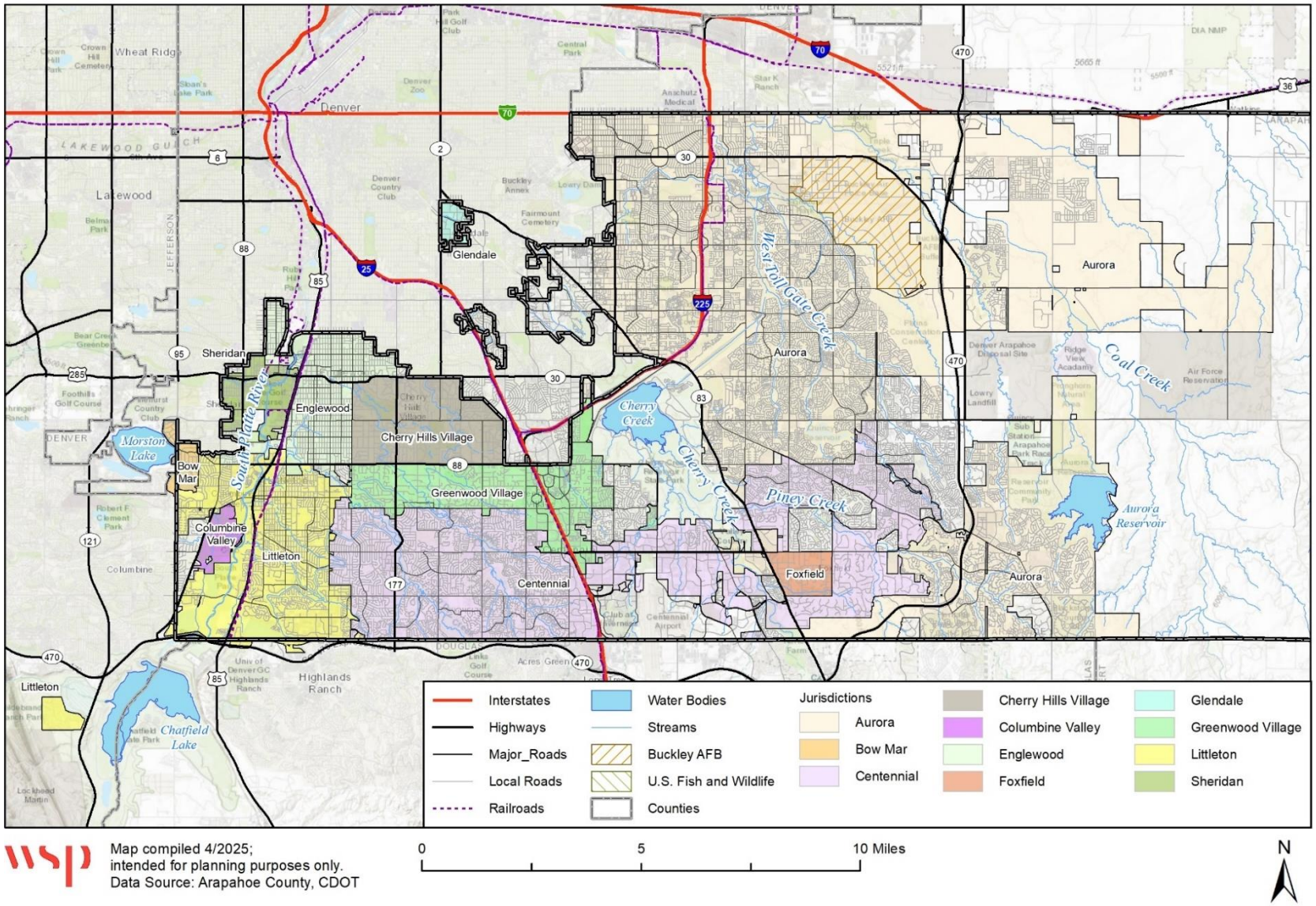


Figure 3-2 Eastern Arapahoe County

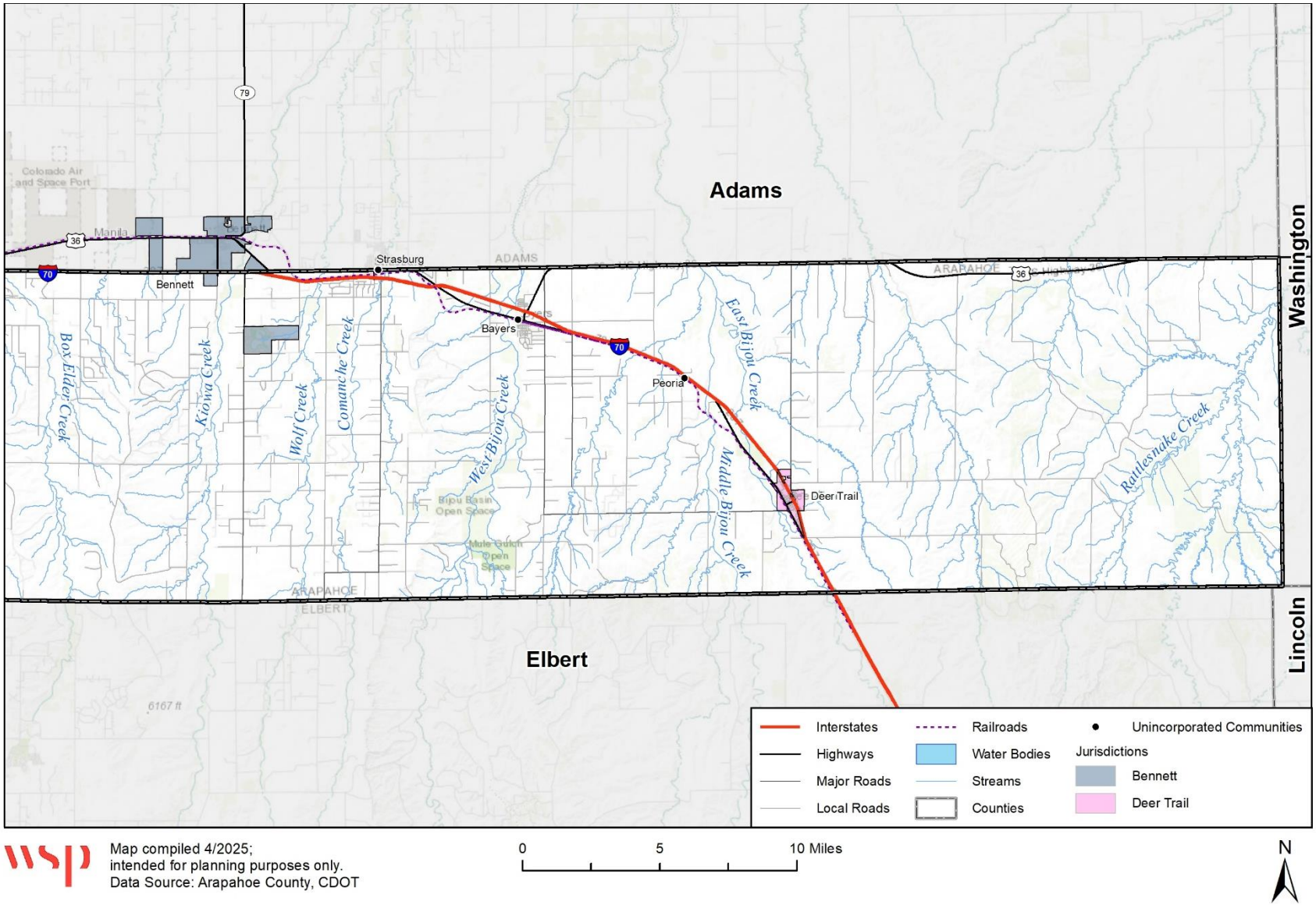


Figure 3-3 South Metro Fire Rescue

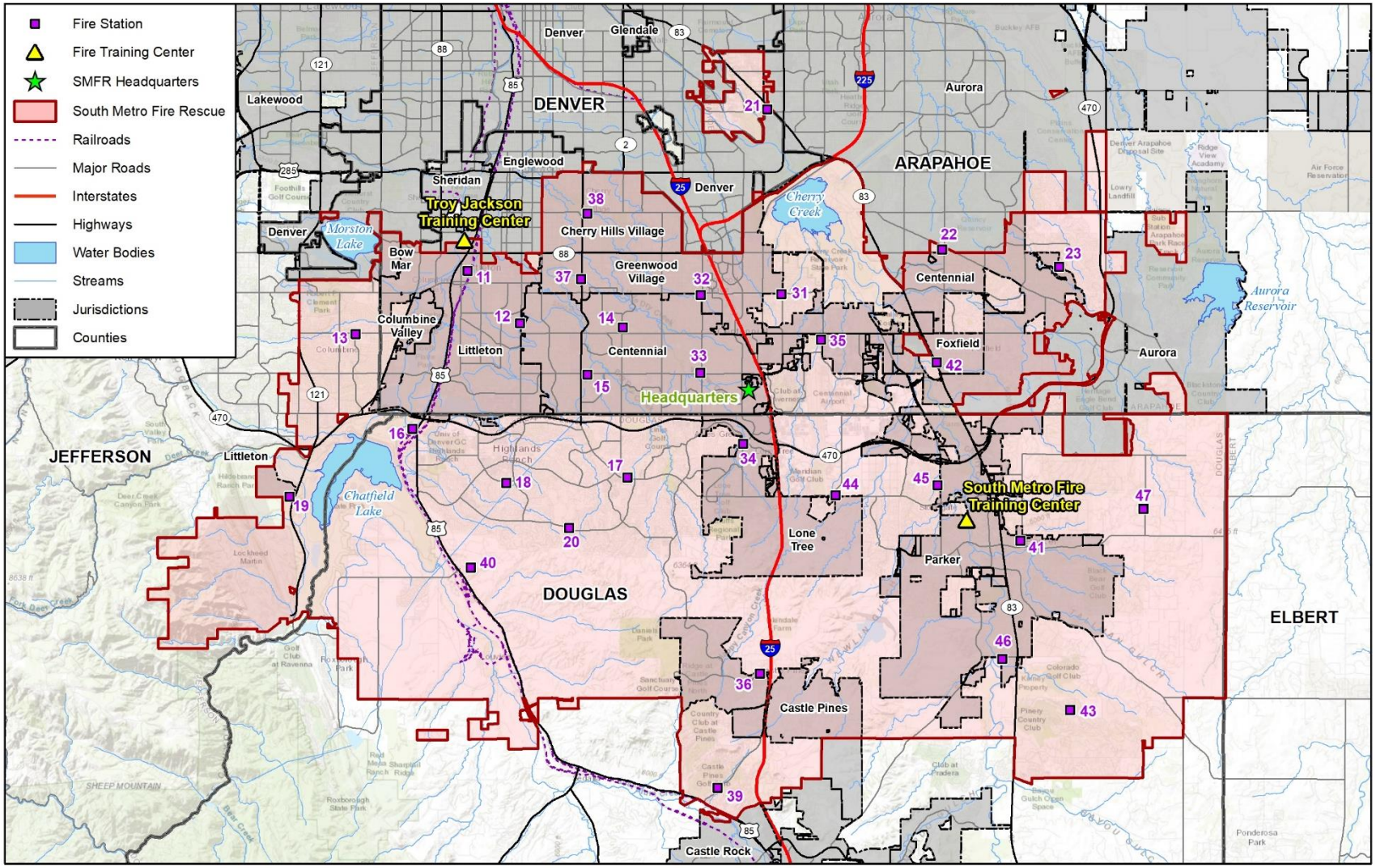
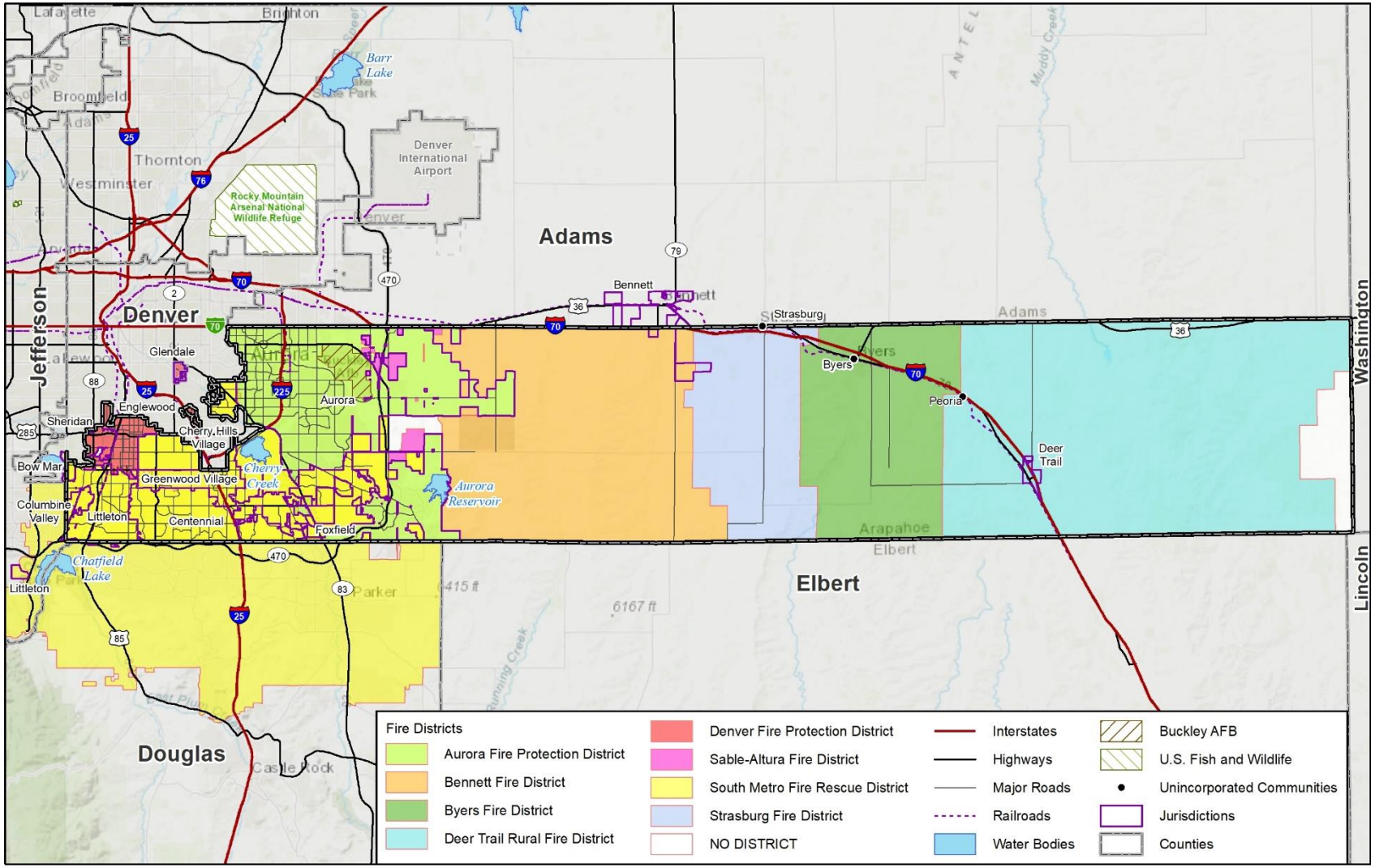


Figure 3-4 Arapahoe County Fire Districts



Map compiled 4/2025;
intended for planning purposes only.
Data Source: Arapahoe County, CDOT,
South Metro Fire Rescue

3.1.1 Fire Districts

Figure 3-4 above shows the fire districts within Arapahoe County including:

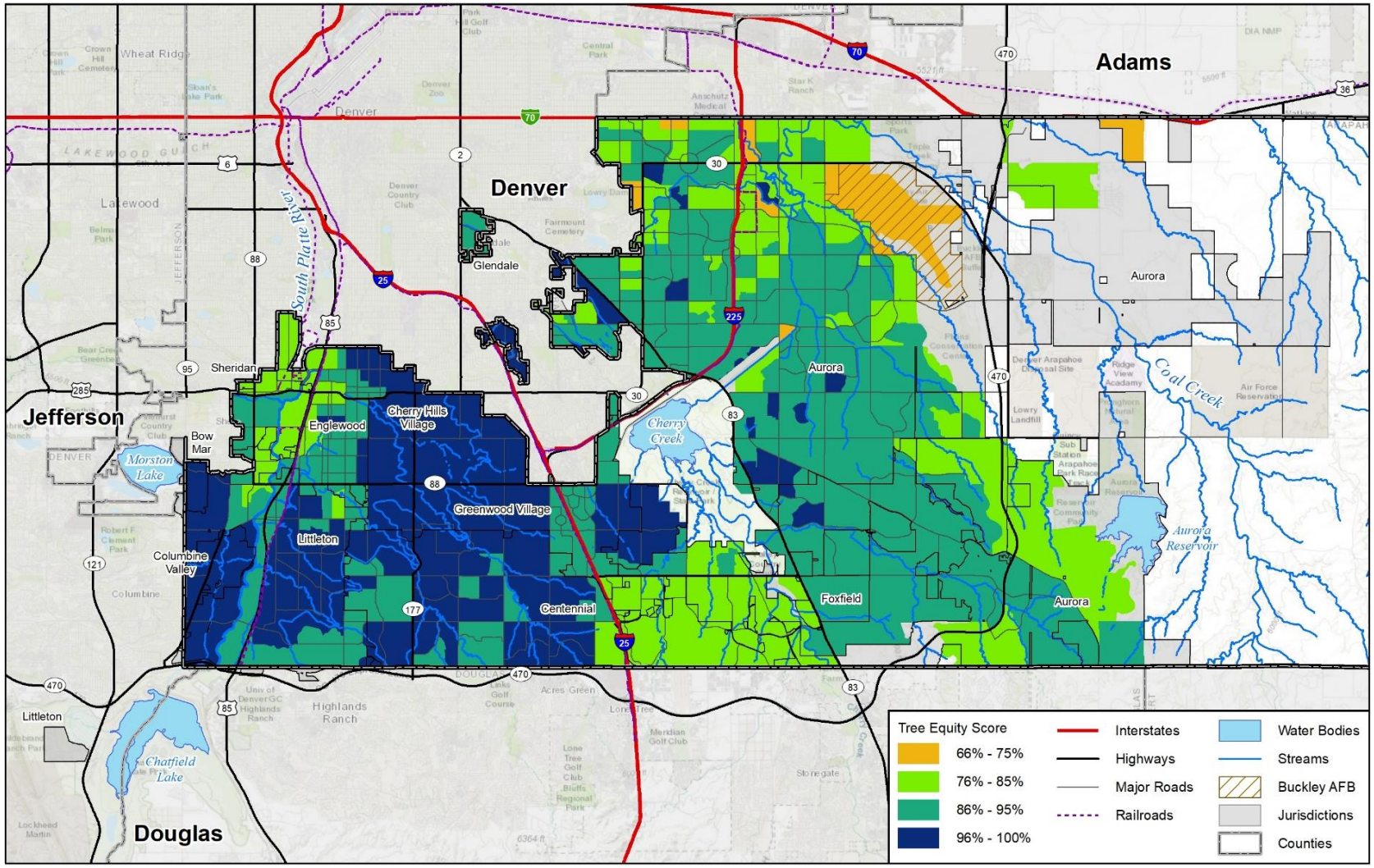
- Aurora Fire Protection District
- Bennett Fire District
- Byers Fire District
- Deer Trail Rural Fire District
- Denver Fire Protection District
- Sable-Altura Fire District
- South Metro Fire Rescue
- Strasburg Fire District

Some of the districts mentioned above, such as the Aurora FPD and South Metro FRD, span multiple counties. This highlights the collaboration Arapahoe County has with neighboring jurisdictions and the ability to get resources from multiple locations. Strong collaboration and fostering relationships with neighboring counties and fire protection districts can be extremely useful during hazard events such as wildfires or urban conflagrations.

3.1.2 Tree Equity Score

Figure 3-5 below shows the tree equity score for the western half of the county. A tree equity score is a tool that measures inequitable access to trees in urban neighborhoods. It generates a score of 0 to 100 indicating how well the benefits of urban tree canopy are reaching those who need them most. The score is calculated using tree canopy data and various socioeconomic indicators, highlighting areas that require prioritization for tree planting and care. A lower score signifies a greater need for increased tree canopy cover in that area. Areas throughout Aurora have a lower tree equity score, indicating a greater need for increased tree canopy cover. In contrast, areas south of Denver such as Greenwood Village and Cherry Hills Village show a score of 96-100%.

Figure 3-5 West Arapahoe County Tree Equity Score



3.2 Communities

Thirteen incorporated cities and towns are wholly or partially located in Arapahoe County. Eight of those are located entirely in Arapahoe County:

- City of Centennial
- City of Cherry Hills Village
- Town of Columbine Valley
- Town of Deer Trail
- City of Englewood
- Town of Foxfield
- City of Glendale
- City of Greenwood Village
- City of Sheridan

The following cities and towns are partially located in Arapahoe County:

- City of Aurora (part in Adams and Douglas Counties)
- Town of Bennett (part in Adams County)
- Town of Bow Mar (part in Jefferson County)
- City of Littleton (part in Douglas and Jefferson Counties)

Arapahoe County also includes several census-designated communities, including:

- Byers
- Holly Hills
- Inverness
- Strasburg
- Watkins

3.2.1 Denver Water

As the primary water provider throughout most of Arapahoe County, Denver Water took part in this Plan update as a participating jurisdiction. Colorado's oldest and largest water utility, Denver Water provides water to 1.5 million people in Denver Metro area. Established in 1918, the utility is a public agency funded by water rates and new tap fees, not taxes. Denver Water is run by a five-member Board of Water Commissioners.

3.2.2 South Metro Fire Rescue (SMFR)

South Metro Fire Rescue (SMFR) participated as a jurisdiction for this plan. SMFR serves nearly 300 square miles of Arapahoe, Douglas, and Jefferson Counties with 30 stations, providing emergency and prevention services to 571,500 residents. For this HMP update, the jurisdictions participating in the update that also receive services by the SMFR include the cities and towns of Bow Mar, Centennial, Cherry Hills Village, Columbine Valley, Foxfield, Greenwood Village, Littleton, and unincorporated parts of the county. Figure 3-3 shows the areas that SMFR services. SMFR has 5 battalions with 30 stations. Battalions 3 and 5 service most of the planning area, with stations that have response areas in unincorporated Arapahoe County, the City of Centennial, parts of Greenwood Village, and Cherry Creek State Park.

3.3 Population

Arapahoe County is the third most populated county in Colorado, behind El Paso and Denver Counties. According to the Colorado State Demography Office and data from the U.S. Census Bureau's 2018-2023 American Community Survey (ACS) 5-Year Estimates, the estimated population of Arapahoe County in 2023 population is 655,709. This constitutes a 5% increase in population since 2019 (644,560). According to the State Demography Office, the projected population for 2025 will decrease from 2023, with an estimated population of 655,645. Table 3-1 below lists population estimates for each jurisdiction and shows how they have changed in the last five years. For simplicity, the city and town populations include their entire jurisdictions, not just the portion within Arapahoe County. Most jurisdictions experienced a positive change in population growth in the past five years, except for these communities: Centennial, Cherry Hills Village, Englewood, Glendale, Greenwood Village, Littleton, and Sheridan.

Table 3-1 Population in Arapahoe County, 2020 – 2023

Jurisdiction	2019	2020	2021	2022	2023	% Change
Arapahoe County	644,560	649,980	651,621	654,453	655,709	1.73%
Aurora	379,312	386,261	389,675	393,319	394,701	4.1%
Bennett	2,358	2,603	2,964	3,299	3,472	47.24%
Bow Mar	956	969	986	996	1,003	4.9%
Centennial	110,911	108,418	106,957	105,860	106,873	-3.6%
Cherry Hills Village	6,647	6,680	6,426	6,405	6,366	-4.2%
Columbine Valley	1,241	1,498	1,701	1,928	2,084	20.7%
Deer Trail	519	462	599	904	1,180	127%
Englewood	34,259	34,840	33,500	33,634	33,774	-1.4%
Foxfield	610	635	648	673	739	21.1%
Glendale	5,177	5,186	4,605	4,580	4,546	-12.1%
Greenwood Village	15,738	15,100	15,548	15,537	15,485	-1.9%
Littleton	47,989	46,208	45,465	45,531	45,092	-6%
Sheridan	6,089	6,072	6,090	6,062	6,031	-.9%

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

Table 3-2 shows several key demographic and social characteristics of Arapahoe County and how those characteristics compare to the rest of the state and nation.

Table 3-2 Select Demographic and Social Characteristics Compared to the State and Nation

Demographic & Social Characteristics (as of 2023)	County	Colorado	U.S.
Median Age	37.4	37.9	39.2
Housing Occupancy Rate	96%	92.04%	90.4%
% of Housing Units with no Vehicles Available	5.8%	5.4%	8.4%
Median Home Value	$567,300	$550,300	$340,200
Unemployment	3.1%	5%	2.7%

Demographic & Social Characteristics (as of 2023)	County	Colorado	U.S.
Mean Travel Time to Work (minutes)	27.3	25.5	26.8
Median Household Income	$132,076	$563,000	$112,834
Per Capita Income	$50,532	$51,768	$43,414
% of Individuals Below Poverty Level	10.7%	9.3%	12.5%
% Without Health Insurance	9.5%	6.7%	7.9%
Average Household Size	2.49	2.37	2.49
% of Population Over 25 with high school diploma	92.1%	93.31%	89.8%
% of Population Over 25 with bachelor's degree or higher	49.9%	46.3%	36.2%
% with Disability	11.4%	11.7%	13.6%
% Speak a language other than English at home	24.6%	16.0%	22.5%

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

The following tables compare demographic and housing characteristics for each jurisdiction in Arapahoe County. As above, the city and town populations include their entire jurisdictions, not just the portion within Arapahoe County. The County numbers include only those portions of the municipalities that fall within the boundaries of Arapahoe County.

Table 3-3 Demographic Characteristics in Arapahoe County by Jurisdiction

	County	Aurora	Bennett	Bow Mar	Centennial	Cherry Hills Village	Columbine Valley	Deer Trail	Englewood	Foxfield	Glendale	Greenwood Village	Littleton	Sheridan
Total Population	**656,061**	**394,701**	**3,472**	**1,003**	**108,418**	**6,366**	**2,084**	**1,180**	**33,774**	**739**	**4,546**	**15,485**	**45,092**	**6031**
Gender/Age														
Male	49.4%	50.2%	51.2%	48.7%	51.1%	51.4%	51.3%	49.5%	49.8%	49.8%	49.2%	50.9%	49.3%	47.8%
Female	50.6%	49.8%	48.8%	51.3%	48.9%	48.6%	48.7%	50.5%	50.2%	50.2%	50.8%	49.1%	50.7%	52.2%
Median Age (value)	37.4	35.3	34	49.1	40.5	47.9	52.2	30.8	37	54.6	30.7	46.2	40.2	35.1
Under 5 years	5.7%	6.3%	5.5%	3.3%	6%	2.8%	5.5%	18.1%	5.5%	1.5%	1.6%	2.1%	4.5%	4.9%
65 years and over	14.9%	13.1%	8.8%	23.7%	19%	23%	29.6%	10.5%	14.3%	31.7%	2.4%	20.5%	19.3%	14.4%
% of Population with Disability	11.4%	12.3%	11.7%	6.1%	8.6%	5.6%	4.7%	9.8%	13.3%	19.1%	13.4%	8.6%	11.5%	10.9%
Race/Ethnicity														
White	58.7%	44.4%	73.2%	90%	74.1%	87.7%	92.3%	78%	75%	72.1%	57.2%	80.5%	83.1%	47.7%
American Indian/ Alaska Native	1.3%	1.2%	1.2%	.1%	.5%	0.1%	0%	.9%	1.6%	0.1%	1.3%	0.6%	.8%	4.7%
Asian	6%	6.5%	2.2%	.9%	6%	1.6%	1.4%	0.5%	1%	16.4%	1%	11.4%	2.9%	3.1%
Black or African American	10.6%	14.9%	2.6%	0%	2.6%	1.3%	0.8%	0%	2.4%	3.5%	15.7%	.5%	1.6%	4%
Hawaiian or Pacific Islander	0%	.5%	0%	0%	0%	0%	0%	0%	0.1%	0%	0%	0%	.1%	0%
Other Race	17.2%	15.2%	20%	4.1%	2.1%	0.5%	2%	7.9%	5.5%	2.2%	7.3%	1.2%	3.7%	20.7%
More Than One Race	3.3%	17.2%	2%	1.7%	4.9%	2%	2.8%	12.7%	11.4%	5.7%	17.4%	5.8%	7.8%	19.8%
Hispanic or Latinx (any race)	19.1%	32.8%	23.8%	10%	13.4%	6.9%	3.8%	26%	19.3%	8%	23.9%	7.1%	12.6%	43.3%
Education														
High school graduate or higher (% of Total >25 years old Population)	92%	86%	93.3%	98.1%	96.9%	99.7%	99.8%	85.6%	93.3%	90.6%	85.3%	98.8%	96.2%	91.6%

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

Table 3-4 Comparison of Housing Tenure in Arapahoe County

	County	Aurora	Bennett	Bow Mar	Centennial	Cherry Hills Village	Columbine Valley	Deer Trail	Englewood	Foxfield	Glendale	Greenwood Village	Littleton	Sheridan
Total Housing Units	272,175	155,356	1,114	337	42,731	2,328	808	420	17,283	292	45,282	6,869	20,938	2,850
# Occupied Housing Units	261,161	149,344	1,108	330	41,393	2,227	786	403	16,308	276	42,813	6,519	20,043	2,733
% Owner-Occupied	65%	65%	88%	97%	78%	98%	99%	86%	48%	76%	60%	64%	61%	47%
% Renter-Occupied	35%	35%	12%	3%	22%	2%	1%	14%	12%	24%	40%	36%	39%	53%

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

Table 3-5 Types and Total Amounts of Housing Units in Arapahoe County

Units In Structure	County	Aurora	Bennett	Bow Mar	Centennial	Cherry Hills Village	Columbine Valley	Deer Trail	Englewood	Foxfield	Glendale	Greenwood Village	Littleton	Sheridan
1, detached	146,124	77,859	1,507,543	330	30,122	2,188	7,619	341	8,418	12,695	24,904	3,436	10,416	138,444
1, attached	29,163	17,263	190,953	0	3,452	39	993	22	1,016	453	2,442	640	2,122	3,1611
2, apartments	2,018	1,389	31,329	0	55	0	0	0	342	350	1,292	23	259	5,764
3 or 4 apartments	7,514	6,838	79,606	0	675	0	232	3	580	337	2,274	238	408	10,009
5 to 9 apartments	11,732	9,313	107,854	0	608	0	232	9	366	629	2,514	450	1,079	17,971
10 or more apartments	63,327	35,117	430,980	0	6,397	0	448	9	5,450	858	6,065	1,729	5,689	138,489
Mobile home or other type of housing	1,283	1,565	79,996	0	84	0	35	19	136	2373	3,322	3	327	708

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

3.3.1 Housing Tenure: Percentage of Owner- vs. Renter- Occupied Housing Units

Homeownership as a community resilience indicator is a measure of a community's economic strength. A high number of homeowners can reflect an individual's connection to a community, place attachment, and ownership of their community. Conversely, low levels of homeownership can be an indication of a fluctuating local economy and may indicate a population with less than long-term commitment to the local community, which according to FEMA could hamper implementation of both individual and community mitigation actions before a disaster as well as during recovery periods.

The County has an average homeownership of 65%, just below the national average of is 65.2%. Seven jurisdictions have a higher percentage of homeownership compared to both the County's average and the national average; three of those jurisdictions have over 90% of occupied units being owner occupied. Conversely, five jurisdictions have a lower than average percentage of homeownership. One jurisdiction, Sheridan (53%) has a higher percentage of renter-occupied homes compared to owner-occupied.

3.3.2 Housing Type

As shown in Table 3-5, the dominant housing type in Arapahoe County is 1-unit detached, otherwise known as single-family houses. A majority of jurisdictions have more than 50% of the housing units as single family housing, with the exception of Sheridan (40%) which has a higher percentage of multi-unit homes compared to the County average. Glendale and Sheridan also have a higher percentage of housing with 10 or more units than the other jurisdictions, which would likely correspond to the high percentage of renter-occupied homes.

The County has an average of 3% of mobile homes as total housings; seven jurisdictions have a greater percentage of mobile homes compared to the county average. Foxfield (13%) and Glendale (8%) have the highest percentage of mobile homes as total housing stock in the County. Mobile homes are considered to be a vulnerable housing type due to generally lower quality of construction and the lack of basements. Higher number of mobile homes are related to lower levels of resilience in a community due to the home's susceptibility to damage from natural hazards.

Figure 3-6 and Figure 3-7 show population densities across Arapahoe County. Figure 3-9 and Figure 3-10 show population growth in the county from 2019 to 2025.

Figure 3-6 Map of Population Density in Western Arapahoe County

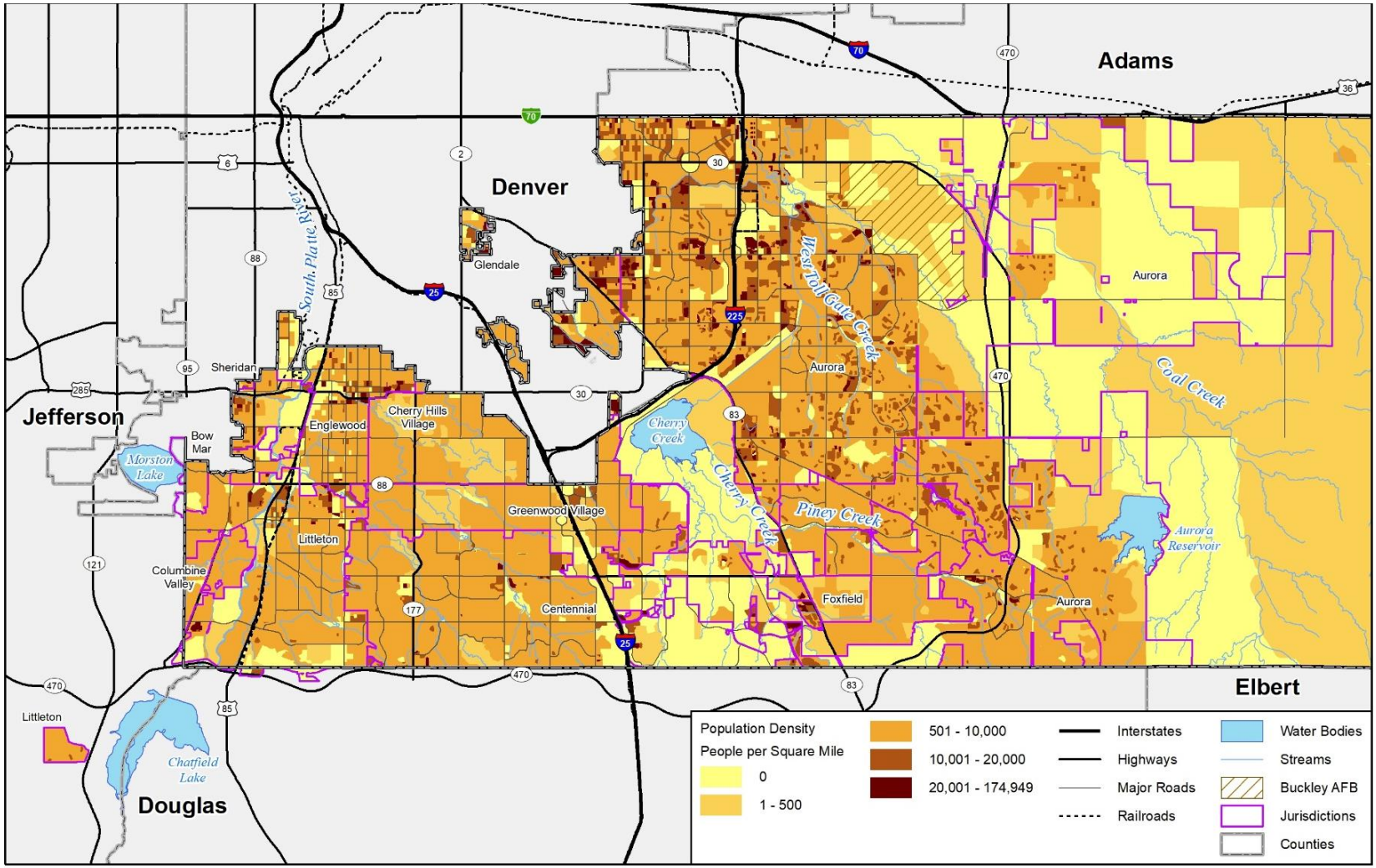
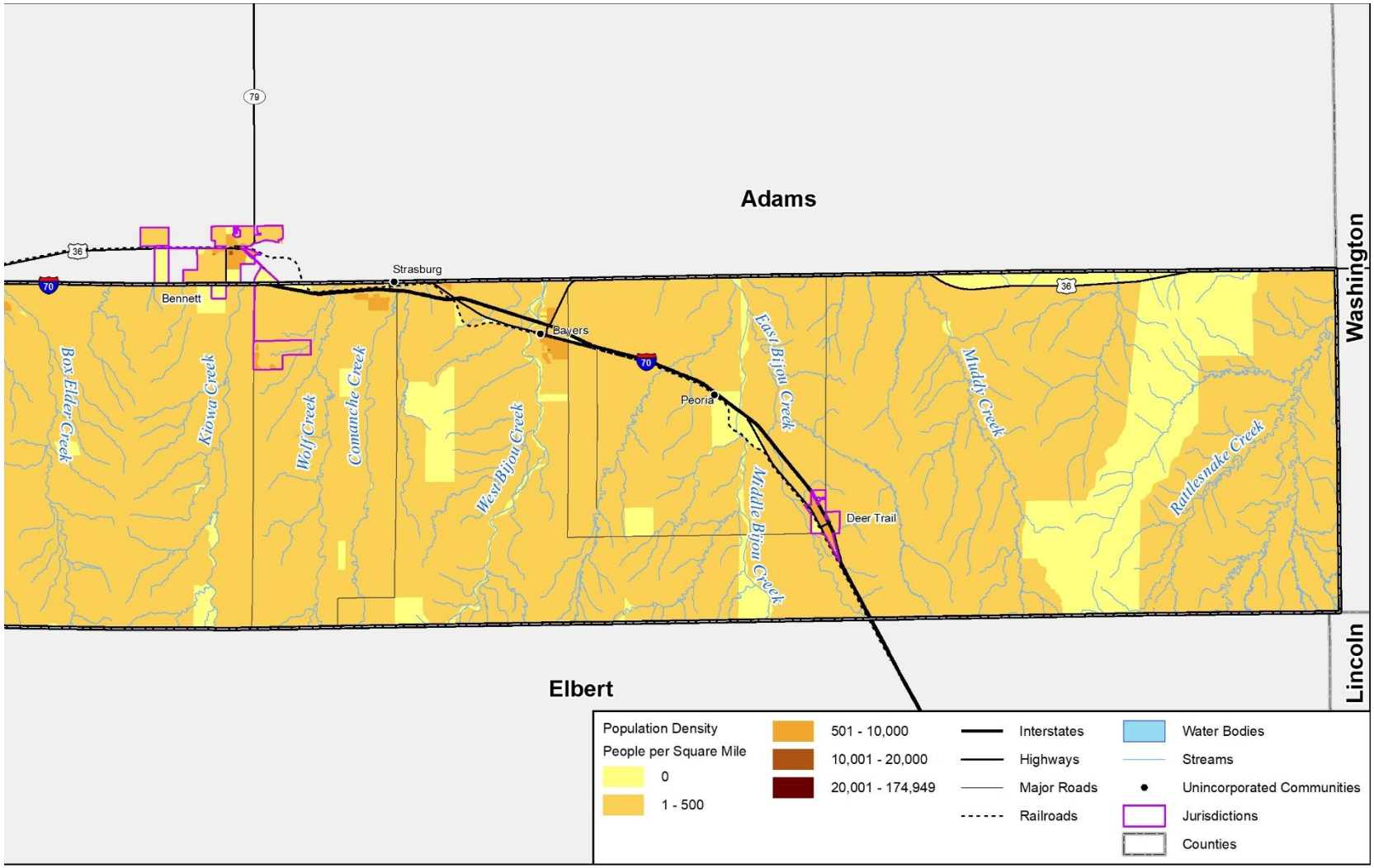


Figure 3-7 Map of Population Density in Eastern Arapahoe



3.3.3 Age – Percentage of Population Age 65 Years and Older

Elderly individuals are often more vulnerable to the impacts of a disaster due to generally being less mobile and having more difficulty preparing for disasters and adapting to extreme circumstances. Individuals over 65 years older often require assistance from other individuals that may not be available during a disaster event. Seniors are more likely to have some form of disability (see below), and many live in some form of group housing such as nursing homes or similar facilities. The national average of individuals age 65 years and older is 17.7% of the population. Arapahoe County has an average of 14.9% of individuals 65 years and older. There are 7 jurisdictions with a higher percentage of elderly individuals compared to both the county's average and the national average. The Towns of Foxfield and Columbine Valley have the highest number of individuals 65 years and older. Glendale and Aurora are the only jurisdictions with an average lower than the County's or national average.

3.3.4 Disability – Percent of the Population with Disabilities

Individuals with disabilities are also often more vulnerable to physical, social, and economic challenges that comes from a disaster event. Individuals with access and functional needs may need more time and assistance to evacuate an area and may require additional support and resources when recovering from a disaster event. Public information and warning strategies need to include methods to reach people with hearing or vision limitations. U.S. Census Bureau data lists 11.4% of Arapahoe County residents as having some form of disability, below the national average of 13.6%. (Note that other sources such as the Centers for Disease Control and Prevention estimate that number to be as high as 25%.) Four of the incorporated jurisdictions have a higher percentage of individuals with disabilities compared to the county's average, and none have a higher percentage than the national average. The following table shows the municipalities with a higher percentage of individuals with disabilities than the County's average.

Table 3-6 Jurisdictions with High Percentage of Individuals 65 years and Older

Jurisdiction	Percent
County	14.9
Foxfield	31.7
Columbine Valley	29.6
Bow Mar	23.7
Cherry Hills Village	23
Littleton	19.3
Greenwood Village	20.5
Deer Trail	10.5
Sheridan	14.4
Bennett	8.8
Centennial	19

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

Table 3-7 Jurisdictions with High Percentage of Individuals with Disabilities

Jurisdiction	Percent
County	11.4
Deer Trail	9.8
Sheridan	11.7
Englewood	13.3
Bennett	11
Littleton	11.5
Aurora	12.3

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

3.3.5 Limited English Language Proficiency

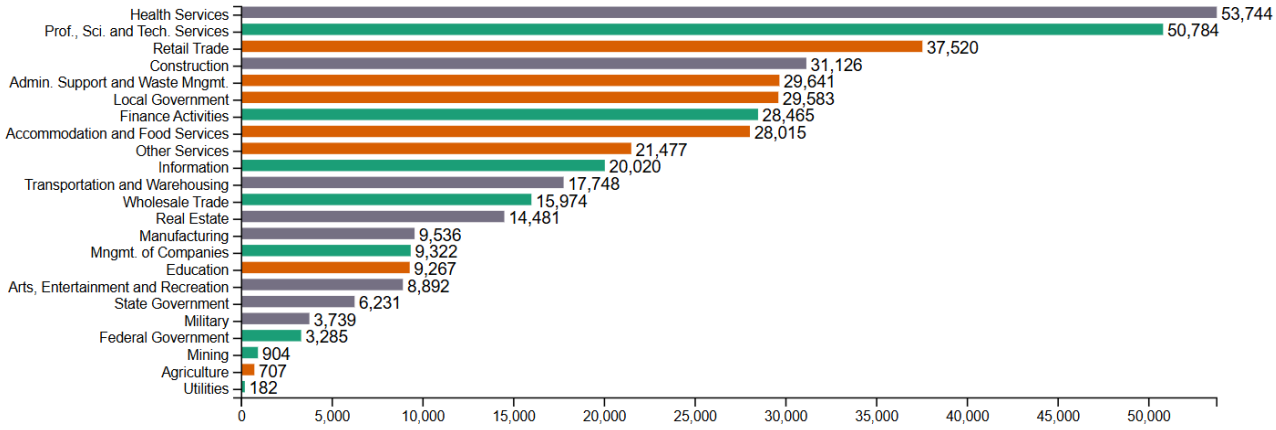
Understanding a community's proficiency in English can improve the ability to communicate to individuals before, during and after an emergency. This also allows individuals to better access community resources and for the community to have translators or information already translated if necessary. Arapahoe County has a higher percentage than both the State of Colorado and the country for percentage of households who speak a language other than English at home. 24.6% of households in Arapahoe County speak a language other than English, 16% of households in Colorado, and 22.5% in the United States. Throughout the County 14% speak Spanish, 3.8% speak other Indo-European languages, 3.2% speak Asian and pacific islander languages, and 3.5% speak other languages.

3.4 Economy

According to data from the U.S. Bureau of Economic Analysis, Arapahoe County's Gross Domestic Product (GDP) in 2023 was $44,037,874. This constitutes 13% of the State's economy and ranks Arapahoe 2nd among Colorado Counties in terms of GDP. The county's GDP has grown by an average of 3% annually since 2015.

The following figure shows the various industries in Arapahoe County and the share of jobs for each sector type. Health care and social assistance has the greatest share of jobs and has seen the greatest growth since 2005.

Figure 3-8 2023 Share of Jobs in Arapahoe County by Industry



Source: Colorado State Demography Office

The following table shows and compares various economic characteristics for each jurisdiction.

Table 3-8 Select Economic Characteristics in Arapahoe County by Jurisdiction

	County	Aurora	Bennett	Bow Mar	Centennial	Cherry Hills Village	Columbine Valley	Deer Trail	Englewood	Foxfield	Glendale	Greenwood Village	Littleton	Sheridan
% of Families below poverty level	7.70%	10.60%	5.90%	3.20%	2.30%	1.40%	0.00%	15.90%	4.80%	5.90%	8.40%	3.30%	1.80%	11.90%
% of Individuals below poverty level	10.70%	13.80%	9.30%	3.30%	3.20%	1.40%	0.10%	15.20%	8.10%	9.30%	15.50%	4.90%	6.30%	13.50%
Median household income	$98,239	$89,300	$92,911	$233,667	$121,531	$250,001	$250,000	$76,250	$82,016	$92,911	$63,526	$145,781	$96,611	$58,571
Per capita income	$50,532	$41,270	$51,768	$115,921	$58,902	$176,847	$145,749	$33,785	$53,403	$51,768	$32,138	$110,266	$57,806	$29,763
% of Population >16 years old in the Labor Force	72.20%	73.40%	69.00%	52.70%	68.70%	54.10%	54.30%	68.40%	74.90%	69.00%	65.30%	63.40%	70.80%	64.80%
% of Population Employed	72%	69%	72%	51%	66%	52%	54%	68%	72%	65%	61%	61%	68%	56%

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

3.5 Growth and Development Trends

3.5.1 Historical Growth and Development

Arapahoe County has grown significantly in the past decade and is one of the fastest growing counties in the Denver Metro Area, due largely to the availability of undeveloped land. The following Table depicts the number of new residential building permits issued annually in Arapahoe County from 2000 to 2023.

Table 3-9 New Residential Building Permits Issued in Arapahoe County

Year	Permits/Buildings	Units
2024	2415	3927
2023	2362	5464
2022	1811	4329
2021	2954	5337
2020	2957	4106
2019	2386	3497
2018	2230	3561
2017	2370	2757
2016	2067	4667
2015	1715	2830
2014	1293	1896
2013	1267	3079
2012	967	1,715
2011	615	805
2010	830	1,279
2009	574	1,172
2008	801	1,764
2007	1,776	3,881
2006	2,791	3,526
2005	3,212	3,986
2004	3,156	3,847
2003	2,431	3,311
2002	3,409	4,805
2001	3,701	7,655
2000	4,442	8,140

Source: U.S. Census Bureau

Figure 3-9 Population Growth in Western Arapahoe County 2010-2020

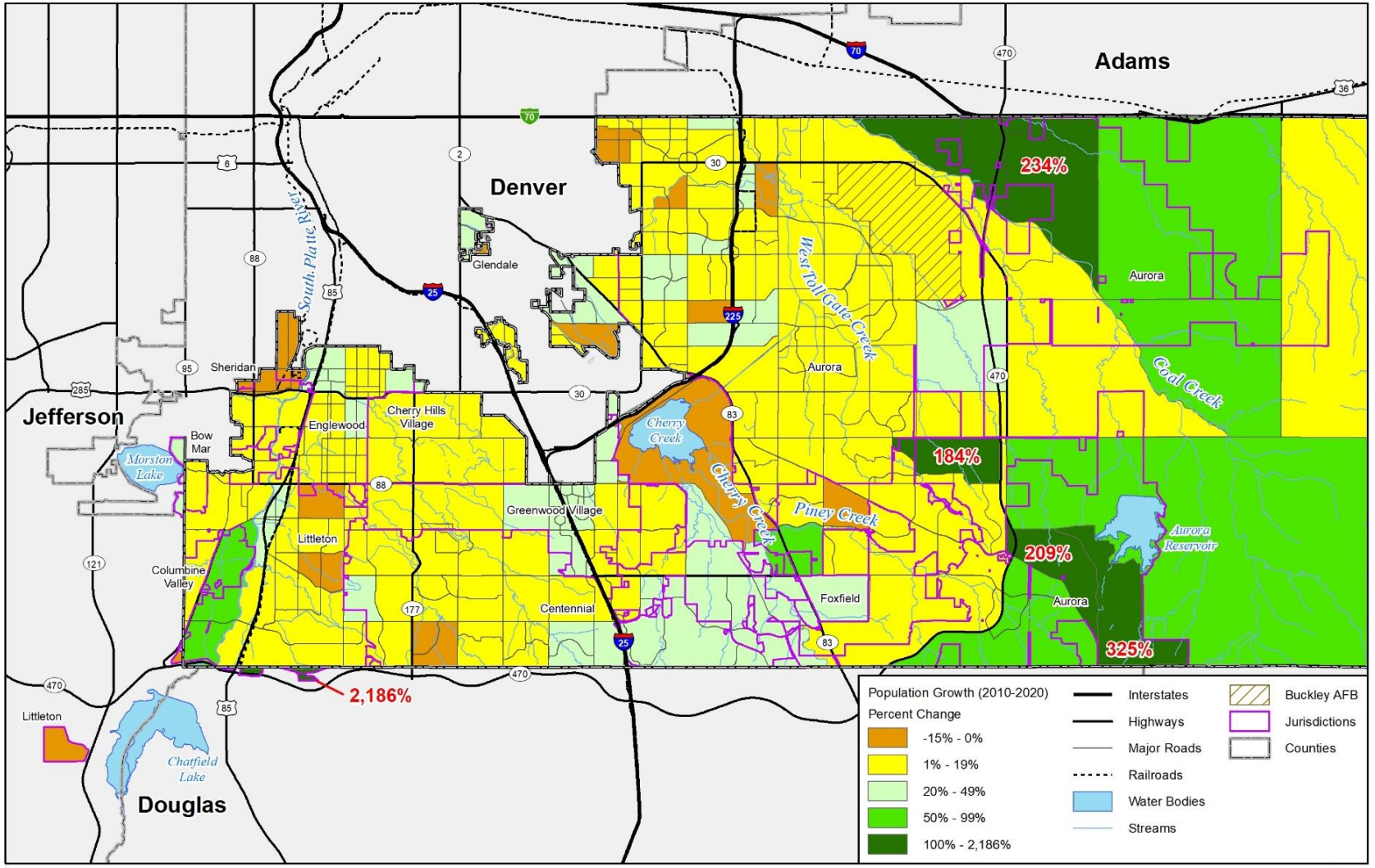
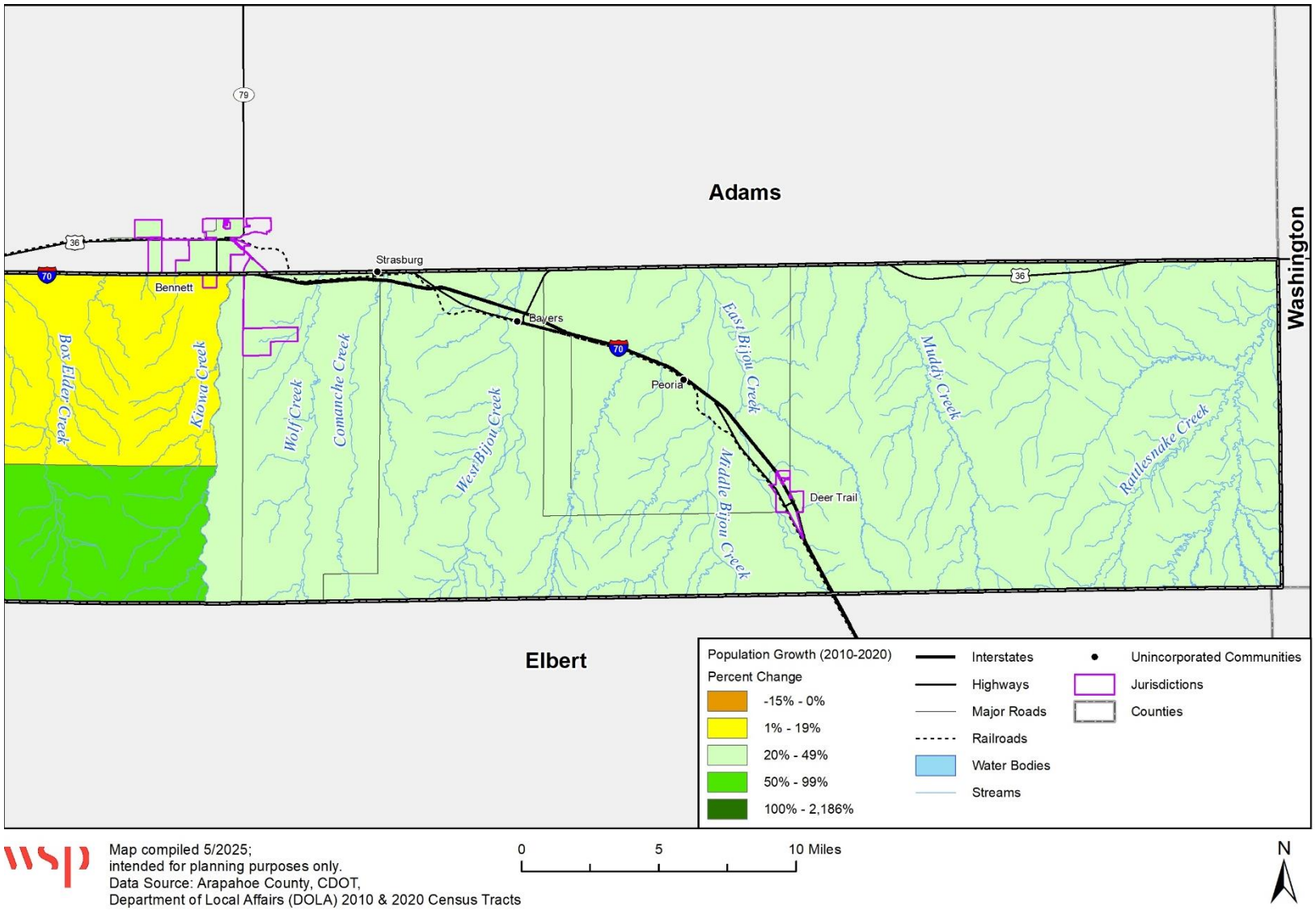


Figure 3-10 Population Growth in Eastern Arapahoe County, 2010-2020

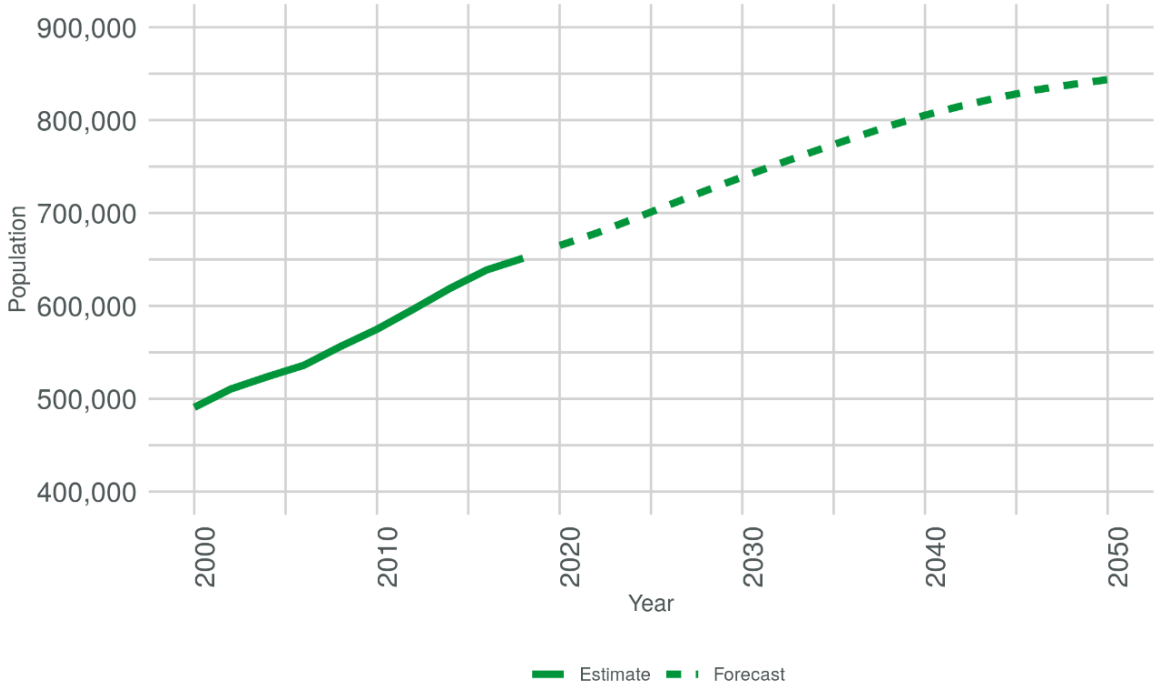


3.5.2 Future Growth and Development

A key strategy for reducing future losses in a community is to avoid development in known hazard areas and to enforce the development of safe structures in other areas. The purpose of this strategy is to keep people, businesses, and buildings out of harm's way before a hazard event occurs.

According to the Colorado State Demography Office, between 2020 and 2030 Arapahoe County's population is projected to grow at an average of 1.1% a year, but the overall growth rate is expected to decrease between 2020 and 2040. The forecasted growth rate between 2030 and 2040 is 0.9%. According to the Demography Office, this is due partly to the aging population and changes in the proportion of the population in childbearing years. The County's population is projected to be 805,302 by 2040. Figure 3-11 shows the population forecast for the next 30 years.

Figure 3-11 Arapahoe County Population Forecast, 2000 to 2050



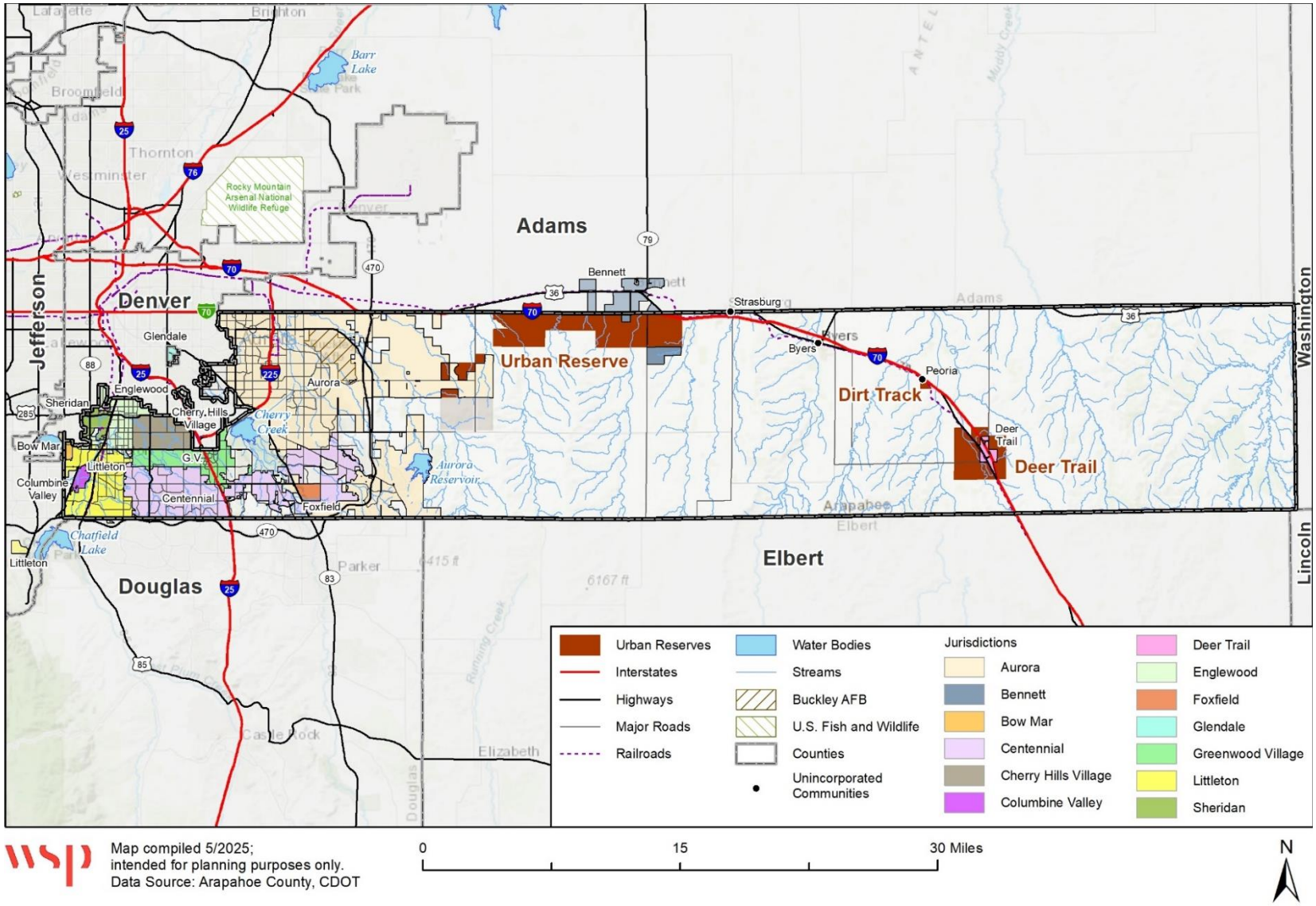
Source: Colorado State Demography Office

Planning Reserve Areas

Planning Reserve Areas are areas designated for a greater mix of uses and higher densities than what is currently being developed across the county. Moreover, the vision of the Planning Reserve Areas is that ample employment opportunities will be available near the places where people live.

The 2018 Comprehensive Plan re-named these areas to "Urban Reserves" with the intent to reserve this land for future development at an urban density. The I-70 corridor, located in the eastern portion of the county, is an important area of emerging residential (and commercial) growth. It has been designated as a priority area for future development of mixed-use, high-density residential properties. As of 2025, the Urban Reserves are found along I-70 near the towns of Bennett and Deer Trail has shown in Figure 3-12.

Figure 3-12 Arapahoe County Planning Reserve Areas



3.6 Capability Assessment

The capability and resource assessment examines the ability of Arapahoe County and its participating jurisdictions to implement and manage the comprehensive mitigation strategy laid out in this Plan. The strengths, weaknesses, and resources of the county, its partner agencies, and local jurisdictions are identified here as a means for evaluating and maintaining effective and appropriate management of the County's hazard mitigation program.

The information included in the capability assessment was gathered primarily from Planning Team members and other representatives of the participating jurisdictions and agencies. The 2025 update process afforded the participating jurisdictions an opportunity to review their capabilities and how those capabilities have changed since the previous plan. Additionally, in summarizing their current capabilities and identifying gaps, plan participants also considered their ability to expand or improve upon existing policies and programs as potential new mitigation strategies. Chapter 5.0 Mitigation Strategy includes mitigation actions aimed at improving community capability to reduce hazard risk and vulnerability.

Together, the capabilities outlined in this plan highlight both strengths and areas of improvement that the county and its local jurisdictions should consider as they work to mitigate hazard impacts, reduce risk to life and property, and build a disaster resilient community.

3.6.1 Planning and Regulatory Mitigation Capabilities

Table 3-10 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Arapahoe County. For each of the profiled hazards, several ordinances, regulations, plans, and programs were identified in various communities within the County. These are listed here to serve as a reference for related planning efforts.

Table 3-10 Planning and Regulatory Capabilities

Planning and Regulatory Capabilities	Arapahoe County	Bow Mar	Centennial	Cherry Hills Village	Columbine Valley	Deer Trail	Englewood	Foxfield	Glendale	Greenwood Village	Littleton	Sheridan
Building Codes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Building Codes Year	2015	Var.	2017	2021	2013	2012	2021	2015	2018	2012[1]	2012[1]	2015
BCEGS Rating	No	No	Yes	No	Yes	No	4/4	No	No[2]	No	5/5	4/4
Capital Improvements Program	Yes	No	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes
Community Wildfire Protection Plan (CWPP)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Comprehensive or General Plan	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Planning and Regulatory Capabilities	Arapahoe County	Bow Mar	Centennial	Cherry Hills Village	Columbine Valley	Deer Trail	Englewood	Foxfield	Glendale	Greenwood Village	Littleton	Sheridan
Comprehensive or General Plan Year	2025	2024	2023	2022	2020	2000	2017	2008	2018	2019	2019	2015
Economic Development Plan	No	No	Yes	No	No	Yes	Yes	No	Yes	Yes	Yes	Yes
Elevation Certificates	No	No	No	No	No	No	No	No	No	No	Yes	No
Emergency Operations Plan	Yes	No	Yes	Yes	No	No	Yes	No	Yes	Yes	Yes	Yes
Erosion/Sediment Control Program	Yes	No	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes
Floodplain Management Plan or Ordinance	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes
Flood Insurance Study	Yes	No	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes
Growth Management Ordinance	No	No	No	No	No	No	No	No	No	No	No	No
Non-Flood Hazard Specific Ordinance or Plan	No	No	No	No	No	No	No	No	No	No	No	Yes
National Flood Insurance Program (NFIP)	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Site Plan Review Requirements	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Stormwater Program, Plan, or Ordinance	Yes	No	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes
Zoning Ordinance	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other			Yes[3]	Yes[4]								Yes[5]

Notes: 1 – Currently in process of adopting 2018 codes; 2 – Pending; 3 – City property maintenance code; 4 – APWA Accreditation; 5 – International Property Maintenance Code. 6- Lead Reduction Program, Enterprise Management Plan. Drought Response Plan, Watershed Management Plan, Climate Adaptation Plan

Denver Water Capabilities

Many of the regulatory capabilities listed above are not applicable to Denver Water. Denver Water does have a number of relevant plans in place, including:

- Emergency Operations Plan
- Drought Response Plan
- Watershed Management Plan
- Water Resource Planning
- Crisis Communications Plan
- Climate Adaptation Plan

- Integrated Resource Plan
- Emergency Action Plans (EAPs) on all high-hazard dams
- Emergency Response Plans (ERPs) for treatment plants and distribution system
- Continuity of Operations Plans
- Facility Security Plans

South Metro Fire Rescue

Many of the regulatory capabilities listed above are not applicable to South Metro Fire Rescue. South Metro Fire Rescue does have a number of relevant plans in place, including:

- Continuity of Operations Plans
- Comprehensive Emergency Management Plan
- Wildfire Pre-Plans
- Special Operations Plan
- Permit Review through Fire Marshals Office
- Capital Improvements Plan
- Community Risk assessment

Land Use Planning and Codes

Local land use plans and building codes are tremendous tools for evaluating local policies related to hazard mitigation and risk reduction. Additionally, comprehensive master plans, capital improvement plans, stormwater plans, and zoning ordinances all present opportunities for enhanced local capabilities. The Arapahoe County Comprehensive Plan was updated in 2018 with multiple amendments added in 2022, which included adopting the 2021 Multi-Hazard Mitigation Plan by reference and integrating mitigating hazards into the goals and policies for the countywide plan. Other amendments included adopting the 2040 Transportation Master Plan by reference, updating public noticing requirements as contained in Chapter VI of the Comprehensive Plan, and fixing mapping and appendix errors throughout the comprehensive plan.

Arapahoe County updated their Land Development Code in 2024, which governs zoning and subdivision regulations, land use, and development guidelines. Within these standards there are provisions which also serve to promote resilience and hazard mitigation, including identifying and mitigating geologic hazards in site design and land use, wildfire defensible space, and the county's Floodplain Management ordinance.

All jurisdictions within Arapahoe County have adopted building codes spanning from 2012-2021. Building codes are one tool that communities use to enhance public safety. For example, they can increase structural integrity, mitigate structure fires, and provide benefits in relation to natural hazard avoidance. Future buildings that conform to local building codes should be able to withstand snow loads from severe winter storms. Overall, building codes substantially reduce the potential for loss of life, helping to reduce damage to future structures by introducing strict requirements.

The table above shows that most participating jurisdictions have a comprehensive or general plan to guide growth and development, along with zoning ordinances. Most have also adopted recent building codes.

National Flood Insurance Program (NFIP) Participation

The National Flood Insurance Program (NFIP) and Community Rating System (CRS) are highly effective in reducing flood risk for participating communities. Arapahoe County and all participating jurisdictions have been mapped for flood hazards and participate fully in the NFIP, except for the Towns of Bow Mar and Foxfield, which have never been mapped. Details of local jurisdiction participation status from the NFIP's Community Information System can be found in the Flooding Section 4.8.8. See also Section 5.2 for the participating jurisdictions' commitment to continue participation in the NFIP.

3.6.2 Administrative and Technical Mitigation Capabilities

Mitigation is an interdisciplinary effort that requires collaboration across numerous departments and individuals. Existing administrative and technical resources in the participating jurisdictions are summarized in Table 3-11.

Table 3-11 Administrative and Technical Capabilities

Personnel Resources	Arapahoe County	Bow Mar	Centennial	Cherry Hills Village	Columbine Valley	Deer Trail	Englewood	Foxfield	Glendale	Greenwood Village	Littleton	Sheridan	South Metro
Emergency Manager	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Floodplain Administrator	Yes	No	Yes	Yes	Yes	N/A	Yes	No	Yes	Yes	Yes	Yes	N/A
Community Planning	Yes	No	Yes	Yes	Yes	N/A	Yes	Yes	Yes	Yes	Yes	No	Yes
Planner/Engineer (Land Development)	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No
Engineer/Professional (construction)	Yes	No	Yes	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Resiliency Planner	No	No	No	No	No	Yes	No	No	Yes	No	No	No	Yes
Transportation Planner	Yes	No	Yes	No	No	N/A	Yes	No	Yes	Yes	Yes	Yes	N/A
Full-Time Building Official	Yes	Yes	Yes	Yes	No	N/A	Yes	Yes	Yes	Yes	Yes	Yes	N/A
GIS Specialist and Capability	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Grant Manager, Writer, or Specialist	Yes	No	Yes	No	No	Yes	No	No	No	No	Yes	No	No
Warning Systems													
· Flood	Yes	Yes	Yes	Yes	No	N/A	Yes	Yes	Yes	Yes	Yes	No	No
· Wildfire	No	No	No	Yes	No	N/A	No	No	No	No	No	No	No
· Tornado	No	No	No	Yes	No	N/A	Yes	No	No	No	No	No	No
· Geological	No	No	No	Yes	No	N/A	No	No	No	No	No	No	No

Based on this assessment, the jurisdictions are generally well-staffed and equipped to assess and mitigate hazards, and to manage exposure through land management and building requirements.

Denver Water Capabilities

Denver Water administrative and technical staff includes:

- Emergency Management Staff
- Land Development Planner/Engineer
- Construction Engineer/Professional
- Resiliency Planner
- GIS Team
- Grant Manager, Writer, or Specialist
- General Warning System/Service

3.6.3 Financial Mitigation Capabilities

Most mitigation projects require funding. Table 3-12 details a variety of financial tools the jurisdictions have used to fund mitigation activities to date.

Table 3-12 Financial Capabilities That Have Been Used to Fund Mitigation Activities

Financial Capabilities Used to Fund Mitigation Activities	Arapahoe County	Bow Mar	Centennial	Cherry Hills Village	Columbine Valley	Deer Trail	Englewood	Foxfield	Glendale	Greenwood Village	Littleton	Sheridan	South Metro
Levy for Specific Purposes with Voter Approval	Yes	No	No	No	Yes	No	Yes	No	Yes	No	No	No	Yes: Mill Levy
Utilities Fees	No	No	Yes	No	No	No	Yes	No	Yes	No	Yes	Yes	No
System Development Fee	Yes	No	Yes	Yes	Yes	No	Yes	No	No	No	No	Yes	No
General Obligation Bonds to Incur Debt	No	No	No	No	Yes	No	Yes	No	Yes	No	No	Yes	No
Special Tax Bonds to Incur Debt	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No
Withheld Spending in Hazard-Prone Areas	No	No	No	No	No	No	No	No	No	No	No	No	No
Stormwater Service Fees	No	No	No	No	No	No	Yes	No	No	No	Yes	Yes	No
Capital Improvement Project Funding	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	No
Community Development Block Grants	Yes	No	No	No	No	No	Yes	No	No	No	Yes	Yes	No

Denver Water Capabilities

Denver Water has used fiscal resources to fund mitigation activities, to include:

- Utilities fees
- System Development Fees
- General Obligation Bonds to Incur Debt

3.6.4 Public Education and Outreach Mitigation Capabilities

Public Education and Outreach

Successful sustained mitigation depends upon robust collaboration between the public and private sector, different levels of government, municipal jurisdictions, departments, agencies, and community groups within Arapahoe County. The participating jurisdictions have several active public education programs to educate the public about hazards and actions they can take to mitigate against those hazards, as shown in Table 3-13.

Table 3-13 Education and Outreach Capabilities

Education & Outreach Resource	Arapahoe County	Bow Mar	Centennial	Cherry Hills Village	Columbine Valley	Deer Trail	Englewood	Foxfield	Glendale	Greenwood Village	Littleton	Sheridan	South Metro
Hazard Awareness/ Education Campaigns	Yes	NA	Yes	Yes	No	NA	Yes	Yes	No	No	Yes	No	Yes
Firewise	No	NA	Yes	No	No	NA	No	Yes	No	No	No	No	Yes
Storm Ready	Yes	NA	Yes	No	No	NA	Yes	No	No	No	No	No	No
Severe Weather Awareness Week	No	NA	No	No	No	NA	No	No	No	No	Yes	No	No
School Programs	Yes	NA	Noo	No	No	NA	Yes	No	No	No	No	No	Yes
Methods used to communicate hazard information to the public													
Local News	Yes	NA	Yes	Yes	Yes	NA	No	No	Yes	No	Yes	No	Yes
Social Media	Yes	NA	Yes	Yes	Yes	NA	Yes	No	Yes	No	Yes	No	Yes
Community Newsletters	Yes	NA	Yes	Yes	Yes	NA	Yes	Yes	No	No	Yes	No	Yes
Utility Bill Inserts	No	NA	No	N/A	No	NA	Yes	No	No	No	No	No	Yes
Community Events	Yes	NA	Yes	Yes	Yes	NA	Yes	Yes	No	No	Yes	No	Yes
Organizations that represent or work with underserved or vulnerable communities													
American Red Cross	Yes	NA	Yes	No	No	NA	No	No	No	No	Yes	No	Yes
Salvation Army	Yes	NA	Yes	No	No	NA	No	No	No	No	Yes	No	No
Veteran Groups	Yes	NA	No	No	No	NA	Yes	No	No	No	Yes	No	No
Senior Groups	Yes	NA	Yes	No	No	NA	Yes	No	No	No	Yes	No	No
Groups for People with Disabilities	Yes	NA	No	No	No	NA	yes	No	No	No	Yes	No	No
Environmental/ Conservation Groups	Yes	NA	No	No	No	NA	Yes	No	No	No	No	No	No
Business Groups, Academia, Other													
Chamber of Commerce	Yes	NA	Yes	N/A	No	NA	Yes	No	No	No	Yes	No	No
Community Organizations (Lions, Kiwanis, etc.)	Yes	NA	Yes	No	No	NA	Yes	No	No	No	Yes	No	No
Homeowner/Neighborhood Associations	Yes	NA	Yes	Yes	Yes	NA	Limited	No	No	No	Yes	No	No
Universities or Community Colleges	Yes	NA	No	No	No	NA	No	No	No	No	Yes	No	No
Agricultural Extension Office	Yes	NA	Yes	No	No	NA	No	No	No	No	No	No	No

Notes: 1 – Members of Colorado Stormwater Council (CSC); 2 – CSC and Splash; 3 – Created communications dept. in 2018 to implement public information and outreach efforts, adopting community engagement plan for the City; 4 – Stormwater Compliance; 5 – Ready Glendale program. NA = Information was not available

Additionally, South Metro Fire Rescue conducts public education to individuals, HOAs, businesses, organizations, and schools throughout their service area on topics ranging from emergency planning and preparation to home safety and wildfire mitigation.

In June 2024, South Metro Fire Rescue published "Preparing For Emergencies: Workbook And Reference Guide" as part of a wildfire educational program, designed to empower residents regarding the basics of wildfire, home hardiness, and preparedness.

Denver Water Capabilities

Denver Water has various outreach and partnerships including public education programs related to water conservation, drought response, water quality, and a very active youth education program focusing on a variety of water-related topics. Denver Water does not currently participate in the Storm Ready or Firewise programs.

Coordination Efforts include:

- Denver Water's outreach is conducted by a series of teams across the organization, including Customer Relations, Communications & Marketing, Government & Stakeholder Relations, Conservation, Treated Water Planning, Demand Planning and Water Resources. These groups provide a plethora of planning and outreach with local partners. Outreach methods -- for both the combined service area of 1.4 million people and for the communities where Denver Water's watersheds and facilities are located -- include media relations, social media, marketing, publications, internal communication, stakeholder relations, government relations, community outreach, and website communications.
- Denver Water's Emergency Management, Health, Safety & Security section partners with local OEMs, local law enforcement agencies to work closely on planning, response, recovery and mitigation efforts in order to build a resilient community that can respond to emergencies, create a culture of preparedness, and foster an understanding of Denver Water's operations and constraints.

Denver Water uses the following communication and coordination methods to conduct public outreach:

- TAP stories, videos, and infographics across all social media channels, which provide content and opportunities for local partners to adapt for use on their social media channels.
- Partnerships with County Emergency Management and offering content for their annual safety guide
- Presentations to community groups, the annual State of the River event, Emergency Manager's Town Halls, etc.
- Expert interview(s) on local PATV station.
- Proactive media pitches to local publications and websites.

Mile High Flood District (MHFD) and Southeast Metro Stormwater Authority (SEMSWA)

Two key partners in Arapahoe County's flood mitigation efforts are the Mile High Flood District (MHFD) and the Southeast Metro Stormwater Authority (SEMSWA).

The Mile High Flood District (MHFD) – formerly the Urban Drainage and Flood Control District – was established by the Colorado legislature in 1969 to assist local governments in the Denver metropolitan area with multi-jurisdictional drainage and flood control challenges. MHFD covers over 1,600 miles of major streams across an area of 1,608 square miles that includes the western half of Arapahoe County. MHFD programs include watershed services, stream services, operations and development, and flood warning and information services, and conducts public education and outreach related to new and revised flood hazard mapping.

The Southeast Metro Stormwater Authority (SEMSWA) provides stormwater and floodplain management services for drainage and flood control facilities within its service areas in the City of Centennial and unincorporated Arapahoe County. SEMSWA's activities include planning, funding, construction, acquisition, operation, and maintenance. They are responsible for land development review and stormwater and floodplain development permitting, and conducts public education and outreach related to new and revised flood hazard mapping. SEMSWA is also responsible for insuring compliance with National Pollutant Discharge Elimination System (NPDES) and other environmental regulations and strives to educate the public about stormwater quality. SEMSWA serves as Centennial's Floodplain Administrator and CRS Coordinator.

3.6.5 Opportunities for Enhancement

Based on the capability assessment, Arapahoe County has several existing mechanisms in place that already help to mitigate hazards, including numerous planning tools and many available funding mechanisms. There are also opportunities for the county and jurisdictions to expand or improve on their capability to further protect the community.

The jurisdictions have several financial tools that could potentially fund mitigation, but many of these tools require further development before they could be used to fund projects. The county may want to consider further investigating the ability to use Community Development Block Grant (CDBG) funds for mitigation projects so that projects can be proposed for any available funds. Additionally, it may be helpful to develop a backlog of projects that could be submitted for CIP funding to anticipate and budget for future mitigation actions.

In addition to funding, smaller jurisdictions often lack the staffing needed to implement mitigation activities. Table 3-11 above shows that several participating jurisdictions are missing key administrative or technical positions that would be helpful for planning and conducting mitigation activities. The County could consider creating mutual aid agreements to share technical staff among jurisdictions when needed, particularly in the aftermath of a disaster or when funding becomes available.

Community Rating System

The Community Rating System (CRS) is a voluntary program for NFIP participating communities focused on reducing flood damages to insurable property and encouraging a comprehensive approach to floodplain management. The CRS rewards communities that go above and beyond the minimum floodplain management requirements and develop extra measures to reduce flood risk by providing discounts to flood insurance premiums. Credit points are assigned for activities and actions in public information, mapping and regulation, flood damage reduction, and flood preparedness. Participating

communities receive a rating from 9 (lowest) to 1 (highest), with each step providing a 5% discount in premiums.

Table 3-14 shows the potential savings to NFIP policy holders in each incorporated community at each CRS class. Six communities participate in the CRS program: Aurora, Centennial, Cherry Hills Village, Englewood, Littleton, and the unincorporated County; their current class and associated savings are highlighted in the table. The table shows that Greenwood Village and Sheridan could potentially benefit from joining the CRS program. However these savings need to be balanced against the considerable administrative costs necessary to achieve those ratings. Refer to Section 4.7.8 for more information on CRS participation.

Table 3-14 Arapahoe County Potential CRS Savings

CRS Class	Discount	Arapahoe County	Centennial	Cherry Hills	Columbine Valley	Englewood	Glendale	Greenwood Village	Littleton	Sheridan
1	45%	$15,400	$19,716	$6,354	$0	$5,322	$1,292	$7,710	$11,763	$8,031
2	40%	$13,689	$17,526	$5,648	$0	$4,730	$1,148	$6,853	$10,456	$7,139
3	35%	$11,978	$15,335	$4,942	$0	$4,139	$1,005	$5,997	$9,149	$6,246
4	30%	$10,300	$13,144	$4,236	$0	$3,548	$861	$5,140	$7,842	$5,354
5	25%	$8,556	$10,954	$3,530	$0	$2,957	$718	$4,283	$6,535	$4,462
6	20%	$6,845	$8,763	$2,824	$0	$2,365	$574	$3,427	$5,228	$3,569
7	15%	$5,133	$6,572	$2,118	$0	$1,774	$431	$2,570	$3,921	$2,677
8	10%	$3,422	$4,381	$1,412	$0	$1,183	$287	$1,713	$2,614	$1,785
9	5%	$1,711	$2,191	$706	$0	$591	$144	$857	$1,307	$892

Source: FEMA Community Information System.

The County has identified a mitigation action (Table 5-3, Action A-13) to improve the County's CRS rating, which would improve the county's flood resilience while lowering flood insurance rates in the unincorporated areas. This Plan was specifically written to achieve floodplain management planning credit under CRS. This could also potentially result in improvements to the CRS ratings of participating jurisdictions.

Other opportunities include the continuation of incorporating updated risk information into comprehensive plan updates and ensuring risk information is taken into consideration in land use code updates and during the development review process. See Section 6.3 for additional information on ways mitigation can be incorporated into other mechanisms.

4.0 RISK ASSESSMENT

DMA Requirement §201.6(c)(2):
[The plan shall include] A risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards. The risk assessment shall include:
(i) A description of the type, location, and extent of all-natural hazards that can affect the jurisdiction. The Plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.
(ii) A description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. The Plan should describe vulnerability in terms of:
(A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.
(B) An estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate.
(C) Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.
(iii) For multi-jurisdictional plans, the risk assessment section must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

Table 4-1 overall hazard significance countywide, based on a combination of frequency, spatial extent, and potential magnitude/severity as defined below. The individual ratings are based on analysis of the hazards in the sections that follow, supplemented by the HMPC's knowledge and experience.

Table 4-1 Arapahoe County Hazard Significance

Hazard	Frequency	Spatial Extent	Severity	Overall Significance
Active Threat	Occasional	Limited	Limited	Low
Cyber Threat	Likely	Significant	Critical	Medium
Dam Incident	Unlikely	Significant	Critical	Medium
Drought	Likely	Extensive	Limited	Medium
Flooding	Likely	Significant	Limited	Medium
Hazmat Release	Likely	Significant	Critical	Medium
Pandemic	Occasional	Extensive	Critical	High
Severe Summer Weather	Highly Likely	Significant	Critical	High
Severe Wind/Tornado	Likely	Significant	Limited	Medium
Severe Winter Weather	Highly Likely	Extensive	Limited	High
Wildfire	Highly Likely	Extensive	Limited	Medium
Urban Conflagration	Occasional	Extensive	Catastrophic	High

Frequency of Occurrence: Highly Likely: Near 100% probability in next year. Likely: Between 10 and 100% probability in next year or at least one chance in ten years. Occasional: Between 1 and 10% probability in next year or at least one chance in next 100 years. Unlikely: Less than 1% probability in next 100 years. **Spatial Extent:** Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area	**Potential Severity:** Catastrophic: Multiple deaths, complete shutdown of facilities for 30 days or more, more than 50% of property is severely damaged Critical: Multiple severe injuries, complete shutdown of facilities for at least 2 weeks, more than 25% of property is severely damaged Limited: Some injuries, complete shutdown of critical facilities for more than one week, more than 10 percent of property is severely damaged Negligible: Minor injuries, minimal quality-of-life impact, shutdown of critical facilities and services for 24 hours or less, less than 10 percent of property is severely damaged. **Overall Significance** Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact

4.1 Hazard Identification and Prioritization

This section of the Arapahoe County Hazard Mitigation Plan describes the local Hazard Identification and Risk Assessment (HIRA) undertaken by the County and participating jurisdictions. The risk assessment process identifies and profiles relevant hazards and assesses the exposure of lives, property, and infrastructure to these hazards. The process allows for a better understanding of a jurisdiction's potential risk to hazards and provides a framework for developing and prioritizing mitigation actions to reduce risk from future hazardous events.

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

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

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

Figure 4-1 Risk Graphic

The term "threat" is sometimes used to refer to human-caused hazards. Arapahoe County has completed a countywide Threat and Hazard Identification and Risk Assessment (THIRA) in accordance with CPG201. However, despite the similarity in their names, the HIRA and THIRA are two very different documents following very different methodologies. As described in Section 6.3, this updated HIRA can serve to help inform Steps 1-2 of the THIRA process.

4.1.1 Disaster Declaration History

To help focus the list of identified hazards for the Plan, the HMPC examined past events that triggered federal and/or state disaster declarations. Federal and/or state declarations may be granted when the severity and magnitude of an event surpasses the ability of the local government to respond and recover. Disaster assistance is supplemental and sequential. When the local government's capacity has been surpassed, a state disaster declaration may be issued, allowing for the provision of state assistance. Should the disaster be so severe that both the local and state governments' capacities are exceeded, a federal emergency or disaster declaration may be issued allowing for the provision of federal assistance.

Since 1955, Colorado has received 97 federal declarations, including 26 presidential disaster declarations, 5 emergency declarations, and 75 fire management assistance awards. Arapahoe County has received 12 declarations, consisting of seven presidential disaster declarations and five emergency declarations. Of those declarations, five were for flooding, two were for heavy snowfall, two were for the COVID-19 pandemic, one was for a wildfire, one was for a tornado, and one was for assisting with evacuees from Hurricane Katrina. These disasters are summarized in Table 4-2. DR indicates a Major Disaster Declaration, while EM means an Emergency Declaration.

The federal government can issue a disaster declaration through FEMA, the U.S. Department of Agriculture (USDA), and/or the Small Business Administration (SBA). FEMA also issues emergency declarations, which are more limited in scope and without the long-term federal recovery programs of major disaster declarations. The quantity and types of damage are the determining factors. These declarations are also included in Table 4-2.

Table 4-2 Federal Disaster and Emergency Declarations in Arapahoe County

Declaration #	Declaration Date	Type	Event Details
DR-200-CO	6/19/1965	Tornado	Tornadoes, severe storms & flooding
DR-261-CO	5/19/1969	Flood	Severe storms & flooding
DR-385-CO	5/23/1973	Flood	Heavy rains, snowmelt and flooding
DR-1421-CO	6/19/2002	Fire	Wildfires
EM-3185-CO	4/9/2003	Snowstorm	Snow
EM-3224-CO	9/5/2005	Coastal Storm	Hurricane Katrina evacuation
EM-3270-CO	1/7/2007	Snowstorm	Snow
EM-3365-CO	9/12/2013	Flood	Severe storms, flooding, landslides, and mudslides
DR-4145-CO	9/14/2013	Flood	Severe storms, flooding, landslides, and mudslides
USDA-S4386	6/26/2018	Drought	Drought-Fast Track
USDA-S4468	11/1/2018	Drought	Drought-Fast Track
USDA-S4532	1/1/2019	Drought	Drought-Fast Track
EM-3436-CO	3/13/2020	Biological	COVID-19
DR-4498-CO	3/28/2020	Biological	COVID-19 Pandemic
USDA-S4755	6/16/2020	Drought	Drought-Fast Track
USDA-S4798	7/21/2020	Drought	Drought-Fast Track
USDA-S4770	8/18/2020	Drought	Drought-Fast Track
USDA-S4775	8/25/2020	Drought	Drought-Fast Track
USDA-08117	4/8/2022	Drought	Drought-Fast Track
DR-4731-CO	8/25/2023	Flood	Severe storms, flooding, and tornadoes

Source: FEMA, USDA Disaster Declarations

4.1.2 Changing Future Conditions

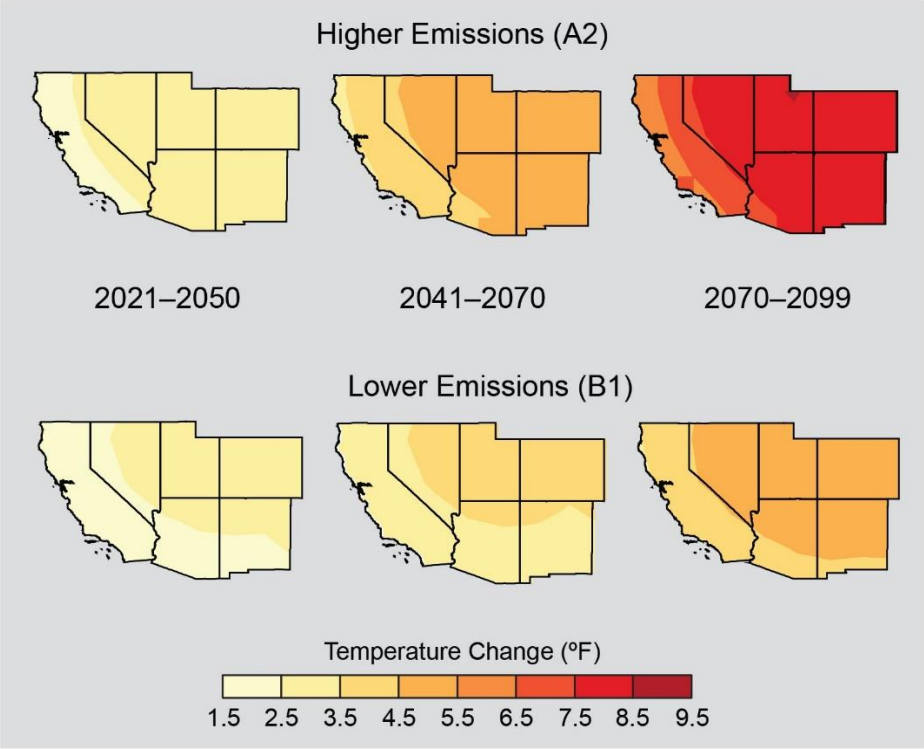
Climate includes patterns of temperature, precipitation, humidity, wind, and seasons. Climate plays a fundamental role in shaping natural ecosystems, and the human economies and cultures that depend on them. The term changing future conditions refers to changes over a long period of time. It is generally perceived that changes in future conditions will have a measurable impact on the occurrence and severity of natural hazards around the world. Impacts are likely to 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.

In 2023, the U.S. Global Change Research Program released the Fifth National Climate Assessment (NCA5), the authoritative and comprehensive report on climate change and its impacts in the United States. Not only did the report confirm that climate change continues to affect Americans in every region of the U.S., but the report also identifies increased heat, drought, insect outbreaks, wildfire, and flooding as key climate-related concerns for the southwest region of the U.S., which includes Colorado.

Recent warming in the southwest region is among the most rapid in the nation and is significantly greater than the global average; the period from 1950 to 2025 has been hotter than any comparable long period in at least 600 years. Summer temperatures across the state are expected to increase more than winter temperatures and projections suggest that typical summer months will be as warm as or warmer than the hottest 10% of summers that occurred between 1950 and 1999. Figure 4-2 shows the projected changes in average temperatures as compared to the period 1971-1999. The top row shows projections assuming the higher emission scenario, while the maps on the bottom row show projections if emissions were reduced substantially. Under the higher emissions scenario average temperatures in Colorado will warm by 2.5°F to 5.5°F by 2041-2070 and by 5.5°F to 9.5°F by 2070-2099 (NCA4 2018).

Figure 4-2 Projected Temperature Increases in Southwest Region



Source: NCA4, Adapted from Kunkel et al. 2013

Increases in temperatures in the southwest region are also projected to increase the probability of natural events such as wildfires, drought, and summer precipitation. These temperature changes have great potential to directly affect public health through increased risk of heat stress. They may also affect infrastructure through increased risk of disruptions of electric power generation. Water supplies are vulnerable to impacts of higher temperatures. While water supplies generally change year-to-year due to variabilities in water use and precipitation, higher temperatures are projected to increase evapotranspiration, reducing the effectiveness of precipitation in replenishing surface water and soil moisture. This will have direct impacts on crop yields and productivity of key regional crops and livestock, representing a major risk for the agricultural industry and food security nationwide. As of 2025, The Southwest is the only region in which the total area of unusually dry soil moisture is increasing.

The impacts of changing future conditions already pose a threat to people and property in the southwest region of the United States, including Arapahoe County. Together, these impacts represent a slow-onset disaster that is likely to manifest and change over time. Current projections predict even more rapid changes in the near future, which are likely to affect many of the natural hazards that Arapahoe County has historically dealt with. This is particularly true for drought, flooding, wildfire, and extreme temperature hazards. The nature of erosion/land subsidence and public health hazards are also likely to evolve in intensity and character due to a changing regional climate. For these reasons, the hazard identification and risk assessment for the 2025 Arapahoe County Hazard Mitigation Plan update takes changing future conditions into consideration when evaluating the frequency, intensity, and distribution of hazards within the County. Because many impacts of climate-related hazards cross county boundaries, some of the discussion looks at impacts on a regional scale. As climate science evolves, future mitigation plan updates may consider including future conditions projections in the risk rankings and vulnerability assessments of the hazards included in the Plan.

4.1.3 Hazard Identification and Ranking

Historical data, catastrophic potential, relevance to the jurisdiction, and the probability and potential magnitude of future occurrences were all used to identify and prioritize the list of hazards most relevant to Arapahoe County. Hazard data was obtained from various federal, state, and local sources such as FEMA, the Colorado Geological Survey (CGS), the Colorado Division of Water Resources Dam Safety Branch, the National Oceanic and Atmospheric Administration's (NOAA) National Centers for Environmental Information (NCEI), the United States Geological Survey (USGS), and others. Local and national news reports were also used to research historic events. Together, these sources were examined to assess the significance of these hazards to the County. The hazards selected for inclusion in this plan include those that have occurred historically or have the potential to cause significant human and/or monetary losses in the future.

Arapahoe County and its communities are vulnerable to a wide range of natural and human-caused hazards that threaten life and property. The hazards identified by the HMPC for inclusion in the Plan are those determined to be of potential threat to the County and its municipalities and are consistent with the hazards identified by the State of Colorado and the Federal Emergency Management Agency for this part of the State and this region of the country. Table 4-3 summarizes changes in the hazards profiled in the 2025 update compared to the 2020 HMP. The only major change for the 2025 update is the addition of urban conflagration as a hazard.

Table 4-3 Updates and Changes to Arapahoe County Hazards

Hazard	Status and Update for 2020
Active Threat	Included in 2020 HMP, updated for 2025.
Cyber Threat	Included in 2020 HMP, updated for 2025.
Dam Incident	Included in 2020 HMP, updated for 2025.
Drought	Included in 2020 HMP, updated for 2025.
Flooding	Included in 2020 HMP, updated for 2025.

Hazard	Status and Update for 2020
Hazardous Materials Release	Included in 2020 HMP, updated for 2025.
Public Health Hazards	Title changed from Public Health Hazards to Pandemic in 2020, section updated in 2025.
Severe Summer Weather	Broken out into Severe Summer Weather and Severe Winter Weather for 2020. Updated in 2025.
Severe Wind/Tornado	Included in 2020 HMP, updated for 2025.
Severe Winter Weather	Included in 2020 HMP, updated for 2025.
Wildfire	Included in 2020 HMP, updated for 2025.
Urban Conflagration	Added in 2025.

The HMPC also reviewed the following hazards from the 2023 Colorado State Hazard Mitigation Plan but determined they do not present sufficient risk in Arapahoe County to justify inclusion.

- Animal Disease Outbreak
- Avalanche
- Earthquake
- Erosion and Deposition
- Expansive Soils*
- Ground Subsidence*
- Landslide/Debris Flows/Rockfall
- Pest Infestation
- Wildlife Vehicle Collision

* Preliminary maps for expansive soils and land subsidence were developed to better understand those hazards. While the HMPC elected not to profile those hazards any further, the maps are included in Appendix H for completeness.

4.1.4 Hazard Rating Methodology

The HMPC evaluated the significance of hazards using the following criteria, which are the same criteria used in 2020.

Frequency of Occurrence:

Highly Likely: Near 100% probability in next year.

Likely: Between 10 and 100% probability in next year or at least one chance in ten years.

Occasional: Between 1 and 10% probability in next year or at least one chance in next 100 years.

Unlikely: Less than 1% probability in next 100 years.

Location:

Limited: Less than 10% of planning area

Significant: 10-50% of planning area

Extensive: 50-100% of planning area

Magnitude/ Severity:

Catastrophic: Multiple deaths, complete shutdown of facilities for 30 days or more, more than 50% of property is severely damaged

Critical: Multiple severe injuries, complete shutdown of facilities for at least 2 weeks, more than 25% of property is severely damaged

Limited: Some injuries, complete shutdown of critical facilities for more than one week, more than 10 percent of property is severely damaged

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

Significance

Low: minimal potential impact

Medium: moderate potential impact

High: widespread potential impact

4.1.5 Overall Hazard Significance Summary

As noted previously, the risk from many hazards varies across the County and between municipalities. Table 4-4 summarizes the overall risk and significance of each hazard by jurisdiction; further details can be found in the Jurisdictional Differences section of the hazard profiles.

Table 4-4 Hazard Significance by Jurisdiction

	Active Threat	Cyber Threat	Dam Incident	Drought	Flooding	Hazmat Release	Pandemic	Severe Summer Weather	Severe Wind/ Tornado	Severe Winter Weather	Wildfire	Urban Conflagration
Bennett	Low	Med	Low	Med	Med	Med	High	High	High	High	Med	Med
Bow Mar	Low	Med	High	Low	Med	Low	High	High	Med	High	Med	Med
Centennial	Low	Med	Low	Med	High	Med	High	High	Med	High	Med	Med
Cherry Hills Village	Low	Med	Low	Med	Med	Med	High	High	Med	High	Med	Med
Columbine Valley	Low	Med	High	Med	Med	Low	High	High	Med	High	Med	Med
Deer Trail	Low	Med	NA	Med	Med	Med	High	High	High	High	Med	Med
Englewood	Low	Med	Med	Med	High	High	High	High	Med	High	Low	Low
Foxfield	Low	Med	NA	Med	Med	Low	High	High	Med	High	Med	Med
Glendale	Low	Med	High	Low	Med	Low	High	High	Med	High	Med	Med
Greenwood Village	Low	Med	Low	Med	Med	Med	High	High	Med	High	Med	Med
Littleton	Med	High	Med	Med	Med	Med	High	High	Med	High	Med	Med
Sheridan	Low	Med	High	Med	High	Med	High	High	Med	High	Low	Low
Denver Water	Low	Med	High	Med	Med	Low	Low	NA	Low	NA	Med	Med
South Metro Fire	Low	Med	High	Med	Med	Med	High	High	Med	High	Med	Med
Unincorporated County	Low	Med	High	Med	Med	Med	High	High	Med	High	Med	Med

4.2 Asset Summary

4.2.1 General Property

General property exposure to hazards is based on Arapahoe County's parcel data containing assessor information such as total number of parcels, improvement values, and residential / non-residential parcel types by jurisdiction. Non-residential property types were not split out by classification in this plan. Only those parcels with improvement values greater than $0 were used for analysis; non-developed or non-improved parcels were excluded for the purposes of conducting the vulnerability assessment.

Counts and values are based on the latest county assessor's data (as of May 2025), which was provided in GIS and tabular (spreadsheet) formats. Improvement values and parcel type attributes were joined to the parcel geometries in GIS, to enable spatial analysis and mapping. Content values were estimated as a percentage of the improvement value based on parcel type using standard FEMA HAZUS rates:

- Agricultural – 100%
- Commercial – 100%
- Exempt – 100%
- Industrial – 150%
- Mixed Use – 100%
- Mobile Home – 50%
- Multi–Family Residential – 50%
- Residential – 50%
- Vacant Improved – 0%

Finally, Total Values were aggregated by adding the improvement and estimated content values for each jurisdiction. Table 4-5 shows the total number of improved parcels, properties, and their estimated values by jurisdiction.

Table 4-6 summarizes parcels for Arapahoe County by parcel type. For this analysis, certain data included all data within city limits, including those in other counties:

- Bennett counts and values represent properties that are within the whole City Limits that includes Adams and Arapahoe Counties.
- Bow Mar counts and values represent properties that are within the whole City Limits that includes Arapahoe and Jefferson Counties.
- Littleton counts and values represent properties that are within the whole City Limits that includes Arapahoe and a small exclave in Jefferson County.

The data shows that 63% of parcels are residential in nature and 37% are non-residential. The Total Values of parcels available for assessment is over $192 billion including both improvement values and content values. A total of 210,844 parcels were summed up for this exposure summary.

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

Table 4-5 Arapahoe County Total Exposure by Jurisdiction

Jurisdiction	Improved Parcels	Improved Value	Total Value
Aurora	103,884	$48,747,908,073	$75,864,651,602
Bennett	1,607	$668,887,282	$1,051,802,806
Bow Mar	306	$326,810,788	$490,245,092
Centennial	38,273	$22,605,777,346	$35,949,191,854
Cherry Hills Village	2,232	$4,060,861,560	$6,143,984,406
Columbine Valley	692	$777,201,638	$1,173,265,912
Deer Trail	553	$135,729,779	$210,359,422
Englewood	11,430	$6,681,617,660	$10,911,924,475
Foxfield	281	$237,189,541	$364,474,378
Glendale	472	$1,054,815,187	$1,773,784,574
Greenwood Village	5,106	$8,235,471,395	$13,631,058,870
Littleton	15,230	$9,543,929,434	$15,133,915,011
Sheridan	1,743	$949,221,425	$1,626,900,997
Unincorporated County	29,035	$17,926,732,007	$28,055,956,228
Total	**210,844**	**$121,952,153,115**	**$192,381,515,625**

Source: Arapahoe, Adams and Douglas County Assessor Data, WSP GIS Analysis

Table 4-6 Arapahoe County Total Exposure by Jurisdiction and Property Types

Jurisdiction	Property Type	Improved Parcels	Improved Value	Total Value
Aurora	Agricultural	10	$2,043,675	$4,087,350
	Commercial	1,740	$3,475,444,490	$6,950,888,980
	Exempt	485	$1,504,351,676	$3,008,703,352
	Mixed Use	26	$505,600,803	$1,011,201,606
	Mobile Home	431	$13,859,724	$20,789,586
	Multi-Family Residential	18,413	$10,860,929,952	$16,291,394,928
	Residential	82,759	$32,383,816,094	$48,575,724,141
	Vacant Improved	20	$1,861,659	$1,861,659
	Total	**103,884**	**$48,747,908,073**	**$75,864,651,602**
Bennett	Agricultural	4	$527,932	$1,055,864
	Commercial	74	$64,002,556	$128,005,112
	Exempt	40	$31,866,517	$63,733,034
	Industrial	2	$273,380	$683,450
	Residential	1,487	$572,216,897	$858,325,346
	Total	**1,607**	**$668,887,282**	**$1,051,802,806**
Bow Mar	Commercial	1	$57,819	$115,638
	Residential	305	$326,752,969	$490,129,454
	Total	**306**	**$326,810,788**	**$490,245,092**
Centennial	Agricultural	2	$1,163,754	$2,327,508
	Commercial	1,249	$3,242,940,222	$6,485,880,444
	Exempt	272	$648,034,534	$1,296,069,068
Centennial	Mixed Use	5	$189,060,120	$378,120,240

Jurisdiction	Property Type	Improved Parcels	Improved Value	Total Value
	Multi-Family Residential	2,731	$2,120,319,286	$3,180,478,929
	Residential	34,008	$16,404,112,470	$24,606,168,705
	Vacant Improved	6	$146,960	$146,960
	Total	**38,273**	**$22,605,777,346**	**$35,949,191,854**
Cherry Hills Village	Agricultural	2	$11,029,140	$22,058,280
	Commercial	7	$34,296,630	$68,593,260
	Exempt	20	$59,729,242	$119,458,484
	Mixed Use	1	$346,050	$692,100
	Residential	2,198	$3,955,443,568	$5,933,165,352
	Vacant Improved	4	$16,930	$16,930
	Total	**2,232**	**$4,060,861,560**	**$6,143,984,406**
Columbine Valley	Commercial	5	$11,143,019	$22,286,038
	Exempt	1	$390,396	$780,792
	Mixed Use	1	$3,395,000	$6,790,000
	Residential	684	$762,271,717	$1,143,407,576
	Vacant Improved	1	$1,506	$1,506
	Total	**692**	**$777,201,638**	**$1,173,265,912**
Deer Trail	Commercial	21	$3,530,171	$7,060,342
	Exempt	15	$8,303,662	$16,607,324
	Mixed Use	5	$1,843,482	$3,686,964
	Mobile Home	42	$534,628	$801,942
	Multi-Family Residential	3	$454,000	$681,000
	Residential	461	$120,916,028	$181,374,042
	Vacant Improved	6	$147,808	$147,808
	Total	**553**	**$135,729,779**	**$210,359,422**
Englewood	Agricultural	3	$780,570	$1,561,140
	Commercial	1,023	$1,414,007,609	$2,828,015,218
	Exempt	133	$188,416,729	$376,833,458
	Industrial	8	$17,713,853	$44,284,633
	Mixed Use	48	$144,663,070	$289,326,140
	Mobile Home	144	$3,006,300	$4,509,450
	Multi-Family Residential	1,072	$1,584,010,726	$2,376,016,089
	Residential	8,982	$3,324,719,088	$4,987,078,632
	Vacant Improved	17	$4,299,715	$4,299,715
	Total	**11,430**	**$6,681,617,660**	**$10,911,924,475**
Foxfield	Commercial	5	$10,072,842	$20,145,684
	Exempt	3	$7,321,483	$14,642,966
	Residential	272	$219,781,024	$329,671,536
	Vacant Improved	1	$14,192	$14,192
	Total	**281**	**$237,189,541**	**$364,474,378**
Glendale	Commercial	92	$327,581,870	$655,163,740
	Exempt	15	$55,541,717	$111,083,434

Jurisdiction	Property Type	Improved Parcels	Improved Value	Total Value
Glendale	Multi-Family Residential	320	$653,689,900	$980,534,850
	Residential	45	$18,001,700	$27,002,550
	Total	**472**	**$1,054,815,187**	**$1,773,784,574**
Greenwood Village	Agricultural	1	$723,537	$1,447,074
	Commercial	401	$2,371,731,851	$4,743,463,702
	Exempt	61	$183,304,252	$366,608,504
	Multi-Family Residential	696	$1,068,205,536	$1,602,308,304
	Residential	3,945	$4,611,450,134	$6,917,175,201
	Vacant Improved	2	$56,085	$56,085
	Total	**5,106**	**$8,235,471,395**	**$13,631,058,870**
Littleton	Agricultural	4	$1,134,480	$2,268,960
	Commercial	733	$1,071,136,429	$2,142,272,858
	Exempt	176	$393,533,959	$787,067,918
	Mixed Use	24	$170,498,210	$340,996,420
	Mobile Home	386	$33,389,111	$50,083,667
	Multi-Family Residential	2,636	$2,041,677,434	$3,062,516,151
	Residential	11,265	$5,832,298,453	$8,748,447,680
	Vacant Improved	6	$261,358	$261,358
	Total	**15,230**	**$9,543,929,434**	**$15,133,915,011**
Sheridan	Commercial	266	$352,923,844	$705,847,688
	Exempt	21	$36,632,028	$73,264,056
	Industrial	3	$7,020,812	$17,552,030
	Mixed Use	8	$2,554,753	$5,109,506
	Mobile Home	238	$13,597,081	$20,395,622
	Multi-Family Residential	88	$179,266,332	$268,899,498
	Residential	1,115	$357,212,045	$535,818,068
	Vacant Improved	4	$14,530	$14,530
	Total	**1,743**	**$949,221,425**	**$1,626,900,997**
Unincorporated	Agricultural	441	$223,064,514	$446,129,028
	Commercial	1,000	$1,573,760,276	$3,147,520,552
	Exempt	197	$339,815,548	$679,631,096
	Industrial	4	$33,384,959	$83,462,398
	Mixed Use	50	$128,823,929	$257,647,858
	Mobile Home	631	$25,679,868	$38,519,802
	Multi-Family Residential	4,169	$3,680,226,055	$5,520,339,083
	Residential	22,522	$11,921,459,108	$17,882,188,662
	Vacant Improved	21	$517,750	$517,750
	Total	**29,035**	**$17,926,732,007**	**$28,055,956,228**
	Grand Total	**210,844**	**$121,952,153,115**	**$192,381,515,625**

Source: Arapahoe, Adams and Douglas County Assessor Data, WSP GIS Analysis

Table 4-7 Improved Parcel Exposure Values by Parcel Type

Property Type	Improved Parcels	Improved Value	Content Value	Total Value
Agricultural	467	$240,467,602	$240,467,602	$480,935,204
Commercial	6,617	$13,952,629,628	$13,952,629,628	$27,905,259,256
Exempt	1,439	$3,457,241,743	$3,457,241,743	$6,914,483,486
Industrial	17	$58,393,004	$87,589,506	$145,982,510
Mixed Use	168	$1,146,785,417	$1,146,785,417	$2,293,570,834
Mobile Home	1,872	$90,066,712	$45,033,356	$135,100,068
Multi-Family Residential	30,128	$22,188,779,221	$11,094,389,611	$33,283,168,832
Residential	170,048	$80,810,451,295	$40,405,225,648	$121,215,676,943
Vacant Improved	88	$7,338,493	$0	$7,338,493
Total	**210,844**	**$121,952,153,115**	**$70,429,362,510**	**$192,381,515,625**

Source: Arapahoe, Adams and Douglas County Assessor Data, WSP GIS Analysis

4.2.2 People

Population estimates were calculated for hazards with a geospatial component and for which data was available for GIS-based parcel analysis. As noted above, population values for municipalities that cross county lines only include those portions within Arapahoe County. Estimates for the number of people living in identified hazard areas were calculated by identifying residential structures at risk and multiplying that number by the average household sizes for that community, as shown in Table 4-8 below.

Table 4-8 Average Population per Residential Parcel

Place Name	Average Population Per Residence
Aurora	2.62
Bennett	2.37
Bow Mar	3.04
Centennial	2.55
Cherry Hills Village	2.86
Columbine Valley	2.65
Deer Trail	2.93
Englewood	2.05
Foxfield	2.37
Glendale	2.53
Greenwood Village	2.36
Littleton	2.19
Sheridan	2.37
Unincorporated	2.49

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

This value was then multiplied by the number of residential parcels that overlap with a hazard layer to get an estimate of the population exposed to that hazard. For more details on economic assets, development trends, and other population and demographic information refer to Chapter 2.0 Community Profile.

4.2.3 Critical Facilities and Infrastructure

A critical facility is one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. Critical facilities are placed into a category based on the type of services and response the facility provides. Arapahoe County has categorized their critical facilities into four categories A through D. For purposes of this plan, analysis was conducted on the two highest classes, Category A and Category B facilities.

- Category A facilities are for incident response including facilities that save lives and properties.
- Category B facilities include those used for stabilization of public safety, public welfare, and the local economy.

Facilities included in these categories are listed in Table 4-9 and

Table 4-10. The County's database of critical facilities was supplemented with additional data from other jurisdictions, the State of Colorado, and other sources. Note that this includes some facilities located in neighboring counties that provide critical services to Arapahoe County.

Table 4-9 Category A Critical Facilities

Category A *Incident Response* (Red)
Ambulance Services
Emergency Communications
Emergency Room
Fire Protection
Hospital
Law Enforcement
Search & Rescue

Table 4-10 Category B Critical Facilities

Category B *Community Stabilization/ National Strategic*
Access & Functional Needs Services
Assisted Living
Clean Water Supply
Critical Data Network
Critical Medical Services
Dialysis Center
Elderly Care
Electric Power Distribution
Electric Power Generation
Electric Power Transmission
Extended Care Facility
Fiber/Cable Network
Food Distribution
Fuel Distribution
Fuel Transmission
Home Healthcare
Homeland Security
Homeless Sheltering
Life Sustaining Chemical Distribution
Mental/Behavioral Health
Mortuary Operations
National Defense
National Rail Network
Nursing Care
Organ/Blood/Tissue Bank
Payroll Services
Pharmacy
Post Office
Public Broadcast
Public Health
Public Transit Network
Road & Bridge Operations
Satellite Network
Solar Generation
Telephone Network Service
Wastewater Management
Wireless Telephone Network

The County has 132 critical facilities in Category A, with 112 of them being used for emergency services. There are 1,266 Category B facilities, with 487 of them being used for healthcare and public health and 383 for bridge operations. Aurora has the most Category A facilities (35) as well as the most Category B facilities (457).

Table 4-11 summarizes the inventory of Category A critical facilities by jurisdiction and by FEMA Lifeline Type in Arapahoe County based on best available data. Table 4-12 does the same but for Category B facilities. The general locations of these facilities are displayed in Figure 4-3 through Figure 4-6. Specific information on facilities, names, and other key details by participating communities may be accessed by permission of the jurisdiction or infrastructure owner.

Table 4-11 Arapahoe County Category A Critical Sector Facilities

Jurisdiction	Emergency Services	Government Facilities	Healthcare & Public Health	Total Count
Aurora	26	1	8	**35**
Centennial	12	4	1	**17**
Cherry Hills Village	1	-	-	**1**
Columbine Valley	1	-	-	**1**
Deer Trail	1	-	-	**1**
Denver City/County	-	-	-	**0**
Englewood	6	-	3	**9**
Foxfield	1	-	-	**1**
Glendale	2	-	-	**2**
Greenwood Village	12	-	-	**12**
Jefferson County	1	-	-	**1**
Littleton	9	-	2	**11**
Sheridan	3	-	-	**3**
Unincorporated County	20	1	-	**21**
Adams County	2	-	-	**2**
Douglas County	15	-	-	**15**
Total	**112**	**6**	**14**	**132**

Source: Arapahoe County Sheriff's Office, HIFLD, South Metro Fire Rescue, WSP GIS Analysis

Table 4-12 Arapahoe County Category B Critical Sector Facilities

Jurisdiction	Bridge Operations	Chemical Storage	Communications	Critical Manufacturing	Dam	Defense Industrial Base	Energy	Financial Services	Food and Agriculture	Government Facilities	Healthcare and Public Health	Information Technology	Postal and Shipping	School	Transportation Systems	Water and Wastewater Systems	Total Count
Aurora	109	3	71	-	3	1	9	1	13	2	232	-	4	1	-	8	**457**
Centennial	51	1	37	1	2	-	13	1	8	-	113	3	3	-	-	4	**237**
Cherry Hills Village	6	-	1	-	-	-	-	-	1	-	2	-	-	-	-	-	**10**
Columbine Valley	5	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	**6**
Deer Trail	5	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	**7**
Denver City/County	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	**2**
Englewood	15	2	6	-	1	-	1	-	4	1	34	-	2	-	-	4	**70**
Foxfield	2	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	**3**
Glendale	1	-	1	-	-	-	-	-	-	-	2	-	-	-	-	-	**4**
Greenwood Village	25	-	35	-	-	-	2	2	6	1	29	2	1	-	-	2	**105**
Jefferson County	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	**1**
Littleton	38	-	15	-	3	-	4	1	3	-	38	-	2	-	-	5	**109**
Sheridan	9	-	3	-	-	-	2	-	2	-	3	-	-	-	-	-	**19**
Unincorporated	116	1	32	-	2	-	18	1	7	1	32	-	2	-	1	14	**227**
Adams County	1	-	-	-	-	-	-	-	-	-	1	-	-	-	1	1	**4**
Douglas County	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	**5**
Total	**383**	**7**	**203**	**1**	**11**	**1**	**52**	**6**	**44**	**5**	**487**	**5**	**15**	**1**	**2**	**43**	**1,266**

Source: Arapahoe County Sheriff's Office, CEPC, DWR, HIFLD, National Bridge Inventory, WSP GIS Analysis

Figure 4-3 West Arapahoe County Critical Facilities- Category A Critical Sectors

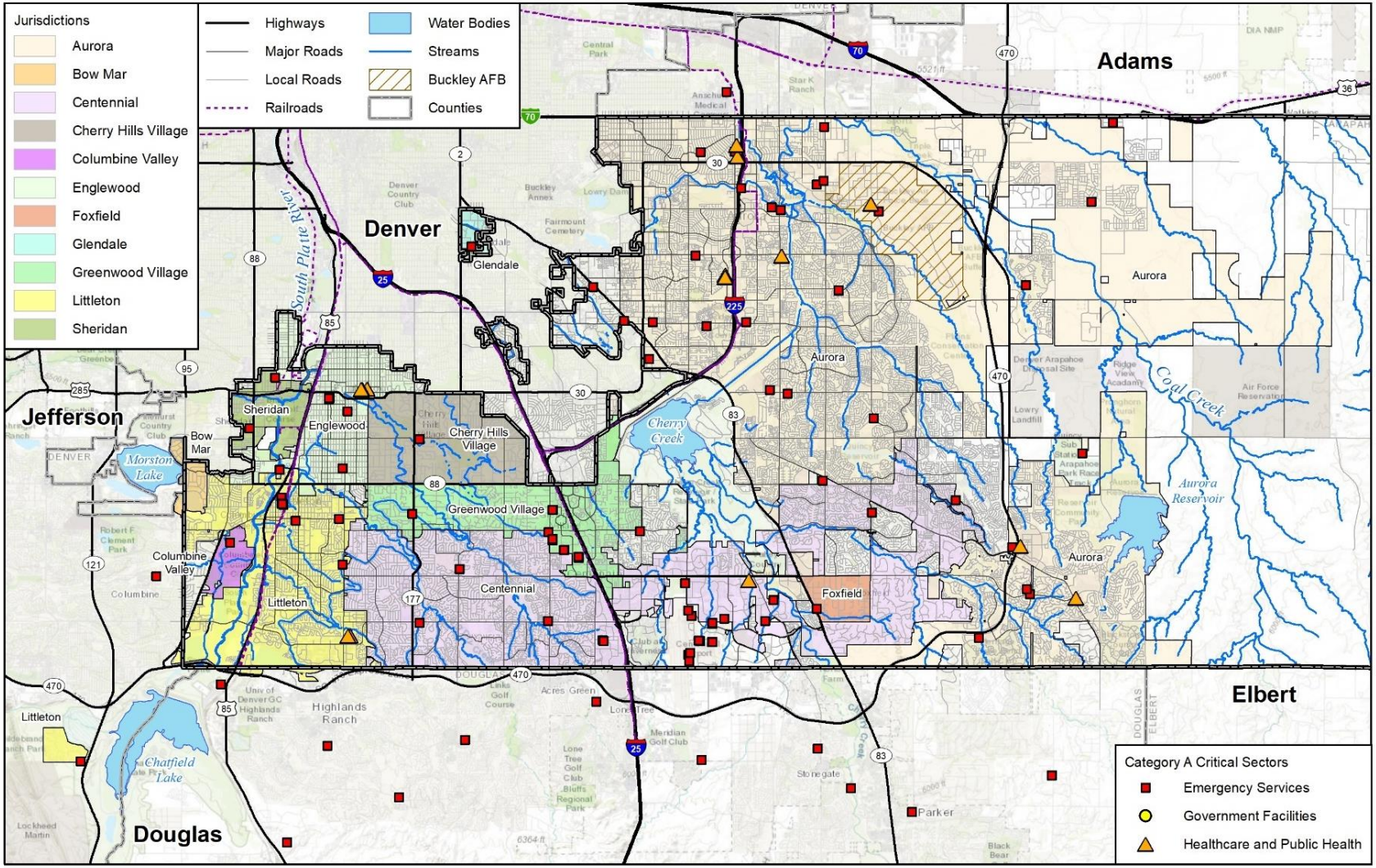
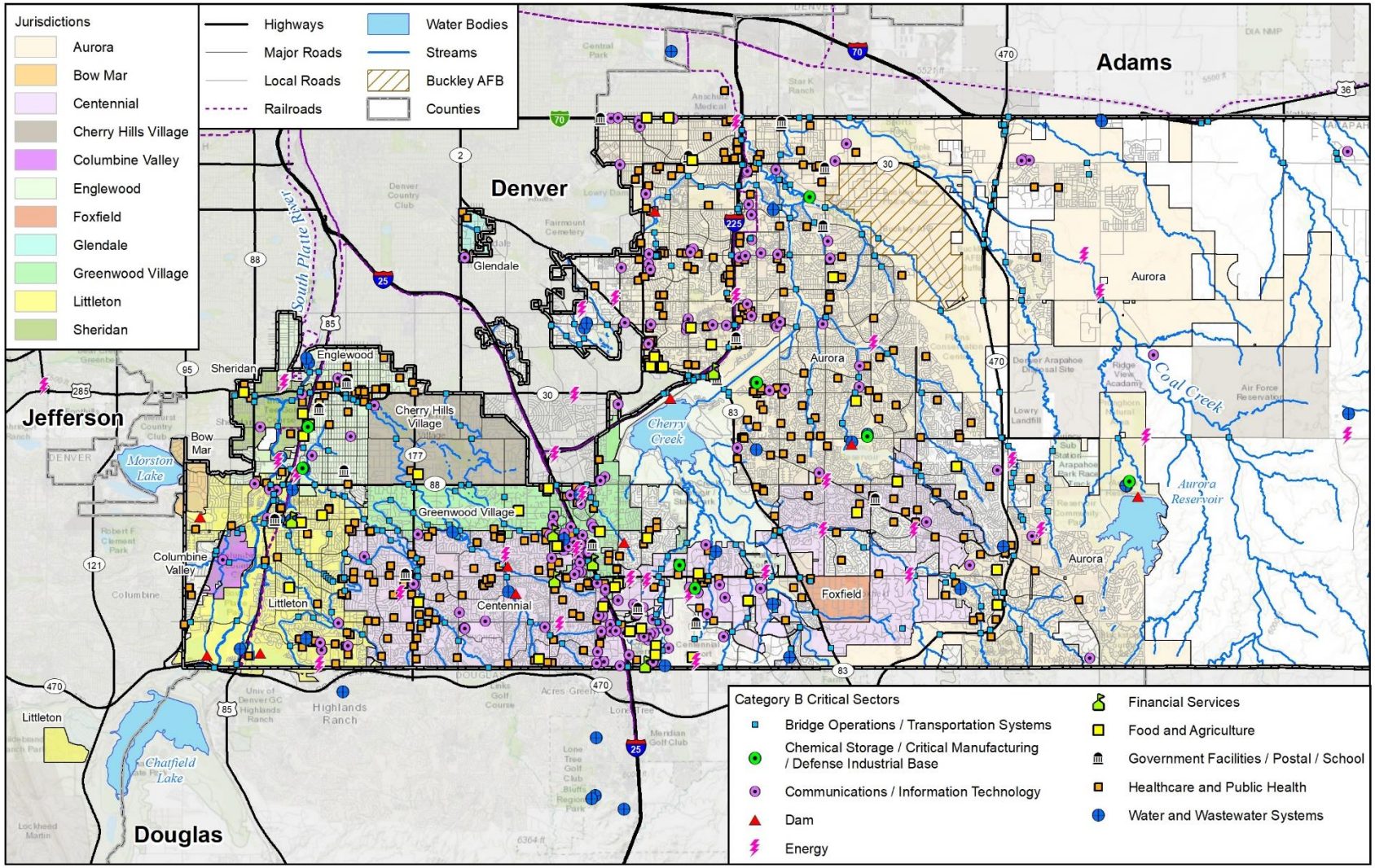
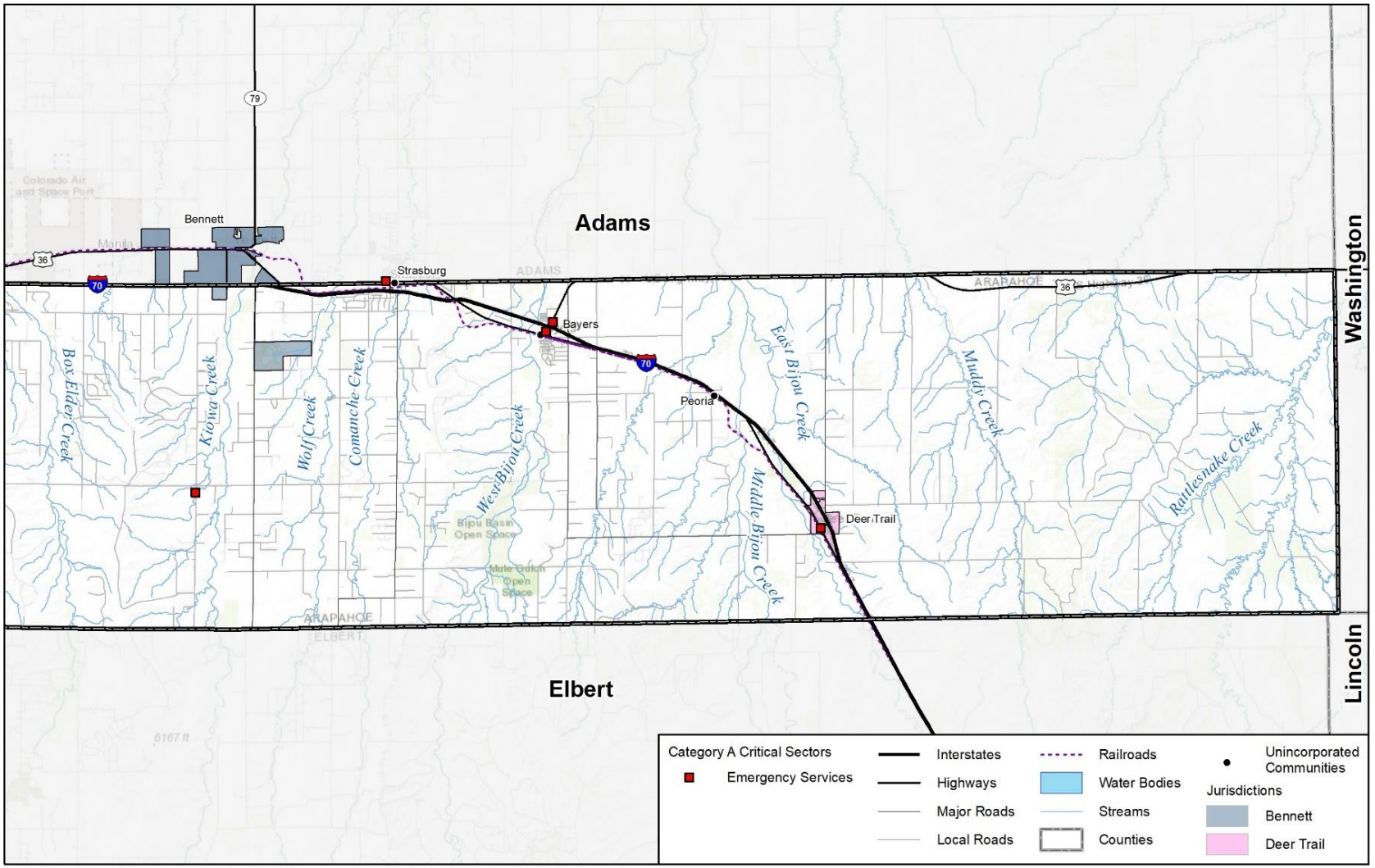


Figure 4-4 West Arapahoe County Critical Facilities- Category B Critical Sectors



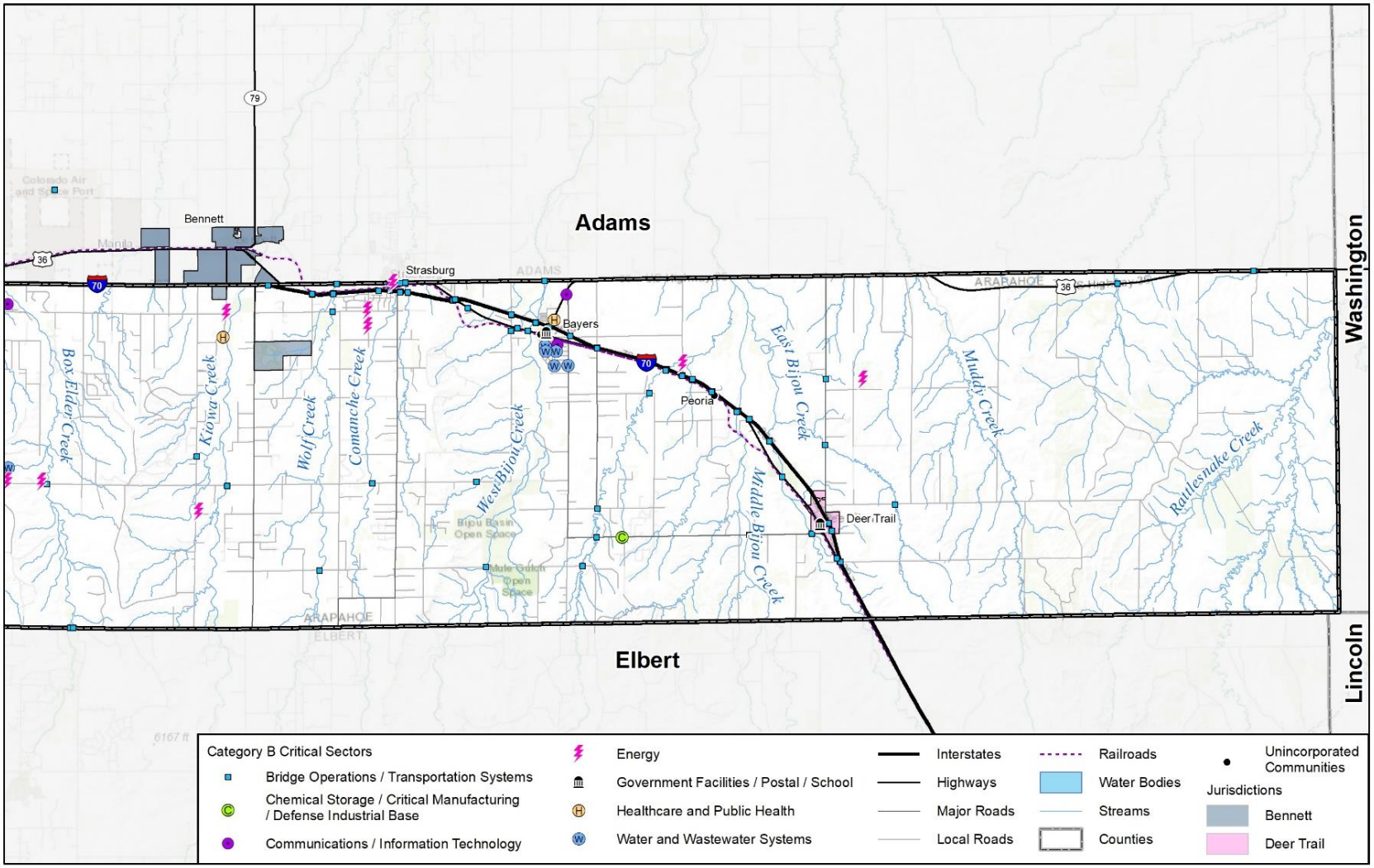
Map compiled 9/2025;
intended for planning purposes only.
Data Source: Arapahoe County, CDOT, Arapahoe Sheriff's Office, CEPC, DWR, HIFLD, NBI, South Metro Fire Rescue

Figure 4-5 East Arapahoe County Critical Facilities- Category A Critical Sectors



Map compiled 5/2025;
intended for planning purposes only.
Data Source: Arapahoe County, CDOT,
Arapahoe Sheriff's Office, CEPC, DWR, HIFLD, NIB

Figure 4-6 East Arapahoe County Critical Facilities- Category B Critical Sectors



South Metro Fire Rescue Critical Facilities and Infrastructure

The South Metro Fire Rescue has 33 critical facilities in Arapahoe, Douglas, and Jefferson Counties listed in Table 4-13. The South Metro Fire Rescue base map shown in Figure 4-7 provides an overview of the geographic area of the district, including prominent features such as municipalities and major highways.

Table 4-13 South Metro Fire Facilities

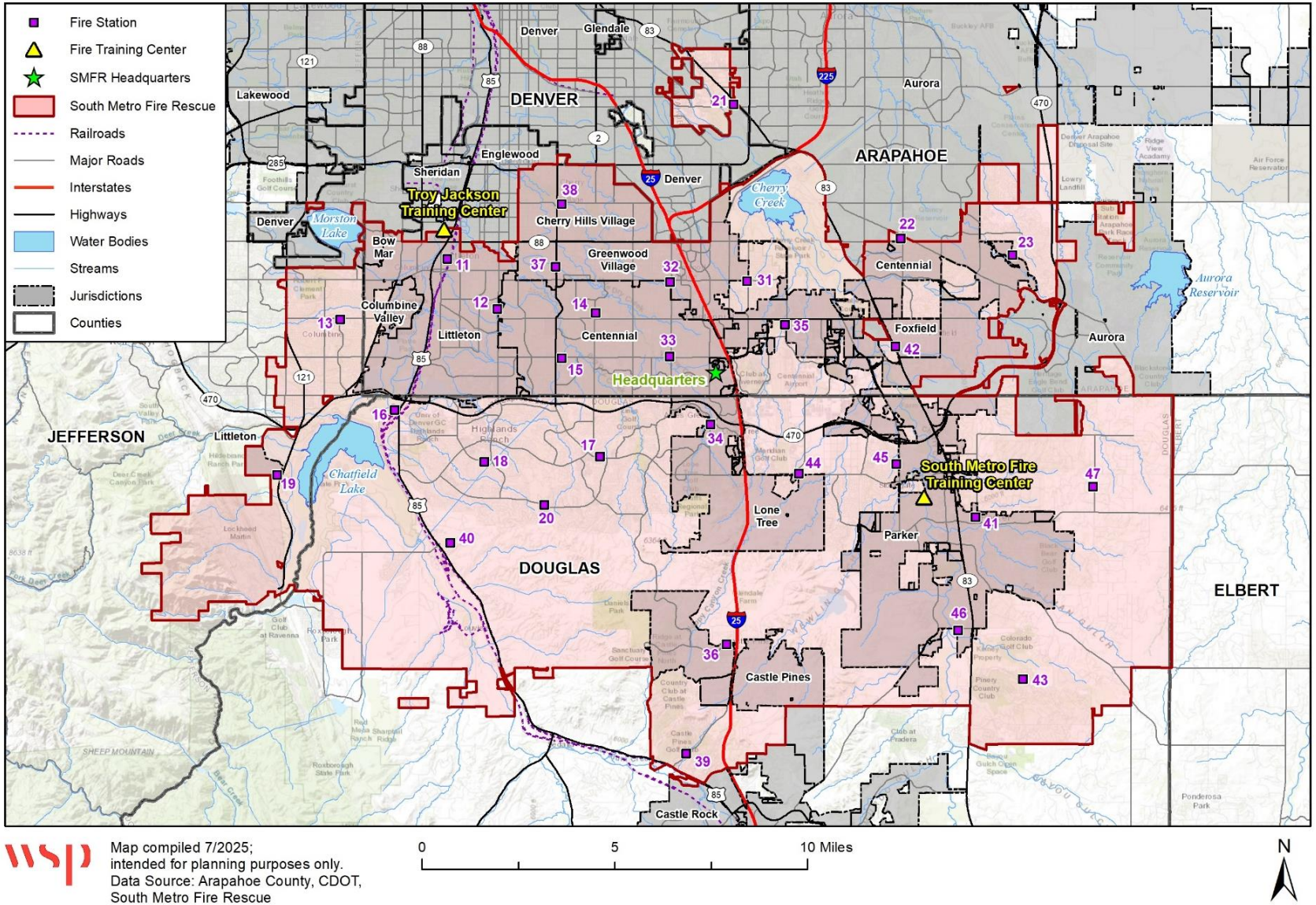
Jurisdiction	Count
Arapahoe County	2
Centennial	7
Cherry Hills Village	1
Douglas County	15
Englewood	1
Foxfield	1
Greenwood Village	2
Jefferson County	1
Littleton	3
Total	**33**

Source: South Netro Fire Rescue

Denver Water Critical Facilities and Infrastructure

Denver Water facilities located in the planning area include the Highlands Back-Up Office and Control Center; Wynetka Decentralization Station, three reservoirs, and three pump stations.

Figure 4-7 South Metro Fire Rescue Facilities



4.2.4 Historic, Cultural and Natural Resources

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

- The community may decide that these types of resources warrant a greater degree of protection due to their unique and irreplaceable nature and contribution to the overall economy.
- If these resources are impacted by a disaster, knowing so ahead of time allows for more prudent care in the immediate aftermath, when the potential for additional impacts are higher.
- The rules and laws for reconstruction, restoration, rehabilitation, and/or replacement are often specific for these types of designated resources (e.g., under the NEPA and Section 106 of the National Historic Preservation Act).
- Natural resources can have beneficial functions that reduce the impacts of natural hazards, such as wetlands and riparian habitat, which help absorb and attenuate floodwaters.

Historic and Cultural Resources

A historic property not only includes buildings or other types of structures such as bridges and dams but can also refer to prehistoric or Native American sites, roads, byways, historic landscapes, and such other features. Given the history of the County, these types of historic properties exist.

Historic properties and cultural resources are also valuable economic assets that increase property values and attract businesses and tourists. Far from being at odds with economic development, preservation of these assets is often an important catalyst for economic development (e.g., historic downtown revitalization programs leading to growth in heritage tourism). Some key information on historic assets and properties in Arapahoe County was obtained from the National Register of Historic Places (NRHP). The NRHP database, administered by the National Park Service, is the Nation's official list of cultural resources worthy of preservation, and the NRHP overall is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect historic and archeological resources. Properties listed include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archeology, engineering, and culture.

The NRHP database lists 24 historic resources in Arapahoe County, as summarized in the following table:

Table 4-14 Historic and Cultural Resources Noted by the NRHP and CSRHP

Location	Historic Place Name or Address	Date Entered	Register
Aurora	Commandant of Cadets Building, US Air Force Academy	4/24/2007	NRHP
Aurora	DeLaney Barn	2/9/1989	NRHP
Aurora	Gully Homestead	1/9/1986	NRHP
Aurora	Jamaica Primary School	5/1/2017	NRHP
Aurora	Melvin School	1/5/1984	NRHP
Aurora	Smith, William, House	9/26/1985	NRHP
Cherry Hills Village	Foster--Buell Estate	4/1/1998	NRHP
Cherry Hills Village	Little Estate	5/29/1998	NRHP

Location	Historic Place Name or Address	Date Entered	Register
Cherry Hills Village	Maitland Estate	9/3/1998	NRHP
Cherry Hills Village	Owen Estate	9/17/1999	NRHP
Cherry Hills Village	Hopkins Farm	4/24/2007	NRHP
Cherry Hills Village	Francis-Petry House	6/25/2015	CSRHP
Englewood	Arapahoe Acres	11/3/1998	NRHP
Englewood	Brown, David W., House	4/10/1980	NRHP
Englewood	Englewood Post Office	7/20/2011	NRHP
Englewood	Key Savings and Loan Association Building	7/18/2016	NRHP
Englewood	Dransfeldt Building	9/30/2016	CSRHP
Englewood	Englewood Depot	11/9/1994	CSRHP
Greenwood Village	Curtis School	6/25/1992	NRHP
Greenwood Village	Cherry Creek Schoolhouse	12/8/1993	CSRHP
Littleton	Arapaho Hills	8/28/2012	NRHP
Littleton	Geneva Home	1/21/1999	NRHP
Littleton	Knight--Wood House	10/6/2004	NRHP
Littleton	Littleton Main Street	4/8/1998	NRHP
Littleton	Littleton Post Office	4/26/2019	NRHP
Littleton	Littleton Town Hall	9/4/1980	NRHP
Strasburg	Comanche Crossing of the Kansas Pacific Railroad	8/10/1970	NRHP
Strasburg	Denver & Rio Grande Railroad Baggage-RPO Car No. 624	12/20/2008	CSRHP
Unincorporated	Seventeen Mile House	10/6/1983	NRHP, CSRHP

Note: NRHP = National Register of Historic Places Source: NPS NRH, State of Colorado Register Listed Historic Properties; https://www.historycolorado.org/national-state-register-listed-properties

Colorado has a similar historical resource record version, called the Colorado State Register of Historic Properties. This database contains the State's significant cultural resources worthy of preservation for the future education and enjoyment of Colorado's residents and visitors. Properties listed in the Colorado State Register include individual buildings, structures, objects, districts, and historic and archaeological sites. The Colorado State Register program is administered by the Office of Archaeology and Historic Preservation within the Colorado Historical Society. Properties listed in the National Register of Historic Places are automatically placed in the Colorado State Register. Based on this statewide record set, Arapahoe County contains an additional 6 existing resources deemed historic preservation-worthy.

The National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) define any property over 50 years of age as a historic resource potentially eligible for the National Register. Thus, in the event that the property is to be altered or has been altered as the result of a major federal action, the property must be evaluated under the guidelines set forth by NEPA and the NHPA regarding this key age period. In addition, by law under the NHPA, "members of the public have a voice when federal actions will affect properties that qualify for the National Register of Historic Places, the nation's

official list of historic properties" (A Citizen's Guide to Section 106 Review, 2016). Structural mitigation projects are considered alterations for the purpose of these NEPA/NHPA regulations, if regarding historical properties and places.

Natural Resources

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

Wetlands

Wetlands are a valuable natural resource for communities due to their benefits to water quality, wildlife protection, recreation, and education, and play an important role in hazard mitigation. Wetlands provide natural floodplain protection by reducing flood peaks and slowly releasing floodwaters to downstream areas. When surface runoff is dampened, the erosive powers of the water are greatly diminished. Furthermore, the reduction in the velocity of inflowing water as it passes through a wetland helps remove sediment being transported by the water. They also provide drought relief in water-scarce areas where the relationship between water storage and streamflow regulation is vital (Wetland Functions and Values, 2016).

Endangered Species

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

According to the U.S. Fish and Wildlife Service (USFW) Environmental Conservation Online System (ECOS), there were 23 federally endangered, threatened, or candidate/proposed/ under/other status review species in Arapahoe County (as of 2025). These are listed in Table 4-15.

Table 4-15 Endangered Species in Arapahoe County

Group	Common Name	Scientific Name	Status
Amphibians	Northern leopard frog	*Rana pipiens*	Resolved Taxon
Birds	Swainson's hawk	*Buteo swainsoni*	Species of Concern
Birds	American peregrine falcon	*Falco peregrinus anatum*	Recovery
Birds	Mountain Plover	*Charadrius montanus*	Resolved Taxon
Birds	Bald Eagle	*Haliaeetus leucocephalus*	Recovery
Birds	White-faced ibis	*Plegadis chihi*	Species of Concern
Birds	Ferruginous Hawk	*Buteo regalis*	Resolved Taxon
Birds	Western Burrowing Owl	*Athene cunicularia hypugaea*	Species of Concern
Fishes	Pallid sturgeon	*Scaphirhynchus albus*	Endangered
Flowering Plants	Ute ladies'-tresses	*Spiranthes diluvialis*	Threatened
Flowering Plants	Western prairie fringed Orchid	*Platanthera praeclara*	Threatened
Insects	Western regal fritillary	*Argynnis idalia occidentalis*	Proposed Threatened
Insects	Suckley's cuckoo bumble bee	*Bombus suckleyi*	Proposed Endangered
Insects	Monarch butterfly	*Danaus plexippus*	Proposed Threatened
Insects	Regal fritillary	*Speyeria idalia*	Resolved Taxon
Mammals	Preble's meadow jumping mouse	*Zapus hudsonius preblei*	Threatened
Mammals	Swift fox	*Vulpes velox*	Resolved Taxon
Mammals	Long-legged myotis	*Myotis volans*	Species of Concern
Mammals	Long-eared myotis	*Myotis evotis*	Species of Concern
Mammals	Tricolored bat	*Perimyotis subflavus*	Proposed Endangered
Mammals	Black-tailed prairie dog	*Cynomys ludovicianus*	Resolved Taxon
Mammals	Little brown bat	*Myotis lucifugus*	Under Review

Source: U.S. Fish & Wildlife Service Environmental Conservation Online System

4.3 Hazard Profiles

The hazards identified in Section 4.1 are profiled individually in the following sections. Each of these profiles will begin by summarizing the probability of future occurrence and potential magnitude of each hazard, as well as assigning an overall vulnerability, or planning significance, rating of high, moderate, or low for each hazard.

The sources used to collect information for these profiles include the plans, studies and reports listed in Table 2-2, as well as:

- Disaster declaration history from FEMA, State of Colorado Governor's Executive Orders, and the USDA Farm Service Agency
- Internet resources on past hazard events including, but not limited to, the National Oceanic and Atmospheric Administration's National Centers for Environmental Information (NCEI) databases, the National Drought Mitigation Center's Drought Impact Reporter, the National Response Center, and the Global Terrorism Database
- Geographic information systems (GIS) data from Arapahoe County GIS
- Statewide GIS datasets compiled by state and federal agencies (e.g. The Homeland Infrastructure Foundation-Level Data, or HIFLD dataset for critical facilities and infrastructure)
- Personal interviews with HMPC members and other stakeholders
- Arapahoe County Plan Update Guides completed by each participating jurisdiction

Hazard profiles are organized into the following subsections:

Risk Summary
Introduces the hazard and summarizes key information for the hazard profiled. A table lists the hazard significance rankings for the planning area as a whole.

Description
This section consists of a general description of the hazard and the general impacts it may have on a community.

Location
This section describes the geographic coverage, or location, of the hazard in the planning area and assesses the potential extent of affected areas.

Magnitude/Severity
This section summarizes the magnitude/severity or extent of a hazard event in terms of deaths, injuries, property damage, interruption of essential facilities and services, and other potential impacts.

Past Occurrences
This section includes information on historic incidents, including impacts and costs, if known. Information from the HMPC was combined with other data sources, including those previously mentioned.

Climate Change Considerations
This section discusses the known or potential impacts of climate change on the specific hazard.

Probability of Future Occurrence

The probability, or chance of occurrence, was calculated where possible based on existing data. Probability was determined by dividing the number of events observed by the number of years and multiplying by 100. This gives the percentage chance of the event happening in any given year. An example would be three droughts occurring over a 30-year period, which suggests a 10% chance of a drought occurring in any given year.

Vulnerability Assessment

The vulnerability assessment further defines and quantifies populations, buildings, critical facilities and infrastructure, natural/cultural resources, and other community assets at risk to the profiled hazards, as well as the potential impacts to the economy and future development trends of the planning area. The vulnerability assessment includes these sub-sections per applicable hazard:

- Impact to the Public
- Impact to Responders
- Impact to Continuity of Operations
- Impact to Property, Facilities, and Infrastructure
- Impact to the Environment
- Impact to the Economic Condition of the County and Jurisdictions
- Impact to Public Confidence in Government
- Changes in Development

Jurisdictional Differences

This section includes a table to summarize the overall rankings of each indicator of hazard significance and also highlight where those rankings may be different between jurisdictions.

4.4 Active Threat

Hazard	Frequency	Spatial Extent	Severity	Significance
Active Threat	Occasional	Limited	Limited	Low

4.4.1 Risk Summary

- Recent years have seen a significant increase in the frequency and lethality of active threat incidents. According to the FBI, from 2014-2018 there were 121 active shooter incidents, an average of 1 every 15 days. From 2019 to 2023 there were 229 incidents, 1 every 8 days.
- Businesses, open spaces, and schools are the most frequent targets.
- These incidents averaged 5 casualties per event.
- Colorado has experienced 63 mass shootings since 1999, 2 of which occurred in Arapahoe County (2012 Aurora Theater Shooting, 2013 Arapahoe High School Shooting)
- Related hazards: Cyber Threat, Hazardous Materials Release

4.4.2 Description

An active threat can encompass a variety of malicious acts including explosive attacks, conventional firearm attacks, explosives, vehicle ramming, or even chemical/biological/radiological/nuclear (CBRN) attacks. Typically, an active threat is a very short-lived incident meant to inflict as many casualties as possible, although recovery from an incident can last days or even months.

The Department of Homeland Security defines an active shooter as “an individual actively engaged in killing or attempted to kill people in a confined and populated area; in most cases, active shooters use firearms(s) and there is no pattern or method to their selection of victims…situations are unpredictable and evolve quickly...and are often over within 10 to 15 minutes.” However, the presence or suspected presence of secondary devices can lengthen the duration of the event until the attack site is determined to be clear. Although this definition focuses on an active shooter, the elements remain the same for most active threat situations.

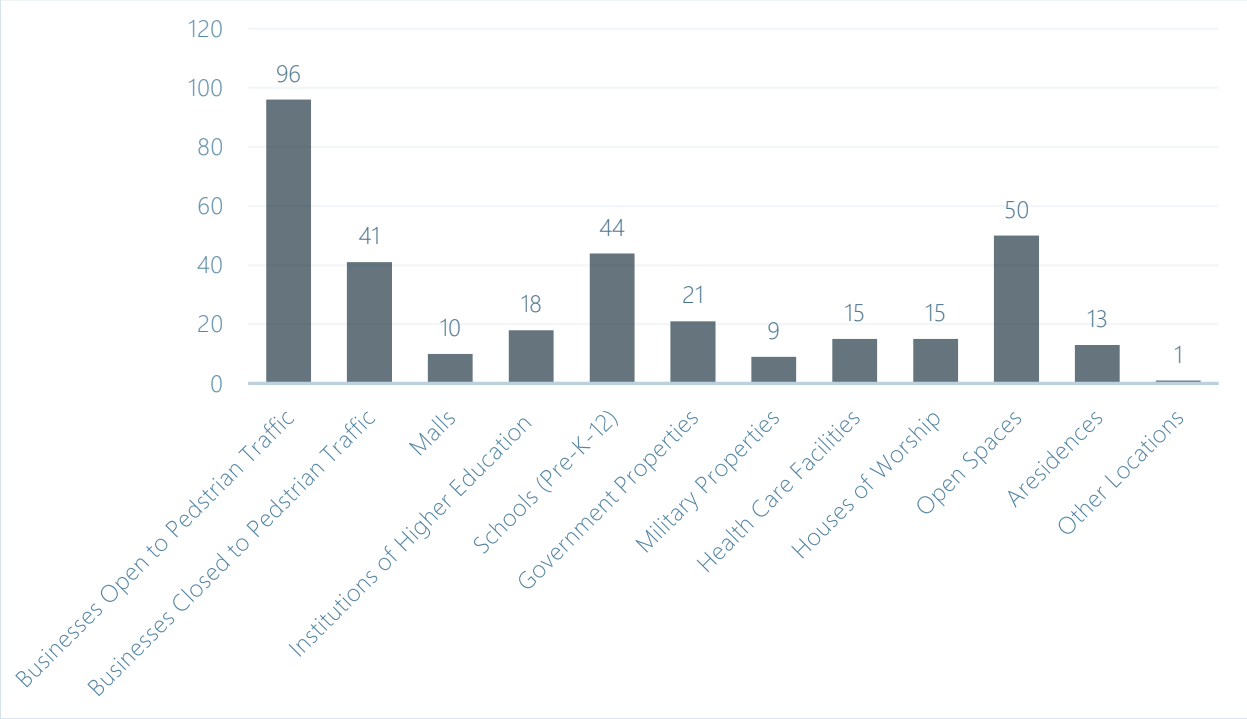
While some active threat scenarios may overlap with terrorists’ activities, this profile focuses on incidents that are typically not linked to organized political or ideological groups, such as mass shootings in schools, workplaces, and places of worship. These events are often motivated by personal grievances, emotional distress, or a desire for retaliation or recognition. In many cases, individuals targeted may be chosen at random or due to personal associations, rather than for strategic or pollical purposes. Typically, active shooters are not interested in taking hostages or attaining material gain and frequently are not even interested in their own survival. Unlike organized terrorist attacks, most active shooter incidents are carried out by one or two individuals.

For the purposes of this hazard profile, normal law enforcement incidents such as barricaded suspects, hostage negotiations, high-risk warrant searches, bomb threats, and other criminal activities are not included.

4.4.3 Location

Active threat incidents can and have happened in Arapahoe County. Although active threats have typically targeted high-population areas, soft targets such as venues, businesses, and schools, incidents in Colorado and across the nation demonstrate that these events can occur anywhere, as shown in Figure 4-8.

Figure 4-8 Locations of 333 Active Shooter Incidents in the U.S., 2000-2019



Source: FBI, 2021

4.4.4 Magnitude/Severity

Active threats can be measured in multiple ways including length of incident, casualties, and number of perpetrators. According to a 2023 FBI study of 48 active shooter incidents across the United States, they resulted in 244 casualties, an average of 5 casualties per event.

Although an active threat may only directly impact one specific site (i.e., a school, theater, or concert venue), it indirectly impacts the community in many ways. Ongoing closures for investigation, local and national media logistics, VIP visits, mental health concerns, and aversions to similar infrastructure and subsequent impacts to businesses can manifest after an active threat. The community may develop long term mental health concerns such as anxiety or PTSD. Schools and public spaces might require increased security measures, changing the community's daily rhythm and sense of safety. In many cases, the psychological and societal toll of an active threat can be more profound and enduring than the physical impact alone.

4.4.5 Past Occurrences

According to the FBI 20-Year Active Shooter Summary, there have been 333 active shooter incidents from 2000-2019 resulting in 2,851 casualties in the United States. Although there is much uncertainty and debate around exactly what constitutes an active shooter incident, the FBI designated 229 active shooter incidents from 2019 to 2023, which is an 89% increase in active shooter incidents from the previous 121 incidents recorded in the five-year period (2014-2018). In 2022, there were 50 active shooter incidents, resulting in 313 casualties, which was the highest casualty count in the past five years. The data indicates a significant upward trend in both frequency and lethality of active shooter incidents over the years.

School violence is sometimes considered a subset of active threat incidents. The U.S. Secret Service conducted a study of incidents of "targeted school violence" in the U.S. from 2008 to 2017, which they defined as "any incident in which (i) a current or recently former K-12 school student (ii) purposefully used a weapon (iii) to cause physical injury to, or the death of, at least one other student and/or school employee (iv) in or on the immediate property of the school (v) while targeting in advance one or more specific and/or random student(s) and/or employee(s)." The study excluded spontaneous incidents that resulted from unplanned fights or were tied to other criminal acts such as gang violence or drug trafficking.

Table 4-16 lists active shooter incidents that have occurred in Colorado since 1999. While only two of these incidents (Aurora Theater and Arapahoe High School) occurred within the boundaries of Arapahoe County, several others took place in neighboring jurisdictions.

Table 4-16 Active Shooter Incidents in Colorado, 1999-2025

Incident	Fatalities
Columbine High School – 1999	15
Platte Canyon High School – 2006	2
New Life Church Shooting – 2007	4
Deer Creek Middle School – 2010	0
Aurora Theater Shooting – 2012	12
Arapahoe High School Shooting – 2013	2
Colorado Springs Shooting – 2015	4
STEM School Shooting, Highlands Ranch – 2019	1
Boulder King Soopers – 2021	10
Colorado Springs – 2021	7
Club Q – 2022	5
American Elm Restaurant– 2023	2
Evergreen High School– 2025	1

Source: news media, HMPC

Turning briefly to the threat of terrorism, the Global Terrorism Database (GTD) catalogues more than 200,000 terrorist attacks from 1970 through 2020. GTD data shows that despite public perception the number of terrorist attacks on US soil has decreased substantially over recent decades. From an average of 148 incidents per year in the 1970s, the frequency of attacks declined to 53 per year in the 1980s, then

to 37 per year in the 1990s, and to 22 per year in the 2000s. An increase in attacks from 2015 through 2020 brought that average back up to 42 incidents per year for the 2010s, but as of July 2025 those numbers appear to be trending back downwards.

4.4.6 Climate Change Considerations

While climate change is unlikely to have a direct impact on active threat incidents, some analysts have predicted that increasing scarcity of resources due to a warming climate could lead to an increase in tensions resulting in more active threat attacks.

4.4.7 Probability of Future Occurrences

The probability of occurrence for an active threat can be difficult to quantify, largely due to different definitions of what constitutes an active threat. According to the FBI's 2023 report, there were 48 active shooter incidents in the United States. As previously mentioned, there had been 229 active shooter incidents from 2019-2023, an average of 45.8 incidents per year or one every 8 days.

According to Colorado Department of Public Health and Environment, Colorado has experienced 61 mass shootings in the last 10 years with 328 people shot, 82 deaths and 246 injured. With 64 counties in the states, this equals to an average of 0.35 incidents per county over two decades. Colorado has experienced seven such incidents in the last 20 years, which over 64 counties also equates to roughly a 0.5% of an incident occurring in any given county in any given year. However, it should be noted that attacks in neighboring counties can still have significant impacts on Arapahoe County.

4.4.8 Vulnerability and Consequence Analysis

The consequences from an active threat can range from single fatalities to the destruction of critical infrastructure.

Impact to the Public

Most terrorist attacks are primarily intended to kill and injure as many people as possible. Physical harm from a firearms attack or explosive device is not completely dependent on location, but risk is greater in areas where higher numbers of people gather. If a biological or chemical agent were released indoors, it could result in exposure to a high concentration of pathogens, whereas an outdoor release could affect many more people but probably at a lower dose. Symptoms of illness from a biological or chemical attack could go undetected for days or even weeks. Local healthcare workers may observe a pattern of unusual illness or early warning monitoring systems may detect airborne pathogens. People could also be affected by an attack on food and water supply. In addition to impacts on physical health, any terrorist attack would likely cause significant stress and anxiety.

Similarly, most active shooters primarily target people, attempting to kill or injure large numbers of individuals. The number of injuries and fatalities are highly variable, dependent on many factors surrounding the attack including the location, the number of type of weapons used, the shooter's skill with weapons, the amount of people at the location, and law enforcement response time. Statistics indicate an average of 6.5 casualties per active shooter incident.

An active threat or terrorist attack has both immediate and long-lasting effects on the community, spanning physical, psychological, social, and economic dimensions. The most direct impact is the physical harm to victims. Also, there is a psychological impact on survivors, witnesses, and first responders, which can result in PTSD, anxiety, and depression.

Impact to Responders

Responders may be the target of secondary attacks meant to exploit the response system. Responders also play a critical role during active threat incidents, often running towards danger to protect lives. Responders typically operate in a dynamic, chaotic, and sometimes hostile environments, facing uncertainty in these situations.

Impact to Continuity of Operations (including continued delivery of services)

Unless the active threat is directed at a government facility or critical infrastructure, it is unlikely that continuity of operations will be significantly impacted. Potential impacts may include:

- Call priority – Low priority calls for service may be delayed until the incident is over. Property crimes, minor injuries, and transports via ambulance will see an increased response time.
- Delivery of services at government facilities may be impacted if a shelter in place/lockdown/lockout is implemented.

Impact to Property, Facilities, and Infrastructure

Active shooter incidents rarely result in significant property damage. However, active threats can close down property, facilities, and infrastructure for days or even months for investigation or rehabilitation of the site. As examples, the Aurora Theater was closed for 6 months after that shooting incident, and transformer replacement after the Metcalf Sniper Attack took 5 months.

Impact to the Environment

Most active shooter attacks do not cause widespread damage to the environment. Atypical attacks utilizing CBRN materials could significantly impact the environment. Unless an attacker targets a hazardous materials site (fixed facility or rail), or infrastructure such as wastewater or water purification sites, it is unlikely to result in significant impacts to the environment.

Impact to the Economic Condition of the County and Jurisdictions

Direct economic impacts from most active shooter attacks are minimal. However, indirect costs can be substantial, including:

- Response costs, including overtime, equipment, resource expenditure, etc.
- Facility damage
- Loss of revenue
- Legal fees
- Mental health/other healthcare related costs
- VIP visits/security
- Policy/legislative changes to increase security

Some statistics from active threats show the different costs, including rebuilding costs. San Bernardino "had to pay $4 million for the response…Connecticut gave the city of Newtown $50 million just for the

costs of rebuilding…the costs from the 1999 shooting at Columbine High School came to roughly $50 million." (Delgadillo, 2018)

Impact to Public Confidence in Government

Public confidence in the government is directly related to the ability to respond to an active threat. The response to the Parkland shooting was widely seen as a failure of both policy and procedure, resulting in multiple lawsuits, a vote of no confidence in the Sheriff, and intense media scrutiny.

Changes in Development

Changes in development in the past five years have not significantly altered the risk of active threats in the planning area. Projected development in the next five is not anticipated to change it significantly either.

4.4.9 Jurisdictional Differences

There are few significant jurisdictional differences for this hazard. Multiple active shooter incidents have occurred in areas immediately adjacent to the City of Littleton, so the frequency is perceived as higher for that jurisdiction.

Table 4-17 Active Threat Rankings by Jurisdiction

Active Threat	Frequency	Spatial Extent	Severity	Overall Significance
Bennett	Occasional	Limited	Limited	Low
Bow Mar	Occasional	Limited	Limited	Low
Centennial	Occasional	Limited	Limited	Low
Cherry Hills Village	Occasional	Limited	Limited	Low
Columbine Valley	Occasional	Limited	Limited	Low
Deer Trail	Occasional	Limited	Limited	Low
Englewood	Occasional	Limited	Limited	Low
Foxfield	Occasional	Limited	Limited	Low
Glendale	Occasional	Limited	Limited	Low
Greenwood Village	Occasional	Limited	Limited	Low
Littleton	Likely	Limited	Limited	Medium
Sheridan	Occasional	Limited	Limited	Low
Denver Water	Occasional	Limited	Limited	Low
South Metro Fire	Occasional	Limited	Limited	Low
Unincorporated County	Occasional	Limited	Limited	Low

4.5 Cyber Threat

Hazard	Frequency	Spatial Extent	Severity	Significance
Cyber Threat	Likely	Significant	Critical	Medium

4.5.1 Risk Summary

- Ransomware attacks have become a major cyber threat in recent years, with local government servers being popular targets.
- The State of Colorado reports over 10,000 victims a year from cyber attacks since 2020, and financial losses have increased over 50% since 2017.
- The United States experienced 3,158 data compromises in 2024 alone.
- The severity of a cyber attack can be critical.
- The Internet Crime Complaint Center (IC3) Annual Report 2024 shows that the total reported losses from cybercrime reached a record $16.6 billion in 2024.
- Related hazards: Active Threat, Dam Incident and Hazardous Materials incident

4.5.2 Description

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

- **Phishing attacks:** Phishing attacks are fraudulent communications that appear to come from legitimate sources. Phishing attacks typically come through email but may come through text messages as well. Phishing may also be considered a type of social engineering meant to exploit employees into paying fake invoices, providing passwords, or sending sensitive information.
- **Malware attacks:** Malware is malicious code that may infect a computer system. Malware typically gains a foothold when a user visits an unsafe site, downloads untrusted software, or may be downloaded in conjunction with a phishing attack. Malware can remain undetected for years and spread across an entire network.
- **Ransomware:** Ransomware typically blocks access to a jurisdiction's/agency's/ business' data by encrypting it. Perpetrators will ask for a ransom to provide the security key and decrypt the data, although many ransomware victims never get their data back even after paying the ransom.
- **Distributed Denial of Service (DDoS) attack:** Perhaps the most common type of cyberattack, a DDoS attack seeks to overwhelm a network and causes it to either be inaccessible or shut down. A DDoS typically uses other infected systems and internet connected devices to "request" information from a specific network or server that is not configured or powerful enough to handle the traffic.
- **Data breach:** Hackers gaining access to large amounts of personal, sensitive, or confidential information has become increasingly common in recent years. In addition to networked systems, data breaches can occur due to the mishandling of external drives.

- **Critical Infrastructure/SCADA System attack:** There have been recent critical infrastructure Supervisory Control and Data Acquisition (SCADA) system attacks aimed at taking down lifelines such as power plants and wastewater facilities. These attacks typically combine a form of phishing, malware, or other social engineering mechanisms to gain access to the system.

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

4.5.3 Location

Cyber-attacks can and have occurred anywhere, regardless of geography, demographics, or existing security measures. These incidents may target a single location or span multiple regions simultaneously. The impacts of a cyber disruption often extend well beyond the immediate targets. Events occurring outside of Colorado can still affect individuals, businesses, and institutions within Arapahoe County. As such, the entire county remains vulnerable to the growing threat of cyber-attacks.

4.5.4 Magnitude/Severity

There is no universally accepted scale to explain the severity of cyber-attacks. The strength of a DDoS (Disrupted Denial of Service) attack is often explained in terms of data transmission rate. In 2024, Cloudfare mitigated the largest DDoS attack recorded to date, which peaks at 5.6 terabits per seconds and over 600 million packets per second.

Data breaches are often described in terms of the number of records or identities exposed. As of recently, the largest data breach ever reported occurred Augst 2024, security researchers discovered approximately 2.9 billion stolen records from National Public Data available for sale on dark web forums. Also in 2024, the largest healthcare data breach to data involving more than 1 million patient records. The hacking incidents associated with Colorado in the Privacy Rights Clearinghouse database are of a smaller scale, ranging from just 32 records to approximately 60,000, along with several cases in which an indeterminate number of records may have been stolen.

Ransomware attacks are typically described in terms of the amount of ransom requested, or by the amount of time and money spent to recover from the attack. One report from cybersecurity firm Emsisoft, shows that there were 6,018 victims in 2024, which was an increase from 2023.

4.5.5 Past Occurrences

The cybersecurity firm Statista, the United States experienced 3,158 data compromises in 2024. This meant that over 1.35 billion individuals were affected in the same year by data compromises, including data breaches, leakage, and exposure.

In early 2024, a ransomware attack on the Colorado State Public Defender's office disrupted court operations across the state. Additionally, the Arapahoe County Sheriff's Office has actively addressed cyber-related crimes.

The Privacy Rights Clearinghouse (PRC), a nonprofit organization based in San Diego, maintains a comprehensive databased of publicly reported data breaches in the United States. As of May 2025, the PRC reported 658 distinct security incidents, impacting over 32 million individuals. Colorado has experienced a significant number of cyberattacks since 2017. The State of Colorado has reported over 10,000 annual victims from 2020 and financial losses have increased over 50% since 2017. Attacks happening outside of the state can also impact local businesses, personal identifiable information, and credit card information. Table 4-18 shows several of the more significant cyberattacks in Colorado in recent years.

Table 4-18 Major Cyber Attacks Impacting Colorado, 2005-2025

Date Reported	Target	Total Records	Description
July 21, 2005	University of Colorado, Boulder	49,000	Data exposure/ personal identifiable information
August 2, 2005	University of Colorado, Denver	36,000	Data exposure/ personal identifiable information
July 17, 2007	Western Union, Greenwood Village	20,000	Credit card breach
April 22, 2014	Centura Health, Englewood	12,286	Health information breach
July 3, 2017	PVHS-ICM Employee Health and Wellness, Fort Collins	10,143	Data exposure/health information
February, 2018	Colorado Department of Transportation (CDOT)	N/A	Data encryption/ ransomware
August, 2019	Regis University	N/A	DDoS
December, 2019	Southeast Metro Storm Water Authority (SEMSWA)	N/A	Ransomware
June, 2020	Colorado Information Analysis Center (CIAC)	Unknown	Data Breach
June, 2023	Colorado Department of Higher Education (CDHE)	Potentially millions	Ransomware
February, 2024	Colorado State Public Defender's Office	Unknown	Ransomware
January, 2025	Aurora Public Schools Network Disruption	Unknown	Security Breach

Source: Privacy Rights Clearinghouse

The Colorado State Public Defender's Office Ransomware Attack targeted the Office of Colorado State Public Defender, affecting its operations statewide, including Arapahoe County. The malware encrypted data, rendering public defenders unable to access case information, which led to numerous court delays and rescheduled hearings. The extent of personal data exposure remains unclear, prompting officials to advise clients to monitor their financial accounts for suspicious activity.

In response to the evolving cyber threat throughout the United States, Arapahoe County has implemented several initiatives to ensure safe cyber security measures. Arapahoe County became the first county in Colorado to partner with StateRAMP, a nationally recognized risk authorization management program.

The collaboration ensures that third-party service providers handling sensitive county data meet stringent cybersecurity standards, thereby enhancing the protection of resident information. The County has also engaged with GovRAMP to assess and manage risk associated with third party cloud service providers.

4.5.6 Climate Change Considerations

Climate Change introduces new dimensions to cyber security risks. As environmental conditions evolve, so do the vulnerabilities of digital infrastructure. For instance, increased frequency of extreme weather events can strain physical infrastructure and digital systems alike. Disruptions can create opportunities for cyber attackers to exploit weakened systems or distracted emergency response.

4.5.7 Probability of Future Occurrence

Small-scale cyber-attacks such as DDoS attacks occur daily, but most have negligible impacts at the local or regional level. Data breaches are also extremely common, but again most have only minor impacts on government services.

Perhaps of greatest concern to Arapahoe County are ransomware attacks, which are becoming increasingly common. It is difficult to calculate the odds of Arapahoe County or one of its municipal governments being hit with a successful ransomware attack in any given year, but it is safe to say it is likely to be attacked in the coming years.

The possibility of a larger disruption affecting systems within the County is a constant threat, but it is difficult to quantify the exact probability due to such highly variable factors as the type of attack and intent of the attacker. Major attacks specifically targeting systems or infrastructure in the County cannot be ruled out.

4.5.8 Vulnerability and Consequence Analysis

The impact of a cyber-attack can vary depending on the type of attack and the intent of the malicious actor. Though a cyber disruption can have limited impacts within a system's own operations, it may cause cascading impacts. Ultimately, cyber-attacks can have significant cumulative economic impacts.

Impact to the Public

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

Data breaches and subsequent identify thefts can have huge impacts on the public. The Internet Crime Complaint Center (IC3) Annual Report 2024 shows that the total reported losses from cybercrime reached a record $16.6 billion that year.

Impact to Responders

Cyber-attacks can interfere with emergency response communications, access to mobile data terminals, and access to critical preplans and response documents. Effective communication is essential for

coordination during emergencies, and cyberattacks have the ability to compromise this by disrupting internal emails, inter-agency coordination platforms, and potentially radio systems.

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

Impact to Continuity of Operations (including continued delivery of services)

The delivery of services can be impacted since governments rely to a great extent upon electronic delivery of services. Most agencies rely on server backups, electronic backups, and remote options for Continuity of Operations/Continuity of Government. Many departments in Arapahoe County have the option to move to a paper method including permitting, DMV services, payments to and from the County, and payroll. However, access to documents on the network, OneDrive access, and other operations that require collaboration across the County will be significantly impacted.

Impact to Property, Facilities, and Infrastructure

The vast majority of cyber-attacks affect only data and computer systems. However, sophisticated attacks have occurred against the Supervisory Control and Data Acquisition (SCADA) systems of critical infrastructure, which could potentially result in system failures on a scale equal with natural disasters. Facilities and infrastructure such as the electrical grid could become unusable. A cyberattack took down the power grid in Ukraine in 2015, leaving over 230,000 people without power. The 2003 Northeast Blackout, while not the result of a cyberattack, caused 11 deaths and an estimated $6 billion in economic loss.

Arapahoe County's proximity to major urban and infrastructure hubs, including Denver, makes it both a potential target and a risk zone in the event of a regional or national cyber incident. Local facilities that depend on networked controls, such as wastewater treatment plants, emergency dispatch, and hospital systems, are vulnerable to cyber intrusions.

Impact to the Environment

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

Impact to the Economic Condition of the County and Jurisdictions

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

Impact to Public Confidence in Government

Public confidence in the government will likely suffer if systems such as permitting, DMV, voting, or public websites are down for a prolonged amount of time. An attack could raise questions regarding the security of using electronic systems for government services. In Arapahoe County, like elsewhere, residents expect government systems to be secure, reliable, and resilient. When those expectations are not met, residents may begin to question the preparedness of authorities.

Changes in Development

Changes in development in the past five years have not significantly altered the risk of active threats in the planning area. Projected development in the next five is not anticipated to change it significantly either.

4.5.9 Jurisdictional Differences

There are few significant jurisdictional differences for this hazard. The City of Littleton feels its increased reliance on technology due to remote working increased the risk of cyber incidents.

Table 4-19 Cyber Threat Rankings by Jurisdiction

Cyber Threat	Frequency	Spatial Extent	Severity	Overall Significance
Bennett	Likely	Significant	Critical	Medium
Bow Mar	Likely	Significant	Critical	Medium
Centennial	Likely	Significant	Critical	Medium
Cherry Hills Village	Likely	Significant	Critical	Medium
Columbine Valley	Likely	Significant	Critical	Medium
Deer Trail	Likely	Significant	Critical	Medium
Englewood	Likely	Significant	Critical	Medium
Foxfield	Likely	Significant	Critical	Medium
Glendale	Likely	Significant	Critical	Medium
Greenwood Village	Likely	Significant	Critical	Medium
Littleton	Likely	Significant	Critical	High
Sheridan	Likely	Significant	Critical	Medium
Denver Water	Likely	Significant	Critical	Medium
South Metro Fire	Likely	Significant	Critical	Medium
Unincorporated County	Likely	Significant	Critical	Medium

4.6 Dam Incident

Hazard	Frequency	Spatial Extent	Severity	Significance
Dam Failure	Unlikely	Significant	Critical	Medium

4.6.1 Risk Summary

- A total of 25 High Hazard and 10 Significant Hazard dams have been identified as potentially impacting Arapahoe County:
- Over 19,000 improved parcels are located within potential dam inundation zones, with a combined exposed value of $21.9 billion and 42,284 people potentially at risk.
- A total of 248 critical facilities are located in dam inundation zones. The most impacted categories include:
  - Bridge Operations (103 assets)
  - Healthcare and Public Health (59 assets)
  - Communications (20 assets)
- Transportation corridors affected by dam failure could severely disrupt emergency access, freight movement, and economic activity, particularly in areas like Littleton, Columbine Valley, Glendale, and Aurora
- Continued urban development within dam inundation areas may increase downstream exposure and could lead to upgrades in dam hazard classifications over time, from Significant to High Hazard status.
- Related hazards: Earthquake, Flooding, Severe Summer Weather, Severe Winter Weather, Severe Wind/Tornado, Cyber Threat.

4.6.2 Description

Dams are water storage, control or diversion structures that impound water upstream in reservoirs. Dams are constructed for a variety of uses, including flood protection, power, agriculture/irrigation, water supply, and recreation. Dams typically are constructed of earth, rock, concrete, or mine tailings. Dam failure can take several forms, including a collapse of, or breach in, the structure. While most dams have storage volumes small enough that failures have few or no repercussions, dams storing large amounts of water can cause significant flooding downstream.

Dam failures can result from any one or a combination of the following causes:

- Prolonged periods of rainfall and flooding resulting in overtopping (overtopping is the primary cause of earthen dam failure)
- Earthquake/seismic activity
- Inadequate spillway capacity resulting in excess overtopping flows
- Internal erosion caused by embankment/foundation leakage or piping or rodent/wildlife activity
- Improper design
- Improper maintenance
- Negligent operation
- Failure of upstream dams on the same waterway

Dam failure can occur with little warning. Intense storms may produce a flood in a few hours or even minutes for upstream locations. Flash floods occur within six hours of the beginning of heavy rainfall and dam failure may occur within hours of the first signs of breaching. Other failures and breaches can take much longer to occur, from days to weeks, as a result of debris jams or the accumulation of melting snow.

Dam inundation can also occur from non-failure events, such as when outlet releases increase during periods of heavy rain or high inflows. Controlled releases to allow water to escape when a reservoir is overfilling can help prevent future overtopping or failure. When outlet releases are not enough, spillways are designed to allow excess water to exit the reservoir and prevent overtopping. This protects the dam but can cause significant flooding downstream. The term Dam Incident is meant to capture both the more common dam inundation as well as less likely dam failures.

Two factors that influence the potential severity of a full or partial dam failure are the amount of water impounded, and the density, type, and value of development and infrastructure located downstream. The U.S. Army Corps of Engineers and the Colorado State Engineer classify dams into four categories as determined by analysis of potential consequences from a sunny day failure of the dam, as shown in Table 4-20.

It is important to keep in mind that the hazard classification of a dam is a measure of the consequences if the dam were to fail, not a measure of how likely the dam is to fail.

Table 4-20 Dam Hazard Classification Definitions

Hazard Class	Definition
High	A dam for which life loss is expected to result from failure of the dam.
Significant	A dam for which significant damage, but no life loss is expected to result from failure of the dam. Significant damage is defined as damage to structures where people generally live, work, or recreate, including public and private facilities. Significant damage is determined to be damage sufficient to render structures or facilities uninhabitable or inoperable.
Low	A dam for which neither life loss nor significant damage as defined for a Significant Hazard dam are expected to result from failure of the dam.
No Public Hazard (NPH)	A dam for which neither life loss nor significant damage as defined for a Significant Hazard dam are expected to result from failure of the dam.

Source: Colorado Division of Water Resources, Dam Safety Division, https://dwr.colorado.gov/services/dam-safety

The Colorado State Engineer periodically reviews the hazard classification of existing dams by evaluating the consequences of failure. If the State Engineer's review indicates the consequences of failure have changed within the dam failure inundation area, the State Engineer will assign an appropriate new hazard classification. The Colorado Division of Water Resources, Dam Safety Branch performs regular dam safety inspections at a frequency appropriate to the hazard classification of the dam.

4.6.3 Location

Dams Within the Planning Area

For this plan update, The Colorado Department of Natural Resources High Hazard Dam 2024 database and the National Inventory of Dams database were queried for those dams either inside the Arapahoe County boundaries, or upstream of it, that may cause inundation into the County if the structures failed..

There are 16 dams within the boundaries of Arapahoe County. Of these, nine are High Hazard dams, three are Significant Hazard dams, and four are Low Hazard dams. Table 4-21 provides the names, locations, and other pertinent information for all high and significant hazard dams in the planning area. Figure 4-9 shows the location of dams within Arapahoe County. Inundation maps can be found in Appendix H (not available for public release).

Table 4-21 High and Significant Hazard Dams in Arapahoe County

Dam Name	NID #	Hazard Class	EAP	Dam Height	Storage (acre-ft.)	River	Nearest Downstream City/Distance (miles)
Cherry Creek	CO01280	H	Y	140’	134,470	Cherry Creek	Denver/0.1
Englewood	CO00300	H	Y	55’	3,500	Willow Creek	Littleton/0.1
Exposition Park	CO02816	H	Y	19’	293	Westerly Creek	Aurora/0
Holly	CO02214	H	Y	40’	455	Little Dry Creek	Littleton/0.1
Mc Lellan	CO01153	H	Y	111’	9,700	Dad Clark Gulch	Littleton/0.1
Quincy	CO00104	H	Y	70’	4,560	West Toll Gate Creek	Aurora/1
Senac	CO02709	H	Y	131’	40,400	Senac Creek	Aurora/10
South Platte Reservoir	CO02858	H	Y	64’	7,435	South Platte River	Littleton/0
Blackmer #1	CO00263	H	Y	12’	69	South Platte River-TR	Cherry Hills Village/1
Arapahoe Lake	CO02089	S	Y	20’	398	Goldsmith Gulch	Denver/0
Belisle	CO01789	S	Y	30’	204	Big Dry Creek	Englewood/0
Upper Tule Lake	CO01816	S	Y	11’	45	S Platte River	Littleton/0

Source: National Inventory of Dams; https://nid.sec.usace.army.mil, Colorado Water Conservation Board: dwr.state.co.us/Tools/DamSafety/Dams
H = High; S = Significant; EAP = Emergency Action Plan

Dams Upstream of the Planning Area

There are also 30 dams located outside of Arapahoe County’s boundaries that could affect Arapahoe County and its population if they were to fail, of which 16 are High Hazard dams and 7 are Significant Hazard dams. Table 4-22 provides the names, locations, and other pertinent information for all high and significant hazard dams with the potential to impact the planning area. One of these dams, Polly A. Deane, is currently rated as Unsatisfactory by the Colorado Dam Safety Program.

Table 4-22 High and Significant Hazard Dams Upstream of Arapahoe County

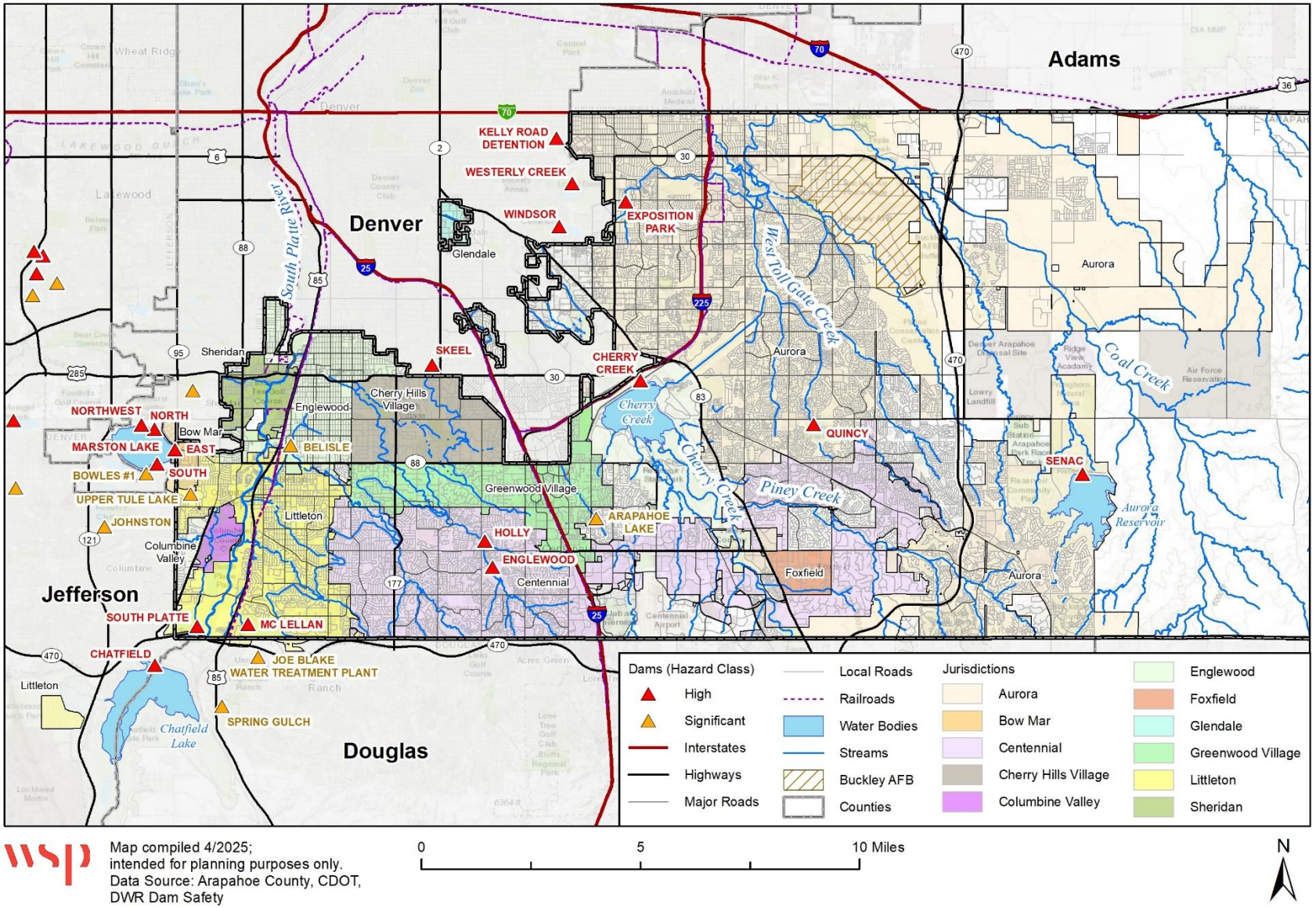
Dam Name	NID #	Hazard Class	Dam Height	Storage (acre-ft.)	River	County	Nearest Downstream City/Distance (miles)
Bear Creek	CO00004	H	179’	75,000	Bear Creek	Jefferson	Lakewood/1
Bergen East	CO01821	H	40’	1,150	Weaver Gulch	Jefferson	Morrison/0
Bergen West	CO01790	H	25’	505	Weaver Gulch	Jefferson	Lakewood/4
Chambers Reservoir	CO03020	H	42.5’	1,436	Happy Canyon Creek	Douglas	Parker, Co/4
Chatfield	CO01281	H	147’	355,000	South Platte River	Jefferson	Littleton/0.1
Franktown Parker Fpp-1	CO00287	H	27’	102	Baldwin Gulch	Douglas	Denver/0
Harriman	CO01823	H	15.3’	963	Weaver Creek	Jefferson	LAKEWOOD/1
Kelly Road Detention	CO02345	H	32’	800	Westerly Creek	Denver	Denver/0.1
Marston Lake – East Dam	CO02799	H	17’	21,100	South Platte River	Denver	Denver/0.1
Marston Lake – North Dam	CO02012	H	30’	22,500	South Platte River	Denver	Denver/0.1
Marston Lake – Northwest Dike	CO02800	H	15’	21,100’	South Platte River	Denver	Denver/0.1
Marston Lake – South Dam	CO02798	H	33’	21,100	South Platte River	Denver	Denver/0.1
Polly A. Deane	CO00336	H	20’	760	Dutch Creek	Jefferson	Littleton/0.1
Rueter Hess	CO02949	H	196’	85,176	Newlin Gulch	Douglas	Parker/0.1
Westerly Creek	CO02708	H	44.5’	9,300	Westerly Creek	Denver	Denver/1
Willow Springs #1	CO01791	H	23’	140	Turkey Creek	Jefferson	Lakewood/5
Beers Sisters Lake	CO00327	S	19.7’	83	S. Platte River	Jefferson	Littleton/0.1
Bowles #1	CO01822	S	20’	3,115	South Platte River	Jefferson	Bowmar/1
Harwood South Storage Reservoir	CO00329	S	32’	184	Weaver Gulch	Jefferson	Lakewood/5
Joe Blake Water Treatment Plant Forebay	CO03051	S	11.5’	86	Dad Clark Gulch	Douglas	Littleton/1

Dam Name	NID #	Hazard Class	Dam Height	Storage (acre-ft.)	River	County	Nearest Downstream City/Distance (miles)
Johnston	CO01827	S	11’	1,134	Lilley Gulch	Jefferson	Littleton/0.1
Memorial Dam	CO02425	S	28’	98	Bear Creek	Denver	Sheridan/1
Spring Gulch	CO01279	S	78’	1,752	Spring Gulch	Douglas	Littleton/0.1

Source: Colorado DWR Dam Safety Program
*H = High; S = Significant; EAP = Emergency Action Plan; * = Currently rated Unsatisfactory by the Colorado Dam Safety Program.*

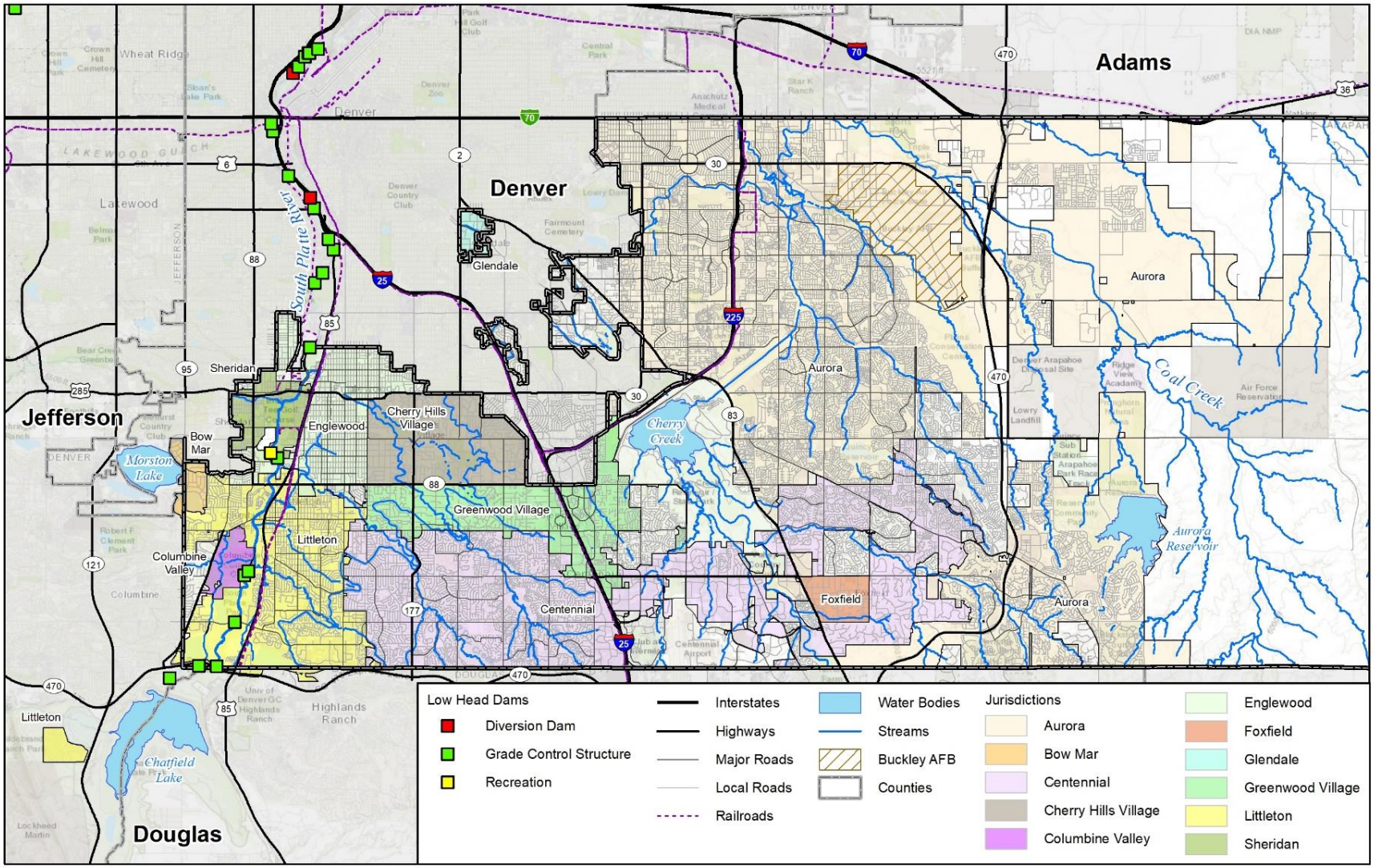
Figure 4-10 depicts the location of low head dams in the County per DWR data, which are structures built across rivers or streams that allow water to flow evenly over the top of the dam’s crest. These dams are important to highlight because they can create dangerous currents, especially when water levels rise, leading to a backward pull that can trap people in the water. This figure is included to help identify areas where these dams are present, thus emphasizing the need for safety and awareness. A map of potential dam inundation areas is included in Appendix K.

Figure 4-9 Dams of Concern in Western Arapahoe County



Map compiled 4/2025;
intended for planning purposes only.
Data Source: Arapahoe County, CDOT, DWR Dam Safety

Figure 4-10 Low Head Dams in Western Arapahoe County



Map compiled 4/2025;
intended for planning purposes only.
Data Source: Arapahoe County, CDOT, DWR Dam Safety

4.6.4 Magnitude/Severity

Potential severity of a dam failure is typically measured by the hazard classification described above. Failure of a high hazard dam could potentially lead to multiple deaths; property destroyed and severely damaged; and/or interruption of essential facilities and services for more than 72 hours. This gives dam incidents a magnitude rating of **critical** for Arapahoe County.

Water released by a failed dam generates tremendous energy and can cause catastrophic flooding that threatens life and property downstream. The largest three dams in terms of maximum storage in or upstream of Arapahoe County are:

- Chatfield Dam in Douglas County on the South Platte River (355,000 acre-feet capacity);
- Cherry Creek Dam in Arapahoe County on the Cherry Creek River (134,470 acre-feet capacity);
- Eleven Mile Canyon Dam in Park County (128,000 acre-feet capacity).

As shown on the maps in Appendix K, large portions of the County are potentially at risk of dam inundation. The property study described in the vulnerability section below identifies 19,364 parcels in inundation areas, 17,382 of which are residential (including mobile homes and multi-family residential). An estimated 42,284 people and $21.9 billion in property are potentially at risk of dam inundation.

A dam failure event's speed of onset can range from sudden, with little warning prior to the release of dangerous flood flows, to an event that gradually unfolds. A spring or summer storm involving heavy rain can lead to a flash flood within six hours of the beginning of the event. Dam failure because of heavy rain can occur within hours of the first signs of failure. Flooding from a non-failure dam event could last for several days depending on the amount of water needing to be released to relieve pressure on the dam.

High Hazard Dam Outlet Release Analysis

In addition to standard hazard classifications, DWR maintains a separate analysis ranking high hazard dams based on their potential downstream impacts from controlled or uncontrolled outlet releases that result in flooding. This dataset, originally prepared in 2020, evaluates dams by:

- Maximum Outlet Release Capacity (in cubic feet per second),
- A Composite Ranking score (1–367), and
- A derived Outlet Release Ranking (High, Moderate, or Low)

The Composite Ranking reflects the relative impact of a dam's outlet flow based on hydrologic modeling, infrastructure vulnerability, and floodplain exposure. DWR segments the scores into three tiers:

- High Impact: Rank 1–139
- Moderate Impact: Rank 140–278
- Low Impact: Rank 279–367

Eight dams in Arapahoe County were evaluated in this analysis: South Platte Reservoir, Cherry Creek, Holly, Englewood, Exposition Park, Quincy, Senac, and McLellan. Each of these dams received High outlet release rankings, indicating significant downstream consequences in the event of outlet failure or misoperation.

This analysis provides an additional layer of risk insight beyond traditional hazard classifications. While all eight of these dams are already designated as High Hazard Potential by DWR, the outlet release data

helps prioritize emergency planning, downstream alerting, and response needs based on likely flood behavior and infrastructure exposure.

Table 4-23 Outlet Release Impact Rankings for High Hazard Dams in Arapahoe County

Dam Name	Outlet Description	Max Release (cfs)	Composite Ranking	Release Ranking
South Platte Reservoir	48" diameter concrete encased welded steel pipe w/ upstream sluice gate. Service spillway drop structure discharges into outlet conduit.	110	10	High
Cherry Creek	3 concrete pipes	8,100	12	High
Holly	36" RCP, ungated	195	15	High
Englewood	36" Concrete	210	22	High
Exposition Park	36" RCP Ungated	109	25	High
Quincy	42" steel	180	36	High
Senac	72” steel-lined concrete	480	64	High
Mc Lellan	30" steel-lined concrete	48	98	High

Source: Colorado DWR. High Hazard Dam Release – Downstream Floodplain Impacts Study. Version No. 12/15/2020.

4.6.5 Past Occurrences

There has not been a recorded dam failure event for any of the participating jurisdictions involved in this plan. The last major dam failure in Colorado happened in 1982 when the deterioration of the earthen Lawn Lake Dam in the Rocky Mountain National Park breached. The dam released 220 million gallons of water, killing three people and causing $31 million in damage around the Town of Estes Park. Closer to the planning area, in 1933 the Castlewood Dam in Douglas County failed, sending more than one billion gallons of water and an estimated 20,000 tons of debris through the City of Denver, killing two people and causing over $1M in damages (the equivalent of $25M adjusted for inflation.

4.6.6 Climate Change Considerations

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

4.6.7 Probability of Future Occurrence

Arapahoe County has no recorded events of significant dam failures. The probability of a future event is unlikely, although it will always remain possible. High and significant hazard dams are closely monitored, as described above. Uncontrolled or controlled release flooding as well as spillway flooding below dams due to excessive rain or runoff are more likely to occur than failures.

4.6.8 Vulnerability and Consequence Analysis

Vulnerability of Dams to Other Hazards

In addition to the threat posed by dam failure, dams are themselves critical facilities that can be impacted by dam failures that occur upstream, as well as natural hazards, such as earthquake, flooding, landslides, severe weather, tornadoes/high wind, and wildfire, as well as human caused hazards such as active threat or cyber threat. Any of these hazards have the potential to damage a dam, potentially triggering a dam failure and the release of water. Therefore, mitigation measures must include measures to protect the dams themselves, as well as actions to reduce downstream impacts of a dam failure. These measures will need to be coordinated with dam owners.

Table 4-24 shows dams in Arapahoe County located in areas at risk of other hazards. There are three dams exposed to the 1% annual chance flood hazard in the County, seven exposed to areas of high or moderate risk of expansive soils, and seven located near hazmat facilities or routes. All dams in Arapahoe County could be affected by earthquakes though the probability of damage is low. Dams are also exposed to all weather hazards, although they are unlikely to be damaged by severe weather. Terrorism and cyber-attacks could also target dams with potentially catastrophic consequences.

Table 4-24 Arapahoe County Dams at Risk to Other Hazards

Dam Hazard Class	Total Number of Dams	1% Flood Hazard	0.2% Flood Hazard	Exp. Soil High Risk	Exp. Soil Moderate Risk	WUI Highest-Moderate	Hazmat RMP/Route
High	8	2	-	2	3	-	5
Significant	3	1	-	-	2	-	2
Total	**11**	**3**	**0**	**2**	**5**	**0**	**7**

Source: Arapahoe County Sheriff's Office, DWR Dam Safety, WSP GIS Analysis

Impact to the Public

Table 4-25 shows the number of residents estimated to live in dam inundation areas, based on the number of residential properties located in inundation zones. Countywide, 42,284 people (6.4% of the County population) are potentially at risk of dam inundation.

While most dam failures have enough advance warning to issue evacuation orders, fatalities are still possible. However, impacts on residential properties can be severe, including not only direct flood damage but also contamination due to flooding of hazardous waste leading to further public health issues, as well as damage to sanitation services. Depending on the severity of an event, large numbers of people may be displaced or left homeless.

Impact to Responders

Responders in flooded areas at the time of incident or assisting in evacuations could be at risk. Impacts to transportation corridors and communications lines could affect first responders' ability to effectively respond.

Impact to Continuity of Operations (including continued delivery of services)

Possible short-term accessibility issues for first responders performing routine duties or personnel reporting to work locations. Damage to facilities/personnel in the incident area may require temporary relocation of some operations.

Impact to Property, Facilities, and Infrastructure

Inundation mapping was provided by the Colorado DWR Dam Safety Division. Using the GIS analysis methodology outlined above allowed comparative analysis to determine number and improvement values of parcels by type that fall within the boundaries of the dam inundation areas. Content value is assumed to be 50% the improvement value for residential structures and 100% the improvement value for non-residential structures.

Table 4-25 shows the number of residential and non-residential parcels located in mapped dam inundation areas, broken down by jurisdiction. The table also shows estimated value of the structures. Total values are determined by adding estimated contents values as described in Section 4.2.1. In total, approximately 9.2% of parcels in the County are at risk of dam inundation, representing over $21.9 billion worth of property. Table 4-26 below summarizes the property exposure summarized by each dam from which mapped inundation originates. Note that many inundation areas overlap jurisdiction boundaries, so the values in Table 4-26 should not be added together as that would inflate the risk.

Table 4-25 Arapahoe County Risk Summary to All Dam Inundation by Jurisdiction

Jurisdiction	Improved Parcels	Improved Value	Total Value	% of Parcels At Risk	Population At Risk
Aurora	6,382	$3,327,458,919	$5,227,378,555	6.1%	16,118
Bennett	-	-	-	-	-
Bow Mar	106	$127,761,539	$191,642,309	34.6%	322
Centennial	1,024	$859,741,311	$1,424,029,670	2.7%	1,938
Cherry Hills Village	108	$210,590,784	$328,670,886	4.8%	300
Columbine Valley	619	$709,262,403	$1,071,357,059	89.5%	1,619
Deer Trail	-	-	-	-	-
Englewood	2,992	$2,047,126,905	$3,569,430,316	26.2%	4,674
Foxfield	-	-	-	-	-
Glendale	465	$1,026,861,364	$1,719,766,928	98.5%	921
Greenwood Village	37	$66,557,400	$99,846,900	0.7%	85
Littleton	3,476	$2,239,708,649	$3,569,736,510	22.8%	6,944
Sheridan	988	$573,529,476	$1,002,770,143	56.7%	1,834
Unincorporated	3,167	$2,394,847,342	$3,699,600,410	10.9%	7,527
Total	**19,364**	**$13,583,446,092**	**$21,904,229,684**	**9.2%**	**42,284**

Source: Arapahoe, Adams, Douglas, and Jefferson County Assessor Data, DWR Dam Safety, WSP GIS Analysis

Table 4-26 Dam Inundation Risk by Dam Name

Dam Name	Improved Parcels	Improved Value	% of Parcels At Risk	Population At Risk
Arapahoe Lake*	4	$2,569,900	0.002%	11
Bear Creek	1,578	$1,136,335,648	0.7%	2,913
Belisle*	12	$14,532,005	0.01%	0
Bergen East	220	$55,499,926	0.10%	505
Bowles #1*	1	$277,289	0.0005%	0
Chambers Reservoir	1	$0	0.0005%	0
Chatfield	7,306	$5,072,599,013	3.5%	13,757
Cherry Creek	4,033	$3,574,034,222	1.9%	9,579
Englewood	2,481	$1,916,993,408	1.2%	4,590
Exposition Park	255	$169,511,657	0.12%	615
Harriman	94	$31,115,632	0.04%	207
Harwood South Storage*	6	$541,400	0.003%	15
Holly	1,605	$1,062,799,470	0.8%	3,073
Johnston*	1	$740,900	0.0005%	3
Kelly Road Detention	5	$7,677,189	0.002%	0
Marston Lake – East	1,775	$1,029,728,550	0.8%	3,642
Marston Lake – North	842	$444,083,363	0.4%	1,672
Marston Lake – Northwest	450	$145,359,674	0.2%	950
Marston Lake – South	36	$46,099,962	0.02%	96
McLellan	1,895	$1,193,864,539	0.9%	3,873
Polly A. Deane	46	$59,934,771	0.02%	120
Quincy	4,768	$2,198,507,520	2.3%	12,281
Rueter Hess	1,975	$1,474,579,575	0.9%	4,755
Senac	529	$309,445,989	0.8%	3,564
South Platte Reservoir	1,661	$1,000,406,133	0.3%	1,333
Spring Gulch*	1,343	$803,732,553	0.6%	2,824
Upper Tule Lake*	146	$97,995,139	0.1%	305
Westerly Creek	290	$88,706,990	0.14%	715
Willow Springs #1	1	$125,000	0.0005%	2

Source: Arapahoe, Adams, Douglas, and Jefferson County Assessor Data, DWR Dam Safety, WSP GIS Analysis
** Indicates Significant Hazard Dams, all other dams are High Hazard*

Critical facilities from Category A and Category B that could be impacted by dam failure are shown in Table 4-27 and Table 4-28, respectively. In all 248 critical facilities have been identified as being at risk from dam inundation. This constitutes 17.7% of the critical facilities in the County.

Table 4-27 Category A Critical Sectors at Risk to Dam Inundation by Jurisdiction

Jurisdiction	Emergency Services	Government Facilities	Healthcare and Public Health	Total Count
Centennial	1	-	-	**1**
Columbine Valley	1	-	-	**1**
Glendale	2	-	-	**2**
Littleton	4	-	-	**4**
Unincorporated County	2	-	-	**2**
Douglas County	3	-	-	**3**
Total	**13**	**0**	**0**	**13**

Source: Arapahoe County Sheriff's Office, HIFLD, South Metro Fire Rescue, DWR Dam Safety, WSP GIS Analysis

Table 4-28 Category B Critical Sectors at Risk to Dam Inundation by Jurisdiction

Jurisdiction	Bridge Operations	Chemical Storage	Communications	Critical Manufacturing	Dam	Defense Industrial Base	Energy	Financial Services	Food and Agriculture	Government Facilities	Healthcare and Public Health	Information Technology	Postal and Shipping	School	Transportation Systems	Water and Wastewater Systems	Total Count
Aurora	28	1	8	-	2	-	6	-	2	1	24	-	-	-	-	3	**75**
Centennial	13	-	-	-	2	-	-	-	-	-	5	-	-	-	-	3	**23**
Cherry Hills Village	2	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	**4**
Columbine Valley	3	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	**4**
Englewood	12	2	4	-	1	-	1	-	4	-	13	-	2	-	-	4	**43**
Glendale	1	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	**3**
Greenwood Village	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**3**
Littleton	18	-	4	-	2	-	2	-	-	-	11	-	1	-	-	2	**40**
Sheridan	9	-	2	-	-	-	2	-	2	-	3	-	-	-	-	-	**18**
Unincorporated Arapahoe County	14	-	-	-	2	-	2	-	-	-	-	-	-	-	-	3	**21**
Adams County	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	**1**
Total	**103**	**3**	**20**	**0**	**9**	**0**	**13**	**0**	**8**	**1**	**59**	**0**	**3**	**0**	**0**	**16**	**235**

Source: Arapahoe County Sheriff's Office, HIFLD, South Metro Fire Rescue, DWR Dam Safety, WSP GIS Analysis

South Metro Fire Rescue Assets

There are five South Metro Fire Rescue facilities within dam inundation zones:

- South Metro Fire Training Center
- Troy Jackson Training Center
- Station 11
- Station 16
- Station 41

Impact to the Environment

Wetland impacts due to dam or levee failure flooding can affect water quality and wildlife habitat. Dam failure flooding may alter stream flow patterns, increase erosion, and lead to release of hazardous materials, sediment, or waste into streams, rivers, drinking water supply, ground water, and air.

Impact to the Economic Condition of the County and Jurisdictions

Extensive and long-lasting economic impacts could result from a major dam failure or inundation event, including the long-term loss of water in a reservoir, which may be critical for potable water needs or local wildlife. A major dam failure and loss of water from a key structure could bring about direct business and industry damages and potential indirect disruption of the local economy and potentially affect important transportation routes enabling business and tourism into the County.

Impact to Public Confidence in Government

Ability to respond and recover may be questioned and challenged by the public if planning, response, and recovery are not timely and effective, regardless of the dam owner.

Changes in Development

Since the 2020 Arapahoe County HMP, there have been 832 new structures built in dam inundation areas. The vast majority of these are residential buildings. Future developments in Arapahoe County will continue to be vulnerable to possible dam failure, and any further development downstream of existing dams will elevate the possible consequences if a dam should fail. Development downstream of dams increases exposure to dams incidents, and can also lead to dams being reclassified to higher hazard ratings.

4.6.9 Jurisdictional Differences

Dam failure has the potential to affect several jurisdictions in Arapahoe County. As can be seen in Figure 4-9, the risk is greatest in the western parts of the County. In terms of total value of property, Table 4-25 shows the greatest exposure is in Aurora, the Unincorporated County, Littleton, and Englewood. Expressed as a percentage of total parcels exposed, the greatest risk is in Glendale (98.5%) Columbine Valley (89.5%), Sheridan (56.7%), and Bow Mar (34.6%). Comparing the critical facilities exposed to dam failure, Aurora, Englewood, Littleton, and Centennial have the greatest number of at risk facilities.

Table 4-29 Dam Incident Hazard Rankings by Jurisdiction

Dam Incident	Frequency	Spatial Extent	Severity	Overall Significance
Bennett	Unlikely	Limited	Negligible	Low
Bow Mar	Unlikely	Extensive	Critical	High
Centennial	Unlikely	Limited	Limited	Low
Cherry Hills Village	Unlikely	Limited	Limited	Low
Columbine Valley	Unlikely	Extensive	Catastrophic	High
Deer Trail	Unlikely	Limited	Negligible	NA
Englewood	Unlikely	Significant	Critical	Medium
Foxfield	Unlikely	Limited	Negligible	NA
Glendale	Unlikely	Extensive	Catastrophic	High
Greenwood Village	Unlikely	Limited	Limited	Low
Littleton	Unlikely	Significant	Critical	Medium
Sheridan	Unlikely	Extensive	Catastrophic	High
Denver Water	Unlikely	Extensive	Critical	High
South Metro Fire	Unlikely	Significant	Critical	Medium
Unincorporated County	Unlikely	Extensive	Critical	High

4.7 Drought

Hazard	Frequency	Spatial Extent	Severity	Significance
Drought	Likely	Extensive	Limited	Medium

4.7.1 Risk Summary

- Since 2000, Arapahoe County has spent 820 weeks (or 63% of the time) in some level of drought.
- The industries most affected within the last two years are:
  - Agriculture
  - Plants and wildlife
  - Relief, response, and restrictions
  - Water supply and quality
- Drought is closely tied to extreme heat and heat waves. The average annual temperature in Arapahoe County increased by 2 degrees Fahrenheit from 2020 to 2024 with a trend of increasing temperatures predicted through 2050.
- Arapahoe County relies on multiple separate water districts and agencies to supply its communities, with a strong commitment to collaborating with districts and municipalities in other counties. Some of the County's water supplies comes from renewable surface water and mountain snowpack while the more rural parts rely on groundwater.
- Population increases and rising temperatures pose a threat to water as a resource in the front range, showing the importance of allocating and putting planning mechanisms into place to reduce the impact of drought.
- Related Hazards: Wildfire, Severe Summer Weather, Urban Conflagration

4.7.2 Description

Drought is a normal part of Colorado's climate, including areas with high and low average rainfall. It is a slow-onset hazard caused by a deficiency of precipitation and can be aggravated by other factors such as high temperatures, high winds, and low relative humidity.

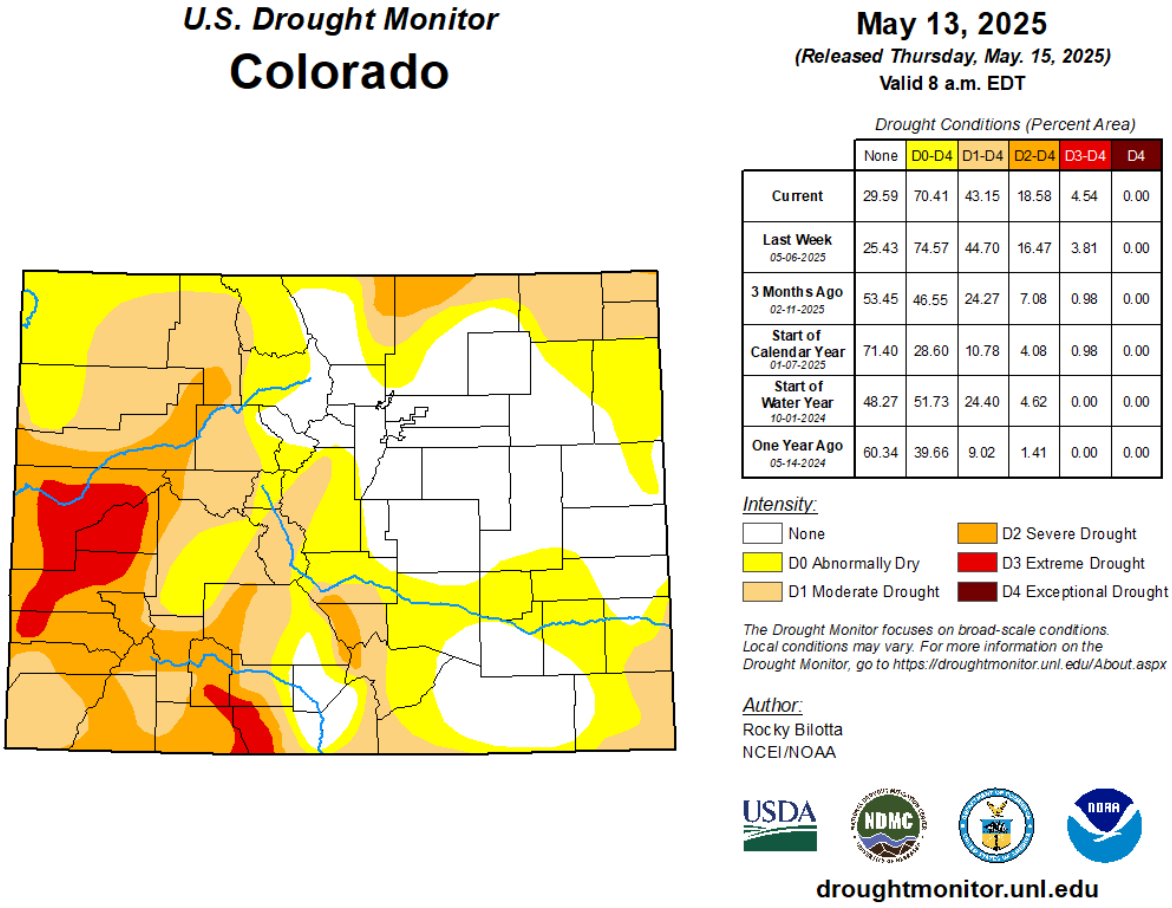
The National Drought Mitigation Center defines four types of droughts based on their impacts:

- **Meteorological drought** is defined solely on the degree and duration of dryness. It is expressed as a departure of actual precipitation from an expected average or normal amount based on monthly, seasonal, or annual time scales.
- **Hydrologic drought** is related to the effects of precipitation shortfalls on surface and subsurface water supplies including stream flows and reservoir, lake, and groundwater levels.
- **Agricultural drought** is defined in terms of soil moisture deficiencies and reduced water supply relative to the variable water demands of crops, livestock, and other agricultural operations.
- **Socioeconomic drought** associates the supply and demand of water or other economic goods or services with elements of meteorological, hydrologic, and agricultural drought. Socioeconomic drought occurs when the demand for water exceeds the supply because of a weather related supply shortfall. The incidence of this type of drought can increase because of a change in the amount of rainfall, a change in societal demands for water (or vulnerability to water shortages), or both.

The U.S. Drought Monitor provides a weekly summary of drought conditions across the United States. It provides a single composite drought indicator, often described as a blend of art and science due to its incorporation of multiple quantitative and qualitative measures of drought, including data-based drought indices as well as local expert input. Indicator ratings range from an intensity of D0 Abnormally Dry to D4 Exceptional Drought. Among the indices considered by the U.S. Drought Monitor are the Palmer Drought Severity Index (PDSI) and the Standardized Precipitation Index (SPI). The PDSI uses temperature and precipitation data to calculate water supply and demand, incorporates soil moisture, and is considered most effective for measuring drought on unirrigated cropland. It primarily reflects long-term drought. The SPI is a more simplified probability index that considers only precipitation.

Figure 4-11 shows the U.S. Drought Monitor for Colorado as of May 13th, 2025, providing a snapshot illustrating the regional and long-term nature of drought.

Figure 4-11 U.S. Drought Monitor

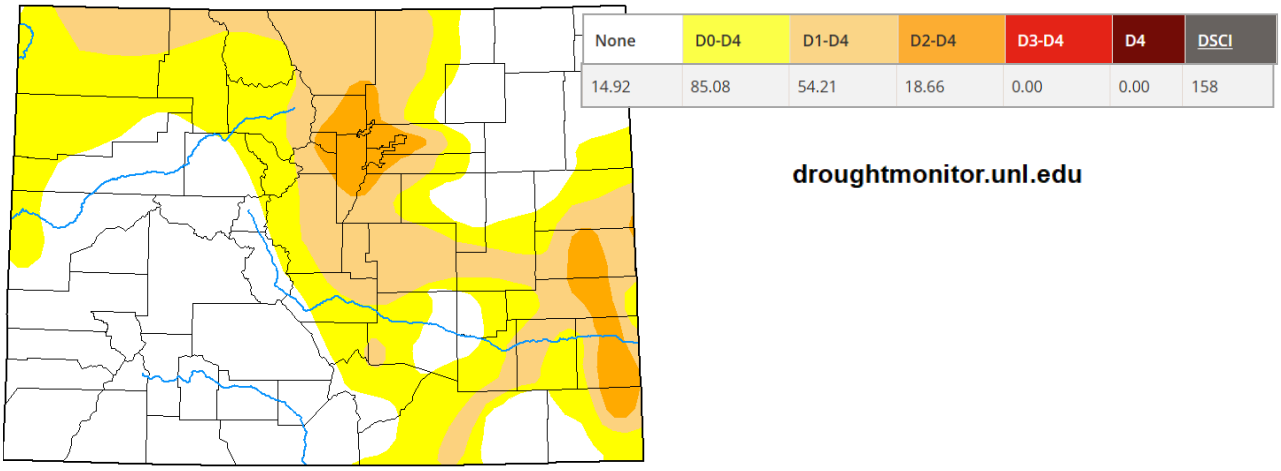


Source: US Drought Monitor

For Arapahoe County, another way the US Drought Monitor shows water availability is through the water year. The water year is from October 1st through September 30th. Figure 4-11 above shows data for the State of Colorado, with 51.73% of the area being in a D0-D4 drought. Figure 4-12 below shows the water year for Arapahoe County from October 1st, 2024 through June 6th, 2025. This shows that the percent area

in Arapahoe County that has been in a D0-D4 drought since the start of the water year (October 1st, 2024) is 85.08%.

Figure 4-12 Arapahoe County Drought Monitor – Water Year



4.7.3 Location

Drought is regional in nature and can occur anywhere in Arapahoe County, affecting all or part of the County at any given time. While the consequences of drought may vary across the County due to the higher vulnerability of agricultural lands, water-dependent recreation, and areas of wildfire risk, all of Arapahoe County may experience drought conditions. Different parts of the County may experience more severe drought depending on where they get their water from; the eastern portion of the County mainly uses groundwater while the western portion uses surface water and snowmelt runoff. According to the United States Geological Survey, surface water is greatly affected by rising temperatures and higher evaporation rates while groundwater levels can be impacted by recharge from infiltration or precipitation. This illustrates that despite what water source a community uses, they can all be impacted by drought.

For the eastern half of Arapahoe County, the shrubland is severely impacted by drought. According to research done on the eastern plains of Colorado by the Colorado State University Department of Biology, loss of aboveground plant growth was 60% greater when short-term drought was extreme compared to the less severe droughts that been more commonly experienced historically.

4.7.4 Magnitude/Severity

Drought impacts can cover large areas and may come in many forms. The impacts associated with drought magnify as the duration of the event increases, as supplemental supplies in reservoirs are depleted and water levels in groundwater aquifers decline.

The U.S. Drought Monitor, which measures drought based on the PDSI, SPI, Keetch-Byram Drought Index, soil moisture indicators, streamflow, and other qualitative inputs, can be used to define drought severity. Figure 4-13 details the criteria for each Drought Monitor category, and Figure 4-14 summarizes the typical impacts associated with each Drought Monitor category in the State of Colorado. These possible impacts indicate that agricultural and rural lands are the primary affected areas under drought

conditions of Category D0 through D2, while Category D3 and worse impacts are felt in urban areas and more severely affect water supplies and recreational industries. Since most of eastern Arapahoe County is agricultural and rural lands, even a D0 through D2 drought could greatly impact the planning area. Up to D4 drought conditions are possible across the County.

Figure 4-13 U.S. Drought Monitor Categories

			Ranges				
Category	Description	Possible Impacts	Palmer Drought Severity Index (PDSI)	CPC Soil Moisture Model (Percentiles)	USGS Weekly Streamflow (Percentiles)	Standardized Precipitation Index (SPI)	Objective Drought Indicator Blends (Percentiles)
D0	Abnormally Dry	Going into drought: ▪ short-term dryness slowing planting, growth of crops or pastures Coming out of drought: ▪ some lingering water deficits ▪ pastures or crops not fully recovered	-1.0 to -1.9	21 to 30	21 to 30	-0.5 to -0.7	21 to 30
D1	Moderate Drought	▪ Some damage to crops, pastures ▪ Streams, reservoirs, or wells low, some water shortages developing or imminent ▪ Voluntary water-use restrictions requested	-2.0 to -2.9	11 to 20	11 to 20	-0.8 to -1.2	11 to 20
D2	Severe Drought	▪ Crop or pasture losses likely ▪ Water shortages common ▪ Water restrictions imposed	-3.0 to -3.9	6 to 10	6 to 10	-1.3 to -1.5	6 to 10
D3	Extreme Drought	▪ Major crop/pasture losses ▪ Widespread water shortages or restrictions	-4.0 to -4.9	3 to 5	3 to 5	-1.6 to -1.9	3 to 5
D4	Exceptional Drought	▪ Exceptional and widespread crop/pasture losses ▪ Shortages of water in reservoirs, streams, and wells creating water emergencies	-5.0 or less	0 to 2	0 to 2	-2.0 or less	0 to 2

Source: U.S. Drought Monitor

Figure 4-14 Colorado Drought Impacts by U.S. Drought Monitor Category

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

Source: U.S. Drought Monitor

4.7.5 Past Occurrences

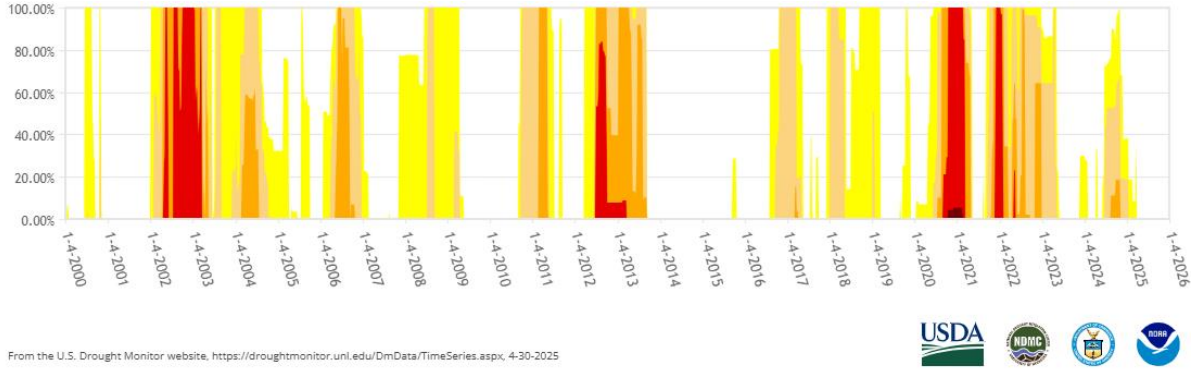
Drought is a regular and widespread occurrence in the State of Colorado. According to the U.S. Drought Monitor records, in the 1,300-week period from 2000 through 2025 Arapahoe County spent 820 weeks (63% of the time) in some level of drought, defined as Abnormally Dry (D0) or worse conditions. Approximately 14.8% of the time, or 190 weeks, was spent in Severe Drought (D2) or worse conditions. Weeks in drought are summarized in Table 4-30 and shown in time series in Figure 4-15.

Table 4-30 U.S. Drought Monitor Weeks in Drought by Intensity, 2000-2025

Category	Description	Palmer Drought Severity Index (PDSI)	Standardized Precipitation Index (SPI)	Arapahoe County Weeks in Drought, 2000-2025
D0	Abnormally Dry	-1.0 to -1.9	-0.5 to -0.7	244
D1	Moderate Drought	-2.0 to -2.9	-0.8 to -1.2	210
D2	Severe Drought	-3.0 to -3.9	-1.3 to -1.5	109
D3	Extreme Drought	-4.0 to -4.9	-1.6 to -1.9	81
D4	Exceptional Drought	-5.0 or less	-2.0 or less	0

Source: U.S. Drought Monitor, through May 2025

Figure 4-15 Arapahoe County Percent Area in US Drought Categories, 2000-2025



Source: U.S. Drought Monitor

Arapahoe County has not faced a single isolated major drought event since 2018, but has been repeatedly affected by a broader, persistent drought cycle impacting the Front Range and Colorado overall. According to the Colorado Climate Center, there have multiple drought events in Arapahoe County including one major drought statewide in 2020 that continued into 2021. The winter of 2021 leading into 2022 also saw significant drought conditions, with 100% of the County in D4 exceptional drought conditions. According to the National Oceanic Atmospheric Administration, the winter leading into 2022 was the warmest winter in County history.

Per the 2018 State of Colorado Drought Mitigation and Response Plan, major droughts that have occurred in the state's history include the Dust Bowl of 1930s, the 1950s drought of the Great Plains, the Colorado drought of 2002, and the 2011-2013 drought. Per the United States Geological Survey, within the last decade there have also been severe droughts throughout the state in the years 2018 and 2020.

During the 2002 drought, Arapahoe County reached Extreme Drought (D3) conditions for a total of 24 weeks. The entire County remained in at least Moderate Drought (D1) conditions from April 2002 through May 2003. The drought of 2002 was the single most intensive year of drought in Colorado's history. Statewide snowpack was at or near all-time lows, and the year is considered the driest single year recorded in Colorado history. What made the 2002 drought event so unusual was that the entire State was dry at the same time. Regional soil moisture was depleted, and reservoirs dropped to extremely low levels. The dramatic drought conditions prompted widespread water restrictions that were heavily enforced and regulated. These restrictions included limits to watering lawns, washing cars, or the use of water for any other non-essential uses. Some municipalities offered incentives for property owners to remove their lawns and adopt xeriscape landscape designs. Ultimately, it was the wet period of the late 1990s and the increased reservoir storage during that time that helped Colorado to survive the drought of 2002.

The County experienced Extreme Drought (D3) conditions during the 2011-2013 drought that impacted the entire State of Colorado. In February and March of 2012, below average snowfall and above average temperatures worsened conditions. In April and May of 2012, warm temperatures caused early runoff as the thin snowpack melted rapidly. Stream flows measured only slightly better compared to the extreme drought years of 1934, 1954, 1977, and 2002. Through spring and summer of 2012, agricultural production was heavily impacted by low soil moisture, high temperatures during the spring planting season, and limited water availability for summer irrigation diversions due to less snowpack and runoff. In the eastern plains of Colorado, June temperatures were consistently over 100°F. Crop prices

dramatically increased, and many crop and livestock operations suffered. The tourism industry also suffered, with impacts to rafting businesses and ski resorts.

The 2011-2013 drought period contributed to elevated wildfire risk across the state. Two of the State's most destructive wildfires occurred during the 2012 drought period: the High Park Fire and the Waldo Canyon Fire. Dry conditions on the Eastern Plains contributed to an extended grass fire season that threatened homes and property.

The 2018 drought impacted most of the state of Colorado including 100% of Arapahoe County. According to the US drought monitor by February 2018 about 84% of Colorado's population was experiencing abnormal dryness or drought. This included reduced soil moisture, lower-than-normal streamflow's, and increased wildfire risk as dry fuels like grasses and trees became more flammable.

The winter of 2020-2021 drought saw conditions similar to that of the 2011-2013 drought. In June of 2020 Governor Jared Polis created the Agricultural Impact Task Force made up of state, federal, and agricultural association partners to discuss drought throughout the industry. The task force found that 2020 was the first time since 2012 that 100% of the state was in drought. Drivers of this drought include absent monsoon seasons, accruing soil moisture deficits, record high temperatures, and extreme evaporative demands from winds and low humidity.

The 2022 Colorado Water Plan has been implemented into Arapahoe County's planning mechanisms and infrastructure. The 2022 plan highlights the need to reduce and monitor water usage as well as adapting land use changes to reduce water use and better coordinate the funding and planning of this work. In 2023 the County initiated an 18 month study to evaluate groundwater resources and investigate best practices in water-efficient landscape regulations. This study found that with these planning mechanisms implemented Arapahoe County could have enough water through 2050, but future population growth could strain this supply.

The National Drought Mitigation Center (NDMC), located at the University of Nebraska in Lincoln, provides information on local drought impacts based on reports from media, observers, impact records, and other sources. According to NDMC's Drought Impact Reporter, during the 25-year period from 2000 through 2025, 2,600 county impacts were reported in Colorado, of which 14 were reported to affect Arapahoe County. These impacts are summarized in Table 4-31 NDMC Drought Impact Reporter, 2000-2025.

Table 4-31 NDMC Drought Impact Reporter, 2000-2025

Impact Category	Count of Impacts	Years Reported
Agriculture	2	2020, 2023
Business & Industry	1	2017
Fire	3	2015, 2016, 2017
Plants & Wildlife	6	2017, 2018, 2020, 2022, 2023
Relief, Response & Restrictions	5	2015, 2017, 2018, 2021, 2024
Tourism & Recreation	2	2017, 2018
Water Supply & Quality	4	2018, 2020, 2021, 2024

Source: NDMC Drought Impact Reporter, https://droughtreporter.unl.edu/advancedsearch/impacts.aspx

During drought conditions Secretarial Disaster Declarations found in Table 4-2 are used to make low interest loans and other emergency assistance available to those who have been affected (largely farmers and ranchers). Under the process laid out by the Farm Services Agency (FSA), a USDA Disaster Declaration can be made if any portion of a County has experienced eight consecutive weeks of severe drought according to the U.S. Drought Monitor. Arapahoe County has been included in USDA Disaster Declarations for drought from 2018-2024 with the only exception being 2019.

4.7.6 Climate Change Considerations

According to NOAA's Climate at a Glace, the average annual temperature in Arapahoe County increased by 2°F from 2020 to 2024. According to the Colorado Climate Assessment Report, cities like Denver and Colorado Springs saw annual temperatures over 2°F above normal in 2024. The greatest amount of warming in recent decades has occurred in the fall, with statewide temperatures increasing by 3.1°F from 1988-2022. The observed warming over the last 20 years is consistent with what was projected by earlier climate models run in the 2000s. Winter projections show fewer extreme cold months, more extreme warm months, and more strings of consecutive warm winters. Between today and 2050, typical January temperatures of the Eastern Plain of Colorado are expected to shift northward by ~150 miles.

The 2024 Colorado Climate Assessment report found that drought conditions in Colorado are likely to become more frequent and persistent over the next century due to climate change. Climate projections indicate significant shifts by 2050, including increased winter rainfall, decreased precipitation during spring and summer, and rising temperatures that affect maximum and minimum daily temperatures, evapotranspiration, runoff, and growing degree days. Between today and 2050, typical January temperatures of the Eastern Plain of Colorado are expected to shift northward by ~150 miles. For temperature, by 2050 the average year is likely to be as warm as the very warmest years on record through 2024. For These changes will have far-reaching implications for water demand, agriculture, and ecosystem health.

For precipitation and snowpack the 2024 Colorado Climate Assessment report states that the entire state has seen a decrease in yearly precipitation from 2000-2023 compared to 1950-1999. Four of the five driest years have occurred since 2000. Future warming will lead to further reductions in Colorado's spring snowpack with climate model projections showing reductions of -5% to -30% by 2050 compared to 1971-2000. It is likely that warmer temperatures will contribute to more frequent and severe droughts, as well as reduce the benefits of wetter years.

Other factors that can increase or decrease the frequency, duration, and spatial extent of drought include soil moisture, evapotranspiration, and heat waves. Heat waves are projected to increase in frequency by as much as ten-fold by the middle of the 21st century, whereas the frequency of cold waves is projected to decrease by less than half. Future warming will lead to declines in summer (June-August) soil moisture throughout the state and Spring (March-May) soil moisture will likely increase at higher elevations as snowmelt shifts earlier. Future warming will also drive greater evaporative demand, with climate model projections showing annual evapotranspiration increasing by 8-17% by 2050 compared to 1971-2000.

In 2022 Arapahoe County implemented the Colorado Water Plan into its drought planning mechanisms and infrastructure. The 2022 plan highlights the need to reduce and monitor water usage as well as adapting land use changes to reduce water use. Following this plan, in 2023 the County initiated an 18-month study to evaluate groundwater resources and investigate best practices in water-efficient landscape

regulations. This study found that with these planning mechanisms implemented Arapahoe County could have enough water through 2050, but future population growth could strain the supply and is not considered in all models.

4.7.7 Probability of Future Occurrences

Identifying various indicators of drought, and tracking these indicators, provides a crucial means of monitoring drought. Additionally, understanding the historical frequency, duration, and spatial extent of drought assists in determining the likelihood and potential severity of future droughts. The characteristics of past droughts provide benchmarks for projecting similar conditions into the future, but must also take into account the impacts of climate change discussed previously.

Overall, the annual probability of severe drought is **likely** (defined as between a 10 and 100% probability of occurrence in the next year).

4.7.8 Vulnerability and Consequence Analysis

The most significant drought impacts in Colorado are related to water-intensive activities including agriculture, municipal use, wildfire protections, recreation, wildlife preservation, commerce, and tourism. Drought conditions can lead to the compaction of soil, increasing erosion potential and decreasing water quality. The following impacts analysis draws from the 2018 Colorado Drought Mitigation and Response Plan.

Impact to the Public

Although drought events rarely pose immediate risks to public health, they can impact local public health in numerous ways. Drought-induced public health impacts may include increased respiratory ailments due to increased particulate matter in the air; health problems due to decreased availability of clean water; increased disease caused by wildlife concentrations; and loss of human life from heat stress or suicide. Drought may also impact mental and behavioral health as a result of elevated stress levels, higher costs for water, restrictions on water usage, and unemployment in the agricultural sector, tourism industries, and other businesses related to the natural environment and/or water. Drought may also drive population migration from rural to urban areas.

Impact to Responders

Impacts to first responders will likely come from drought conditions increasing the frequency and duration of wildland fires and urban conflagration. Not only will conditions worsen fires, but the available supply of water to extinguish the fires will also be reduced. Responders may receive increased calls during extended periods of drought.

Impact to Continuity of Operations (including continued delivery of services)

Drought may require disaster declarations, aid programs, water restrictions, and/or fire restrictions. These needs may impact funding or administrative resources for other regular operations or may necessitate changes to existing operating procedures.

Water utilities are likely to face the greatest challenges to continuity of operations and delivery of services, especially during long-term widespread droughts, where opportunities for resource-sharing are

limited. Water suppliers may need to change water rates, set usage restrictions, adjust to changes in demand, address water line damage or repairs due to drought stress, account for changes in water quality, and seek alternative water supplies. Should a public water system be severely affected, shipping in outside water could cost millions of dollars.

Individuals with private well water may also face impacts, including drinking water turbidity, change in water color or odor, and wells running dry.

Impact to Property, Facilities, and Infrastructure

Drought conditions rarely affect existing buildings, infrastructure, and critical infrastructure; however, critical facilities may lose critical function due to low water supplies. Additionally, severe droughts can damage the water system infrastructure as a result of low flows and water levels. Possible losses to infrastructure include the temporary loss of potable water and potential increases in treatment costs due to water quality impacts.

Impact to the Environment

The impacts of drought on local vegetation and wildlife can include death from dehydration and spread of invasive species or disease because of stressed conditions, loss of biodiversity, loss of trees in rural and urban landscapes, loss of wetlands, and degradation of habitat. In general, environmental impacts from drought are more likely at the interface of the human and natural world. The loss of crops or livestock due to drought can have far-reaching economic effects on communities, wind and water erosion can alter the visual landscape, and dust can damage property. Water-based recreational resources are also heavily affected by drought conditions. Indirect impacts from drought arise from increased wildfire risk and greater occurrence of fire. Wildfire may have additional effects on the landscape and sensitive resources such as historic or archeological sites.

Impact to the Economic Condition of the County and Jurisdictions

Drought impacts associated with industries such as; agriculture, farming, aquaculture, horticulture, forestry or ranching 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 people and 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

According to the Risk Management Agency there have been 115 incidents that resulted in monetary compensation for a loss due to drought since 2019-2022. In insurance, the principle of indemnity ensures that the compensation provided does not exceed the policyholder's economic loss. The indemnity amounts

paid are listed below in Table 4-24. The crops that were affected included corn, wheat, millet, and sunflowers.

Table 4-32 Indemnity Amounts for Drought Related Incidents in Arapahoe County (2019-2022)

Year	# of Incidents	Indemnity Amount
2019	13	$352,954
2020	28	$1,544,076
2021	32	$1,747,796
2022	42	$6,069,503

Source: Risk Management Agency

Drought also has a direct impact on multiple species that help with the pollination of native plants and crops. Species such as the lady beetle, lacewing larvae, and bumblebees are all greatly impacted by drought with a reduction in reproduction and less food available, leading to less pollination. This can greatly reduce crops and native plants, leaving areas susceptible to invasive species and predators.

Economic damages may also result from impacts to tourism and recreation industries, including water access or navigation problems for recreation; bans on recreational activities; reduced license, permit, or ticket sales (e.g., hunting, fishing, etc.); losses related to curtailed activities (e.g., bird watching, hunting and fishing, boating, etc.); reduced park visitation; and cancellation or postponement of sporting events.

Drought may also indirectly impact businesses such as lawn care, sales of recreational vehicles or other recreational gear, and plant nurseries. Examples of drought-induced business impacts could include reduction or loss of employees, change in sales or volume of business, variation in number of calls for service, early closure or late opening for the season, bankruptcy, permanent store closure, economic impacts.

Drought may also affect power production, electricity rates, energy revenue, and purchase of alternate sources of energy. Examples of potential impacts include hydropower and non-hydropower production when affected by drought, electricity rates, revenue shortfalls and/or windfall profits, and purchase of electricity when hydropower generation is down.

Impact to Public Confidence in Government

Public confidence may be affected because of the drought response process. Water usage restrictions and potential penalties for violations of these restrictions can cause frustration with government. Meetings to discuss drought, efforts to create community drought plans, and public service announcements and education efforts may affect public confidence. Elevated stress levels may result from these processes as well as from demand for higher water rates, cancellation of fundraising events, cancellation/alteration of festivals or holiday traditions, stockpiling water, and/or protests.

Changes in Development

Society's vulnerability to drought is affected largely by population growth, urbanization, demographic characteristics, technology, water use trends, government policy, social behavior, and environmental awareness. These factors are continually changing, and society's vulnerability to drought may rise or fall in response to these changes. For example, increasing and shifting populations puts increasing pressure on water and other natural resources—more people need more water.

Future development greatly impacts drought hazards by stressing both surface and ground water resources. Agricultural and industrial water users consume large amounts of water. Expansion of water-intensive enterprises is limited in a time when water resources are strained. In rapidly growing communities, new water and sewer systems or significant well and septic sites could use up more of the water available, particularly during periods of drought. Public water systems are monitored, but individual wells and septic systems are not as strictly regulated. Therefore, future development could have a profound impact on the vulnerability of Arapahoe County to drought.

Related to both current land use and future development trends, the use of turf grass affects the available water supplies. Maintaining lush, green lawns in the semi-arid climate of the Front Range requires large amounts of water. Urban lawn watering is the single largest water demand on most municipal supplies. Outdoor water use accounts for about 55% of the residential water use in the Front Range urban area, most of which is used on turf. Residential and commercial landscaping can greatly impact future drought events and future water use regulations may be able to mitigate this trend.

According to the USDA 2022 Census of Agriculture, from 2017 to 2022 farm operations in Arapahoe County decreased from 851 to 607 and land enrolled in crop insurance programs increased from 74,668 acres to 88,011. However, total land in farms decreased from 283,226 acres to 144,975 acres, and irrigated agricultural land decreased from 1,155 acres to 987. Overall, these trends suggest a slight decrease in agricultural vulnerability to drought in recent years.

As Arapahoe County continues to grow, it will consider practical guidelines for determining the impacts of drought such as measuring the economic value of water in alternative uses and objective methods for quantifying non-market impacts of drought on those uses. Additionally, Arapahoe County will continue to follow guidance found within the State of Colorado Hazard Mitigation Plan as well as the Colorado Drought Mitigation and Response Plan.

However, the Colorado Water Conservation Boards Future Avoided Cost Explorer (FACE) tool shows that by 2050 drought may cost the state of Colorado an additional $830 million in expected annual damages with $511 million from agricultural damage alone. Table 4-33 shows how much damages would cost in different climate and population scenarios.

Table 4-33 Potential Future Economic Losses from Drought in Araphoe County

Climate Scenarios	Damages	Low Growth (~1,200)	Medium Growth (~1,600)	High Growth (~2,000)
Current Conditions	Total	$10 million	$300M	$410M
	Per Person	$220	$40	$40
Moderately Warmer by 2050	Total	$610M	$600M	$700M
	Total Damages per Person	$80	$70	$70
Severely Warmer by 2050	Total Damages	$740M	$760M	$830M
	Total Damages per Person	$100	$90	$90

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

4.7.9 Jurisdictional Differences

Due to the regional nature of drought, all jurisdictions within Arapahoe County are expected to experience the same magnitude of drought conditions and the same probability of occurrence. However, the impacts of these drought conditions can vary across the County, with greater direct impacts on agricultural areas in the eastern portion of the County. Agricultural communities such as the Town of Bennett, the Town of Deer Trail and unincorporated Arapahoe County are expected to bear the brunt of drought effects in the County due to the potential for crop and livestock losses and the associated economic impacts. The communities in the western portion of the County are more urbanized and less vulnerable to direct impacts from drought. These areas may experience minor impacts to lawns and gardens and restrictions on water usage but are unlikely to suffer direct property losses.

Table 4-34 Drought Hazard Rankings by Jurisdiction

Drought	Frequency	Spatial Extent	Severity	Overall Significance
Bennett	Likely	Extensive	Critical	Medium
Bow Mar	Likely	Extensive	Negligible	Low
Centennial	Likely	Extensive	Limited	Medium
Cherry Hills Village	Likely	Extensive	Limited	Medium
Columbine Valley	Likely	Extensive	Limited	Medium
Deer Trail	Likely	Extensive	Critical	Medium
Englewood	Likely	Extensive	Limited	Medium
Foxfield	Likely	Extensive	Limited	Medium
Glendale	Likely	Extensive	Negligible	Low
Greenwood Village	Likely	Extensive	Limited	Medium
Littleton	Likely	Extensive	Limited	Medium
Sheridan	Likely	Extensive	Limited	Medium
Denver Water	Likely	Extensive	Limited	Medium
South Metro Fire	Likely	Extensive	Limited	Medium
Unincorporated County	Likely	Extensive	Limited	Medium

4.8 Flooding

Hazard	Frequency	Spatial Extent	Severity	Significance
Flooding	Likely	Significant	Limited	Medium

4.8.1 Risk Summary

- 541 improved parcels are located within the FEMA 1% annual chance floodplain, with an estimated 1,127 people at risk.
- An additional 1,711 improved parcels fall within the FEMA 0.2% annual chance floodplain, affecting a further 3,960 people.
- 2 improved parcels are located within Future Conditions flood zones, with 5 people at risk.
- Across all FEMA-designated flood zones, total exposed population exceeds 5,000 residents, and improved property value exceeds $2.49 billion, with estimated losses over $655 million.
- A combined 120 critical sector facilities are exposed in the 1% floodplain, with additional 39 facilities identified in the 0.2% flood zone.
- Related hazards: Dam Failure, Severe Summer Weather, Severe Winter Weather

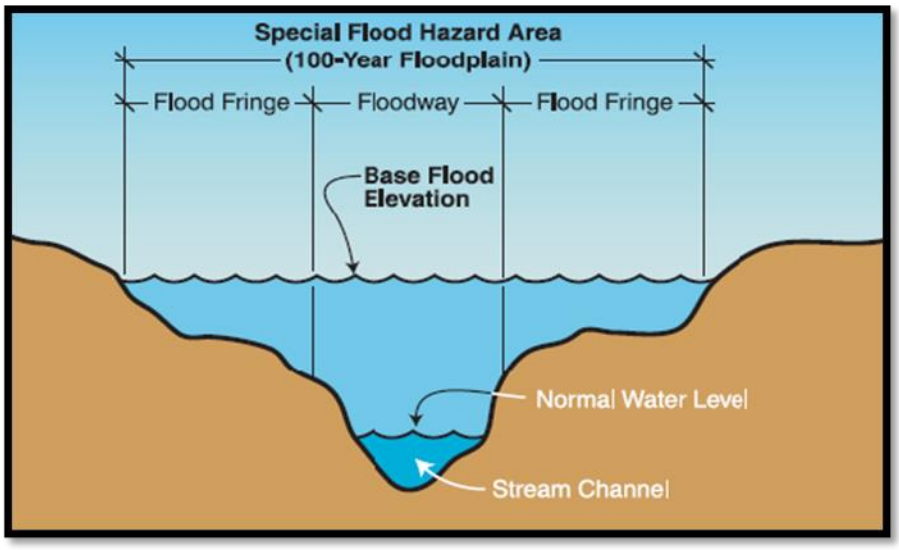
4.8.2 Description

Floods involve inundation of normally dry land or other areas. Common types of flooding applicable to Arapahoe County include riverine flooding, localized or flash flooding (including storm generated flash floods), stormwater drainage flooding, and dam failure inundation.

Floods can cause substantial damage to structures, landscapes, and utilities, as well as cause life safety issues. Certain related health hazards are also common to flood events. Standing water and wet materials in structures can become breeding grounds for microorganisms such as bacteria, mold, and viruses. This can cause disease, trigger allergic reactions, and damage materials long after the flood. When flood waters contain sewage or decaying animal carcasses, infectious disease becomes a concern. Direct impacts to populations such as drowning can be limited with adequate warning and public education about what to do during floods. Where flooding occurs in populated areas, warning and evacuation will be of critical importance to reduce life and safety impacts.

Riverine flooding is defined as when a watercourse exceeds its “bank-full” capacity and is usually the most common type of flood event in Colorado. Riverine flooding generally occurs as a result of prolonged rainfall, or rainfall that is combined with soils already saturated from previous rain events. It also occurs as a result from snowmelt, in which case the extent of flooding depends on the depth of winter snowpack and spring weather patterns. Floodplains are lowlands, adjacent to rivers, streams, and creeks that are subject to recurring floods. Figure 4-16 illustrates common floodplain terminology.

Figure 4-16 Floodplain Terminology



Source: FEMA

Flooding events are typically measured in terms of magnitude and the statistical probability that they will occur. The 1% annual chance flood event is the standard national measurement for flood mitigation and insurance. A 1% annual chance flood, also known as a 100-year flood, has a 1 in 100 chance of being equaled or exceeded in any 1 year and has an average recurrence interval of 100 years. It is important to note that this recurrence interval is an average; it does not necessarily mean that a flood of such a magnitude will happen exactly every 100 years. Sometimes, only a few years may pass between one 1% annual chance flood and another, while two other 1% annual chance floods may be separated by 150 years. The 0.2% annual chance flood event, or a 500-year flood, is another measurement which represents a 0.2% chance (or 1 in 500 chance) of occurring in a given year.

A change in environmental conditions or land uses can create localized flooding problems inside and outside of natural floodplains by altering or confining natural drainage channels (e.g., leading to flash flooding). These changes are most often created by human activity in developed areas but can also be created by other natural events (such as wildland fires) which cause compound effects. For example, 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.

Flash flooding events can occur from sudden intense storms, a dam or levee failure, or from a rapid release of water held by an ice jam or snowmelt. Most flash flooding is caused by slow-moving thunderstorms in a local area or by heavy rains associated with hurricanes and tropical storms. Flash flooding in Arapahoe County occurs most often around urbanized areas where much of the ground is covered by impervious surfaces. Flash floodwaters move at very high speeds due to the sudden rush of water, leading to "walls" of water which can reach heights of 10 to 20 feet. Flash floodwaters and the accompanying debris can uproot trees, roll boulders, and damage or destroy buildings, bridges, and roads.

Previous flash flooding events have occurred within Arapahoe County, and an area of Greenwood Village along Belleview and I-25 has been identified as a high-incidence zone. Although data does not currently exist to perform robust assessments of flash flood risk within Arapahoe County, local jurisdictions have

expressed a desire and a need for data and information specifically related to flash flooding so that appropriate mitigation strategies can be identified and implemented.

Urban flooding is the result of development and the ground's decreased ability to absorb excess water without adequate drainage systems in place. Typically, this type of flooding occurs when land uses change from fields or woodlands to roads and parking lots. Urbanization can increase runoff two to six times more than natural terrain. Stormwater refers to water that collects on the ground surface or is carried in the stormwater system when it rains. In runoff events where the amount of stormwater is too great for the system, or if the channel system is disrupted by vegetation or other debris that blocks inlets or pipes, excess water remains on the surface. This water may pond in low-lying areas, often in street intersections. This is also known as ***stormwater flooding***, and can carry debris, dirt, chemicals, and pollutants from impervious surfaces, leading to health issues.

Stream bank erosion is measured as the rate of the change in the position or horizontal displacement of a stream bank over a period of time. It is generally associated with riverine flooding and discharge and may be exacerbated by human activities such as bank hardening and dredging.

Ice jams are stationary accumulations of ice that restrict flow through a waterway. Ice jams can cause considerable increases in upstream water levels, while at the same time, downstream water levels may drop. Types of ice jams include freeze up jams, breakup jams, or combinations of both. When an ice jam releases, the effects downstream can be similar to that of a flash flood or dam failure. Ice jam flooding generally occurs in the late winter or spring, and is more common at higher elevations in Colorado, but can still impact the planning area.

Dam inundation can occur because of structural failure, overtopping, seismic activity, or other reasons that cause a dam or levee to release its contents (often water), leading to flooding. Dam inundation flooding is described in detail under Section 4.6.

According to the latest Arapahoe County Flood Insurance Study (FIS), dated April 11, 2024, most of the County's major floods have historically been on the South Platte River and its tributaries, resulting from snow melt and summer thunderstorms coupled with the tributary basins' structure as they are narrow, hydraulically steep, and composed of highly erodible clay and loam soils. Cherry Creek has also experienced significant floods. The FIS states that major floods have occurred on the South Platte River and its tributaries in Arapahoe County since 1844. During the period, 11 devastating floods have occurred on the South Platte River; 17 have occurred on Cherry Creek; 3 each have occurred on Bijou, Box Elder, Comanche, and Sand Creeks; and 1 has occurred on Toll Gate Creek. Historic flood information on other streams in Arapahoe County is not available.

Construction of Cherry Creek Dam and Chatfield Dam in the 1950s and 1970s respectively has mitigated the worst flooding problems along those waterways. The FIS notes that intense thunderstorms in the area can generate floods that exceed the existing structural capacities (FEMA 2018).

4.8.3 Location

Arapahoe County falls within the South Platte River Basin, which encompasses 24,151 square miles across 25 Colorado counties. Elevation in the basin ranges from 14,000 feet at the Continental Divide to 3,400 feet at the Colorado-Nebraska state line. Some of Colorado's most devastating floods have taken place in the South Platte Basin. The South Platte River is the major stream in the basin and flows through

the western portion of the County in shifting channels and a broad shallow bed with low flat overbanks. The tributaries in the eastern two-thirds of the County flow similarly to the river. The tributary channels to the South Platte River in the western portion of the County are ephemeral and flow in steep narrow channels. Figure 4-17 and Figure 4-18 show the mapped FEMA special flood hazard areas in Arapahoe County. Figure 4-19 shows the same data for the full South Metro Fire Rescue.

As shown in Figure 4-17 and Figure 4-18, most of the higher risk areas are located in the western portion of the County and where suburban development is occurring in and along the floodplains of the South Platte River, Big Dry Creek, Little Dry Creek, Box Elder Creek, Cottonwood Creek Cherry Creek Sand Creek, Piney Creek, Coal Creek and Comanche Creek (FEMA 2018). According to the County's Flood Insurance Study, the City of Littleton experiences sheetflow flooding on the lower reaches of Little Dry Creek and Slaughterhouse Gulch. While the Flood Insurance Study acknowledges the County Government's efforts to retain open space along the floodplain, historic urbanization has allowed commercial, industrial, and residential developments to encroach into the floodplain.

Figure 4-23 shows the Mile High Flood District which serves as a key partner in regional flood risk management. MHFD supports local governments in maintaining existing infrastructure, while also prioritizes and funds future flood projects. A specific area of concern is the Muskrat Gulch/Coyote Run area, where a fatal flood incident occurred.

CWCB – DRAFT BLE Floodplain Mapping

In addition to FEMA's effective FIRMs, this plan includes analysis of draft floodplain data developed through Colorado Water Conservation Board's (CWCB) Base Level Engineering (BLE) effort. While not yet adopted by FEMA, CWCB BLE data provides a broader and more refined look at flood risk across the state. The mapping integrates advanced hydrologic and hydraulic modeling and covers areas that may lack updated regulatory flood studies. For Arapahoe County, CWCB BLE mapping includes a delineation of 1% and 0.2% annual chance floodplains, as well as facilities and assets potentially affected. Though considered non-regulatory, these datasets represent best-available information and are critical for planning future development, assessing vulnerability, and informing local mitigation strategies. This section presents risk findings based on CWCB's draft data, distinct from FEMA's regulatory products. Figure 4-20 through Figure 4-22 below show the CWCB mapping for the County.

Figure 4-17 FEMA Flood Hazard Areas in Western Arapahoe County

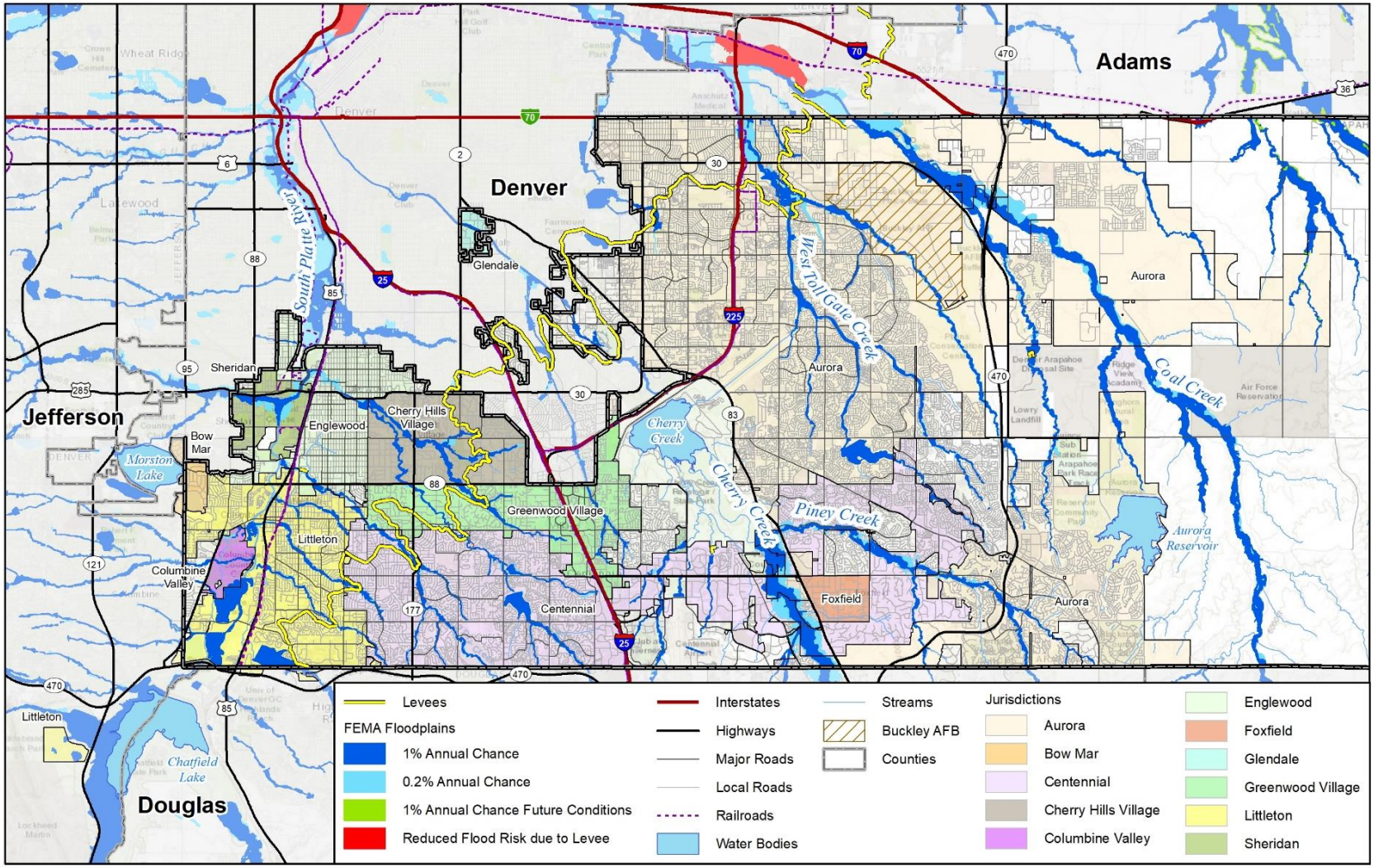


Figure 4-18 FEMA Flood Hazard Areas in Eastern Arapahoe County

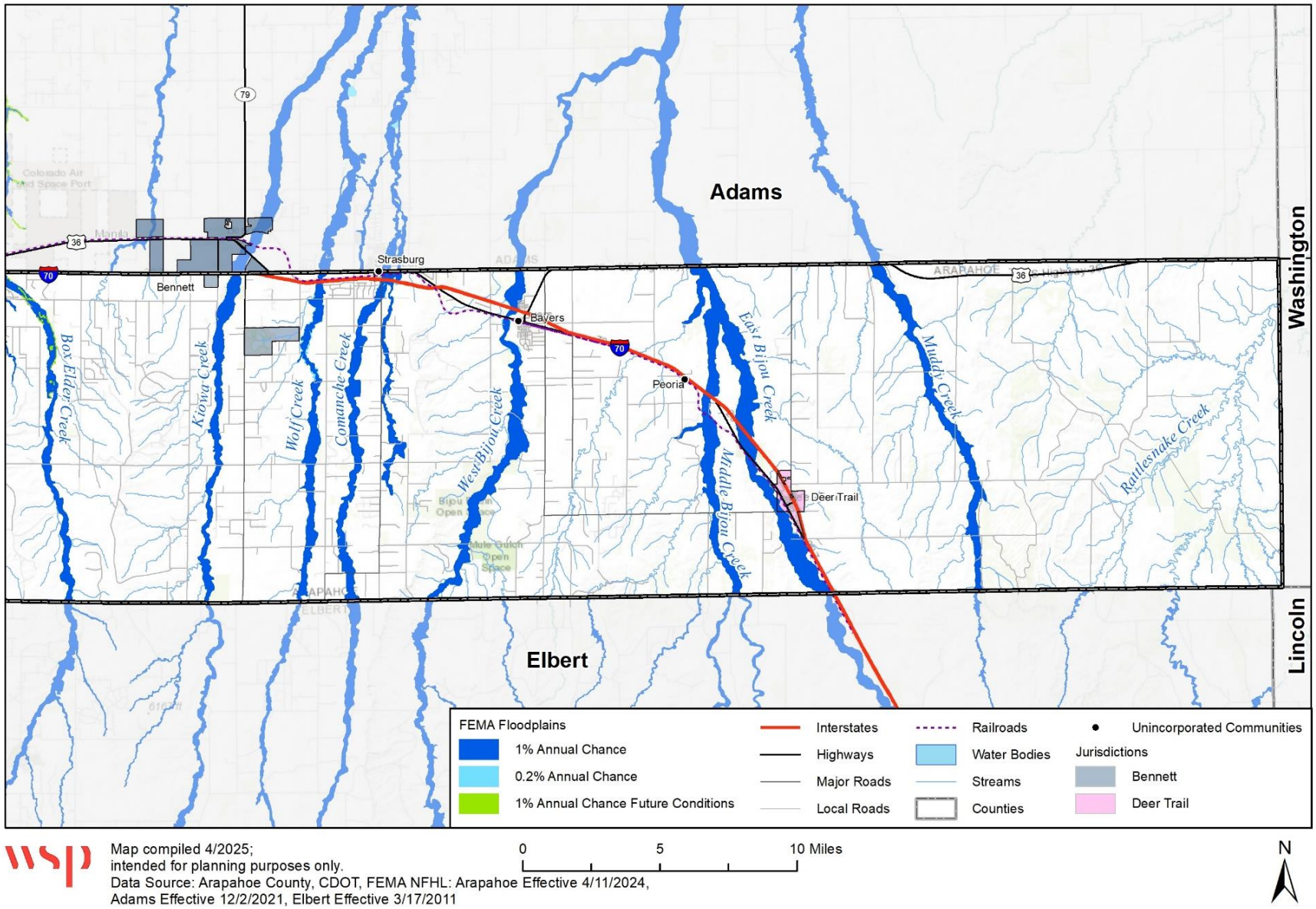


Figure 4-19 South Metro Fire Rescue FEMA Flood Hazard Areas

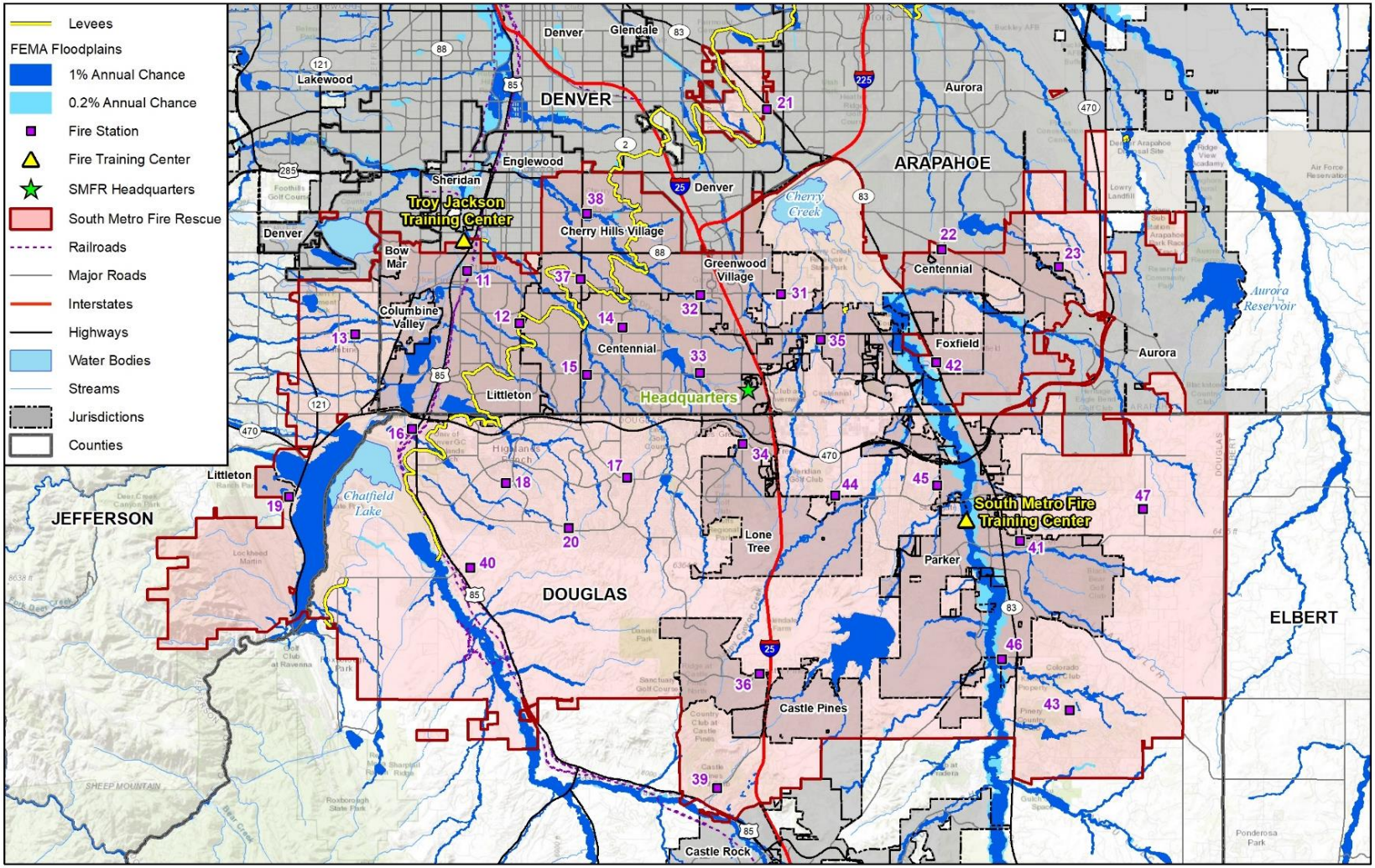


Figure 4-20 Colorado Water Conservation Board Flood Mapping for Western Arapahoe County

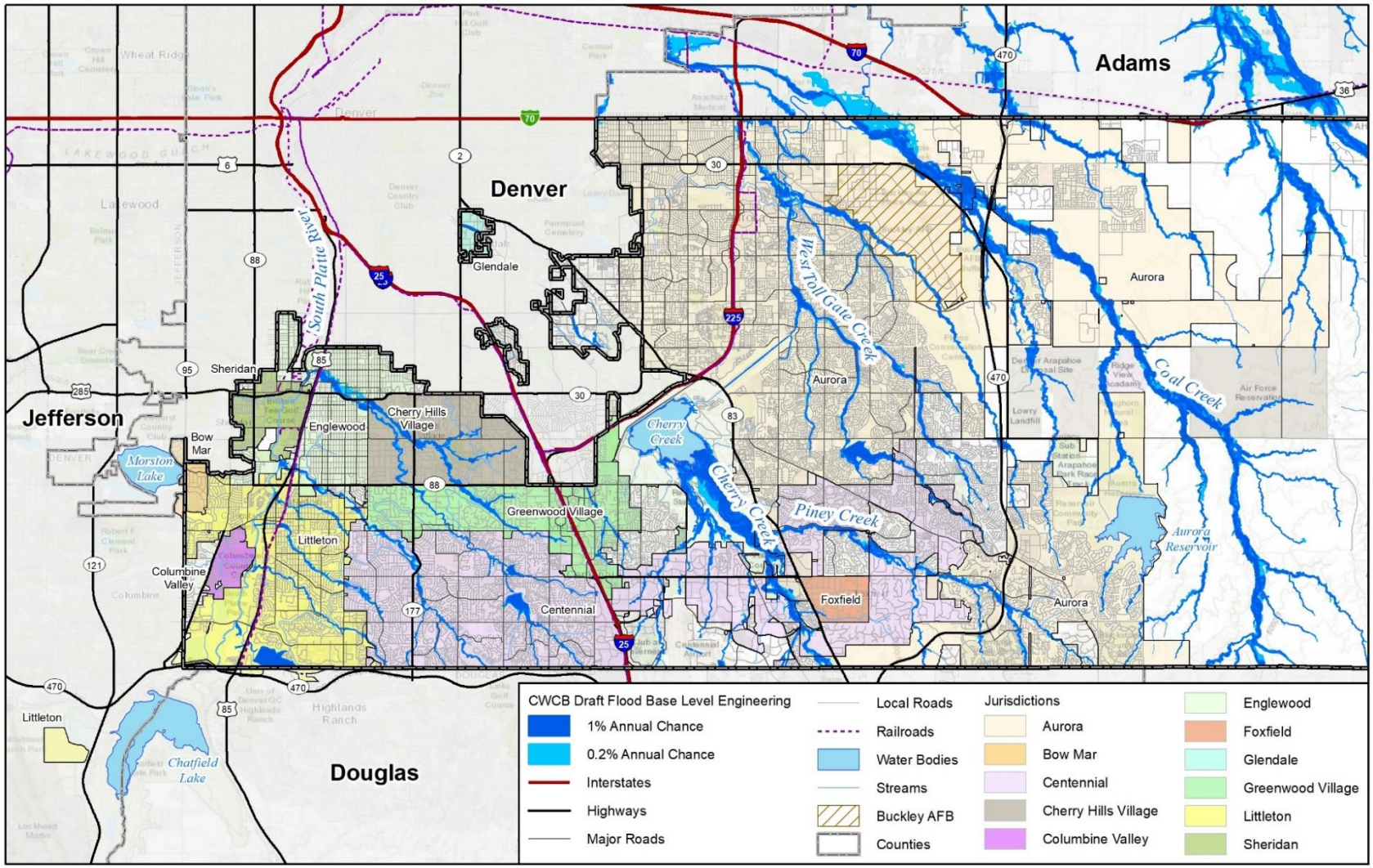


Figure 4-21 Colorado Water Conservation Board Flood Mapping for Eastern Arapahoe County

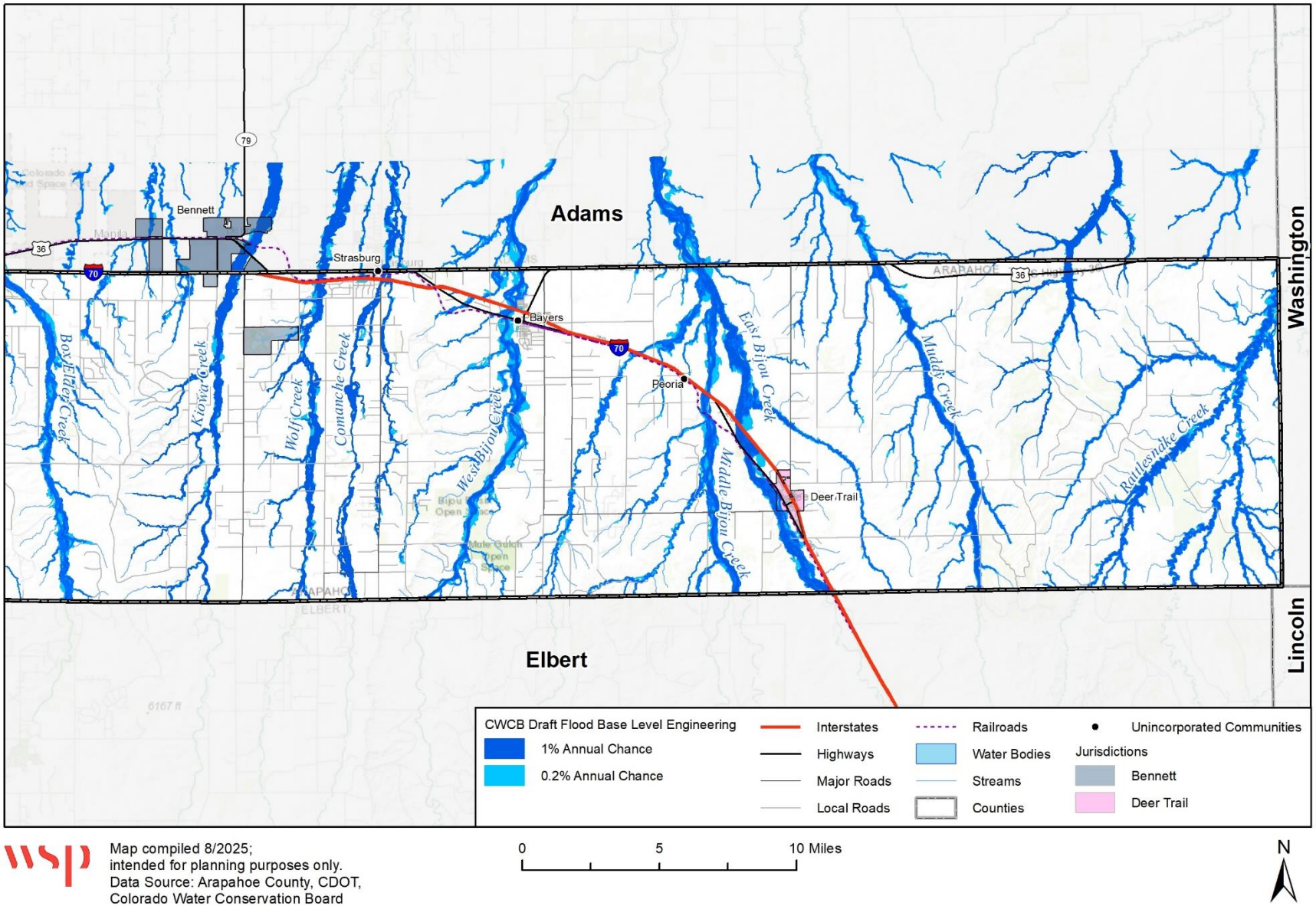


Figure 4-22 Colorado Water Conservation Board Flood Mapping for South Metro Fire Rescue

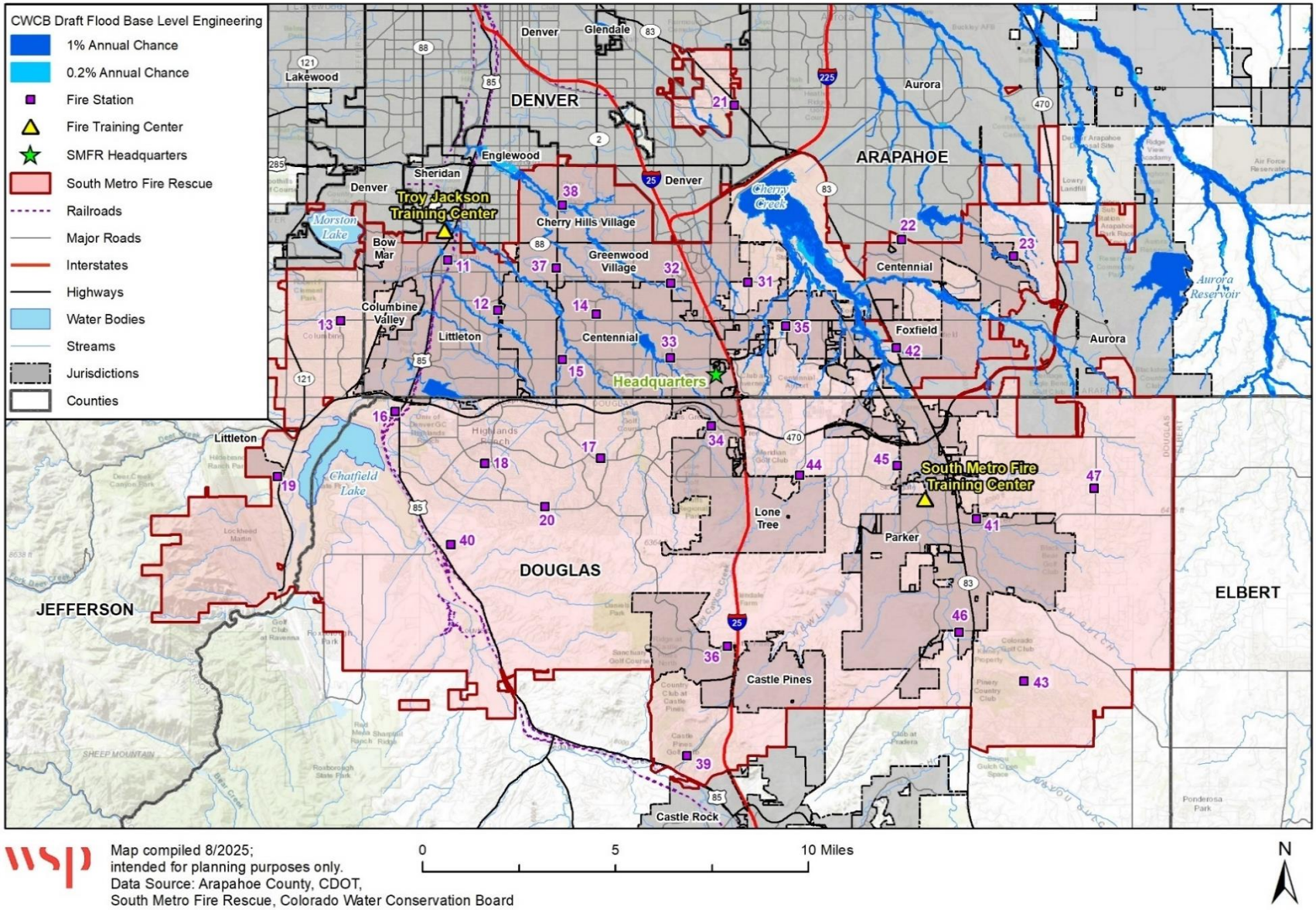
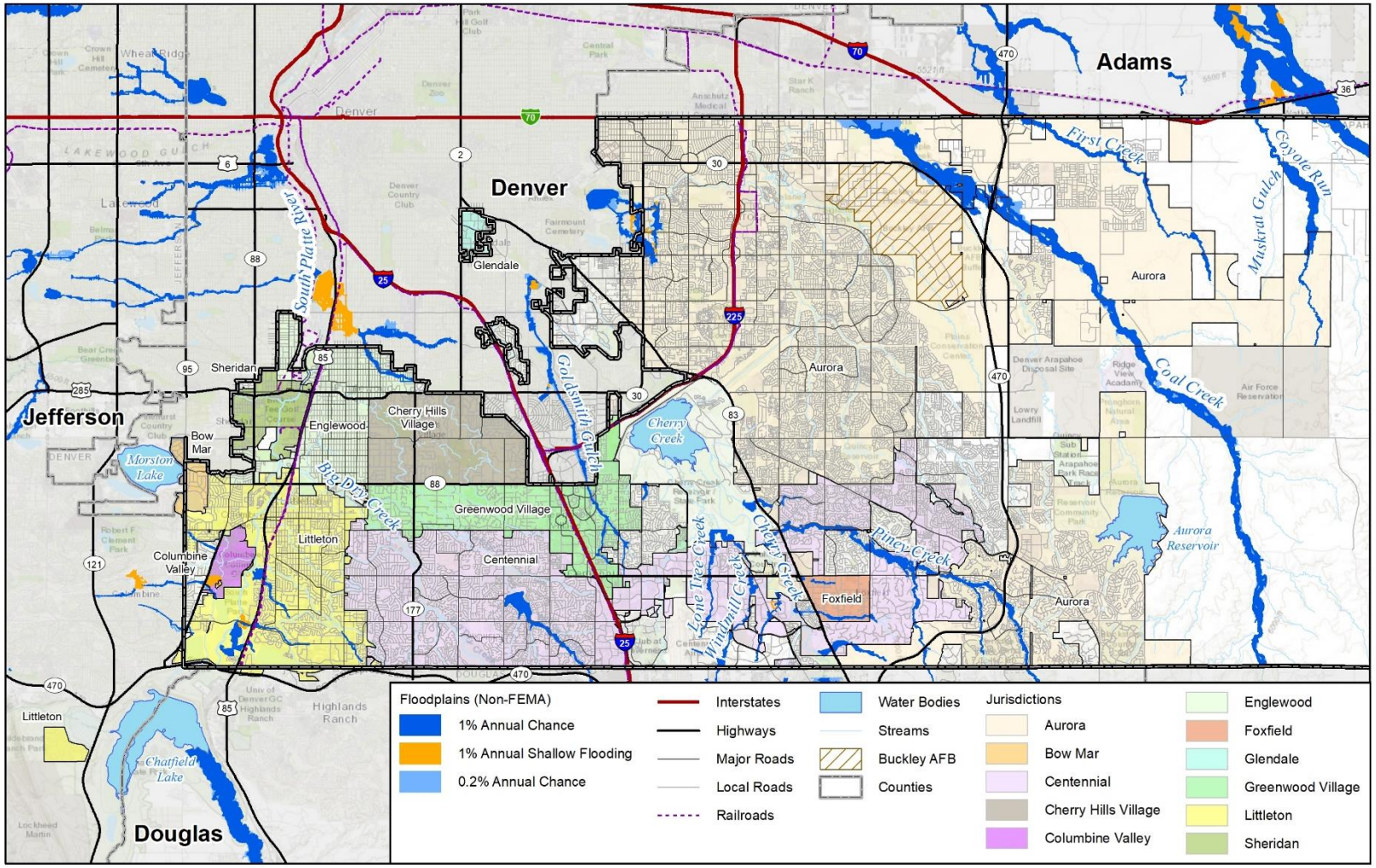


Figure 4-23 West Arapahoe County Mile High Flood District Flood Hazards



Map compiled 4/2025;
intended for planning purposes only.
Data Source: Arapahoe County, CDOT,
Mile High Flood District

0 5 10 Miles

N

4.8.4 Magnitude/Severity

The severity of a flooding event is determined by the following key aspects: 1) a combination of stream and river basin topography and physiography; 2) precipitation and weather patterns; 3) recent soil moisture conditions; 4) the degree of vegetative clearing, and 5) effects on life, property, the environment, and the economy in terms of injuries and deaths, and damages or losses to structures, crops, resources, and critical facilities.

As previously discussed, major floods can result in death and injuries, induce property damages that threaten structural integrity, and impact critical services, facilities, and infrastructure. Flooding impacts a community only to the degree that it affects the lives or property of its citizens and the community's overall ability to function. Therefore, the most vulnerable areas of a community will be those most affected by floodwaters in terms of potential losses, damage, and disruption of community services and utilities. For example, an area with large developments on the floodplain is significantly more vulnerable to the impacts of flooding than a rural or undeveloped zone where potential floodwaters would have little impact on the community due to lack of the built environment and human presence.

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

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

Floods may also be caused by structural or hydrologic failures of dams or levees. Each of these causes results in floods that have distinct characteristics relative to flow rate, rate of rise, volume, duration, and flood season. For more information on dam and structural inundation hazards, refer to Section 4.5 Dam Incident.

4.8.5 Past Occurrences

There have been several past flooding events throughout the County, ranging widely in terms of location, magnitude, and impacts. The most frequent flooding events are quite localized in nature, resulting from heavy rains in a short period of time over urbanized areas that are not able to appropriately handle stormwater runoff. These events typically do not significantly threaten lives or property and will not result in emergency or disaster declarations; however, some events can lead to injuries and death, as well as thousands or millions of incurred damages. Notable flood events from 1979 to 2023 are summarized in Table 4-35. These events include event-related injuries, deaths, and property or crop damages as applicable. Full details, including a narrative description of the impacts of each event, can be found in Appendix J.

Table 4-35 Arapahoe County Historical Flood Events (1979-2023)

Date of Event	Flood Type	# Fatalities	# Injuries	Property Damage	Crop Damage
6/7/1979		0	0	$793	$0
7/18/1985		0	0	$5,555	$5,555
7/30/1985		0	0	$555	$5,555
7/20/1990		0	0	$5,000	$0
5/21/1997	Flash Flood	0	0	$0	$0
6/1/1997		0	0	$35,000	$0
6/13/1997	Flash Flood	0	0	$0	$0
7/27/1997	Flash Flood	0	0	$0	$0
7/29/1997	Flash Flood	0	0	$30,000	$0
8/11/1997	Flash Flood	0	0	$0	$0
7/23/1998	Flash Flood	0	0	$0	$0
7/24/1998	Flash Flood	0	0	$0	$0
7/25/1998		0	0	$0	$0
4/28/1999	Flood	0	0	$0	$0
8/4/1999	Flood	0	0	$0	$0
8/19/1999	Flood	0	0	$0	$0
7/16/2000	Flood	0	0	$0	$0
8/17/2000	Flash Flood	0	0	$0	$0
7/8/2001	Flash Flood	0	0	$0	$0
7/13/2001	Flash Flood	0	0	$0	$0
7/18/2003	Flash Flood	0	0	$0	$0
7/23/2004	Flash Flood	0	0	$0	$0
8/18/2004	Flash Flood	0	0	$0	$0
6/3/2005	Flash Flood	0	0	$0	$0
7/2/2006	Flash Flood	0	0	$0	$0
8/1/2006	Flash Flood	0	0	$0	$0

Date of Event	Flood Type	# Fatalities	# Injuries	Property Damage	Crop Damage
8/8/2008	Flash Flood	0	0	$10,000	$0
7/6/2010	Flash Flood	0	0	$10,000	$0
7/14/2011	Flash Flood	1	0	$10,000	$0
6/6/2012	Flash Flood	0	0	$50,000	$50,000
8/3/2013	Flash Flood	0	0	$5,000	$0
8/8/2013	Flash Flood	0	0	$50,000	$0
9/12/2013	Flood	0	0	$3,300,000*	$0
9/14/2013	Flash Flood	0	0	$0	$0
5/9/2015	Flash Flood	0	0	$15,000	$5,000
6/11/2015	Flash Flood/ Flood	0	0	$15,000	$0
8/10/2015	Flash Flood	0	0	$50,000	$0
7/24/2018	Flash Flood	1	0	$500,000	$0
8/15/2022	Flash Flood	0	0	$10,000	$0
5/12/2023	Flood	0	0	$50,000	$10,000
6/21/2023	Flash Flood	1	0	$50,000 ($1.34 Million in PA Funding)	$0
7/8/2023	Flood	0	0	$0	$0
Total Events: 42		**3**	**0**	**$851,903**	**$76,110**

*Source: NCEI, Plan Update Guides. * Other sources list the damage from this storm at over $50 million, including $10,000 in crop losses.*

Almost all recorded floods on the South Platte River have been generated near the river's headwaters on the slopes of Monument Divide. The following flood events, principal flood problems, and general terrain and flood related information for Arapahoe County were pulled from the County's 2018 Flood Insurance Study report:

- Major recorded floods (32 total) have occurred on the South Platte River and its tributaries in Arapahoe County from 1844 through 2018. There were 11 devastating floods on the South Platte River, 17 on Cherry Creek, 3 on Bijou, Box Elder, Comanche and Sand Creeks, tributaries of the South Platte and 1 on occurred on Toll Gate Creek.
- The most significant floods of recent times on the South Platte River occurred in 1912, 1921, 1933, 1935, 1942, 1965, and 1973. The discharges for these floods were 13,000 cubic feet per second (cfs), 8,790 cfs, 22,000 cfs, 12,320 cfs, 10,200 cfs, 40,300 cfs, and 33,000 cfs, respectively, at the Denver gage. Cherry Creek experienced similar flood history, with flood discharges of 25,000 cfs, 34,000 cfs, 10,700 cfs, 17,600 cfs, 10,800 cfs and 39,900 cfs in 1912, 1933, 1945, 1963, 1956 and 2013.
- Citizens interviewed in Watkins, Strasburg, Byers, and Deer Trail recalled severe damage and lives lost in 1905, 1933, 1935, and 1965 floods on Box Elder Creek, Comanche Creek, West Bijou Creek, and East Bijou Creek.
- In 1965, a unique combination of orthographic effects and meteorological conditions in the South Platte River Basin caused the worst flooding in the region's recorded history. Severe thunderstorms commenced over the headwaters of Plum Creek and Cherry Creek on June 16 and

moved northeasterly down the creeks following and augmenting peak flows. More than 14 inches of rain were recorded at Palmer Lake in 4 hours. Overnight, westerly winds moved the storm front to a position over the Kiowa and Bijou Creek Basins where it met with thunderstorms forming just south of Agate. Here, 5.25 inches fell in 45 minutes. Six people drowned, with two other deaths caused by flood-related activities, and an estimated damages of $500 million in the South Platte River Basin, of which $300 million occurred in the Denver area.

4.8.6 Climate Change Considerations

In addition to increasing drought and wildland fire potential (which in turn both can increase runoff), climate change has the potential to intensify rain events and storms in Colorado. According to NOAA, there is generally more rain and snow falling in the Northern Hemisphere and precipitation has increased by about 5% over the last century. An increase in precipitation alone is not immediately alarming but coupled with factors such as precipitation intensity and type (rainfall vs. snowfall), soil moisture, snowpack conditions, and basin topography all influence the severity and frequency of flooding. Warmer temperatures in the winters may cause increased precipitation to fall as rain instead of snow, which may lead to elevated stream flows and increased flood risk across the state.

4.8.7 Probability of Future Occurrence

Periodic flooding of lands adjacent to rivers and streams is a natural occurrence in the County and can vary in magnitude depending on flood recurrence intervals.

As previously discussed, a 1% annual chance flood is a regulatory standard used by federal agencies, states, and NFIP- participating communities to administer and enforce floodplain management programs, as well as set insurance requirements nationwide.

A 0.2% annual chance flood is another commonly mapped and studied event by FEMA flood related programs and efforts. For context, the main flood recurrence intervals used in planning, floodplain studies, and other regulatory contexts are summarized in Table 4-36, and more detailed descriptions of FEMA special flood hazard zones applicable to Arapahoe County are contained in Table 4-37. The most recent FEMA special flood hazard areas mapped, which contain the 100- and 500-year events and hence where riverine flooding is expected to primarily occur in the future, are shown on Figure 4-17 and Figure 4-18 under the Location subsection of this chapter.

Table 4-36 Annual Probability of Flooding Based on Recurrence Intervals

Flood Recurrence Interval	Annual Chance of Occurrence
10-year	10%
50-year	2%
100-year	1%
500-year	0.2%

Source: FEMA

Table 4-37 FEMA Special Flood Hazard Zones Present in Arapahoe County

Flood Zone	Definitions
Zone A	100-year floodplain, or areas with a 1% annual chance of flooding. Because detailed analyses are not performed these areas, no depths or base flood elevations are shown in Zone A areas.
Zone AE	Detailed studies for the 100-year floodplain. The base floodplain where base flood elevations are provided. AE Zones are now used on new format FIRMs instead of A1-A30 zones.
Zone AO	River or stream flood hazard areas and areas with a 1% or greater chance of shallow flooding each year, usually in the form of sheet flow, with an average depth ranging from 1 to 3 feet. Average flood depths derived from detailed analyses.
Other Flood Areas	
Floodway	A regulatory floodway is the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height.
Zone X (shaded)	Areas with a 0.2% annual chance flooding (1 in 500 chance), between the limits of the 100-year and 500-year floodplains. This zone is also used to designate base floodplains of lesser hazards, such as areas protected by levees from the 100-year flood, shallow flooding areas with average depths of less than one foot, or drainage areas less than 1 square mile.
Zone X (unshaded)	500-year floodplain (0.2% annual chance). Area of minimal flood hazard.

Source: FEMA

Based on historical records of 42 flood events since 1979, a damaging flood has occurred in Arapahoe County roughly once every year from 1979 through 2024. Based on this historic frequency, we can assume there is a 95% chance of a flooding event occurring in Arapahoe County each year.

4.8.8 Vulnerability

Flood hazards affect most of the communities in the County, will continue to occur in the future, and can be critical in their magnitude causing injuries or even deaths, and damaging property and infrastructure. The following sub-sections discuss the results of the parcel analysis conducted for Arapahoe County, using parcel centroids and the latest FEMA National Flood Hazard Layer (NFHL) data, updated as of April 11, 2024. Other data sources and vulnerability assessment methods may be used for assets not available in geospatial format, or to supplement existing GIS analysis (e.g., discussion of properties insured by the NFIP).

Impact to the Public

Previous Occurrences of flood events in Arapahoe County have led to 3 recorded fatalities, as detailed in Table 4-35 above.

Based on the GIS analysis performed using FEMA special flood hazards, the total at-risk population to this hazard was estimated. This assessment estimates that 1,127 people (0.17% of total population) reside within the 1% flood hazard area, while an additional 3,960 people reside in the 0.2% flood hazard area. This is a significant overall decrease in the number of people exposed to the 1% annual chance flood compared to the vulnerability analysis conducted in 2020. However, this is due primarily to a change in methodology used for the vulnerability analysis, rather than properties being actually removed from the

floodplain. The City of Centennial noted they have seen a significant increase in buildings in the SFHA since 2020 due to new FEMA mapping for streams that weren't previously studied. Centennial also noted that many of the homes located in the floodplain are older and their owners may no longer have mortgages, which means homeowners are not required to carry flood insurance.

The impacts of flooding on certain vulnerable populations can be more severe. Low income families may have fewer financial resources to prepare for or recover from a flood, and they may be more likely to be uninsured or underinsured. Individuals with disabilities may need more time to evacuate, so evacuation notices will need to be issued as soon as feasible, and communicated by multiple, inclusive methods. Motorists are typically more vulnerable to death or injury when they try to cross inundated roadways.

Impact to Responders

Flooding can have various impacts to responders in terms of response time and the personal safety of first responders. Flooded roadways are a common occurrence in Arapahoe County and can block emergency vehicles from crossing certain areas, delaying response times. The past events detailed in Table 4-17 show that approximately 24% of flood events resulted in motorists being rescued from stalled vehicles in flooded roadways. These types of rescues can often be dangerous for the first responders due to potentially polluted waters as well as swift moving currents that can make the response challenging.

Impact to Continuity of Operations (including continued delivery of services)

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

Impact to Property, Facilities, and Infrastructure

The type of property damage caused by flood events depends on the depth and velocity of the floodwaters. Faster moving floodwaters can wash buildings off their foundations and sweep cars downstream. Pipelines, bridges, and other infrastructure can be damaged when high waters combine with flood debris. Extensive damage can be caused by basement flooding related to soil saturation from flood events. Seepage into basements is common during flood events. Most flood damage is caused by water saturating materials susceptible to loss (e.g., wood, insulation, wallboard, fabric, furnishings, floor coverings, and appliances). Homes in flooded areas can also suffer damage to septic systems and drain fields. In many cases, flood damage to homes renders them uninhabitable.

Results of the overlay analysis are summarized in Table 4-38 and Table 4-40, with potentially flooded parcels shown in Figure 4-24 and Figure 4-25. Based on these results, there are 541 parcels in the 1% annual chance flood zone: 388 are residential properties (including multi-family residential), 56 are mobile homes, and the remaining 102 are non-residential properties. Total values are calculated by adding improved values to estimated contents values as described in Section 4.2.1. The total improved parcel exposure value vulnerable to the 1% annual chance flood is almost $526 million. The greatest potential losses from 1% annual chance flooding would occur in Centennial, Cherry Hills Village, Littleton, and unincorporated Arapahoe County. As a percentage of total property values, the community with the greatest percentage by far is Sheridan, with 6.3% of total parcels exposed to the 1% annual chance flood.

Cherry Hills Village has 1.7% of total parcels exposed, while all other jurisdictions have less than 1% each. Analysis reveals that 2 homes and approximately 5 residents are projected to be at future flood risk as development and hydrologic conditions change, summarized in Table 4-39.

There are 1,711 improved parcels vulnerable to the 0.2% annual chance flooding: 1,131 are residential properties, 395 are mobile homes, and 185 are non-residential properties. The City of Aurora has the greatest potential losses from 0.2% annual chance flooding followed by the City of Centennial and unincorporated Arapahoe County.

Table 4-38 Arapahoe County Risk to FEMA 1% Annual Chance Flood Hazards

Jurisdiction	Property Type	Improved Parcels	Improved Value	Total Value	Estimated Loss	% of Parcels At Risk	Population At Risk
Aurora	Commercial	10	$11,038,108	$22,076,216	$5,519,054	0.6%	-
	Exempt	2	$43,063	$86,126	$21,532	0.4%	-
	Mobile Home	3	$38,700	$58,050	$14,513	0.7%	8
	Multi-Family Residential	30	$9,179,500	$13,769,250	$3,442,313	0.2%	79
	Residential	7	$2,573,005	$3,859,508	$964,877	0.0%	18
	Vacant Improved	1	$26,381	$26,381	$6,595	5.0%	-
	Total	**53**	**$22,898,757**	**$39,875,531**	**$9,968,883**	**0.05%**	**106**
Bennett	Agricultural	1	$24,048	$48,096	$12,024	25.0%	-
	Total	**1**	**$24,048**	**$48,096**	**$12,024**	**0.1%**	**0**
Centennial	Commercial	2	$954,578	$1,909,156	$477,289	0.2%	-
	Exempt	13	$2,850,792	$5,701,584	$1,425,396	4.8%	-
	Multi-Family Residential	10	$3,280,800	$4,921,200	$1,230,300	0.4%	26
	Residential	103	$52,346,120	$78,519,180	$19,629,795	0.3%	269
	Vacant Improved	2	$2,100	$2,100	$525	33.3%	-
	Total	**130**	**$59,434,390**	**$91,053,220**	**$22,763,305**	**0.3%**	**295**
Cherry Hills Village	Agricultural	1	$9,074,145	$18,148,290	$4,537,073	50.0%	-
	Commercial	1	$24,626,175	$49,252,350	$12,313,088	14.3%	-
	Exempt	3	$1,623,567	$3,247,134	$811,784	15.0%	-
	Residential	32	$41,026,924	$61,540,386	$15,385,097	1.5%	98
	Total	**37**	**$76,350,811**	**$132,188,160**	**$33,047,040**	**1.7%**	**98**
Englewood	Commercial	3	$6,112,679	$12,225,358	$3,056,340	0.3%	-
	Multi-Family Residential	4	$13,440,000	$20,160,000	$5,040,000	0.4%	8
	Total	**7**	**$19,552,679**	**$32,385,358**	**$8,096,340**	**0.06%**	**8**
Glendale	Commercial	1	$112,480	$224,960	$56,240	1.1%	-
	Total	**1**	**$112,480**	**$224,960**	**$56,240**	**0.2%**	**-**
Greenwood Village	Residential	4	$3,058,300	$4,587,450	$1,146,863	0.1%	10
	Total	**4**	**$3,058,300**	**$4,587,450**	**$1,146,863**	**0.08%**	**10**
Littleton	Commercial	9	$4,344,669	$8,689,338	$2,172,335	1.2%	-

Jurisdiction	Property Type	Improved Parcels	Improved Value	Total Value	Estimated Loss	% of Parcels At Risk	Population At Risk
Littleton	Exempt	9	$2,232,238	$4,464,476	$1,116,119	5.1%	-
	Multi-Family Residential	24	$31,051,900	$46,577,850	$11,644,463	0.9%	52
	Residential	48	$19,436,300	$29,154,450	$7,288,613	0.4%	104
	Total	**90**	**$57,065,107**	**$88,886,114**	**$22,221,529**	**0.6%**	**156**
Sheridan	Commercial	4	$8,334,000	$16,668,000	$4,167,000	1.5%	-
	Exempt	1	$9,270	$18,540	$4,635	4.8%	-
	Mixed Use	1	$136,039	$272,078	$68,020	12.5%	-
	Mobile Home	51	$2,457,600	$3,686,400	$921,600	21.4%	124
	Multi-Family Residential	1	$960,000	$1,440,000	$360,000	1.1%	2
	Residential	52	$15,215,800	$22,823,700	$5,705,925	4.7%	126
	Total	**110**	**$27,112,709**	**$44,908,718**	**$11,227,180**	**6.3%**	**253**
Unincorporated	Agricultural	22	$9,368,365	$18,736,730	$4,684,183	5.0%	-
	Commercial	8	$3,994,829	$7,989,658	$1,997,415	0.8%	-
	Exempt	1	$77,258	$154,516	$38,629	0.5%	-
	Mixed Use	2	$258,697	$517,394	$129,349	4.0%	-
	Mobile Home	2	$15,400	$23,100	$5,775	0.3%	5
	Residential	73	$42,936,124	$64,404,186	$16,101,047	0.3%	196
	Total	**108**	**$56,650,673**	**$91,825,584**	**$22,956,396**	**0.4%**	**202**
	Grand Total	**541**	**$322,259,954**	**$525,983,191**	**$131,495,798**	**0.3%**	**1,127**

Source: Arapahoe, Adams, Douglas, and Jefferson County Assessor Data, FEMA Effective NFHL: Arapahoe 4/11/2024, Adams 12/2/2021, Douglas 12/2/2021, Jefferson 8/2/2022, WSP GIS Analysis

Table 4-39 Arapahoe County Risk to FEMA Future Conditions Flood Hazards

Jurisdiction	Property Type	Improved Parcels	Improved Value	Total Value	Estimated Loss	% of Parcels At Risk	Population At Risk
Unincorporated	Residential	2	$917,789	$917,789	$1,835,578	$458,895	0.01%
	Total	**2**	**$917,789**	**$917,789**	**$1,835,578**	**$458,895**	**0.01%**

Source: Arapahoe, Adams, Douglas, and Jefferson County Assessor Data, FEMA Effective NFHL: Arapahoe 4/11/2024, Adams 12/2/2021, Douglas 12/2/2021, Jefferson 8/2/2022, WSP GIS Analysis

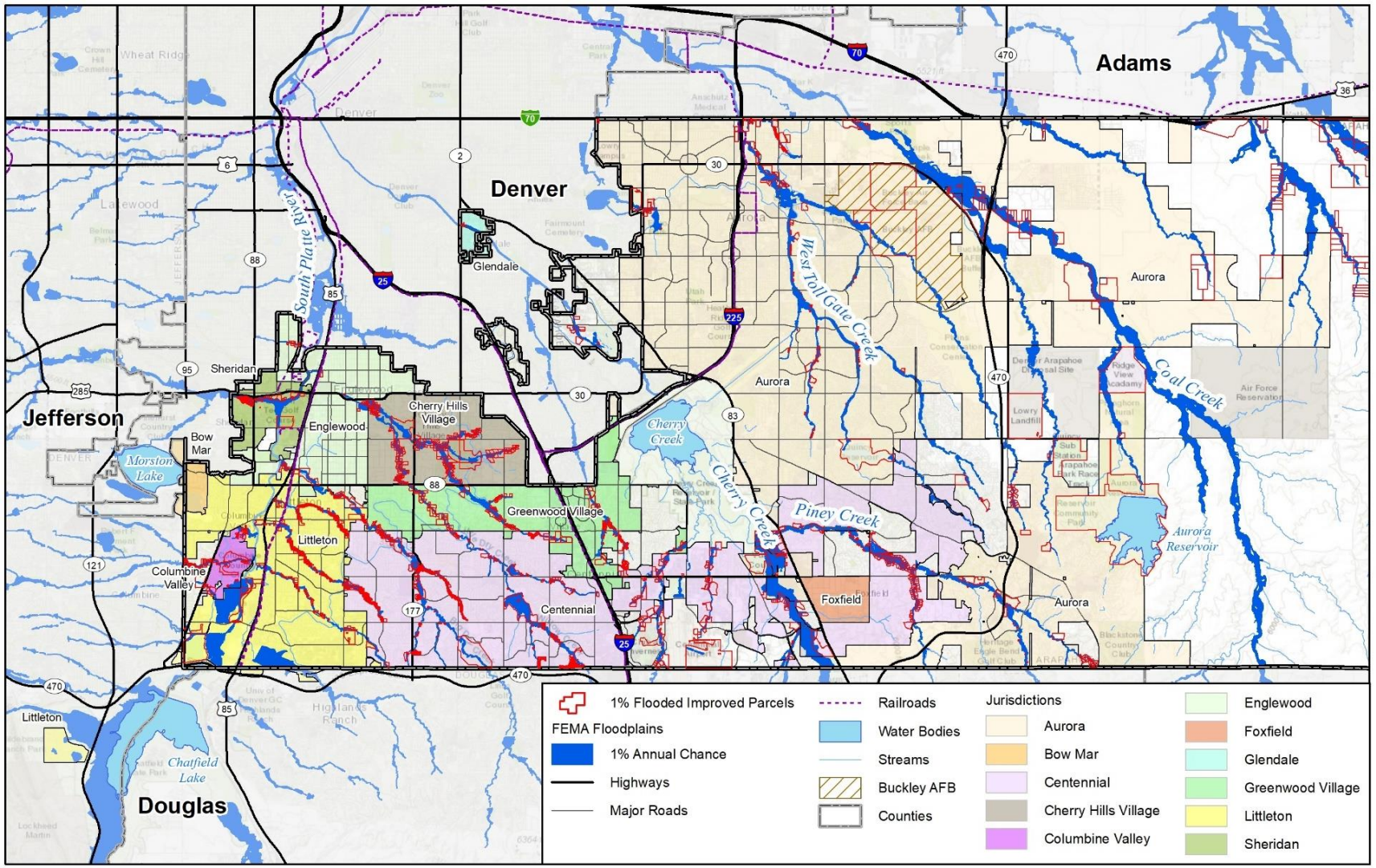
Table 4-40 Arapahoe County Risk to FEMA 0.2% Annual Chance Flood Hazards

Jurisdiction	Property Type	Improved Parcels	Improved Value	Total Value	Estimated Loss	% of Parcels At Risk	Population At Risk
Aurora	Commercial	48	$40,544,374	$81,088,748	$20,272,187	2.8%	-
	Exempt	4	$25,442,567	$50,885,134	$12,721,284	0.8%	-
	Mobile Home	270	$8,887,500	$13,331,250	$3,332,813	62.6%	713
	Multi-Family Residential	54	$243,185,300	$364,777,950	$91,194,488	0.3%	143
	Residential	130	$50,268,462	$75,402,693	$18,850,673	0.2%	343
	Total	**506**	**$368,328,203**	**$585,485,775**	**$146,371,444**	**0.5%**	**1,199**
Centennial	Agricultural	1	$1,093,058	$2,186,116	$546,529	50.0%	-
	Commercial	71	$98,972,376	$197,944,752	$49,486,188	5.7%	-
	Exempt	9	$13,848,132	$27,696,264	$6,924,066	3.3%	-
	Multi-Family Residential	11	$61,384,200	$92,076,300	$23,019,075	0.4%	29
	Residential	267	$152,167,295	$228,250,943	$57,062,736	0.8%	697
	Vacant Improved	1	$39,662	$39,662	$9,916	16.7%	-
	Total	**360**	**$327,504,723**	**$548,194,037**	**$137,048,509**	**0.9%**	**726**
Cherry Hills Village	Residential	8	$10,136,100	$15,204,150	$3,801,038	0.4%	24
	Total	**8**	**$10,136,100**	**$15,204,150**	**$3,801,038**	**0.4%**	**24**
Columbine Valley	Residential	23	$27,784,300	$41,676,450	$10,419,113	3.4%	61
	Total	**23**	**$27,784,300**	**$41,676,450**	**$10,419,113**	**3.3%**	**61**
Englewood	Commercial	17	$26,964,553	$53,929,106	$13,482,277	1.7%	-
	Exempt	3	$11,150,029	$22,300,058	$5,575,015	2.3%	-
	Mobile Home	65	$617,200	$925,800	$231,450	45.1%	133
	Multi-Family Residential	16	$44,809,200	$67,213,800	$16,803,450	1.5%	33
	Residential	27	$8,687,850	$13,031,775	$3,257,944	0.3%	55
	Total	**128**	**$92,228,832**	**$157,400,539**	**$39,350,135**	**1.1%**	**221**
Greenwood Village	Residential	6	$6,047,432	$9,071,148	$2,267,787	0.2%	15
	Total	**6**	**$6,047,432**	**$9,071,148**	**$2,267,787**	**0.1%**	**15**
Littleton	Commercial	2	$3,673,395	$7,346,790	$1,836,698	0.3%	-
	Multi-Family Residential	3	$8,869,500	$13,304,250	$3,326,063	0.1%	7
	Residential	19	$6,880,848	$10,321,272	$2,580,318	0.2%	41

Jurisdiction	Property Type	Improved Parcels	Improved Value	Total Value	Estimated Loss	% of Parcels At Risk	Population At Risk
Littleton	**Total**	**24**	**$19,423,743**	**$30,972,312**	**$7,743,078**	**0.2%**	**48**
Sheridan	Commercial	18	$9,196,486	$18,392,972	$4,598,243	6.8%	-
	Mobile Home	60	$4,095,725	$6,143,588	$1,535,897	25.2%	146
	Multi-Family Residential	2	$2,139,125	$3,208,688	$802,172	2.3%	5
	Residential	14	$5,053,600	$7,580,400	$1,895,100	1.3%	34
	Total	**94**	**$20,484,936**	**$35,325,647**	**$8,831,412**	**5.4%**	**185**
Unincorporated	Agricultural	2	$460,404	$920,808	$230,202	0.5%	-
	Commercial	6	$4,269,414	$8,538,828	$2,134,707	0.6%	-
	Exempt	2	$2,641	$5,282	$1,321	1.0%	-
	Mixed Use	1	$1,164,166	$2,328,332	$582,083	2.0%	-
	Multi-Family Residential	69	$164,718,600	$247,077,900	$61,769,475	1.7%	186
	Residential	482	$188,053,612	$282,080,418	$70,520,105	2.1%	1,297
	Total	**562**	**$358,668,837**	**$540,951,568**	**$135,237,892**	**1.9%**	**1,482**
	Grand Total	**1,711**	**$1,230,607,106**	**$1,964,281,626**	**$491,070,406**	**0.8%**	**3,960**

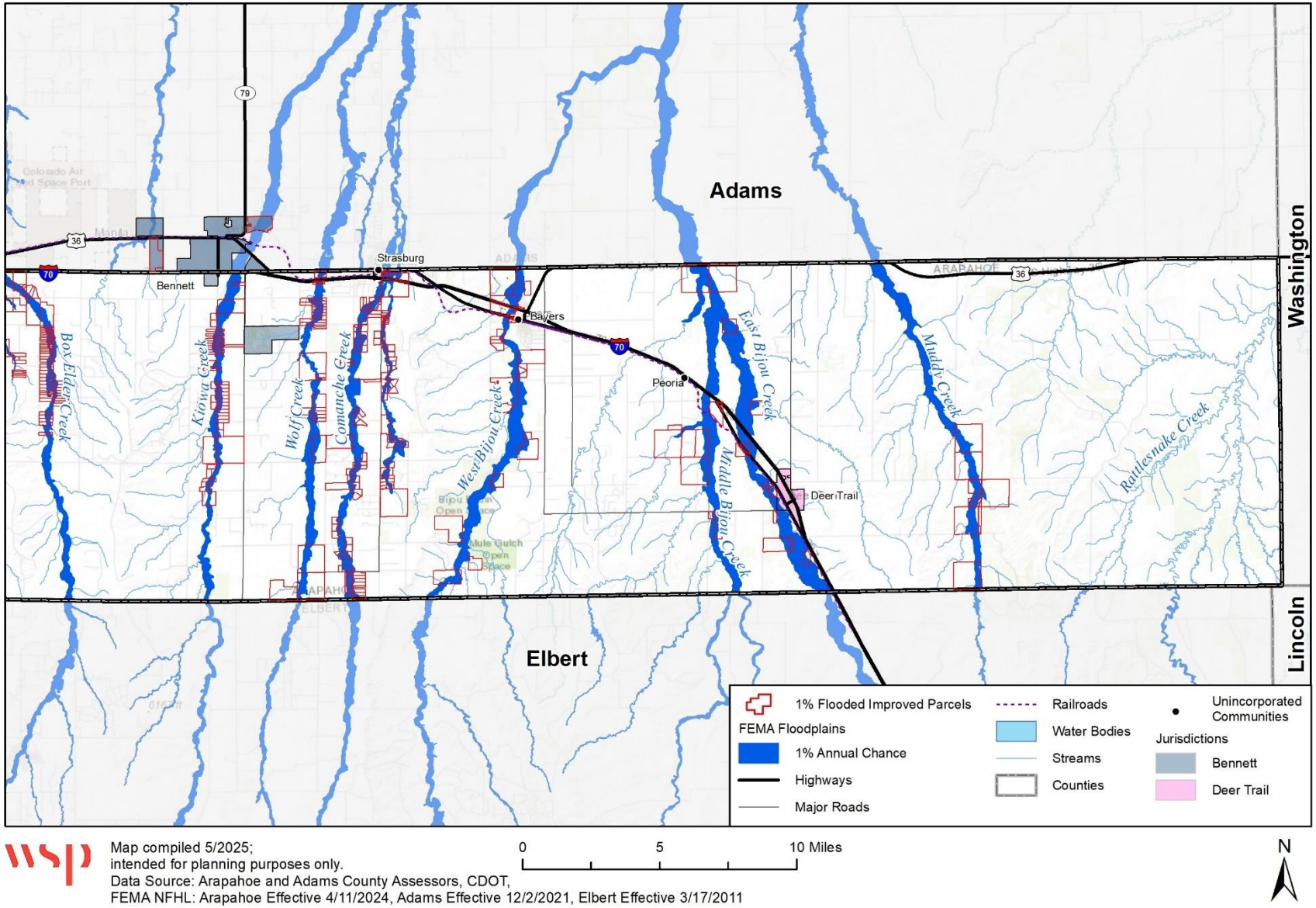
Source: Arapahoe, Adams, Douglas, and Jefferson County Assessor Data, FEMA Effective NFHL: Arapahoe 4/11/2024, Adams 12/2/2021, Douglas 12/2/2021, Jefferson 8/2/2022, WSP GIS Analysis

Figure 4-24 West Arapahoe County FEMA 1% Flood Hazard Areas & Flooded Parcels



Map compiled 5/2025;
intended for planning purposes only.
Data Source: Arapahoe, Douglas, and Jefferson County Assessors, CDOT, FEMA NFHL: Arapahoe Effective 4/11/2024, Adams Effective 12/2/2021, Denver Effective 1/19/2024, Douglas Effective 12/2/21, Elbert Effective 3/17/2011, Jefferson Effective 8/2/2022

Figure 4-25 East Arapahoe County FEMA 1% Flood Hazard Areas & Flooded Parcels



The impacts of floodwater on critical facilities such as police and fire stations, health facilities, and water or wastewater treatment facilities among others can greatly increase the overall effect of a flood event on a community (e.g., if critical potable facilities are impacted). In general, most of these facilities are located in areas with lower risk to flooding due to recent requirements for developers to consider hazard risks in their plans. However, the GIS analysis performed indicates several critical facilities (mostly bridges) were found to be vulnerable to 1% annual flood hazard area, as listed in Table 4-41. Analysis of critical facilities vulnerable to 0.2% annual flood hazard area is summarized in Table 4-42 and Table 4-43.

Table 4-41 Category B Critical Facilities in 1% Flood Hazard Area, by Jurisdiction

Jurisdiction	Bridge Operations	Communications	Dam	Healthcare and Public Health	Water and Wastewater Systems	Total Count
Aurora	20	1	-	1	-	**22**
Centennial	14	-	1	1	1	**17**
Cherry Hills Village	2	1	-	1	-	**4**
Deer Trail	1	-	-	-	-	**1**
Englewood	8	-	-	-	-	**8**
Glendale	1	-	-	-	-	**1**
Greenwood Village	4	-	-	-	-	**4**
Littleton	16	-	1	-	-	**17**
Sheridan	5	-	-	1	-	**6**
Unincorporated County	37	-	1	-	-	**38**
Adams County	1	-	-	-	1	**2**
Total	**109**	**2**	**3**	**4**	**2**	**120**

Source: Arapahoe County Sheriff's Office, CEPC, DWR, HIFLD, National Bridge Inventory, FEMA Effective NFHL: Arapahoe 4/11/2024, Adams 12/2/2021, Denver 1/19/2024, Douglas 12/2/21, Jefferson 8/2/2022, WSP GIS Analysis

According to the analysis there are no Category A critical facilities in the 1% flood area. A total of 120 Category B facilities are located in 1% annual chance flood areas, representing approximately 9% of the County's total Category B critical facilities. The majority of those facilities are found in the unincorporated portions of the County, followed by Aurora, Centennial, and Littleton. As shown in Table 4-42, the greatest number of facilities in the 1% annual chance flood area across the County are bridge operations.

According to the analysis summarized in Table 4-42 and Table 4-43 above, there are two (2) Category A critical facilities in the 0.2% flood area. A total of 37 Category B facilities are located in 0.2% annual chance flood areas as well. The majority of those facilities are found in the City of Aurora, followed by Centennial, and the unincorporated county. As shown in Table 4-43, the greatest number of facilities in the 0.2% annual chance flood area across the County are bridge operations.

Table 4-42 Category A Critical Facilities in 0.2% Flood Hazard Area, by Jurisdiction

Jurisdiction	Emergency Services	Government Facilities	Healthcare and Public Health	Total Count
Centennial	1	-	-	**1**
Douglas County	1	-	-	**1**
Total	**2**	**0**	**0**	**2**

Source: Arapahoe County Sheriff's Office, CEPC, DWR, HIFLD, National Bridge Inventory, FEMA Effective NFHL: Arapahoe 4/11/2024, Adams 12/2/2021, Denver 1/19/2024, Douglas 12/2/21, Jefferson 8/2/2022, WSP GIS Analysis

Table 4-43 Category B Critical Facilities in 0.2% Flood Hazard Area, by Jurisdiction

Jurisdiction	Bridge Operations	Energy	Healthcare and Public Health	Water and Wastewater Systems	Total Count
Aurora	13	1	3	-	**17**
Centennial	9	-	-	-	**9**
Englewood	1	-	2	-	**3**
Greenwood Village	1	-	-	-	**1**
Littleton	2	-	-	-	**2**
Unincorporated County	4	-	-	1	**5**
Total	**30**	**1**	**5**	**1**	**37**

Source: Arapahoe County Sheriff's Office, CEPC, DWR, HIFLD, National Bridge Inventory, FEMA Effective NFHL: Arapahoe 4/11/2024, Adams 12/2/2021, Denver 1/19/2024, Douglas 12/2/21, Jefferson 8/2/2022, WSP GIS Analysis

CWCB – DRAFT BLE Floodplain Mapping

A corresponding parcel and facility analysis was also completed using the CWCB BLE flood hazard data. This analysis identifies buildings, population, and critical infrastructure located within the draft 1% and 0.2% annual chance floodplains, providing a non-regulatory but detailed perspective on potential flood exposure across Arapahoe County. This analysis identified significantly less parcel-level exposure throughout Arapahoe County than the adopted FEMA flood analysis. Within the draft 1% annual chance floodplain, 291 improved parcels representing approximately $318.8 million in total value. Of that, estimated potential damages reach $79.7 million, with approximately 559 residents at risk. Unincorporated Arapahoe County contains the largest share of exposed parcels, followed by Englewood and Aurora. In the 0.2% annual chance floodplain, the exposure increases slightly, with 373 improved parcels valued at $485 million, with potential damages exceeding $121 million. The population at risk also increases to 601 residents. Under this scenario Aurora is the city with the greatest exposure, followed closely by Englewood and then the unincorporated County. Results are summarized in Table 4-44 and Table 4-45.

Table 4-44 Arapahoe County Risk to CWCB 1% Annual Chance Flood Hazards

Jurisdiction	Property Type	Improved Parcels	Improved Value	Total Value	Estimated Loss	% of Parcels At Risk	Population At Risk
Aurora	Commercial	3	$9,902,584	$19,805,168	$4,951,292	0.2%	-
	Exempt	3	$130,898	$261,796	$65,449	0.6%	-
	Mobile Home	1	$1,000	$1,500	$375	0.2%	3
	Multi-Family Residential	16	$4,908,500	$7,362,750	$1,840,688	0.09%	42
	Residential	19	$4,766,000	$7,149,000	$1,787,250	0.02%	50
	Total	**42**	**$19,708,982**	**$34,580,214**	**$8,645,054**	**0.04%**	**95**
Bennett	Agricultural	1	$24,048	$48,096	$12,024	25.0%	-
	Total	**1**	**$24,048**	**$48,096**	**$12,024**	**0.06%**	**0**
Centennial	Exempt	8	$948,174	$1,896,348	$474,087	2.9%	-
	Residential	21	$10,706,471	$16,059,707	$4,014,927	0.06%	55
	Vacant Improved	1	$1,783	$1,783	$446	16.7%	-
	Total	**30**	**$11,656,428**	**$17,957,838**	**$4,489,459**	**0.1%**	**55**
Cherry Hills Village	Commercial	1	$24,626,175	$49,252,350	$12,313,088	14.3%	-
	Exempt	3	$1,623,567	$3,247,134	$811,784	15.0%	-
	Residential	19	$23,581,024	$35,371,536	$8,842,884	0.9%	58
	Total	**23**	**$49,830,766**	**$87,871,020**	**$21,967,755**	**1.03%**	**58**
Deer Trail	Commercial	1	$99,000	$198,000	$49,500	4.8%	-
	Total	**1**	**$99,000**	**$198,000**	**$49,500**	**0.2%**	**0**
Englewood	Commercial	7	$15,205,082	$30,410,164	$7,602,541	0.7%	-
	Exempt	1	$12,000	$24,000	$6,000	0.8%	-
	Multi-Family Residential	10	$7,198,000	$10,797,000	$2,699,250	0.9%	21
	Residential	42	$13,744,000	$20,616,000	$5,154,000	0.5%	86
	Total	**60**	**$36,159,082**	**$61,847,164**	**$15,461,791**	**0.5%**	**107**
Glendale	Commercial	1	$112,480	$224,960	$56,240	1.1%	-
	Total	**1**	**$112,480**	**$224,960**	**$56,240**	**0.2%**	**0**
Greenwood Village	Exempt	1	$2,282	$4,564	$1,141	1.6%	-
	Residential	1	$808,400	$1,212,600	$303,150	0.03%	2
Greenwood Village	**Total**	**2**	**$810,682**	**$1,217,164**	**$304,291**	**0.04%**	**2**

Jurisdiction	Property Type	Improved Parcels	Improved Value	Total Value	Estimated Loss	% of Parcels At Risk	Population At Risk
Littleton	Commercial	1	$1,363,950	$2,727,900	$681,975	0.14%	-
	Exempt	4	$30,542	$61,084	$15,271	2.3%	-
	Multi-Family Residential	15	$17,148,500	$25,722,750	$6,430,688	0.6%	33
	Residential	5	$1,959,900	$2,939,850	$734,963	0.04%	11
	Total	**25**	**$20,502,892**	**$31,451,584**	**$7,862,896**	**0.2%**	**43**
Unincorporated	Agricultural	23	$6,662,015	$13,324,030	$3,331,008	5.2%	-
	Commercial	5	$3,112,609	$6,225,218	$1,556,305	0.5%	-
	Exempt	2	$174,137	$348,274	$87,069	1.0%	-
	Mixed Use	2	$1,264,143	$2,528,286	$632,072	4.0%	-
	Mobile Home	2	$15,400	$23,100	$5,775	0.3%	5
	Residential	72	$40,661,052	$60,991,578	$15,247,895	0.3%	194
	Total	**106**	**$51,889,356**	**$83,440,486**	**$20,860,122**	**0.4%**	**199**
	Grand Total	**291**	**$190,793,716**	**$318,836,526**	**$79,709,131**	**0.14%**	**559**

Source: Arapahoe, Adams, Douglas, and Jefferson County Assessor Data, Colorado Water Conservation Board, WSP GIS Analysis

Table 4-45 Arapahoe County Risk to CWCB 0.2% Annual Chance Flood Hazards

Jurisdiction	Property Type	Improved Parcels	Improved Value	Total Value	Estimated Loss	% of Parcels At Risk	Population At Risk
Aurora	Commercial	6	$9,391,323	$18,782,646	$4,695,662	0.3%	-
	Exempt	4	$10,104,999	$20,209,998	$5,052,500	0.8%	-
	Mixed Use	1	$593,771	$1,187,542	$296,886	3.8%	-
	Mobile Home	10	$168,900	$253,350	$63,338	2.3%	26
	Multi-Family Residential	54	$32,065,700	$48,098,550	$12,024,638	0.3%	143
	Residential	43	$13,990,535	$20,985,803	$5,246,451	0.05%	-
	Total	**118**	**$66,315,228**	**$109,517,889**	**$27,379,472**	**0.11%**	**169**
Centennial	Commercial	2	$1,202,185	$2,404,370	$601,093	0.2%	-
	Exempt	1	$52,000	$104,000	$26,000	0.4%	-
	Multi-Family Residential	3	$25,768,800	$38,653,200	$9,663,300	0.11%	8
	Residential	28	$15,367,934	$23,051,901	$5,762,975	0.08%	73
Centennial	**Total**	**34**	**$42,390,919**	**$64,213,471**	**$16,053,368**	**0.09%**	**81**

Jurisdiction	Property Type	Improved Parcels	Improved Value	Total Value	Estimated Loss	% of Parcels At Risk	Population At Risk
Cherry Hills Village	Agricultural	1	$9,074,145	$18,148,290	$4,537,073	50.0%	-
	Residential	7	$8,602,575	$12,903,863	$3,225,966	0.3%	21
	Total	**8**	**$17,676,720**	**$31,052,153**	**$7,763,038**	**0.4%**	**21**
Deer Trail	Commercial	1	$45,000	$90,000	$22,500	4.8%	-
	Total	**1**	**$45,000**	**$90,000**	**$22,500**	**0.2%**	**0**
Englewood	Commercial	33	$41,616,290	$83,232,580	$20,808,145	3.2%	-
	Exempt	8	$7,697,095	$15,394,190	$3,848,548	6.0%	-
	Mixed Use	2	$2,265,595	$4,531,190	$1,132,798	4.2%	-
	Multi-Family Residential	20	$34,275,976	$51,413,964	$12,853,491	1.9%	41
	Residential	54	$18,606,850	$27,910,275	$6,977,569	0.6%	111
	Total	**117**	**$104,461,806**	**$182,482,199**	**$45,620,550**	**1.0%**	**152**
Foxfield	Residential	1	$1,722,140	$2,583,210	$645,803	0.4%	3
	Total	**1**	**$1,722,140**	**$2,583,210**	**$645,803**	**0.4%**	**3**
Greenwood Village	Residential	4	$4,777,438	$7,166,157	$1,791,539	0.10%	10
	Total	**4**	**$4,777,438**	**$7,166,157**	**$1,791,539**	**0.08%**	**10**
Littleton	Commercial	2	$1,414,230	$2,828,460	$707,115	0.3%	-
	Exempt	1	$9,065,250	$18,130,500	$4,532,625	0.6%	-
	Multi-Family Residential	10	$5,159,100	$7,738,650	$1,934,663	0.4%	22
	Residential	13	$5,326,760	$7,990,140	$1,997,535	0.12%	28
	Total	**26**	**$20,965,340**	**$36,687,750**	**$9,171,938**	**0.2%**	**50**
Unincorporated	Agricultural	17	$5,584,435	$11,168,870	$2,792,218	3.9%	-
	Commercial	3	$1,037,249	$2,074,498	$518,625	0.3%	-
	Mobile Home	1	$6,245	$9,368	$2,342	0.2%	3
	Residential	42	$25,425,045	$38,137,568	$9,534,392	0.2%	113
	Vacant Improved	1	$5,287	$5,287	$1,322	4.8%	-
	Total	**64**	**$32,058,261**	**$51,395,590**	**$12,848,898**	**0.2%**	**116**
	Grand Total	**373**	**$290,412,852**	**$485,188,418**	**$121,297,105**	**0.2%**	**601**

Source: Arapahoe, Adams, Douglas, and Jefferson County Assessor Data, Colorado Water Conservation Board, WSP GIS Analysis

There are no Category A critical sectors at risk to either the 1% or 0.2% annual chance flood risk according to the CWCB Base Level Engineering (BLE) flood data. The CWCB 1% annual chance floodplain intersects with 141 category B critical sectors across Arapahoe County. The majority of at-risk infrastructure falls under the bridge operations category (137 facilities), highlighting potential disruptions to key corridors and evacuation routes. Unincorporated Arapahoe County contains the highest concentration of exposed assets (51), followed by Aurora (38) and Centennial (19). In the broader 0.2% annual chance floodplain, exposure decreases significantly to 19 category B critical sectors, with continued dominance of bridge operations assets (13). Although total counts are lower than in the 1% zone, these facilities reflect long-term exposure under climate-adjusted flood conditions, with continued risk to emergency access and public services. Table 4-46 and Table 4-47 below detail this analysis.

Table 4-46 Category B Critical Sectors at Risk to CWCB BLE 1% Flood Hazards

Jurisdiction	Bridge Operations	Communications	Dam	Healthcare and Public Health	Total Count
Aurora	37	1	-	-	**38**
Centennial	19	-	-	-	**19**
Cherry Hills Village	2	1	-	1	**4**
Deer Trail	1	-	-	-	**1**
Englewood	8	-	-	-	**8**
Glendale	1	-	-	-	**1**
Greenwood Village	7	-	-	-	**7**
Littleton	10	-	1	-	**11**
Unincorporated County	51	-	-	-	**51**
Adams County	1	-	-	-	**1**
Total	**137**	**2**	**1**	**1**	**141**

Source: Arapahoe County Sheriff's Office, HIFLD, National Bridge Inventory, CEPC, CWCB, WSP GIS Analysis

Table 4-47 Category B Critical Sectors at Risk to CWCB BLE 0.2% Flood Hazards

Jurisdiction	Bridge Operations	Energy	Healthcare and Public Health	Water and Wastewater Systems	Total Count
Aurora	1	3	-	-	**4**
Centennial	2	-	1	-	**3**
Englewood	3	-	1	-	**4**
Greenwood Village	2	-	-	-	**2**
Littleton	3	-	-	-	**3**
Unincorporated County	2	-	-	-	**2**

Jurisdiction	Bridge Operations	Energy	Healthcare and Public Health	Water and Wastewater Systems	Total Count
Adams County	-	-	-	1	**1**
Total	**13**	**3**	**2**	**1**	**19**

Source: Arapahoe County Sheriff's Office, HIFLD, National Bridge Inventory, CEPC, CWCB, WSP GIS Analysis

South Metro Fire Rescue

The South Metro Fire Rescue has one facility, the South Metro Fire Training Center, in the 0.2% floodplain.

National Flood Insurance Program (NFIP) Participation and Compliance

FEMA insures properties against flooding losses through the National Flood Insurance Program (NFIP). In support of the NFIP, FEMA identifies flood hazard areas through the US and its territories by producing Flood Hazard Boundary Maps (FHBMs), Flood Insurance Rate Maps (FIRMs) and Flood Boundary and Floodway Maps (FBFMs). Several areas of flood hazards are commonly identified on these maps. One of these areas is the Special Flood Hazard Area (SFHA) or high-risk area defined as any land that would be inundated by a flood having a 1% chance of occurring any given year (also referred to as the base flood level).

Participation in the NFIP is completely voluntary and participation is on a community rather than an individual basis. Participating in the program allows those who want to purchase flood insurance for their insurable property, whether it is a home or other property. Almost every type of walled and roofed building that is principally above ground and not entirely over water may be insured if it is in a participating community.

Arapahoe County and all participating jurisdictions have been mapped for flood hazards and participate fully in the NFIP, except for the Towns of Bow Mar and Foxfield, which have never been mapped and are not required to participate. Table 4-48 provides detailed information on National Flood Insurance Program (NFIP) policies in the plan-participating county jurisdictions, current as of December 9, 2024. NFIP insurance data indicates that as of December 2024, there were 344 flood insurance policies in force in Arapahoe County and its jurisdictions, with $97,006,000 of combined coverage.

Table 4-48 Community Participation in the NFIP and Summary Information

Community	Date Joined	Current Map Date	Study Underway?	Policies in Force	Insurance in Force	# of Paid Losses	Total Losses Paid
Aurora	6/1/1978	9/4/2020	Yes	136	$36,648,000	94	$333,169
Bennett	9/12/2014	3/5/2007	Yes	0	$0	-	-
Centennial	12/1/2002	4/11/2024	No	135	$28,202,000	25	$41,805
Cherry Hills Village	8/1/1978	4/11/2024	Yes	25	$8,202,000	17	$392,765
Columbine Valley	6/15/1978	4/11/2024	Yes	0	$0	1	$0

Community	Date Joined	Current Map Date	Study Underway?	Policies in Force	Insurance in Force	# of Paid Losses	Total Losses Paid
Deer Trail	11/5/1985	12/17/2010	Yes	1	$0	-	-
Englewood	2/11/1972	4/11/2024	Yes	19	$7,637,000	12	$14,785
Glendale	12/5/2005	9/4/2020	Yes	3	$835,000	-	-
Greenwood Village	1/5/1978	4/11/2024	Yes	29	$9,783,000	18	$45,087
Littleton	12/1/1978	4/11/2024	Yes	53	$18,938,000	23	$19,657
Sheridan	7/13/1976	4/11/2024	Yes	17	$3,520,000	-	-
Unincorporated	8/15/1977	4/11/2024	Yes	63	$19,889,000	29	$79,156
			Total	**344**	**$97,006,000**	**125**	**$593,255**

Source: FEMA Community Information System

Details of local jurisdiction participation status from the NFIP's Community Information System are included below. All have adopted floodplain regulations that meet, or exceed in some cases, the minimum NFIP standards. See also Section 5.2.1 for details on how the participating jurisdictions will continue to participate in the NFIP.

Table 4-49 Arapahoe County NFIP Compliance

Community	Adoption of NFIP Min. Floodplain Management Criteria	Implementation & Enforcement of Local Flood-Plain Regulation on Development in SFHAs	Designee/ Agency to Implement NFIP Requirements	Describe How Jurisdiction Implements Substantial Improvement/ Substantial Damage Provision
Arapahoe County	Yes	Yes (floodplain management ordinance)	Arapahoe County Engineering Services	The County floodplain ordinance treats substantially improved/ substantially damaged properties the same as new construction for purposes of meeting floodplain requirements. It is the intent of the County that no new permanent structures be constructed in a floodplain or special flood hazard area and that all such existing legal, non-conforming uses cease upon obsolescence of existing non-conforming structures or be improved to meet criteria set forth in the ordinance.
Aurora	Yes	Yes (Floodplain Damage Prevention Ordinance)	General Manager of Aurora Water	The City floodplain ordinance treats substantially improved/ substantially damaged properties the same as new construction for purposes of meeting floodplain requirements.
Bennett	Yes	Yes (Flood Damage Prevention Ordinance)	Town Manager	The Town floodplain ordinance treats substantially improved/ substantially damaged properties the same as new construction for purposes of meeting floodplain requirements.
Centennial	Yes	Yes (floodplain management ordinance)	Southeast Metro Stormwater Authority (SEMSWA)	Requires substantial improvement/substantial damage to any existing structure in the floodplain be removed from the floodway and have two (2) feet of freeboard without increasing the footprint of the structure.
Cherry Hills Village	Yes	Yes (floodplain management ordinance)	City Manager or Designee	The City floodplain ordinance treats substantially improved/ substantially damaged properties the same as new construction for purposes of meeting floodplain requirements.

Community	Adoption of NFIP Min. Floodplain Management Criteria	Implementation & Enforcement of Local Flood-Plain Regulation on Development in SFHAs	Designee/ Agency to Implement NFIP Requirements	Describe How Jurisdiction Implements Substantial Improvement/ Substantial Damage Provision
Englewood	Yes	Yes (Floodplain Regulations)	City Manager or Designee	The City floodplain ordinance treats substantially improved/ substantially damaged properties the same as new construction for purposes of meeting floodplain requirements.
Glendale	Yes	Yes (Floodplain Regulations)	Public Works Director or Designee	The City floodplain ordinance treats substantially improved/ substantially damaged properties the same as new construction for purposes of meeting floodplain requirements.
Greenwood Village	Yes	Yes (Floodplain Ordinance in Land Development Code, Drainage Criteria specifies Floodplain Criteria)	Community Developmen t – Engineer	The City floodplain ordinance treats substantially improved/ substantially damaged properties the same as new construction for purposes of meeting floodplain requirements.
Littleton	Yes	Yes (Floodplain Regulations)	City Manager or Designee	The City floodplain ordinance treats substantially improved/ substantially damaged properties the same as new construction for purposes of meeting floodplain requirements.
Sheridan	Yes	Yes (floodplain management ordinance)	Public Works Director or Designee	The City floodplain ordinance treats substantially improved/ substantially damaged properties the same as new construction for purposes of meeting floodplain requirements.

Source: HMPC, NFIP Community Information System, Municipal Codes of Ordinances

As part of the process to reduce or eliminate repetitive flooding to structures across the United States, FEMA has developed an official Repetitive Loss Strategy. The purpose behind the national strategy is to identify, catalog, and propose mitigation measures to reduce flood losses to the relatively few numbers of structures that absorb the majority of the premium dollars from the national flood insurance fund. A repetitive loss property is defined by FEMA as "a property for which two or more NFIP losses of at least $1,000 each have been paid within any 10-year period since 1978." A repetitive loss property may or may not be currently insured by the NFIP.

A Severe Repetitive Loss property (SRL) is defined as a residential property that is covered under an NFIP flood insurance policy and: a) has at least four NFIP claim payments (including building and contents) over $5,000 each, and the cumulative amount of such claims payments exceeds $20,000; or, b) a property for which at least two separate claim payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building. For both a) and b) above, at least two of the referenced claims must have occurred within any ten-year period and must be greater than ten days apart.

As of December 9, 2024, there are seven Repetitive Loss properties in Arapahoe County that have resulted in a total of 15 claims. Table 4-50 shows these repetitive loss buildings along with information on losses and payments made. Note that total payments are reported by jurisdiction, so it is not always possible to break them down by individual property. The property listed in the Unincorporated County

has now been mitigated. There are no Severe Repetitive Loss properties in Arapahoe County or its jurisdictions.

Table 4-50 Repetitive Loss Properties

Community	Total Payments	Building Type	# of Losses
Aurora	$92,906.74	Single Family Residential	2
Aurora	$92,906.74	Single Family Residential	3
Unincorporated County *	$ 11,578.00	Single Family Residential	2
Cherry Hills Village	$33,129.98	Single Family Residential	2
Cherry Hills Village	$33,129.98	Single Family Residential	2
Littleton	$4,030.57	Other Residential	2
Centennial	$41,538.23	Single Family Residential	2
TOTAL	**$183,183.52**		**15**

Source: FEMA Community Information System
** indicates the property has been mitigated*

Community Rating System (CRS) Participation

In addition to participating in the NFIP, Arapahoe County and several of its municipalities participate in the Community Rating System (CRS). The CRS is a voluntary program for NFIP participating communities. The goals of the CRS are to reduce flood damage to insurable property, to strengthen and support the insurance aspects of the NFIP, and to encourage a comprehensive approach to floodplain management. The CRS provides incentives in the form of insurance premium discounts to communities that go above and beyond the minimum floodplain management requirements and develop extra measures to reduce flood risk. There are 10 CRS classes which determine the insurance premium discount for policy holders, which range from 5% to a maximum of 45%.

Six communities including Arapahoe County participate in the CRS program; Table 4-51lists the participants. Five of the communities are a Class 7 CRS community. These communities have a 15% premium discount for properties in the SFHA and a 5% discount for properties in the non-SFHA. The City of Littleton is Class 5 CRS community. Littleton receives a 25% premium discount for properties in the SFHA and a 10% discount for properties in the non-SFHA.

Table 4-51 CRS Participating Communities in Arapahoe County

Community	CRS Class	SFHA Discount
Centennial	5	25%
Littleton	5	25%
Arapahoe County	7	15%
Aurora	7	15%
Cherry Hills Village	7	15%
Englewood	7	15%

Source: FEMA Community Information System.

Refer to Section 3.6 Capability Assessment for additional details on the CRS program and discussion on opportunities to enhance participating communities' Class.

Impact to the Environment

Natural areas within the floodplain often benefit from periodic flooding as a naturally recurring phenomenon. These natural areas often reduce flood impacts by allowing absorption and infiltration of floodwaters. Natural resources are generally resistant to flooding, except where natural landscapes and soil compositions have been altered for human development or after periods of previous disasters such as drought and fire. Wetlands, for example, exist because of natural flooding incidents. Areas that are no longer wetlands may suffer from oversaturation of water, as will areas that are particularly impacted by drought. Areas which may have recently suffered from wildfire damage may erode because of flooding, which can permanently alter an ecological system.

Impact to the Economic Condition of the County and Jurisdictions

Flooding can have a major economic impact on the economy, including indirect losses such as business interruption, lost wages, reduced tourism and visitation, and other downtime costs. Flood events can cut off customer access to a business as well as close a business for repairs or permanently. A quick response to the needs of businesses affected by flood events can help a community maintain economic vitality in the face of flood damage. Responses to business damages can include funding to assist owners in elevating or relocating flood-prone business structures.

In rural areas, property damage caused by flooding can be devastating to ranchers and farmers. When flooding occurs during the growing season, farmers can suffer widespread crop loss. Stock growers may lose livestock if they are unable to find safety from rising floodwaters. Flooding may also cause damage to pastureland, fences, barns, and outbuildings. A review of past flood events shows crops damages due to flooding has resulted in $76,110 in crop damages in the past 45 years.

Impact to Public Confidence in Government

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

Changes in Development

As population continues to increase in Arapahoe County, future development trajectories can be expected to put more people and property, both private and public, at risk of flooding. It is essential that zoning and land use plans take into account not only the dollar amount of damage that buildings near waterways could incur, but also the added risk of floodplain development activity that alters the natural floodplain of the area (for example, narrowing the floodplains by building new structures close to rivers and streams). Historically, suburban residential development has encroached on floodplains throughout the County, specifically along the South Platte River. While development continues, the County is working to retain open space adjacent to floodplains as well as implementing and enforcing the County's Floodplain Regulations which were updated in 2018 in conjunction with updated floodplain mapping.

Of the 7,144 structures built after 2019, only 14 are located in FEMA 1% floodplains, with an additional 52 in the 0.2% floodplains. The structures in the 1% floodplain are required to incorporate mitigation per

local floodplain management regulations. This is a comparatively small increase in exposure to flood vulnerability to the larger, less frequent floods since the last plan update, and it is offset by the very significant decrease in flood exposure identified in this plan update since the previous iteration of the plan. Risk could be further reduced by strengthening floodplain ordinances and floodplain management programs beyond minimum NFIP minimum requirements.

The Future Avoided Cost Explorer (FACE) tool developed by the Colorado Water Conservation Board helps to estimate annual damages from future droughts. The tool looks at three different climate scenarios (current climate conditions, moderately warmer climate by 2050, and severely warmer climate by 2050), and compares them against current population as well as low, medium, and high growth population scenarios. The following table compares the estimated annual damages for Arapahoe County from flooding for each of the climate and population scenarios.

Table 4-52 Potential Future Economic Losses from Flooding in Arapahoe County

Climate Scenarios	Low Growth (846,000)	Medium Growth (900,000)	High Growth (956,000)
Current Conditions	Total Damages: $26M	Total Damages: $26M	Total Damages: $26M
	Total Damages per person: $30	Total Damages per person: $30	Total Damages per person: $30
Moderately Warmer Climate by 2050	Total Damages: $29M	Total Damages: $39M	Total Damages: $39M
	Total Damages per person: $30	Total Damages per person: $40	Total Damages per person: $40
Severely Warmer Climate by 2050	Total Damages: $50M	Total Damages: $50M	Total Damages: $50M
	Total Damages per person: $60	Total Damages per person: $60	Total Damages per person: $50

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

4.8.9 Jurisdictional Differences

Flooding has the potential to affect several jurisdictions in Arapahoe County depending on the location of the event. Refer to Figure 4-17 and Figure 4-18 under the Location subsection for the location of the 1% and 0.2% flood hazard areas in the County. Jurisdictions in the western portion of the County are listed most often in the NCEI Storm Events Database compared to jurisdictions in the eastern portion. Due to the more urbanized nature of the western county, the western portion is likely to experience more damage to homes and businesses compared to the eastern portion. While homes and business can also be impacted in the eastern portion of County, there is the additional potential economic impact on agricultural properties due to crop damage.

Based on the GIS Analysis described in the Vulnerability section, the jurisdiction with the greatest percentage of parcels at risk in the 1% annual chance flood zone by a wide margin is Sheridan, with 6.3% of total parcels at risk. The next highest jurisdiction is Cherry Hills Village with 1.7% of parcels at risk. After this, all jurisdictions including the unincorporated county, drop off rather quickly, with each have less than 0.5% of total parcels at risk.

Additionally, flooding can cause significant localized impacts outside of the 1% annual chance flood zone due to inadequate drainage infrastructure. The City of Englewood has suffered repetitive damaging street flooding, as well as one death when a woman was trapped in a flooded basement in 2018 (see Previous

Occurrences in Table 4-35 for more detail). Since this incident, the City of Englewood has updated their flood hazard mapping to reflect their current infrastructure. Additionally, the City has updated their Stormwater System Master Plan that prioritizes stormwater improvement projects for the City. While the City falls outside of the 1% annual chance flood zone due to these drainage constraints the flood risk in Englewood remains elevated for portions of the City.

Each incorporated jurisdiction must implement and enforce their own Floodplain and Development Regulations and take into consideration flood risk across the jurisdictions within the County when considering future development and infrastructure plans.

Table 4-53 Flooding Hazard Rankings by Jurisdiction

Flooding	Frequency	Spatial Extent	Severity	Overall Significance
Bennett	Likely	Limited	Limited	Medium
Bow Mar	Likely	Limited	Limited	Medium
Centennial	Likely	Significant	Critical	High
Cherry Hills Village	Likely	Significant	Limited	Medium
Columbine Valley	Likely	Limited	Limited	Medium
Deer Trail	Likely	Limited	Limited	Medium
Englewood	Likely	Limited	Critical	High
Foxfield	Likely	Limited	Limited	Medium
Glendale	Likely	Limited	Limited	Medium
Greenwood Village	Likely	Significant	Limited	Medium
Littleton	Likely	Significant	Limited	Medium
Sheridan	Likely	Significant	Critical	High
Denver Water	Likely	Significant	Limited	Medium
South Metro Fire	Likely	Significant	Limited	Medium
Unincorporated County	Likely	Significant	Limited	Medium

4.9 Hazardous Materials Release

Hazard	Frequency	Spatial Extent	Severity	Significance
Hazmat Release	**Likely**	**Significant**	**Critical**	**Medium**

4.9.1 Risk Summary

- Hazardous Materials incidents can happen anywhere hazmat materials are stored or transported.
- There are 7 Risk Management Plan (RMP) sites in Arapahoe County.
- According to National Response Center (NRC), there have been 441 incidents in the County from 1990-2024.
- From 1990-2024, there was 56 incidents that resulted in injuries, fatalities, or evacuations. However, most of the fatalities or injuries were caused by the accident, rather than from the exposure to a hazardous material.
- Related Hazards: Severe Wind/Tornado, Flood

4.9.2 Description

Hazardous Materials are any material or group of materials of a specific quantity that individually or when combined, cause harm to people, property, or the environment. Arapahoe County recognizes the Environmental Protection Agency's (EPA) list of hazardous materials as required by the Emergency Planning and Community Right to Know Act (EPCRA) as the authoritative list of regulated substances. Hazardous Materials may be stored in fixed locations or transported on road or railways.

The U.S. Department of Transportation (DOT), U.S. Environmental Protection Agency (EPA) and the Occupational Safety and Health Administration (OSHA) all have responsibilities relating to the transportation, storage, and use of hazardous materials and waste. The Right to Know Network maintained by the U.S. Coast Guard's National Response Center (NRC) is a primary source of information on the use and storage of hazardous materials, as well as data regarding spills and releases. In Colorado, the manufacture, use, storage, and transportation of hazardous materials is regulated by the Colorado Department of Public Health and the Environment (CDPHE). Hazardous materials carriers are subject to Colorado Public Utility Commission (PUC) registration and insurance requirements. Colorado statutes require that any person transporting hazardous materials that require placarding to obtain a Hazardous Materials Permit from the Public Utilities Commission. Safety oversight is the jurisdiction of the Colorado State Patrol.

The U.S. Department of Transportation divides Hazardous materials into the following classes:

- Explosives
- Compressed gases: flammable, non-flammable compressed, poisonous
- Flammable & combustible liquids
- Flammable solids: spontaneously combustible, dangerous when wet
- Oxidizers and organic peroxides
- Toxic materials: poisonous material, infectious agents
- Radioactive material
- Corrosive material: destruction of human skin, corrodes steel

4.9.3 Location

Hazmat incidents can occur anywhere hazardous materials are stored or transported. Overall, the geographic coverage of this hazard in Arapahoe County has been limited—less than 10% of the planning area affected based on historical experience – but depending on the type and quantity of spills and the medium affected, the geographic coverage could become large, particularly if a material was released into a stream or waterway.

Generally, with a fixed facility, the hazards are pre-identified. EPCRA requires industries to report on the storage, use, and releases of hazardous substances to federal, state, and local governments. Facilities in Colorado must submit a Tier II emergency and hazardous chemical inventory form to the CDPHE and, if required by local reporting regulations, the Local Emergency Planning Committee (LEPC) and local fire departments annually. Tier II forms provide state and local officials and the public with information on the general hazard types and locations of hazardous chemicals present at facilities during the previous calendar year. The inventory forms require basic facility identification information, employee contact information for both emergencies and non-emergencies, and information about chemicals stored or used at the facility.

Figure 4-26 through Figure 4-28 show hazardous materials facilities and shipping routes in Arapahoe County. As shown in those maps, the majority of these sites are located in the western part of the County, with the largest concentrations in Aurora, Sheridan, Englewood, Foxfield, Centennial, Glendale, Greenwood Village, and the unincorporated Four Square Mile/Sullivan neighborhood west of Aurora.

The EPA also requires facilities containing certain extremely hazardous substances to generate Risk Management Plans (RMPs) and resubmit these plans every five years. There are 7 RMP facilities located in Arapahoe County. As shown in Table 4-54, most are in the western portion of the County, with two located in the eastern part of the County along I-70. However, plotting these facilities against the other hazards in this plan, three RMP facilities are located in potential dam inundation areas.

Table 4-54 Risk Management Plan (RMP) Facilities in Arapahoe County

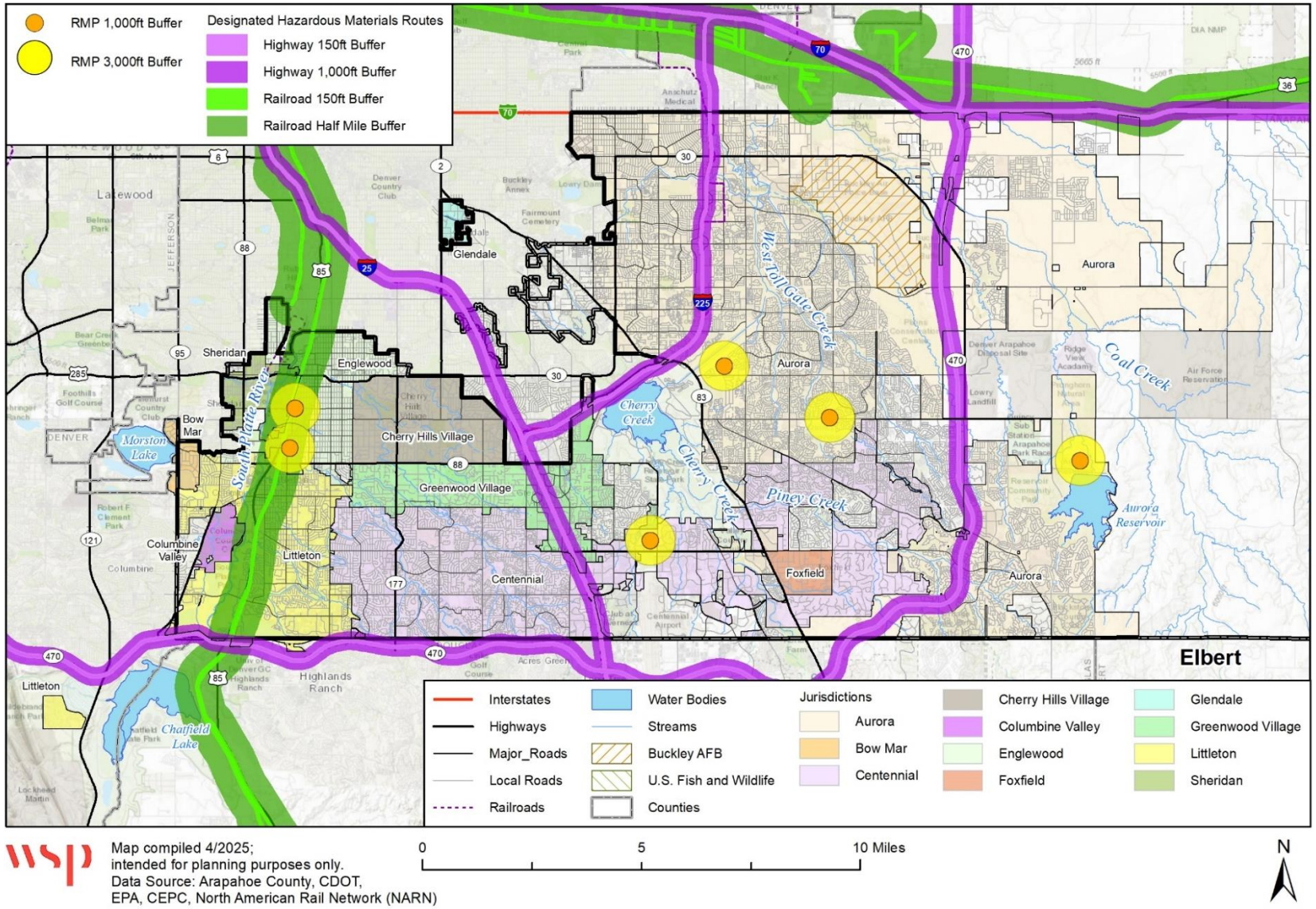
Jurisdiction	RMP Facilities
Aurora	3
Centennial	1
Englewood	2
Unincorporated	1
Total	**7**

Source: Arapahoe, Adams and Douglas County Assessor Data, Environmental Protection Agency (EPA), WSP GIS Analysis

The designated hazardous materials routes in Arapahoe County are I-25, I-225, I-70, E-470, and US 36, as shown in Figure 4-26 through Figure 4-28. Arapahoe County is also transited by Union Pacific and Burlington Northern railroads.

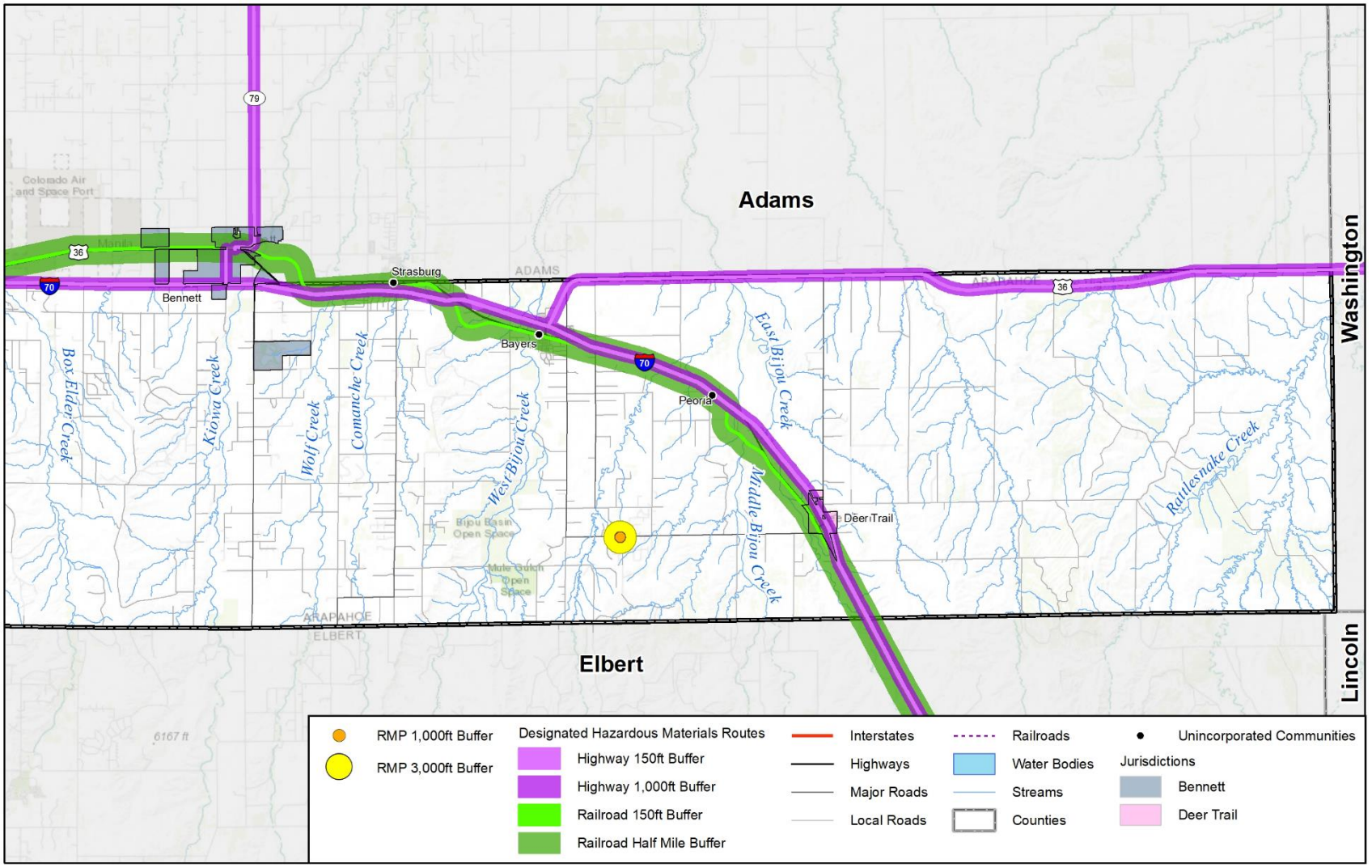
Finally, there are a number of oil and gas wells in the planning area that could potentially cause or contribute to a hazmat incident; these sites are mapped in Figure 4-29.

Figure 4-26 West Arapahoe County Hazardous Materials Routes and Facilities



Map compiled 4/2025;
intended for planning purposes only.
Data Source: Arapahoe County, CDOT,
EPA, CEPC, North American Rail Network (NARN)

Figure 4-27 East Arapahoe County Hazardous Materials Routes and Facilities



Map compiled 5/2025;
intended for planning purposes only.
Data Source: Arapahoe County, CDOT,
EPA, CEPC, North American Rail Network (NARN)

Figure 4-28 South Metro Fire Rescue Hazardous Materials Routes and Facilities

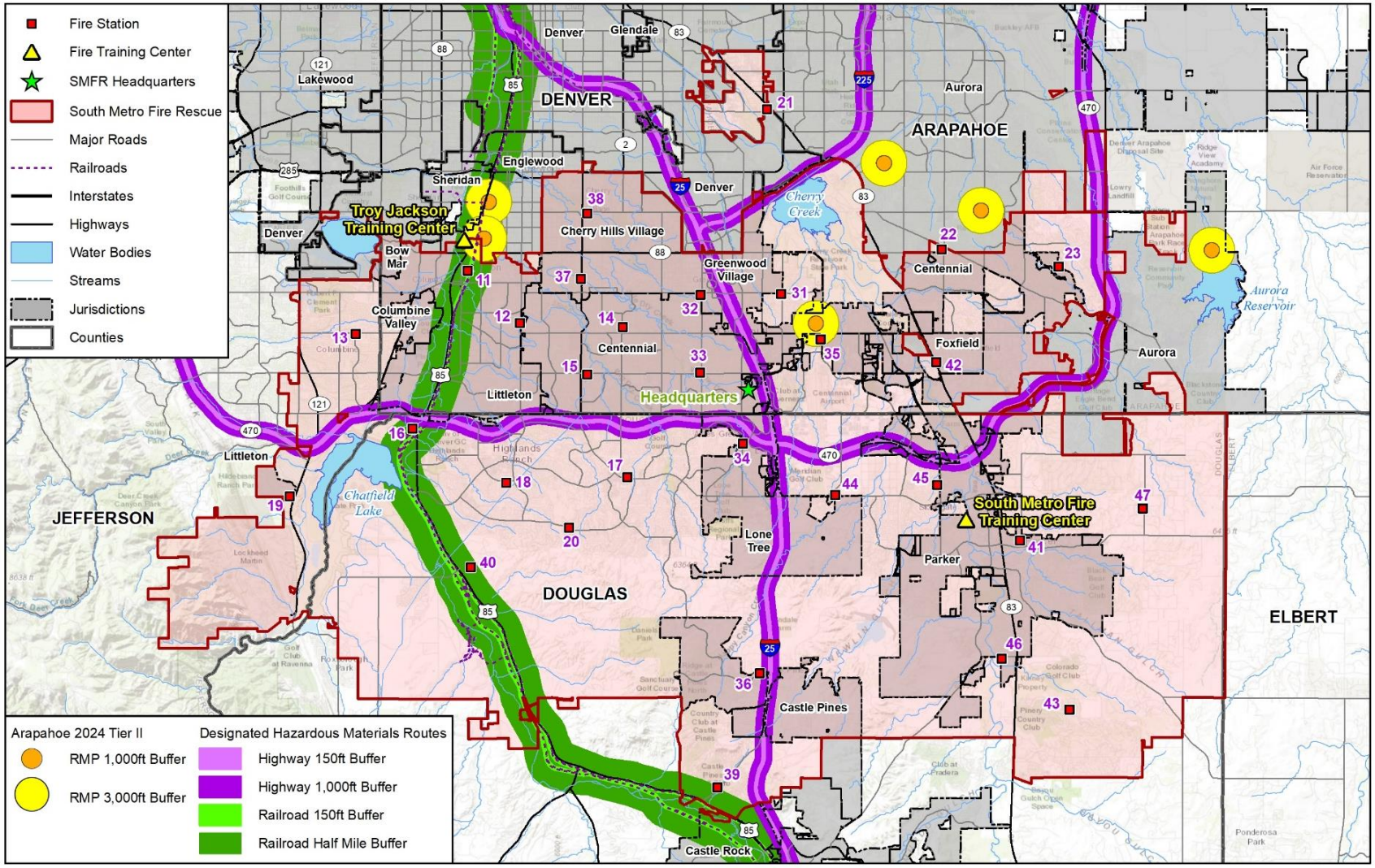
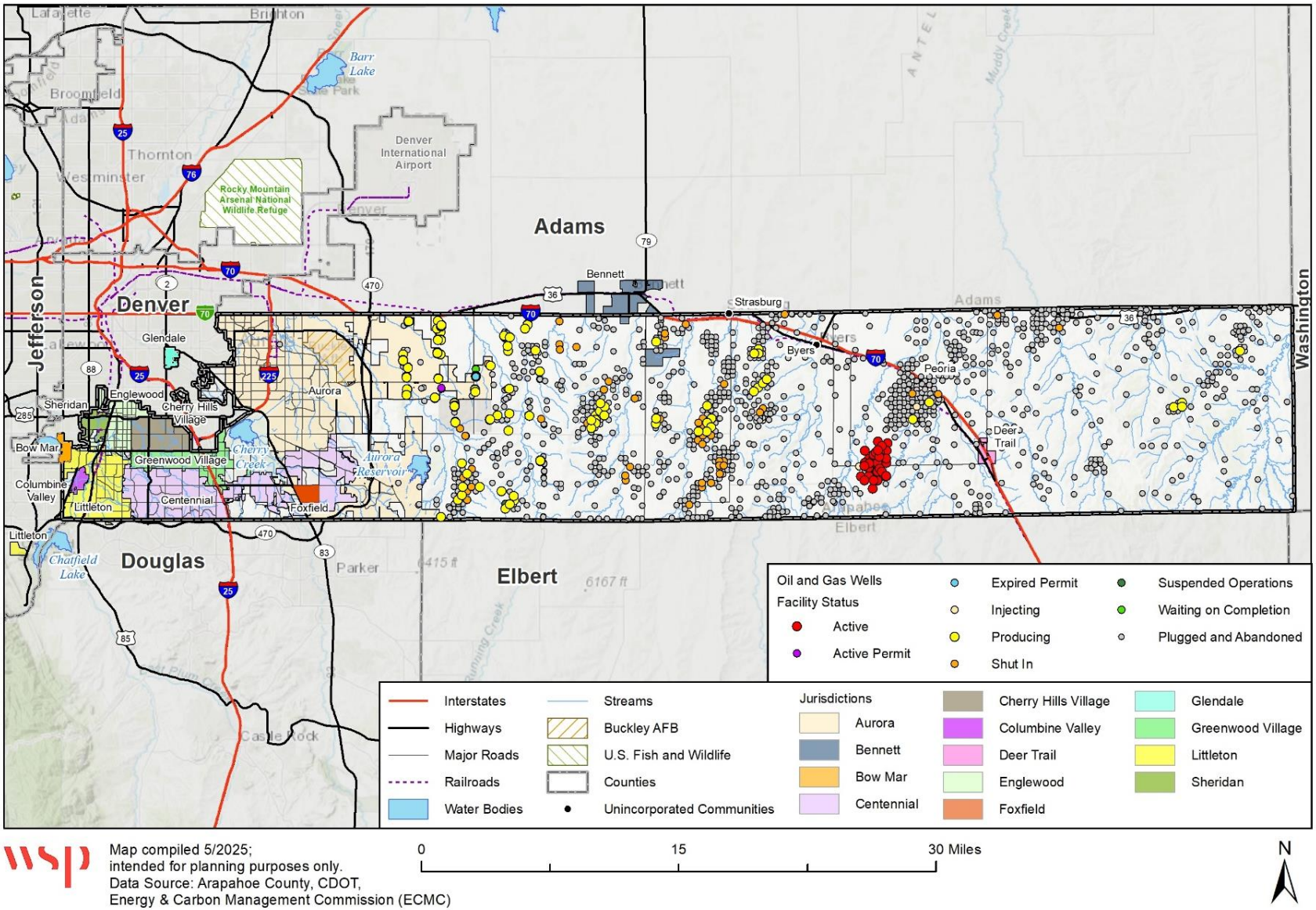


Figure 4-29 Arapahoe County Oil and Gas Wells



4.9.4 Magnitude/Severity

Hazardous materials come in the form of explosives, flammable and combustible substances, poisons, and radioactive materials. Hazards can occur during production, manufacturing, storage, transportation, use, or disposal. Impacts from hazardous materials releases can include:

- Fatalities
- Injury
- Evacuations
- Property damage
- Animal fatalities (livestock, fish & wildlife)
- Air pollution
- Surface or ground water pollution/contamination
- Interruption of commerce and transportation

Numerous factors influence the impacts of a hazardous materials release, including the type and quantity of material, location of release, method of release, weather conditions, and time of day. This makes it difficult to predict precise impacts. The impact to life and property from any given release depends primarily on:

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

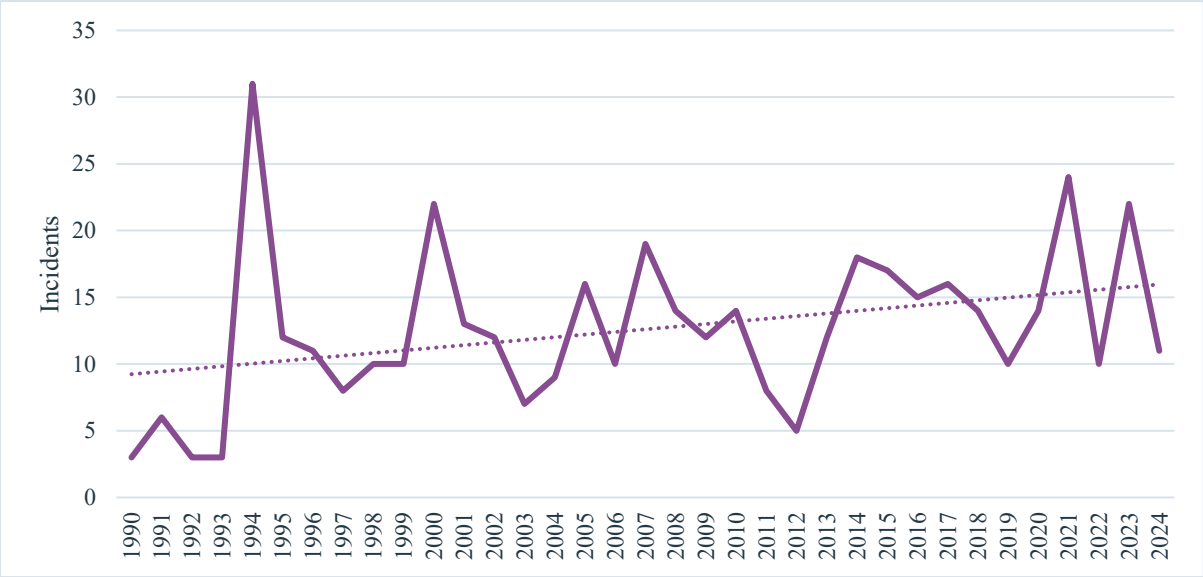
The release or spill of hazardous materials can also require different emergency responses depending on the amount, type, and location of the spill incident.

The impacts of major hazardous materials incidents are potentially catastrophic, causing multiple deaths, property damage, and/or interruption of essential facilities and service for more than 72 hours. However, historically the impact of hazardous materials incidents in Arapahoe County have been limited. Majority of deaths and injuries result from the accident that caused the release, rather than from exposure to the hazardous material itself. Pipeline accidents and gas explosions account for the majority of deaths and injuries caused directly by hazardous materials.

4.9.5 Past Occurrences

Hazardous materials incidents occur regularly in Arapahoe County. Statistics from the National Response Center (NRC), which serves as the primary national point of contact for reporting all oil, chemical, radiological, biological, and etiological discharges into the environment anywhere in the United States and its territories, indicate that between 1990 and the end of 2024, 441 hazardous materials incidents were reported in Arapahoe County. This number almost certainly excludes a number of very small spills that were not reported to the NRC. As shown in Figure 4-30, the trend has been fairly consistent over the last 34 years, with an average of 12 incidents per year.

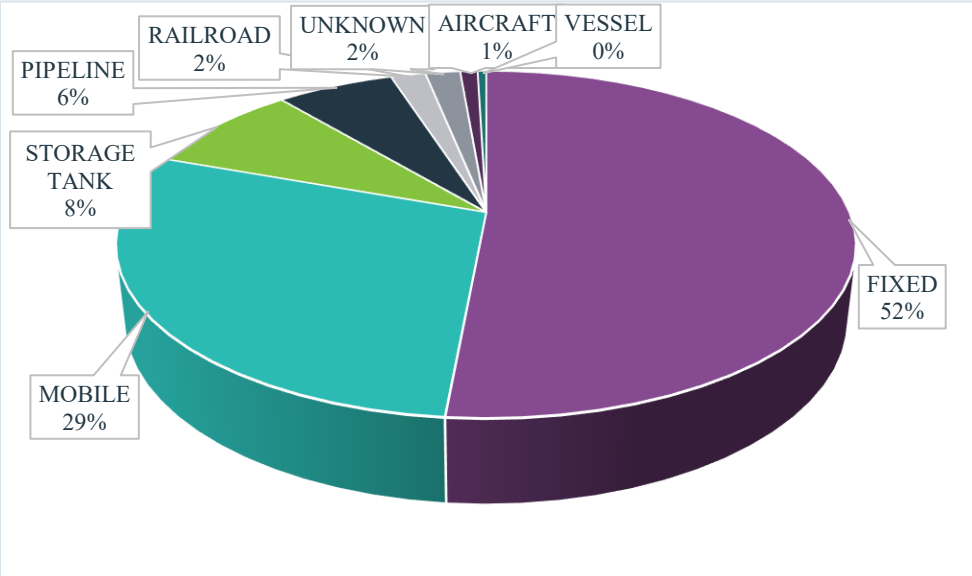
Figure 4-30 Hazardous Materials Incidents Reported in Arapahoe County, 1990-2024



Source: National Response Center

As shown in Figure 4-31, hazardous material incidents in Arapahoe County are most common at fixed sites.

Figure 4-31 Hazardous Materials Incidents in Arapahoe County by Type, 1990-2024



Source: National Response Center

Of these 441 reported incidents listed in the NRC data from 1990 through 2024, 52 (12%) resulted in any reported injuries, fatalities, evacuations, or property damage. Those 52 incidents are listed as resulting in 6 fatalities, 46 injuries (31 requiring hospitalization), 52 evacuations and $500,050 in property damages. However, it is important to note that the NRC counts all injuries or damages resulting from an accident where hazardous materials were involved, whether or not the injuries or damages were caused by exposure to the hazardous substance; closer analysis shows that a majority of the injuries, fatalities, and

property damages were from the physical impacts of the accident that caused the release, rather from exposure to hazardous materials themselves.

4.9.6 Climate Change Considerations

There are no known effects of climate change on human-caused hazards such as hazardous materials incidents.

4.9.7 Probability of Future Occurrence

It is almost certain that Arapahoe County will experience a hazardous material incident in any given year. Since 1990, the County has averaged 12 hazardous materials incidents per year, with 1.4 incidents per year resulting in injuries, fatalities, damage, or evacuations. The most common causes of hazardous materials incidents in the County involve transportation-related spills on roadways and fixed facilities leaks or failures. Given the County's proximity to major highway, rail corridors, industrial areas and pipelines, the potential for hazmat release remains likely.

4.9.8 Vulnerability

Arapahoe County faces on going vulnerability to hazardous materials releases stemming from both industrial activities and transportation related incidents. Key threats include spills, leaks, or accidents involving hazmat during transport by roadways, rail, or pipelines, particularly given the County's proximity to major transportation corridors and industrial zones. Lowry Landfill is one significant fixed site concern which continues to pose environmental and public health risks. Contaminated soil, groundwater, and the presence of landfill gas remain a persistent issue, requiring long-term monitoring. In addition, a recent change in Colorado's hazardous materials transportation routing law introduces a revision that enables the E-470 Public Highway Authority to formally petition CDOT for designation as an approved hazardous materials route.

Impact to the Public

Hazardous materials incidents impact on people is highly dependent on the location of the incident, but can cause injuries, hospitalizations, and even fatalities to people nearby. The most likely routes are inhalation, absorption, and ingestion. People living near hazardous facilities and along transportation routes may be at a higher risk of exposure, particularly those living or working downstream and downwind from such facilities. The most common routes in which hazardous materials can enter the body include inhalation, absorption, and ingestion. The risks are found in areas with higher population densities, such as Aurora and Centennial, where an incident could impact large numbers of people in a short time.

Certain vulnerable populations can be more severely impacted by hazardous materials incidents. People with existing health risks or compromised immune systems could be severely affected by releases of even relatively low-impact materials. Low-income families may be more likely to live in industrial areas or near hazardous materials routes. Individuals with disabilities may need more time to evacuate, so evacuation notices will need to be issued as soon as feasible, and communicated by multiple, inclusive methods.

Impact to Responders

Hazardous Materials incidents can have a more significant impact on responders, particularly those responders conducting initial size-up operations and those conducting scene entry, mitigation, and clean-up operations. First responders are particularly vulnerable due to limited protective equipment and the urgency to assess and contain the situation. This qualitative assessment is based on the likelihood of lower levels of personal protective equipment donned by initial responders, the handling and proximity of trained mitigation responders and clean-up technicians.

Impact to Continuity of Operations (including continued delivery of services)

The vast majority of hazardous materials incidents have minimal impacts on continuity of operations beyond short-term road closures. These routine events are usually contained and resolved within hours by trained response teams, allowing normal activities to resume quickly. However, a large spill or a particularly hazardous substance could take weeks or even months to clean up. Extended closures of facilities, roads, or utilities could interrupt government services, supply chains, and business operations.

Impact to Property, Facilities, and Infrastructure

The impact of most fixed facility incidents is typically localized to the property where the incident occurs. The impact of small spills during transportation may also be limited to the extent of the spill and remediated if needed. Cleanup from major spills can be lengthy and expensive; a petroleum release in 2017 in Greenwood Village resulted in complete removal of asphalt and concrete in multiple lanes of both directions of Interstate 25 in both directions, leading to extended closures, traffic delays, and significant repair costs.

Impacts on critical facilities are similarly most often limited to the area or facility where they occurred, such as at a transit station, airport, fire station, hospital, or railroad. However, they can cause long-term traffic delays and road closures resulting in major delays in the movement of goods and services. These impacts can spread beyond the planning area to affect neighboring counties, or vice-versa. While cleanup costs from major spills can be significant, they do not typically cause significant long-term impacts to critical facilities.

Table 4-55 through Table 4-60 summarize the number of properties within the planning buffers. Note that the larger buffer zones include smaller buffer zones, i.e., the numbers for the 3000’ buffer include people in the 1000’ buffer.

Table 4-55 Risk Within 1,000’ Buffers of a RMP Facility

Jurisdiction	Improved Parcels	% of Parcels At Risk	Population At Risk
Aurora	149	0.14%	380
Centennial	11	0.03%	0
Englewood	110	0.96%	170
Littleton	1	0.01%	0
Sheridan	2	0.11%	0
Total	**273**	**0.13%**	**550**

Source: Arapahoe, Adams and Douglas County Assessor Data, Environmental Protection Agency (EPA), WSP GIS Analysis

Table 4-56 Risk Within 3,000' Buffers of a RMP Facility

Jurisdiction	Improved Parcels	% of Parcels At Risk	Population At Risk
Aurora	2,826	2.7%	7,358
Centennial	95	0.2%	0
Englewood	1,548	13.5%	2,720
Greenwood Village	187	3.7%	452
Littleton	100	0.7%	145
Sheridan	53	3.0%	5
Unincorporated	172	0.6%	425
Total	**4,981**	**2.4%**	**11,105**

Source: Arapahoe, Adams and Douglas County Assessor Data, Environmental Protection Agency (EPA), WSP GIS Analysis

Table 4-57 Risk Within 150' Buffers of Designated Highway

Jurisdiction	Improved Parcels	% of Parcels At Risk	Population At Risk
Bennett	21	1.3%	9
Centennial	1	0.003%	0
Deer Trail	3	0.5%	8
Greenwood Village	3	0.06%	5
Unincorporated	1	0.003%	0
Total	**29**	**0.01%**	**22**

Source: Arapahoe, Adams and Douglas County Assessor Data, Environmental Protection Agency (EPA), WSP GIS Analysis

Table 4-58 Risk Within 1,000' Buffers of Designated Highway

Jurisdiction	Improved Parcels	% of Parcels At Risk	Population At Risk
Aurora	4,330	4.2%	10,763
Bennett	540	33.6%	1,388
Centennial	381	1.0%	767
Cherry Hills Village	3	0.13%	9
Deer Trail	406	73.4%	1,051
Greenwood Village	586	11.5%	1,067
Littleton	235	1.5%	471
Unincorporated	1,789	6.2%	4,629
Total	**8,270**	**3.9%**	**20,146**

Source: Arapahoe, Adams and Douglas County Assessor Data, Environmental Protection Agency (EPA), WSP GIS Analysis

Table 4-59 Risk within 150' Buffer of Designated Railroads

Jurisdiction	Improved Parcels	% of Parcels At Risk	Population At Risk
Bennett	4	0.2%	0
Deer Trail	2	0.4%	0

Jurisdiction	Improved Parcels	% of Parcels At Risk	Population At Risk
Littleton	33	0.2%	67
Sheridan	2	0.11%	0
Unincorporated	3	0.01%	0
Total	**44**	**0.02%**	**67**

Source: Arapahoe, Adams and Douglas County Assessor Data, Environmental Protection Agency (EPA), WSP GIS Analysis

Table 4-60 Risk within Half Mile Buffers of Designated Railroads

Jurisdiction	Improved Parcels	% of Parcels At Risk	Population At Risk
Aurora	15	0.01%	29
Bennett	1,361	84.7%	3,966
Columbine Valley	26	3.8%	69
Deer Trail	543	98.2%	1,357
Englewood	2,699	23.6%	4,465
Littleton	4,205	27.6%	8,368
Sheridan	125	7.2%	80
Unincorporated	986	3.4%	2,324
Total	**9,960**	**4.7%**	**20,657**

Source: Arapahoe, Adams and Douglas County Assessor Data, Environmental Protection Agency (EPA), WSP GIS Analysis

South Metro Fire Rescue

The South Metro Fire Rescue has 2 facilities at risk within 3000' buffers of a RMP facility:

- Troy Jackson Training Center
- Station 35

Additionally, there are 4 facilities at risk within half mile buffers of designated railroads:

- Troy Jackson Training Center
- Station 11
- Station 16
- Station 40

Impact to the Environment

In many instances of hazardous materials releases, the environment is the most significantly affected component of the system consisting of people, property, and the environment. When hazardous materials are released they can severely degrade natural ecosystems. Environmental impact often includes water quality, air quality, and soil contamination. Again, the impact to the environment is scale dependent and ranges from minimal and temporary such as a small chemical spill on a roadway to catastrophic and permanent as seen at the nearby Rocky Mountain Arsenal. Widespread effects can occur when materials contaminate the groundwater and eventually the municipal water supply, or they migrate to a major waterway or aquifer. Impacts on wildlife and natural resources can also be significant/..

Impact to the Economic Condition of the County and Jurisdictions

The primary economic impact of hazardous material incidents results from lost business, delayed deliveries, property damage, and potential contamination. The economic impacts of major road closures alone can range from $2,000 to $250,000. Large and publicized hazardous material-related events can deter tourists and recreationists and could potentially discourage residents and businesses. Economic effects from major transportation corridor closures can be significant not only for Arapahoe County but also for the entire Denver-metro region. According to the National Response Center, from 1990 to 2024, Arapahoe County has seen 52 incidents that resulted in over $500,000 in damages total.

Even small incidents have cleanup and disposal costs, and for a larger scale incident, these could be extensive and protracted. Evacuations can disrupt home and business activities. Large-scale incidents can easily reach $1 million or more in direct damages, with clean-ups that can last for years. An extreme example is the Lowry Superfund site located near East Quincy Avenue and South Gun Club Road, a billion-dollar cleanup with national economic impacts.

Impact to Public Confidence in Government

Nationally, recent large hazardous materials incidents such as the 2013 fertilizer plant explosion in West, Texas, and the 2023 train derailment and chemical release in East Palestine, Ohio, have significantly impacted public trust. In Arapahoe County, the public's confidence in government during a hazardous materials incident is likely to remain stable if authorities provide timely, transparent, and accurate information. Typically, the impact to public confidence is minimal so long as the government acts appropriately by sharing timely and accurate information, follows mitigation procedures focused on, in this order, life safety, incident stabilization, property protection, and environmental protection. Additionally, the government is responsible for ensuring proper resolution by reviewing remediation reports in the event of spill involving mitigation actions. Issues such as long-term closures of major Interstates may cause frustration from the public. These impacts can be mitigated by following proper messaging and cleanup procedures.

Changes in Development

Since the previous plan update, there are ongoing efforts primarily focused on stricter oil and gas regulations. Arapahoe County is currently implementing regulations that make it a requirement for all oil and gas operations to be located more than one mile from existing and planned reservoirs. The County is also updating its landscape regulations for future commercial and residential development that will focus on water conservation.

4.9.9 Jurisdictional Differences

Hazardous materials are present throughout the entire County. However, the majority of both fixed sites and major transportation routes are in the western County. That portion of the County also has much greater population density and more critical facilities, which means the impacts from a release would likely be more significant. As discussed above under Hazard Location, the largest concentrations of hazardous materials sites are in Aurora, Englewood, Littleton, Centennial, and the unincorporated. Table 4-61 breaks down the NRC-reported hazardous materials incidents for Arapahoe County by the closest reported city. Aurora, Englewood, and Littleton together account for more than 60% of the County's hazmat incidents.

Table 4-61 Hazardous Materials Incidents in Arapahoe County by Closest City, 1990-2024

Jurisdiction	# of Incidents		Jurisdiction	# of Incidents
Aurora	136		Bennett	7
Englewood	101		Deer Trail	7
Littleton	56		Buckley	6
Centennial	33		Watkins	5
Unincorporated	27		Cherry Hills Village	1
Byers	13		Frostburg	1
Strasburg	10		Glendale	1
Sheridan	8		Greenwood Village	1
Parker	1		Quincy	1

Source: NRC

Table 4-62 Hazardous Materials Release Hazard Rankings by Jurisdiction

Hazardous Materials Release	Frequency	Spatial Extent	Severity	Overall Significance
Bennett	Occasional	Significant	Critical	Medium
Bow Mar	Occasional	Limited	Critical	Low
Centennial	Likely	Significant	Critical	Medium
Cherry Hills Village	Occasional	Significant	Critical	Medium
Columbine Valley	Unlikely	Limited	Critical	Low
Deer Trail	Occasional	Significant	Critical	Medium
Englewood	Likely	Significant	Critical	High
Foxfield	Unlikely	Limited	Critical	Low
Glendale	Unlikely	Limited	Critical	Low
Greenwood Village	Likely	Significant	Critical	Medium
Littleton	Likely	Significant	Critical	Medium
Sheridan	Occasional	Significant	Critical	Medium
Denver Water	Likely	Limited	Limited	Low
South Metro Fire	Likely	Significant	Critical	Medium
Unincorporated County	Likely	Significant	Critical	Medium

4.10 Pandemic

Hazard	Frequency	Spatial Extent	Severity	Significance
Pandemic	Occasional	Extensive	Critical	High

4.10.1 Risk Summary

- The recent COVID-19 pandemic showed the risks of a pandemic spreading across the County and the world.
- Historically there has been a major pandemic roughly every 20 years:
  - Spanish Flu (1918-1919)
  - Asian Flu (1957-1958)
  - H3N3 Hong Kong Flu (1968-1969)
  - H1N1 Swine Flu (2009-2010)
  - COVID-19 (2020-2023)
- There are other diseases that affect Arapahoe County every year, as listed in Table 4-63. These diseases have had occurrences every year in the County since 2000, so it is important to keep information on them up to date.

4.10.2 Description

A public health emergency is an emergency need for health care [medical] services to respond to a disaster, significant outbreak of an infectious disease, bioterrorist attack or other significant or catastrophic event. Public health emergencies can occur as primary events by themselves, or they may be secondary to another disaster or emergency, such as tornado, flood, or hazardous material incident.

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

There are three conditions that must be met before a pandemic begins:

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

This hazard risk assessment includes an analysis of pandemic risk in Arapahoe County and an analysis of the impacts of the hazards profiled in this plan on public health.

4.10.3 Location

Pandemics occur on a national and global scale. It is likely that most communities in Arapahoe County would be affected, either directly or by secondary impacts. More highly-populated areas may be affected sooner and may experience higher infection rates due to more publicly shared spaces.

The COVID-19 pandemic affected all 64 Colorado counties. Arapahoe County has reported 199,619 cases and 1,425 deaths, as of May 21st, 2025. All communities in the County were impacted, either directly or indirectly. Some indirect consequences are the diversion of resources that may be otherwise available.

4.10.4 Magnitude/Severity

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

Today, a much larger percentage of the world's population is clustered in cities, making them ideal breeding grounds for epidemics. Additionally, the explosive growth in air travel means the virus could spread around the globe within hours. Under such conditions, there may be very little warning time. Most experts believe we will have just one to six months between the time that a dangerous new influenza strain is identified and the time that outbreaks begin to occur in the United States. Outbreaks are expected to occur simultaneously throughout much of the nation, preventing shifts in human and material resources that normally occur with other natural disasters. These and many other aspects make influenza pandemic unlike any other public health emergency or community disaster. Pandemics typically last for several months to 1-2 years.

The Pandemic Intervals Framework (PIF) is a six-phased approach to defining the progression of an influenza pandemic. This framework is used to guide influenza pandemic planning and provides recommendations for risk assessment, decision-making, and action. These intervals provide a common method to describe pandemic activity which can inform public health actions. The duration of each pandemic interval might vary depending on the characteristics of the virus and the public health response.

The six-phase approach was designed for the easy incorporation of recommendations into existing national and local preparedness and response plans. Phases 1 through 3 correlate with preparedness in the **pre-pandemic interval**, including capacity development and response planning activities, while Phases 4 through 6 signal the need for response and mitigation efforts during the **pandemic interval**.

Pre-Pandemic Interval

In nature, influenza viruses circulate continuously among animals (primarily birds). Even though such viruses might develop into pandemic viruses, in Phase 1 no viruses circulating among animals have been reported to cause infections in humans.

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

In Phase 2 an animal influenza virus circulating among domesticated or wild animals is known to have caused infection in humans and is thus considered a potential pandemic threat.

- **Phase 2** involves cases of animal influenza that have circulated among domesticated or wild animals and have caused specific cases of infection among humans.

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

- **Phase 3** represents the mutation of the animal influenza virus in humans so that it can be transmitted to other humans under certain circumstances (usually very close contact between individuals). At this point, small clusters of infection have occurred.

Pandemic Interval

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

- **Phase 4** involves community-wide outbreaks as the virus continues to mutate and become more easily transmitted between people (for example, transmission through the air)

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

- **Phase 5** represents human-to-human transmission of the virus in at least two countries

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

- **Phase 6** is the pandemic phase, characterized by community-level influenza outbreaks.

4.10.5 Past Occurrences

The Colorado Department of Public Health and Environment releases an annual reportable disease summary for each county. The diagnoses with the highest incidences in Arapahoe County for 2020 through 2023 are summarized in Table 4-63.

Table 4-63 Reportable Disease Diagnosis, Arapahoe County 2020-2023

Diagnosis	Incidents in 2020	Incidents in 2021	Incidents in 2022	Incidents in 2023
Influenza – Hospitalized	364	36	543	296
Hepatitis C, Chronic	186	386	138	N/A
Animal Bites	416	416	531	N/A

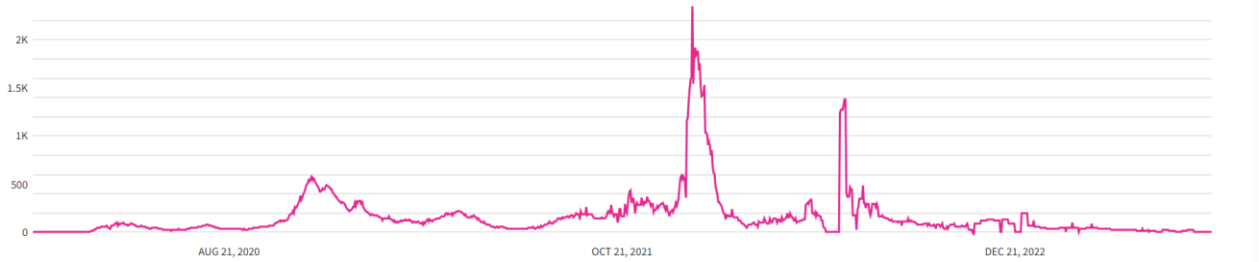
Diagnosis	Incidents in 2020	Incidents in 2021	Incidents in 2022	Incidents in 2023
Hepatitis B, Chronic	143	143	138	114
Carbapenem-Resistant Pseudomonas Aeruginosa (CRPA)	144	144	74	N/A
Campylobacteriosis	107	107	98	150
Salmonellosis	119	119	94	87
Group A Strep Invasive	67	67	0	140
Pertussis	4	4	15	28
Giardiasis	48	48	47	65

Source: https://www.colorado.gov/pacific/cdphe/colorado-reportable-disease-data. N/A = data not available

Since the early 1900s, five lethal pandemics have swept the globe:

- **1918-1919 Spanish Flu:** The Spanish Flu was the most severe pandemic in recent history. The number of deaths was estimated to be 50-100 million worldwide and 675,000 in the United States. Its primary victims were mostly young, healthy adults. At one point, more than 10 percent of the American workforce was bedridden.
- **1957-1958 Asian Flu:** The 1957 Asian Flu pandemic killed 1-2 million people worldwide, including about 70,000 people in the United States, mostly the elderly and chronically ill. Fortunately, the virus was quickly identified, and vaccine production began in May 1957.
- **1968-1969 H3N2 Hong Kong Flu:** The 1968 Hong Kong Flu pandemic killed 34,000 Americans. Again, the elderly were more severely affected. This pandemic peaked during school holidays in December, limiting student-related infections, which may have kept the number of infections down. Also, people infected by the Asian Flu ten years earlier may have gained some resistance to the new virus.
- **2009-2010 H1N1 Swine Flu:** This influenza pandemic emerged from Mexico in early 2009 and was declared a public health emergency in the U.S. on April 26. By June, approximately 18,000 cases had been reported in the U.S. and the virus had spread to 74 countries. Most cases were fairly mild, with symptoms similar to the seasonal flu, but there were cases of severe disease requiring hospitalization and a number of deaths. The CDC estimates that 43-89 million people were infected worldwide, with an estimated 8,870 to 18,300 H1N1 related deaths, including 12,469 deaths in the United States.
- **2020-2023:** The COVID-19 or novel coronavirus pandemic began in December 2019 and was declared a pandemic in March of 2020. As of May 25th, 2025, 777 million cases have been reported around the world with over 7 million deaths, including 9 million cases and 1.2 million deaths in the US. Arapahoe County has seen 199,619 cases so far resulting in 1,425 deaths. The pandemic was declared over by the World Health Organization on May 23rd, 2023, however the Federal Drug Administration claims it is ongoing, with restrictions on who should get vaccinated only applying to the immunocompromised and those over 65 years of age.

Figure 4-32 COVID-19 Cases in Arapahoe County (as of 5/22/2025)



Source: Center for Disease Control and Prevention, May, 22, 2025

Figure 4-33 COVID-19 Deaths Arapahoe County (as of 5/22/2025)

Source: Center for Disease Control and Prevention, May, 22, 2025

Other diseases that pose a public health threat include those that are vector-borne and transmitted from a host such as a tick or mosquito to humans. In the summer of 2024, the County reported that the first human case of West Nile Virus for the year in Colorado was detected in Arapahoe County. Arapahoe County resident and public health officials sent out a warning to residents to take precautions as mosquito season ramps up earlier in the summer. Summer weather continues to get hotter with fewer cool nights and storms, creating a favorable environment for mosquitoes throughout the state. 2023 was the worst year in state history for West Nile virus since 2000, with 631 cases spanning 40 counties with 50 deaths. Arapahoe County alone saw 56 cases.

According to the Center for Disease Control and Prevention, tick-borne diseases such as Colorado tick fever come from species found throughout the Rocky Mountains with some previous cases in Arapahoe county and surrounding areas. From 2003 through 2022, 223 cases were reported nationwide. Although early symptoms start out similar to flu like symptoms, if left untreated symptoms can increase to stiff neck, confusion, and hospitalization.

In each of these cases hosts like ticks thrive in warmer environments with plenty of vegetation and tall grasses. Although there have not been as many confirmed cases of Colorado tick fever or Lyme disease compared to other diseases, current climate trends and the land use in Arapahoe County could create a favorable environment for ticks to affect humans as well as dogs, horses, and cattle.

4.10.6 Climate Change Considerations

Climate change can exacerbate the risk of pandemics and worsen their impact. Climate-driven shifts in ecosystems can cause changes in animal behavior and alter human-animal interactions, increasing the chance of emerging infectious diseases from animal to human.

The National Oceanic Atmospheric Administration climate projections show fewer extreme cold months, more extreme warm months, and more strings of consecutive warm winters throughout the entire State of Colorado. Consecutive warm months with higher temperatures create the perfect environment for reproduction and migration of host species such as mosquitos. Mosquitos are able to travel further west towards the Rocky's, to areas previously too cold to inhabit. Earlier cases of diseases such as the West Nile Virus as well as an increase in hospitalizations and deaths could continue throughout the County as the climate gets warmer for longer periods of time.

4.10.7 Probability of Future Occurrence

Even before the COVID-19 pandemic began, the Colorado Department of Public Health and Environment (CDPHE) considered a pandemic to be inevitable. However, there is no definite way to predict when the next pandemic might happen. Some indicators will be present, but not every new virus turns into a pandemic. Based on the five pandemics that have affected the United States in roughly the last 100 years, a pandemic occurs on average roughly every 20 years.

There are some diseases that have been present in the County every year since 2000. Based on historical incidents from 2019 through 2023, Arapahoe County experiences an average of 327 reported cases of influenza hospitalizations each year. 2022 had the highest year with 543 hospitalizations. Although it decreased in 2023 to 296, historically influenza has been present in the County every year and will continue to have cases at both the County and state level. Table 4-63 Reportable Disease Diagnosis, Arapahoe County 2020-202 also discusses the diseases present in the County for the last 5 years that will continue to be reported by the Colorado Department of Public Health and Environment in the upcoming years.

4.10.8 Vulnerability

Future development in and around Arapahoe County has the potential to change how infectious diseases spread through the community and impact human health in both the short and long term. New development may increase the number of people and facilities exposed to public health hazards and greater population concentrations (often found in special needs facilities and businesses) put more people at risk.

Population growth and development contribute the greatest to pandemic exposure. As populations increase and the cost of health care climbs, potential losses can be expected to rise. It is possible that infrastructure may not be able to be maintained as necessary during a pandemic because of a significantly decreased workforce.

Impact to the Public

Adverse impacts are expected to be severe for unprotected personnel and moderate to light for protected personnel. Medications may be limited to help prevent or treat the disease. It takes years to manufacture a

vaccine and would likely become available in small quantities at first. It may become necessary to ration limited amounts of medications, vaccinations, and other health care supplies. Risk groups cannot be predicted with certainty; the elderly, people with underlying medical conditions, and young children are usually at higher risk, but as discussed above this is not always true for all pandemics. People without health coverage or access to good medical care are also likely to be more adversely affected. Mental health of the public could also be impacted depending on the length of the event and public health guidance on prevention.

As noted in the previous occurrences section, The COVID-19 or novel coronavirus pandemic began in December 2019 and was declared a pandemic in March of 2020. As of May 25th, 2025, 777 million cases have been reported around the world with over 7 million deaths, including 9 million cases and 1.2 million deaths in the United States. Arapahoe County has seen 199,619 cases so far resulting in 1,425 deaths. The pandemic was declared over by the World Health Organization on May 23rd, 2023, however the Federal Drug Administration claims it is ongoing, with restrictions on who should get vaccinated only applying to the immunocompromised and those over 65 years of age.

A report released by the Urban Institute with support from the Robert Wood Johnson Foundation on Wednesday, found that U.S. workers without paid sick leave during the first two years of the coronavirus pandemic lost an estimated $28 billion in wages. Work absences due to illness, child care or other family matters increased by 50 percent when compared to the 2 years prior to the pandemic. This disproportionally affected women and minorities. Women were 40 percent more likely to miss work without pay, while they were also among several group, including self-employed, Black and Hispanic workers, who experienced the biggest increase in missed days. Nearly two-thirds of Hispanic workers and 57 percent of Black workers were not paid for days they were absent due to childcare needs, personal illness, or other family obligations.

Impact to Responders

Medical staff can become overburdened with hundreds of additional cases on top of their normal workload. All other responders will be impacted in similar proportions to the general public, thereby reducing available responders. Adverse impacts are expected to be severe for unprotected personnel and uncertain for trained and protected personnel, depending on the nature of the incident.

The COVID-19 pandemic had severe impacts on healthcare workers and other responders. The difficulty of trying to protect themselves and their families while still doing their jobs was exacerbated initially by shortages of personal protective equipment (PPE). The mental health impacts on responders and healthcare workers have not been fully quantified but are likely to have impacts for months if not years to come.

Impact to Continuity of Operations (including continued delivery of services)

Unscheduled sick leave from a large portion of the workforce could result in loss of productivity and delivery of services. About 1.5 million employers claimed $9.8 billion in tax credits for 2020 to help with the costs of paid leave. Even without large numbers of infected workers, social distancing requirements and workplace closures can have a major impact on the government's ability to deliver services, as seen during the COVID-19 pandemic. As residents are quarantined due to the pandemic, as seen during the COVID-19 pandemic the demand for deliveries of essential goods will also increase. Starting in March 2020, Congress passed several laws, including the CARES Act, to provide employers with tax relief in

response to the economic burden brought on by the COVID-19 pandemic. Provisions in these laws established the paid sick and family leave credits (leave credits), the Employee Retention Credit (ERC), and payroll tax deferrals. IRS implemented these provisions while facing delays caused by facility closures and other challenges. As new laws were enacted, IRS continued to revise employment tax returns and guidance.

Leave credits and ERCs for 2020 totaled about $20.7 billion. Payroll tax deferrals totaled about $123.6 billion, as shown in the table. In addition, preliminary data indicate 2021 usage of leave credits and ERCs likely exceed 2020 usage.

Impact to Property, Facilities, and Infrastructure

Although property would not be directly affected by a pandemic, access to facilities and infrastructure in the area of the incident may be denied until decontamination is complete. Workplace closures due to social distancing and quarantine requirements can make facility operation more difficult. Additionally, following the COVID-19 pandemic many businesses switched to a work from home or hybrid remote work. the fourth edition of McKinsey's American Opportunity Survey (AOS) explores Americans' views on economic opportunity. This survey found that on average, workers go into the office about 30 percent less frequently than they did prior to the pandemic. Office vacancy rates are expected to reach 18% by 2030, a 55% increase since 2019, according to Fortune. Companies in Denver are opting to sign leases with less workspace for in person work, with leases signed in 2024 averaging about 3,300 SF, representing a 40% decrease in average lease size since its peak in 2015. This shift to remote work and delivery following COVID-19 pandemic continues to affect both the commercial and retail real estate industries.

Impact to the Environment

Incident may cause denial or delays in the use of some areas. Remediation may be needed. Ironically, the decrease in people commuting to work due to the COVID-19 pandemic has led to measurable air quality improvements in many places, including the Denver metro area.

Impact to the Economic Condition of the County and Jurisdictions

In 2025 the effects of the COVID-19 pandemic are still felt in many industries. According to the US Bureau of Labor Statistics, the pandemic affected all sectors of the economy in 2020, from movie theaters and nail salons to warehouses and meat processing facilities. Many businesses across the country saw their supply chains interrupted, demand for their products and services decline, shortages in supplies and inputs, and government-mandated closures.

U.S. workers without paid sick leave during the first two years of the coronavirus pandemic lost an estimated $28 billion in wages

Local economy and finances may be adversely affected, possibly for an extended period of time. Unscheduled sick leave from a large portion of the workforce could result in millions, even billions, of dollars lost in productivity. Business restrictions due to social distancing requirements can also be significant. In a normal year, lost productivity due to illness costs U.S. employers an estimated $530 billion. During a pandemic, that figure would likely be considerably high and could trigger a recession or even a depression.

The economic impact of the COVID-19 pandemic and associated closures was significant, triggering a recession and high unemployment; the unemployment rate jumped for 4.4% in March of 2020 to 14.7% in April and stayed in the double-digits through most of the summer. Some studies estimate that 1 in 5 renters were at risk of eviction. The stock market suffered major losses in the early days of the pandemic. The restaurant, retail, and oil and gas industries have been particularly hit hard, with numerous businesses closing or filing for bankruptcy. And among household with children, food insecurity – defined as when a household does not have sufficient food for its members to maintain healthy and active lives and lacks the resources to obtain more food – has more than doubled from 14% in 2018 to 32% in July 2020.

In 2025 the effects of the COVID-19 pandemic are still felt in many industries, the pandemic affected all sectors of the economy in 2020, from movie theaters and nail salons, to warehouses and meat processing facilities. Many businesses across the country saw their supply chains interrupted, demand for their products and services decline, shortages in supplies and inputs, and government-mandated closures.

Impact to Public Confidence in Government

Ability to respond and recover may be questioned and challenged if planning, response, and recovery are not timely and effective. Help from the federal government and from other states would likely be limited, as all personnel would be deployed throughout the country already. While the federal government would do what they can, communities would have to rely on their own resources for a much longer period of time as compared to other disasters.

It is expected that the government will work towards a solution that will end the pandemic, typically by helping to distribute vaccines and antiviral agents. Continual public messaging and outreach are vital.

Changes in Development

Future development in and around Arapahoe County has the potential to change how infectious diseases spread through the community and impact human health in both the short and long term. New developments may increase the number of people and facilities exposed to public health hazards and greater population concentrations (often found in special needs facilities and businesses) put more people at risk. As mentioned in Table 4-63 in section 4.9.5 (Previous Occurrences), certain diseases such as influenza continue to occur throughout the County with 1,239 cases causing hospitalizations from 2020-2023. Other diseases such as Group A Strep, Hepatitis B and C, and Giardiasis also have had cases every year since the last plan update.

Although the COVID-19 pandemic has greatly reduced in number of cases since the last plan update (see Figure 4-32 and Figure 4-33) the risk of a pandemic rapidly spreading is still present as population and developments grow within the County. Additionally, as populations and healthcare costs increase, potential losses can be expected to rise. Infrastructure may not be able to be maintained as necessary during a pandemic because of a significantly decreased workforce.

4.10.9 Jurisdictional Differences

Pandemics have the potential to occur anywhere in Arapahoe County, therefore the location, extent, and probability of occurrence are the same county-wide.

Table 4-64 Pandemic Rankings by Jurisdiction

Pandemic	Frequency	Spatial Extent	Severity	Overall Significance
Bennett	Occasional	Extensive	Critical	High
Bow Mar	Occasional	Extensive	Critical	High
Centennial	Occasional	Extensive	Critical	High
Cherry Hills Village	Occasional	Extensive	Critical	High
Columbine Valley	Occasional	Extensive	Critical	High
Deer Trail	Occasional	Extensive	Critical	High
Englewood	Occasional	Extensive	Critical	High
Foxfield	Occasional	Extensive	Critical	High
Glendale	Occasional	Extensive	Critical	High
Greenwood Village	Occasional	Extensive	Critical	High
Littleton	Occasional	Extensive	Critical	High
Sheridan	Occasional	Extensive	Critical	High
Denver Water	Occasional	Significant	Limited	Low
South Metro Fire	Occasional	Extensive	Critical	High
Unincorporated County	Occasional	Extensive	Critical	High

4.11 Severe Summer Weather

Hazard	Frequency	Spatial Extent	Severity	Significance
Severe Summer Weather	Highly Likely	Significant	Critical	High

4.11.1 Risk Summary

- Severe summer weather, including thunderstorms and extreme heat, are an annual occurrence for Arapahoe County, with numerous instances recorded each summer.
- Severe summer weather and extreme heat typically occur on a regional scale, and most occurrences would impact large swaths of Arapahoe County at once.
- These events have cumulatively caused over $1 billion in reported property and crop damage, 4 injuries, and at least 7 deaths in the County since 1996. Extreme heat is the greatest killer amongst these hazards.
- 10.7% of Medicare beneficiaries in the County rely on electricity-dependent medical equipment to live independently in their own homes making them vulnerable to lightning and extreme heat events that may result in power outages.
- Related hazards: Drought, Flooding, Wildfire, Urban Conflagration, Severe Wind/Tornado.

4.11.2 Description

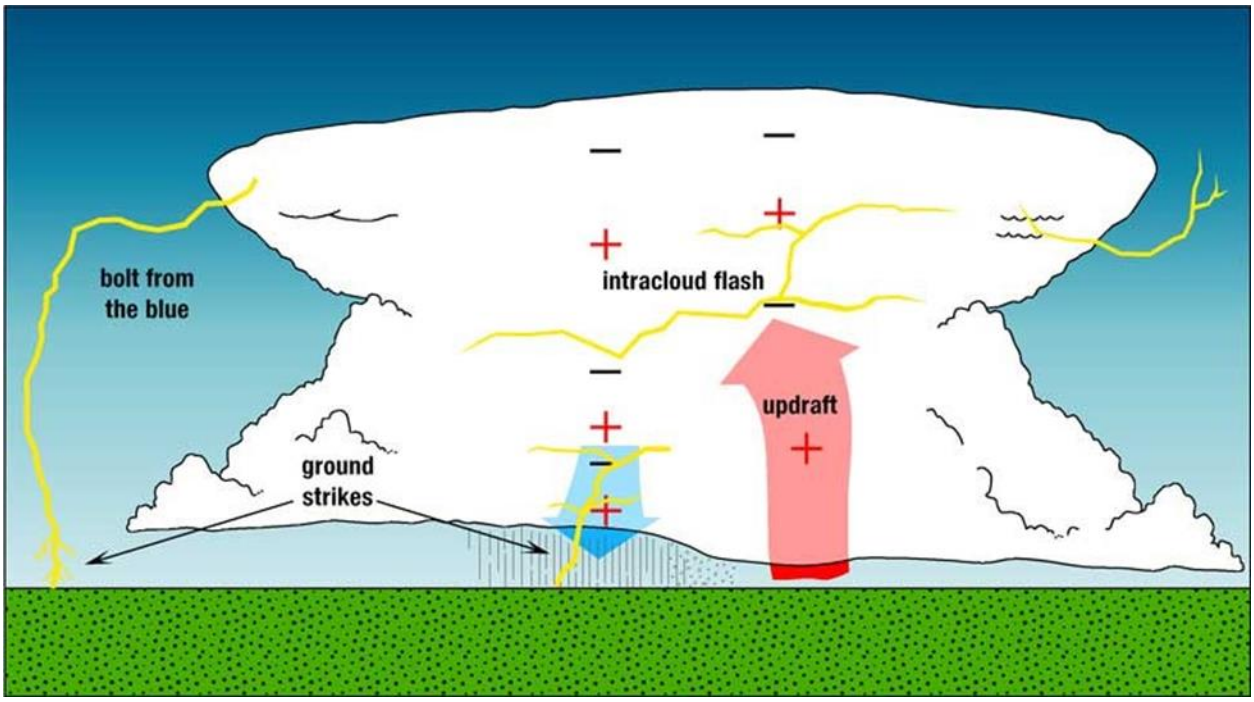
This profile contains hazards associated with severe summer weather, including thunderstorms, lightning, hail, and extreme heat. While high winds typically accompany thunderstorms as well, they are profiled under Severe Wind/Tornadoes.

A typical thunderstorm is 15 miles in diameter and lasts an average of 30 minutes. Every thunderstorm needs three basic components: (1) moisture to form clouds and rain, (2) unstable air which is warm air that rises rapidly, and (3) lift, which is a cold or warm front capable of lifting air to help form thunderstorms. The National Weather Service classifies a thunderstorm as severe if it produces any of the following: hail at least 3/4 inch in diameter, winds of 58 MPH or stronger, or a tornado. Approximately 100,000 thunderstorms occur each year in the United States, roughly 10% of which are classified as severe.

Lightning

Lightning is a visible electrical discharge caused by thunderstorms, typically accompanied by rain. The most common form is intra-cloud lightning, which occurs between charged centers within the same cloud and often appears as flickering inside the cloud. Sometimes the flash exits the cloud and is visible for miles. Cloud-to-ground lightning is the most dangerous and damaging type, though less common. Most strikes deliver a negative charge to the ground, but some, particularly in the storm's dissipating stage or during winter, carry positive charges. Positive strikes often occur away from the storm's rain core, up to 10 miles away, and have longer durations, making them more likely to start fires, see Figure 4-34. Bolts of lightning can heat to 50,000 degrees Fahrenheit and contain approximately 100 million electrical volts. The rapid expansion of the heated air causes thunder.

Figure 4-34 Cloud to Ground Lightning



Source: National Weather Service

Hail

Hail is precipitation that is formed when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere causing them to freeze. The raindrops form into small frozen droplets and then continue to grow as they come into contact with super-cooled water which will freeze on contact with the frozen rain droplet. This frozen rain droplet can continue to grow and form hail. As long as the updraft forces can support or suspend the weight of the hailstone, hail can continue to grow.

At the time when the updraft can no longer support the hailstone, it will fall down to the earth. For example, a ¼" diameter or pea sized hail requires updrafts of 24 mph, while a 2 ¾" diameter or baseball sized hail requires an updraft of 81 mph. The largest hailstone recorded in the United States was found in Vivian, South Dakota on July 23, 2010, measuring eight inches in diameter, almost the size of a soccer ball. Soccer-ball-sized hail is the exception, but even small pea sized hail can do damage.

Extreme Heat

Extreme heat is defined in the Colorado State Hazard Mitigation Plan as "temperatures over 90°F for an extended period of time, or that hover 10°F or more above the average high temperature for the region and last for multiple consecutive days." It is useful to consider extreme heat hazard in conjunction with drought because of the direct impact high temperatures can have on drought incidence. Extreme heat can occur quickly and without warning. Older adults, children, and sick or overweight individuals are more vulnerable to extreme heat.

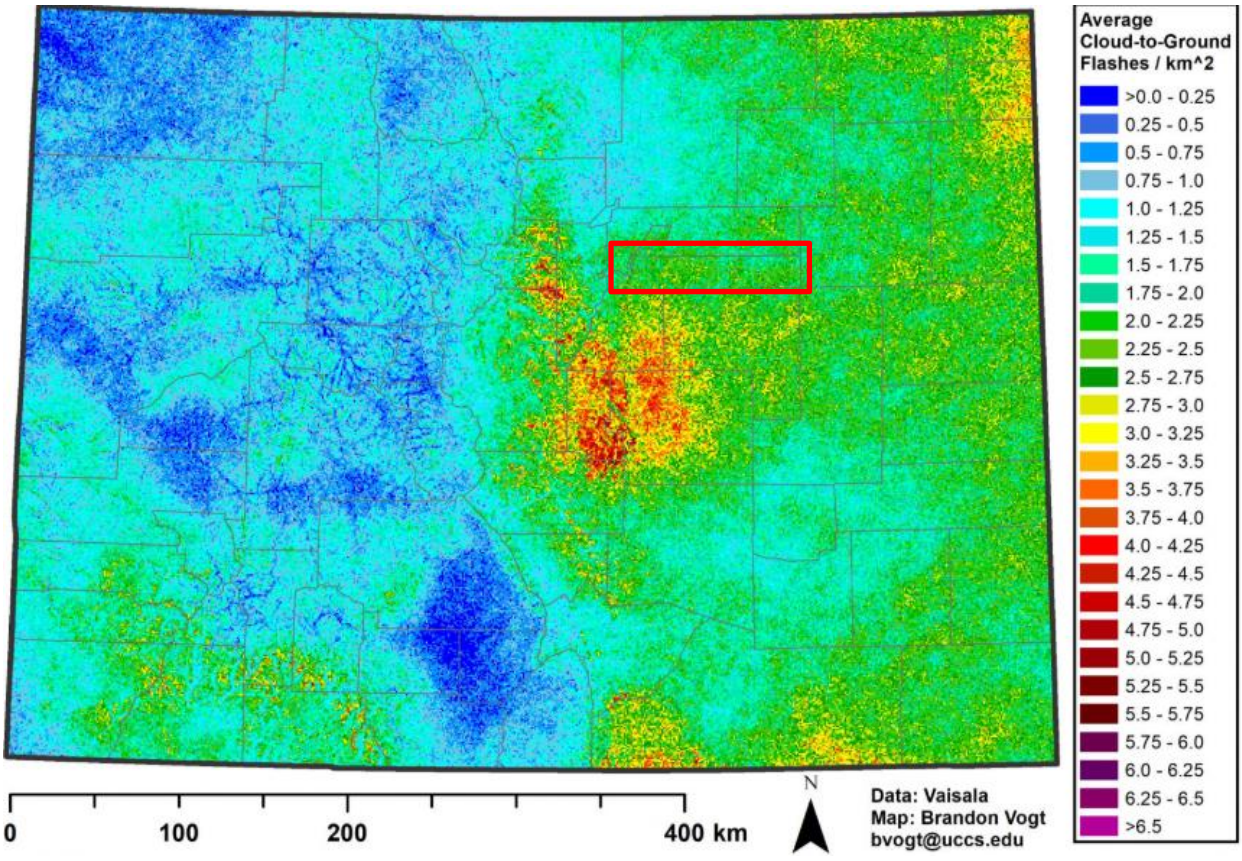
The National Weather Service outlines how excessive heat warnings, watches, and advisories are determined for a given area. Keep in mind that these criteria may vary depending on the region.

- **Excessive Heat Warning:** issued within 12 hours of the onset of extremely dangerous heat conditions.
- **Excessive Heat Watches:** issues when conditions are favorable for an excessive heat event in the next 24 to 72 hours.
- **Heat Advisory:** issued within 12 hours of the onset of extremely dangerous heat conditions. Advisories usually occur when the maximum heat index temperature is expected to be 100°F or higher for at least two days, and the nighttime air temperatures will not drop below 75°F.

4.11.3 Location

Severe summer weather as a whole is considered extensive, with 50% or more of the County generally impacted at a time during an event. The entire County is susceptible to any of the effects of severe thunderstorms, including hail, lightning, heavy rain, and thunderstorm winds. Severe summer weather events impact the entire County with relatively similar frequency. Although these events occur similarly throughout the planning area, they are more frequently reported in more urbanized areas. Figure 4-35 shows the lightning flash density for Colorado from 1996 to 2023. Parts of Arapahoe County experience some of the highest flash densities in the State.

Figure 4-35 Colorado Lightning Density, 1996-2023



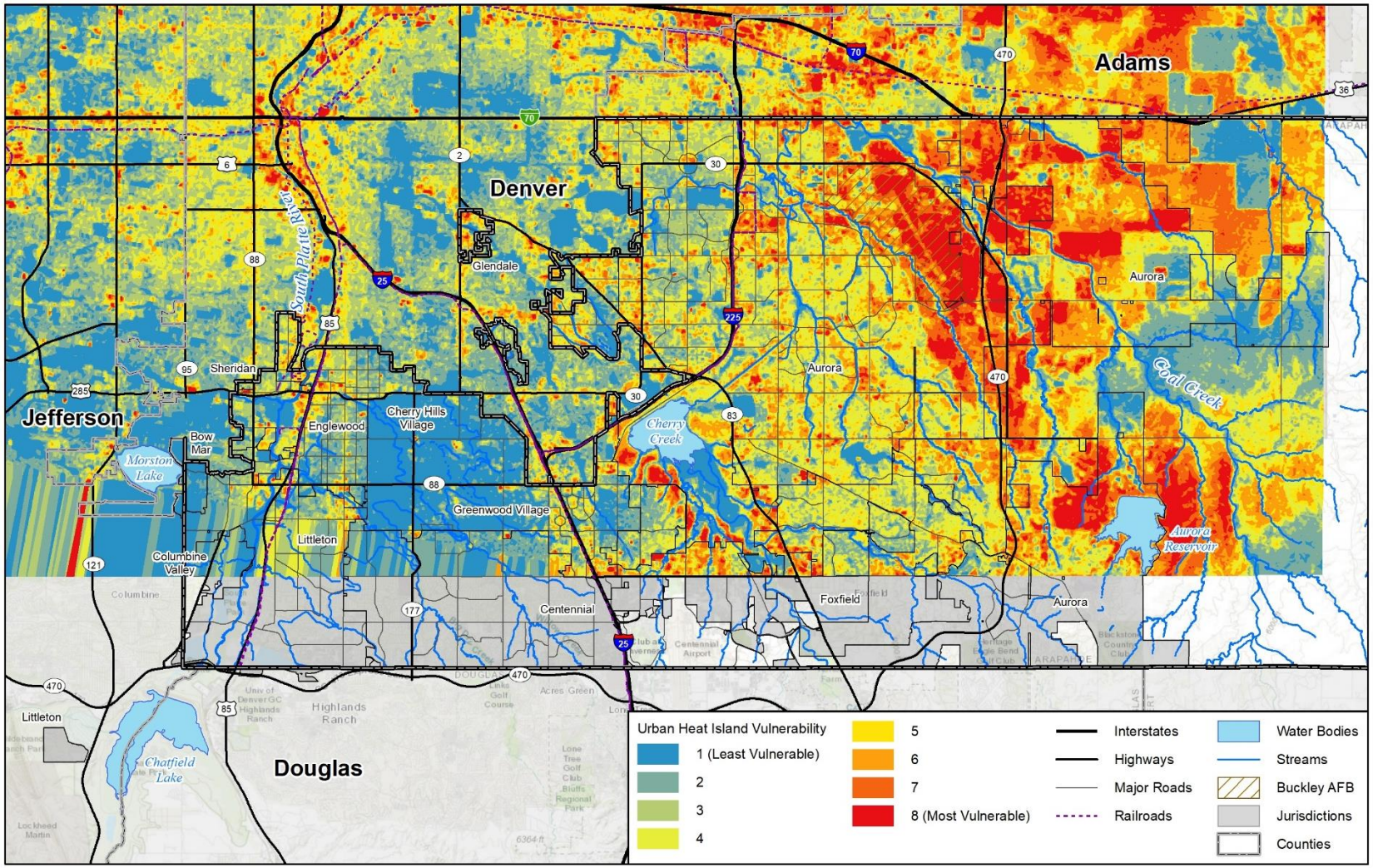
Source: NWS

The same is true for extreme heat, with instances of this hazard typically being regional in nature. While there may be slight variations in temperature from location to location, if one area of Arapahoe County is

experiencing extreme heat then it is highly likely the entire county will be experiencing it. Being located on Colorado's Front Range, Arapahoe County experiences some of the higher temperatures in the State. July is typically the hottest month of the year when the average maximum temperature is approximately 88 degrees. Extreme heat can occur throughout the entire County, although it may be more severe in the western portions of the County due to the urban heat island effect. The urban heat island effect is a phenomenon where urbanized areas can experience pockets of heightened temperatures as surfaces such as pavement and roofs become hotter than the air temperatures. These hot surfaces also retain heat, causing high temperatures to persist even when air temperature drops. Per the EPA, "the annual mean air temperature of a city with 1 million people or more can be 1.8–5.4°F (1–3°C) warmer than its surroundings. On a clear, calm night, however, the temperature difference can be as much as 22°F" (US EPA).

Areas most vulnerable to extreme heat conditions are mapped in Figure 4-36. Note that heat island data is only available for northwest Arapahoe County.

Figure 4-36 Urban Heat Island Vulnerability in Western Arapahoe County



Map compiled 4/2025;
intended for planning purposes only.
Data Source: Arapahoe County, CDOT,
California Polytechnic State University

4.11.4 Magnitude/Severity

The magnitude and severity of severe summer weather is **critical**. It is possible for the entire county to be affected by a large thunderstorm and lightning event that moves across the entire county, but effects are often localized. Thunderstorms can bring large hail that can damage homes and businesses, break glass, destroy vehicles, and cause bodily injury to people, pets, and livestock. One or more severe thunderstorms occurring over a short period can lead to flooding and cause extensive damage, power and communication outages, and agricultural damage.

In extreme or isolated circumstances, severe thunderstorms can bring straight-line winds in excess of 100 mph. Straight-line winds are responsible for most thunderstorm damage. High winds can damage trees, homes (especially mobile homes), and businesses and can knock vehicles off of the road. The power of lightning's electrical charge and intense heat can electrocute people and livestock on contact, split trees, ignite fires, and cause electrical failures. As mentioned above, the NWS classifies a thunderstorm as severe if it produces hail at least 3/4 inch in diameter, winds of 58 MPH or stronger, and/or a tornado, with about 10% of all thunderstorms meeting these criteria.

Lightning

Lightning can occur anywhere there is a thunderstorm and can even strike miles away from the storm. Lightning is measured by the Lightning Activity Level (LAL) scale, shown in Table 4-65Table 4-65, which was created by the NWS to define lightning activity into a specific categorical scale. The LAL is a common parameter that is part of fire weather forecasts nationwide. Arapahoe County is at risk to experience lightning in any of these categories.

Table 4-65 NWS Lightning Activity Level Scale

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

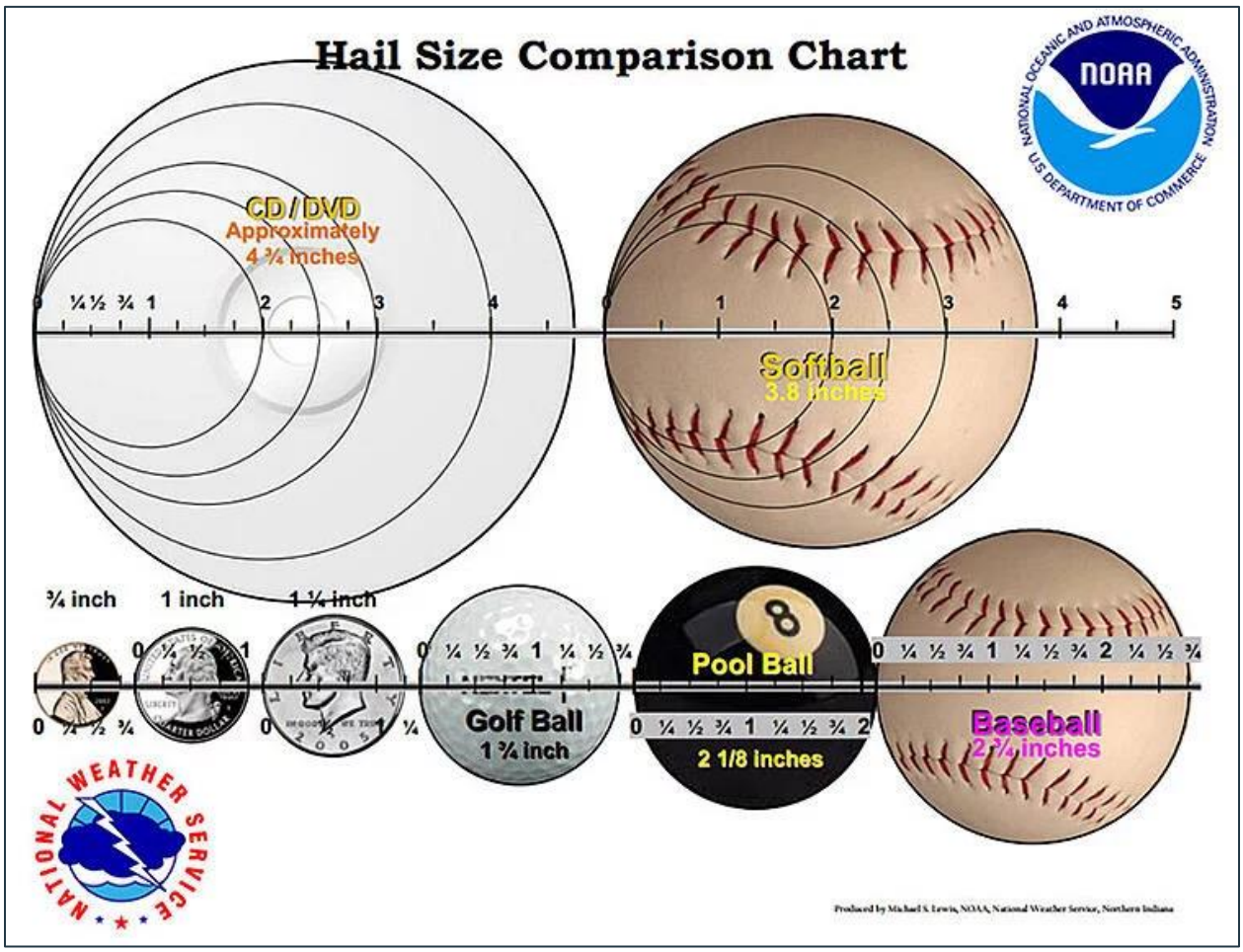
Source: NWS

Hail

Hail size is often estimated by comparing it to a known object. Most hailstorms are made up of a mix of different sizes. Hail measuring one inch or larger is considered severe. Figure 4-37 below compares hailstones to various objects for reference, and Table 4-66 describes the typical damage impacts that could be expected at each of the various sizes of hail. Based on past records of hailstones found in the

County since 1990, the average hailstone is about 1.25 inches in diameter, or the size of a quarter. The largest recorded hailstone found over this same 35-year period was 4.25 inches in diameter.

Figure 4-37 Hail Size Comparison Chart



Source: NWS

Table 4-66 Tornado and Storm Research Organization Hailstorm Intensity Scale

Intensity Category	Diameter (mm)	Diameter (inches)	Size Description	Typical Damage Impacts
Hard Hail	5-9	0.2-0.4	Pea	No damage
Potentially Damaging	10-15	0.4-0.6	Mothball	Slight general damage to plants, crops
Significant	16-20	0.6-0.8	Marble, grape	Significant damage to fruit, crops, vegetation
Severe	21-30	0.8-1.2	Walnut	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
Severe	31-40	1.2-1.6	Pigeon's egg > squash ball	Widespread glass damage, vehicle bodywork damage

Intensity Category	Diameter (mm)	Diameter (inches)	Size Description	Typical Damage Impacts
Destructive	41-50	1.6-2.0	Golf ball > Pullet's egg	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
Destructive	51-60	2.0-2.4	Hen's egg	Bodywork of grounded aircraft dented, brick walls pitted
Destructive	61-75	2.4-3.0	Tennis ball > cricket ball	Severe roof damage, risk of serious injuries
Destructive	76-90	3.0-3.5	Large orange > Soft ball	Severe damage to aircraft bodywork
Super Hailstorms	91-100	3.6-3.9	Grapefruit	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
Super Hailstorms	>100	4.0+	Melon	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

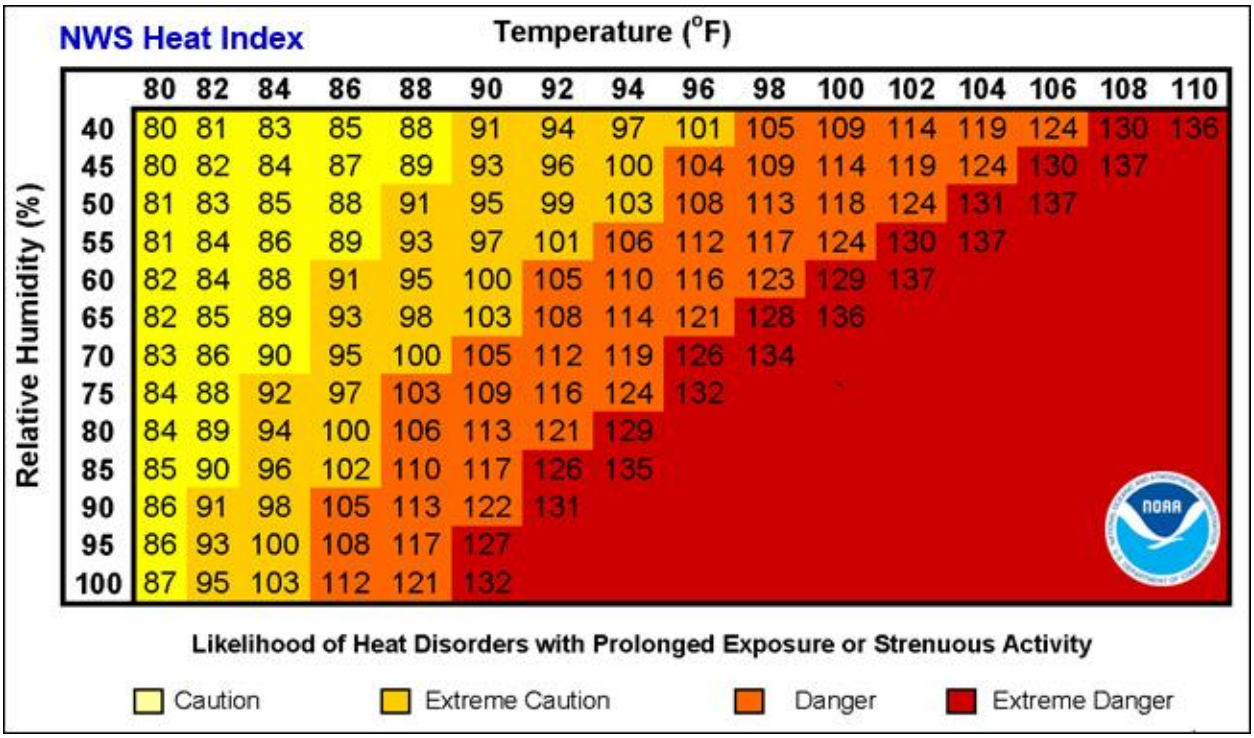
Source: Tornado and Storm Research Organization (TORRO), Department of Geography, Oxford Brookes University
Notes: In addition to hail diameter, factors including number and density of hailstones, hail fall speed and surface wind speeds affect severity.

Extreme Heat

Although extreme heat events can occur in May or September, they are most common between June and August when above average temperatures are sustained for a prolonged period. During extended periods of very high temperatures, or high temperatures coupled with high humidity, individuals can suffer a variety of health problems, including heatstroke, heat exhaustion, heat syncope, and heat cramps.

The Heat Index, shown in Figure 4-38, measures the severity of hot weather by estimating how hot it feels to humans. By combining air temperature and relative humidity, the Heat Index is directly related to skin temperature. The ambient temperature is quantified by examining the relation between relative humidity versus skin temperature. If the relative humidity is higher (or lower) than the base value, the apparent temperature is higher (or lower) than the ambient temperature. Typically, high humidity is not a concern in Arapahoe County.

Figure 4-38 NWS Heat Index



Source: NWS

Table 4-67 outlines the heat disorders associated with apparent temperature values during extreme heat events. Temperatures in the mid to high 90s are common in summer months in Arapahoe County, however it is relatively rare for temperatures to exceed 100 degrees, and even more rare for two or more consecutive days in a row of 100 degrees or more.

Table 4-67 NWS Heat Danger Categories

Danger Category	Heat Disorders	Apparent Temperature (°F)
I Caution	Fatigue possible with prolonged exposure and physical activity	80-90
II Extreme Caution	Sunstroke, heat cramps, and heat exhaustion possible with prolonged exposure and physical activity	90-105
III Danger	Sunstroke, heat cramps, and heat exhaustion likely; heatstroke possible with prolonged exposure and physical activity	105-130
IV Extreme Danger	Heatstroke or sunstroke imminent	>130

Source: NWS

4.11.5 Past Occurrences

Since 1965, Arapahoe County has been included in five Presidential Disaster Declarations that included severe summer storms/weather. Some of the damages that resulted in those declarations were caused by tornadoes and flooding that accompanied the severe weather.

Lightning

In an average year, about 500,000 lightning flashes hit the ground in Colorado, ranking 19th in the Nation with respect to the number of cloud-to-ground lightning flashes (2009-2018). More seriously, Colorado has recorded 151 deaths caused by lightning between 1959 and 2024, and ranks as the state with the third highest rate of lightning fatalities since 2006, following Florida and Texas

Data from NOAA's NCEI Storm Events Database was used to determine previous occurrences of lightning for Arapahoe County. The Storm Events Database only includes lightning events that resulted in a fatality, injury, and/or reported property or crop damage. Table 4-68 lists reported lightning strikes for Arapahoe County from 1996 through 2024. Full details, including a narrative description of the impacts of each event, can be found in Appendix J. Overall, there have been 30 recorded events, with 7 injuries, no fatalities, $944,000 in property damage, and $2,000 in crop damages.

Table 4-68 Lightning Strikes Causing Damage Reported in Arapahoe County, 1996-2024

Date of Event	# Fatalities	# Injuries	Property Damages	Crop Damages
6/24/1996	0	0	$1,000	$0
6/13/1997	0	0	$0	$0
7/30/1997	0	0	$75,000	$0
7/22/1998	0	0	$0	$0
7/25/1998	0	0	$0	$0
7/25/1998	0	1	$0	$0
7/19/1999	0	0	$0	$0
7/19/1999	0	0	$30,000	$0
8/19/1999	0	0	$0	$0
8/8/2000	0	0	$47,000	$0
8/16/2000	0	0	$250,000	$0
4/28/2001	0	1	$0	$0
5/29/2001	0	0	$100,000	$0
6/13/2001	0	0	$0	$0
6/17/2003	0	0	$0	$0
2/2/2008	0	0	$1,000	$0
8/15/2008	0	0	$20,000	$0
8/25/2008	0	0	$75,000	$0
7/3/2009	0	0	$0	$0
8/3/2009	0	0	$0	$1,000

Date of Event	# Fatalities	# Injuries	Property Damages	Crop Damages
9/9/2009	0	1	$0	$0
8/8/2010	0	0	$100,000	0
8/16/2010	0	1	$0	$0
6/20/2011	0	0	$50,000	$0
6/29/2011	2	0	$0	$0
7/14/2011	0	0	$50,000	$0
7/21/2011	0	0	$70,000	$0
6/8/2014	0	0	$25,000	$1,000
5/1/2015	1	0	$0	$0
9/6/2019	0	0	$50,000	$0
Total: 30	**7**	**0**	**$944,000**	**$2,000**

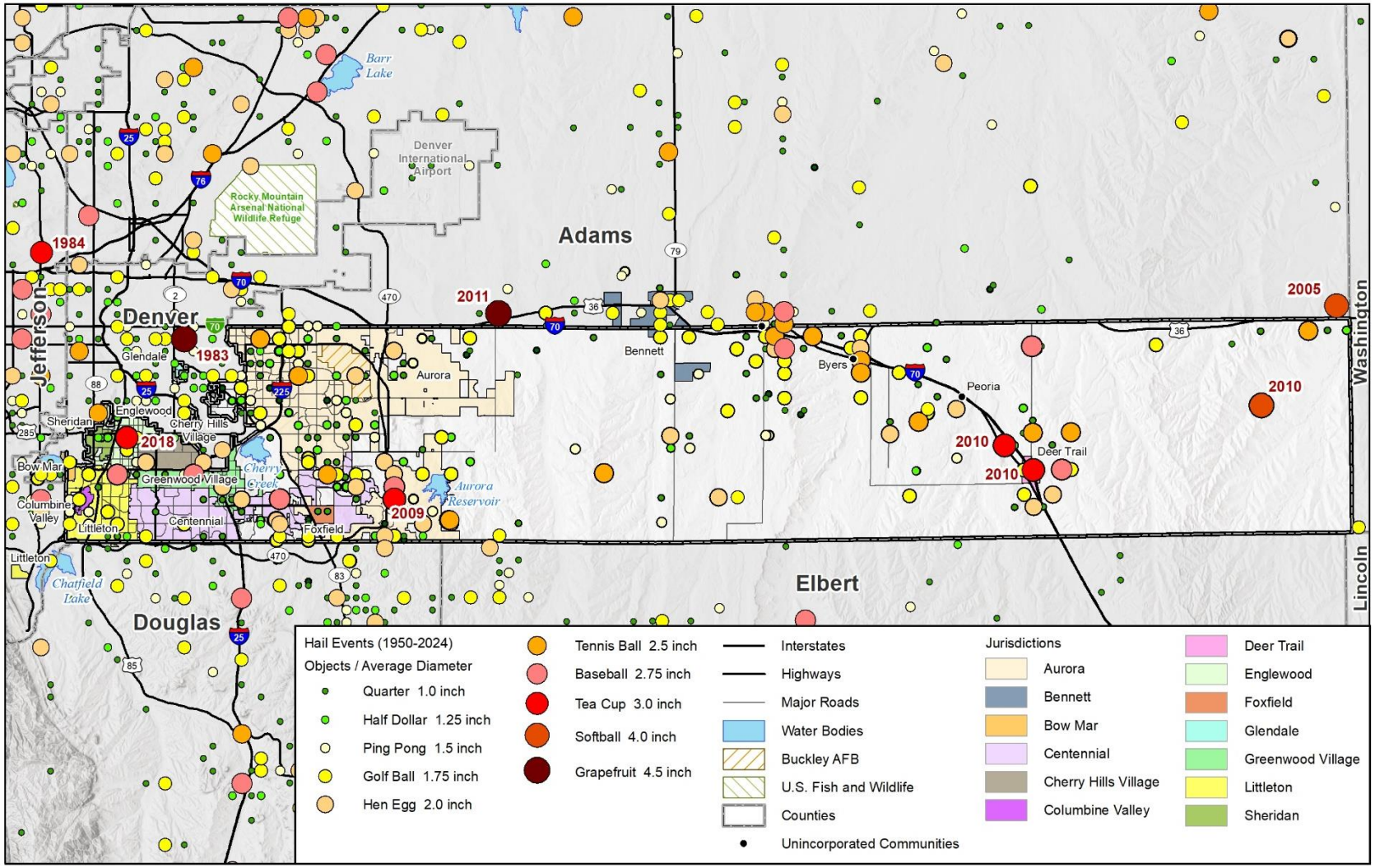
Source: NCEI

Hail

Data from NOAA's NCEI Storm Events Database was also used to determine previous occurrences of hail for Arapahoe County, as listed in Table 4-69 and mapped in Figure 4-39. The Storm Events Database only includes hail events with measured diameters of ¾ of an inch or larger, or events that cause significant damages. There have been 586 recorded hail events reported within Arapahoe County between 1996 and 2024. Of those 586 hail events, 10 events were reported as causing property and/or crop damage. These events resulted in no injuries or fatalities, but caused $1.06 billion in property damage, $31,000 in crop damage. It should be noted that the property damage totals are for all areas impacted by the hail event, which may include areas outside Arapahoe County. Full details, including a narrative description of the impacts of each event, can be found in Appendix J.

Note that the NCEI database only captures uninsured crop losses. Data from the U.S. Department of Agriculture's Risk Management Agency shows more than $5.4 million in insured crop losses from hail during the same time period.

Figure 4-39 Arapahoe County Hail Events, 1950-2024



Map compiled 4/2025;
intended for planning purposes only.
Data Source: Arapahoe County, CDOT, NCEI Storm Events,
NOAA, National Weather Service SRVGIS 2023

Table 4-69 Hail Events Causing Damage Reported in Arapahoe County, 1996-2024

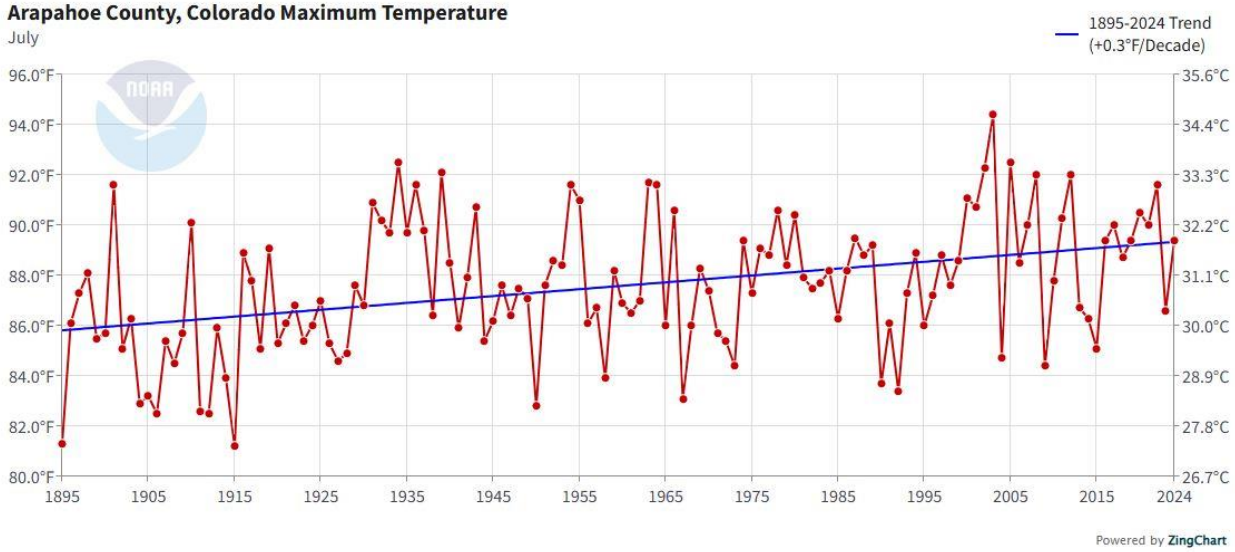
Date	Magnitude (Inches)	Deaths	Injuries	Property Damage	Crop Damage
10/16/1998	2	0	0	$87,800,000	$0
7/23/2001	1.5	0	0	$606,000	$6,000
7/17/2008	1.75	0	0	$5,000	$0
6/7/2009	3	0	0	$161,000,000	$0
8/10/2009	1.25	0	0	$0	$25,000
8/17/2009	1.5	0	0	$15,000	$0
6/6/2012	1	0	0	$160,000,000	$0
6/7/2012	2.5	0	0	$161,100,000	$0
9/29/2014	1.75	0	0	$213,300,000	$0
6/19/2018	3	0	0	$276,400,000	$0
Total: 10			**4**	**$1.06 billion**	**$31,000**

Source: NCEI

Extreme Heat

Figure 4-40 shows the average daily maximum temperatures in July for Arapahoe County from 1895 to 2024. According to NOAA, the average maximum temperature in July has increased by 0.3 °F per decade since 1895. According to Arapahoe County Public Health, in 2022 extreme heat resulted in 494 emergency room visits, 60 hospitalizations, and 10 deaths statewide.

Figure 4-40 Average Maximum Temperatures for July in Arapahoe County, 1895-2020



Source: NOAA

4.11.6 Climate Change Considerations

Climate change presents a significant challenge for risk management associated with severe weather. The frequency of severe weather events has increased steadily over the last century. The number of weather-related disasters nationally during the 1990s was four times higher than in the 1950s, and cost 14 times as much in economic losses. Historical data shows that the probability for severe weather events increases in a warmer climate. The changing hydrograph caused by climate change could have a significant impact on the intensity, duration, and frequency of storm events. All of these impacts could have significant economic consequences.

According to the Fifth National Climate Assessment, extreme heat and high-ozone days are expected to increase under climate change in the Southwest U.S. region, and with this increase comes increases in heat and air pollution exposure, illness, and premature death.

4.11.7 Probability of Future Occurrence

Lightning

Although there are a couple records of lightning events prior to 1996, the NCEI did not track lightning events prior to 1996, so it is used as the reference period for the lightning probability of occurrence calculation. Based on historical record of 30 reported lightning strikes from 1996 to 2024 that have caused reported damages to buildings and infrastructure or resulted in an injury or death, on average the County experiences one damaging lightning strike per year. Non-damaging lightning strikes will continue to occur multiple times each year.

Hail

Although Arapahoe County experiences multiple hail events per year, based on historical record of 10 recorded hail events from 1960 to 2024 that have either caused reported damages to buildings and infrastructure or resulted in an injury or death, the County experiences a damaging hail event every six years on average. As noted previously, this does not include insured losses and therefore the frequency is likely higher.

Extreme Heat

Based on 1,431 days over 90 degrees in Arapahoe County from 1981 to 2024, the County averages 33 days per year with temperatures over 90 degrees.

4.11.8 Vulnerability

In general, assets in the County are vulnerable to severe summer weather including people, crops, livestock, vehicles, and buildings. Although this hazard results in high annual losses, generally private property insurance and crop insurance cover the majority of losses. Considering insurance coverage as a recovery capability and therefore mitigation of devastating impacts to the economy, the overall impact on jurisdictions is reduced. While hail can do considerable damage to vehicles and buildings, it only rarely results in loss of life directly, although injuries can occur.

Effects of this hazard could range from minimal and localized property damage to widespread or significant property damage affects a large portion of a jurisdiction. In addition to routine damage, several

jurisdictions in the County do not currently have safe rooms available for their residents. These factors could affect each community' vulnerability to thunderstorm, lightning, and hail events.

Impact to the Public

Lightning

Colorado ranks as the state with the third highest rate of lightning fatalities since 2006, following Florida and Texas. This is an increase, as the state was ranked 4th overall from 1959-2017.

Cloud to ground lightning can kill or injure people by direct or indirect means. The lightning current can branch off to a person from a tree, fence, pole, or other tall object. In addition, lighting strikes may conduct their current through the ground to a person after the lightning strikes a nearby tree, antenna, or another tall object. The current also may travel through power or telephone lines, or plumbing pipes to a person who is in contact with an electric appliance, telephone, or plumbing fixture. People recreating outdoors are at the highest risk to death or injury from lightning strikes. Lightning strikes have caused 13 injuries in Arapahoe County.

Hail

Hail is unlikely to cause fatalities but may cause injuries to the public. There have been no recorded injuries due to hail in Arapahoe County, but there may have been minor injuries that went unreported. Impacts to personal property, such as cars and homes, are likely. The public may experience financial losses due to damaged property and insurance costs.

Extreme Heat

Impacts on public health are a primary concern during extreme heat events. Heat stroke is the most serious heat-related disorder. It occurs when the body becomes unable to control its temperature. The body's temperature rises rapidly, the sweating mechanism fails, and the body cannot cool itself down. This condition can cause death or permanent disability if emergency treatment is not given. Small children, the elderly, and certain other groups including people with chronic diseases, low-income populations, people experiencing homelessness, and outdoor workers have higher risk for heat-related illness (Refer to Table 4-83). Previous injuries and deaths due to extreme heat are not well documented in the County or State. This is likely due to milder summer temperatures and low humidity compared to much of the United States. However, the entire County population is vulnerable to the impacts of extreme heat, particularly during times of extended temperatures above 90 degrees.

Impact to Responders

The impact to first responders from lightning and hail events is likely to be minimal. An exception would be if lightning sparks a wildland fire. Responders are as vulnerable to the effects of extreme heat as the general population and may receive increased calls during extended periods of extreme heat. Additionally, cooling shelters may need to be established during extended extreme heat events.

Impact to Continuity of Operations (including continued delivery of services)

Lightning, hail, and extreme heat will likely have a minimal impact on the continuity of operations for Arapahoe County. However, power loss is possible from any severe summer weather event and may cause disruption if there are no backup generators.

Impact to Property, Facilities, and Infrastructure

Lightning

Lightning strikes can damage property, facilities, and infrastructure. If struck by lightning, structural damage is possible, as well as the potential for a fire. There have been $944,000 in property damage recorded from lightning in the County. Much of this damage was a result of lightning-caused structural fires.

Hail

Hail in Arapahoe County can cause extensive damage to property, facilities, and infrastructure. The damage is likely to be primarily rooftops and vehicles. There has been a total of $1.06 billion in property damage from hailstorms that have occurred in or near Arapahoe County.

Extreme Heat

Extreme heat may cause structural damage to infrastructure such as roadways, railroads, and airport runways. Impacts include buckling roads and distorted railway tracks. Additionally, extreme heat can strain the power grid, particularly with increased air conditioner use, which can lead to power loss or rolling blackouts.

Impact to the Environment

Lightning strikes are a major cause of wildfires. Impacts from hail on the environment are typically minimal. Extreme heat can impact plant and animal species, as well as water levels and soil moisture. This hazard can also contribute to increased drought conditions.

Impact to the Economic Condition of the County and Jurisdictions

Lightning

Power outages from lightning strikes can have economic impacts on businesses; even brief outages can result in significant costs from having to restart production lines. Otherwise, lightning events typically result in little direct impact to the economic condition of the County and jurisdictions. Businesses may be impacted if their structure catches fire due to a lightning strike. Economic losses would be endured during reconstruction of the structure, or the business may have to permanently relocate or shut down. It is unlikely large-scale closures would occur to significantly impact the economy.

Hail

Hail events impact the economy similarly to lightning, in that losses may be accrued if structures endure major damage during a hailstorm. However, hail also has the potential to damage crops in the eastern portion of the County, which may cause losses that impact the economy for the jurisdictions and populations in eastern Arapahoe County that are more reliant on agriculture. According to the USDA Risk Management Agency (RMA), the County has seen almost 88,000 acres of insured crops damaged by hail since 2007, totaling approximately $5.4 million in insured crop losses to this hazard.

Extreme Heat

Extended power outages resulting from extreme heat may cause economic losses to the County and jurisdictions. Extreme heat can also impact crop production and contribute to economic losses in the eastern portion of the County. According to the US Congress Joint Economic Committee (JEC), the loss

of productivity caused by heat is emerging as one of the biggest economic costs of climate change. One recent study in the International Journal of Biometeorology found that worker productivity drops by about 25% when temperatures exceed 90 °F, and drop by as much as 70% when temperatures reach 100 °F. In addition to the impacts to productivity are the physical dangers to workers exposed to these heat conditions, in industries such as agriculture, construction, airport workers, and first responders.

Impact to Public Confidence in Government

Lightning and hail events are likely to have little impact on the public's confidence in government. However, during an extended extreme heat event, the public would expect alerts and warnings as well as cooling shelters from the government.

Changes in Development

New development over the past five years has not changed the planning area's vulnerability to severe summer weather. New critical facilities such as communication towers should be built to withstand heavy rain, hail, wind, and lighting damage. Future development projects should consider severe thunderstorm hazards at the planning, engineering, and architectural design stage with the goal of reducing vulnerability. Development trends in the County are not expected to increase overall vulnerability to the hazard, but all development will be affected by severe thunderstorm events and any population growth will increase potential exposure to hazards such as severe thunderstorms.

4.11.9 Jurisdictional Differences

Severe summer weather has the potential to occur anywhere in the County; therefore the location, extent, and probability of occurrence are the same county-wide.

Lightning

The major differences in impacts coincide with the population density differences between the western and eastern portions of the County. The more densely populated, urbanized communities of Bow Mar, Centennial, Cherry Hills Village, Columbine Valley, Englewood, Foxfield, Glendale, Greenwood Village, Littleton, and Sheridan are likely to experience the most damages from structural fires as a result from lightning. Additionally, higher populations in these communities puts more people at risk of being struck by lightning.

The eastern portion of the County, to include the communities of Bennett, Deer Trail, and the majority of unincorporated County are also at risk to structural fires and damages from lightning but are at a higher risk of crop losses and losses related to lightning-caused wildland fires as well. Additionally, due to lower population fewer people are at risk of being struck by lightning.

Hail

Similar to the lightning hazard, hail is possible in all jurisdictions in the County. Due to the increased density and number of structures, the communities in the western portion of the County are likely to experience high amounts of property losses from a hailstorm. The eastern portion of the County is still at risk to property losses in addition to crop losses.

Extreme Heat

Extreme heat can occur throughout the entire County, although it may be more severe in the western portions of the County due to the urban heat island effect described above. The increased population in the western portion of the County puts more people at risk from extreme heat events, but populations across the County are vulnerable. Jurisdictions in the eastern portion of the County may experience crop losses from extreme heat.

Table 4-70 Severe Summer Weather Hazard Rankings by Jurisdiction

Severe Summer Weather	Frequency	Spatial Extent	Severity	Overall Significance
Bennett	Highly Likely	Significant	Critical	High
Bow Mar	Highly Likely	Significant	Critical	High
Centennial	Highly Likely	Significant	Critical	High
Cherry Hills Village	Highly Likely	Significant	Critical	High
Columbine Valley	Highly Likely	Significant	Critical	High
Deer Trail	Highly Likely	Significant	Critical	High
Englewood	Highly Likely	Significant	Critical	High
Foxfield	Highly Likely	Significant	Critical	High
Glendale	Highly Likely	Significant	Critical	High
Greenwood Village	Highly Likely	Significant	Critical	High
Littleton	Highly Likely	Significant	Critical	High
Sheridan	Highly Likely	Significant	Critical	High
Denver Water	Highly Likely	Significant	Negligible	NA
South Metro Fire	Highly Likely	Significant	Critical	High
Unincorporated County	Highly Likely	Significant	Critical	High

4.12 Severe Wind/Tornado

Hazard	Frequency	Spatial Extent	Severity	Significance
Severe Wind/Tornado	Likely	Significant	Limited	Medium

4.12.1 Risk Summary

- Since 1964 to 2024, there has been 98 tornado events and 284 severe wind events.
- The highest rated tornado in Arapahoe County has been an EF2.
- In the last 30 years, there have been 5 reported injuries from tornadoes and 20 reported injuries from severe wind.
- Severe wind has cause $783,500 in property damages and tornadoes have cause $9,630,180 in property damages.
- Older, mobile, or poorly built homes may be impacted more than others.
- Related Hazards: Severe Summer Weather, Severe Winter Weather, Wildfire, Urban Conflagration

4.12.2 Description

Tornadoes in Colorado are most often generated by thunderstorm activity when cool, dry air intersects and overrides a layer of warm, moist air forcing the warm air to rise rapidly. The damage caused by a tornado is a result of high wind velocities and wind-blown debris. Tornado wind speeds can range between 30 to more than 300 miles per hour.

Severe wind can also occur independent of a tornado event. These winds typically develop with strong pressure gradients and gusty frontal passages. The closer and stronger two systems (one high pressure, one low pressure) are, the stronger the pressure gradient, and therefore, the stronger the winds are.

Downburst winds, which can cause more widespread damage than a tornado, occur when air is carried into a storm's updraft, cools rapidly, and comes rushing to the ground. Cold air is denser than warm air, and therefore, wants to fall to the surface. On warm summer days, when the cold air can no longer be supported by the storm's updraft, or when an exceptional downdraft develops, the air crashes to the ground in the form of strong winds. These winds are forced horizontally when they reach the ground and can cause significant damage. These types of strong winds can also be referred to as straight-line winds. Downbursts with a diameter of less than 2.5 miles are called microbursts and those with a diameter of 2.5 miles or greater are called macrobursts. A "derecho" is a series of downbursts associated with a line of thunderstorms. This type of phenomenon can extend for hundreds of miles and contain wind speeds in excess of 100 mph.

4.12.3 Location

Tornado

Colorado is fortunate to experience less frequent and intense tornadoes than its neighboring states to the east. However, tornadoes remain a significant hazard in the region, particularly during the spring and summer months when atmospheric conditions are more conducive to severe weather. Although tornadoes are not common occurrences, eastern Colorado is more likely to experience tornadoes. While Colorado

may not see the same frequency or intensity as the heat of tornado alley, the threat is still real especially along the eastern plains and in the Front Range counties, including Arapahoe County.

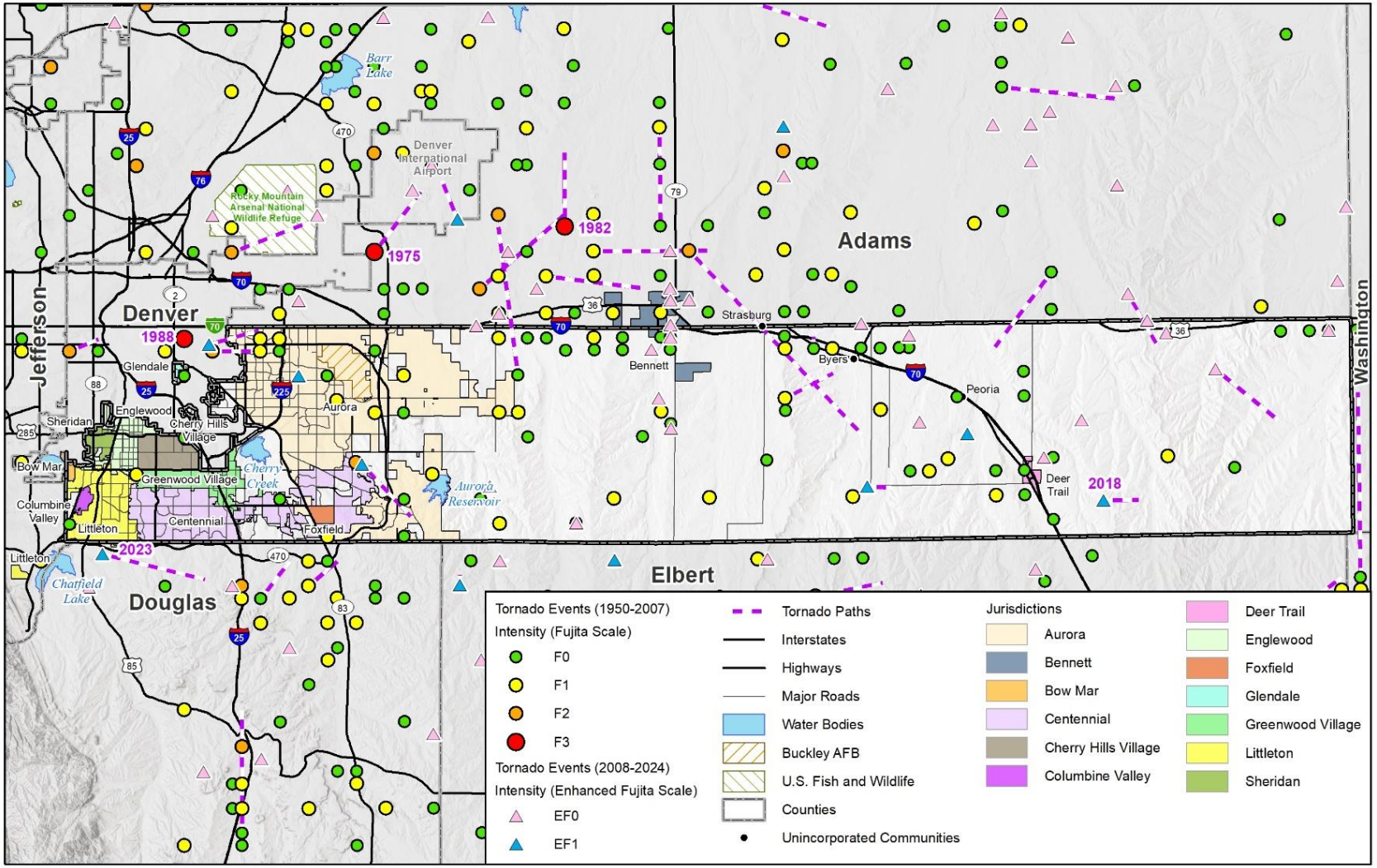
Figure 4-41 shows where tornadoes have touched down and traveled from 1950 through 2024.

Severe Wind

All of Arapahoe County is susceptible to experience severe winds especially during transitional season such as spring and fall when pressure gradients tend to be more extreme. However, as the air moves down off the Rocky Mountains, it rapidly accelerates as it hurdles down towards the Front Range. These winds rapidly accelerate as they move downhill due to the compressional warming and the decrease in surface friction. This results in the strong gusty winds reaching the Front Range and extending to adjacent plains, including large portions of Arapahoe County. The eastern portion of the County can experience stronger winds as there is a lack of trees, hills, and other terrain features to provide friction. This area consists of open plains with relatively flat topography and sparse vegetation.

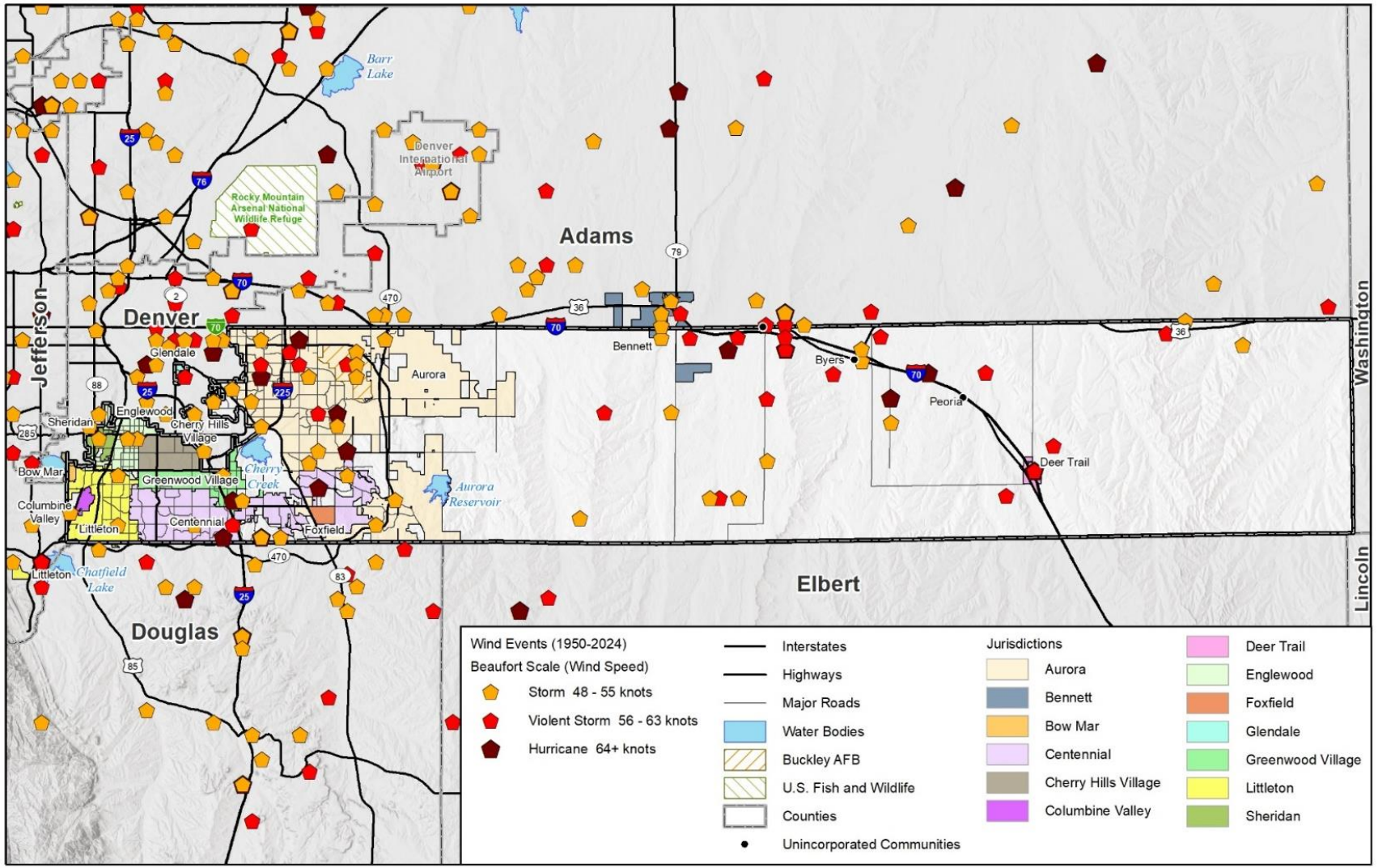
Figure 4-42 shows severe wind events causing damage from 1950 through 2024.

Figure 4-41 Tornado Events in Arapahoe County, 1950-2024



Map compiled 4/2025;
intended for planning purposes only.
Data Source: Arapahoe County, CDOT, NCEI Storm Events,
NOAA, National Weather Service SRVGIS 2023

Figure 4-42 Damaging Wind Events in Arapahoe County, 1950-2024



Map compiled 4/2025;
intended for planning purposes only.
Data Source: Arapahoe County, CDOT, NCEI Storm Events,
NOAA, National Weather Service SRVGIS 2023

4.12.4 Magnitude/Severity

Tornado

Tornadoes are the most intense storm on earth, a destructive rotating column of air ranging in diameter from a few yards to greater than a mile, usually associated with a downward extension of cumulonimbus clouds. Tornadoes have been recorded with wind speeds exceeding 315 mph.

Before 2007, tornadoes were classified by their intensity using the Fujita (F) Scale, with F0 being the least intense and F6 being the most intense. The Fujita Scale, shown in Table 4-71, was used to rate the intensity of a tornado by examining the damage caused by the tornado after it has passed over a man-made structure.

Table 4-71 Fujita Tornado Damage Scale

F-Scale Number	Intensity Phrase	Wind Speed (mph)	Type of Damage
F0	Gale tornado	40-72	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages signboards.
F1	Moderate tornado	73-112	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
F2	Significant tornado	113-157	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
F3	Severe tornado	158-206	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted
F4	Devastating tornado	207-260	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown, and large missiles generated.
F5	Incredible tornado	261-318	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel reinforced concrete structures badly damaged.
F6	Inconceivable tornado	319-379	These winds are very unlikely. The small area of damage they might produce would probably not be recognizable along with the mess produced by F4 and F5 wind that would surround the F6 winds. Missiles, such as cars and refrigerators would do serious secondary damage that could not be directly identified as F6 damage. If this level is ever achieved, evidence for it might only be found in some manner of ground swirl pattern, for it may never be identifiable through engineering studies

Source: NWS

On February 1, 2007, the Fujita scale was replaced by the more accurate Enhanced Fujita Scale (aka the EF Scale). The EF-Scale measures tornado strength and associated damages and classifies tornadoes into six intensity categories, as shown in Table 4-72. The scale was revised to reflect better examinations of tornado damage surveys to align wind speeds more closely with associated storm damage. The new scale takes into account how most structures are designed and is thought to be a much more accurate representation of the surface wind speeds in the most violent tornadoes.

Table 4-72 Enhanced Fujita (EF) Scale

Enhanced Fujita Category	Wind Speed (mph)	Potential Damage
EF0	65-85	Light damage: Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.
EF1	86-110	Moderate damage: Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	111-135	Considerable damage: Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF3	136-165	Severe damage: Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
EF4	166-200	Devastating damage: Well-constructed houses and whole frame houses completely leveled; cars thrown, and small missiles generated.
EF5	>200	Incredible damage: Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 m (109 yds.); high-rise buildings have significant structural deformation; incredible phenomena will occur.

Source: NWS

In Arapahoe County, most tornadoes that have occurred have been classified as EF0 or EF1, making them relatively weak in terms of wind speed. There has been one EF2 tornado in the planning area, bringing more significant damage, as shown in Table 4-73.

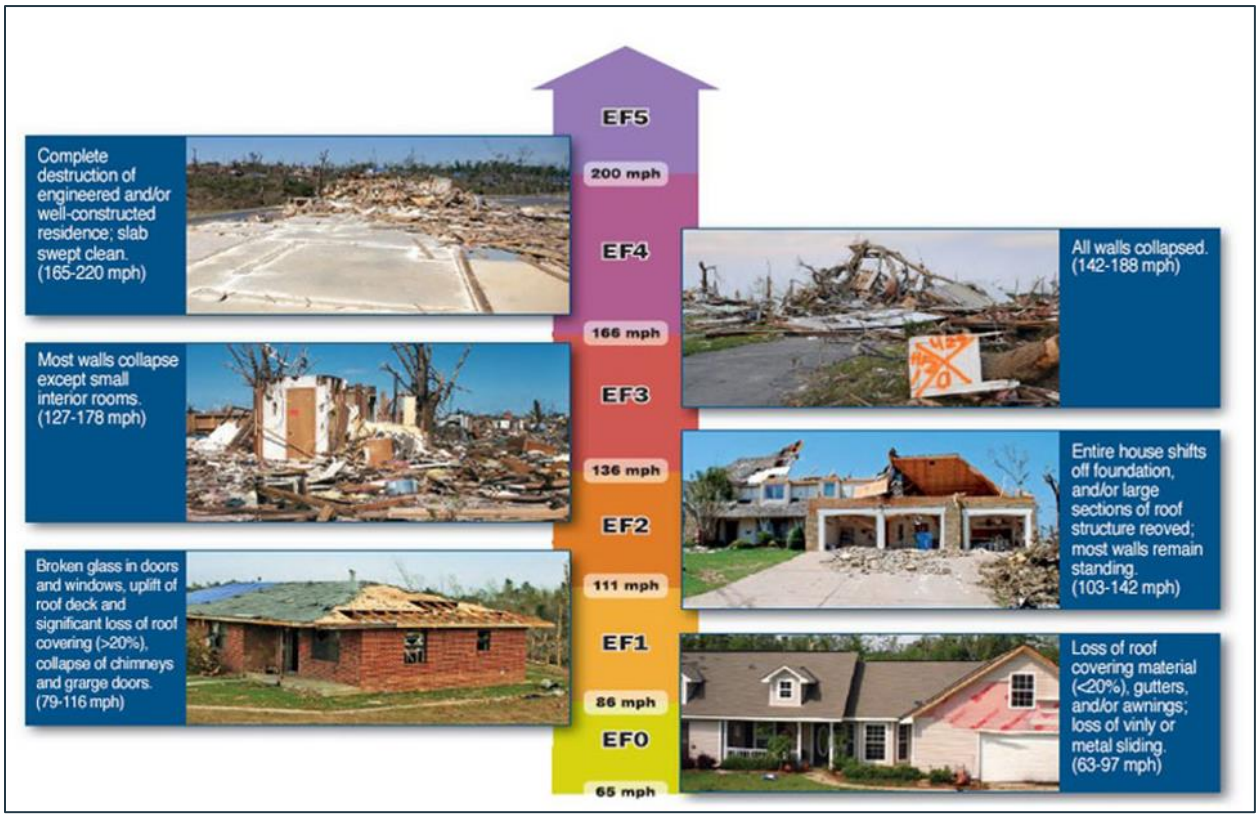
Table 4-73 Tornado History in Arapahoe County by Magnitude, 1964– 2024

Magnitude	Number		Magnitude	Number
F0	46		EF0	17
F1	27		EF1	4
F2	1		EF2	0

Source: NCEI Storm Events Database

Figure 4-43 illustrates the types of damage that can be expected by different magnitude tornadoes.

Figure 4-43 Potential Impact and Damage from a Tornado



Source: NOAA National Weather Service, Storm Prediction Center

Severe Wind

The Storm Prediction Center has developed damage indicators to be used with the Enhanced Fujita Scale for different types of buildings. These indicators can also be used to classify any high wind event. Indicators for different building types are shown in the following tables.

Table 4-74 Damage to Institutional Buildings from High Wind

Damage Description	Wind Speed Range (Expected Speed)
Threshold of visible damage	59-88 MPH (72 MPH)
Loss of roof covering (<20%)	72-109 MPH (86 MPH)
Damage to penthouse roof & walls, loss of rooftop HVAC equipment	75-111 MPH (92 MPH)
Broken glass in windows or doors	78-115 MPH (95 MPH)
Uplift of lightweight roof deck & insulation, significant loss of roofing material (>20%)	95-136 MPH (114 MPH)
Façade components torn from structure	97-140 MPH (118 MPH)
Damage to curtain walls or other wall cladding	110-152 MPH (131 MPH)
Uplift of pre-cast concrete roof slabs	119-163 MPH (142 MPH)
Uplift of metal deck with concrete fill slab	118-170 MPH (146 MPH)

Damage Description	Wind Speed Range (Expected Speed)
Collapse of some top building envelope	127-172 MPH (148 MPH)
Significant damage to building envelope	178-268 MPH (210 MPH)

Source: Storm Prediction Center, 2009

Table 4-75 Damage to Educational Institutions from High Wind

Damage Description	Wind Speed Range (Expected Speed)
Threshold of visible damage	55-83 MPH (68 MPH)
Loss of roof covering (<20%)	66-99 MPH (79 MPH)
Broken windows	71-106 MPH (87 MPH)
Exterior door failures	83-121 MPH (101 MPH)
Uplift of metal roof decking; significant loss of roofing material (>20%); loss of rooftop HVAC	85-119 MPH (101 MPH)
Damage to or loss of wall cladding	92-127 MPH (108 MPH)
Collapse of tall masonry walls at gym, cafeteria, or auditorium	94-136 MPH (114 MPH)
Uplift or collapse of light steel roof structure	108-148 MPH (125 MPH)
Collapse of exterior walls in top floor	121-153 MPH (139 MPH)
Most interior walls of top floor collapsed	133-186 MPH (158 MPH)
Total destruction of a large section of building envelope	163-224 MPH (192 MPH)

Source: Storm Prediction Center, 2009

Table 4-76 Damage to Metal Building Systems from High Wind

Damage Description	Wind Speed Range (Expected Speed)
Threshold of visible damage	54-83 MPH (67 MPH)
Inward or outward collapsed of overhead doors	75-108 MPH (89 MPH)
Metal roof or wall panels pulled from the building	78-120 MPH (95 MPH)
Column anchorage failed	96-135 MPH (117 MPH)
Buckling of roof purlins	95-138 MPH (118 MPH)
Failure of X-braces in the lateral load resisting system	118-158 MPH (138 MPH)
Progressive collapse of rigid frames	120-168 MPH (143 MPH)
Total destruction of building	132-178 MPH (155 MPH)

Source: Storm Prediction Center, 2009

Table 4-77 Damage to Electric Transmission Lines from High Wind

Damage Description	Wind Speed Range (Expected Speed)
Threshold of visible damage	70-98 MPH (83 MPH)
Broken wood cross member	80-114 MPH (99 MPH)
Wood poles leaning	85-130 MPH (108 MPH)

Damage Description	Wind Speed Range (Expected Speed)
Broken wood poles	98-142 MPH (118 MPH)

Source: Storm Prediction Center, 2009

4.12.5 Past Occurrences

NOAA's Storm Events Database estimates that 98 tornadoes have touched down in, or moved through, Arapahoe County between 1964 and 2024. Together, these tornadoes have caused no fatalities, five injuries, and $9,630,180 in property damage. Nearly all of these have been F0/EF0 or F1/EF1. However, on June 8, 1986 an F2 tornado touched down in the vicinity of Peoria St. and 1st Ave, causing $2.5M in damages. The most damaging tornado in Arapahoe County's history was an F1 that touched down on August 29, 2002 in a subdivision under construction at Gartrell and Arapahoe Road. Four large condominiums under construction were destroyed. A man suffered four broken ribs and several cuts and bruises when the trailer he sought shelter in was flipped three times and torn apart by the tornado. Note that Table shows tornado history in the last seven years in Arapahoe County. The tornadoes that occurred in 2022 and 2023 are classified at EFU, which stands for "Enhanced Fujita Unknown." This designation is used when a tornado is confirmed to have occurred, but there is insufficient or inconclusive damage data to assign a definitive EF (from EF0 to EF5). EFU tornadoes may still pose a hazard, but without observable damage, their intensity cannot be accurately assessed.

Table 4-78 Tornado History in the Last Seven Years, Arapahoe County, 2017– 2024

Date	Magnitude	Deaths	Injuries	Prop. Damage	Crop Damage
6/5/2017	EF0	0	0	$0	$0
10/6/2017	EF1	0	0	$0	$0
7/27/2018	EF1	0	1	$200,000	$0
7/27/2018	EF0	0	0	$0	$0
7/27/2018	EF0	0	0	$0	$0
5/22/2021	EF0	0	0	$0	$0
7/29/2022	EFU	0	0	$0	$0
7/6/2023	EFU	0	0	$0	$0

Source: NCEI Storm Events Database

Severe Wind

Data from NOAA's Storm Events Database was used to complete the risk assessment for severe wind events in Arapahoe County. Currently, the Storm Events Database includes wind events that are classified as "Thunderstorm Winds", "Strong Winds", and "High Winds".

High Winds: Sustained non-convective winds of 35 knots (40 mph) or greater lasting for 1 hour or longer, or gusts of 50 knots (58 mph) or greater for any duration.

Strong Winds: Non-convective winds gusting less than 50 knots (58 mph), or sustained winds less than 35 knots (40 mph), resulting in a fatality, injury, or damage.

Thunderstorm Winds: Winds, arising from convection (occurring within 30 minutes of lightning being observed or detected), with speeds of at least 50 knots (58 mph), or winds of any speed (non-severe thunderstorm winds below 50 knots) producing a fatality, injury, or damage.

Based on data provided by NOAA's Storm Events Database, Table 4-79 below shows 137 Thunderstorm Wind events, 141 High Wind events and 6 Strong Wind events have occurred in Arapahoe County between 1964 and 2024. These 284 events resulted in 20 injuries, $783,500 in property damage and $5,000 in crop damage.

Table 4-79 Severe Wind Events in Arapahoe County, 1950-2024

Wind Event	Number of Events
High Winds	141
Strong Winds	6
Thunderstorm Winds	137
Total	**284**

Source: NCEI

4.12.6 Climate Change Considerations

The relationship between severe wind/tornado and climate change remains an area of ongoing research. For instance, tornado formation is influenced by a combination of factors and as a result, establishing clear long-term trends in tornado frequency or intensity directly linked to climate change is uncertain. The County is prone to strong downslope winds, particularly in the western part near the Rocky Mountain foothills. These winds can be intense regardless of storm activity and may be influenced by broader climatic trends.

4.12.7 Probability of Future Occurrence

As noted above, Arapahoe County has experienced 98 recorded tornadoes since 1964, an average of 1.6 per year. However, only 21 of those tornadoes resulted in any damage or injuries, an average of one damaging tornado every 2.6 years.

Severe wind events are even more common. Arapahoe County has experienced 284 wind events since 1964, an average of four per year. However, only 22 of those wind events resulted in damage or injuries, giving a frequency of one damaging wind event every 2.7 years.

Cold air aloft and wind shear are two of the major variables when it comes to severe weather across all of Colorado. As the summer months approach, the jet stream weakens and travels north impacting the state less often and reducing wind shear. Therefore, tornadoes and severe wind events are more likely to occur during the spring and early summer months of March through June and are most likely to form in the late afternoon and early evening.

4.12.8 Vulnerability

All structures in Arapahoe County may be exposed to severe wind and tornado damage. High winds associated with severe thunderstorms or tornadoes can cause a range of impacts such as rood and siding

damage to complete structure failure in extreme cases. This threat shows the importance of building code enforcement and early warning systems to reduce risks to life and property.

Impact to the Public

Over the last 70 years there have been no deaths reported in Arapahoe County due to severe wind or tornado events. During the same time period, there have been 5 reported injuries from tornadoes and 20 reported injuries from severe wind.

The impacts on certain vulnerable populations can be severe. Poorer families are more likely to live in poorly constructed homes that are more likely to be damaged. Individuals with disabilities may need more assistance after an event, especially if transportation or utility services are disrupted. Severe weather warnings must use methods that reach vision or hearing impaired people and those with limited English proficiency.

Impact to Responders

In the event of a tornado or severe wind event there may be localized impacts to response personnel. Impacts to transportation corridors and communications lines affect first responders' ability to respond effectively.

Impact to Continuity of Operations (including continued delivery of services)

Most structures, including the County's critical facilities, should be able to withstand and provide adequate protection from severe wind and tornadoes. Buildings constructed or renovated under recent codes, such as the 2018 International Building Code (IBC) currently adopted by the County, are typically designated to resist wind speeds up to 90 mph. Foremost, facilities with back-up generators should be fully equipped to handle severe wind and tornado events should the power go out.

Impact to Property, Facilities, and Infrastructure

Damage to property from severe wind has cost $783,500 and $5,000 to crop damage. Tornadoes have caused $9,630,180 in property damages. All infrastructure and facilities located in Arapahoe County can be considered at risk from severe wind and tornadoes. Older homes, which are often subject to less advanced building codes, suffer increased vulnerability to wind and tornadoes over time. Mobile homes, which are most often occupied by low-income, socially vulnerable residents, are the most dangerous places during a windstorm or tornado.

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

- Electric power disruption
- Communication disruption
- Water and fuel shortages
- Road closures
- Damaged infrastructure components, such as sewer lift stations and treatment plants
- Damage to homes, structures, and shelters

Downed electrical lines following a storm can increase the potential for lethal electrical shock and can also lead to other hazard events such as wildfires.

Impact to the Environment

Agriculture may be impacted during a tornado or severe wind event, particularly in the eastern and rural portions of the County where farming remains an important land use and economic activity. High winds can flatten crops, damage irrigation systems, destroy fencing, and disrupt farming operations. Although NCEI documents crop losses from severe wind and tornado events, often economic impact on specific agricultural parcels is underreported or not systematically recorded.

Impact to the Economic Condition of the County and Jurisdictions

Generally, severe wind events and tornadoes destroy private, commercial, and public property. Additional costs stem from debris removal, maintenance, repair, and response. Indirect costs include loss of industrial and commercial productivity because of damage to infrastructure, facilities, or interruption of services. Because no specific, countywide loss estimation exists for severe wind and tornado hazards, potential losses are related to historical property damage and injuries/deaths.

Impact to Public Confidence in Government

To maintain public confidence, Arapahoe County and its jurisdictions must continue to adhere to building codes and to facilitate new development that is built to the highest design standards to account for heavy winds. As population grows in the County, there is growing responsibility to ensure that all structures, both residential and commercial, are designated and constructed with wind resistance and public safety as priority.

Changes in Development

All structures in Arapahoe County may be exposed to severe wind and tornado damage. As with other large extent hazards, the increased development trends within Planning Reserve Areas and along the I-70 corridor will increase the vulnerability of these areas. Since the previous plan, the municipalities and unincorporated areas along the I-70 corridor have seen dramatic increase in single family housing units and new commercial development. As this area has been more likely to experience tornadoes, there is an increased population vulnerability. The County's current building code (2018 International Building l Code) requires new structures to be built to withstand a 90-mph wind event (EF1).

Recent assessments confirm that open terrain, limited windbreaks, and expanding infrastructure in eastern Arapahoe has contributed to a slight increase in vulnerability since the last plan update, tempered somewhat by modern building codes. With more structures and residents located in areas previously dominated by agriculture or open space, the potential consequence of even low to moderate intensity tornadoes have increased.

4.12.9 Jurisdictional Differences

As shown in the maps under Hazard Location, tornadoes and severe wind events are more common in the eastern half of the County. Eastern jurisdictions such as Deer Trail, Bennett, and Byers lie on the open plains, where terrain is flat and unobstructed, allowing wing speeds to accelerate. In contrast, western municipalities like Englewood, Littleton, and Cherry Hills Village are more urbanized and buffered by development and vegetation, which can slightly reduce wind intensity and tornado formation.

Table 4-80 Severe Wind/Tornado Hazard Rankings by Jurisdiction

Severe Wind/Tornado	Frequency	Spatial Extent	Severity	Overall Significance
Bennett	Likely	Significant	Critical	High
Bow Mar	Occasional	Significant	Limited	Medium
Centennial	Occasional	Significant	Limited	Medium
Cherry Hills Village	Occasional	Significant	Limited	Medium
Columbine Valley	Occasional	Significant	Limited	Medium
Deer Trail	Likely	Significant	Critical	High
Englewood	Occasional	Significant	Limited	Medium
Foxfield	Occasional	Significant	Limited	Medium
Glendale	Occasional	Significant	Limited	Medium
Greenwood Village	Occasional	Significant	Limited	Medium
Littleton	Occasional	Significant	Limited	Medium
Sheridan	Occasional	Significant	Critical	Medium
Denver Water	Likely	Significant	Limited	Low
South Metro Fire	Likely	Significant	Limited	Medium
Unincorporated County	Likely	Significant	Limited	Medium

4.13 Severe Winter Weather

Hazard	Frequency	Spatial Extent	Severity	Significance
Severe Winter Weather	Highly Likely	Extensive	Limited	High

4.13.1 Risk Summary

- In the past 29 years the County has experienced 320 winter storm events, bringing heavy snow, high winds, and sometimes blizzard conditions to the County.
- The majority of severe winter weather-related casualties and injuries in the County are from traffic incidents caused by inclement weather.
- 11,017 Medicare Beneficiaries in the County rely on electric equipment and are more vulnerable to power outages due to a winter storm event.
- Winter weather resulted in over $1.9 million in crop insurance claims and affected almost 39,000 acres between 2007-2024. Freeze was the most common cause of loss.
- Severe winter weather can isolate residents and travelers by closing E-470 and I-70 into and out of the eastern portions of the County.
- Heavy snow can lead to limited structural damage.
- Power outages are possible in severe winter storms.
- Related Hazards: Severe Wind/Tornado

4.13.2 Description

Severe winter weather such as blizzards, heavy snow, ice storms and extreme low temperatures can occur throughout the fall, winter, and spring seasons in Arapahoe County. Snow and ice storms can take down trees and cause damage to property and infrastructure. Cold temperatures are considered hazardous when they drop well below what is considered normal for an area. Combined with increases in wind speed, such temperatures can be life threatening to those who are exposed for extended periods of time.

Blizzards, as defined by the National Weather Service, are a combination of sustained winds or frequent gusts of 35 mph or greater, and visibility of less than a quarter mile from falling or blowing snow for 3 hours or more. A blizzard does not necessarily indicate heavy amounts of snow, although they can happen together. The falling or blowing snow usually creates large drifts from the strong winds. The reduced visibilities make travel treacherous, even on foot. The strong winds may also cause dangerous wind chills. Ground blizzards can develop when strong winds lift snow off the ground and severely reduce visibility.

Heavy snow may fall during winter storms in large quantities. Six inches or more in 12 hours, or eight inches or more in 24 hours, creates conditions that may significantly hamper travel or create hazardous conditions. The National Weather Service issues warnings for such events. Smaller amounts can also make travel hazardous, but in most cases, only results in minor inconveniences. Heavy wet snow before the leaves drop from the trees in the fall, or after the trees have leafed out in the spring, may cause problems with broken tree branches and power outages.

Ice storms develop when a layer of warm (above freezing), moist air aloft coincides with a shallow cold (below freezing) pool of air at the surface. As snow falls into the warm layer of air, it melts to rain and then freezes on contact when hitting the frozen ground or cold objects at the surface, creating a smooth

layer of ice. This phenomenon is called freezing rain. Similarly, sleet occurs when the rain in the warm layer subsequently freezes into pellets while falling through a cold layer of air at or near the Earth's surface. Extended periods of freezing rain can lead to accumulation of ice on roadways, walkways, power lines, trees, and buildings. Almost any accumulation can make driving and walking hazardous. Thick accumulation of snow can bring down trees and power lines.

Extreme cold in extended periods, although infrequent, can occur throughout the winter months in Arapahoe County. When cold temperatures and wind combine, dangerous wind chills can develop. Wind chill is how cold it "feels" and is based on the rate of heat loss on exposed skin from wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature, and eventually lowering internal body temperature. This makes the environment feel much colder than the actual temperature. Most people limit their time outside during extreme cold conditions, but common complaints usually include pipes freezing and cars refusing to start.

4.13.3 Location

Each municipality in Arapahoe County has an equal susceptibility to severe winter weather as profiled in this section. The majority of Arapahoe County is located in the flat, grass-covered eastern plains – the high plains of the Great Plains. Winters on the eastern plains are typically dry, cold, and windy. Although snowfall is usually light, winter blizzards can affect all Arapahoe County residents when they occur.

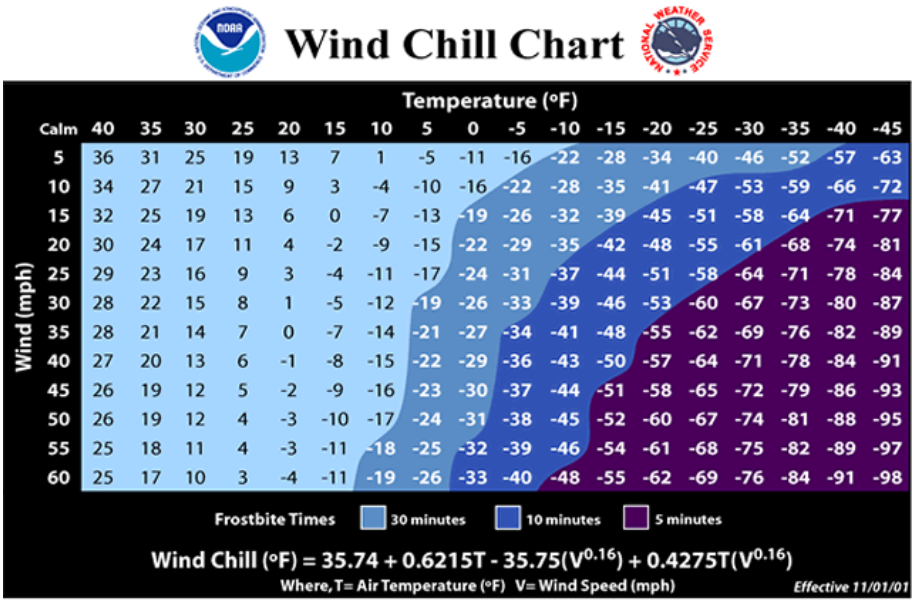
All areas of Arapahoe County are assumed to have the same snowstorm risk. Heavy snow can result in the closing of primary and secondary roads, particularly in rural locations, loss of utility services, and depletion of oil heating supplies.

4.13.4 Magnitude/Severity

The winter storm season usually runs from November to April. Arapahoe County comes under winter weather advisory and winter storm watches/warnings several times throughout these months. Although snow does fall outside of this time frame, such snowfall is comparatively light and more likely to melt quickly.

In 2001, the National Weather Service (NWS) implemented an updated Wind Chill Temperature index, which is reproduced in Figure 4-44. This index was developed to describe the relative discomfort/danger resulting from the combination of wind and temperature. Wind chill is based on the rate of heat loss from exposed skin caused by wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature and eventually the internal body temperature.

Figure 4-44 NWS Wind Chill Chart



Source: NWS

The NWS has defined winter season watches, warnings, and advisories based on specific criteria. The following is a breakdown on the various warnings that could be issued:

- **Ice Storm Warning** is issued when a period of freezing rain is expected to produce ice accumulations of 1/4" or greater, or cause significant disruptions to travel or utilities.
- **Sleet Warning** is issued when a period of sleet is expected to produce ice accumulations of 1/2" or greater, or cause significant disruptions to travel or utilities.
- **Heavy Snow Warning** is issued when snow is expected to accumulate 4 inches or more in 12 hours, or 6 inches or more in 24 hours.
- **Winter Storm Warning** is issued for a winter weather event in which there is more than one hazard present, and one of the warning criteria listed above is expected to be met.
- **Blizzard Warning** is issued for sustained wind or frequent gusts greater than or equal to 35 mph accompanied by falling and/or blowing snow, frequently reducing visibility to less than 1/4 mile for three hours or more. Watches are issued when conditions may be met 12 to 48 hours in the future.
- **Wind Chill Warning** is issued when wind and temperature combine to produce wind chill values of -20°F.
- **Winter Weather Advisory** is issued when wintry weather is expected, and caution should be exercised. Light amounts of wintery precipitation of patchy blowing snow will cause slick conditions and could affect travel if precautions are not taken.

The state of Colorado experiences extreme cold events fairly frequently, although extended periods of sub-zero temperatures are rare. Average nighttime low temperatures for the month of January range from around 10 to 30 °F, with daily highs averaging from the mid-30s to 50°F. Sudden and frequent changes in temperature occur quite often in Colorado. Prolonged periods of extremely cold weather are unusual; however, temperatures have occurred below 0° F in Arapahoe County. When conditions are appropriate, the National Weather Service issues wind chill warnings.

Severe winter storms can be forecasted with a reasonable level of certainty. Through the identification of various indicators of weather systems, and by tracking these indicators, warning time for snowstorms can be as much as a week in advance.

4.13.5 Past Occurrences

The analysis of NCEI records reveals that winter weather events are frequent in the Arapahoe County region, with 320 reported events between 1996 and February 2025. These 320 events were responsible for 4 indirect deaths, 2 injuries (directly), 70 injuries (indirectly), approximately $18.6 million in property damage over a 29-year period. Winter weather events occur frequently and can have a significant impact on Arapahoe County's most vulnerable populations.

Significant winter weather events noted by NCEI or listed in the previous Hazard Mitigation Plan include:

- November 1983 – Extreme cold temperatures as low as -21°F were accompanied by a prolonged snowstorm that dumped over 21 inches of snow on the region.
- November 1991 – A large snowstorm dumped over 21 inches of snow.
- October 1997 – An October blizzard dumped over 31 inches of snow in the region, leaving 4,000 travelers stranded at the Denver International Airport. A state of emergency was declared for Colorado.
- December 9, 1998 – Extreme cold temperatures across the region led to power outages, cracked water pipes, and a number of deaths and injuries. Temperatures dipped below 0°F, with a low of -19°F for six consecutive days.
- April 2001 – Severe spring snow, high winds and ice led to snapped power poles and downed power lines. Many residents and businesses were left without power. DIA lost power over two consecutive weekends.
- March 17, 2003 – Largest snowstorm in the Denver Metro region since 1946. The three-day snowfall accumulation measured on March 20th, 2003 remains the most extreme in Arapahoe County to date, coming in at 46.3 inches.
- December 20-29, 2006 – Extreme cold temperatures and multiple snowstorms created ice build-up on local streets. Over 20 inches of snow accumulated and led to the closure of the airport, grocery stores, and the US mail service at the height of holiday travel. A state-wide disaster was declared. The snowfall on December 21st, 2016 remains the most extreme one-day snowfall in Arapahoe County to date with an accumulation of 35 inches.
- March 30, 2009 – A band of heavy snow, induced by a strong upper level jetstream. The snow was heaviest on the east side of the Denver metro area where storm totals ranged from 2 to 5 inches. The combination of reduced visibility and snow packed roadways resulted in multiple accidents during the morning rush hour including an 18-car pileup, a school bus crash and at least three fatalities.
- March 1, 2014 – A band of heavy snow, produced around one inch in less than 30 minutes, contributed to a chain of accidents in the northbound lanes of Interstate 25. The combination of excessive speed and very poor driving conditions led the chain reaction; it involved 104 vehicles and resulted in one death along with 30 injuries. The interstate was closed for approximately 5 hours.
- March 2019 – A rapidly intensifying storm system or bomb cyclone brought hurricane strength winds to the northeast plains of Colorado, along with moderate to heavy snowfall. Peak wind gusts ranged from 60 to 80 mph. Widespread outages, multi-vehicle accidents and road closures

prompted the governor to declare a state of emergency which activated the Colorado National Guard to assist state and local authorities in rescuing hundreds of stranded motorists. Arapahoe County, along with many other counties, issued a disaster declaration. Nearly 1,400 flights in and out of Denver International Airport were canceled due to the blizzard. The number of people who lost power during the storm totaled 445,000. At least 33 public school districts were closed on the 13 and 14th. Warming centers and shelters opened area wide.

- March 2021 – A winter storm turned to blizzard conditions along the I-25 Corridor from Palmer Divide north to the Wyoming border. All major Interstates were closed except for those areas around Denver and Fort Collins. Extensive drifting snow was observed, with drifts anywhere from 3 to 7 feet deep. The heavy wet snow caused extensive tree damage and produced power outages. Xcel stated the number of customers in northern Colorado affected by power outages exceeded 15,000. Storm snowfall totals included: 24 inches 3 miles south-southeast of Arapahoe Park; 14.8 inches 4 miles south of Bennett; 10 inches near Byers. Numerous road closures were documented throughout Arapahoe County and, while there were no significant injuries, hundreds of people were rescued from stranded vehicles. These operations cost around $300,000 from the County budget.

Understanding the historical frequency of winter weather events in Arapahoe County also assists in determining the likelihood of future occurrences. The characteristics of past extreme cold and significant winter weather events provide a benchmark for projecting similar conditions into the future. Table 4-81 lists the significant winter weather, blizzards and winter storms, and cold/wind chill events reported to NCEI for Arapahoe County.

Table 4-81 Severe Weather Events in Arapahoe County, 1996-February 2025

Year	Blizzard	Extreme Cold/ Wind Chill	Heavy Snow	Winter Storm	Winter Weather	Total
1996	1		6	1		8
1997	1		5	3		9
1998			2	1		3
1999			4	1		5
2000			2			2
2001	2		5	1		8
2002			2	1		3
2003	1		1			2
2004	1			4		5
2005	1			3		4
2006	2		1	2		5
2007	2			2	1	5
2008				1	2	3
2009	1			7	2	10
2010				2	2	4
2011		1		2	4	7

Year	Blizzard	Extreme Cold/ Wind Chill	Heavy Snow	Winter Storm	Winter Weather	Total
2012				1	3	4
2013	3			2	2	7
2014				2	3	5
2015	1			3	4	8
2016	1		1	3		5
2017	1			2	1	4
2018				1	1	2
2019	2			2	9	13
2020				1	6	
2021				2	8	
2022				3	13	
2023		1		2	7	
2024		1		3	10	
2025					1	
Total	**20**	**3**	**29**	**58**	**79**	**320**

Source: NCEI, data through 2/28/2025

Table 4-82 summarizes the impacts of those storms in terms of deaths, injuries, property damage, and crop damage.

Table 4-82 Severe Weather Events in Arapahoe County, 1996-2025

Year	Deaths (Direct)	Deaths (Indirect)	Injuries (Direct)	Injuries (Indirect)	Property Damage	Crop Damage
1996	0	0	0	0	$0	$0
1997	0	0	0	0	$0	$0
1998	0	0	0	0	$0	$0
1999	0	0	0	0	$0	$0
2000	0	0	0	0	$0	$0
2001	0	0	0	0	$3,100,000	$0
2002	0	0	0	0	$0	$0
2003	0	0	2	0	$15,500,000	$0
2004	0	0	0	0	$0	$0
2005	0	0	0	0	$0	$0
2006	0	0	0	0	$0	$0
2007	0	0	0	0	$0	$0
2008	0	0	0	0	$0	$0
2009	0	2	0	2	$0	$0

Year	Deaths (Direct)	Deaths (Indirect)	Injuries (Direct)	Injuries (Indirect)	Property Damage	Crop Damage
2010	0	0	0	18	$0	$0
2011	0	1	0	0	$0	$0
2012	0	0	0	0	$0	$0
2013	0	0	0	0	$0	$0
2014	0	1	0	30	$0	$0
2015	0	0	0	0	$0	$0
2016	0	0	0	0	$0	$0
2017	0	0	0	0	$0	$0
2018	0	0	0	0	$0	$0
2019	0	0	0	0	$0	$0
2020	0	0	0	0	$0	$0
2021	0	0	0	0	$0	$0
2022	0	0	0	20	$0	$0
2023	0	0	0	0	$0	$0
2024	0	0	0	0	$0	$0
2025	0	0	0	0	$0	$0
Total	**0**	**4**	**2**	**70**	**$18,600,000**	**$0**

Source: NCEI

4.13.6 Climate Change Considerations

Climate change has the potential to exacerbate the severity and intensity of winter storms, including potential heavy amounts of snow. A warming climate may also result in warmer winters, the benefits of which may include lower winter heating demand, less cold stress on humans and animals, and a longer growing season. However, these benefits are expected to be offset by the negative consequences of warmer winter temperatures with more precipitation falling as rain than snow.

The effects of climate change in Colorado have already been observed. The following climate change observations are noted from the EPA, Climate Indicators Trends in Snowpack in the Western United States: in the 2023 Colorado State Hazard Mitigation Plan:

- From 1955-2023, April snowpack has declined at 81 percent of all measured sites
- Colorado has seen a shift toward an earlier peak snowpack along with a shorter snowpack season.
- More precipitation is falling as rain rather than snow.
- There has been an increase in rainfall events during the winter, although they are small by measurable precipitation standards.

Over the past 30 years, the timing of snowmelt and peak runoff has shifted earlier in the spring by 1-4 weeks across the state's river basins. This shift is due to lower SWE since 2000, rising temperatures and increased solar absorption from dust on snow.

4.13.7 Probability of Future Occurrence

Arapahoe County has experienced 320 such events since 1996. This works out to an average of 11 winter weather events recorded in Arapahoe County each year. This gives the County a probability of rating of Highly Likely.

As a result of global climate change, the United States is already experiencing more intense rain and snowstorms. The amount of snow falling in the heaviest one percent of storms has risen nearly 74%, averaged nationally, between 1958 and 2011. As Arapahoe County prepares for regional changes in climate, it will be important to consider scenarios in which larger amounts of snow will fall over shorter periods of time. The impacts have the potential to affect infrastructure, public safety, and the local economy in a diversity of ways.

4.13.8 Vulnerability

Impact to the Public

In the context of extreme winter temperatures and winter storm events, the most vulnerable members of Arapahoe County are:

- The elderly (people over 65 years of age)
- Infants (under 1 year old)
- Individuals experiencing homelessness
- Low-income families
- Socially isolated individuals
- People with mobility restrictions and/or mental impairments
- The infirm
- Outdoor laborers

Extended power outages during extreme cold events may make many homes and offices unbearably cold. Additionally, during extended winter-time power outages, people often make the mistake of bringing portable generators inside or not venting them properly, leading to carbon monoxide poisoning. With poor road conditions, sheltering residents may present significant logistical challenges with getting people to heated facilities, feeding, and providing medical care. These situations, accompanied by stranded motorists that need to be rescued, represent significant threats to the population of Arapahoe County.

Casualties caused by extreme cold events can result from a lack of adequate heating, carbon monoxide poisoning from unsafe or unventilated heating systems, and frostbite from exposure to the elements. Again, the most vulnerable populations to extreme cold are the elderly, infirm, homeless, and low-income families. Often, these individuals do not have access to a heat source or are unable to afford to operate one on a regular basis.

Table 4-83 shows Census data related to populations that may be more vulnerable to extreme temperatures. Refer to Section 4.11.8 for impacts related to extreme heat.

Table 4-83 Populations Vulnerable to Extreme Temperatures

Jurisdiction	Age: 65 and Over (%)	Persons Below Poverty Level (%)	Renter-occupied housing units (%)
Aurora	13.10%	11.20%	35%
Bennett	8.80%	5.00%	12%
Bow Mar	23.70%	3.30%	3%
Centennial	19%	3.10%	22%
Cherry Hills Village	23%	1.40%	2%
Columbine Valley	29.60%	0.10%	1%
Deer Trail	10.50%	15.20%	14%
Englewood	14.30%	8.10%	12%
Foxfield	31.70%	2.30%	24%
Glendale	2.40%	15.50%	40%
Greenwood Village	20.50%	4.90%	36%
Littleton	19.30%	6.30%	39%
Sheridan	14.40%	13.50%	53%
Unincorporated County	14.90%	8.50%	35%

Source: Census Bureau, American Community Survey 5-Year Estimates, 2014-2018

Ongoing mitigation activities should focus on protecting lives and preventing injuries during periods of extreme cold and winter storms. This includes, but is not limited to, preseason community outreach campaigns to educate the public about risks and available support; establishing heating centers; reaching out to vulnerable populations and caregivers; and issuing advisories and warnings.

Impact to Responders

The impact to first responders can be extensive during a severe winter storm. Operations can include rescue missions for stranded motorists, medical responses to motor vehicle accidents, and transportation of citizens to warming shelters and medical facilities. First responders are often subjected to the harsh elements of winter storms such as exposure to extreme low temperatures, high winds, and extensive snow for long periods of time.

Impact to Continuity of Operations (including continued delivery of services)

Blizzards, heavy snow, ice storms and extreme low temperatures can have limited impacts to the continuity of operations throughout Arapahoe County. Events such as power loss and poor road conditions can interrupt daily services such as delivery services and staff being able to perform their normal job functions.

Impact to Property, Facilities, and Infrastructure

Although losses to structures are typically minimal and covered by insurance, there can be impacts with lost time, maintenance costs, and contents within structures. All assets located in Arapahoe County can be considered at risk from winter storms and extreme cold temperatures. This includes 662,111 people, or 100% of the County's population and all buildings and infrastructure within the County. Damages primarily occur because of high winds, ice storms, and snow loading. Unlike other natural hazards that

affect Arapahoe County, extreme temperatures have limited physical destructive force. However, damages to inventory assets exposed to extreme cold are dependent on the age of the building, type, construction material used, and condition of the structure. Heavy snow loads on roofs, particularly large span roofs, can cause roofs to leak or even collapse depending on their construction. Extremely cold temperatures may cause pipes to freeze and subsequently burst, causing water damage. During the winter months, freezing temperatures and repeated freeze-thaw events can cause potholes, which may damage vehicles. Hazardous travel conditions may result if potholes are not tended to promptly. Frozen pipes, a common occurrence during extreme cold events, can cause service interruptions in water supply, gas supply, and drainage.

The vulnerability of assets exposed to winter storms and extreme cold varies based on the age of the building, type, construction material used, and condition of the structure. The greatest issue for critical facilities during significant winter storms and extreme cold temperatures is most commonly the inaccessibility of facilities due to poor roadways, utility outages, or dangerous wind chills. During periods of heavy snow, ice, or blizzards, roads can quickly become impassable, stranding motorists and isolating communities. Long term road closures during an extended cold period may diminish and threaten propane and fuel supplies. Possible losses to critical infrastructure include:

- Electric power disruption
- Communication disruption
- Water and fuel shortages
- Road closures
- Damaged infrastructure components, such as sewer lift stations and treatment plants

Debris may also block roadways making transportation and commerce difficult if not impossible. Those facilities with back-up generators are better equipped to handle a prolonged extreme cold temperature or severe winter storm situation should the power go out.

Impact to the Environment

Environmental impacts often include damage to trees and landscaping due to heavy snow loading, ice build-up, and/or high winds which can break limbs or even bring down large trees. Gradual melting of snow and ice provides excellent groundwater recharge; however, high temperatures following a heavy snowfall can cause rapid surface water runoff and severe flash flooding.

Impact to the Economic Condition of the County and Jurisdictions

In addition to the economic cost of direct property and crop damage caused by winter weather, indirect impacts to the economy may occur. Heavy snowfall may impede shoppers and workers from traveling to businesses and power outages may force businesses to close temporarily, resulting in wage and revenue losses. Closure of I-225, E-470, I-70 and other major highways can also temporarily disrupt the flow of goods and services throughout the County.

Impact to Public Confidence in Government

During extreme winter weather events the public will expect notifications as early as possible and updated frequently as events unfold. The local government agencies will enact winter weather operations such as extensive plowing operations and the opening of warming shelters. First responders and rescue personnel

will perform missions throughout the weather event to ensure safety of the public and continuation of crucial services.

Changes in Development

Since 2015 there has been a steady increase in the population of Arapahoe County. Since all future structures built in Arapahoe County will be exposed to severe winter weather extremes and damage, the location of development does not increase or reduce the risk necessarily. However, the increase in population density, and any accompanying increases in social vulnerability, could strain response resources and increase the County's vulnerability overall.

The eastern part of the County especially continues to add new housing developments; its population will continue to increase for the foreseeable future. Arapahoe County and its jurisdictions must adhere to building codes, and therefore, new development will be built to current standards to account for adverse weather. Additionally, as homes go up in more remote parts of the County, accessing those rural residents may become more challenging should sheltering or emergency services be needed in an extreme event.

Future buildings constructed in accordance with local building codes should be able to withstand snow loads from severe winter storms.

4.13.9 Jurisdictional Differences

Severe winter weather has the potential to occur anywhere in Arapahoe County; therefore the location, extent, and probability of occurrence are the same county-wide. Jurisdictions with higher numbers of socially vulnerable residents may experience magnified impacts of extreme temperatures. This includes places with high numbers of elderly residents, notably Foxfield, Columbine Valley, and Bow Mar; a high percentage of low-income families, such as Glendale, Deer Trail, and Sheridan; as well as homeless individuals/outdoor laborers.

Table 4-84 Severe Winter Weather Hazard Rankings by Jurisdiction

Severe Winter Weather	Frequency	Spatial Extent	Severity	Overall Significance
Bennett	Highly Likely	Extensive	Limited	High
Bow Mar	Highly Likely	Extensive	Limited	High
Centennial	Highly Likely	Extensive	Limited	High
Cherry Hills Village	Highly Likely	Extensive	Limited	High
Columbine Valley	Highly Likely	Extensive	Limited	High
Deer Trail	Highly Likely	Extensive	Limited	High
Englewood	Highly Likely	Extensive	Limited	High
Foxfield	Highly Likely	Extensive	Limited	High
Glendale	Highly Likely	Extensive	Limited	High
Greenwood Village	Highly Likely	Extensive	Limited	High
Littleton	Highly Likely	Extensive	Limited	High
Sheridan	Highly Likely	Extensive	Limited	High

Severe Winter Weather	Frequency	Spatial Extent	Severity	Overall Significance
Denver Water	Highly Likely	Extensive	Negligible	NA
South Metro Fire	Highly Likely	Extensive	Limited	High
Unincorporated County	Highly Likely	Extensive	Limited	High

4.14 Wildfire

Hazard	Frequency	Spatial Extent	Severity	Significance
Wildfire	Highly Likely	Extensive	Limited	Medium

4.14.1 Risk Summary

- Although wildfires are more common in areas within and near forested areas, exaggerating drought conditions and development into wildland urban interface, including grassland open space areas, has increased the risk of wildfires throughout the state.
- 14,958 people in Arapahoe County live within Wildland Urban Interface zones
- Properties with a total value of $12.4 billion are within Wildland Urban Interface zones
    - $4.9 billion and 38.9% of properties are within the highest risk zone
    - The property type with the highest total value are residential properties with $4.18 billion in highest risk zones
- There are 9 category A facilities and 50 category B facilities within wildfire risk zones
    - All category A facilities are for emergency services
    - 30 category B facilities are for emergency services, the other two are for healthcare and public health, postal and shipping, communications, and water and wastewater systems
- Related Hazards: Drought, Severe Summer Weather, Severe Wind/Tornado, Urban Conflagration

4.14.2 Description

A wildfire is an unplanned fire that burns in a natural area such as a forest, grassland or prairie. They include unauthorized human-caused fires, escaped prescribed burn projects and all other fires where the objective is to put the fire out. Wildfires are frequently associated with lightning and drought conditions, as dry conditions make vegetation more flammable. As new development encroaches into the wildland/urban interface (areas where development occurs within or immediately adjacent to wildland, near fire-prone trees, brush, and/or other vegetation) more and more structures and people are at risk. On occasion, ranchers and farmers intentionally set fire to vegetation to restore soil nutrients or alter the existing vegetation growth. Also, individuals in rural areas frequently burn trash, leaves and other vegetation debris. These fires have the potential to get out of control and turn into wildfires.

Wildfires are fueled by natural ground cover, including native and non-native species of trees, brush, grasses, and crops along with weather conditions and topography. While available fuel, topography and weather provide conditions that allow wildfires to spread, the majority of Colorado's wildfires are caused by people through criminal or accidental misuse of fire.

The risk factors considered are:

- High temperature
- High wind speed
- Fuel Type
- Fuel moisture (greenness of vegetation)
- Low humidity
- Little or no cloud cover
- Topography (not a significant factor in most of Arapahoe County)

Wildfires pose a serious risk to human safety and property in Arapahoe County. In addition they can destroy crops, vegetation, recreation areas, and critical wildlife habitat. The National Weather Service monitors the conditions supportive of wildfires in the State daily so that wildfires can be predicted, and possibly prevented.

4.14.3 Location

Historically, wildfires have been commonly perceived a hazard primarily for rural areas in the western part of the state; however, wildfires have become a growing problem in Colorado's Front Range. Higher risk areas within Arapahoe County include areas of Centennial, Aurora, Greenwood Village, and portions of unincorporated Arapahoe County along the I-70 corridor. The risk of grass or brushfires remains significant throughout the eastern half of the County, although being less dense in population and development reduces the vulnerability.

Of greatest concern is the area where this vegetation meets and intermingles with developed areas, known as the Wildland-Urban Interface (WUI), because this is the area where wildfire can directly impact people and property. The areas with a darker purple have more than 3 housing units for every 1 acre, showing a higher density of units. For the western half of the County, areas with high housing density are sporadic, with the areas around Foxfield and Cherry Hills Village having a high WUI housing density. WUI areas in western and eastern Arapahoe County and the wider South Metro FPD are shown in Figure 4-45 through Figure 4-47.

Figure 4-45 West Arapahoe County Wildland Urban Interface (WUI) Areas

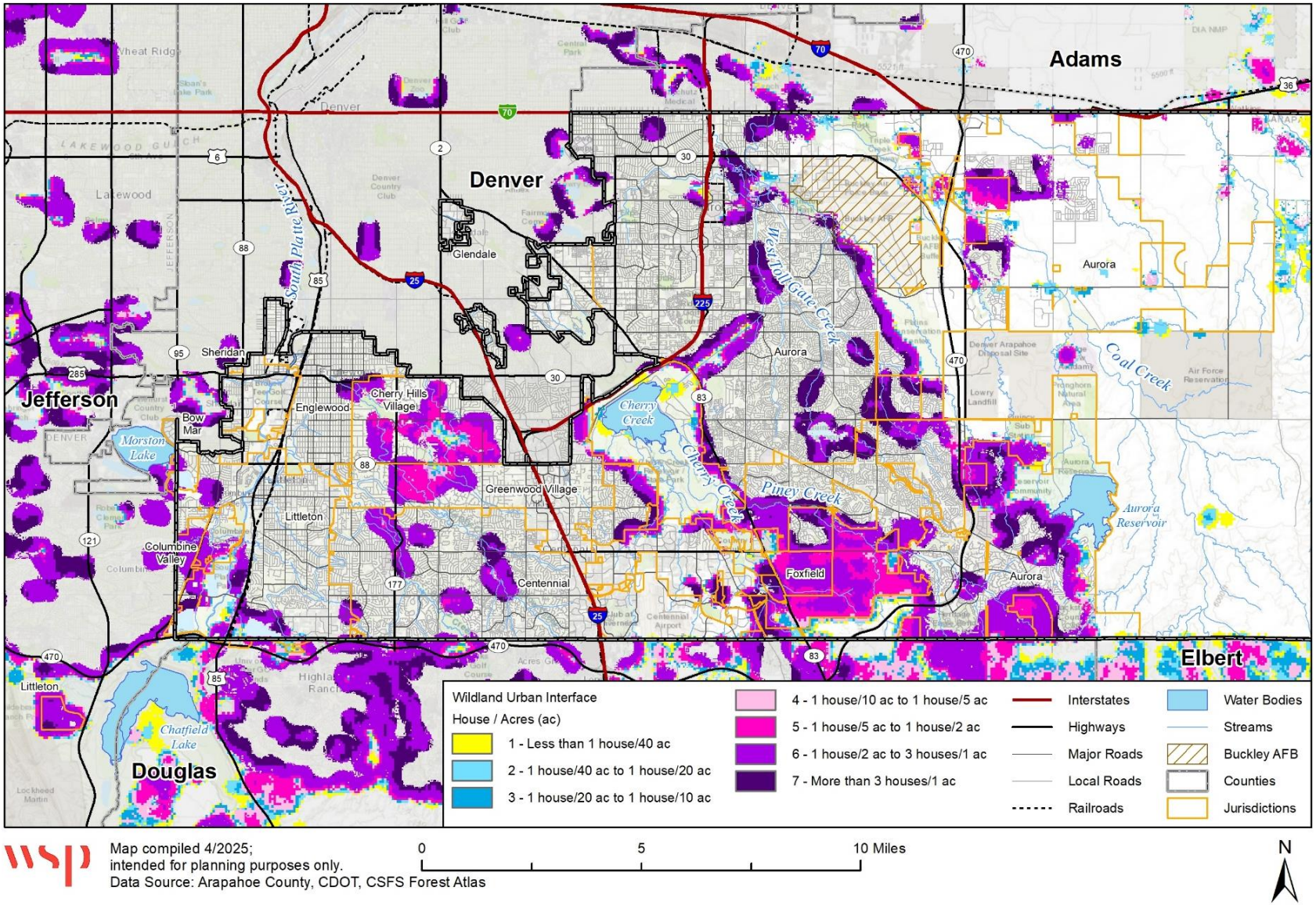


Figure 4-46 Eastern Arapahoe Wildland Urban Interface (WUI) Areas

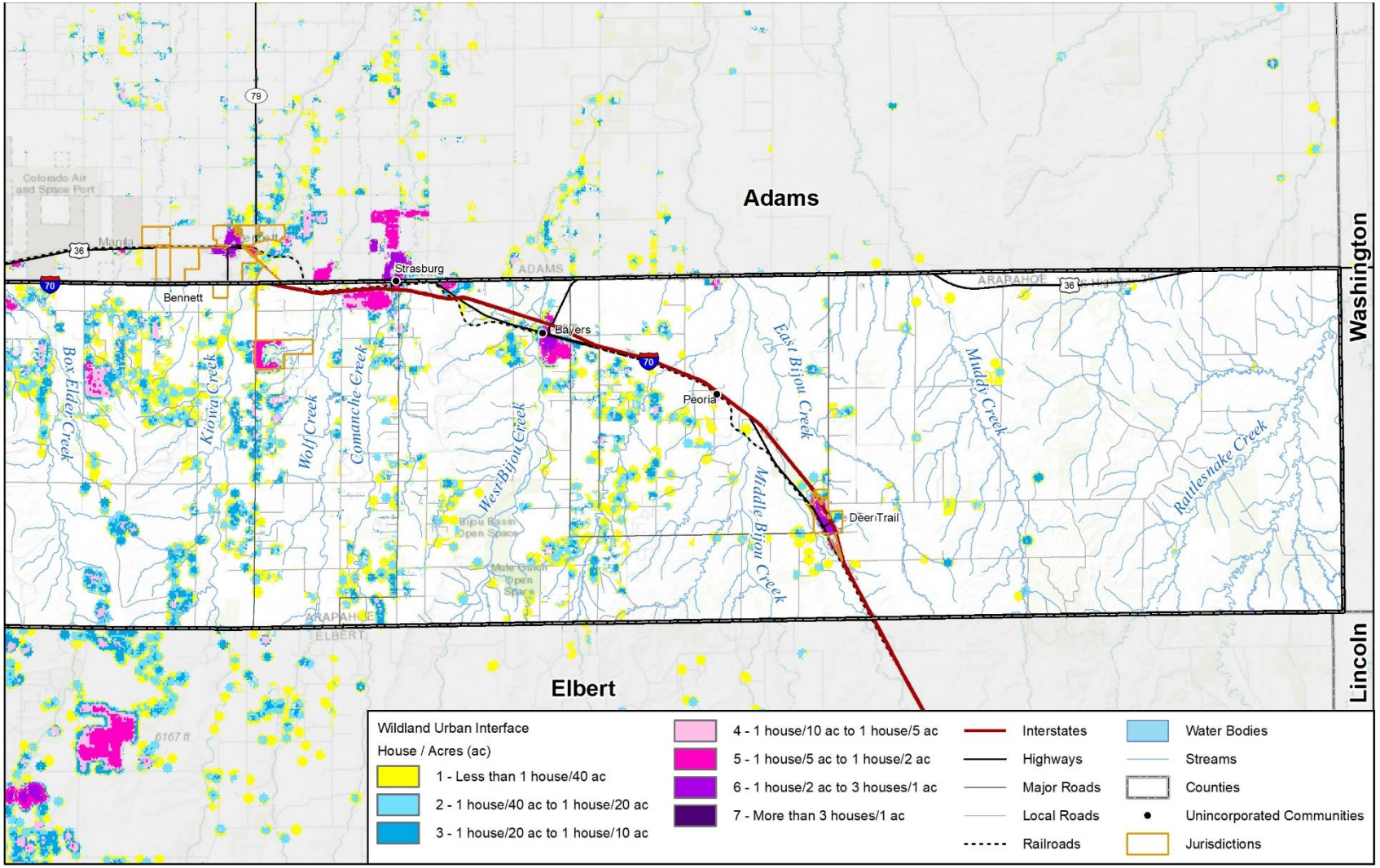
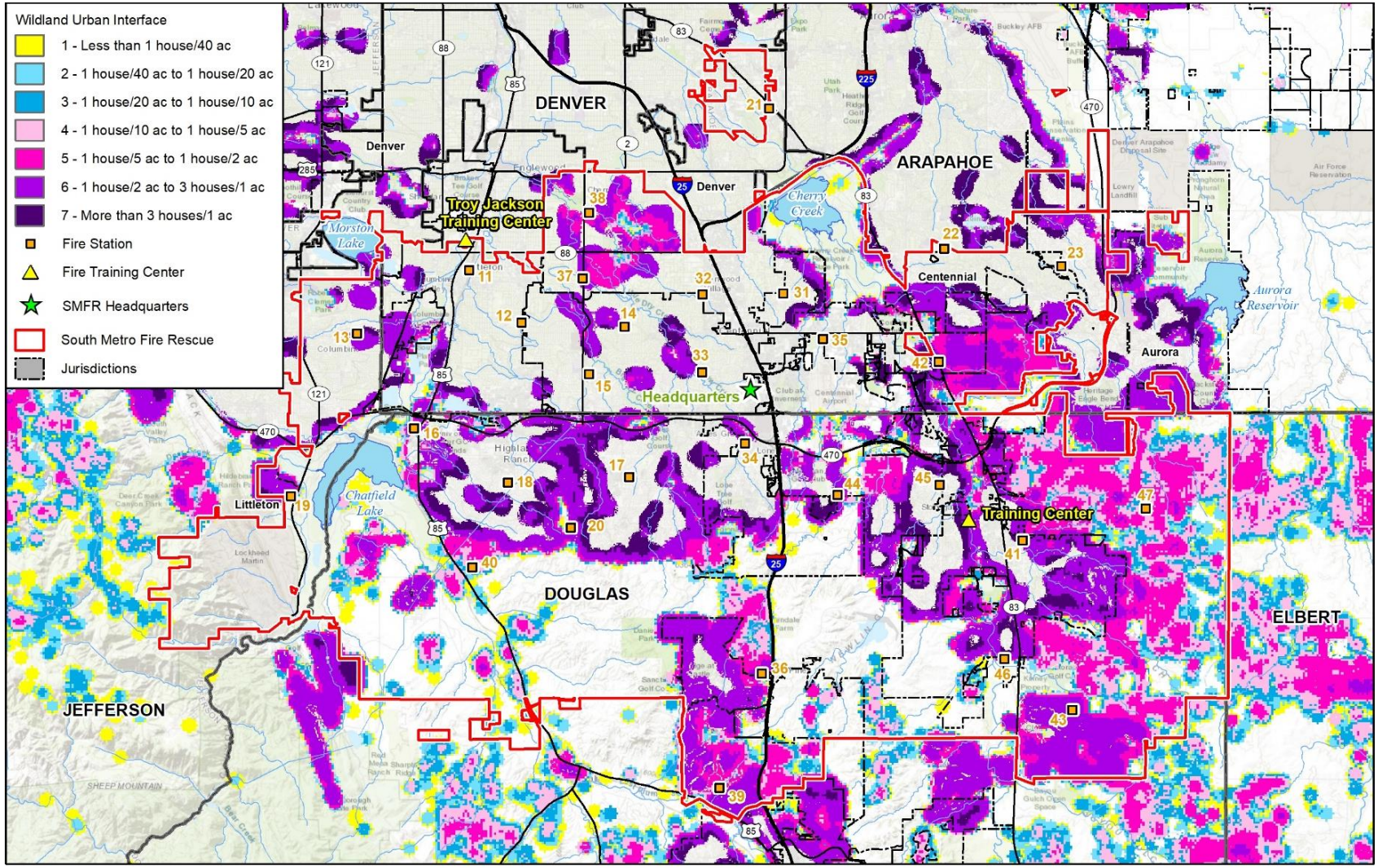


Figure 4-47 South Metro Fire Rescue Wildland Urban Interface (WUI) Areas



4.14.4 Magnitude/Severity

Wildfire behavior is dictated in part by the quantity and quality of available fuels. Fuel quantity is the mass of material per unit area. Fuel quality is determined by several factors, including fuel density, chemistry and arrangement. Arrangement influences the availability of oxygen surrounding the fuel source. Another important aspect of fuel quality is the total surface area of the material that is exposed to heat and air. Fuels with large area-to-volume ratios, such as grasses, leaves, bark, and twigs are easily ignited when dry.

Climatic and meteorological conditions that influence wildfires include solar insulation, atmospheric humidity, and precipitation, all of which determine the moisture content of wood and leaf litter. Dry spells, heat, low humidity, and wind increase the susceptibility of vegetation to fire. Additional, natural agents can be responsible for igniting wildfires, including lightning, sparks generated by rocks rolling down a slope, friction produced by branches rubbing together in the wind, and spontaneous combustion.

Arson and accidents, including sparks from equipment and vehicles, can also cause wildfires. Human-caused wildfires are typically worse than those caused by natural agents. Arson and accidental fires usually start along roads, trails, streams, or at dwellings that are generally on lower slopes or bottoms of hills and valleys. Nurtured by updrafts, these fires can spread quickly uphill. Arson fires are often set deliberately at times when factors such as wind, temperature and dryness contribute to the spread of flames.

Figure 4-48 through Figure 4-50 show the WUI areas portrayed earlier, but also factors like burn probability and expected flame length to determine where the greatest potential impact to homes and people is likely to occur. The WUI Risk Index has been calculated consistently for all areas in Colorado, which allows for comparison and ordination of areas across the entire state. Figure 4-48 also shows that areas around the Cherry Creek and Aurora Reservoirs are at moderate to high risk as well as the cities of Foxfield and Cherry Hills Village. The Eastern half of the County shows moderate to lowest WUI risk.

Figure 4-48 Western Arapahoe Wildland Urban Interface Risk

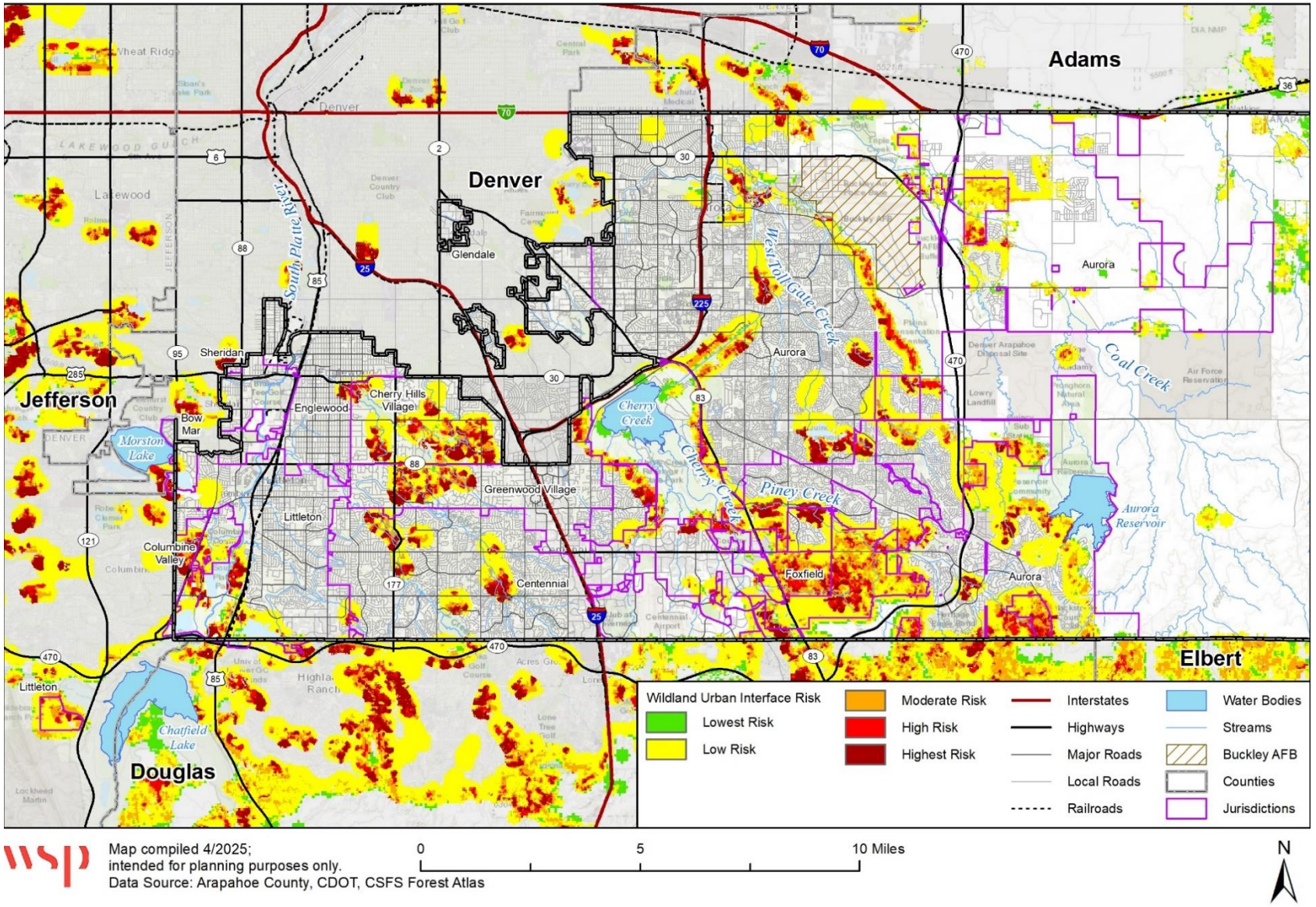


Figure 4-49 Eastern Arapahoe Wildland Urban Interface Risk

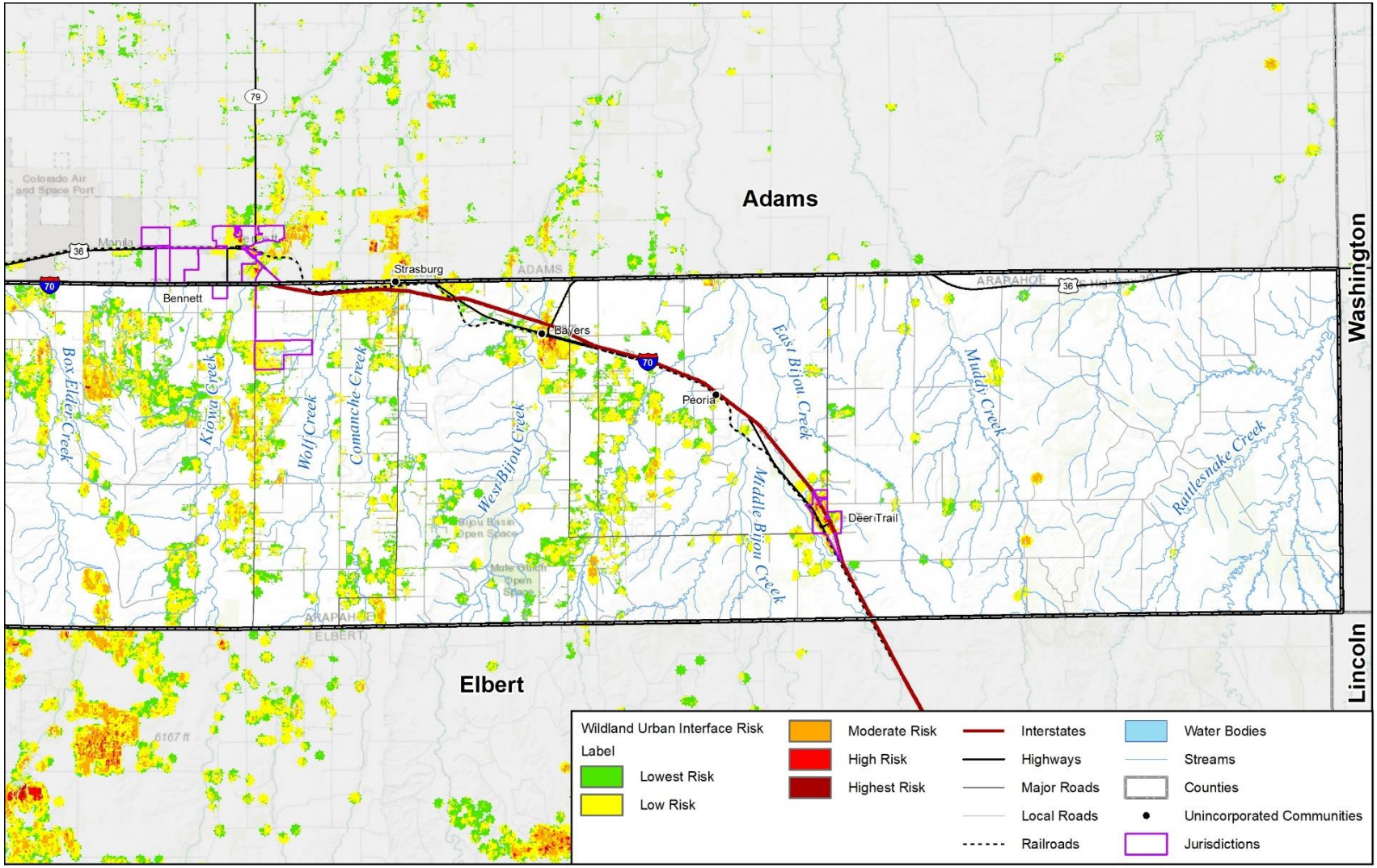
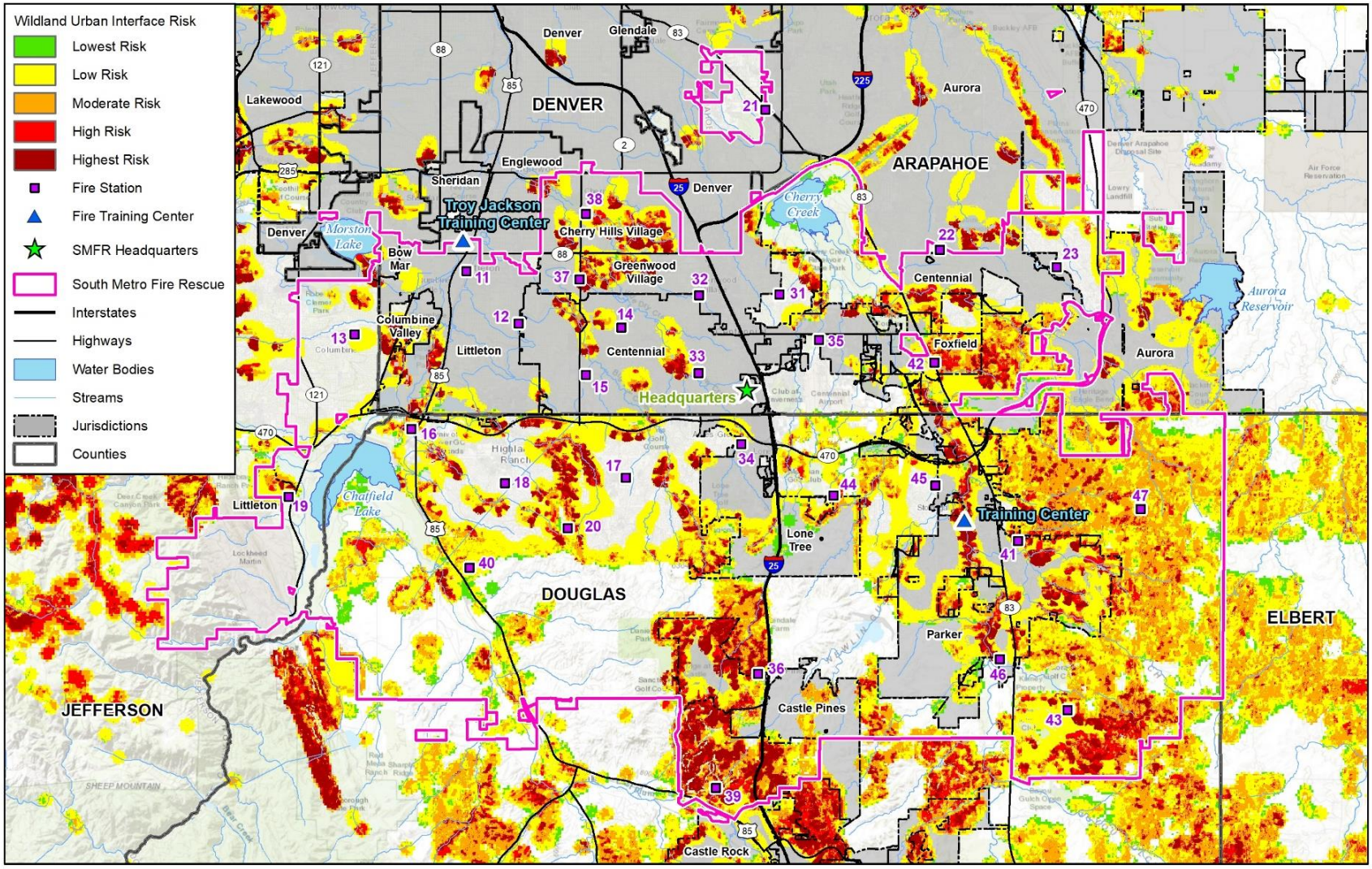


Figure 4-50 South Metro Fire Rescue Wildland Urban Interface Risk



4.14.5 Past Occurrences

Historical wildfire occurrence data was collected from the Colorado Division of Fire Prevention and Control's Fire Incident Reporting System (CFIRS). The CFIRS data includes wildfire incident types related to natural vegetation fires and cultivated vegetation fires and is currently available for events that occurred from 2009-2022. It is important to note that CFIRS wildfire data is only available when it is voluntarily submitted by participating local fire departments. For this analysis all fires reported in any of these fire departments jurisdictions have been counted; therefore, the totals may include some fires outside of the County, such as fires in Douglas and Jefferson County.

Based on the CFIRS data for the Bennett-Watkins Fire Rescue, Aurora Fire Department, and the South Metro Fire Rescue there were 300,021 incidents reported, and aid given 4,923 times between the years of 2020-2022. Table 4-85 below shows the incident counts and aid given using data from the CFIRS with the most updated years 2020-2022.

Table 4-85 Fire Department Yearly Incident Counts

Fire Department		2020	2021	2022
Bennett-Watkins Fire Rescue	Count	973	1,168	1,165
	Aid Given	162	82	129
Aurora Fire	Count	49,327	55,718	58,053
	Aid Given	16	179	151
South Metro Fire Rescue	Count	39,854	44,755	49,008
	Aid Given	1,275	1,487	1,442
Totals	**Count**	**90,154**	**101,641**	**108,226**
	Aid Given	**1,275**	**1,487**	**1,722**

Source: CFIRS, WSP analysis

It should be noted that the above numbers are based on self-reporting by individual fire departments, some of whose service areas that extend beyond their city limits. As such, these numbers likely include some fires that were reported by the listed municipality but did not actually occur inside the municipal limits. Some fires were able to be excluded where data made this clear, but a lack of precise location data made it impossible to do this for many fires.

South Metro Fire Rescue reported 23 incidents with 1 or more acre burned to the National Fire Incident Reporting System (NFIRS). The NFIRS requires that incident type also be specified, including the following criteria:

- Natural vegetation fire, not otherwise classified
- Forest, woods, or wildland fire
- Brush, or brush and grass mixture fire
- Grass fire

The HMPC notes that there are four incidents from 2020-2025 that resulted in substantial acreage loss:

- 06/30/2020 – Bradbury Krebs, Byers: 100 acres
- 08/13/2020 - CCSP Shooting Center: 18.0 acres
- 12/09/2020 – Lowry landfill (Superfund site): 10 acres.
- 12/09/2020 – 3500–4281 S Gun Club Rd: 10.0 acres

- 02/07/2021 – Cherry Creek State Park. Multi operational period response: 234 acres
- 07/04/2022 – 3800 Block Himalaya Way, Aurora (Unincorporated). Classified as WUI fire in the open space behind homes. No structures lost. Human caused – illegal fireworks.
- 07/13/2024 - 2400 Block of South Quail Hollow Road, grass fire with multiple outbuilding structures lost/damaged: 1,150.0 acres

SMFR also notes that many smaller incidents, typically 0.1 acres, involved mulch fires on commercial property landscaping. Including those incidents, SMFR reports 270 incidents.

Table 4-86 below shows incidents within the county with one or more acres burned between 2020 and 2025.

Table 4-86 Arapahoe County Wildfire Incidents 2020-2025

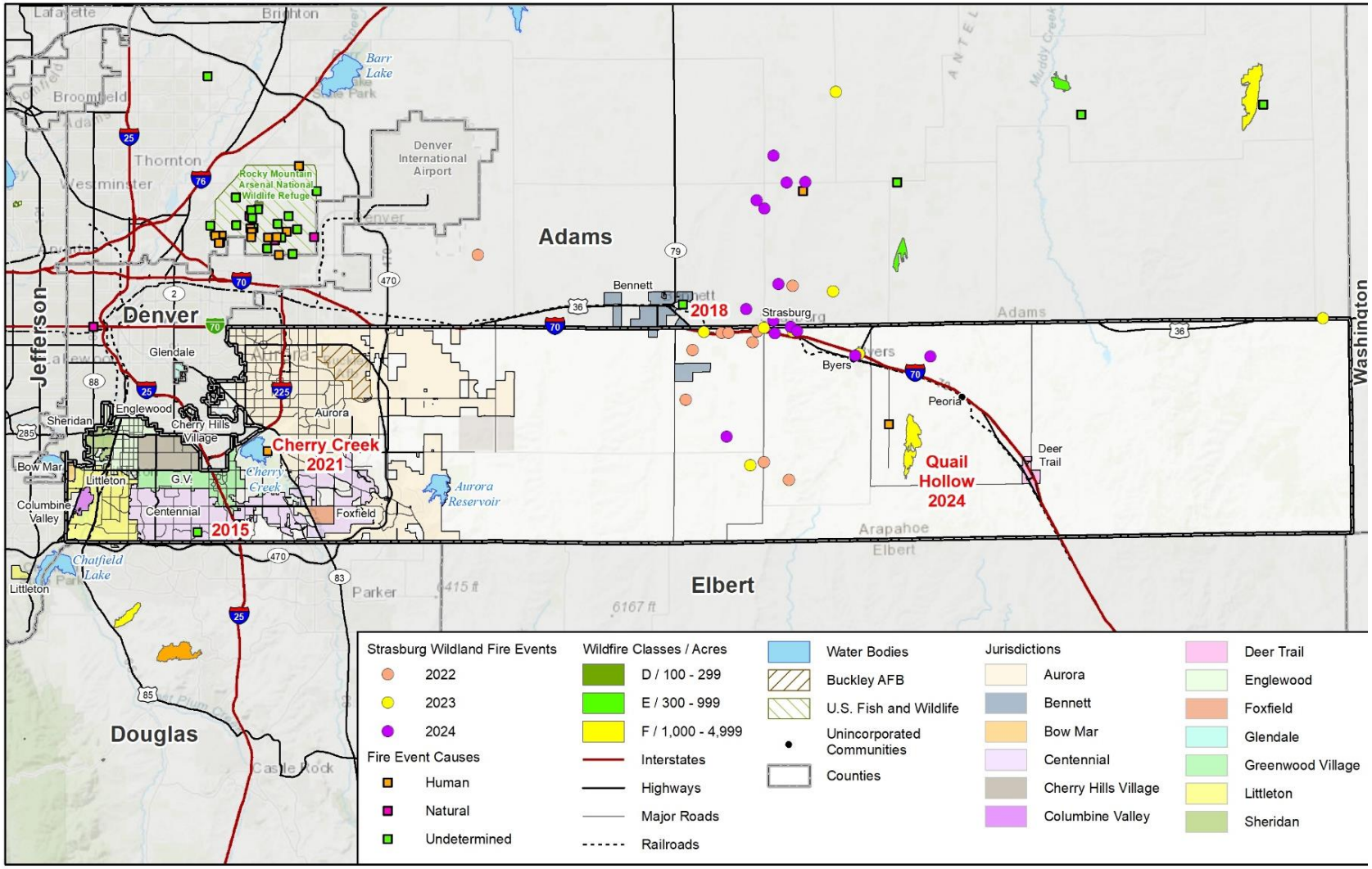
Year	Incident Type	Location	Location Type	Acres Burned
2020	Brush, or brush and grass mixture fire	CCSP Shooting Center	Fixed-use recreation places, other	18
2020	Brush, or brush and grass mixture fire	3500-4281 S Gun Club Road	Dump, sanitary landfill	10
2020	Brush, or brush and grass mixture fire	5254 S Lisbon Way	Open land or field	1
2020	Brush, or brush and grass mixture fire	4801-4823 S Windermere St.	Railroad, right-of-way	1
2021	Brush, or brush and grass mixture fire	4201 S Parker Road	Open land or field	202
2021	Brush, or brush and grass mixture fire	3501 S Gun Club Rd	Open land or field	1
2022	Brush, or brush and grass mixture fire	3880 S Himalaya Way	Open land or field	1.5
2022	Brush, or brush and grass mixture fire	CCSP Shooting Center	Fixed-use recreation places, other	1
2022	Brush, or brush and grass mixture fire	3500 S Gun Club Rd & E Hampden Ave	Open land or field	1
2023	Brush, or brush and grass mixture fire	7600-7649 S Tagawa Ln	Forest, timberland, woodland	1
2023	Natural Vegetation fire, not otherwise classified	7132 South Poplar Street And S Poplar Way/Dead End Centennial Co	1 or 2 family dwelling	1
2023	Brush, or brush and grass mixture fire	22631-23286 E Hampden Ave	Open land or field	1
2024	Brush, or brush and grass mixture fire	2400 Block Of South Quail Hollow Road (Quail Hollow Fire)	Open land or field	1,150
2024	Brush, or brush and grass mixture fire	0 E470 Nb And Parker Nb	Highway or divided highway	2
2024	Brush, or brush and grass mixture fire	0 17 Mile House Parking And S Parker Rd/Dead End Centennial	Open land or field	1
2024	Natural Vegetation fire, not otherwise classified	Broadway/Powers Ave And S Broadway/E Powers Ave Littleton, Co	Residential street, road or residential driveway	1
2024	Natural Vegetation fire, not otherwise classified	Broadway/Powers Ave And S Broadway/E Powers Ave Littleton, Co	Residential street, road or residential driveway	1

Year	Incident Type	Location	Location Type	Acres Burned
2024	Brush, or brush and grass mixture fire	4400 East Quincy Avenue And S Bellaire Cir/S Dahlia St Cherry Hills Village, Co	Open land or field	1
2024	Brush, or brush and grass mixture fire	0 Homestead Parkway And S Ivy Way/E Costilla Ave Centennial, Co	Open land or field	1
2024	Brush, or brush and grass mixture fire	0 Santa Fe Drive And S Santa Fe Dr/W Bowles Ave Littleton, Co	Open land or field	1
2024	Grass Fire	9635 East Idaho Place And Dead End/S Dayton St, Unincorporated	Open land or field	1
2025	Brush, or brush and grass mixture fire	0 Dam Road And S Dayton St/Cherry Creek Trail, Unincorporated	Open land or field	1
2025	Brush, or brush and grass mixture fire	8740 East Belleview Avenue And E Crescent Pkwy/S Yosemite St Greenwood Village, Co	none	1

Source: NFIRS, SMFR, NIFC, 2025

Figure 4-51 presents the history of wildfires in and around Arapahoe County as provided by the National Interagency Fire Center (NIFC) and the Colorado Forest Atlas. This map was derived by modeling historic wildfire ignition locations to create an ignition density map. Historic fire report data was used to create ignition points for all Colorado fires. This included both federal and non-federal fire ignition locations. The class breaks are determined by analyzing the wildfire occurrence output values for the entire state and determining cumulative percent of acres (i.e., Class 9 has the top 1.5% of acres with the highest occurrence rate). This scale of data was chosen to be consistent with the accuracy of the primary surface fuels dataset used in the assessment. While not sufficient for site specific analysis, it is appropriate for regional, county, or local protection mitigation or prevention planning. Based on Figure 4-51, the highest occurrences of wildfires are in Eastern Arapahoe County, although fires in the Western urbanized part of the County have a higher potential for loss of life and property.

Figure 4-51 Arapahoe County Wildfire History (1995-2025)



Map compiled 5/2025;
intended for planning purposes only.
Data Source: Arapahoe County, CDOT,
National Interagency Fire Center (NIFC), Strasburg Fire

4.14.6 Climate Change Considerations

Climate change is, and will continue to, increase wildfire frequency and amplify its ability to spread rapidly. The Fifth National Climate Assessment (NCA5) explicitly documents that climate change has caused wildfires to become larger, more frequent, and more severe in the western United States. In recent decades wildfires in the western United States have become larger, hotter, and more destructive and deadly due to a suite of factors, including climate change. Development in the last 50 years has greatly expanded the wildland-urban interface and increased human-caused ignitions, jeopardizing people, property, and infrastructure. Climate change has increased the area burned and severity of wildfires and impacts on the environment, human health, and society. Wildfires can impact snowmelt, runoff, and vegetation as well as cause smoke-related health risks, risks to critical infrastructure and properties, and reduced access for recreation and other cultural practices.

Climate change has produced warmer and drier conditions with prolonged droughts that stress forest vegetation. This can facilitate pest outbreaks and tree death that can lead to accumulation of surface fuel. Climate change has also increased vapor pressure deficit that dries fuels altering fire behavior that results in large, hotter, and more severe fires.

In areas such as Eastern Arapahoe County with primarily shrubland and agricultural land use, changes in frequency and extent of wildfires are being driven primarily by invasive annual grasses that have benefited from climate change. This includes species that benefit from increased temperatures and elevated atmospheric carbon dioxide levels. Species such as the Canada Thistle can experience significant increases in biomass as atmospheric carbon dioxide levels rise. According to the Rocky Mountain Research Station, future carbon dioxide concentrations could stimulate invasive plant biomass by an average of 46%, outcompeting native plants that reduce fire severity and spread. Another invasive species is Cheatgrass, which increases fire frequency and is highly adaptable to survive through fires, causing high levels of regrowth if a fire were to occur. Even without fires, droughts also reduce the amount of native vegetation, leaving areas susceptible invasive plants. Longer growing seasons and shorter winters can alter growth patterns to favor those that thrive in drier and warmer environments.

4.14.7 Probability of Future Occurrence

Burn probability, as provided by the Colorado Forest Atlas, has been calculated for the County as the annual probability of any location burning due to a wildfire. The annual burn probability was calculated as the number of times that a cell was burned, and the number of iterations used to run the wildfire simulation models. Figure 4-52 and Figure 4-53 present the burn probability for Arapahoe County and the South Metro FPD. From these figures we can see the area with the highest burn probability is located around the Auror and Cherry Creek Reservoirs. An additional map showing the South Metro Fire District burn probability is included, to show how surrounding counties and the districts jurisdictions burn probability. Areas in Jefferson, Douglas, and Elbert counties surrounding Arapahoe County and within the SMFR district have high to very high burn probabilities, showing that although the planning area only has a few areas with high probability, the surrounding areas could put the County at risk if one were to start nearby.

Figure 4-52 Burn Probability in Arapahoe County

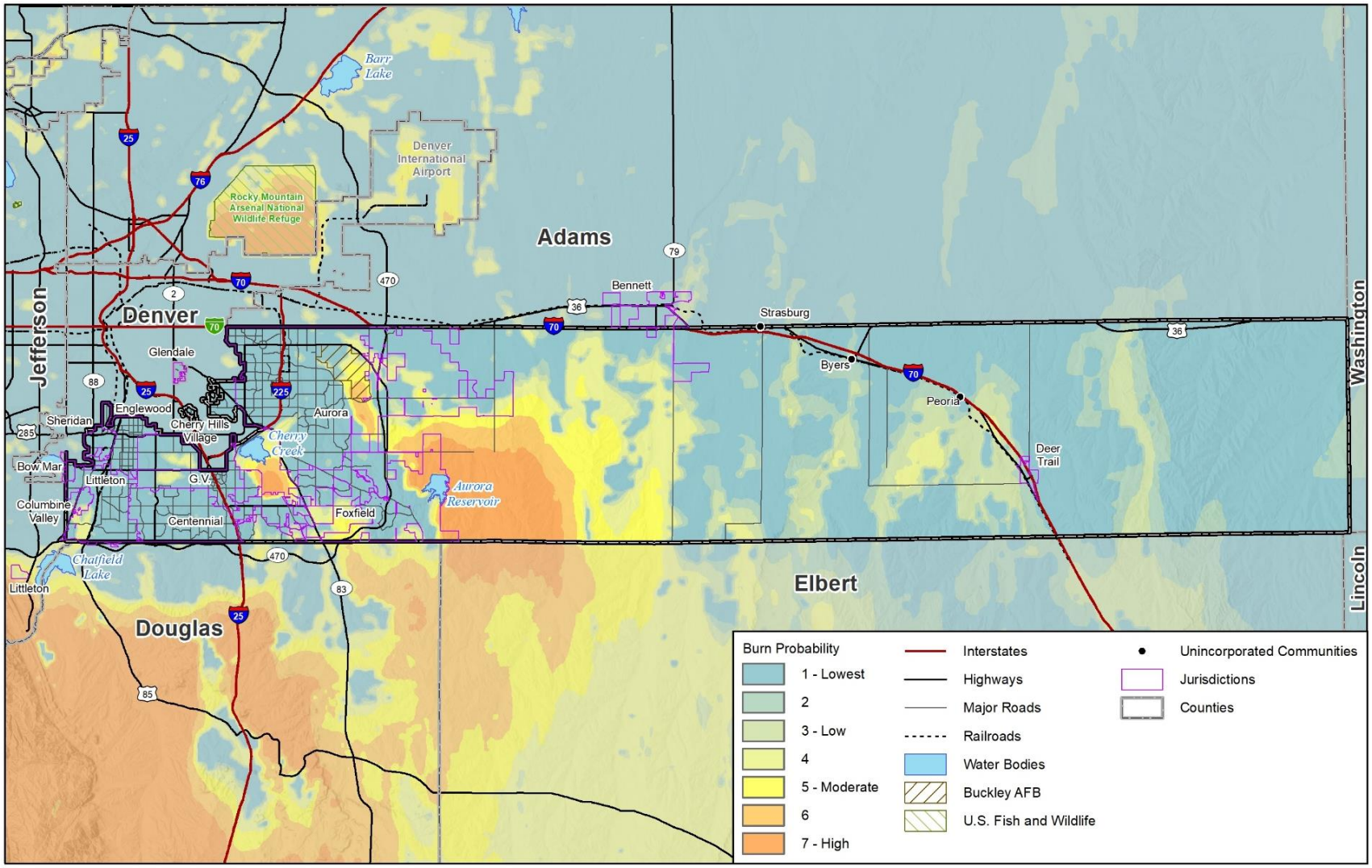
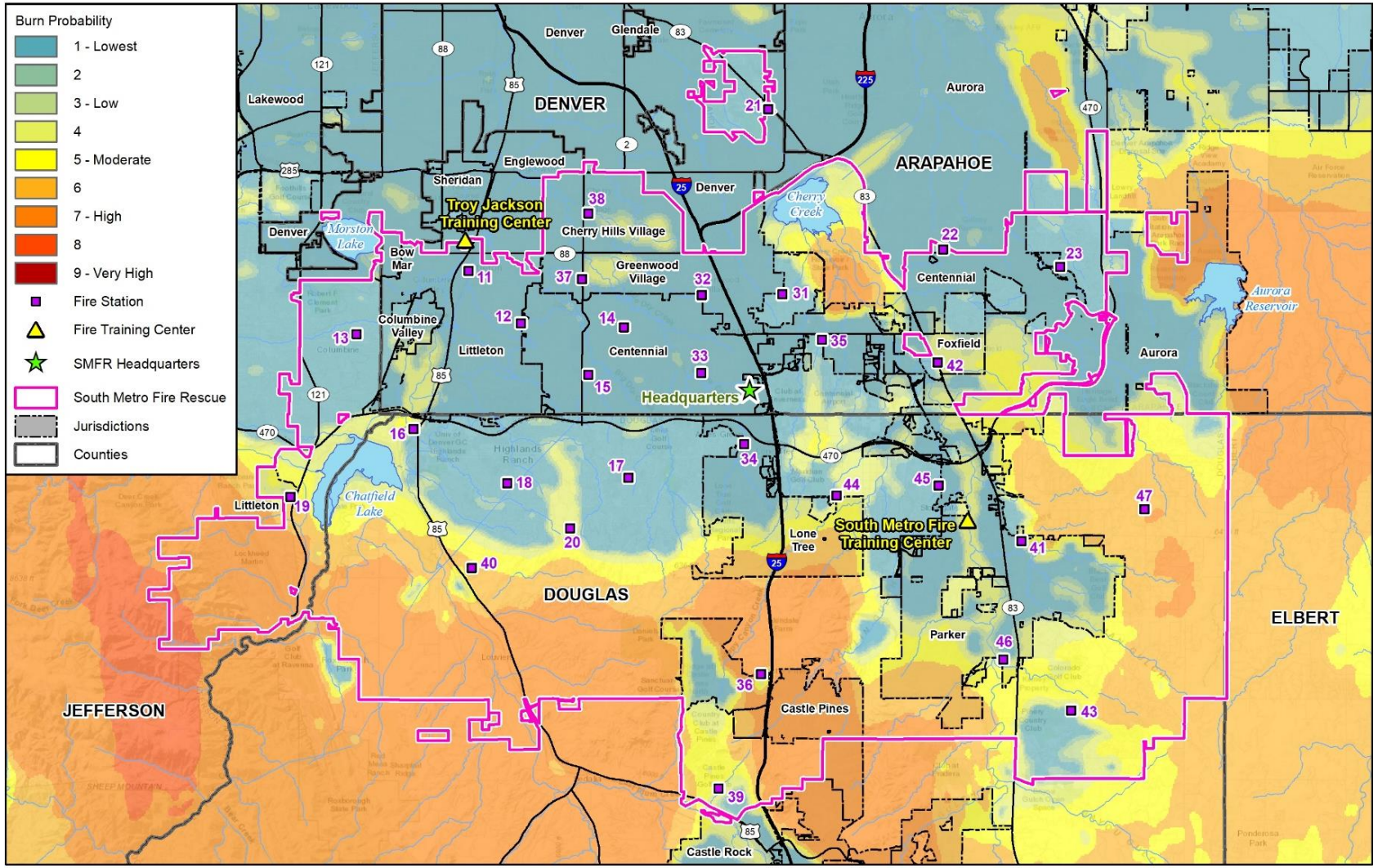


Figure 4-53 Burn Probability in the South Metro Fire Rescue



4.14.8 Vulnerability

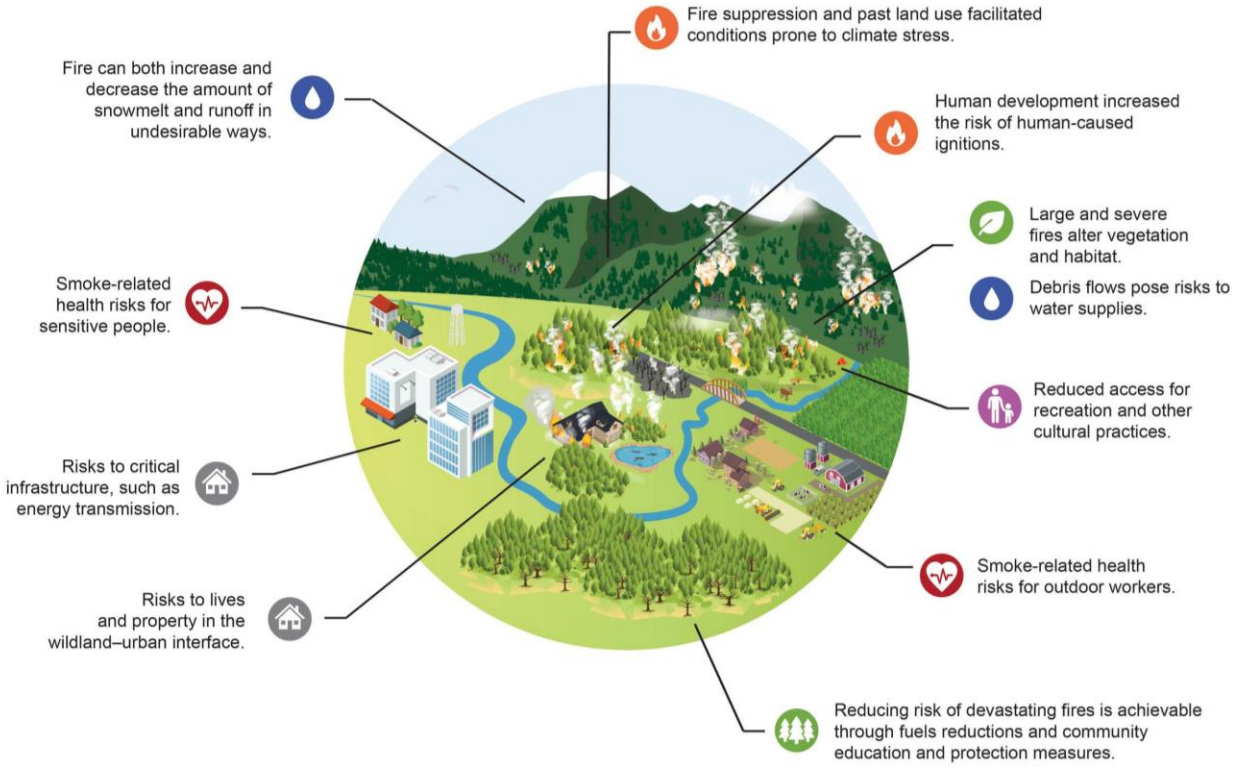
The following sub-sections discuss the results of the parcel and facility vulnerability analysis conducted for Arapahoe County, using Wildland Urban Interface (WUI) risk data from the Colorado Forest Service and address point data from Arapahoe County to determine the value and number of properties exposed to the various WUI Risk levels (Lowest, Low, Moderate, High, and Highest Risk) throughout Arapahoe County. The same methodology was used for critical facility analysis by utilizing facility location data from Arapahoe County, Colorado Department of Transportation (CDOT), Denver Water, the EPA, the Homeland Infrastructure Foundation-Level Database (HIFLD), Colorado Division of Water Resources, National Bridge Inventory (NBI), and Colorado Emergency Response Committee to determine exposure to WUI Risk. The results are summarized in the following subsections.

Impact to the Public

Fire can cause direct physical impacts to people, including physical injuries and burns, and breathing issues from smoke inhalation. In some extreme cases, wildfires can cause the loss of life for humans, livestock, and wildlife. It can also cause evacuations and the displacement of people, as seen with the Marshal Fire when over 35,000 people were displaced. Additionally, wildfires can cause indirect impacts, such as widespread smoke from wildland fires occurring outside of the planning area boundaries. According to the Western Fire Chiefs' Association, wildfire smoke can travel hundreds of miles and last for weeks. This can still cause significant air quality issues in the cities, especially for those with breathing sensitivity problems more likely to be affected by the pollutants in the air. In the summer of 2021, the Denver metropolitan area recorded the worst air quality of any major city in the world, recording an air quality index of 167 on August 7, 2021. This was the result of wildland fire smoke and particulate matter from some 107 wildfires which were burning across the Western US at that time. An air quality index above 100 is considered unhealthy for those with increased health risks, and above 150 is considered unhealthy for everyone. Prolonged and frequent occurrences of large fires, both in Colorado and other western states, can result in these conditions which can harm the population.

Figure 4-54 from the Fifth National Climate Assessment shows the different impacts wildfires can have on humans, properties, and natural ecosystems.

Figure 4-54 Wildfire Impacts



Source: The Fifth National Climate Assessment

Table 4-87 shows the estimated population living in Wildland Urban Interface zones. A total of 33,712, or roughly 5.1% of the total population, are estimated to be living in moderate to highest WUI areas at risk of wildfire. Within the 5.1% of the total population, 41.8% are in the highest risk zones, 30.1% in the high risk zone, and 28% in the moderate risk zone.

Table 4-87 Population at Risk to WUI Hazard within Arapahoe County

Jurisdiction	Population at Moderate WUI Risk	Population at High WUI Risk	Population at Highest WUI Risk	Total
Aurora	3,429	4,897	6,632	14,958
Bennett	134	28	9	171
Bow Mar	20	34	17	71
Centennial	1,647	1,509	2,764	5,920
Cherry Hills Village	269	343	591	1,203
Columbine Valley	74	93	61	228
Deer Trail	281	112	14	407
Englewood	8	35	94	137
Foxfield	245	215	78	538
Greenwood Village	272	318	581	1,171
Littleton	890	503	434	1,827

Jurisdiction	Population at Moderate WUI Risk	Population at High WUI Risk	Population at Highest WUI Risk	Total
Unincorporated	2,174	2,074	2,833	7,081
Total	**9,443**	**10,161**	**14,108**	**33,712**

Source: Colorado Forest Atlas, Arapahoe County GIS

Impact to Responders

Fire event-related duties may cause significant danger to response personnel including evacuation, suppression, law enforcement, and damage assessment. Local impacts to responders from wildfire events can include the following:

- Loss of life
- Injuries – burns, smoke inhalation, etc.
- Expense of responding (equipment, personnel, supplies, etc.)

Impact to Continuity of Operations (including continued delivery of services)

Local impacts to Continuity of Operations from wildfire events include the following:

- Availability of resources over an extended response
- Power interruption is likely if not adequately equipped with backup generation.
- Loss or degradation of radio towers
- Loss of County or municipal facilities

Impact to Property, Facilities, and Infrastructure

Buildings, equipment, vehicles, and communications and utility infrastructure are exposed and lost to wildfires every year in Arapahoe County. Local impacts to property, facilities and infrastructure from wildfire events include the following:

- Damage to the highways and bridges.
- Visibility issues along highways due to wildfire smoke.
- Damage or destruction of transmission and distribution lines, substations, and other vulnerable facilities and infrastructure.
- Coal seam or other energy facility ignitions (solar; radio towers; pipelines; rail lines)
- Loss of businesses, crops, and livestock
- Interruption of utilities

Wildfire risk is a composite risk map created by combining the Values at Risk Rating and the Burn Probability layers of the GIS data provided by the County. The Values at Risk Rating is a key component of Wildfire Risk. It is comprised of several individual risk layers including Wildland Urban Interface (housing density), Forest Assets, Riparian Assets and Watershed Protection risk outputs. The WUI component is a key element of the composite risk since it represents where people live in the wildland and urban fringe areas that are susceptible to wildfires and damages. The found individual risk layers are weighted to derive the Values at Risk Rating layer. Figure 4-55 and Figure 4-56 show the wildfire risk to assets for both the western and eastern halves of the County. In the western half there are a few areas with moderate and high risk, as shown near the Cherry Creek, however the eastern half is all low risk.

Table 4-88 through Table 4-90 present potential losses to improved structures and population within Arapahoe County for moderate, high, and highest risk. Total values are calculated by adding improved values to estimated contents values as described in Section 4.2.1. The total value of properties located in WUI zones (including moderate, high, and highest risk) is more than $12 billion, which represents 6.3% building at risk out of the total properties in the County. The highest risk WUI zone alone includes over $4.9 billion worth of property and contents, which is 2.7% of the parcels at risk.

Figure 4-55 Wildfire Risk to Assets in Western Arapahoe County

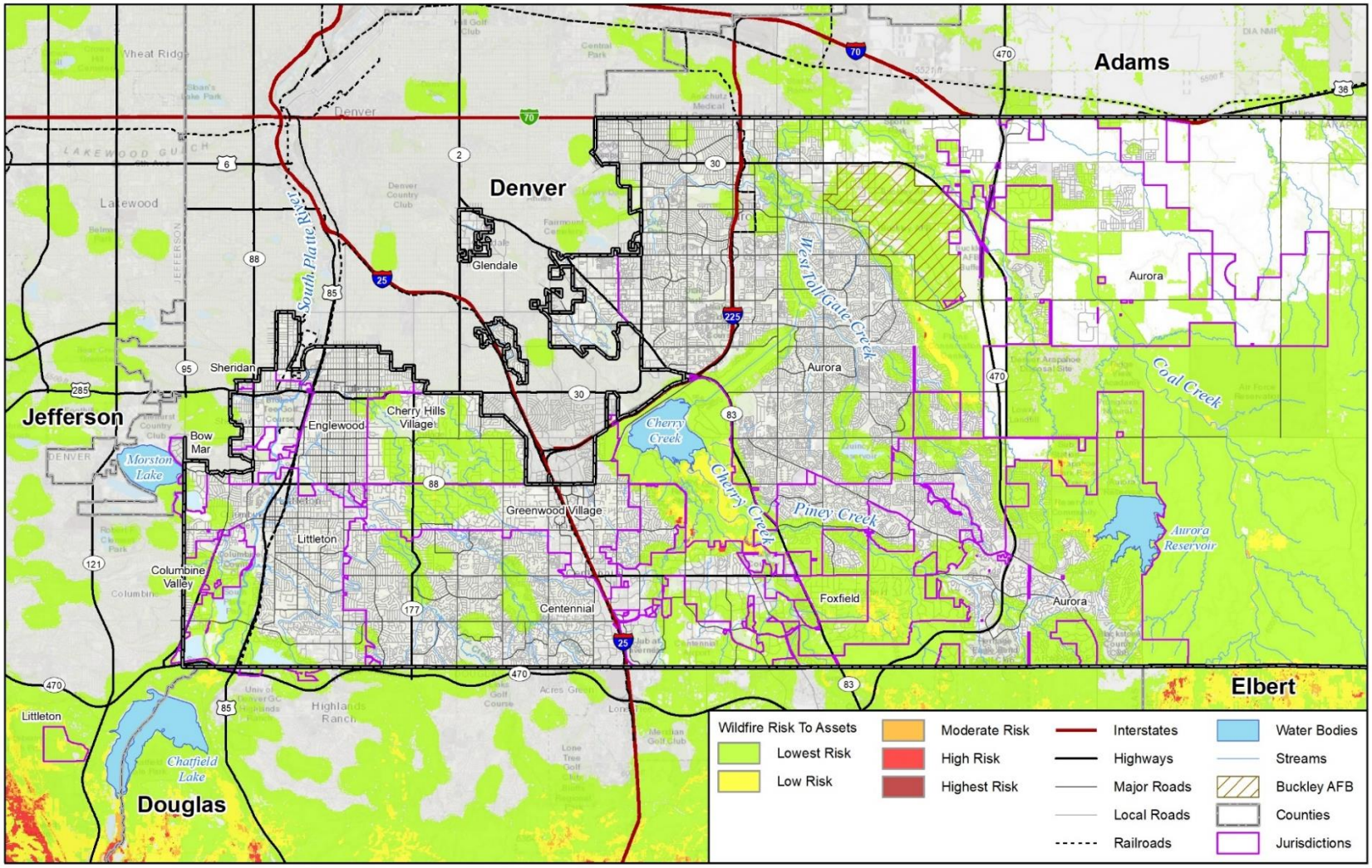


Figure 4-56 Wildfire Risk to Assets in Eastern Arapahoe County

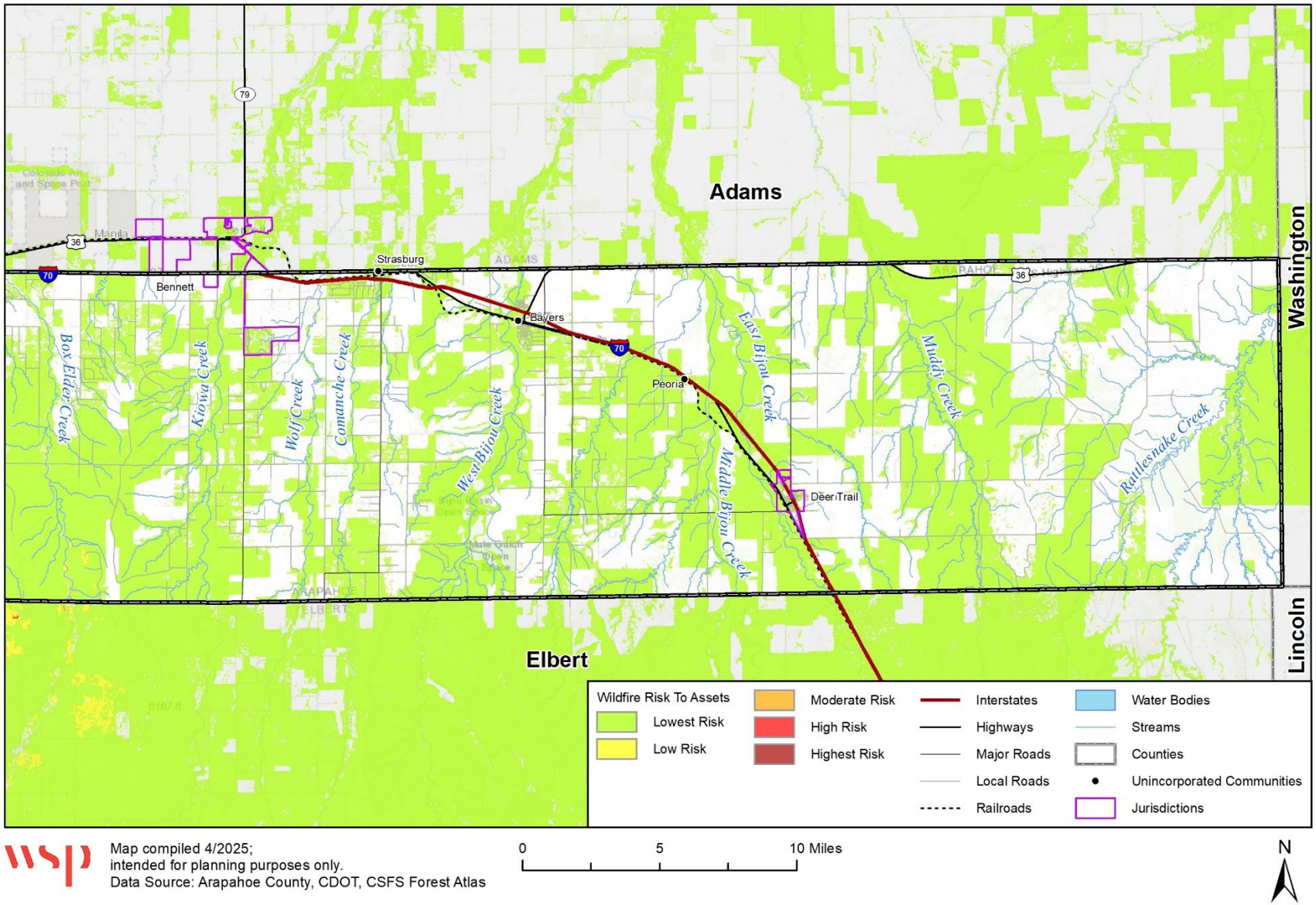


Table 4-88 Improved Properties in Highest WUI Hazard Areas in Arapahoe County

Jurisdiction	Property Type	Improved Parcels	Improved Value	Total Value	% of Parcels At Risk
Aurora	Agricultural	1	$21,648	$43,296	10.0%
	Commercial	1	$2,867,660	$5,735,320	0.06%
	Exempt	5	$10,265,655	$20,531,310	1.0%
	Multi-Family Residential	745	$355,939,710	$533,909,565	4.0%
	Residential	1,767	$727,454,266	$1,091,181,399	2.1%
	Total	**2,519**	**$1,096,548,939**	**$1,651,400,890**	**2.4%**
Bennett	Residential	3	$684,000	$1,026,000	0.2%
	Total	**3**	**$684,000**	**$1,026,000**	**0.2%**
Bow Mar	Residential	6	$7,632,274	$11,448,411	2.0%
	Total	**6**	**$7,632,274**	**$11,448,411**	**2.0%**
Centennial	Commercial	8	$26,358,547	$52,717,094	0.6%
	Exempt	6	$7,085,345	$14,170,690	2.2%
	Residential	1,059	$622,395,262	$933,592,893	3.1%
	Total	**1,073**	**$655,839,154**	**$1,000,480,677**	**2.8%**
Cherry Hills Village	Exempt	2	$3,793,370	$7,586,740	10.0%
	Residential	193	$365,639,241	$548,458,862	8.8%
	Vacant Improved	1	$13,890	$13,890	25.0%
	Total	**196**	**$369,446,501**	**$556,059,492**	**8.8%**
Columbine Valley	Residential	23	$20,322,350	$30,483,525	3.4%
	Total	**23**	**$20,322,350**	**$30,483,525**	**3.3%**
Deer Trail	Residential	5	$1,200,628	$1,800,942	1.1%
	Total	**5**	**$1,200,628**	**$1,800,942**	**0.9%**
Englewood	Commercial	2	$2,779,450	$5,558,900	0.2%
	Exempt	3	$20,577,063	$41,154,126	2.3%
	Multi-Family Residential	13	$33,347,750	$50,021,625	1.2%
	Residential	33	$11,622,800	$17,434,200	0.4%
	Total	**51**	**$68,327,063**	**$114,168,851**	**0.4%**
Foxfield	Residential	29	$20,772,085	$31,158,128	10.7%
	Total	**29**	**$20,772,085**	**$31,158,128**	**10.3%**
Greenwood Village	Exempt	3	$551,519	$1,103,038	4.9%
	Residential	239	$319,497,486	$479,246,229	6.1%
	Total	**242**	**$320,049,005**	**$480,349,267**	**4.7%**
Littleton	Commercial	1	$671,157	$1,342,314	0.14%
	Exempt	2	$108,335	$216,670	1.1%
	Mobile Home	93	$8,783,698	$13,175,547	24.1%
	Residential	317	$173,048,625	$259,572,938	2.8%
	Total	**413**	**$182,611,815**	**$274,307,469**	**2.7%**
Unincorporated	Commercial	7	$5,522,335	$11,044,670	0.7%
	Exempt	3	$720,082	$1,440,164	1.5%

Jurisdiction	Property Type	Improved Parcels	Improved Value	Total Value	% of Parcels At Risk
Unincorporated	Multi-Family Residential	63	$20,627,300	$30,940,950	1.5%
	Residential	990	$518,118,730	$777,178,095	4.4%
	Total	**1,063**	**$544,988,447**	**$820,603,879**	**3.7%**
	Grand Total	**5,623**	**$3,288,422,261**	**$4,973,287,530**	**2.7%**

Source: Colorado Forest Atlas, Arapahoe County GIS, WSP Analysis

Table 4-89 Improved Properties in High WUI Hazard Areas in Arapahoe County

Jurisdiction	Property Type	Improved Parcels	Improved Value	Total Value	% of Parcels At Risk
Aurora	Commercial	1	$2,291,380	$4,582,760	0.06%
	Exempt	7	$4,541,317	$9,082,634	1.4%
	Mixed Use	1	$4,937,030	$9,874,060	3.8%
	Multi-Family Residential	420	$113,437,510	$170,156,265	2.3%
	Residential	1,435	$720,113,147	$1,080,169,721	1.7%
	Vacant Improved	1	$2,964	$2,964	5.0%
	Total	**1,865**	**$845,323,348**	**$1,273,868,404**	**1.8%**
Bennett	Exempt	2	$7,681,795	$15,363,590	5.0%
	Residential	9	$3,199,567	$4,799,351	0.6%
	Total	**11**	**$10,881,362**	**$20,162,941**	**0.7%**
Bow Mar	Residential	12	$12,796,878	$19,195,317	3.9%
	Total	**12**	**$12,796,878**	**$19,195,317**	**3.9%**
Centennial	Commercial	1	$5,016,124	$10,032,248	0.08%
	Exempt	6	$8,802,898	$17,605,796	2.2%
	Multi-Family Residential	13	$3,690,100	$5,535,150	0.5%
	Residential	565	$401,492,087	$602,238,131	1.7%
	Total	**585**	**$419,001,209**	**$635,411,325**	**1.5%**
Cherry Hills Village	Agricultural	1	$1,954,995	$3,909,990	50.0%
	Exempt	2	$3,410,000	$6,820,000	10.0%
	Residential	112	$186,682,181	$280,023,272	5.1%
	Total	**115**	**$192,047,176**	**$290,753,262**	**5.2%**
Columbine Valley	Residential	35	$36,623,350	$54,935,025	5.1%
	Total	**35**	**$36,623,350**	**$54,935,025**	**5.1%**
Deer Trail	Exempt	1	$175,685	$351,370	6.7%
	Mobile Home	11	$206,300	$309,450	26.2%
	Residential	30	$7,252,286	$10,878,429	6.5%
	Total	**42**	**$7,634,271**	**$11,539,249**	**7.6%**
Englewood	Commercial	1	$3,225,500	$6,451,000	0.10%
	Multi-Family Residential	2	$6,720,000	$10,080,000	0.2%
	Residential	15	$5,314,200	$7,971,300	0.2%
	Total	**18**	**$15,259,700**	**$24,502,300**	**0.2%**
Foxfield	Exempt	1	$776,540	$1,553,080	33.3%

Jurisdiction	Property Type	Improved Parcels	Improved Value	Total Value	% of Parcels At Risk
Foxfield	Residential	80	$66,844,262	$100,266,393	29.4%
	Total	**81**	**$67,620,802**	**$101,819,473**	**28.8%**
Greenwood Village	Exempt	1	$1,053,508	$2,107,016	1.6%
	Residential	131	$182,356,986	$273,535,479	3.3%
	Total	**132**	**$183,410,494**	**$275,642,495**	**2.6%**
Littleton	Commercial	1	$2,865,460	$5,730,920	0.14%
	Exempt	1	$8,446,395	$16,892,790	0.6%
	Mobile Home	49	$3,927,300	$5,890,950	12.7%
	Multi-Family Residential	1	$83,300,000	$124,950,000	0.04%
	Residential	182	$138,133,590	$207,200,385	1.6%
	Total	**234**	**$236,672,745**	**$360,665,045**	**1.5%**
Unincorporated	Agricultural	1	$944,043	$1,888,086	0.2%
	Exempt	2	$30,022	$60,044	1.0%
	Mobile Home	2	$56,700	$85,050	0.3%
	Multi-Family Residential	122	$41,180,950	$61,771,425	2.9%
	Residential	647	$365,890,412	$548,835,618	2.9%
	Vacant Improved	2	$19,441	$19,441	9.5%
	Total	**776**	**$408,121,568**	**$612,659,664**	**2.7%**
	Grand Total	**3,906**	**$2,435,392,903**	**$3,681,154,498**	**1.9%**

Source: Colorado Forest Atlas, Arapahoe County GIS, WSP Analysis

Table 4-90 Improved Properties in Moderate WUI Hazard Areas in Arapahoe County

Jurisdiction	Property Type	Improved Parcels	Improved Value	Total Value	% of Parcels At Risk
Aurora	Commercial	3	$1,801,471	$3,602,942	0.2%
	Exempt	4	$8,044,576	$16,089,152	0.8%
	Mixed Use	2	$1,232,393	$2,464,786	7.7%
	Multi-Family Residential	48	$14,753,180	$22,129,770	0.3%
	Residential	1,251	$667,565,302	$1,001,347,953	1.5%
	Total	**1,308**	**$693,396,922**	**$1,045,634,603**	**1.3%**
Bennett	Exempt	2	$601,023	$1,202,046	5.0%
	Residential	43	$21,483,112	$32,224,668	2.9%
	Total	**45**	**$22,084,135**	**$33,426,714**	**2.8%**
Bow Mar	Residential	7	$8,564,983	$12,847,475	2.3%
	Total	**7**	**$8,564,983**	**$12,847,475**	**2.3%**
Centennial	Commercial	7	$23,565,903	$47,131,806	0.6%
	Exempt	8	$10,768,959	$21,537,918	2.9%
	Multi-Family Residential	1	$12,000,000	$18,000,000	0.04%
	Residential	630	$493,374,644	$740,061,966	1.9%
	Vacant Improved	2	$2,100	$2,100	33.3%
	Total	**648**	**$539,711,606**	**$826,733,790**	**1.7%**

Jurisdiction	Property Type	Improved Parcels	Improved Value	Total Value	% of Parcels At Risk
Cherry Hills Village	Exempt	6	$26,180,302	$52,360,604	30.0%
	Residential	88	$177,273,148	$265,909,722	4.0%
	Total	**94**	**$203,453,450**	**$318,270,326**	**4.2%**
Columbine Valley	Mixed Use	1	$3,395,000	$6,790,000	100%
	Residential	28	$26,685,300	$40,027,950	4.1%
	Total	**29**	**$30,080,300**	**$46,817,950**	**4.2%**
Deer Trail	Commercial	4	$411,127	$822,254	19.0%
	Exempt	3	$321,156	$642,312	20.0%
	Mobile Home	9	$102,042	$153,063	21.4%
	Multi-Family Residential	2	$307,000	$460,500	66.7%
	Residential	92	$23,100,531	$34,650,797	20.0%
	Vacant Improved	3	$78,147	$78,147	50.0%
	Total	**113**	**$24,320,003**	**$36,807,073**	**20.4%**
Englewood	Multi-Family Residential	1	$442,000	$663,000	0.09%
	Residential	3	$1,151,800	$1,727,700	0.03%
	Total	**4**	**$1,593,800**	**$2,390,700**	**0.0%**
Foxfield	Exempt	1	$447,943	$895,886	33.3%
	Residential	91	$72,075,200	$108,112,800	33.5%
	Vacant Improved	1	$14,192	$14,192	100%
	Total	**93**	**$72,537,335**	**$109,022,878**	**33.1%**
Greenwood Village	Exempt	1	$374,414	$748,828	1.6%
	Residential	112	$148,326,995	$222,490,493	2.8%
	Total	**113**	**$148,701,409**	**$223,239,321**	**2.2%**
Littleton	Commercial	4	$8,371,431	$16,742,862	0.5%
	Exempt	2	$830,039	$1,660,078	1.1%
	Mobile Home	40	$3,069,700	$4,604,550	10.4%
	Residential	210	$148,441,640	$222,662,460	1.9%
	Total	**256**	**$160,712,810**	**$245,669,950**	**1.7%**
Unincorporated	Agricultural	8	$4,331,950	$8,663,900	1.8%
	Commercial	16	$22,623,784	$45,247,568	1.6%
	Exempt	9	$2,046,573	$4,093,146	4.6%
	Mixed Use	10	$8,963,693	$17,927,386	20.0%
	Mobile Home	31	$612,150	$918,225	4.9%
	Multi-Family Residential	2	$94,079,400	$141,119,100	0.05%
	Residential	775	$443,627,764	$665,441,646	3.4%
	Vacant Improved	1	$2,685	$2,685	4.8%
	Total	**852**	**$576,287,999**	**$883,413,656**	**2.9%**
	Grand Total	**3,562**	**$2,481,444,752**	**$3,784,274,435**	**1.7%**

Source: Colorado Forest Atlas, Arapahoe County GIS, WSP Analysis

The following tables list critical facilities in the individual jurisdictions. Critical facilities were separated into two categories, A and B, representing the two critical sectors. These two sectors were then split into

three categories of WUI risk: moderate, high, and highest. 20 facilities representing 44% of the County's total critical facilities are in the highest WUI risk zones. Within all three zones the category A facilities only include emergency services, no government facilities or healthcare and public health facilities were identified in WUI risk areas.

Table 4-91 Category A Critical Facilities at Highest WUI Risk by Jurisdiction

Jurisdiction	Emergency Services	Government Facilities	Healthcare and Public Health	Total Count
Greenwood Village	1	-	-	**1**
Douglas County	4	-	-	**4**
Total	**5**	**0**	**0**	**5**

Source: Arapahoe County Sheriff's Office, HIFLD, South Metro Fire Rescue, Colorado Forest Atlas, WSP GIS Analysis

Table 4-92 Category B Critical Facilities at Highest WUI Risk by Jurisdiction

Jurisdiction	Bridge Operations	Chemical Storage	Communications	Critical Manufacturing	Dams	Defense Industrial Base	Energy	Financial Services	Food and Agriculture	Government Facilities	Healthcare & Public Health	Information Technology	Postal and Shipping	School	Transportation Systems	Water and Wastewater	Total Count
Aurora	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	**1**
Centennial	4	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	**6**
Englewood	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	**2**
Greenwood Village	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**1**
Unincorporated	1	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	**5**
Total	**6**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**0**	**0**	**0**	**0**	**1**	**15**

Source: Arapahoe County Sheriff's Office, CEPC, DWR, HIFLD, National Bridge Inventory, Colorado Forest Atlas, WSP GIS Analysis

Table 4-93 Category A Critical Facilities at High WUI Risk by Jurisdiction

Jurisdiction	Emergency Services	Government Facilities	Healthcare and Public Health	Total Count
Aurora	1	-	-	**1**
Foxfield	1	-	-	**1**
Total	**2**	**0**	**0**	**2**

Source: Arapahoe County Sheriff's Office, HIFLD, South Metro Fire Rescue, Colorado Forest Atlas, WSP GIS Analysis

Table 4-94 Category B Critical Facilities at High WUI Risk by Jurisdiction

Jurisdiction	Bridge Operations	Chemical Storage	Communications	Critical Manufacturing	Dams	Defense Industrial Base	Energy	Financial Services	Food and Agriculture	Government Facilities	Healthcare & Public Health	Information Technology	Postal and Shipping	School	Transportation Systems	Water and Wastewater	Total Count
Unincorporated	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	**1**
Aurora	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**2**
Centennial	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**5**
Cherry Hills Village	1	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	**3**
Deer Trail	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**4**
Greenwood Village	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**2**
Total	**14**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**17**

Source: Arapahoe County Sheriff's Office, CEPC, DWR, HIFLD, National Bridge Inventory, Colorado Forest Atlas, WSP GIS Analysis

Table 4-95 Category A Critical Facilities at Moderate WUI Risk by Jurisdiction

Jurisdiction	Emergency Services	Government Facilities	Healthcare and Public Health	Total Count
Deer Trail	1	-	-	**1**
Douglas County	1	-	-	**1**
Total	**2**	**0**	**0**	**2**

Source: Arapahoe County Sheriff's Office, HIFLD, South Metro Fire Rescue, Colorado Forest Atlas, WSP GIS Analysis

Table 4-96 Category B Critical Facilities at Moderate WUI Risk by Jurisdiction

Jurisdiction	Bridge Operations	Chemical Storage	Communications	Critical Manufacturing	Dams	Defense Industrial Base	Energy	Financial Services	Food and Agriculture	Government Facilities	Healthcare & Public Health	Information Technology	Postal and Shipping	School	Transportation Systems	Water and Wastewater	Total Count
Aurora	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	**2**
Centennial	4	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	**5**
Cherry Hills Village	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-		**1**
Greenwood Village	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**1**

Jurisdiction	Bridge Operations	Chemical Storage	Communications	Critical Manufacturing	Dams	Defense Industrial Base	Energy	Financial Services	Food and Agriculture	Government Facilities	Healthcare & Public Health	Information Technology	Postal and Shipping	School	Transportation Systems	Water and Wastewater	Total Count
Unincorporated	3	-	-	-	-	-	-	-	-	-	1	-	1	-	-	2	**7**
Douglas County	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	**2**
Total	**10**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**1**	**0**	**0**	**4**	**18**

Source: Arapahoe County Sheriff's Office, CEPC, DWR, HIFLD, National Bridge Inventory, Colorado Forest Atlas, WSP GIS Analysis

South Metro Fire Rescue Facilities

There are 15 facilities in the South Metro Fire Rescue within Wildland Urban Interface (WUI) risk zones. The following stations are within low to highest WUI risk zones:

Highest WUI Risk
- South Metro Fire Training Center
- Station 16
- Station 34
- Station 36
- Station 37

High WUI Risk
- Station 42

Moderate WUI Risk
- Station 47

Low WUI Risk
- Station 13
- Station 19
- Station 20
- Station 38
- Station 40
- Station 41
- Station 44
- Station 46

Impact to the Environment

Local impacts to the environment from wildfire events include the following:

- Damage to municipal watersheds
- Reductions in air quality
- Loss of vegetation (erosion, loss of forage and habitat for livestock and wildlife)
- Loss of revenue from destroyed recreation and tourism areas

Impact to the Economic Condition of the County and Jurisdictions

Local impacts to the economic condition of the County and jurisdictions from wildfire events include the following:

- Expense of responding (equipment, personnel, supplies, etc.)
- Loss of revenue from destroyed businesses, recreation, and tourism areas

Impact to Public Confidence in Government

Public holds high expectations of government capabilities for warning, public information, and response and recovery activities related to wildfires. Local impacts to public confidence in government from wildfire events include the following:

- Expense of responding (equipment, personnel, supplies, etc.)
- Communication of real-time property-level damage assessments

Changes in Development

Additional development over the past five years has increased the planning area's wildfire risk by increasing the number of people and buildings exposed. Wildfires can occur throughout Arapahoe County; however, the threat is not evenly distributed. Wildfire risk and Wildland Urban Interface Risk are highest in the western portion of the County, as shown in Figure 4-48 and Figure 4-49. The risk of brushfires remains significant throughout the eastern half of the County, although the sparse development reduces its vulnerability.

Future development is an important factor to consider in the context of wildfire mitigation because development and population growth can contribute to increased exposure of people and property to wildfire. Exposure to wildfire will likely increase as development continues in interface areas, expanding the WUI. Subdivisions and other high-density developments have created a situation where wildland fires can involve more buildings and people. By identifying areas with significant potential for population growth and/or future development in high-risk areas, communities can identify areas of mitigation interest and reduce hazard risks associated with increased exposure.

The Future Avoided Cost Explorer (FACE) tool developed by the Colorado Water Conservation Board helps to estimate annual damages from future droughts. The tool looks at three different climate scenarios (current climate conditions, moderately warmer climate by 2050, and severely warmer climate by 2050), and compares them against current population as well as low, medium, and high growth population scenarios. The following table compares the estimated annual damages for Arapahoe County from wildfire for each of the climate and population scenarios.

Table 4-97 Potential Future Economic Losses from Wildfire in Arapahoe County

Climate Scenarios	Damages	Low Growth (~1,200)	Medium Growth (~1,600)	High Growth (~2,000)
Current Conditions	Total	$250M	$270M	$300M
	Per Person	$30	$30	$30
Moderately Warmer by 2050)	Total	$330M	$380M	$400M
	Total Damages per Person	$40	$40	$40
Severely Warmer by 2050	Total Damages	$380M	$410M	$450M
	Total Damages per Person	$50	$50	$50

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

4.14.9 Jurisdictional Differences

Wildfires can occur throughout Arapahoe County; however, the threat is not evenly distributed. Wildfire risk and burn probability are highest in the central portion of the County, as shown in Figure 4-52 through Figure 4-53. The risk of brushfires remains significant throughout the eastern half of the County, although the sparse development reduces its vulnerability. 5.2% of the County's population overall lives in WUI

areas exposed to moderate to highest wildfire risk, but that percentage varies greatly as shown in Figure 4-48 through Figure 4-50 ; 88% of the population in Foxfield, 70% in unincorporated Arapahoe County, 22% in Greenwood Village, and 11% in Littleton, are estimated to live in WUI areas.

Looking at property values exposed to wildfire risk, the greatest dollar value at risk is in Aurora ($3.97 billion), Centennial ($2.46 billion), the unincorporated County ($2.32 billion). The greatest percentage of property values at moderate to highest risk are in Foxfield (72.2%), Deer Trail (28.9%), and Cherry Hills Village (18.1%).

Table 4-98 Wildfire Hazard Rankings by Jurisdiction

Wildfire	Frequency	Spatial Extent	Severity	Overall Significance
Bennett	Highly Likely	Extensive	Limited	Medium
Bow Mar	Highly Likely	Significant	Limited	Medium
Centennial	Highly Likely	Significant	Limited	Medium
Cherry Hills Village	Likely	Extensive	Critical	Medium
Columbine Valley	Highly Likely	Extensive	Critical	Medium
Deer Trail	Likely	Extensive	Critical	Medium
Englewood	Occasional	Limited	Limited	Low
Foxfield	Likely	Extensive	Critical	Medium
Glendale	Highly Likely	Limited	Limited	Medium
Greenwood Village	Likely	Extensive	Limited	Medium
Littleton	Likely	Significant	Limited	Medium
Sheridan	Likely	Significant	Limited	Low
Denver Water	Highly Likely	Extensive	Limited	Medium
South Metro Fire	Highly Likely	Significant	Limited	Medium
Unincorporated County	Highly Likely	Extensive	Limited	Medium

4.15 Urban Conflagration

Hazard	Frequency	Spatial Extent	Severity	Significance
Urban Conflagration	Occasional	Extensive	Catastrophic	High

4.15.1 Risk Summary

- With recent occurrences in nearby counties and other states, urban conflagration has made an emergence in Colorado over the last five years.
- Data for urban conflagration is shared with Section 4.13 Wildfire as an urban conflagration is similar to a wildfire, but the fire spreads beyond natural or artificial barriers to threaten lives and property.
- Related hazards: Wildfire, Drought, Severe Summer Weather, Severe Wind/Tornado

4.15.2 Description

An urban conflagration is a large disastrous and destructive fire in an urban area that spreads beyond natural or artificial barriers to threaten lives and property. According to the NFPA, every 24 seconds a fire department responds to a fire somewhere in the US. Fire protection in Arapahoe County is provided by multiple fire districts and departments, including South Metro Fire Rescue and Aurora Fire Rescue. In 2024 Aurora Fire Rescue responded to 108 structure fires in one year. Nearly all of these fires are contained to a single structure, but the risk of fire spreading to multiple structures is ever present.

Due to the urbanized nature of the western part of the County, the risk presented by structural fires is more present than wildland fires. The leading cause of home structure fires and non-fatal home fire is home cooking equipment. While smoking and the use of smoking materials is the leading cause of home fire deaths. Three out of five home fire deaths resulted from fires in which no smoke alarms were present or in which smoke alarms were present but did not operate. Compared to other age groups, older adults are more likely to be killed in a home fire.

Urban fires can be caused by wildland fires spreading into an urban area, as was seen in the destruction of the Town of Paradise, California in the 2018 Camp Fire; in the 2021 Marshall Fire that destroyed much of the Colorado towns of Louisville and Superior; and in the January 2025 Los Angeles wildfires that destroyed over 18,000 homes and killed 30 people.

However, urban conflagrations can originate from many different sources, not just wildfires. Incidents such as explosions, hazardous materials incidents, or ruptured gas lines during earthquakes can all start urban fires. The 2013 Lac-Mégantic rail disaster started an urban fire that killed 47 people and destroyed much of the Town of Lac-Mégantic, Quebec, Canada. Although more fires starting within buildings are prevented with current building codes, electrical faults, unattended cooking, heating equipment, or improper use of flammable materials can start fires within buildings.

4.15.3 Location

All buildings and infrastructure have some vulnerability to a structure fire; areas with older buildings or buildings built closer together have a higher risk for fire ignition and fire spread. WUI areas are at greater risk from spreading wildland fires (see 4.13 Wildland Fire). Similarly, areas adjacent to hazardous

materials facilities and major transportation routes (such as rail lines) may be at greater risk of fires started from a hazardous materials incident (see 4.8 Hazardous Materials Incident). According to the U.S. Forest Service's 'Wildfire Risk to Communities" project, the town of Littleton has been identified as one of the 1,100 communities in 32 states as a community that shares similar characteristics to those that have recently experienced an urban conflagration event such as Los Angeles.

Figure 4-45 and Figure 4-46 in Section 4.13.3 shows the location and areas in which properties fall within the Wildland Urban Interface.

4.15.4 Magnitude/Severity

In the mid to late 1800s it was quite common in American cities for large, destructive fires to burn entire cities to the ground, due to the wide presence of timber buildings. Advances in building practices, building codes, and fire suppression systems have positively impacted the extent to which a fire permanently damages structures, especially in more recent construction. However, urban fires still have the potential to cause extensive damage to residential, commercial, or public property. Property damage can range from minor smoke and/or water damage to the destruction of buildings. People could be displaced for several months to years, depending on the magnitude of the event. In the most serious urban fire events, the extreme heat of a fire event can damage the underlying infrastructure such as a bridge or tall building.

Historically urban conflagrations have caused the destruction of hundreds to thousands of buildings. In the past these fires have started both in nature and within communities, showing that conflagrations can have many ignition sources. With a mixture of conditions, conflagrations can range in severity from a few structures to thousands.

4.15.5 Past Occurrences

The Front Range area's last significant conflagration was in 2021 with the Marshall Fire in Boulder County. Due to the rarity of major conflagrations in Arapahoe County and nationally, more recent significant events from outside of planning area are described below to demonstrate the possible scope of such events.

- **April 1863**: A large fire broke out in downtown Denver. Fueled by high winds, the fire burned the majority of the City's wooden buildings in downtown. According to the Denver Firefighter Museum, this fire destroyed over 70 buildings and 115 businesses and resulted in the loss of nearly half of the material goods in the City at the time. This was the largest urban fire experienced by the City and County of Denver and sparked a wave of new laws prohibiting wood construction and other flammable materials. The rebuilt Denver was largely built from brick, stone, and masonry, and an official volunteer fire department was created in 1866.
- **June 26, 2012**: The Waldo Canyon Fire had started three miles northwest of Colorado Springs, Colorado. Record high temperatures and wind gusts up to 65 mph pushed the fire into residential neighborhoods, destroying 346 homes. Fortunately there were no fatalities, but insurance claims totalled $453.7 million, the most destructive fire in Colorado at that time.
- **June 12, 2013**: The Black Forest Fire destroyed 509 homes and killed 2 people in the Town of Black Forest northeast of Colorado Springs, surpassing the previous year's Waldo Canyon Fire as the most destructive fire in Colorado.

- **July 6, 2013:** A freight train carrying fuel oil derailed in the town of Lac-Mégantic, Quebec, Canada resulting in a fire and explosion of multiple tank cars, killing 47 people. More than 30 buildings in the Town center were destroyed, and all but three of the 39 remaining buildings had to be demolished due to petroleum contamination.
- **November 8, 2018:** The Camp Fire in Northern California spread into the Town of Paradise. Driven by high winds of up to 50 miles per hour, the fire spread rapidly through the Town. While an estimated 52,000 people were evacuated, the fire spread so quickly that many were unable to evacuate, resulting in the loss of 85 lives. Nearly 19,000 buildings were destroyed.
- **December 30, 2021:** The Marshall Fire demonstrated how destructive grass fires can be when they spread to an urban area. On December 30, 2021, a brush fire broke out in Boulder County following months of unusually warm and dry conditions. Driven by high winds with gusts up to 115 mph, the fire quickly spread to the Town of Superior and the City of Louisville. Thousands of people were forced to evacuate. The fire destroyed 1,084 homes and seven businesses and damaged another 149 homes and 30 businesses; total estimated damages were $513M as of January 7, 2022. At least one person was killed, and six others were injured.
- **January 7th, 2025:** Los Angeles had two deadly wildfires; the Palisades and the Eaton fire, both erupting on the same day and fueled by drought conditions and Santa Ana winds. Multiple residential communities including the Pacific Palisades, Malibu, Altadena, and Pasadena had structures burn down. More than 12,000 structures were damaged or destroyed, and 29 people died. The total damage and economic loss attributed to the Los Angeles-area wildfires is estimated at between $135-150 billion.

4.15.6 Climate Change Considerations

With heat waves, longer drought spells, and more consecutive months in a row of higher temperatures, the ability to suppress and extinguish fires in urban areas has become even more challenging.

A nearby example is the Marshall Fire in Superior and Louisville. Extreme drought conditions were in place across much of Colorado, with the six-month period before the fire being one of the warmest and driest on record in Denver. However, preceding the drought was a three-month wet period that supported rapid and high growth of prairie grasses. On the day of the wildfires, December 30th, 2021, there was also a very severe down sloping high wind event that created significant turbulence across the foothills of the Rockies, preventing the use of aerial fire suppression resources to control the fire. Wind gusts over 90 miles per hour were common across the foothills. Multiple homes in the area also had a wooden privacy fence between themselves and the structures next door, providing fuel for the fire to go from structure to structure.

The combination of more intense drought conditions, high wind, and proximity of structures can cause a wildland fire to quickly turn into a suburban conflagration, burning down 1,036 structures. Climate change, or periodic modification of Earth's climate brought about as a result of changes in the atmosphere, will continue to create longer and more extreme periods of dry and wet weather, causing more intense hazards such as droughts, floods, and wildfires.

4.15.7 Probability of Future Occurrence

Single-structure fires are an annual occurrence in Arapahoe County. Large-scale conflagrations such as those described above are unlikely but remain a possibility. Fire probability data from Arapahoe County and South Metro Fire Rescue is shown in Figure 4-52 and Figure 4-53 in section 4.13.3.

4.15.8 Vulnerability

Following the Marshall Fire, Einar Jensen, a Risk Reduction Specialist from South Metro Fire wrote a list of lessons learned from the Marshall Fire. These lessons specifically address how to reduce impacts on people during an urban conflagration:

1. Conventional wildfire mitigation is not effective against high- and extreme- intensity wildfires pushed by hurricane-force winds.
2. When extreme wildfires are burning near or through neighborhoods, the only option is evacuation.
3. It's critical that residents register for their county's reverse emergency notification systems.
4. All families need a neighborhood evacuation plan.
5. We all need a family communications plan.
6. Inventory your home now before an emergency occurs.

Impact to the Public

Most wildfires and urban conflagrations are directly or indirectly caused by humans. Urban conflagrations by definition jump natural and artificial barriers and threaten the lives of people and property. Previous urban conflagrations have resulted in the loss of life of residents as well as the loss of homes, businesses, and transportation routes. The worst wildfire in California state history at the time, the Camp Fire in 2018, quickly turned into an urban conflagration with the loss of 58 lives. Other incidents such as the Tubbs Fire in 2017 had 22 casualties and the Marshall Fire in 2021 had 2 casualties. This had devastating impacts on local residents as they had to not only rebuild their homes but also rebuild their lives without loved ones. These fires show the importance of community and having resources in place to evacuate yourself, your family, neighbors, and those in need of extra assistance. It also shows the importance of having the resources needed following the fires in order to rebuild, heal, and cope with trauma immediately following such an event.

Urban conflagrations can also have an input on the general public by displacing those in evacuation zones. The Marshall Fire in nearby Boulder County displaced approximately 35,000 people. This highlights the need for safe areas and places to go for displaced members of the public, especially those who require extra help or need to travel with medical equipment.

Finally, as mentioned in the Wildfire section (Section 4.13.2), another impact on the public that urban conflagration has is the health impact of lower air quality due to smoke.

Impact to Responders

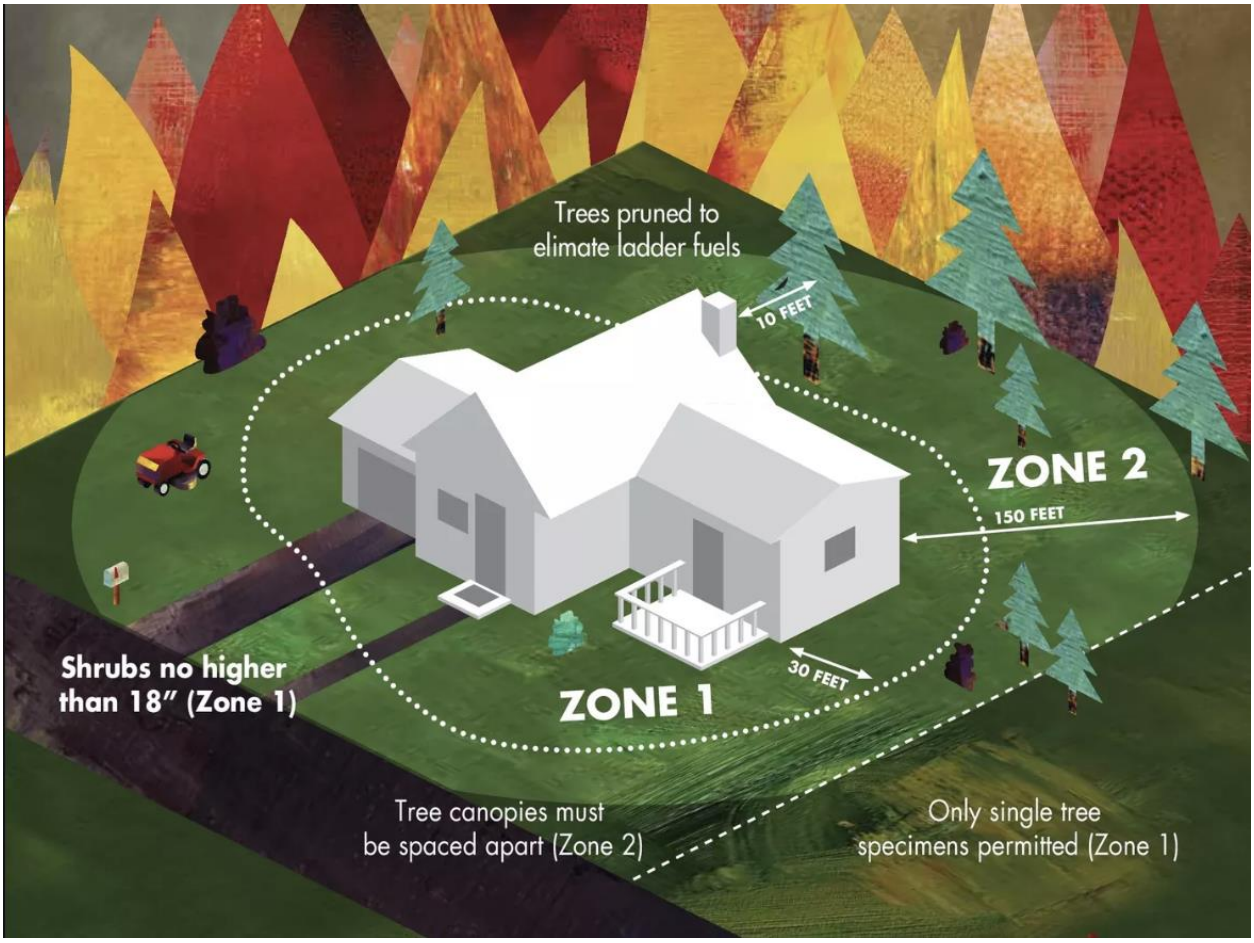
Urban conflagration can impact both the physical and mental wellness of first responders. According to the First Responders Foundation, first responders have an increased risk of developing post traumatic stress disorder (PTSD), depression, and anxiety. The unpredictability and intensity of their work can also lead to chronic stress and fatigue. Physical impacts on responders include smoke exposure, injuries while

moving heavy equipment and members of the public, and fatigue from working long hours. Smoke exposure has been linked to increased cancer rates in firefighters.

Impact to Property, Facilities, and Infrastructure

The behavior of fire in wildland areas differs significantly from that in Wildland-Urban Interface environments due to the complexities of the terrain and the variability in fuel types, such as their composition, height, density, and connectivity. As people build into Wildland-Urban Interface environments, the risk of an urban conflagration increases significantly. The natural environment consists of topography, climate, local weather, and fuel. When structures are intertwined with the natural environment variables, urban conflagrations occur when wildland fires happen. Structure density can also contribute to the intensity of an urban conflagration, as shown with the Marshall fire. Multiple homes in the towns of Superior and Louisville also had a wooden privacy fence between themselves and the structures next door, providing a bridge for the fire to go from structure to structure. According to FEMA, there is a 75% chance that residential, multifamily, and commercial structures within a wildfire boundary will be destroyed. This creates the need for building defensible spaces when building within a wildfire boundary. As shown in Figure 4-57, defensible space includes mowing grass within a 30 feet radius of the structure, keeping woodpiles and sheds more than 30 feet from structures, and not putting up wooden fences between structures in more densely populated areas.

Figure 4-57 Defensible Space



Source: Butte County Fire Safe Council

Another factor that determines the intensity of an urban conflagration is the extent and size of the fire front. Fire fronts have three mechanisms: ember attack, direct flame contact, and radiant heat. A fire that starts closer to a community will have a narrower fire front and ember-cast exposure toward the exposed community. A fire that starts further away will have a larger fire front and ember cast exposure as it consumes more total fuel. In this scenario, the entire community can be exposed to conditions more conducive to structure ignition. For example, the Camp Fire began seven miles from the Town of Paradise, but the fire front and ember transport exposed the entire town to all three ignition mechanisms making an effective response complicated for first responders. As shown in Figure 4-58 there are many contributing factors that can turn a wildfire into an urban conflagration including the presence of ignitable structures, proximity to the wildfire, and effectiveness of fire protection measures. Both the Marshall fire and Camp Fire had devastating impacts to properties and infrastructure, with the Marshall Fire destroying 1,084 structures and the Camp Fire destroying more than 18,000 structures.

Figure 4-58 Wildfire to Urban Conflagration Steps

Source: Butte County Fire Safe Council

Additionally, having adequate road infrastructure in place prior to a fire is key to the efficient and timely evacuation of the public from the fire's path and for access by emergency responders. water supply systems that deliver water to firefighters when needed can be degraded by an aging infrastructure, the infrastructure being directly impacted by the fire, loss of electrical power, and being overtaxed by firefighting operations.

Other infrastructure that is crucial during conflagrations is cell towers and the ability to communicate with the community. Past incidents such as the Tubbs and Camp Fires damaged the cellular towers cutting off communication to a majority of the community.

The tables in Section 4.13.8 discuss the risk to properties and critical facilities within the Wildland Urban Interface.

Impact on the Natural Environment

Urban conflagration can have devastating impacts on the surrounding natural environment. Previous conflagrations contaminated water supplies, increased air pollution, and disrupted nearby natural environments.

Impact to the Economic Condition of the County and Jurisdictions

A wildfire that spreads to an urban area can disrupt tourism, transportation routes, and local business functions. The surge in insurance claims after a major fire can drive up insurance premiums for all property owners in the area, including the cost of living and doing business. Local businesses are forced to close temporarily or permanently and although reconstruction stimulates short-term economic activity the long-term economic impact is often negative if the area loses population and/or businesses do not return to the area. Municipalities face increased costs for emergency response, public safety, and infrastructure repair.

The damage from the Marshall Fire is estimated to be over $2 billion, with 7 businesses destroyed and 30 businesses damaged according to the Boulder County website. It also destroyed 1,100 homes and caused up to $1.6 billion in damage to residential housing alone. As shown in Figure 4-45 in Section 4.13.2, there are over $4.9 billion of total improved parcels in the highest WUI risk zone in Arapahoe County.

Impact to Public Confidence in Government

The public holds high expectations of government capabilities for warning, public information, and response and recovery activities related to wildfires. Local impacts to public confidence in government from wildfire events include the following:

- Expense of responding (equipment, personnel, supplies, etc.)
    - Reaching disproportionately impacted communities such as individuals with disabilities or those unable to evacuate on their own as well as those relying on electricity-dependent medical equipment
- Communication of real-time property-level damage assessments
    - Lack of access to translated materials during emergencies
    - Access to other sources of information in case of a power outage or no access to a phone

Changes in Development

The increasing development in wildland urban interface areas brings an elevated risk to human populations. 33,821 people throughout the County live in WUI areas exposed to wildfire risk. The City of Aurora makes up 44.4% of that population, with 14,958 people living within WUI risk areas. Table 4-87 shows the populations within each jurisdiction estimated to live in WUI areas. As discussed in Section 3.4 (Community Profile), the County has seen a 1.73% overall increase, with Aurora's population increasing by 47.2% since 2019.

Future projections show an increase in population (Figure 3-8), with a forecasted population of 850,000 by 2050. As more people move into the County, the Wildland Urban Interface will increase in size. The

Denver metro area overall is seeing more multi-family residences and other high density housing, which can increase vulnerability.

Once wildfires move into urbanized environments, they can spread rapidly from building to building and can be intensified with strong seasonal winds as shown with both the Marshall fire and Los Angeles fires. According to the IBHS wildfire research report (2023) historically, building codes and natural breaks (such as rivers) could be used to suppress fires. As populations and the built environment expand throughout the County, it will be important to include natural breaks in development.

4.15.9 Jurisdictional Differences

Table 4-99 Urban Conflagration Hazard Rankings by Jurisdiction

Wildfire	Frequency	Spatial Extent	Severity	Overall Significance
Bennett	Highly Likely	Extensive	Limited	Medium
Bow Mar	Highly Likely	Significant	Limited	Medium
Centennial	Highly Likely	Significant	Limited	Medium
Cherry Hills Village	Likely	Extensive	Critical	Medium
Columbine Valley	Highly Likely	Extensive	Critical	Medium
Deer Trail	Likely	Extensive	Critical	Medium
Englewood	Occasional	Limited	Limited	Low
Foxfield	Likely	Extensive	Critical	Medium
Glendale	Highly Likely	Limited	Limited	Medium
Greenwood Village	Likely	Extensive	Limited	Medium
Littleton	Likely	Significant	Limited	Medium
Sheridan	Likely	Significant	Limited	Low
Denver Water	Likely	Extensive	Limited	Medium
South Metro Fire	Highly Likely	Significant	Limited	Medium
Unincorporated County	Highly Likely	Extensive	Limited	Medium

5.0 MITIGATION STRATEGY

DMA Requirement §201.6(c)(3):
[The plan shall include] a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.
[The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.
[The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.
[The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

This section describes the mitigation strategy and action plan developed by the Hazard Mitigation Planning Committee (HMPC) for Arapahoe County. It is based on the consensus of the Arapahoe County Planning Team and stakeholder feedback, along with the findings of the Hazard Identification and Risk Assessment. It also describes how the County and participating jurisdictions met the following requirements from the 10-step planning process described in Section 2.3:

- Planning Step 6: Set Goals
- Planning Step 7: Review Possible Activities
- Planning Step 8: Draft an Action Plan

Up to this point in the planning process, the HMPC has organized resources, assessed natural hazards and risks, and documented mitigation capabilities. The HMPC developed goals and objectives for this plan were developed by the HMPC based on the plan's risk assessment. This analysis of the risk assessment identified areas where improvements could be made and provided the framework for the HMPC to formulate planning goals and objectives and the mitigation strategy for Arapahoe County.

The results of the planning process, the risk assessment, the goal setting, the identification of mitigation actions, and the hard work of the HMPC are captured in this mitigation strategy and mitigation action plan. The mitigation strategy was developed through a collaborative group process and consists of goals, objectives, and mitigation actions.

- **Goals** are general guidelines that explain what you want to achieve. Goals are defined before considering how to accomplish them so that they are not dependent on the means of achievement. They are usually long-term, broad, policy-type statements.
- **Objectives** (optional) define strategies or implementation steps to attain the identified goals and are specific and measurable.
- **Mitigation Actions** are specific projects or activities that help achieve the goals and objectives.

To support the updated goals, the mitigation actions from 2020 were also reviewed and assessed for their value in reducing risk and vulnerability to the planning area from identified hazards and evaluated for their inclusion in this plan update. Opportunities to better enhance mitigation efforts throughout the County were also identified and discussed.

5.1 Goals and Objectives

As described above, mitigation goals are overarching targets and describe the ideal long-term outcomes envisioned by the community, while mitigation objectives describe the "how" of the mitigation strategy and are specific and measurable. The HMPC reviewed the goals from the 2020 Plan, determined they were still valid, and reapproved them for Arapahoe County and the participating jurisdictions to provide direction for reducing future hazard-related losses across Arapahoe County.

2025 Arapahoe County Hazard Mitigation Goals:

1. Prevent the loss of lives and injuries from hazards.
2. Prevent and/or reduce damages to public and private property from hazards.
3. Reduce the adverse economic and natural resource impacts of hazards.
4. Reduce the vulnerability of critical infrastructure and key facilities to the impacts of hazards.

The 2020 Planning Team had decided not to include mitigation objectives in that Plan, and the 2025 Planning Team elected to continue that. The prioritization criteria listed in Section 5.2 below can be regarded as objectives for implementing the mitigation goals.

5.2 Progress on Previous Mitigation Plan Actions

The 2026 Plan identifies several mitigation actions that the County and jurisdictions have been successful in implementing to work steadily towards meeting their mitigation goals. During the 2026 plan update process, the Planning Team reviewed the mitigation actions in the 2021 Plan and updated their status based on input from the responsible agency for each action, describing which actions had been completed, which were either in progress or not yet started, and if any should be deleted as no longer relevant of achievable. The 2020 Plan contains a total of 105 mitigation actions. (88 not counting actions for the jurisdictions that declined to participate in the 2025 plan.) Of those, 20 actions were reported as having been completed. Three actions from the 2020 Plan were determined to no longer be relevant or feasible and were deleted. Completed and deleted actions are listed in Table 5-1 below. Overall, the high number of actions that have been completed is a sign of the effectiveness of Arapahoe County's hazard mitigation program and that the County and its jurisdictions are steadily working towards the goals of this plan.

Table 5-1 Completed and Deleted Mitigation Actions from the 2020 HMP

2020 ID	Jurisdiction	Description/Background/Benefits	Comments
A-4 (2015)	Arapahoe County	Centralize the storage and dissemination of FOUO GIS data sets	Deleted
A-14 (2015)	Arapahoe County	Improve County's Community Rating System	Completed
A-15 (2020)	Arapahoe County	Subdivision Design/Setback requirements in Wildland Urban Interface	Completed
A-17 (2020)	Arapahoe County	Complete a Master Drainage Plan for the Kiowa Creek watershed.	Completed
A-18 (2020)	Arapahoe County	Wolf Creek Master Drainage Plan.	Completed
A-19 (2020)	Arapahoe County	Comanche Creek Master Drainage Plan.	Completed

2020 ID	Jurisdiction	Description/Background/Benefits	Comments
B-7 (2020)	Town of Bennett	Stoplight and intersection infrastructure at Marketplace Drive and Hwy 79	Completed
B-11 (2024)	Town of Bennett	Parking lot by Love's Truck Stop for tractor trailer rigs, large truck and campers and cars.	Completed
B-13 (2024)	Town of Bennett	I70 eastbound ramp signalization.	Completed
D-7 (2020)	City of Centennial	Public Works Mutal Aid Agreements	Deleted
D-8 (2020)	City of Centennial	Bridge Replacement on Arapahoe Road over Big Dry Creek	Completed
D-10 (2023)	City of Centennial	Work with South Metro Fire Rescue to Evaluate the Risk of Wildfires	Completed
E-4 (2020)	City of Centennial	Hazard and Stormwater Mapping.	Completed
E-7 (2020)	City of Cherry Hills Village	Belleview/Clarkson Drainage Improvements.	Deleted. Funding was not achieved.
H-10 (2020)	City of Englewood	Converting wastewater plant disinfection process to UV eliminating need for chemical treatment.	Completed
K-7 (2020)	City of Glendale	Adopt 2018 IFC (International Fire Code).	Completed
L-2 (2020)	City of Greenwood Village	Active Threat assessment and mitigation plan for Cherry Creek High School campus.	Completed
L-6 (2020)	City of Greenwood Village	Village Greens Park Lightning Prediction Update.	Completed
M-8 (2020)	City of Littleton	Storm and Flood Master Planning.	Completed
M-9 (2020)	City of Littleton	City data network center.	Completed
O-1 (2020)	Denver Water	Castlewood Pump Station.	Completed
O-2 (2020)	Denver Water	Cherry Hills Pump Station.	Completed
O-3 (2020)	Denver Water	Clarkson Pump Station. Major rebuild of facility.	Completed

5.2.1 Continued Compliance with the National Flood Insurance Program

Recognizing the importance of the National Flood Insurance Program (NFIP) in mitigating flood losses, an emphasis will be placed on continued compliance with the NFIP by Arapahoe County and all participating communities have been mapped for flood hazards: Arapahoe County, Aurora, Bennett, Centennial, Cherry Hills Village, Columbine Valley, Deer Trail, Englewood, Glendale, Greenwood Village, Littleton, and Sheridan. As NFIP participants, these communities have and will continue to make every effort to remain in good standing with NFIP. This includes continuing to comply with the NFIP's

standards for updating and adopting floodplain maps and maintaining and updating the floodplain zoning ordinance. See Table 5-3 mitigation actions A-1, B-3, D-1, E-5, G-1, H-1, K-1, L-1, M-1, and N-1. Arapahoe County, Aurora, Centennial, Cherry Hills Village, Englewood, and Littleton will also continue to participate in the Community Rating System (CRS) to go above and beyond the requirements of the NFIP. Other details related to NFIP participation are discussed in Section 3.6 and in the flood vulnerability discussion in Section 4.7.8.

5.3 Identification and Analysis of Mitigation Actions

The natural and human-caused hazards identified in Section 4.0 Risk Assessment were evaluated to identify and prioritize mitigation actions to support the mitigation goals and objectives described above. While the HMPC focused primarily on addressing high and medium priority hazards, individual mitigation actions were also suggested for the low priority hazards.

5.3.1 Mitigation Alternatives

The Planning Team also considered the following categories of mitigation actions, as defined in FEMA's 2013 Local Mitigation Planning Handbook:

- **Plans and regulations:** These actions include government authorities, policies, or codes that influence the way land and buildings are developed and built.
- **Structure and infrastructure projects:** These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.
- **Natural systems protection:** These are actions that minimize damage and losses and preserve or restore the functions of natural systems.
- **Education and awareness**: These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as StormReady or Firewise Communities. Although this type of mitigation reduces risk less directly than structural projects or regulation, it is an important foundation. A greater understanding and awareness of hazards and risk among local officials, stakeholders, and the public is more likely to lead to direct actions.

The Planning Team also considered the following categories as defined in the Community Rating System:

- **Prevention:** Administrative or regulatory actions or processes that influence the way land and buildings are developed and built.
- **Property protection:** Actions that involve the modification of existing buildings or structures to protect them from a hazard or remove them from the hazard area.
- **Structural:** Actions that involve the construction of structures to reduce the impact of a hazard.
- **Natural resource protection:** Actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems.
- **Emergency services:** Actions that protect people and property during and immediately after a disaster or hazard event.
- **Public information/education and awareness:** Actions to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigate them.

At planning meeting #3, the HMPC was provided with handouts describing the categories and listing examples of potential mitigation actions for each category. FEMA's 2013 document *Mitigation Ideas* and 2024 *Mitigation Action Portfolio* were also shared and referenced. Attendees were then asked to submit mitigation action ideas via an online survey. Action submissions included details describing how the actions will be implemented and administered, to include cost estimates, potential funding sources, and estimated timeline for completion. Each action was required to be tied to one or more of the goals.

Actions were compared against identified hazards to ensure that the plan contains a comprehensive range of mitigation actions and projects for each of the highest risk hazards. An emphasis on both new and existing buildings and infrastructure was stressed. While the Planning Team focused primarily on those hazards identified as posing the highest risk to the jurisdiction, mitigation actions were also suggested for low priority hazards. Some jurisdictions identified actions that did not fall into one of the above categories and which may be better defined as preparedness or response activities; several of these actions were included in the plan, as the jurisdiction felt they were important actions to reduce losses from future disasters even if they do not meet the strict definition of mitigation.

A total of 56 new actions were submitted. These new actions, along with the continuing actions carried over from the 2020 Plan, form the 2025 mitigation action plan as summarized in Table 5-2 and detailed in Table 5-3 through Table 5-13.

Table 5-2 Mitigation Actions Summary by Jurisdiction

Jurisdiction	2021 Actions	Completed	Deleted	Continued	New Actions	Total 2025 Actions
County	19	5	1	13	8	21
Centennial	10	2	1	7	10	17
Cherry Hills	7	1	1	5	10	15
Englewood	13	1	0	12	3	15
Foxfield	4	0	0	4	2	6
Glendale	9	1	0	8	4	12
Greenwood Village	6	2	0	4	2	6
Littleton	10	2	0	8	4	12
Sheridan	7	0	0	7	2	9
Denver Water	3	3	0	0	5	5
South Metro Fire	N/A	N/A	N/A	N/A	6	6
Total	**88**	**17**	**3**	**68**	**56**	**124**

5.3.2 Available Funding Options

In the third planning meeting, an updated list of potential funding sources was provided and used when identifying and updating mitigation actions. The sources mentioned included FEMA resources available as of June 2025, as well as other funding sources such as those from the US Bureau of Reclamation, US Department of Agriculture, and U.S. Department of Commerce. At the state and local level, multiple sources were listed including the Colorado Department of Homeland Security and Emergency

Management, the Colorado Department of Transportation, and local general and capital improvement budgets.

5.3.3 Prioritization Process

After the Planning Team had developed new mitigation actions as described above, those new actions were consolidated into lists by jurisdiction for prioritization. Continuing actions from the 2020 Plan were also included in the list so they could be re-prioritized relative to the new actions.

The Planning Team was provided with several decision-making tools, including FEMA's recommended prioritization criteria, STAPLEE, to assist in deciding why one recommended action might be more important, more effective, or more likely to be implemented than another. STAPLEE stands for the following:

- **Social:** Does the measure treat people fairly? (e.g., different groups, different generations) Does it consider social equity, disadvantaged communities, or vulnerable populations?
- **Technical:** Will it work? (Is the action technically feasible? Does it solve the problem?)
- **Administrative:** Is there capacity to implement and manage the project? (adequate staffing, funding, and other capabilities to implement the project?)
- **Political:** Who are the stakeholders? Did they get to participate? Will there be adequate political and public support for the project?
- **Legal:** Does the jurisdiction have the legal authority to implement the action? Is it legal? Are there liability implications?
- **Economic:** Is the action cost-beneficial? Is there funding available? Will the action contribute to the local economy?
- **Environmental:** Does the action comply with environmental regulations? Will there be negative environmental consequences from the action?

In accordance with the Disaster Mitigation Act requirements, an emphasis was placed on the importance of a benefit-cost analysis in determining action priority. Other criteria used to assist in evaluating the benefit-cost of a mitigation action included:

- Does the action address hazards or areas with the highest risk?
- Does the action protect lives?
- Does the action protect infrastructure, community assets or critical facilities?
- Does the action meet multiple goals?
- What will the action cost?
- What is the timing of available funding?

The above criteria were used to prioritize actions in an iterative process over the course of the plan update process. At the start of the process, participating jurisdictions were asked to validate or update the status and priority of their continuing actions from the 2020 Plan. When submitting new mitigation actions, planning team members were asked to prioritize those as well. Finally, once all new and continuing actions had been collated into a draft mitigation action plan, jurisdictions were asked to verify or update the priorities of each action compared to their other actions based on the above criteria.

5.4 Mitigation Action Plan

The 2025 Arapahoe County mitigation action plan lists the actions developed and prioritized as described above, to include continuing actions from the 2020 Plan. The action plan details how the participating jurisdictions will reduce the vulnerability of people, property, infrastructure, and natural and cultural resources to future disaster losses. The action plan summarizes who is responsible for implementing each of the prioritized actions as well as when and how the actions will be implemented. All actions are tied to specific goals to ensure alignment with the Plan's overall mitigation strategy. Over time the implementation of these projects will be tracked as a measure of demonstrated progress on meeting the plan's goals.

Many of these mitigation actions are intended to reduce impacts to existing development. Actions that protect future development from hazards, as required per the DMA 2000 regulations, are indicated by an asterisk in the action identification number. These actions include those that promote wise development and hazard avoidance, such as building code, mapping, and zoning improvements, and continued enforcement of floodplain development regulations.

Mitigation actions for Arapahoe County and the participating jurisdictions are listed in Table 5-3 through Table 5-13 below. Actions carried over from the 2020 plan have been given new item numbers for simplicity. As discussed in Section 5.3, the priorities of each action were reviewed to reflect changes since 2020.

Table 5-3 Arapahoe County Hazard Mitigation Actions

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
A-1	**Continued National Flood Insurance Program (NFIP) Participation.** This includes continuing to comply with the NFIP's standards for updating and adopting floodplain maps and maintaining and updating the floodplain zoning ordinance.	Flooding	1,2,3,4	County Public Works: Engineering Services Division, OEM, SEMSWA	Staff Time	Dept. Budget, SEMSWA	High	Ongoing	Annual. Majority of jurisdictions continue to participate in the NFIP, additional jurisdictional participation added as new Plan Action in 2015. Floodplain Management and Flood Damage Prevention Regulations in Section 4-3 of the Land Development Code have been updated to remain current with State and federal requirements: 2007, 2010, 2013, 2017, 2018, 2020, 2024 in Big Dry Creek. County Storm Ready recert completed in July 2020.
A-2	**Monitor proceedings of the Colorado Water Availability Task Force.** This will help maintain awareness of conditions that affect Colorado's water supply, including snowpack, precipitation, reservoir storage, streamflow and weather forecasts. The task forces also provide a forum for interpreting potential flood hazard and water availability information. Meetings of the two task forces are held regularly and occasionally are held together.	Drought	2,3,4	OEM, MHFD	Staff Time	Dept. Budget	Medium	Ongoing	Annual. Follow the drought monitor maps. Snowpack maps.
A-3	**Continue public education about wildfire mitigation.**	Wildfire	1,2,3,4	OEM, SMFR	$0 – $10,000	EMPG	High	Ongoing	Annual. Follow the drought monitor maps. Snowpack maps.
A-4	**Develop, maintain, centralize, and store CIKR GIS data sets.** Help ensure the availability and	Active Threat, Cyber Threat, Dam Failure,	1,2,3,4	Arapahoe County GIS, OEM	$0 – $10,000	Dept Budget	Low	2025	In Progress. Almost completed as a CIKR

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
	improve the accuracy of data used across the County for numerous efforts. This will include better identification of critical facilities located in areas at increased risk of hazards.	Drought, Flooding, Hazmat, Pandemic, Summer Weather, Wind/ Tornado, Winter Weather, Wildfire							resource hub. Map viewer established but all interviews with stakeholders per sector have no been finalized.
A-5	**Continued utilization of the MHFD alert system.** Real-time alert system provides precipitation and flooding related notifications.	Flooding, Dam Failure	1,2,3,4	OEM, MHFD	Staff Time	Dept Budget	Medium	Ongoing	Annual. Added an additional alert location. Flashing lights given threshold of water at specific intersection.
A-6	**Involvement in the MHFD Emergency Action Plans for the Holly & Englewood Dams.** Participate in the roll-out of these newly produced EAPs and integrate into County EOP.	Dam Failure	1,2,3,4	OEM, MHFD, Centennial	Staff Time	Dept Budget	Medium	Ongoing	Annual. All EAPs kept up to date when received by dam owner. OEM represents per IGA.
A-7	**Participation and adoption of the MHFD master plans affecting the County.** Part of the master planning efforts involves identification of capital improvement projects and are based on future conditions hydrology (watershed level).	Flooding, Dam Failure	2,3,4	Arapahoe County, Bennett, Bow Mar, Centennial, Cherry Hills Village, Columbine Valley, Foxfield, Sheridan, Glendale, Greenwood Village, Littleton, Englewood, MHFD, SEMSWA	Staff Time	MHFD, SEMSWA	Medium	2020-2025	Annual.
A-8	**Continued development of the Cherry Creek School District's collaboration meetings with first responders.** Meetings are quarterly and currently involve nine agencies across the District.	Active Threat, Summer Storm, Wind/ Tornado, Winter Weather	1,2,3,4	Cherry Creek School District, OEM	Staff Time	Dept Budget	Medium	Ongoing	Annual. Coordinated with Cherry Creek Schools to attend power outage/fuel shortage exercise. Amend and/or add new actions to include Littleton Public Schools reunification planning in support of active threat. Coordination with ACSO, OEM, and Littleton.
A-9	**Monitor Hazardous Materials commodity flow by rail through the BNSF and UP rail lines.**	Hazmat	1,2,3,4	County LEPC, Littleton	Staff Time	Dept Budget	Medium	Ongoing	Annual.

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
	Obtain and monitor commodity flow from the Burlington Northern Santa Fe and Union Pacific Railroads. Share that information with the Arapahoe County LEPC as appropriate.								
A-10	**Involvement in the Denver Water Emergency Action Plans for the Marston & Harriman Dams.** Participate in the update and orientation of the Dam EAPs and integrate into County EOP.	Dam Failure	1,2,3,4	Littleton, OEM, Denver Water	Staff Time	Dept Budget	Medium	Ongoing	Annual. Marston EAP exercise in August.
A-11	**Participation and adoption of the MHFD Flood Hazard Area Delineation (FHAD) Studies affecting the County.** New or updated flood risk areas are identified, providing communities with best available flood risk data for permitting and land development decisions.	Flooding	1,2,3,4	Arapahoe County Public Works, MHFD, SEMSWA	Staff Time	MHFD, SEMSWA, Other Jurisdictions	Medium	Ongoing	Annual. Initial review of highline canal studies.
A-12	**Continue participation in the NFIP Community Rating System (CRS) Program.** Flood Insurance premiums are reduced to reflect the reduced flood risk based on the community's floodplain management programs and activities.	Flooding	1,2,3,4	Arapahoe County Public Works, SEMSWA	Staff Time	Dept Budget	High	Ongoing	Annual. County was re-certified as a CRS 7 community effective 2024
A-13	**Alternate EOC.** Relocate and implement a warm alternate EOC. Perform studies of County infrastructure to determine best location – generator use, IT infrastructure, access, multi-use space. Provides additional critical infrastructure in a space geographically separated from the primary, outfitted with the required technology to perform mission critical support functions.	Active Threat, Cyber Threat, Dam Failure, Drought, Flooding, Hazmat, Pandemic, Summer Weather, Wind/ Tornado, Winter Weather, Wildfire	4	Arapahoe County Sheriff/OEM	TBD	EMPG	Medium	1-2 years	Not Started. Temporarily had a space with Public Health but in summer 2025 that lease terminated. No alternate has been identified. Re-write this to focus on fully virtual EOC platform advances. Included Centennial as Lead through IGA.
A-14	**Carson Nature Center is a historic location and under threat from fire and flooding.** The County would like to arrange a prescribed burn for the area around CNC	Fire/Wildfire	3	Rin Viles/South Metro Fire. South Metro/City of Littleton/South Platte	Unknown at this time	Unknown	High	1 Year	New in 2025

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
A-15	**Develop and/or update mitigation-related Plans.** Storm Water Master Plan. Nature-based Solutions Master Plan. Community Wildfire Protection Plan.	Active Threat, Cyber Threat, Dam Failure, Drought, Flooding, Hazmat, Pandemic, Summer Weather, Wind/ Tornado, Winter Weather, Wildfire	1, 2	Arapahoe County Open Spaces, Public Works, OEM	Unknown	Department Budget	Medium	Ongoing	New in 2025
A-16	**Eastern AC wildland fire mitigation, response, capacity.** Develop capacity / collaboration with local fire districts on eastern plains	Wildfire	1, 2	AC OEM. Local fire districts.	Unknown	FEMA grants, State of Colorado grants	Medium	1-2 years	New in 2025
A-17	**Arapahoe County Public Health (ACPH) seeks to identify and integrate public and environmental health roles into existing OEM mitigation plans (e.g., debris management, flood response, hazardous materials).** This project addresses multiple known hazards impacting Arapahoe County, including limited response capacity in underserved areas, proximity of homes to landfills, and risks from the Lowry Bombing Range and Superfund sites. Rather than creating new standalone plans, ACPH will collaborate with OEM to review existing plans and develop internal SOPs to better define public health's role and responsibilities.	Wildfire, Urban Conflagration, Winter Weather, Wind/Tornado, Summer Weather, Pandemic, Hazmat, Flooding, Drought	1, 2	Arapahoe County Public Health and OEM, with others depending on sub-topic (e.g., Waste Mgmt., South Metro, Aurora, State Agencies)	Little to no cost	Existing Dept. Budgets	Medium	Ongoing	New in 2025
A-18	**Fuels Reduction Plan.** Develop and implement a plan and operation to reduce the dead fuels along the Cherry Creek Corridor. This property is adjacent open spaces and dense suburban neighborhoods. Leverage the fuels moisture monitoring data.	Flooding, Urban Conflagration, Wildfire	1, 2	Arapahoe County, Centennial, SMFR, Cherry Creek State Park	Planning cost: staff time. Implementation cost: unknown	Fire Mitigation Grants, Open Spaces Fees	Medium	2 years	New in 2025
A-19	**Highline Canal Revitalization Plan.** Develop and implement a Stormwater Transformation and Enhancement Program (STEP). Renewed utility	Flooding	3, 4	Arapahoe County, Denver Water, Mile High Flood District	Planning cost: staff time.	Open Spaces Taxes	Medium	2 Years	New in 2025

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
	to the High Line Canal as a green infrastructure system that provides for stormwater quality management.				Implementation cost: unknown				
A-20	**Public Alert and Warning.** Implement the EOP public alert and warning annex within the 911 Authority jurisdiction. Provide best practice template messaging to all PSAPs.	Active Threat, Cyber Threat, Dam Failure, Drought, Flooding, Hazmat, Pandemic, Summer Weather, Wind/ Tornado, Winter Weather, Wildfire, Urban Conflagration	1	Arapahoe County, All Municipalities, SMFR, 911 Authority	Planning cost: staff time. Implementation cost: unknown	911 Authority, Dept Budget	Medium	1 year	New in 2025
A-21	**WUI Code Implementation.** Implement WUI code in accordance with 8 CCR 1507-39. Ensure deconfliction of references to existing County codes. Educate appropriate to staff to changes.	Wildfire, Urban Conflagration	1, 2	Arapahoe County, All Municipalities, SMFR	Planning cost: staff time. Implementation cost: unknown	Permit Fees	High	1 year	New in 2025

Table 5-4 City of Centennial Mitigation Actions

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
C-1	**Continued National Flood Insurance Program (NFIP) Participation.** This includes continuing to comply with the NFIP's standards for updating and adopting floodplain maps and maintaining and updating the floodplain zoning ordinance.	Flooding	1,2,3,4	City Community Development, SEMSWA	Staff Time	City General Fund, SEMSWA	High	Ongoing	Annual Implementation. SEMSWA administers the floodplain management regulations and program on behalf of Centennial to ensure NFIP compliance. New PMRs currently on hold by MHFD.
C-2	**Participation in MHFD master plans affecting the County.** Part of the master planning efforts involves identification of capital improvement projects and are based on future conditions hydrology (watershed level).	Flooding	2,3,4	City Community Development, MHFD, SEMSWA	Staff Time	MHFD, SEMSWA	Medium	Ongoing	Annual Implementation. 5-year plan requests submitted to MHFD annually. There are several on-going Master Planning Studies throughout the City.
C-3	**Participation and adoption of the MHFD Flood Hazard Area Delineation (FHAD) Studies affecting the County.** New or updated flood risk areas are identified, providing communities with best available flood risk data for permitting and land development decisions.	Flooding	1,2,3,4	City Community Development, MHFD	Staff Time	MHFD	Medium	Ongoing	Annual Implementation. 5-year plan requests submitted to MHFD annually. SEMSWA's goal is to increase outreach to impacted property owners identified at risk in FHAD Studies.
C-4	**Continue participation in the NFIP Community Rating System (CRS) Program.** Flood Insurance premiums are reduced to reflect the reduced flood risk based on the community's floodplain management programs and activities	Flooding	1,2,3,4	City Community Development, SEMSWA	Varies by year for consultant support	SEMSWA	Medium	Ongoing	Annual Implementation. Centennial improved from Class 7 to Class 5 with 5-year Cycle Verification in 2024. The next 5-year Cycle Verification is in 2029.

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
C-5	**Replace span-wire traffic signals.** Remove span wire poles and install mast-arm poles at existing signalized intersections. This prevents wires hanging over traffic and is a known crash reduction factor listed by FHWA. Varies by intersection. Can be analyzed with known software, purchase of which would be part of the mitigation plan. Depending on traffic volumes and conditions, B/C of 2-5 are expected.	Summer Weather, Wind/ Tornado, Winter Weather	1,2,3,4	Centennial Public Works – Traffic Engineering, CDOT, FHWA, adjoining jurisdictions	$10 Million	HSIP, DRCOG, collaboration with adjoining jurisdictions	Medium	2030	In Progress. 2025: Arapahoe & Forest, Arapahoe & Heritage Plaza conversions in final stages of construction completion. Holly/Dry Creek spanwire replacement design beginning, with Chenango and Himalaya spanwire conversion planned as next HSIP funded design project.
C-6	**Electrical Undergrounding.** Summer and winter storms often impact above ground power lines and cause downed power lines. Prevent loss of critical resources that utilize electricity (e.g., heat, medical equipment, refrigeration, etc.) Avoid fire hazards by not having above ground lines near open space and undeveloped areas. Prevent injury or death from human interacting with downed power lines	Summer Weather, Wind/ Tornado, Winter Weather, Wildfire	1,2,4	City of Centennial Public Works, Xcel Energy, IREA	$500,000	CIP Fund, IREA, Xcel Energy, FEMA grants	High	2030	In Progress. 2025: Arapahoe & Clarkson, Arapahoe & Forest, Arapahoe & Heritage Plaza overhead electric undergrounding completed. Holly St from Maplewood Ave to Caley overhead electric undergrounding completed. Next overhead electric undergrounding request to be with Xcel or Core to still be reviewed and determined by the City.
C-7	**Update the City's Land Development Code.** Centennial is working with WaterNow Alliance and Western Resource Advocates to evaluate ways to update the City's Land Development Code to increase community resilience related to water supply and stormwater management.	Drought, Flooding	1,2,3,4	City Community Development, SEMSWA	Staff Time	N/A	Medium	2026	In Progress. Projected to be completed by end of 2026.
C-8	**Urban Conflagration Plan.** City does not have a plan for urban conflagration and scenarios. Developing a	Urban Conflagration	1, 2, 3, 4	City of Centennial, Arapahoe OEM,	Staff Time	City General Fund	Medium	2027	New in 2025

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
	plan would identify high risk areas, create predesignated evacuation routes, determine how fire OEM, city, and water will convert			Wildfire Plan, WUI Code adoption and implementation					
C-9	**Fuel Capacity Increase (Diesel).** 3600 Gallon capacity now. Burn rate of 700 gallons per 12-hour shift. 20 Trucks. Increasing to 10,000 gallons, new buck tank. Extend shift capabilities / up to 1 month of operations instead of 1 week or even a few days, reduce multiple order placement / deliveries	Severe Summer Weather, Severe Wind/Tornado, Severe Winter Weather, Wildfires, Urban Conflagration	1, 2, 3, 4	Jeff Dankenbring, Public Works Director / Mike Nelson, Program Director, South Metro Fire	$200,000	City funded/ Facilities	High	2026	New in 2025
C-10	**Review Safe Rooms at all City Facilities.** City buildings have received several modifications over the past few years. As such, the City needs to review and potentially update its safe rooms. Additionally, as part of this process, the City is evaluating how it physically identifies safe room and what resources should be stored in them.	Active Threat	1	Centennial, Arapahoe County Sheriff Office's	$10,000	City Budget	High	End of 2026	New in 2025
C-11	**Cyber Threat Plan Development and Tabletop Exercise.** The City is currently working to update and expand on its existing cybersecurity plans. While currently plans do exist, there is a need for a more robust and structured plan outlining the City's approach and response to City security due to a growing number of cyberattacks. Once the new plan is complete and relevant staff receive training, the City will conduct a tabletop exercise to test the plan.	Cyber Threat	2, 4	City of Centennial IT, Arapahoe County OEM, Arapahoe County IT	Staff Time	N/A	High	End of 2025	New in 2025
C-12	**On-call hazmat clean up services.** The City will continue on-call contracted services to address non-emergency hazmat spills occurring on Centennial property and Centennial-owned right-of-way. It is important to note the City has no authority or responsibility for large-scale/emergency hazmat	Hazmat Release	2, 3	City of Centennial Facilities	Staff Time	N/A	Low	Ongoing	New in 2025

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
	releases, which are the jurisdiction of South Metro Fire Rescue.								
C-13	**Public Health Communication.** The City of Centennial does not provide public health services. In case of a pandemic, the City will work with public health to distribute messaging. Additionally, the City will continue to provide public health the opportunity to speak at community meetings hosted by the City.	Pandemic	1	Arapahoe County Public Health	Staff Time	N/A	Low	Ongoing	New in 2025
C-14	**Adopt and Implement WUI Code Regulation.** The City will be adopting State drafted Wildland Urban Interface codes that will help regulate properties within the WUI and mitigate the risk of wildfires in these areas.	Wildfire	1, 2, 3, 4	City of Centennial, South Metro Fire Rescue	Staff Time	N/A	Medium	Fall 2025	New in 2025
C-15	**Fuels Reduction Plan.** Develop and implement a plan and operation to reduce the dead fuels along the Cherry Creek Corridor. This property is adjacent open spaces and dense suburban neighborhoods. Leverage the fuels moisture monitoring data.	Flooding, Urban Conflagration, Wildfire	1, 2	Arapahoe County, Centennial, SMFR, Cherry Creek State Park	Unknown	Fire Mitigation Grants, Open Spaces Fees	Medium	2 years	New in 2025
C-16	**Public Alert and Warning.** Implement the EOP public alert and warning annex within the 911 Authority jurisdiction. Provide best practice template messaging to all PSAPs.	Active Threat, Cyber Threat, Dam Failure, Drought, Flooding, Hazmat, Pandemic, Summer Weather, Wind/ Tornado, Winter Weather, Wildfire, Urban Conflagration	1	Arapahoe County, All Municipalities, SMFR, 911 Authority	Planning cost: staff time. Implementation cost: unknown	911 Authority, Dept Budget	Medium	1 year	New in 2025
C-17	**WUI Code Implementation.** Implement WUI code in accordance with 8 CCR 1507-39. Ensure deconfliction of references to existing County codes. Educate appropriate to staff to changes.	Wildfire, Urban Conflagration	1, 2	Arapahoe County, All Municipalities, SMFR	Planning cost: staff time. Implementation cost: unknown	Permit Fees	High	1 year	New in 2025

Table 5-5 City of Cherry Hills Village Mitigation Actions

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
CH-1	**Participation and adoption of the MHFD master plans affecting the County.** Part of the master planning efforts involves identification of capital improvement projects and are based on future conditions hydrology (watershed level).	Flooding	2,3,4	Cherry Hills Village Community Development and Public Works Departments, MHFD	Staff Time	City General Fund	Medium	Ongoing	Annual Implementation. The City continues to participate in and adopt MHFD master plans
CH-2	**Participation and adoption of the MHFD Flood Hazard Area Delineation (FHAD) Studies affecting the County.** New or updated flood risk areas are identified, providing communities with best available flood risk data for permitting and land development decisions.	Flooding	1,2,3,4	Cherry Hills Village Community Development and Public Works Departments,	Staff Time	City General Fund	Medium	Ongoing	Annual Implementation. The City continues to participate in and adopt FHAD studies
CH-3	**Enforcement of Floodplain Regulations to limit development in floodplain areas.** New or updated flood risk areas are identified, providing communities with best available flood risk data for permitting and land development decisions.	Flooding	1,2,4	Cherry Hills Village Community Development and Public Works Departments	Staff Time	City General Fund	High	Ongoing	Annual Implementation. Staff enforces the City's floodplain regulations through the review of every building permit and land use application.
CH-4	**Continued National Flood Insurance Program (NFIP) Participation.** This includes continuing to comply with the NFIP's standards for updating and adopting floodplain maps and maintaining and updating the floodplain zoning ordinance.	Flooding	1,2,3,4	Public Works	Staff Time	City General Fund	High	2020-2025	Annual Implementation. The City provides the yearly information required by FEMA to comply with the NFIP standards.
CH-5	**Utility Line Undergrounding.** In 2014, City Council appointed a Utility Line Undergrounding Study Committee to evaluate strategies and options to bury existing overhead utility lines. The Committee studied the likely cost, the possibility for cost sharing, the priority for the sequence of work and possible changes to the Municipal Code. The City of Cherry Hills Village is in the preliminary stages of undergrounding	Summer Weather, Wind/ Tornado, Winter Weather	3,4	Public Works, Xcel Energy	$1M	Capital Fund, Xcel Energy Fund	Medium	2024	Not Started. The city is placing this project on hold until sufficient funds are available in the 1% fund. The City continues to identify funding opportunities to underground utility lines.

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
	utility lines along Quincy Avenue from Happy Canyon Road to Holly Street. Quincy Avenue has been identified as a priority because of the view corridors and the damage to the mature tree canopy when Xcel Energy trims tree branches along the lines.								
CH-6	**Blackmer Tributary – Controlled spill – High Line Canal.** Mitigate flooding by controlling overflow points.	Flooding	1, 2, 3, 4	Cherry Hills Village. Arapahoe County – High Line Conservancy, Denver Water MHFD	$500,000	City Budget, Arapahoe County Grants, MHFD – Capital Improvement Fund	Medium	2-3 years	New in 2025
CH-7	**High Line Canal Overflow Construction – Blackmer Gulch.** Construct an engineered overflow at Blackmer Gulch to minimize canal topping events and eliminate flooding hazards by releasing water into Blackmer Gulch.	Flooding	1,2	Cherry Hills Village, Arapahoe County, MHFD, Denver Water	$250,000	CHV CIP budget, Arapahoe County Open Space Grant, MHFD Capital Construction Program	Medium	2-3 Years	New in 2025
CH-8	**City Electronic Data.** Evaluate and improve the city's network data backup system. This will help protect city data from cyber-attacks reduce recovery time, and help ensure continuity of critical government services following an attack.	Cyber Threat	4	Cherry Hills Village Administration Department	Unknown	Department Budget	High	Ongoing	New in 2025
CH-9	**Dam Emergency Action Plans.** The City is a plan holder for the annual dam emergency action plans for both the Holly Dam and Englewood Dam. Both dams are owned and operated by Mile Flood District, with the City having no legal authority over operational or planning activities.	Flooding	1, 2, 3, 4	MHFD, Cherry Hills Village	None	NA	Low	Ongoing	New in 2025
CH-10	**Hazmat Response and Clean up.** The City will utilize on-call contracted services and in-house staff to address non-emergency hazmat spills occurring on Cherry Hills Village property and City-owned right-	Hazardous Materials Release	2, 3	Cherry Hills Village, South Metro Fire Rescue	Little to no cost	Department Budget	Low	Ongoing	New in 2025

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
	of-way. The City relies on South Metro Fire Rescue for large-scale/emergency hazmat releases.								
CH-11	**The City continues to improve and update communication through its website and social media outlets, with additions like live plowing maps, email blasts, and social media posts.** Additionally, the City has begun the use of weather stations and cameras around the City for utilization by on-call Public Works staff to monitor in real time the weather and road conditions.	Summer Weather, Wind/ Tornado, Winter Weather	1, 4	City of Cherry Hills Village	Little to no cost	Department Budget	Medium	Ongoing	New in 2025
CH-12	**Hazard and Stormwater Mapping.** The City continues to update mapping and study its stormwater and drainage infrastructure to better understand and maintain the system and look for potential localized improvement opportunities.	Flooding	1, 2, 3, 4	Cherry Hills Village	$25,000	Department Budget	Medium	Ongoing	New in 2025
CH-13	**The City will continue mowing/maintenance of ditches, open spaces and roadways, as preventative maintenance to assist with wildfire mitigation.** Zoning regulations, building codes, and landscape requirements will be reviewed and considered as needed to assist with the reduction and prevention of Urban Conflagration and Wildfires. The City will continue to require sprinklers systems in all new construction	Urban Conflagration, Wildfire	1, 2, 3, 4	City of Cherry Hills Village, South Metro Fire	Little to no cost	Department Budget	Medium	Ongoing	New in 2025
CH-14	**Public Alert and Warning.** Implement the EOP public alert and warning annex within the 911 Authority jurisdiction. Provide best practice template messaging to all PSAPs.	Active Threat, Cyber Threat, Dam Failure, Drought, Flooding, Hazmat, Pandemic, Summer Weather, Wind/ Tornado, Winter Weather, Wildfire, Urban Conflagration	1	Arapahoe County, All Municipalities, SMFR, 911 Authority	Planning cost: staff time. Implementation cost: unknown	911 Authority, Dept Budget	Medium	1 year	New in 2025

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
CH-15	**WUI Code Implementation.** Implement WUI code in accordance with 8 CCR 1507-39. Ensure deconfliction of references to existing County codes. Educate appropriate to staff to changes.	Wildfire, Urban Conflagration	1, 2	Arapahoe County, All Municipalities, SMFR	Planning cost: staff time. Implementation cost: unknown	Permit Fees	High	1 year	New in 2025

Table 5-6 City of Englewood Mitigation Actions

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
E-1	**Continued National Flood Insurance Program (NFIP) Participation.** This includes continuing to comply with the NFIP's standards for updating and adopting floodplain maps and maintaining and updating the floodplain zoning ordinance.	Flooding	1,2,3,4	Englewood Utilities	$10,000	Staff Time	High	Ongoing	Annual Implementation
E-2	**Participation and adoption of the MHFD master plans affecting the County.** Part of the master planning efforts involves identification of capital improvement projects and are based on future conditions hydrology (watershed level).	Flooding	2,3,4	Englewood Utilities	$10,000	Staff Time	Medium	Ongoing	In Progress. Worked with MHFD on annual maintenance projects, which include outfall and stream bank repair/stabilization in 2025. Continuing working with MHFD on Little Dry Creek, Dry Gulch, and South Englewood Basin master plans to identify capital projects.
E-3	**Increase public awareness by utilizing the County's various social media and public events and trainings.** Utilize the city's various social media and listservs to educate citizens on hazards and the recommended protective actions; host preparedness trainings and safety fairs for citizens. Possible funding: NCR Citizen Corps Grants, department budgets.	Active Threat, Cyber Threat, Dam Failure, Drought, Flooding, Hazmat Pandemic, Summer Weather, Wind/ Tornado, Winter Weather, Wildfire	2,3,4	Englewood Communications Department	Staff Time	Dept. Budget	Medium	Ongoing	Annual. Positions with Communications and PD related to social media posts and communicating both filled. Both departments post regularly via the City's social media channels.
E-4	**Implement Water Conservation Plan.** Ensure Water Conservation Plan is implemented, and citizens are educated on conservation measures.	Drought	4	Englewood Utilities	$0 – $10,000	Dept. Budget	Low	2023-2030	In Progress. The 7-year implementation period began in 2023.
E-5	**Create and consolidate a GIS vulnerability dataset.** Consolidate various hazard maps to create one overall city-wide hazard vulnerability map.	Active Threat, Cyber Threat, Dam Failure, Drought, Flooding, Hazmat, Pandemic, Summer Weather,	3,4	Englewood IT	$0 – $10,000	Dept. Budget	Medium	2-3 years	In progress. No significant progress. Still working on it.

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
	Possible funding: HMEP and department budgets.	Wind/ Tornado, Winter Weather, Wildfire							
E-6	**Participation and adoption of the MHFD Flood Hazard Area Delineation (FHAD) Studies affecting the County.** New or updated flood risk areas are identified, providing communities with best available flood risk data for permitting and land development decisions.	Flooding	1,2,3,4	Englewood Utilities	$100,000	$100,000 Match from MHFD	Medium	Ongoing	In Progress. City continues to work with MHFD on the Little Dry Creek MDP and FHAD and will continue throughout 2025. Preliminary work and progress was presented at a City Council Study Session on March 10th, 2025.
E-7	**Continue participation in the NFIP Community Rating System (CRS) Program.** Flood Insurance premiums are reduced to reflect the reduced flood risk based on the community's floodplain management programs and activities	Flooding	1,2,3,4	Englewood Utilities	20000	Dept. Budget	High	Ongoing	Annual implementation.
E-8	**Evacuation and shelter plan.**	Active Threat, Dam Failure, Flooding, Hazmat, Summer Weather, Wind/ Tornado, Winter Weather, Wildfire	1,2,3,4	Englewood PD/OEM	$0 – $10,000	Dept. Budget	Medium	1-2 years	In progress. Staff are continuing to work with Arapahoe County OEM on practice / training events. In addition, existing Englewood facilities are under evaluation for evacuation and potential shelter, including review of offline power and other resources.
E-9	**Stormwater Plan Implementation.** Implement stormwater mitigation projects identified in Stormwater Master Plan to reduce private property flooding in the City. Reduce damages to private property, preventing loss of life/injury	Flooding	1,2,3,4	Englewood Public Works & Utilities, CDPHE, MHFD	$31 million	Stormwater Utility Fees	High	3-5 years	In progress. The South Englewood Flood Reduction project has been substantially completed. The Old Hampden/Hospital utility project started in 2025 and is under construction.
E-10	**Emerald Ash Borer Mitigation.** Develop a strategy for removing or treating Ash trees on town property and a strategy to support citizens as they address treating	Summer Weather, Wind, Tornado, Winter Weather, Wildfire	1,2,3	Englewood Parks (PRLG)	$250,000	Capital Improvements Fund	High	Ongoing	In progress. City continues to provide residential grants for EAB treatment and removal on private property. City owned ash trees are treated and inspected annually.

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
	or removing trees on private property. Do this in advance of significant tree damage, which could lead to property damage.								
E-11	**Security Camera expansion/ replacement program.** The City's network of cameras needs to be updated for continued usability. The City depends on security cameras as an investigative tool. Without the ability to upgrade existing cameras to ensure better quality video or add additional cameras where needed may place our employees and assets in a vulnerable situation.	Active Threat	1,4	Information Technology, Police	$180,000	Capital Improvements Fund	Medium	Ongoing	In progress. P.D. has expanded Flock to include a mobile camera trailer. We are also working with PRLG to potentially include cameras at some of the updated parks through the bond. Chase cameras are also up and running for the 285 corridor.
E-12	**IT Disaster Recovery Site.** Develop and implement an IT Disaster Recovery Site that the IT Department can temporarily relocate to following a security breach or natural disaster. A disaster recovery site ensures that Englewood can continue operations until it becomes safe to resume work at its usual location.	Active Threat, Cyber Threat, Dam Failure, Flooding, Summer Weather, Wind/ Tornado, Winter Weather	2,3,4	Information Technology	$55,000	Capital Improvements Fund	High	Ongoing	In progress. Englewood IT is working on a secondary internet circuit at Elati to keep the network up and running in the event of an outage at Civic Center. We are currently exploring the possibility of putting our server infrastructure in the cloud to enable us to continue operations in the event of a catastrophic event at our current facility. We are early in that process, with no target date at this time.
E-13	**Englewood Dam Impacts.** Englewood has 2 dams; Charles Allen treatment plant and McLellan Reservoir. Review and update EAP for each. Conduct public education campaign on hazards	Flooding, Dam Incident	1, 2, 3, 4	Englewood Utilities Dept	Staff time	Dept. Budget	Medium	Ongoing	New in 2025
E-14	**Public Alert and Warning.** Implement the EOP public alert and warning annex within the 911 Authority jurisdiction. Provide best practice template messaging to all PSAPs.	Active Threat, Cyber Threat, Dam Failure, Drought, Flooding, Hazmat, Pandemic, Summer Weather, Wind/ Tornado,	1	Arapahoe County, All Municipalities, SMFR, 911 Authority	Planning cost: staff time. Implementation cost: unknown	911 Authority, Dept Budget	Medium	1 year	New in 2025

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
		Winter Weather, Wildfire, Urban Conflagration							
E-15	**WUI Code Implementation.** Implement WUI code in accordance with 8 CCR 1507-39. Ensure deconfliction of references to existing County codes. Educate appropriate to staff to changes.	Wildfire, Urban Conflagration	1, 2	Arapahoe County, All Municipalities, SMFR	Planning cost: staff time. Implementation cost: unknown	Permit Fees	High	1 year	New in 2025

Table 5-7 Town of Foxfield Mitigation Actions

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
F-1	**Participation and adoption of the MHFD master plans affecting the County.** Part of the master planning efforts involves identification of capital improvement projects and are based on future conditions hydrology (watershed level).	Flooding	2,3,4	Town Clerk	Staff Time	Dept Budget	Medium	2025-2026	Annual
F-2	**Participation and adoption of the MHFD Flood Hazard Area Delineation (FHAD) Studies affecting the County.** New or updated flood risk areas are identified, providing communities with best available flood risk data for permitting and land development decisions.	Flooding	1,2,3,4	Town Clerk	Staff Time	Dept Budget	Medium	2025-2026	Annual
F-3	**Fire Bans And Warnings.** Working with our local fire district, publicizing fire bans and warnings, especially related to fireworks	Wildfire	1,2,3,4	Town Clerk	$0 – $10,000	Dept Budget	Low	Ongoing	Annual
F-4	**Wildfire Mitigation Planning and Maintenance.** Create a wildfire mitigation plan, in addition to preventative maintenance in our ditches and open spaces. Avoiding the loss of property, homes, and lives.	Wildfire	1,2,3,4	Town Clerk, South Metro Fire	$1,000	General Fund	High	Ongoing	Annual
F-5	**Public Alert and Warning.** Implement the EOP public alert and warning annex within the 911 Authority jurisdiction. Provide best practice template messaging to all PSAPs.	Active Threat, Cyber Threat, Dam Failure, Drought, Flooding, Hazmat, Pandemic, Summer Weather, Wind/Tornado, Winter Weather, Wildfire, Urban Conflagration	1	Arapahoe County, All Municipalities, SMFR, 911 Authority	Planning cost: staff time. Implementation cost: unknown	911 Authority, Dept Budget	Medium	1 year	New in 2025
F-6	**WUI Code Implementation.** Implement WUI code in accordance with 8 CCR 1507-39. Ensure deconfliction of references to existing County codes. Educate appropriate to staff to changes.	Wildfire, Urban Conflagration	1, 2	Arapahoe County, All Municipalities, SMFR	Planning cost: staff time. Implementation cost: unknown	Permit Fees	High	1 year	New in 2025

Table 5-8 City of Glendale Mitigation Actions

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
G-1	**Continued National Flood Insurance Program (NFIP) Participation.** This includes continuing to comply with the NFIP's standards for updating and adopting floodplain maps and maintaining and updating the floodplain zoning ordinance.	Flooding	1,2,3,4	City Public Works, FEMA, State	Staff Time	Dept Budget	Medium	Ongoing	Annual Implementation. Continuing effort to have new property owners/usage plans which adopt the standard.
G-2	**Participation and adoption of the MHFD master plans affecting the County.** Part of the master planning efforts involves identification of capital improvement projects and are based on future conditions hydrology (watershed level).	Flooding	2,3,4	Glendale Public Works, MHFD, City of Denver	Staff Time	Dept Budget	Low	Ongoing	Annual Implementation.
G-3	**Participation and adoption of the MHFD Flood Hazard Area Delineation (FHAD) Studies affecting the County.** New or updated flood risk areas are identified, providing communities with best available flood risk data for permitting and land development decisions.	Flooding	1,2,3,4	Glendale Public Works, MHFD, City of Denver	Staff Time	Dept Budget	Low	2027	In Progress.
G-4	**Continue/expand community-wide "Run- Hide-Fight-Treat" training.**	Active Threat	1,2,3,4	Glendale Police Dept.	$0 – $10,000	Dept Budget	Medium	Ongoing	Annual Implementation. This program continues to be offered to our community for both initial and follow-up training.
G-5	**Increase participation in Reverse 911 opt-in.**	Active Threat, Cyber Threat, Dam Failure, Flooding, Hazmat, Pandemic, Summer Weather, Wind/ Tornado, Winter Weather, Wildfire	1,2,3,4	Glendale Police Dept.	$0 – $10,000	Dept Budget	Medium	Ongoing	Annual Implementation. The City of Glendale PSAP is participating in the on-going implementation of the "RAVE" reverse 911 functionality. In addition, Glendale PD Crime Prevention staff has prioritized efforts to increase opt-in from community members.

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
G-6	**Re-Locate the City Gas Pumps.** The City Gas Pumps are in an area that is prone to flooding and provides easy access to non-city employees. This is a key vulnerability. Loss of the ability to fuel critical vehicles during flooding. Potential explosion causing damage and loss of ability to fuel critical vehicles following a criminal act.	Active Threat, Flooding	1,2,4	Glendale Public Works Department, Glendale Police Department, County OEM	$100,000	General Fund	Low	2030	Not Started. The City of Glendale has prioritized other programs over this, but continues to see the importance of accomplishing this.
G-7	**Relocate 911 center.** Glendale 911 is located within the Cherry Creek Dam inundation area and is currently in the basement. Moving this center out of the basement will increase resiliency and city operations during and after a dam failure event	Dam Failure	4	IT Dept, County OEM	$250,000	Capital Improvement Budget	High	2030	Not Started. Alternate locations continue to be evaluated, but none have been decided upon.
G-8	**Relocate server room.** The City server room is located within the Cherry Creek Dam inundation area and is currently in the basement. Moving the server room out of the basement will increase resiliency and city operations during and after a dam failure event	Dam Failure	4	IT Dept, County OEM	$250,000	Capital Improvement Budget	High	2030	Not Started. Alternate locations continue to be evaluated, but none have been decided upon.
G-9	**Clear overgrown brush along Cherry Creek greenway, between S Colorado Blvd and E Kentucky Ave.** The Cherry Creek greenway (creek bed) has substantial overgrowth/downed trees/potential fuel source for which could serve as an initial start of or a conflagration or continue one initiated elsewhere throughout the community.	Urban Conflagration	1, 2	Glendale Public Works, Denver Water, Denver Public Works	$25,000	Glendale Public Works Operating Budget	Medium	2028	New in 2025
G-10	**Monitor the Denver Water Watch Report and Distributors Forum.** This will help maintain awareness of conditions that affect Denver and Glendale's water supply, including snowpack, precipitation, reservoir storage, customer usage, and weather forecasts. The Distributors forum also provides updates water availability and drought response information. Water watch reports are updated weekly, and meetings of the Distributors forum are held regularly.	Drought	1,2,3	Denver Water, Glendale Public Works	Staff Time	Glendale Public Works Operating Budget	Low	Ongoing	New in 2025

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
G-11	**Public Alert and Warning.** Implement the EOP public alert and warning annex within the 911 Authority jurisdiction. Provide best practice template messaging to all PSAPs.	Active Threat, Cyber Threat, Dam Failure, Drought, Flooding, Hazmat, Pandemic, Summer Weather, Wind/Tornado, Winter Weather, Wildfire, Urban Conflagration	1	Arapahoe County, All Municipalities, SMFR, 911 Authority	Planning cost: staff time. Implementation cost: unknown	911 Authority, Dept Budget	Medium	2026	New in 2025
G-12	**WUI Code Implementation.** Implement WUI code in accordance with 8 CCR 1507-39. Ensure deconfliction of references to existing County codes. Educate appropriate to staff to changes.	Wildfire, Urban Conflagration	1, 2	Arapahoe County, All Municipalities, SMFR	Planning cost: staff time. Implementation cost: unknown	Permit Fees	High	2026	New in 2025

Table 5-9 City of Greenwood Village Mitigation Actions

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
GV-1	**Continued National Flood Insurance Program (NFIP) Participation.** This includes continuing to comply with the NFIP's standards for updating and adopting floodplain maps and maintaining and updating the floodplain zoning ordinance.	Flooding	1,2,3,4	Greenwood Village Public Works, Community Development	Staff Time	NA	High	Ongoing	Annual Implementation
GV-2	**Goldsmith Gulch drainage project:** under crossing storm water pipe installs under Orchard Rd at Silo Park, and Storm water under-crossing pipe and box at the intersection of Belleview and Clarkson. Both of these will improve drainage runoff and mitigate flooding issues.	Flooding	1,2,3,4	Greenwood Village Public Works	$2 million	CIP budget and MHFD funding	High	2030	In Progress.
GV-3	**Belleview/Clarkson Drainage Improvements.** The existing storm sewer does not have adequate capacity which contributes to ponding issues. Upsizing the storm sewer piper will resolve the ponding issue by increasing drainage capacity. This project is a partnership with Cherry Hills Village.	Flooding	2,3,4	Greenwood Village Public Works, Cherry Hills Public Works	$180,000	CIP budget and Chery Hills Village CIP budget (50-50 cost sharing)	Medium	2030	In Progress.
GV-4	**Goldsmith Gulch – Orchard -Silo Park Drainage improvements.** Replace existing culvert with a larger structure to reduce the potential for overtopping of Orchard Road in a 100-year flood. The schedule is based on anticipated funding from the Mile High Flood District.	Flooding	2,3,4	Greenwood Village Public Works, MHFD	$1,535,000	CIP budget and MHFD	Medium	2030	In Progress.
GV-5	**Public Alert and Warning.** Implement the EOP public alert and warning annex within the 911 Authority jurisdiction. Provide best practice template messaging to all PSAPs.	Active Threat, Cyber Threat, Dam Failure, Drought, Flooding, Hazmat, Pandemic, Summer Weather, Wind/ Tornado, Winter Weather, Wildfire, Urban Conflagration	1	Arapahoe County, All Municipalities, SMFR, 911 Authority	Planning cost: staff time. Implementation cost: unknown	911 Authority, Dept Budget	Medium	1 year	New in 2025
GV-6	**WUI Code Implementation.** Implement WUI code in accordance with 8 CCR 1507-39. Ensure deconfliction of	Wildfire, Urban Conflagration	1, 2	Arapahoe County, All	Planning cost: staff time.	Permit Fees	High	1 year	New in 2025

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
	references to existing County codes. Educate appropriate to staff to changes.			Municipalities, SMFR	Implementation cost: unknown				

Table 5-10 City of Littleton Mitigation Actions

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
L-1	**Continued National Flood Insurance Program (NFIP) Participation.** This includes continuing to comply with the NFIP's standards for updating and adopting floodplain maps and maintaining and updating the floodplain zoning ordinance.	Flooding	1,2,3,4	Public Works	Staff Time	Storm water enterprise fund	High	Ongoing	Annual. Continued participation and compliance with NFIP. Update new PMR as applicable. Review and update stormwater ordinances in compliance with NFIP.
L-2	**Participation and adoption of the MHFD master plans affecting the County.** Part of the master planning efforts involves identification of capital improvement projects and are based on future conditions hydrology (watershed level).	Flooding	2,3,4	Public Works	$400,000	Storm water enterprise and cost sharing with MHFD	Medium	Ongoing	Annual. Current Master Plans in process include Jackass Gulch, Slaughterhouse Gulch, Rangeview Gulch, Lee Gulch and the HLC STAMP. The City works with MHFD to develop a 5 year Capital plan for both master planning and implementation of the master plans.
L-3	**Involvement in the Denver Water Emergency Action Plans for the Marston & Harriman Dams.** Participate in the update and orientation of the Dam EAPs and integrate into City EOP.	Dam Failure	1,2,3,4	Emergency Management, Public Works, Denver Water	Staff Time	NA	High	Ongoing	Annual
L-4	**Participation and adoption of the MHFD Flood Hazard Area Delineation (FHAD) Studies affecting the County.** New or updated flood risk areas are identified, providing communities with best available flood risk data for permitting and land development decisions.	Flooding	1,2,3,4	Public Works	$300,000	Storm water enterprise and cost sharing with MHFD	Medium	Ongoing	Annual. Many plans in the City are outdated, the City is currently working on updating FHADs including Slaughterhouses Gulch, Rangeview Gulch, Lee Gulch and Jackass Gulch.
L-5	**Continue participation in the NFIP Community Rating System (CRS) Program.** Flood Insurance premiums are reduced to reflect the reduced flood risk based on the community's floodplain management programs and activities.	Flooding	1,2,3,4	Public Works	Staff Time	Storm water enterprise fund	High	Ongoing	Annual recertification, next cycle verification is 2027
L-6	**Identify evacuation shelters and evacuation routes.** Create and refine emergency vehicular evacuation	Active Threat, Dam Failure, Flooding, Hazmat, Pandemic,	1,4	Public Works	$0 – $10,000	FEMA HMA grant	High	5 years	In Progress. Evaluate and update emergency evacuation routes to include new development.

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
	routes and procedures specific to hazard types. Will help reduce loss of life and injuries.	Summer Weather, Wind/ Tornado, Winter Weather, Wildfire							
L-7	**Emergency Management Organization.** Designate emergency manager and/or team for the city and update Emergency Operations Center program including planning and training of city staff. Will help reduce loss of life, property, damages, economic impacts	Active Threat, Cyber Threat, Dam Failure, Drought, Flooding, Hazmat, Pandemic, Summer Weather, Wind/ Tornado, Winter Weather, Wildfire	1,2,3,4	Littleton Police Department, Public Works	$100,000	City general fund	High	5 years	In Progress. IGA in place
L-8	**Power line undergrounding master plan and power line burial.** Phase 1 would create an Undergrounding Master Plan to access funds in the Xcel Energy 1% undergrounding set aside. This plan would prioritize locations for burying overhead power lines throughout the city and identify costs for each project. Phase 2 would then implement line burials.	Summer Weather, Wind/ Tornado, Winter Weather, Wildfire	2,3,4	City of Littleton Public Works, Xcel Energy	$75,000 for Phase 1 master plan; Phase 2 costs TBD	Capital Improvements Budget, Xcel Energy Funds	Medium	In Progress	Not Started.
L-9	**Storm infrastructure assessment and improvements.** There are over 50 miles of storm sewer owned and maintained by the City of Littleton, 22.3% of which have been identified as high and very high risk of failure. Failure of storm sewers has caused sinkholes in roadways and open spaces, leading to flooding, property damage and road closures.	Flooding	1,2,3,4	Public Works	$50M	Storm sewer Enterprise Fund, Grants	High	2030	New in 2025. The City has recent storm sewer and culvert collapses that have required emergency repairs. The City is currently completing a risk assessment on all storm infrastructure as identified from the storm master plan and site inspection. In 2025, the City has also kicked off a utility rate study to help identify funding sources for needed repairs.
L-10	**Climate Risk and Vulnerability Assessment.** The city is requesting proposals from consultants to develop a Climate Risk and Vulnerability Assessment.	Dam Failure, Drought, Flooding, Pandemic, Summer	1	Community Development, OEM	Unknown	Department Budget	Medium	2 years	New in 2025

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
	This plan will be completed in 2026 and will include risks associated with climate change including drought and urban conflagration.	Weather, Wind/ Tornado, Winter Weather, Wildfire, Urban Conflagration							
L-11	**Public Alert and Warning.** Implement the EOP public alert and warning annex within the 911 Authority jurisdiction. Provide best practice template messaging to all PSAPs.	Active Threat, Cyber Threat, Dam Failure, Drought, Flooding, Hazmat, Pandemic, Summer Weather, Wind/ Tornado, Winter Weather, Wildfire, Urban Conflagration	1	Arapahoe County, All Municipalities, SMFR, 911 Authority	Planning cost: staff time. Implementation cost: unknown	911 Authority, Dept Budget	Medium	1 year	New in 2025
L-12	**WUI Code Implementation.** Implement WUI code in accordance with 8 CCR 1507-39. Ensure deconfliction of references to existing County codes. Educate appropriate to staff to changes.	Wildfire, Urban Conflagration	1, 2	Arapahoe County, All Municipalities, SMFR	Planning cost: staff time. Implementation cost: unknown	Permit Fees	High	1 year	New in 2025

Table 5-11 City of Sheridan Mitigation Actions

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
S-1	**Continued National Flood Insurance Program (NFIP) Participation.** This includes continuing to comply with the NFIP's standards for updating and adopting floodplain maps and maintaining and updating the floodplain zoning ordinance.	Flooding	1,2,3,4	Sheridan Community Development	Staff Time	Department Budget	High	Ongoing	Annual Implementation. This is an ongoing program.
S-2	**Participation and adoption of the MHFD master plans affecting the County.** Part of the master planning efforts involves identification of capital improvement projects and are based on future conditions hydrology (watershed level).	Flooding	2,3,4	Sheridan Community Development	Staff Time	Department Budget	Medium	Ongoing	Annual Implementation
S-3	**Participation and adoption of the MHFD Flood Hazard Area Delineation (FHAD) Studies affecting the County.** New or updated flood risk areas are identified, providing communities with best available flood risk data for permitting and land development decisions.	Flooding	1,2,3,4	Sheridan Community Development	Staff Time	Department Budget	Medium	Ongoing	Annual Implementation
S-4	**Monitor Flood Plan and Hazard Zone for Overgrowth and Homeless Population.** Monitor flood hazard and flood way for overgrowth of brush and trees, particularly along Bear Creek and Parts of the South Platte. Dense growth in these areas led to a lot of issues with trees falling obstructing water flow and causing dam issues during low flows. The dense growth also allows undetected homeless camps and contamination within waterways. By thinning trees and brush we can better identify homelessness within flood hazard zones and reduce contamination of waterway from e coli and human waste, as well as prevent loss of life when the area floods.	Flooding, Pandemic	1,2,3,4	Sheridan Public Works/ Mile High Flood District, All agencies with flood zone	$20,000 per year	Mile High Flood District Grants, General Fund	Medium	Ongoing	Annual Implementation
S-5	**Develop an early warning system to alert the public about extreme heat and extreme cold events.**	Summer Weather, Winter Weather	1,2	Sheridan Public Works	Unknown	CIP budget, grants	2023	2030	Not Started
S-6	**Emergency shelters.** Identify sites to be used as emergency shelters during severe weather events. Develop an action plan, identify and implement structural changes needed to shelter sites such as backup power capability.	Summer Weather, Wind/ Tornado, Winter Weather	1	Sheridan Public Works	Unknown	CIP budget, grants	2025	2030	Not Started

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
S-7	**Debris cleanup contractor.** Identify and implement on-call contracts for private contractors to assist with debris following a severe weather incident. This will make Sheridan more resilient and reduce recovery time.	Summer Weather, Wind/ Tornado, Winter Weather	2,3	Sheridan Public Works	Staff Time	NA	Medium	2024	Not Started
S-8	**Public Alert and Warning.** Implement the EOP public alert and warning annex within the 911 Authority jurisdiction. Provide best practice template messaging to all PSAPs.	Active Threat, Cyber Threat, Dam Failure, Drought, Flooding, Hazmat, Pandemic, Summer Weather, Wind/ Tornado, Winter Weather, Wildfire, Urban Conflagration	1	Arapahoe County, All Municipalities, SMFR, 911 Authority	Planning cost: staff time. Implementation cost: unknown	911 Authority, Dept Budget	Medium	1 year	New in 2025
S-9	**WUI Code Implementation.** Implement WUI code in accordance with 8 CCR 1507-39. Ensure deconfliction of references to existing County codes. Educate appropriate to staff to changes.	Wildfire, Urban Conflagration	1, 2	Arapahoe County, All Municipalities, SMFR	Planning cost: staff time. Implementation cost: unknown	Permit Fees	High	1 year	New in 2025

Table 5-12 Denver Water Mitigation Actions

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
DW-1	**Forests to Faucets Partnership.** Helps protect the Denver Water supply by restoring forests to their naturally resilient conditions through thinning, patch cuts, and reforestation.	Wildfire	2, 3, 4	US Forest Service, Colorado State Forest Service, Colorado Forest Restoration Institute, National Resources Conservation Service, Local Entities (Fire Protection Districts, Local Conservation Districts, County Governments, Non-Profit Organizations)	Very High: More than $1,000,000	Existing budget, funding contributed by partners	High	Ongoing	New in 2025
DW-2	**Alternate EOC location and agreements.** Identify partner agencies (i.e., County OEMs) that would permit the use of their EOC, or other facilities, to serve as an alternate EOC location for Denver Water's EOC. Formalize agreements in documentation	Active Threat, Cyber Threat, Drought, Hazmat Release, Pandemic, Severe Wind/ Tornado, Summer Weather, Winter Weather, Urban Conflagration	2, 4	Denver Water Emergency Management, County OEM	Staff-Time	No funding required	Medium	Ongoing	New in 2025
DW-3	**Treatment Facility Trainings** - Host trainings and seminars at the Marston Water Treatment Facility for first responder partners and Arapahoe County OEM	HazMat	1, 2, 4	Denver Water – Emergency Management, Arapahoe County OEM, First responder agencies	Staff time	No funding required	High	Ongoing	New in 2025
DW-4	**Marston Dam Trainings:** Host trainings and seminars for the Marston Dam facility for first responder partners and Arapahoe County OEM	Dam Failure	1,2,3,4	Denver Water – Emergency Management, Arapahoe County OEM, First responder agencies	Staff time	No funding required	High	Ongoing	New in 2025
DW-5	**Harriman Dam Trainings:** Host trainings and seminars for the Marston Dam facility for first responder partners and Arapahoe County OEM	Dam Failure	1,2,3,4	Denver Water – Emergency Management, Arapahoe County OEM, First responder agencies	Staff time	No funding required	High	Ongoing	New in 2025

Table 5-13 South Metro Fire Rescue Mitigation Actions

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
SM-1	**Fuels Reduction Plan.** Develop and implement a plan and operation to reduce the dead fuels along the Cherry Creek Corridor. This property is adjacent open spaces and dense suburban neighborhoods. Leverage the fuels moisture monitoring data.	Flooding, Urban Conflagration, Wildfire	1, 2	Arapahoe County, Centennial, SMFR, Cherry Creek State Park	Unknown	Fire Mitigation Grants, Open Spaces Fees	Medium	2 years	New in 2025
SM-2	**Public Alert and Warning.** Implement the EOP public alert and warning annex within the 911 Authority jurisdiction. Provide best practice template messaging to all PSAPs.	Active Threat, Cyber Threat, Dam Failure, Drought, Flooding, Hazmat, Pandemic, Summer Weather, Wind/ Tornado, Winter Weather, Wildfire, Urban Conflagration	1	Arapahoe County, All Municipalities, SMFR, 911 Authority	Planning cost: staff time. Implementation cost: unknown	911 Authority, Dept Budget	Medium	1 year	New in 2025
SM-2	**WUI Code Implementation.** Implement WUI code in accordance with 8 CCR 1507-39. Ensure deconfliction of references to existing County codes. Educate appropriate to staff to changes.	Wildfire, Urban Conflagration	1, 2	Arapahoe County, All Municipalities, SMFR	Planning cost: staff time. Implementation cost: unknown	Permit Fees	High	1 year	New in 2025
SM-3	**Cyber Security Improvements.** SMFR's Info Tech Division has 17 members plus contractors that have plans, systems, and operations to continuously protect our IT systems for our Administration, Line Operations, and Dispatch center. The IT Division continuously updates and replaces equipment and software.	Cyber Threat	4	SMFR Community Risk Reduction, Arapahoe County, Douglas County	$500,000	HSGP, SMFR budget	High	Ongoing	New in 2025
SM-4	**Fuels Reduction Plan.** Plans and operations to conduct structure assessments to suggest mitigation efforts on landscaping and vegetation that is adjacent to residential homes. Homeowners can sign up for these assessment days which are scheduled from spring to late summer.	Flooding, Wildfire, Urban Conflagration	1, 2, 3, 4	SMFR Community Risk Reduction	$10,000 per year	Department staff hours & overtime, exploring grant options	Medium	Ongoing	New in 2025

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
SM-5	**Relocation of Joint Service Facilities (JSF) and Training Division Admin.** The need to expand and update SMFRs current Fleet shops and Training facilities has been identified. Plans to expand and update existing buildings have been stalled due to funding and the constraints of the flood plain in the area. Relocation to another site would address the flood plain concerns.	Flooding	3	SMFR Internal Services; Douglas County Schools	$3 million	Exploring grant options	Medium	2028	New in 2025
SM-6	**Wildfire Prevention Campaign.** SMFR provides public education with the goals of preventing Wildfire starts and to lessen its impact on residential properties. This education is primarily organized by the Community Risk Reduction (CRR) team through online and in person services. CCR provides a wide variety of public education resources on their website: https://www.southmetrocrr.org/. One section of the website is dedicated to wildfire including Preparation, Plans, Evacuation info, and other resources. Included are Newsletters, Preparedness guides, Guidelines, etc.	Wildfire, Urban Conflagration	1, 2	SMFR Community Risk Reduction, Arapahoe County, Douglas County, Jefferson County	$50,000 per year	Department staff hours & overtime, exploring grant options	High	2029	New in 2025

6.0 PLAN IMPLEMENTATION AND MAINTENANCE

DMA Requirement §201.6(c)(4)(ii):
[The plan shall include] *[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] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.* *[a] discussion on how the community will continue public participation in the plan maintenance process.*

This Chapter discusses how the Arapahoe County Mitigation Strategy will be implemented by participating jurisdictions and how the overall Hazard Mitigation Plan will be evaluated and enhanced over time. Implementation and maintenance of the plan is the final step of the 10-step planning process and is critical to the overall success of hazard mitigation planning. This chapter provides an overview of the strategy for plan implementation and maintenance, and outlines the method and schedule for monitoring, evaluating, and updating the plan. The chapter also discusses incorporating the plan into existing planning mechanisms and how the participating jurisdictions will ensure continued public involvement in mitigation planning. Chapter 6.0 consists of the following subsections:

- Plan Adoption & Implementation
- Plan Maintenance
- Incorporation into Other Planning Mechanisms
- Continued Public Involvement

6.1 Plan Adoption & Implementation

Once adopted, the plan faces the truest test of its worth: implementation. While this plan contains many worthwhile actions, the participating jurisdictions will need to decide which action(s) to undertake first. Two factors will help with making that decision: the priority assigned to the actions in the planning process and funding availability. Low or no-cost actions most easily demonstrate progress toward successful plan implementation.

Implementation will be accomplished by adhering to the schedules identified for each mitigation action in Table 5-3 in Chapter 5.0, and through consistent efforts to network and highlight the multi-objective, win-win benefits of each project to the Arapahoe County community and its stakeholders.

Mitigation is most successful when it is incorporated into the day-to-day functions and priorities of government and development. Implementation will be accomplished through the routine actions of monitoring agendas, as well as attending meetings, and promoting a safe, sustainable community. Additional mitigation strategies could include consistent and ongoing enforcement of existing policies and vigilant review of programs for coordination and multi-objective opportunities.

It will also be important to maintain a constant monitoring of funding opportunities that can be leveraged to implement some of the costlier recommended actions. This will include creating and maintaining a bank of ideas on how to meet local match or participation requirements, should grants be pursued; this will help ensure participating jurisdictions are in a position to capitalize on the opportunity when funding becomes available. Funding opportunities to be monitored include special pre- and post-disaster funds,

special district budgeted funds, state and federal earmarked funds, and other grant programs, including those that can serve or support multi-objective applications.

6.1.1 Role of the Planning Team in Implementation and Maintenance

With adoption of this plan Arapahoe County and its participating jurisdictions will be tasked with plan implementation and maintenance. This will be accomplished by keeping the Planning Team active throughout the lifecycle of the plan. The participating jurisdictions agree to:

- Act as a forum for hazard mitigation issues,
- Disseminate hazard mitigation ideas and activities to all participants,
- Pursue the implementation of high-priority, low/no-cost recommended actions,
- Keep the concept of mitigation in the forefront of community decision making by identifying plan recommendations when other community goals, plans, and activities overlap, influence, or directly affect increased community vulnerability to disasters,
- Maintain a monitoring of multi-objective cost-share opportunities to help the community implement the plan's recommended actions for which no current funding exists,
- Monitor and assist in implementation and update of this plan,
- Report on plan progress and recommended changes to the county Commissioners, City/Town Councils, governing boards, and other partners, and
- Inform and solicit input from the public.

Other duties include reviewing and promoting mitigation proposals, providing technical assistance in implementing codes and ordinances, considering stakeholder concerns about hazard mitigation, passing concerns on to appropriate entities, and posting relevant information on the county and jurisdiction websites, in the local newspaper, and on social media. Unincorporated communities and special districts not participating in this plan will be integrated into mitigation implementation wherever possible.

Implementation and Maintenance of the 2020 Plan

In general, the jurisdictions have made considerable progress on the implementation of the plan, and on decreasing their vulnerability to hazards. The 2020 Plan included a process for implementation and maintenance of the plan, which was generally followed. The 2020 Plan stated that the Planning Team would meet annually to review progress on mitigation actions, assess how effective those actions have been in mitigating losses, and how well the Plan's goals and objectives are being met. The Planning Team would also monitor how elements of this Plan were being incorporated into other planning mechanisms. Over the past five years, the Planning Team has met five times.

The status of mitigation actions and success stories are captured in Chapter 5.0. Other ways in which the 2020 Plan was integrated into other planning mechanisms and processes include:

- Arapahoe County used risk assessment data from this plan to update the County EOP in 2019.
- The Arapahoe County Office of Emergency Management used the risk assessment data from this plan to aid in closing POETE gap areas annually in the Integrated Preparedness Plan.
- The Arapahoe County Sheriff's Office worked with the Planning Department to include hazard information in the 2018 update of the county Comprehensive Plan.
- The City of Centennial used risk assessment data from this plan to update the City EOP in 2021

- The City of Englewood used the risk assessment data from this plan to complete a capability assessment and ongoing use to prioritize hazard scenarios for EOC exercises.
- The City of Glendale integrated hazard information into its Ready Glendale public education program.
- The City of Littleton used the risk assessment data from this plan to complete its capability assessment in 2024.

6.2 Plan Maintenance

The Arapahoe County Hazard Mitigation Plan is a living document that may be adjusted or updated as conditions change, actions progress, or new information becomes available. This section describes the method and schedule the participating jurisdictions will follow for monitoring, evaluating, and updating the Plan over the next five years. All participating jurisdictions will follow the process and schedule described below.

6.2.1 Monitoring

Monitoring refers to tracking the implementation of the plan over time. Arapahoe County OEM will be responsible for reaching out to lead and supporting agencies identified in the Mitigation Actions table for status on those mitigation actions. OEM will also coordinate with Planning Team members at least annually to identify and track any significant changes in their agencies' mitigation efforts.

Arapahoe County OEM will use the following process to track progress, note changes in vulnerabilities, and consider changes in priorities as a result of project implementation:

- A representative from the responsible entity identified in each mitigation action will be responsible for tracking and reporting to the Planning Team when project status changes. The representative will provide input on whether the project as implemented meets the defined goals and objectives and is likely to be successful in reducing vulnerabilities.
- If the project does not meet identified goals and objectives, the Planning Team may select alternative projects for implementation.
- Projects that were not ranked high priority but were identified as potential mitigation strategies will be reviewed periodically to determine feasibility of future implementation.
- New mitigation projects identified will require an individual assigned to be responsible for defining the project scope, implementing the project, and monitoring the success of the project.
- Mitigation activities not identified as actions in this plan will also be tracked to ensure a comprehensive hazard mitigation program, and to assist with future updates.

As part of this coordination, OEM and the Planning Team will also monitor repetitive losses; evaluate changes in hazards, vulnerabilities, or the distribution of risk across the county; and seek to identify new and ongoing mitigation opportunities.

6.2.2 Evaluation

Evaluating refers to assessing the effectiveness of the plan at achieving its stated purpose and goals. Evaluation of progress can be achieved by monitoring changes in vulnerabilities identified in the plan, such as:

- Decreased vulnerability because of implementing recommended actions,
- Increased vulnerability because of failed or ineffective mitigation actions,
- Changes to hazards due to climate change, and/or
- Increased vulnerability because of new development (and/or annexation).

The Planning Team will meet annually to evaluate the implementation of the plan and consider any changes in priorities that may be warranted. The annual evaluation will not only include an investigation of whether mitigation actions were completed, but also an assessment of how effective those actions were in mitigating losses. A review of the qualitative and quantitative benefits (or avoided losses) of mitigation activities will support this assessment. Results of the evaluation will then be compared to the goals established in the plan and decisions will be made regarding whether actions should be discontinued or modified in any way in light of new developments in the community. Progress will be documented by the Planning Team for use in the next plan update. Finally, the Planning team will monitor and incorporate elements of this Plan into other planning mechanisms, as detailed in Section 6.3.

Arapahoe County OEM will coordinate with all participating jurisdictions to facilitate an effective maintenance and implementation process. Completed projects will be evaluated to determine how they have reduced vulnerability. Changes will be made to the plan to accommodate for projects that have failed or are not considered feasible after a review for their consistency with established criteria, the time frame, priorities, and/or funding resources.

6.2.3 Updates

The Arapahoe County Hazard Mitigation Plan will be reviewed and revised at least once every five years in accordance with the DMA 2000 requirements and latest FEMA and DHSEM hazard mitigation planning guidance. Updates to this plan will consider:

- Consider changes in vulnerability due to project implementation,
- Document success stories where mitigation efforts have proven effective,
- Document areas where mitigation actions were not effective,
- Document any new hazards that may arise or were previously overlooked,
- Document hazard events and impacts that occurred within the five-year period,
- Incorporate new data or studies on hazards and risks,
- Incorporate new capabilities or changes in capabilities,
- Document continued public involvement,
- Document changes to the planning process, which may include new or additional stakeholder involvement,
- Incorporate growth and development-related changes to building inventories,
- Incorporate new project recommendations or changes in project prioritization,
- Include a public involvement process to receive public comment on the updated plan prior to submitting the updated plan to DHSEM/FEMA, and

Include re-adoption by all participating entities following DHSEM/FEMA approval. The updated plan will document success stories where mitigation efforts have proven effective, as well as areas where mitigation actions were not effective, and will include re-adoption by all participating entities following DHSEM/FEMA approval.

Any interested party wishing for an update of this Plan sooner than the regular 5-year update will submit such a request to Arapahoe County OEM for consideration. OEM will evaluate all such requests and bring them to the full Planning Team for consideration.

6.3 Incorporation Into Other Planning Mechanisms

Another important implementation mechanism that is highly effective and low-cost is the incorporation of the hazard mitigation plan recommendations and their underlying principles into other jurisdictional plans and mechanisms. Mitigation is most successful when it is incorporated into the day-to-day functions and priorities of government and development. The mitigation plan can be considered as the hub of a wheel with spokes radiating out to other related planning mechanisms that will build from the information and recommendations contained herein. Properly implemented, the HMP should serve as one of the foundational documents of the jurisdictions' emergency management programs, since everything emergency management does should relate back in one way or another to the hazards the jurisdiction faces.

As stated in Section 6.1 above, implementation through existing plans and/or programs is recommended wherever possible. Based on this Plan's capability assessment and progress made on mitigation actions noted in Chapter 5.0, the participating jurisdictions continue to implement policies and programs to reduce losses to life and property from natural and human-caused hazards. The Planning Team will be responsible for integrating the data, goals and objectives, and other elements of this Plan into other plans, as appropriate.

The following sections provides some guidance on how Arapahoe County may use the updated HMP to inform and improve other plans, procedures, and programs.

Comprehensive Plans

Integrating hazard mitigation into the jurisdiction's comprehensive or general plan is considered a best practice by both FEMA and the American Planning Association. The Arapahoe County Comprehensive Plan was last updated in 2018 and amended in 2022, and included hazards information from the 2015 and 2020 versions of the HMP, which is cited as a supporting document to the Comprehensive Plan. Arapahoe County OEM will work with the Planning Department to ensure that hazards data and mitigation goals and objectives inform the next Comprehensive Plan update.

Threat and Hazard Identification and Risk Assessment (THIRA)

Arapahoe County has completed a County-level Threat and Hazard Identification and Risk Assessment (THIRA). CPG201 Threat and Hazard Identification and Risk Assessment (THIRA) establishes Step 1 as "Identify the Threats and Hazards of Concern" and lists HIRAs and HMPs as possible sources of threat/hazard information.

The criteria for selecting which Threats/Hazards are "of concern" are defined as:

- Factor #1: Likelihood of a Threat or Hazard Affecting a Community
- Factor #2: The Impacts of a Threat or Hazard

Each natural and human-caused hazard profiled in the HIRA (Chapter 4.0) contains a section analyzing the probability of future events, which provides a data-driven answer to Factor #1. Similarly, the

vulnerability assessment section of the hazard profiles address what impacts can realistically be expected from both routine and extreme events of each hazard, which specifically addresses Factor #2.

Step 2 of CPG 201 is to "Give the Threats and Hazards Context" by creating a scenario for each hazard of concern, with specifics like time of day, area, and magnitude of the event, which are then used to establish capability targets for each of the 32 core capabilities. All the hazards profiled in the HIRA contain detailed information to ensure the hazard scenarios are plausible. For some hazards, such as flooding, detailed GIS analysis has been done that can easily be incorporated as THIRA scenarios. Other hazards include details on the most extreme historical events on record that can quickly be updated to modern scenarios.

Response Plans

The Arapahoe County Emergency Operations Plan (EOP) was last updated in 2022. While the EOP is an all-hazards document, it also contains hazard-specific information and concerns. Hazard information from the 2020 HMP were incorporated into the EOP and helped to inform the 2022 update.

Several other operational or functional response plans are also influenced by information contained in the HMP. These plans include but are not limited to:

- **Damage Assessment Plan:** A review of the vulnerability and estimated losses detailed in the hazard profiles can help identify what areas to initially prioritize following a hazard event. Similarly, a review of Section 4.2 Asset Summary can help identify what critical facilities need to be assessed following a hazard event.
- **Evacuation & Sheltering Plan:** A review of the vulnerability and estimated losses detailed in the hazard profiles can help identify what areas are more likely to need evacuation in different hazard scenarios. The Community Profile in Chapter 2.0 can help identify not only how many people would potentially be impacted by disasters, but how many are likely to need assistance with transportation, special medical or sheltering needs, etc. This review can also help evaluate the impacts of multiple or cascading hazards, so that evacuees are not relocated into an area that puts them at risk from other hazards.

Recovery Plan

The Arapahoe County Recovery Plan was last updated in 2024. The risk and vulnerability data in the HMP should help inform the post-disaster recovery planning process, especially by ensuring that the recovery elements of those plans fully take into account the dangers posed by other hazards, rather than focusing exclusively on the most recent hazard event. The HMP in turn will be revisited during recovery to help identify opportunities to incorporate mitigation in the recovery and rebuilding process, including maximizing FEMA PA and HMGP funding where applicable.

The FEMA publication "Pre-Disaster Recovery Planning Guide for State Governments" notes:

"…much of the research involved in the development of mitigation plans can be used to inform the pre-disaster recovery planning effort. The pre-disaster recovery planning process will benefit from and build upon hazard mitigation as:

- The mitigation planning process identifies local hazards, risks, exposures, and vulnerabilities;
- Implementation of mitigation policies and strategies will reduce the likelihood or degree of disaster-related damage, decreasing demand on resources post-disaster;

- The process will identify potential solutions to future anticipated community problems; and
- Mitigation activities will increase public awareness of the need for disaster preparedness.

"Pre-disaster recovery planning efforts also increase resilience by:

- Establishing partnerships, organizational structures, communication resources, and access to resources that promote a more rapid and inclusive recovery process;
- Describing how hazard mitigation will underlie all considerations for reinvestment;
- Laying out a process for implementation of activities that will increase resilience; and
- Increasing awareness of resilience as an important consideration in all community activities."

Continuity of Operations Plans (COOP)

All departments and agencies of Arapahoe County government are required to maintain a Continuity of Operations Plan (COOP) that details that agency's critical functions and how they will protect those functions in order to continue to provide essential services during a disaster or interruption. By defining and describing the hazards facing the county, including frequency and severity, the HIRA informs agency COOP plans by giving context to what types of disasters of interruptions are most likely to occur. Critical facilities and assets located in hazard areas in Section 4.2 should be prioritized for COOP planning.

Training and Exercise Plan

Training on hazard mitigation principles and procedures should be included in training and exercise planning. Any training and exercise needs identified in the Capabilities Assessment (Chapter 5.0) and Mitigation Strategy (Chapter 5.0) should also be included in the county's training and exercise planning.

Public Awareness and Education Programs

The county's ongoing public education and outreach efforts should reflect the hazards and vulnerabilities described in this Plan. In addition to preparing for disasters, public education should include ways in which the public can reduce their vulnerability to natural and human caused hazards. Furthermore, mitigation activities and success stories should be communicated to the public to show the benefits of effective mitigation planning.

Critical Infrastructure Protection Plan

Critical facilities and assets identified in Section 4.2 should be included in Critical Infrastructure Protection Planning (CIPP), with prioritization given to assets located in hazard-prone areas. Hazardous materials facilities in particular should be viewed both as critical assets in need of protection, and as potential hazards in their own right.

Capital Improvements Plan

Many of the mitigation actions listed in the Mitigation Strategy (Section 5.3) came from the county's Capital Improvements Plan and thus have already been identified for funding. Other high-dollar actions listed or identified in the future can also be added to the Capital Improvements Plan to ensure that hazard mitigation projects continue to receive funding. The prioritization of actions listed in Table 5-3, while not binding on capital improvement planning, can be used to inform the prioritization of those actions. Even projects for which the county intends to seek grant funding may also need to be addressed in the Capital Improvements Plan, given that most mitigation grants require significant local matching funds.

Sustainability Plans

Sustainability is a separate area of concern from hazard mitigation, but there are areas where the two fields overlap and influence one another positively or negatively.

Sustainability plans should be reviewed to identify where there may be synergy between sustainability and mitigation/resiliency. For example, sustainability efforts aimed at increasing County's adaptability to climate change can also make the county more resilient to drought and severe weather. Increasing the percentage of food obtained locally could make the county more resilient to supply-chain interruptions or the impacts of disasters in other states. Adding more trees and grass to urban areas to reduce the heat island effect could help mitigate the impact of extreme weather events, as well as reducing flood risk by increasing the amount of permeable surfaces. This may help raise the priority of some sustainability efforts, as well as suggest complimentary mitigation efforts.

It is equally important to identify areas where sustainability efforts may work to reduce the county's resilience to hazards. For example, a sustainability goal of promoting use of public transit and reducing private car ownership could potentially make it harder to evacuate the public during a disaster if public transit is damaged and offline (as was observed during Hurricane Sandy). Similarly, reduced production of solid waste could lead to a reduction in the number of public resources such as dump trucks, which means that in a disaster those resources would not be available for debris removal and similar tasks. The intent of this review is not to say that sustainability goals should not be pursued, but rather to identify areas of concern that should be considered during implementation of these goals. For example, evacuation plans may need to be revised to reflect a larger percentage of families without cars; or contracts may need to be put in place to obtain additional dump trucks in a disaster.

6.4 Continued Public Involvement

Continued public involvement is also imperative to the overall success of the Plan's implementation. This updated HMP will be posted on the county's website for reference and can be used to help inform the county's ongoing public education and outreach program, such as the completion of mitigation actions that reduce the community's vulnerability, can be shared with the public through forums like the Local Emergency Planning Committee (LEPC), public meetings, and through social media. This helps keep the concept of hazard mitigation alive and helps show the public that their government officials are working to keep them safe.

The update process provides an opportunity to publicize success stories from the Plan implementation and seek additional public comment. When the Planning Team reconvenes for the five-year plan update, they will coordinate with all stakeholders participating in the planning process—including those that joined the committee since the planning process began—to update and revise the plan. The plan maintenance and update process will include continued public and stakeholder involvement and input through participation in designated committee meetings, surveys, web postings, and press releases to local media.

Arapahoe County

- The 2025 HMP will be posted on the County's website for reference.
- The HMP will be used to help inform the County's ongoing public education and outreach program.
- The Local Emergency Planning Committee will be used as a forum to communicate with business owners and the public.

City of Centennial

- The 2025 HMP will be posted on the Sheriff's Office website for reference.
- The HMP risk assessment data will be used to help inform targeted public education and outreach messages.

City of Cherry Hills Village

- The 2025 HMP will be posted on the Sheriff's Office website for reference.
- The HMP will be used to help inform the City's public education and outreach program.

City of Englewood

- The 2025 HMP will be posted on the Sheriff's Office website for reference.
- The HMP will be used to help inform the City's public education and outreach program.

Town of Foxfield

- The 2025 HMP will be posted on the Sheriff's Office website for reference.
- The HMP will be used to help inform the City's public education and outreach program.

City of Glendale

- Ready Glendale presentations are being updated to reflect information contained in this plan.
- Increased Social Media effort regarding informing the public will be made.

City of Greenwood Village

- The 2025 HMP will be posted on the Sheriff's Office website for reference.
- The HMP will be used to help inform the City's public education and outreach program.

City of Littleton

- The 2025 HMP will be posted on the Sheriff's Office website for reference.
- The HMP risk assessment data will be used to help inform targeted public education and outreach messages.

City of Sheridan

- The 2025 HMP will be posted on the Sheriff's Office website for reference.
- The HMP will be used to help inform the City's public education and outreach program.

Denver Water

- Inclusion of participation in Hazard Mitigation Plan development in communications and outreach for the Forest to Faucet program.
- Inclusion of Denver Water's participation in Hazard Mitigation Plan development in monthly newsletter to ratepayers

South Metro Fire Rescue

- South Metro Fire Rescue will continue to conduct public education to individuals, HOAs, businesses, organizations, and schools throughout their service area on topics ranging from emergency planning and preparation to home safety and wildfire mitigation.

- Information from this Plan will be incorporated into the next edition of "Preparing For Emergencies: Workbook And Reference Guide."

APPENDIX A: ADOPTIONS AND APPROVALS

Note: The records of adoption will be incorporated as an electronic appendix. When the plan is adopted in 2025, the jurisdictions and adoption date will be noted here, but scanned versions of all adoption resolutions will be kept on file with Arapahoe County Emergency Management. A sample adoption resolution is provided here.

Hazard Mitigation Plan Adoption Sample Resolution

Resolution # _____

Adopting the Arapahoe County

Hazard Mitigation Plan 2025

Whereas, (name of county or community) recognizes the threat that natural hazards pose to people and property within our community; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and

Whereas, an adopted Multi-Jurisdictional Hazard Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

Whereas, (name of county or community) resides within the Planning Area, and fully participated in the mitigation planning process to prepare this Hazard Mitigation Plan; and

Whereas, the Colorado Department of Homeland Security and Emergency Management and Federal Emergency Management Agency, Region VIII officials have reviewed the Arapahoe County Hazard Mitigation Plan and approved it contingent upon this official adoption of the participating governing body; and

Now, therefore, be it resolved, that the (name of board or council), hereby adopts the Arapahoe County Hazard Mitigation Plan, as an official plan; and

Be it further resolved, Arapahoe County Emergency Management will submit this Adoption Resolution to the Colorado Department of Homeland Security and Emergency Management and Federal Emergency Management Agency, Region VIII officials to enable the Plan's final approval.

Passed: ___(date)___

_____

Certifying Official

APPENDIX B: PLANNING TEAM

The following tables list the members of the Hazard Mitigation Planning Committee (Table B-1) and stakeholders (Table B-2) that participated in this planning process, either by attending meetings or by contributing in other ways such as providing information, developing mitigation actions, and reviewing draft documents. Table B-3 lists additional stakeholders that were invited to participate but were unable to do so. See Section 2.3 for more information on the planning team.

Table B-1 Hazard Mitigation Planning Committee

Dept./Agency	Title	Name	Mtg 1 3/18/25	Mtg 2 5/28/25	Mtg 3 6/26/25	Other
Arapahoe County	Senior GIS Administrator	Dominick Cisson	X			X
Arapahoe County	GIS Administrator	Michael Hubbard	X			X
Arapahoe County	Manager of Information Security and Compliance	Nikki Rosecrans	X			
Arapahoe County 911 Authority	Executive Director	Cathy Raley	X			
Arapahoe County 911 Authority	Technical Advisor	Paul Smith				X
Arapahoe County CART & Animal Services	Field Supervisor	Alyssa Haden	X	X	X	
Arapahoe County Communications	Deputy Director	Chris Henning	X			
Arapahoe County Human Services	Deputy Director	Bob Prevost	X			
Arapahoe County OEM	Emergency Management Coordinator	Dave Autrey	X	X	X	
Arapahoe County OEM	Deputy Director	Ashley Cappel	X	X		X
Arapahoe County OEM	Emergency Management Coordinator	Jenika Doberstein	X			
Arapahoe County OEM	Emergency Management Coordinator	Jared Parker	X			
Arapahoe County OEM	Emergency Management Specialist	Anthony Zarella			X	X
Arapahoe County Open Spaces	Operations Manager	Glen Poole	X	X	X	
Arapahoe County Public Health	EPR Specialist	Lindsay Brown	X		X	
Arapahoe County Public Health	Environmental Health Manager	Steven Chevalier		X		
Arapahoe County Public Health	Emergency Preparedness & Response Manager	Sara Garrington	X			X
Arapahoe County Public Health	EPR Specialist	Lauren Johnson	X		X	X
Arapahoe County Public Works and Development	Transportation Division Manager	James Katzer	X			
Arapahoe County Public Works and Development	Environmental Program Manager	Lisa Knerr	X			
Arapahoe County Public Works and Development	Zoning and Animal Services	Caitlyn Mars	X	X		

Dept./Agency	Title	Name	Mtg 1 3/18/25	Mtg 2 5/28/25	Mtg 3 6/26/25	Other
Arapahoe County Public Works and Development	Road and Bridge Division Manager	Eric McKinnon	X	X		
Arapahoe County Public Works and Development	Engineering Services Division Manager	Ceila Rethamel	X			X
Arapahoe County Public Works and Development	Planning Division Manager	Jason Reynolds	X			
Arapahoe County Sheriff's Office	Communications Center Manager	Nate Treusch				X
Arapahoe County Sheriff's Office	PIO	John Bartmann	X	X	X	
Arapahoe County Sheriff's Office	Telecom	John Kyler	X	X		
Arapahoe County Sheriff's Office	PIO	Anders Nelson	X			
Centennial Airport	Director of Operations	Jeremy Gunn	X			
City of Centennial	Field Services Manager	Todd Harrison			X	
City of Centennial	Permit Tech.	Mariam Khokhar	X		X	
City of Centennial	Strategic Initiatives Manager	Jonah Schneider	X		X	
Cherry Hills Village	Deputy City Manager	Jay Goldie			X	
Cherry Hills Village	Community Development Director	Paul Workman	X	X		X
Denver Water	Senior Emergency Management Specialist	Nick Sporer	X	X		X
City of Englewood	Deputy City Manager	Tim Dodd	X			
City of Englewood	Public Works Director	Victor Rachael	X	X	X	
Town of Foxfield	Town Clerk	Monica Torres	X	X		
Glendale Police Department	Command Sergeant	Megan Gillis		X		
Glendale Police Department	Chief of Police	WJ Haskins			X	X
Glendale Police Department	Detective	Michael Sweeney	X	X		
City of Greenwood Village	Community Development Engineer	Cayla Cappello				X
Greenwood Village Police Dept.	Commander	Joe Gutgsell	X	X		
City of Littleton	Director of Public Works and Utilities	Brent Soderlin				X
City of Littleton	Water Resources Manager	Sarah White				X
Littleton Police	Division Chief	Gene Enley	X			
Sheridan Police Department	Commander	Joe Connelly			X	
Sheridan Police Department	Commander	Edward Leger			X	
Sheridan Police Department	Chief of Police	Jeffrey A. Martinez	X			
South Metro Fire Rescue	Emergency Manager	Dan Stutz	X	X		X
South Metro Fire Rescue	Accreditation Manager	Scot Swindall		X	X	

Table B-2 Stakeholder Participation

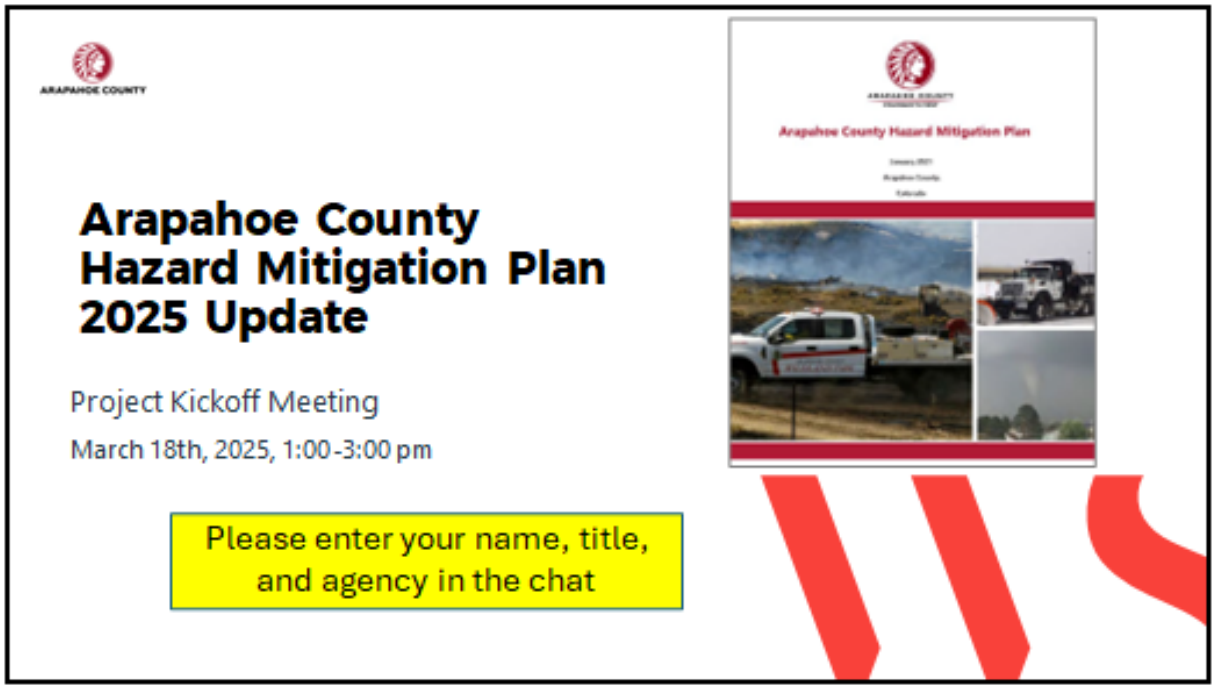
Dept./Agency	Title	Name	Mtg 1 3/18/25	Mtg 2 5/28/25	Mtg 3 6/26/25	Other
AdventHealth Littleton	Director of Safety/Security/EM	Rick Boyer	X	X		
American Red Cross	Disaster Program Volunteer	Mark Lindstone			X	
American Red Cross	Disaster Program Manager	Stacey Pottish	X			
Arapahoe Community College/ Colorado Community College System	Director of Emergency Management	Cory Stark	X			
Arapahoe County Public Works and Development	Chief Building Official	Greg Bragdon				X
Arapahoe County Public Works and Development	Planning and Land Development	Larry Mugler				X
Town of Bennett	Town Safety Officer	Gerilynn Scheidt				X
Bennett-Watkins Fire Rescue	Assistant Chief	Caleb Connor	X			
Bennett-Watkins Fire Rescue	Fire Chief	Earl Cumley	X			
Byers Fire	Fire Chief	Mike Disher	X			
Colorado DHSEM	Field Manager	Conner Berens				X
Colorado DHSEM	Mitigation Specialist	Jason Humble	X	X		X
Colorado DHSEM	Mitigation Project Specialist	Debbie Goerlitz			X	
Colorado DHSEM	State Hazard Mitigation Officer	Mark Thompson	X	X		X
Colorado DHSEM	Plans Supervisor	Matt West			X	
Town of Columbine Valley	Town Administrator	JD McCumb				X
Craig Hospital	Director of Safety and Emergency Management	Julie Negron	X			
Douglas County OEM	Director of Emergency Management	Michael Alexander	X			
HealthONE Aurora/Centennial/ Spalding/MHWC	Director of Safety HCA	Kelli Herndon	X			
Jefferson County OEM	EM Supervisor	Steph Baker	X			
Jefferson County OEM	Emergency Management Coordinator	Sarah Fry	X			
Mile High Flood District	Flood Warning Manager	Bruce Rindahl	X			
NWS	WCM	Greg Heavener			X	
NCR HCC	Executive Director	Chelsie Mazur		X		
Our Front Porch	COO	Heather Korth	X			
Platte River Power Authority	Communications & Marketing Manager	Steve Roalstad	X			
SEMSWA	Environmental Manager	Ashley Byerly		X		
SEMSWA	Drainage Crew Supervisor	Manuel Castillo	X			

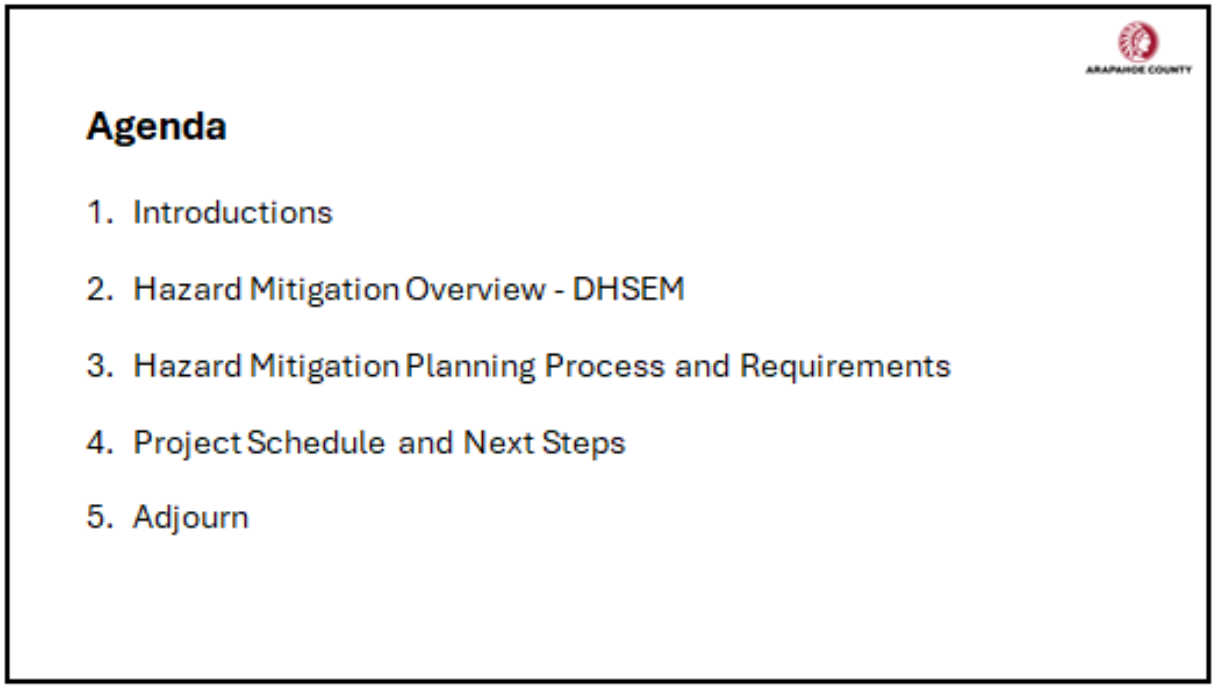
Dept./Agency	Title	Name	Mtg 1 3/18/25	Mtg 2 5/28/25	Mtg 3 6/26/25	Other
SEMSWA	Inspections and Contract Maintenance Manager	Britni Kahler	X	X		
SEMSWA	GIS/IT	Andy Kuster		X		
SEMSWA	Floodplain Manager	Cynthia Love			X	
SEMSWA	Senior Environmental Specialist	James Linden	X			
SEMSWA	Supervisor	Jeremy Marshall	X			
SEMSWA	Executive Director	Dan Olsen	X			
SEMSWA	GIS Analyst	Kevin Rierdan	X			
SEMSWA	Maintenance Manager	Brad Sullivan	X	X	X	
SEMSWA	Floodplain Manager	Jessica Traynor		X		
South Suburban Parks and Recreation	Park Ranger	Kendra Kimball			X	
South Suburban Parks and Recreation	Park Ranger	Ron Viles			X	
Strasburg Fire Protection District	Chief	Patrick Conroy	X	X		
USACE	Tri-Lakes Project	Delmar "Gene" Seagle	X			
WSP	Senior Technical Advisor	Jeff Brislawn	X			
WSP	GIS Analyst	Mack Chambers	X			
WSP	Project Manager	Scott Field	X	X	X	
WSP	HM Planner	Carlie Hager	X	X		
WSP	Deputy PM	Christopher Johnson	X			
WSP	HM Planner	Bailey Nock	X	X	X	
Xcel Energy	Senior Wildfire Community Engagement Manager	Zoe DeVito	X			
Xcel Energy	Area Manager	Nathan Steele	X			

Table B-3 Additional Stakeholders Invited To Participate

Agency	
Adams County Office of Emergency Management	Denver Office of Emergency Management
Centennial Airport	Elbert County Office of Emergency Management
Colorado Baptists	Lincoln County Office of Emergency Management
Colorado Department of Natural Resources, Dam Safety Program	Littleton Hospital
Colorado Parks and Wildlife	Platte River Power Authority
Colorado State Forest Service	Our Front Porch
Colorado State University	Sable Altura Fire
CORE Electric Cooperative	U.S. Forest Service
Deer Trail Fire	Washington County Office of Emergency Management

APPENDIX C: PLANNING PROCESS DOCUMENTATION





Arapahoe County, Colorado Multi-Jurisdictional Hazard Mitigation Plan 2025 Update Kick-Off Meeting Summary

Tuesday, March 18, 2025,
1:00 – 3:00 pm MST
Virtual Meeting via Teams

Introductions and Opening Remarks

This document summarizes the kickoff meeting for the 2025 update of the Arapahoe County Hazard Mitigation Plan. The meeting was held virtually via Teams, with members of the Hazard Mitigation Planning Committee (HMPC) in attendance. The meeting was facilitated by WSP USA Environment & Infrastructure, the consulting firm contracted by Arapahoe County to guide the planning process and develop the updated Plan.

Ashley Cappel with Arapahoe County Emergency Management began the meeting with a brief introduction of the plan update and emphasized the importance of maintaining a current Hazard Mitigation Plan (HMP). Scott Field, Project Manager with WSP, explained that updating the HMP every five years is necessary for jurisdictions who seek FEMA grant funding before or after disasters. Sixty-nine (69) people attended, representing a mix of county departments, city/town departments, special districts, and stakeholders:

- Alyssa Haden
- Anders Nelson
- Ashley Cappel
- Bob Prevost
- Brad Sullivan
- Britni Kahler
- Bruce Rindahl
- Caitlyn Mars
- Caleb Connor
- Carlie Hager
- Cathy Raley
- Ceila Rethamel
- Christopher Johnson
- Cory Stark
- Dan Stutz
- Dan Olsen
- Dave Autrey
- Delmar "Gene" Seagle
- Dominick Cisson
- Earl Cumley
- Eric McKinnon
- Gene Enley
- Glen Poole
- Heather Korth
- James Katzer
- James Linden
- Jared Parker
- Jason Humble
- Jason Reynolds
- Jeff Brislawn
- Jeffrey A. Martinez
- Jenika Doberstein
- Jeremy Gunn
- Jeremy Marshall
- Joe Gutgsell
- John Kyler
- John Bartmann
- Jonah Schneider
- Julie Negron
- Kelli Herndon
- Kevin Rierdan
- Lauren Johnson
- Lindsay Brown
- Lisa Knerr
- Mack Chambers
- Manuel Castillo
- Mariam Khokhar
- Mark Thompson
- Michael Alexander
- Michael Sweeney
- Michael Hubbard
- Mike Disher
- Monica Torres
- Nathan Steele
- Nick Sporer
- Nikki Rosecrans
- Pat Conroy
- Paul Workman
- Rick Boyer
- Sara Garrington
- Sarah Fry
- Scott Field
- Stacey Pottish
- Steph Baker
- Steve Roalstad
- Tim Dodd
- Victor Rachael
- Zoe DeVito

Following introductions, Scott discussed the agenda items; the key discussion is summarized below, and additional details are within the meeting PowerPoint presentation.

Hazard Mitigation Overview (Colorado DHSEM)

The Colorado Division of Homeland Security & Emergency Management (DHSEM) gave a presentation on the concept of hazard mitigation planning and its importance. Mitigation is any sustained action taken to reduce or eliminate long-term risk to human life and property from natural or human-caused hazards. Mitigation planning guides mitigation activities in a coordinated and economic manner to make communities more disaster resilient. An example of hazard mitigation is the practice of elevating homes located near a river so the house stays above rising water during a flooding event and therefore minimizes damages to the home. The FEMA definition of mitigation does not include purchasing emergency vehicles or radios for communication, because those resources would be used to respond to a disaster, not prevent one.

The U.S. Disaster Mitigation Act of 2000 requires state and local governments to adopt a hazard mitigation plan, updated every five years, to maintain eligibility for pre- and post-disaster FEMA mitigation assistance grants. There are two main types of benefits a community gain from having a FEMA approved hazard mitigation plan (HMP); (1) the planning process is a great way to collaborate with other jurisdictions in the community; (2) having an HMP approved by FEMA makes a community eligible for FEMA grants to include the Hazard Mitigation Grant Program (HMGP), Building Resilient Communities and Infrastructure (BRIC), Flood Mitigation Assistance (FMA), and the Rehabilitation of High Hazard Dams (HHPD) grant. Funding requests from FEMA needs to be based on the hazards and mitigation strategy in the HMP. Information from the HMP, specifically the vulnerability assessment and mitigation strategy, can be used in other hazard related plans such as an Emergency Operations Plans or Community Wildfire Protection Plans.

There are trends resulting in increased costs for disaster response and recovery related to population growth and the increase in the types of events we experience as a community. HMPs reduce future recovery costs by planning for predicted events, and guide mitigation activities in a coordinated manner. Additionally, mitigation efforts are economically beneficial; a recent study found that on average every $1 spent on mitigation saves $6 in disaster response costs.

Hazard Mitigation Planning Process and Requirements

This HMP update will build on the 2020 Arapahoe County HMP, updating the risk assessment to reflect changes in current hazards, risk and vulnerability, and climate change considerations. Other requirement for the plan update includes revisiting goals, reviewing the progress on previous mitigation actions, and creating new actions.

The Arapahoe County Hazard Mitigation Plan (HMP) will be updated in accordance with the Disaster Mitigation Act (DMA) requirements following a 4 Phase approach:

1. **Get Organized:** The first phase in the approach is a commitment from jurisdictions to participate in planning and determine the planning team. The Hazard Mitigation Planning Committee (HMPC) includes county, municipalities, and special districts. Local input and participation from HMPC members is required for FEMA approval. Stakeholders include other local, state, and federal agencies with a stake in hazard mitigation in the County or may include academic institutions and local business and industry. Neighboring counties were also notified about the update and will be given an

opportunity to provide input into the process. The HMPC noted to add the US Army Corp of Engineers and Team Rubicon to the plan update.

The following jurisdictions are expected to participate in the 2025 update and re-adopt the plan:

- Arapahoe County
- Town of Bennett
- Town of Bow Mar
- Town of Columbine Valley
- City of Centennial
- City of Cherry Hills Village
- Town of Deer Trail
- City of Englewood
- Town of Foxfield
- City of Glendale
- City of Greenwood Village
- City of Littleton
- City of Sheridan
- Denver Water
- South Metro Fire Rescue (new in 2025 plan)

Planning for Public Involvement: It is advantageous to involve the public in the planning process to strength local support for the plan and ensure that the mitigation actions outlined in the HMP will better suit local needs. There will be two main opportunities for public engagement.

Early in the update, an online survey will be circulated to gather input from the public on hazard concerns and mitigation ideas. The survey is an online form that takes less than 5 minutes to complete. The URL for the survey will be sent to the HMPC to be advertised to community members through public information channels, official websites, social media, email blasts, etc.

Later in the process, a public review draft of the plan will be made available for public review and comment.

2. **Risk Assessment:** The hazard identification and risk assessment (HIRA) is used to describe hazards, identify community assets, analyze risk based on gaps in assets, and summarize vulnerability. Conducting a risk assessment is a key aspect of a hazard mitigation plan and involves two components; hazard identification (what can happen here) and the vulnerability assessment (what will be affected). The HMP update will be based on existing documents and studies, with the Arapahoe County Hazard Mitigation Plan (2020) providing the baseline for identified hazards and the groundwork for goals, policies, and actions for hazard mitigation. Data on hazards from the past 5 years will be used to conduct the risk assessment, using sources such as GIS-based maps, historic records, insurance data, etc. Members of the HMPC and the public will ground truth this data to ensure the HMP is accurate and to maximize the utility of the document.

   The list of hazards from the 2020 County HMP were reviewed.

- Severe Summer Weather
- Severe Winter Weather
- Pandemic
- Dam Failure/Incident
- Flooding
- Drought
- Hazardous Materials
- Cyber Threat
- Severe Wind/Tornado
- Wildfire
- Active Threat

The group thought the original list of hazards is still valid, but suggested adding urban conflagration (urban fire) to the plan. Other comments regarding the hazard identification included:

- Juliane noted that the HHS HVA tool uses great data to assess risks
- Ashley noted that Arapahoe just kicked off a fuel moisture monitoring program. Three locations are spread out across the county.
- Jason mentioned that the Colorado Wildfire Resiliency Code Board has published their draft statewide fire hazard map; direct link: https://experience.arcgis.com/experience/34c113129c044004bc672ca5493378de/

The 7 FEMA community lifelines will be used to organize community assets and then a vulnerability assessment will be conducted to identify infrastructure and groups of people who will be more likely to experience losses.

3. **Develop the Mitigation Plan:** Scott continued to explain that the third step consists of reviewing goals and objectives from the 2020 Arapahoe HMP, reviewing mitigation alternatives to expand or improve previous goals, and then drafting an action plan.

The goals of the 2020 Arapahoe County HMP were reviewed:

Goal 1: Prevent the loss of lives and injuries from hazards.

Goal 2: Prevent and/or reduce damages to public and private property from hazards.

Goal 3: Reduce the adverse economic and natural resource impacts of hazards.

Goal 4: Reduce the vulnerability of critical infrastructure and key facilities to the impacts of hazards.

Several types of mitigation projects are eligible for FEMA funding, including wildfire fuels reduction, culvert replacement, generator installation, climate resilience activities, etc. The 2020 Plan contained 105 mitigation actions; the participating jurisdictions will need to provide an update on the status of each mitigation action, in addition to creating new mitigation actions.

Four drafts of the plan will be developed over the course of the planning process:

1. Internal review

2. Public review
3. State review
4. FEMA review

4. **Adoption and Implementation:** Once the plan is officially adopted, the designated project manager for each participating jurisdiction will integrate the plan into existing structures and track progress of the mitigation actions. The HMP will be revised as necessary to keep the plan current. Scott emphasized that in order to keep this HMP used, it is important to incorporate the document into existing plans and reference the document in future plans.

Ashley noted that OEM reconvenes the HMPC annually for a one-hour meeting to update the status of mitigation actions, to share lessons learned, projects, or case studies applicable to the HMP.

Project Schedule and Next Steps:

The HMP will be updated over the next ten months, with at least two more meetings with the HMPC and a predicted final approval date for the HMP by December 2025. WSP will be updating the Hazard Identification and Risk Assessment (HIRA) in the next couple of months, with input from the HMPC. The anticipated timeline of the planning process is displayed below.

Phase/Task	Feb 2025	Mar	Apr	May	Jun	Jul 2025	Aug	Sep	Oct	Nov	Dec
Phase 1: Organize Resources											
Initial Coordination											
Stakeholder Outreach											
Kickoff Meeting	Mtg										
Data Collection and Review											
Public Survey											
Phase 2: Assess Risks											
Assess Existing Risk Assessment											
Update Risk Assessment											
Capability Assessment											
Planning Meeting #2				Mtg							
Phase 3: Develop HMP Mitigation Strategy											
Update Mitigation Strategy											
Planning Meeting #3					Mtg						
Preparation of Draft Plan											
Planning Team Review											
Public Comment Period											
Phase 4: Plan Adoption, Monitoring & Evaluation											
State Review											
FEMA Review											
Local Adoptions											
Final Plan											

Participants are encouraged to send updated information to OEM and/or WSP, to include:

- Recent hazard events (since 2020) – damages, incident logs, damage assessments, etc.
- Growth and development trends
- Community Wildfire Protection Plan (CWPP) updates
- Recent updated plans and policies
- Latest GIS data

A Plan Update Guide will be sent to all participating jurisdictions. Jurisdictions should review the hazard rankings, capability assessment tables, and fill out the status of actions from the previous HMP and **return the Plan Update Guide to WSP by April 25, 2025.**

It is important that all jurisdictions stay involved in the planning process to get FEMA approval of the HMP and ensure that the plan is suited to local needs. The role of the HMPC is to provide accurate information and contribute ideas that will ensure the HMP is a useful document.

Participation requirements for **jurisdictions**:

- Attend and participate in planning meetings/workshops
- Provide available data requested by County OEM & WSP
    - Complete & return Plan Update Guides
- Advertise and assist with public input process
- Provide input on progress of local mitigation actions
- Identify new actions
- Review and comment on draft plan
- Coordinate formal adoption

Participation requirements for **stakeholders**:

- Attend HMPC meetings
- Stay in loop via email list
- Provide data/information – no need to wait for us to ask!
- Help advertise public survey and review draft
- Partner on mitigation efforts
- Review and comment on draft plan

Arapahoe County HMPC will share the meeting summary, handouts, presentation, and meeting recording so that other HMPC members that could not attend today's meeting could get up to speed. WSP will begin work on the Hazard Identification and Risk Assessment update and develop a public survey that can be used online. The next HMPC meeting will be focused on the update of the Hazard Identification and Risk Assessment section. The specific date will be shared when available.

Adjourn
The meeting adjourned at 2:35 pm MST.

Arapahoe County Hazard Mitigation Plan 2025 Update

Hazard Identification and Risk Assessment (HIRA) Meeting

May 28th, 2025, 9:30am

Please complete the sign in sheet linked in the chat

Agenda

1. Review of the hazard mitigation planning process
2. Hazards review
3. Update of hazard mitigation goals & actions
4. Next steps
5. Questions and answers

Summary of the Arapahoe County, Colorado
Multi-Jurisdictional Hazard Mitigation Plan Update
Risk Assessment and Goals Meeting

Wednesday, May 28th, 2025
9:30 am to 11:30 pm MST
In Person Meeting
13101 E Broncos Pkwy, Centennial

Subject/Purpose
The purpose of the meeting was to review the highlights of the updated Hazard Identification and Risk Assessment and revisit the plan's goals. The meeting was delivered as an in person meeting with no virtual option.

Attendees
31 people total attended the meeting including:

- Ashley Cappel
- Alyssa Haden
- Rick Boyer
- David Autrey
- Glen Poole
- Steven Chevalier
- Caitlyn Mars
- Eric McKinnon
- John Bartmann
- John Kyler
- Paul Workman
- Victor Rachael
- Jason Humble
- Mark Thompson
- Nick Sporer
- Megan Gillis
- Michael Sweeney
- Joe Gutgsell
- Chelsie Mazur
- Brad Sullivan
- Britni Kahler
- Andy Kuster
- Ashley Byerly
- Jessica Traynor
- Scot Swindall
- Dan Stutz
- Monica Torres
- Carlie Hager
- Bailey Nock
- Scott Field
- Patrick Conroy

Introductory Remarks/Review of the planning process

Ashley Cappel, Arapahoe County OEM, gave a brief introduction of the meeting and its purpose.

There was a general discussion of the uncertainty surrounding FEMA and the Hazard Mitigation Assistance grants. While the BRIC and FMA grants have been canceled, it is expected that some new grant(s) will be released to replace them. Additionally there are a lot of federal and state grants out there to fund mitigation activities. This will be discussed in more detail at the next meeting.

Scott Field, WSP, gave an overview of planning activities completed so far.

- The kickoff meeting was held March 18, 2025;
- WSP has updated the risk assessment based on research, GIS analysis, and stakeholder input.
- Capability assessment update is in progress, with 10 out of 15 participating jurisdictions so far returned completed Plan Update Guides;

The public survey ran through April 20th, 2025, and received 400 responses.

- The hazards that the public ranked highest were drought, severe summer weather, wildfire, and cyber incident.
    - The lowest ranked hazards were dam failure, flooding, and pandemic.

- The highest ranked mitigation activities were wildfire/grass fire fuels treatment projects, evacuation route development, critical facilities & infrastructure resiliency, and public education and awareness on hazards.
    - The lowest ranked mitigation activities were buyout of floodprone properties, tornado safe rooms, and dam safety.
- 66% of respondents were from the City of Centennial

Review of identified hazards and vulnerability assessment update highlights

The general risk assessment requirements were outlined before turning to a detailed discussion of each hazard. An overview was given of the changes in the hazards profiled and Arapahoe County decided to continue with the same hazards as the previous plan, except for adding a hazard. WSP discussed the hazard rankings that will be used for the plan update and highlights were presented on each hazard included in the updated risk assessment chapter of the plan. Refer to the PowerPoint presentation for specific details on each hazard. Highlights of the discussion are noted by hazard in the bulleted list below.

- Flooding – Medium Significance
    - In addition to FEMA flood maps, newer data from the Colorado Water Conservation Board will be analyzed.
    - In the 1% floodplain there are 1,127 residents and 541 parcels at risk, with estimated property losses of $164M. There are 0 Category A critical facilities and 120 Category B critical facilities in the 1% floodplain; most of these are bridges.
    - In the 0.2% floodplain there are an additional 3,960 residents and 1,711 parcels at risk, with estimated losses at $491M. There are 2 Category A critical facilities and 37 Category B critical facilities in the 0.2% floodplain.

- Dam Failure – High Significance
    - There are 8 high hazard dams in Arapahoe County, and another 13 upstream that have the potential to impact the County.
    - There are more than 42,000 residents and 19,000 properties in potential dam inundation areas, along with 13 Category A critical facilities and 135 Category B critical facilities.
    - Dam inundation maps cannot be included in public version.
- Drought – Medium Significance
    - In the last 5 years, the County was in some level of drought 63% of the time.
    - Impacts include economic losses from crop damage, public health issues such as impaired drinking water quality, and increased risk of wildfires and floods.
- Severe Summer Weather – High Significance
    - Includes lightning, hail, and extreme heat.
    - Very frequent: 40-50 thunderstorms per year
    - Hail is the costliest hazard, causing $339,000 in insured crop losses a year in Arapahoe County.
    - Closely related to drought and tornado
- Severe Wind/Tornado – Medium Significance
    - Since 2004 the County has experienced 21 tornadoes and 62 strong/high wind events
    - Combined these events caused $3M in insured crop losses, $700K in uninsured property damage, and 5 injuries.
    - The HMPC noted the recent tornado that touched down in Colorado.
    - The HMPC discussed potentially breaking this into two hazards, but decided to keep them together.
- Severe Winter Weather – High Significance
    - Very frequent: average of 8 severe winter storms per year

    - Since 1996, 236 winter storms have impacted the County, causing $18.6M in property damage.
- Wildfire – Medium Significance
    - Includes both forest fires and grassland fires.
    - HMPC considered changing severity rating and overall significance rating to high.
    - There are 33,000 residents and 5,600 properties worth $12B in areas of moderate, high, or highest WUI risk.
    - The rural areas of the county more likely to be affected than the urban areas, although potential impacts are higher in the urban parts.
    - Also significant WUI risk in the South Metro response area south of Arapahoe County.
- Urban Conflagration – High Significance
    - New hazard for in 2025.
    - Examples include the 2025 Palisades Fire, 2021 Marshall Fire, the 2018 Camp Fire, and the 2013 Lac-Mégantic train derailment.
    - High winds involved can make conventional mitigation ineffective.
    - Planning for notification and evacuation is critical.
- Pandemic – High Significance
    - While the COVID pandemic is over, the US has experienced a new pandemic every 20 years and that rate may be accelerating.
    - Arapahoe Public Health and Denver Water both said this is high and still an ongoing issue for them.
- Hazmat Release – Medium Significance
    - In 35 years there have been 52 hazmat incidents with injuries, fatalities, damage, or evacuations, although most injuries/fatalities result from the accident that caused the release rather than the material itself.
    - Frequency of incidents has increased over the years from under 5/year in 1990 to over 15/year by 2023.
    - There are 7 Risk Management Plan (RMP) hazmat facilities in the County, along with multiple rail and highway routes that ship hazardous materials.
    - There are 550 residents, 273 properties, and 22 critical facilities are within 1,000 feet of an RMP site.
- Active Shooter – Low Significance
    - Active shooter incidents can occur at any mass gathering, including workplaces, schools, places of worship, or events.
    - Number of incidents per year depends on what criteria you use, but the numbers have definitely been increasing.
- Cyber Threat – Medium Significance
    - Trend is also on the rise; local governments are a popular target for ransomware attacks.
- Subsidence/Expansive Soils
    - Not profiled in previous plan, but new data is available showing a significant portion of the County has the potential for subsidence or collapsing soils.
    - A slow hazard, it rarely impacts life safety, but causes significant property damage over time.
    - HMPC decided not to include the hazard in the plan, but to make sure planning departments have access to the data when permitting construction.

Next Steps

- The next meeting will be held in June (date TBD) and will focus on updating the mitigation strategy part of the plan.

- Scott briefly reviewed the mitigation goals from the 2020 plan; these will be revisited during our next meeting.
- Mitigation actions from the previous plan will need to be updated. There is no expectation they have been completed, but we'll need a status update.
- The HMPC discussed how the HMP has been integrated or cross-referenced with other plans.

ARAPAHOE COUNTY

Arapahoe County Hazard Mitigation Plan 2025 Update

Mitigation Strategy Workshop
June 26th, 2025,
9:00-11:00am MDT

wsp

Agenda

ARAPAHOE COUNTY

1. Introductions
2. Planning process update
3. Mitigation goals & objectives
4. Progress on existing mitigation actions
5. Types of mitigation actions
6. Development of new mitigation actions
7. Mitigation action prioritization
8. Next steps

wsp

Arapahoe County Hazard Mitigation Plan Update Meeting #3
Mitigation Strategy Meeting
June 26th, 2025, 9-11:00am MST
13101 East Broncos Parkway, Centennial, Colorado, 80112

The meeting began with an introduction by Anthony Zarrella of the Arapahoe County Office of Emergency Management. He explained the purpose of hazard mitigation plans and the importance of each jurisdiction participating. He then passed it over to Scott Field from the consulting company WSP to start the presentation.

Scott gave introductions for himself and his team and then had everyone in the room introduce themselves and their positions.

Bailey Nock from WSP then presented a planning process update and a refresh on what was discussed in the previous meetings, as well as the hazard rankings decided on by the HMPC. She also discussed the mitigation goals and objectives. The HMPC read the 2020 HMP goals and agreed to keep them the same for this update.

Bailey then presented the progress on existing mitigation actions and went over what the HMPC will need to do with the mitigation action tables. The status of each mitigation action will need to be updated, with each jurisdiction having their own tab.

Scott then discussed potential mitigation actions, he started by giving examples of what is and what is not an acceptable mitigation action. He then reviewed mitigation alternatives and categories, followed by a review of critical infrastructure tiers and climate change adaptation considerations.
The following hazards were reviewed for projects eligible for FEMA funding:

- Flooding
- Winter Storms
- Wildfire

Potential funding sources were discussed from the following sources:

- FEMA

Comments from HMPC: FMA is back, it was just paused not canceled

- Other federal agencies
- State and local

The next section discussed the development of new mitigation actions.
Comments from HMPC:

- A member of the HMPC noted that the plan does not need a new action for every hazard, actions can carry over, but every hazard will need at least one action
- The HMPC also noted that high hazards should have more actions than just education
- It can still include education but that shouldn't be the only action

Scott went over the STAPLEE acronym (Social, Technical, Administrative, Political, Legal, Economic, and Environmental) as well as other selection and prioritization things to consider. He then went over the sources of ideas for mitigation actions, public survey results, thing FEMA will not count, and new mitigation actional development.

Comments from HMPC:

- Comment on public survey: "Designate one or more emergency methods of communication that all residents know about and can readily use in event of an emergency." It shows the need to make the public aware of certain resources that are available.

The new mitigation actions were assigned to a due date of July 15th, 2025.
The new mitigation action worksheets were handed out to the HMPC and a 10-minute break was held to write a new action down.
Comments from HMPC: It was emphasized to include which jurisdiction(s) will need the action
Once the new mitigation actions were handed back to Scott he went over them individually to allow for the HMPC member to give further explanation on what they wrote. Comments for each action were recorded below:

Action: Blackmer Tributary – Controlled spill – Highline canal
HMPC members' comments:
- Collaboration between Arapahoe County and the jurisdictions that the highline will go through
- Updates to model
- Cherry Hills not acting independently
- Should be done in the next 6 months

Action: Centennial Building Division – COOP
HMPC members' comments:
- New building division
- Look up COOP if haven't
- Don't know Arapahoe COOP planner

Action: S. Platte River between West Hampden and West Oxford (Mary Carter Trail)
HMPC members' comments:
- In Broomfield

Action: The Cherry Creek Greenway Creek Bed has downed trees
HMPC members' comments:
- Cut back undergrowth
- Hasn't gotten to Glendale

Action: Wildland/Grass Fire Mitigation
HMPC members' comments:
- Counties' open space program
    - Fire districts are very small
- Need to collaborate with each other
- Resource protection = wildlife

Action: Fuel Capacity Increase (Diesel)
HMPC members' comments:
- New bulk tank
- Fueling city vehicles
- Conversations with the county
    - Can't take snowplows to a private gas station
    - Supply can run low or attack son supply (Sun Corp energy)
- Disperse fuel with power outage
    - need above ground tanks
    - generator at gas stations?

Action: Urban Conflagration in Centennial

HMPC members comments:

- developing coordination
    - proactive to plan to not lose pressure
    - public understanding of evacuation routes

Action: Prescribed Burn at the Carson Nature Center

HMPC members comments:

- unsure who does them in that area
- need to figure out who

Develop SWMP, CWPP

- Implementation and maintenance sections

Action: Develop and/or update mitigation related plans

Action: Backup generator at fire station

HMPC members comments:

- OHSEM discussed how all critical facilities need them

Scott then discussed next steps in the planning process and went over the project tasks and schedules.

Are we ready for an emergency?

CA Communication Services <communicationservices@arapahoegov.com>
To Ashley Cappel
Retention Policy ACG 24 Months (2 years) Expires 4/11/2027
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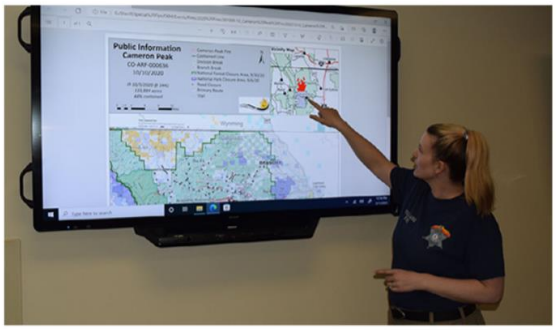
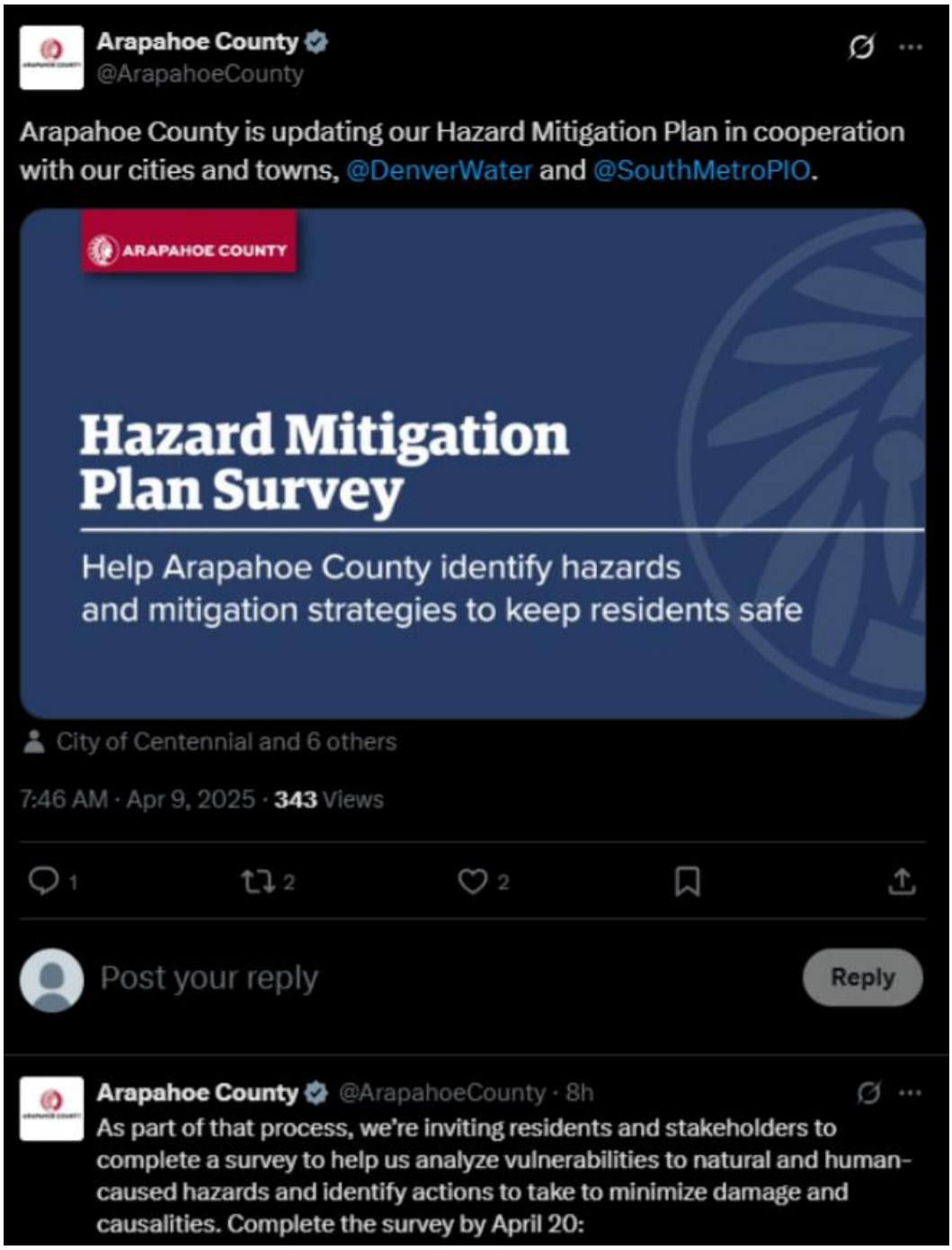


Help Us Reduce the Impacts of Hazards Before They Occur

The County is updating our Hazard Mitigation Plan in cooperation with our cities and towns, Denver Water, and South Metro Fire. As part of that process, we're inviting residents and stakeholders to complete a survey that helps us analyze vulnerabilities to natural and human-caused hazards and identify actions to take to minimize damage and causalities. You can complete the survey through April 20.


Arapahoe County
@ArapahoeCounty
Arapahoe County is updating our Hazard Mitigation Plan in cooperation with our cities and towns, @DenverWater and @SouthMetroPIO.
ARAPAHOE COUNTY
Hazard Mitigation Plan Survey
Help Arapahoe County identify hazards and mitigation strategies to keep residents safe
City of Centennial and 6 others
7:46 AM · Apr 9, 2025 · 343 Views
1
2
2
Post your reply
Reply
Arapahoe County @ArapahoeCounty · 8h
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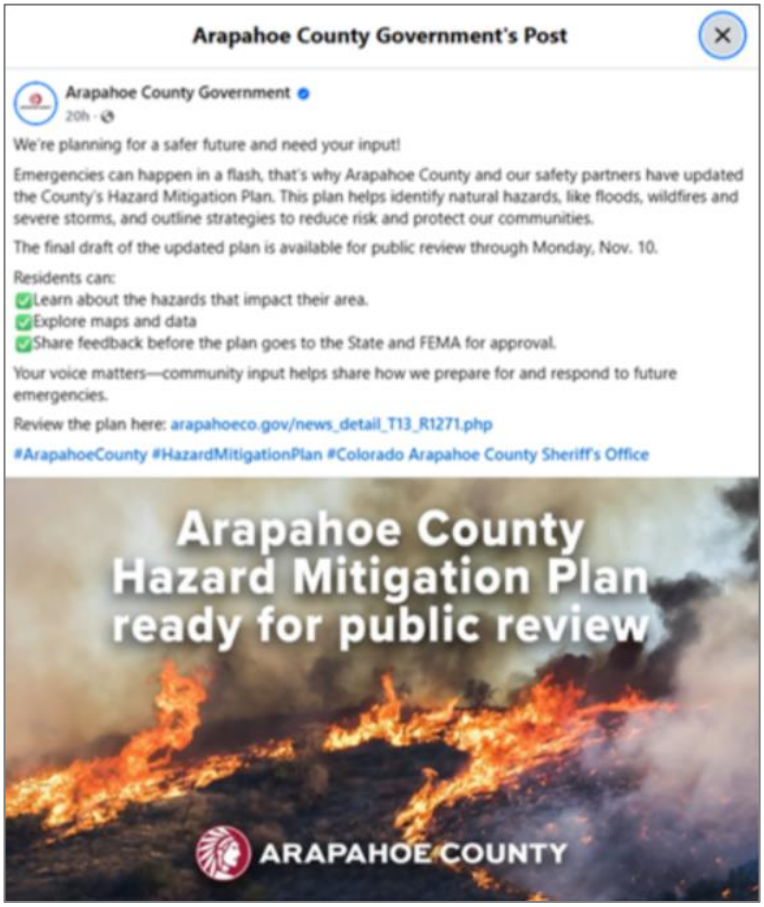
Arapahoe County Government's Post
Arapahoe County Government
20h ·
We're planning for a safer future and need your input!
Emergencies can happen in a flash, that's why Arapahoe County and our safety partners have updated the County's Hazard Mitigation Plan. This plan helps identify natural hazards, like floods, wildfires and severe storms, and outline strategies to reduce risk and protect our communities.
The final draft of the updated plan is available for public review through Monday, Nov. 10.
Residents can:
✅Learn about the hazards that impact their area.
✅Explore maps and data
✅Share feedback before the plan goes to the State and FEMA for approval.
Your voice matters—community input helps share how we prepare for and respond to future emergencies.
Review the plan here: arapahoeco.gov/news_detail_T13_R1271.php
#ArapahoeCounty #HazardMitigationPlan #Colorado Arapahoe County Sheriff's Office
Arapahoe County Hazard Mitigation Plan ready for public review
ARAPAHOE COUNTY

Arapahoe County Hazard Mitigation Plan ready for public review
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We're planning for a safer future and need your input! The Final Draft of Arapahoe County's Hazard Mitigation Plan is ready for public review through Nov. 10.
✅Learn about local hazards
✅Explore maps and strategies
✅Share your feedback
Together, we can make Arapahoe County safer and more resilient.
Visit the link in our bio to review the plan.
#ArapahoeCounty #HazardMitigationPlan #Colorado @ArapahoeSO
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✅Learn about local hazards
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Review the plan: arapahoeco.gov/news_detail_T1...
Arapahoe County Hazard Mitigation Plan ready for public review
ARAPAHOE COUNTY
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2

Arapahoe County Hazard Mitigation Planning Public Input Survey

4/11/25, 10:27 AM The news to know from your County Commissioners

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ARAPAHOE COUNTY

The County Line

The weekly newsletter from the Arapahoe County Board of Commissioners | April 11, 2025

Gimme Shelter! Reserve your park shelters now at Dove Valley

Ready to plan a group picnic or outdoor gathering? Rent one of our new and improved park shelters at Dove Valley Regional Park in Centennial. Now accepting reservations between April 1–Oct. 19, weekends only! (During 2025, all other park shelters at County-owned parks and open spaces are available on a first-come, first-served basis.)

For general shelter information and to make a reservation at Dove Valley, visit arapahoeco.gov/parkshelters

https://mailchi.mp/78ab06ecdbd8/the-news-to-know-from-your-county-commissioners?e=[UNIQID] 1/5

4/11/25, 10:27 AM The news to know from your County Commissioners

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Estimated 46,000 tons of asphalt to be used in 2025 road projects!

Public Works and Development's Road & Bridge division has a "Titanic" summer paving program ahead for unincorporated roadways in eastern and western portions of the County.

The 46,000 tons of asphalt that will be used in this year's road projects are the same weight as the massive ocean liner. -Read Full Article-

https://mailchi.mp/78ab06ecdbd8/the-news-to-know-from-your-county-commissioners?e=[UNIQID] 2/5

business?

Boots to Business Reboot provides an overview of entrepreneurship and applicable business ownership fundamentals. Veterans of all eras, active-duty service members, and spouses are eligible to participate.

Friday, April 18 | 8 a.m.–5 p.m.
CentrePoint Plaza | 14980 E. Alameda Dr. in Aurora
For more information, call 719-310-7262 or email CHundley@mtcarmelcenter.org

Advocates for those who can't speak for themselves

Animal Services' dedicated staff does more than just enforce laws. They are emergency responders, providing lifesaving care, rescuing the lost, preventing cruelty, and educating the public.

They advocate for a huge population that can't speak for itself and are reliant on their owners or agencies for their well-being.

This month these professionals are celebrated for their dedication and sacrifices during Animal Control Officer Appreciation Week, which is April 13–19. -Read Full Article-

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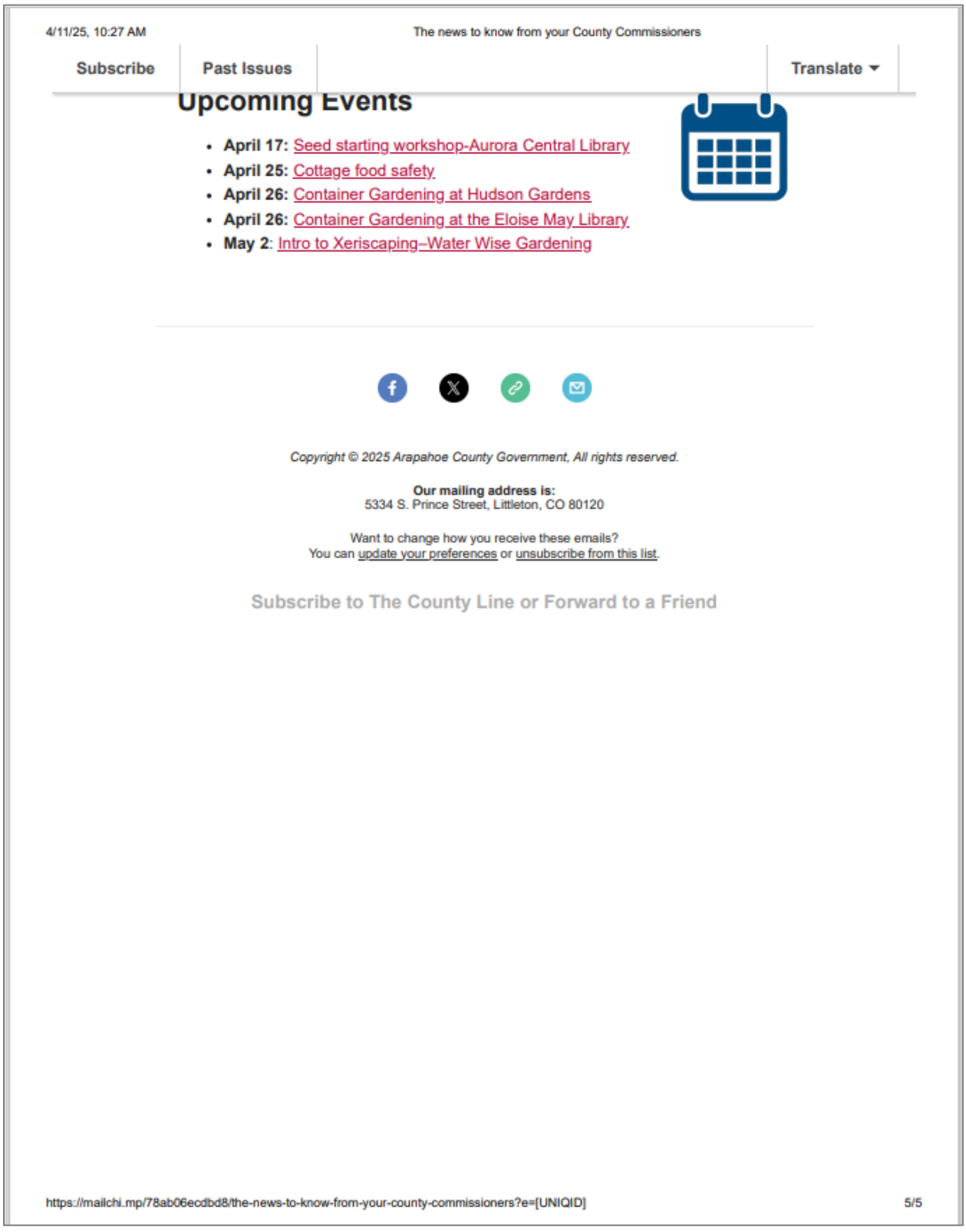
Hazard Mitigation Plan Survey

Help Arapahoe County identify hazards and mitigation strategies to keep residents safe

Arapahoe County is updating our Hazard Mitigation Plan in cooperation with our cities and towns, Denver Water, and South Metro Fire. As part of that process, we're inviting residents and stakeholders to complete a survey that helps us analyze vulnerabilities to natural and human-caused hazards and identify actions to take to minimize damage and causalities.

Complete the Survey **by April 20**.

Get involved in the Arapahoe County community by joining the Liquor Authority! This group conducts public hearings for consideration of all applications relating to new alcohol beverage licenses, the consideration of a change of location for a current license, alleged violations of the Colorado Liquor and Beer Codes, and controversial issues pertaining to the liquor licensing process and/or laws. Learn more and apply at arapahoeco.gov/getinvolved.



4/11/25, 10:27 AM The news to know from your County Commissioners

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Upcoming Events

- **April 17:** Seed starting workshop-Aurora Central Library
- **April 25:** Cottage food safety
- **April 26:** Container Gardening at Hudson Gardens
- **April 26:** Container Gardening at the Eloise May Library
- **May 2**: Intro to Xeriscaping–Water Wise Gardening

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To: Ashley Cappel
Subject: Are we ready for an emergency?
Date: Friday, April 11, 2025 8:31:09 AM

ACWeekly April 11, 2025

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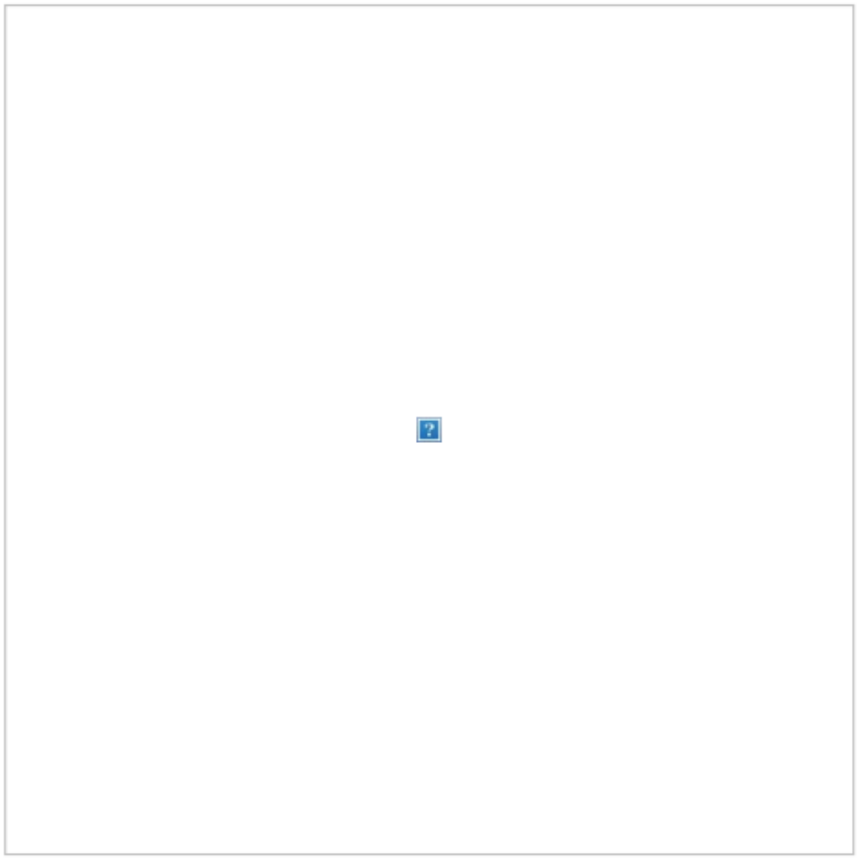

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Complete the Survey

Centennial
COLORADO

Help Shape Arapahoe County's Hazard Mitigation Plan

Hi Centennial Residents,

Arapahoe County is in the process of updating its Hazard Mitigation Plan and your input is requested.

The Hazard Mitigation Plan identifies local risks—like natural disasters and other human-caused hazards—and outlines steps to reduce their impact on people and property. As part of this update, Arapahoe County is working with cities across the region, including Centennial, as well as partners like South Metro Fire and Denver Water.

Your feedback is an important part of the process. Will you complete this quick 5-minute survey to share your thoughts and help shape how our region prepares for and responds to hazards? Your valuable input will help guide future planning decisions that keep our communities safe and resilient. **Please complete the survey by April 20**.

Take the survey.

From: Jonah Schneider
To: Ashley Cappel
Subject: FW: Help Shape Arapahoe County"s Hazard Mitigation Plan
Date: Wednesday, April 9, 2025 12:48:49 PM
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Sent: Tuesday, April 8, 2025 2:32 PM
To: Michael Gradis <mgradis@centennialco.gov>
Subject: Help Shape Arapahoe County's Hazard Mitigation Plan

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Centennial
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Take the survey.

Thank you for helping to make Centennial—and Arapahoe County—safer and better prepared for the future.

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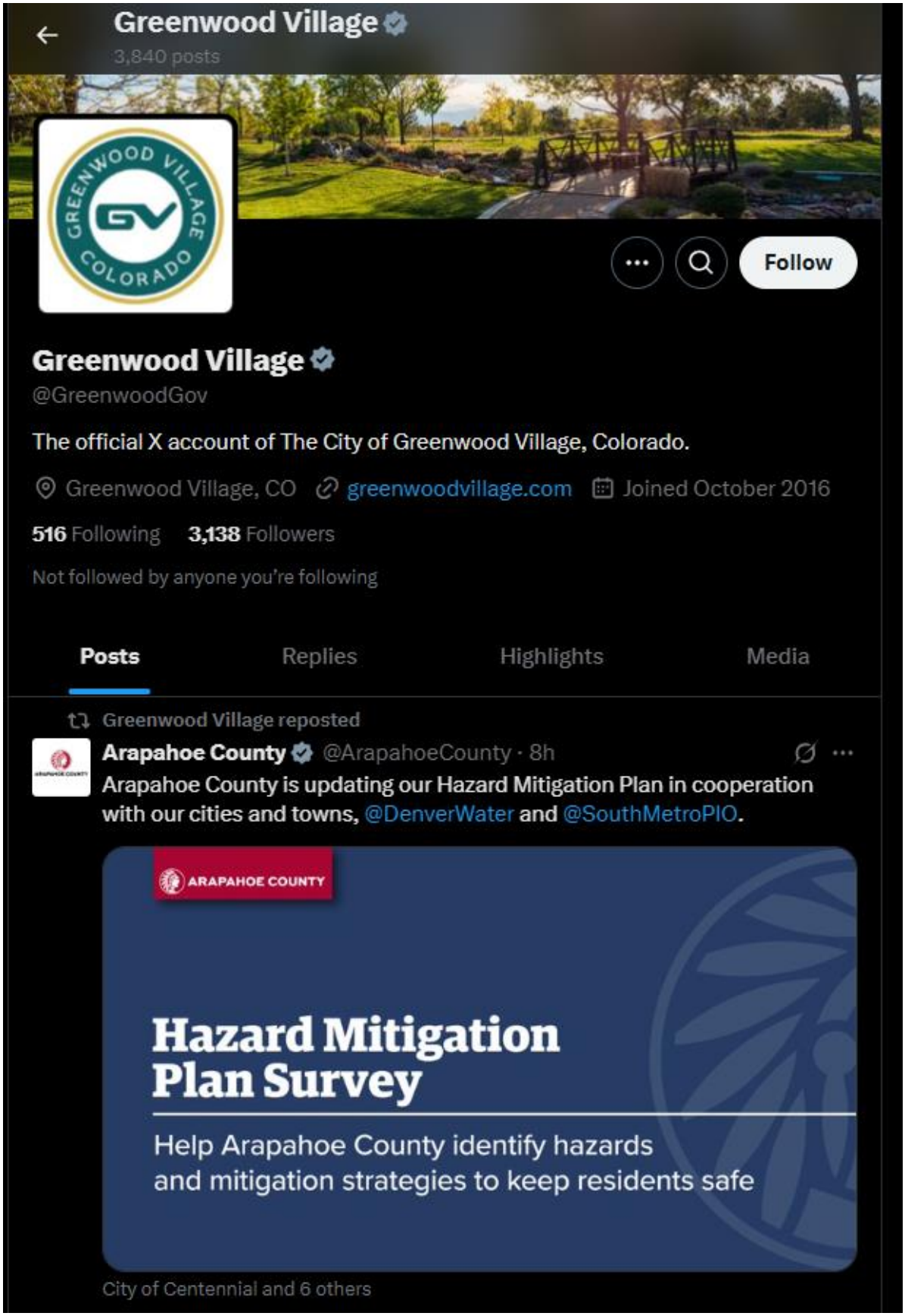
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ARAPAHOE COUNTY
Hazard Mitigation Plan Survey
Help Arapahoe County identify hazards and mitigation strategies to keep residents safe
City of Centennial and 6 others

From: Ashley Cappel
To: Cathy Raley; Alyssa Haden; Chris Henning; Lisa Knerr; Dominick Cisson; Michael Hubbard; Elizebeth Loomis; Bob Prewost; Nikki Rosecrans; Nathan Fogg; David Autrey; Jared Parker; Ashley Cappel; Jenika Doberstein; Glen Poole; Jason Reynolds; Sara Garrington; Lindsay Brown; Lauren Johnson; Steve Chevalier; Ceila Rethamel; Eric McKinnon; John Kyler; James Katzer; Caitlyn Mars; Adam Burson; Nathen Treusch; John Bartmann; Anders Nelson; Ronald Sigman; stacey.pottish@redcross.org; matthew.lepkowski@redcross.org; Chapman, Matthew; Earl Cumley; Capt. Caleb Conner; Brett Cottrell; Sue Blair; Mike Disher; Vanessa Gates; jschneider@centennialco.gov; mkhokhar@centennialco.gov; kelli.dahl@healthonecares.com; pworkman@cherryhillsvillage.com; Jay Goldie; dbelz@coloradobaptists.org; cory.stark@cccs.edu; brichter@core.coop; Brett Cottrell; JD McCrumb; brent.lounsbury@state.co.us; jnegron Craig POC; Rich Loveless; nspore@denverwater.org; Mallory.Buys@denverwater.org; christe.coleman@state.co.us; markw.thompson@state.co.us; jason.humble@state.co.us; matthew.west@state.co.us; malexand@dcsheriff.net; Vrachael@englewoodco.gov; Tim Dodd; bockstahler.breann@epa.gov; msweeney@glendale.co.us; Megan Gillis; MSweeney@Glendale.co.us; jgutgsell@greenwoodvillage.com; Nathaniel J. Whittington; sefry@co.jefferson.co.us; stabaker@co.jefferson.co.us; Jeremy Gunn; Gene Enley; rick.boyer@adventhealth.com; brindahl@mhfd.org; cmazur@ncrhcc.org; greg.heavener@noaa.gov; heather@ourfrontporchco.org; rsolomon@sablealturafire.org; abyerley@semswa.org; krierden@semswa.org; bsullivan@semswa.org; bkahler@semswa.org; jlinden@semswa.org; jmarshall@semswa.org; dolsen@semswa.org; MCastillo@semswa.org; clove@semswa.org; Jeffrey A. Martinez; chelsea.molitor@southmetro.org; Jeff Keener; mike.dellorfano@southmetro.org; scot.swindall@southmetro.org; dan.stutz@southmetro.org; aceda@ssprd.org; mfraser@ssprd.org; pconroy@svfd8.org; gscheidt; Randi Gallivan; joseph.r.maxwell@usace.army.mil; delmar.e.seagle@usace.army.mil; michael.chancey@xcelenergy.com; nathan.a.steele@xcelenergy.com; Steve.P.Roalstad@xcelenergy.com; Zoe.DeVito@xcelenergy.com
Cc: John Bartmann; Anders Nelson
Subject: Hazard Mitigation Plan Public Survey
Date: Monday, April 7, 2025 3:20:42 PM
Attachments: Arapahoe County Public Survey QR Code.jfif
image001.png

Survey Says?!?

Our first survey is ready for distribution far and wide. Please coordinate with your respective Communications Teams to help our survey reach throughout the community. (We also need a little bit of proof to satisfy this task, so send me your screenshots from social media, newsletters, website, etc as you are able. Especially important participation proof for our municipalities and two special districts that plan to adopt.) If you'd like to coordinate your communication distribution with the internal team, John and Anders on the cc line will be your points of contact.

This is for the public AND you as our stakeholders. Don't forget about your own employees who live and work in our community!

Brief talking points and link below plus a flyer with a mobile friendly version is attached:

Arapahoe County is updating our Hazard Mitigation Plan in cooperation with the incorporated cities and towns in the County, as well as Denver Water and South Metro Fire.

The Hazard Mitigation Plan analyzes the County's vulnerabilities to natural and human-caused hazards, and identifies mitigation actions the County can take to minimize property damage and reduce the loss of life by lessening the impacts of disasters. It is updated every 5 years in accordance with the federal Disaster Mitigation Act of 2000.

The purpose of this survey is to collect information from the public and stakeholders to better

understand the risks within the County, as well as solicit input on how to best mitigate or reduce the impacts of hazards before they occur. The survey should take approximately 5 minutes to complete.

Please complete this survey by April 20th.

https://forms.office.com/e/Ciwj5pAg2q

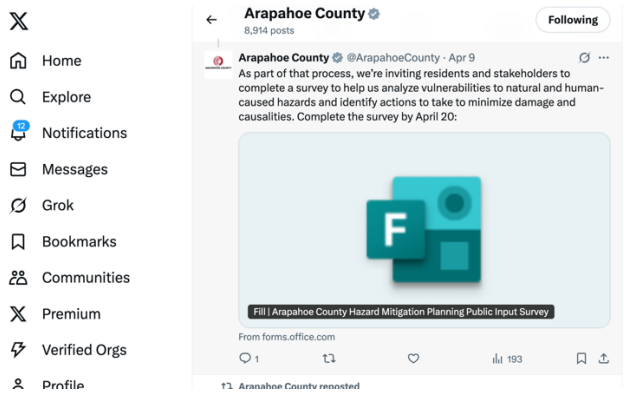
Ashley Cappel, CO-CEM
Deputy Director
Office of Emergency Management
13101 E. Broncos Parkway
Centennial, Colorado 80112
720-874-4046

Arapahoe County
Hazard Mitigation Survey 2025
Survey communications

Social Media

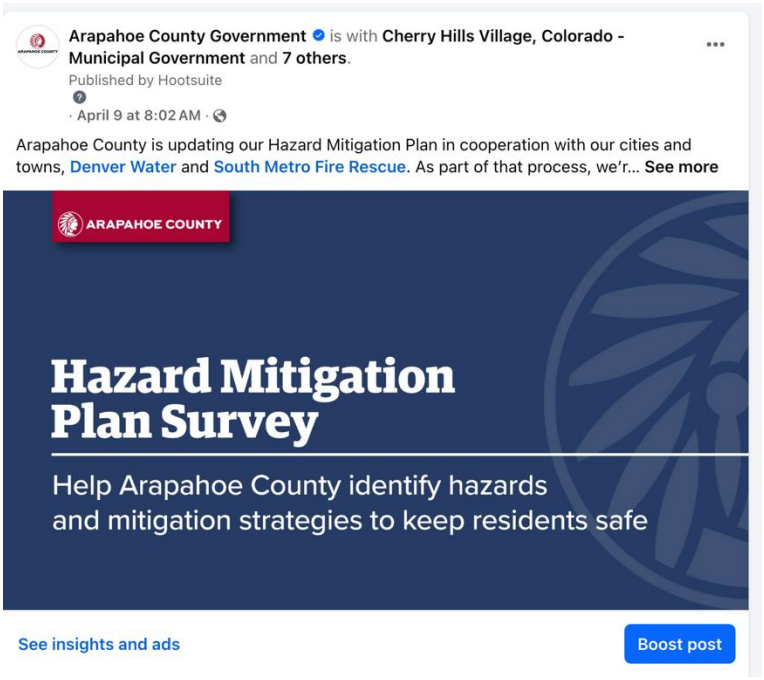
Twitter

- Views: 2,094
- Clicks: 5



Facebook/Threads

- Views: 6,136
- Reach: 3,299
- Interactions: 14
- Link clicks: 420



Owned Media

The County Line Newsletter

- Total distributed: 2,141
- Open rate: 61.3% (high)
- Clicks to survey: 66

ACWeekly (employee) newsletter

- Total distributed: 2,751
- Overall Open rate: 98.3%
- Survey specific clicks: 94 (11.5%)

County Website

Our Front Porch
Published by Heather Korth
· Just now ·

Arapahoe County is updating their Hazard Mitigation Plan and needs your input if you live within the county.

The Hazard Mitigation Plan analyzes the County's vulnerabilities to natural and human-caused hazards, and identifies mitigation actions the County can take to minimize property damage and reduce the loss of life by lessening the impacts of disasters. It is updated every 5 years in accordance with the federal Disaster Mitigation Act of 2000.

The purpose of this survey is to collect information from the public and stakeholders to better understand the risks within the County, as well as solicit input on how to best mitigate or reduce the impacts of hazards before they occur. The survey should take approximately 5 minutes to complete.

Please complete this survey by April 20th.

Scan the QR code or go here: https://forms.office.com/e/Ciwj5pAg2q

4/18/25, 11:52 AM Share Your Input – Hazard Mitigation Plan Update for Arapahoe County | Workshop

Arapahoe County Hazard Mitigation Planning Public Input Survey

Hello SMFR Personnel,

South Metro is currently collaborating with Arapahoe County along with city, town and agency stakeholders to update the County's Hazard Mitigation Plan — and your input is a vital part of the process. This plan helps identify risks and actions we can take before disasters happen to protect lives and property. The plan is updated every five years in compliance with the federal Disaster Mitigation Act of 2000.

As part of this important effort, we are seeking input to better understand the risks facing our communities. Your feedback will also help identify ways to reduce those risks before disasters occur.

We invite you to take this brief survey, linked in the button below. The survey should take about **5 minutes** to complete. **Please complete this by April 20th.**

Thank you for helping make Arapahoe County safer and more resilient.

Share your input here

SMFR Communications Team
South Metro Fire Rescue
9195 E Mineral Ave | Centennial, CO 80112

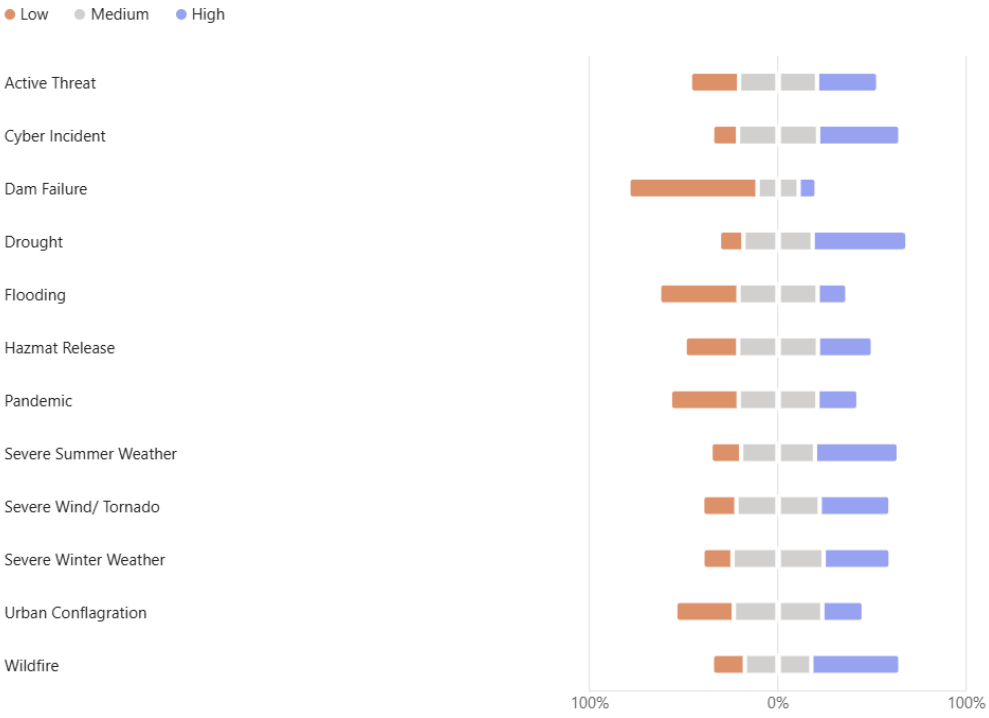
APPENDIX D: PUBLIC INPUT

Public Survey

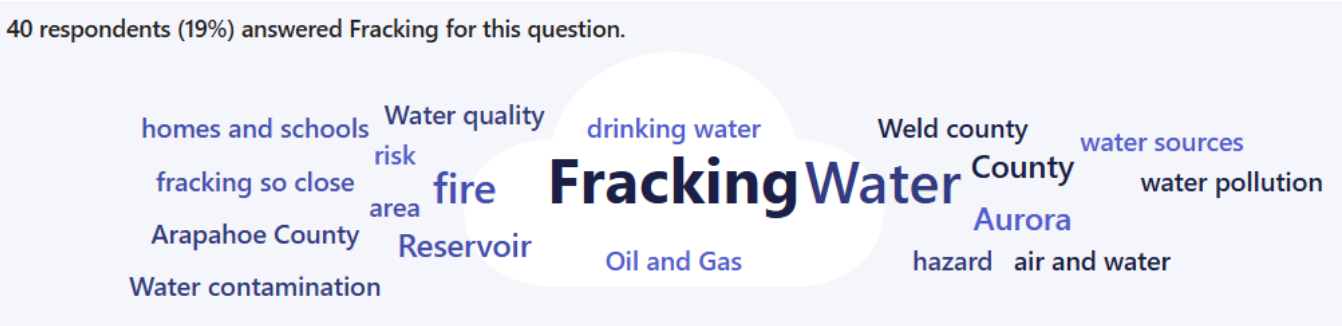
Public and stakeholder input was also collected at the beginning of the planning process through an online survey from March 14th to June 30th, 2025. The survey was advertised by the County and participating jurisdictions through social media.

The survey provided an opportunity for public input during the planning process prior to finalization of the plan update. The public survey received responses from 401 individuals. Responses to the survey are shown on the following pages. Based on this survey, the public perceives the most significant hazards to be Cyber Incidents, Severe Summer Weather, Wildfire, and Drought.

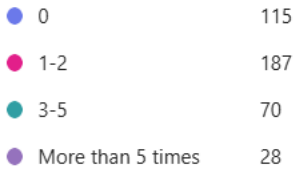
1. The Arapahoe County Hazard Mitigation Plan addresses the following hazards. Please rate how significant you feel each hazard is in Arapahoe County in terms of both how likely an event is as well as severe the impacts would be.

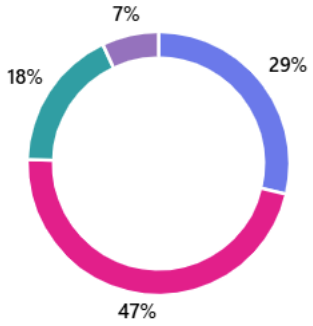


2. Are there other natural or human-caused hazards you feel the planning team should consider?



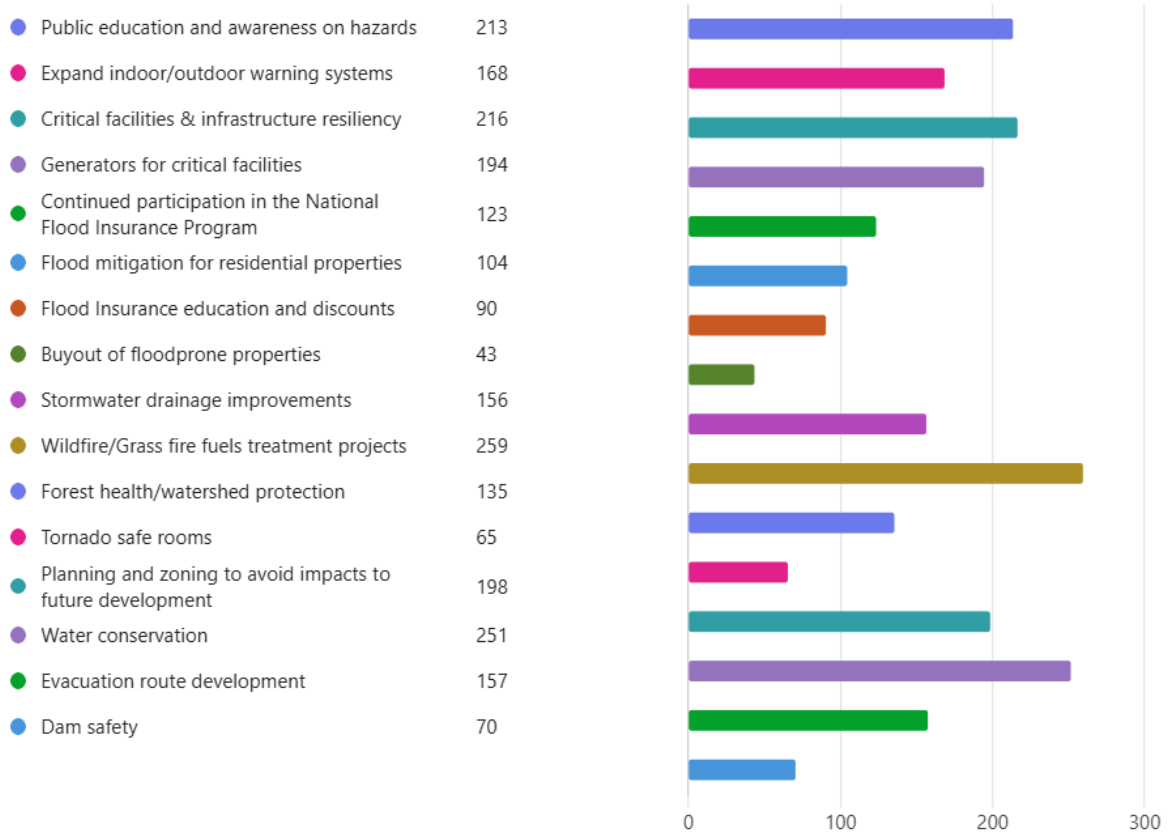
3. How many times has a natural hazard disrupted your daily life in the last five years?





4. Do you have information on specific hazard issues or problem areas you would like the planning committee to consider? Note the jurisdiction to which it applies.

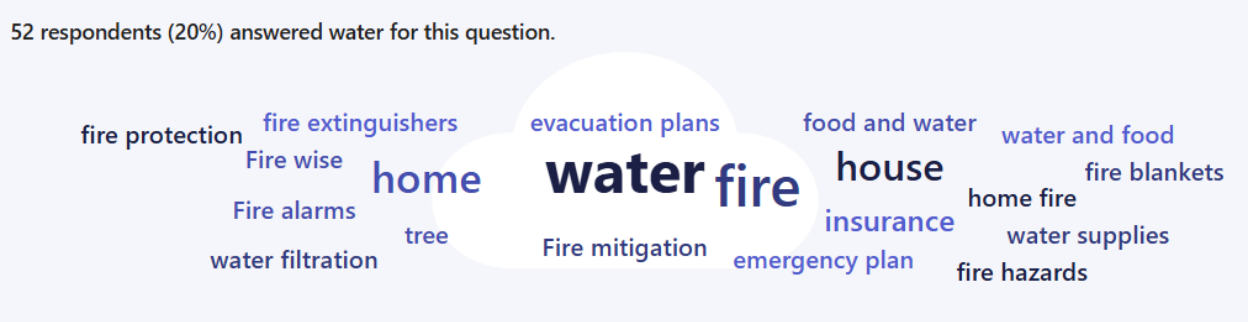
5. The following types of mitigation actions may be considered in Arapahoe County. Please ind icate which actions you think should have the highest priority in Arapahoe County?



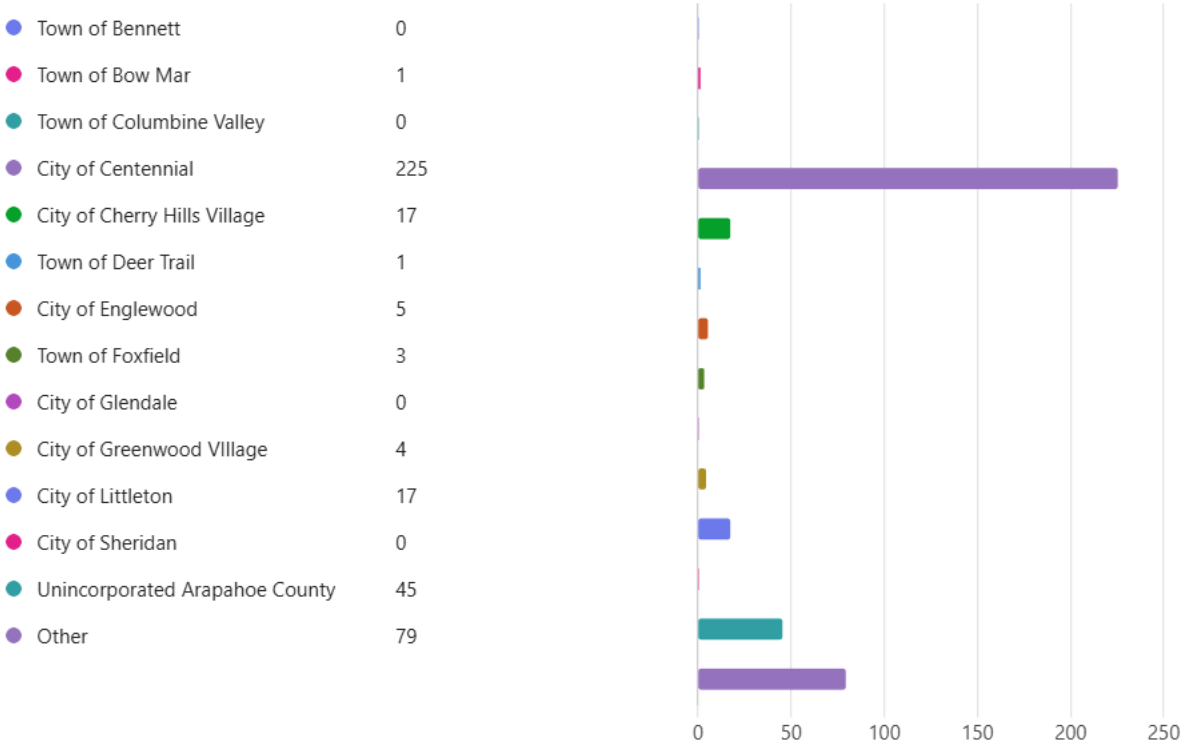
6. Are there any other pre-disaster strategies you think the planning committee should consider for reducing future losses from hazards.

31 respondents (20%) answered fire for this question.

7. What have you personally done to protect yourself and your household from hazards?



8. Where do you live?



9. How long have you lived in this community?

Public Review

Public input was collected through an opportunity to review and comment on the completed draft plan in October 2025. The draft plan was made available on the County website, along with an online comment form. The plan was advertised by the County through social media and their websites. The public was given a two-week period from October 30th to November 10th, 2025, to review and provide comments. No public comments were received on the draft Plan.

APPENDIX E: REFERENCES

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APPENDIX F: GLOSSARY

Acronyms

ACS	American Community Survey
AFB	Air Force Base
AOS	American Opportunity Survey
APWA	American Public Works Association
BCEGS	Building Code Effectiveness Grading Schedule
BLE	Base Level Engineering
BP	Burn Probability
BRIC	Building Resilient Infrastructure and Communities grant program
CBRN	Chemical/Biological/Radiological/Nuclear
CDBG	Community Development Block Grant
CDC	Center of Disease Control and Prevention
CDHE	Colorado Department of Higher Education
CDOT	Colorado Department of Transportation
CDPHE	Colorado Department of Public Health and Environment
CEPC	Colorado Emergency Planning Committee
CIP	Capital Improvements Plan
CIPP	Critical Infrastructure Protection Planning
CFIRS	Colorado Division of Fire Prevention and Control's Fire Incident Reporting System
CFR	Code of Federal Regulations
CGS	Colorado Geological Survey
CISA	Cyber & Infrastructure Security Agency
COOP	Continuity of Operations Plan
CO-WRAP	Colorado Wildfire Risk Assessment Program
COVID-19	Coronavirus Disease 2019
CPG	Comprehensive Preparedness Guide
CRS	Community Rating System
CWCB	Colorado Water Conservation Board
CWPP	Community Wildfire Protection Plan
DDoS	Distributed Denial-of-Service
DEM	Digital Elevation Model
DFIRM	Digital Flood Insurance Rate Maps
DHSEM	Department of Homeland Security and Emergency Management

DIA	Denver International Airport
DMA	Disaster Mitigation Act
DOJ	Department of Justice
DOT	Department of Transportation
DRCOG	Denver Regional Council of Governments
DWR	Division of Water Resources
EAP	Emergency Action Plan
ECOS	Environmental Conservation Online System
EF	Enhanced Fujita
EMAP	Emergency Management Accreditation Program
EOP	Emergency Operations Plan
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESF	Emergency Support Functions
FBI	Federal Bureau of Investigation
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FIRM	Flood Insurance Rate Map
FMA	Flood Management Assistance grant program
FIS	Flood Insurance Study
FSA	Farm Services Agency
GDP	Gross Domestic Product
GIS	Geographic Information System
GTD	Global Terrorism Database
Hazus-MH	Hazards, United States-Multi Hazard
HHPD	High Hazard Potential Dam
HIFLD	Homeland Infrastructure Foundation-Level Data
HMA	Hazard Mitigation Assistance grant program
HMGP	Hazard Mitigation Grant Program
HMP	Hazard Mitigation Plan
HMPC	Hazard Mitigation Planning Committee
IBC	International Building Code
IBHS	Insurance Institute for Business & Home Safety
IC3	Internet Crime Compliant Center

IPAWS	Integrated Public Alert and Warning System
LAL	Lightning Activity Scale
LEPC	Local Emergency Planning Committee
MHFD	Mile High Flood District
Mph	Miles per Hour
NASA	National Aeronautics and Space Administration
NCA4	Fourth National Climate Assessment
NCEI	National Center for Environmental Information
NDMC	National Drought Mitigation Center
NEPA	National Environmental Protection Act
NFHL	National Flood Hazard Layer
NFIP	National Flood Insurance Program
NFIRS	National Fire Incident Reporting System
NHPA	National Historic Preservation Act
NID	National Inventory of Dams
NIFC	National Interagency Fire Center
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRC	National Response Center
NRHP	National Register of Historic Places
NWS	National Weather Service
OEM	Office of Emergency Management
OIT	Office of Information Technology
OSHA	Occupational Safety and Health Administration
PA	Public Assistance
PDSI	Palmer Drought Severity Index
PIO	Public Information Officer
PPE	Personal Protective Equipment
PUC	Colorado Public Utility Commission
RMA	Risk Management Agency
RMP	Risk Management Plan
SBA	Small Business Administration
SCADA	Supervisory Control and Data Acquisition

SEMSWA	Southeast Metro Stormwater Authority
SFHA	Special Flood Hazard Area
SMFR	South Metro Fire Rescue
SPI	Standardized Precipitation Index
SRL	Severe Repetitive Loss
STAPLEE	Social, Technical, Administrative, Political, Legal, Economic, and Environmental
SWE	Snow Water Equivalent
THIRA	Threat Hazard Identification Risk Assessment
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildfire Service
USGS	U.S. Geological Survey
WEA	Wireless Emergency Alert
WHO	World Health Organization
WUI	Wildland Urban Interface

Definitions

100-Year Flood: The term "100-year flood" can be misleading. The 100-year flood does not necessarily occur once every 100 years. Rather, it is the flood that has a 1% chance of being equaled or exceeded in any given year. Thus, the 100-year flood could occur more than once in a relatively short period of time. The Federal Emergency Management Agency (FEMA) defines it as the **1% annual chance flood**, which is now the standard definition used by most federal and state agencies and by the National Flood Insurance Program (NFIP).

500-Year Flood: Like the 100-Year flood, the term "500-year flood" can be misleading. It does not mean that such a flood occurs only once every 500 years. Instead, it refers to a flood event that has a 0.2% chance of being equaled or exceeded in any given year. This means that even though it is less likely to occur than the100-year flood, it could still happen more than once within a few centuries, or even within a single decade. FEMA recognizes the 500-year flood as the **0.2% annual chance flood**, which is often used to define areas of moderate flood hazard beyond the boundaries of the 100-year floodplain.

Acre-Foot: An acre-foot is the amount of water it takes to cover 1 acre to a depth of 1 foot. This measure is used to describe the quantity of storage in a water reservoir. An acre-foot is a unit of volume. One acre foot equals 7,758 barrels; 325,829 gallons; or 43,560 cubic feet. An average household of four will use approximately 1 acre-foot of water per year.

Asset: An asset is any man-made or natural feature that has value, including, but not limited to, people; buildings; infrastructure, such as bridges, roads, sewers, and water systems; lifelines, such as electricity and communication resources; and environmental, cultural, or recreational features such as parks, wetlands, and landmarks.

Base Flood: The flood having a 1% chance of being equaled or exceeded in any given year, also known as the "100-year" or "1% chance" flood. The base flood is a statistical concept used to ensure that all properties subject to the NFIP are protected to the same degree against flooding.

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 or water reactive materials.
- Hospitals, nursing homes, and housing likely to contain occupants who may not be sufficiently mobile to avoid death or injury during a hazard event.
- Police stations, fire stations, vehicle and equipment storage facilities, and emergency operations centers that are needed for disaster response before, during, and after hazard events.
- Public and private utilities, facilities and infrastructure that are vital to maintaining or restoring normal services to areas damaged by hazard events.
- Government facilities.

Dam: Any artificial barrier or controlling mechanism that can or does impound 10 acre-feet or more of water.

Dam Failure: Dam failure refers to a partial or complete breach in a dam (or levee) that impacts its integrity. Dam failures occur for a number of reasons, such as flash flooding, inadequate spillway size, mechanical failure of valves or other equipment, freezing and thawing cycles, earthquakes, and intentional destruction.

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.

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.

Exposure: Exposure is defined as the number and dollar value of assets considered to be at risk during the occurrence of a specific hazard.

Extent: The extent is the size of an area affected by a hazard.

Fire Behavior: Fire behavior refers to the physical characteristics of a fire and is a function of the interaction between the fuel characteristics (such as type of vegetation and structures that could burn), topography, and weather. Variables that affect fire behavior include the rate of spread, intensity, fuel consumption, and fire type (such as underbrush versus crown fire).

Fire Frequency: Fire frequency is the broad measure of the rate of fire occurrence in a particular area. An estimate of the areas most likely to burn is based on past fire history or fire rotation in the area, fuel conditions, weather, ignition sources (such as human or lightning), fire suppression response, and other factors.

Flash Flood: A flash flood occurs with little or no warning when water levels rise at an extremely fast rate

Flood Insurance Rate Map (FIRM): FIRMs are the official maps on which the Federal Emergency Management Agency (FEMA) has delineated the Special Flood Hazard Area (SFHA).

Flood Insurance Study: A report published by the Federal Insurance and Mitigation Administration for a community in conjunction with the community's FIRM. The study contains such background data as the base flood discharges and water surface elevations that were used to prepare the FIRM. In most cases, a community FIRM with detailed mapping will have a corresponding flood insurance study.

Floodplain: Any land area susceptible to being inundated by flood waters from any source. A FIRM identifies most, but not necessarily all, of a community's floodplain as the SFHA.

Floodway: Floodways are areas within a floodplain that are reserved for the purpose of conveying flood discharge without increasing the base flood elevation more than 1 foot. Generally speaking, no development is allowed in floodways, as any structures located there would block the flow of floodwaters.

Floodway Fringe: Floodway fringe areas are located in the floodplain but outside of the floodway. Some development is generally allowed in these areas, with a variety of restrictions. On maps that have identified and delineated a floodway, this would be the area beyond the floodway boundary that can be subject to different regulations.

Freeboard: Freeboard is the margin of safety added to the base flood elevation.

Frequency: For the purposes of this plan, frequency refers to how often a hazard of specific magnitude, duration, or extent is expected to occur on average. Statistically, a hazard with a 100-year frequency is expected to occur about once every 100 years on average and has a 1% chance of occurring any given year. Frequency reliability varies depending on the type of hazard considered.

Fujita Scale of Tornado Intensity: Tornado wind speeds are sometimes estimated on the basis of wind speed and damage sustained using the Fujita Scale. The scale rates the intensity or severity of tornado events using numeric values from F0 to F5 based on tornado wind speed and damage. An F0 tornado (wind speed

less than 73 miles per hour [mph]) indicates minimal damage (such as broken tree limbs), and an F5 tornado (wind speeds of 261 to 318 mph) indicates severe damage.

Goal: A goal is a general guideline that explains what is to be achieved. Goals are usually broad-based, long-term, policy-type statements and represent global visions. Goals help define the benefits that a plan is trying to achieve. The success of a hazard mitigation plan is measured by the degree to which its goals have been met (that is, by the actual benefits in terms of actual hazard mitigation).

Geographic Information System (GIS): GIS is a computer software application that relates data regarding physical and other features on the earth to a database for mapping and analysis.

Hazard: A hazard is a source of potential danger or adverse condition that could harm people or cause property damage.

Hazardous Material: A substance or combination of substances which, because of quantity, concentration, or physical, chemical, or infectious characteristics, may either cause or significantly contribute to an increase in mortality or an increase in serious, irreversible, or incapacitating reversible, illness.

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.

Lightning: Lightning is an electrical discharge resulting from the buildup of positive and negative charges within a thunderstorm. When the buildup becomes strong enough, lightning appears as a "bolt," usually within or between clouds and the ground. A bolt of lightning instantaneously reaches temperatures approaching 50,000ºF. The rapid heating and cooling of air near lightning causes thunder. Lightning is a major threat during thunderstorms. In the United States, 75 to 100 Americans are struck and killed by lightning each year (see http://www.fema.gov/hazard/thunderstorms/thunder.shtm).

Local Government: Any county, municipality, city, town, township, public authority, school district, special district, intrastate district, council of governments (regardless of whether the council of governments is incorporated as a nonprofit corporation under State law), regional or interstate government entity, or agency or instrumentality of a local government; any Indian tribe or authorized tribal organization, or Alaska Native village or organization; and any rural community, unincorporated town or village, or other public entity.

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 Actions: Mitigation initiatives are specific actions to achieve goals and objectives that minimize the effects from a disaster and reduce the loss of life and property.

Objective: For the purposes of this plan, an objective is defined as a short-term aim that, when combined with other objectives, forms a strategy or course of action to meet a goal.

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.

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.

Special Flood Hazard Area: The base floodplain delineated on a FIRM. The SFHA is mapped as a Zone A in riverine situations. The SFHA may or may not encompass all of a community's flood problems

Stakeholder: Business leaders, civic groups, academia, non-profit organizations, major employers, managers of critical facilities, farmers, developers, special purpose districts, and others whose actions could impact hazard mitigation.

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.

Wildfire: Wildfire refers to any uncontrolled fire occurring on undeveloped land that requires fire suppression. The potential for wildfire is influenced by three factors: the presence of fuel, topography, and air mass. Fuel can include living and dead vegetation on the ground, along the surface as brush and small trees, and in the air such as tree canopies. Topography includes both slope and elevation. Air mass includes temperature, relative humidity, wind speed and direction, cloud cover, precipitation amount, duration, and the stability of the atmosphere at the time of the fire. Wildfires can be ignited by lightning and, most frequently, by human activity including smoking, campfires, equipment use, and arson.

Windstorm: Windstorms are generally short-duration events involving straight-line winds or gusts exceeding 50 mph. These gusts can produce winds of sufficient strength to cause property damage. Windstorms are especially dangerous in areas with significant tree stands, exposed property, poorly constructed buildings, mobile homes (manufactured housing units), major infrastructure, and aboveground utility lines. A windstorm can topple trees and power lines; cause damage to residential, commercial, critical facilities; and leave tons of debris in its wake.

Zoning Ordinance: The zoning ordinance designates allowable land use and intensities for a local jurisdiction. Zoning ordinances consist of two components: a zoning text and a zoning map.

APPENDIX G: SAMPLE OF ANNUAL PROGRESS MEETING AGENDA AND REPORT

Arapahoe County Hazard Mitigation Plan

Annual Progress Meeting Agenda

1. Discussion on hazard events and impacts that occurred during the performance period
2. Review of progress on mitigation action implementation
3. Discussion on success stories
4. Recommendations for new actions/projects
5. Review of funding options and grant opportunities
6. Review of changes in plan maintenance or implementation
7. Review of continuing public involvement

Arapahoe County Hazard Mitigation Plan
Annual Progress Report Template

Reporting Period:

Background: Arapahoe 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 online at: _____.

Summary Overview of the Plan's Progress: The performance period for the Hazard Mitigation Plan became effective on ____, 2025, with the final approval of the plan by FEMA. The initial performance period for this plan will be five years, with an anticipated update to the plan to occur before _____, 2029. The *Arapahoe County Hazard Mitigation Plan* has targeted 40 hazard mitigation activities to be pursued during the five-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 *Arapahoe County Hazard Mitigation Plan*. The objective is to ensure that there is a continuing and responsive planning process that will keep the hazard mitigation plan dynamic and responsive to the needs and capabilities of the partner jurisdictions. This report discusses the following:

- Natural hazard events that have occurred within the last year
- Changes in risk exposure within the planning area
- Mitigation success stories
- Review of the action plan
- Changes in capabilities that could impact plan implementation
- Recommendations for changes/enhancement

The Hazard Mitigation Planning Committee: The Hazard Mitigation Planning Committee, made up of planning partners and stakeholders within the planning area, reviewed and approved this progress report at its annual meeting held on _____, 202_. It was determined through the plan's development process that the HMPC would remain in service to oversee maintenance of the plan. At a minimum, the HMPC will provide technical review and oversight on the development of the annual progress report. It is anticipated that there will be turnover in the membership annually, which will be documented in the progress reports. For this reporting period, the HMPC membership present at the meeting is as indicated in Table 1.

Table 1		
Name	**Title**	**Jurisdiction/Agency**

Hazard Events within the Planning Area: During the reporting period, there were __ __ hazard events in the planning area that had a measurable impact on people or property. A summary of these events is as follows:

_____

_____

_____

Changes in Risk Exposure in the Planning Area: *(Insert brief overview of any natural hazard event in the planning area that changed the probability of occurrence or ranking of risk for the hazards addressed in the hazard mitigation plan)*

Mitigation Success Stories: *(Insert brief overview of mitigation accomplishments during the reporting period)*

Review of the Action Plan: Table 2 reviews the action plan, reporting the status of each initiative. Reviewers of this report should refer to the *Arapahoe County Hazard Mitigation Plan* for more detailed descriptions of each initiative and the prioritization process.

Address the following in the "status" column of the following table:

- *Was any element of the initiative carried out during the reporting period?*
- *If no action was completed, why?*
- *Is the timeline for implementation for the initiative still appropriate?*
- *If the initiative was completed, does it need to be changed or removed from the action plan?*

Table 2								
ID	**Title and Description**	**Hazards Mitigated**	**Goals & Lifelines**	**Lead Agency & Partners**	**Cost Estimate & Potential Funding**	**Priority**	**Timeline**	**Status & Implementation Notes**

Changes That May Impact Implementation of the Plan: *(Insert brief overview of any significant changes in the planning area that would have a profound impact on the implementation of the plan. Specify any changes in technical, regulatory and financial capabilities identified during the plan's development)*

Recommendations for Changes or Enhancements: Based on the review of this report by the Hazard Mitigation Planning Committee, the following recommendations will be noted for future updates or revisions to the plan:

_____

_____

_____

_____

_____

Public review notice: *The contents of this report are considered to be public knowledge and have been prepared for total public disclosure. Copies of the report have been provided to the governing boards of all planning partners and to local media outlets and the report is posted on the Arapahoe County Hazard Mitigation Plan website. Any questions or comments regarding the contents of this report should be directed to:*

(Insert Contact Info Here)

APPENDIX H: EXPANSIVE SOIL AND SUBSIDENCE

Preliminary maps for expansive soil and land subsidence were developed to better assess those hazards. While the HMPC elected not to profile those hazards any further, they are included in this appendix for reference.

Figure H-1 Arapahoe County Expansive Soil and Subsidence

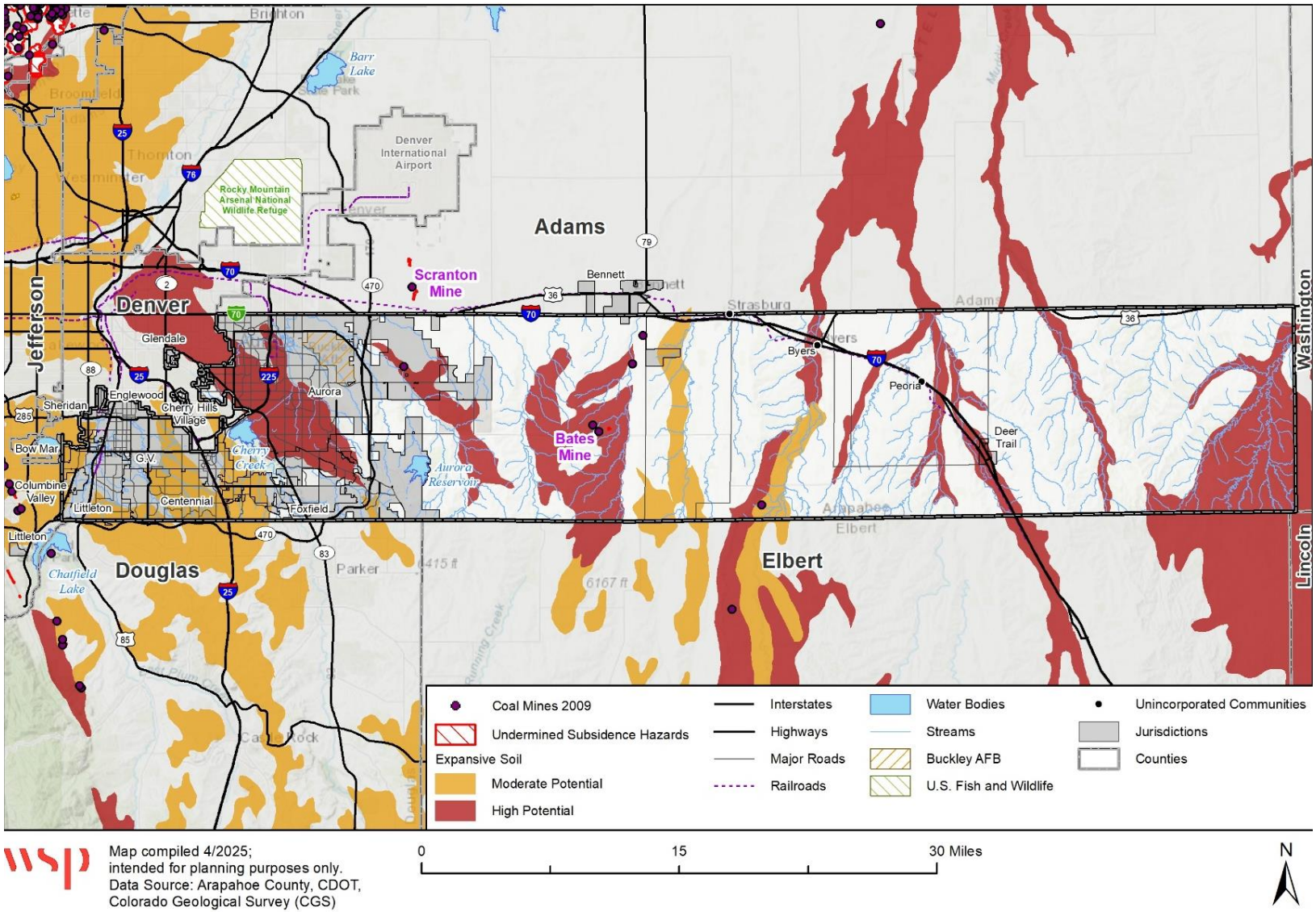
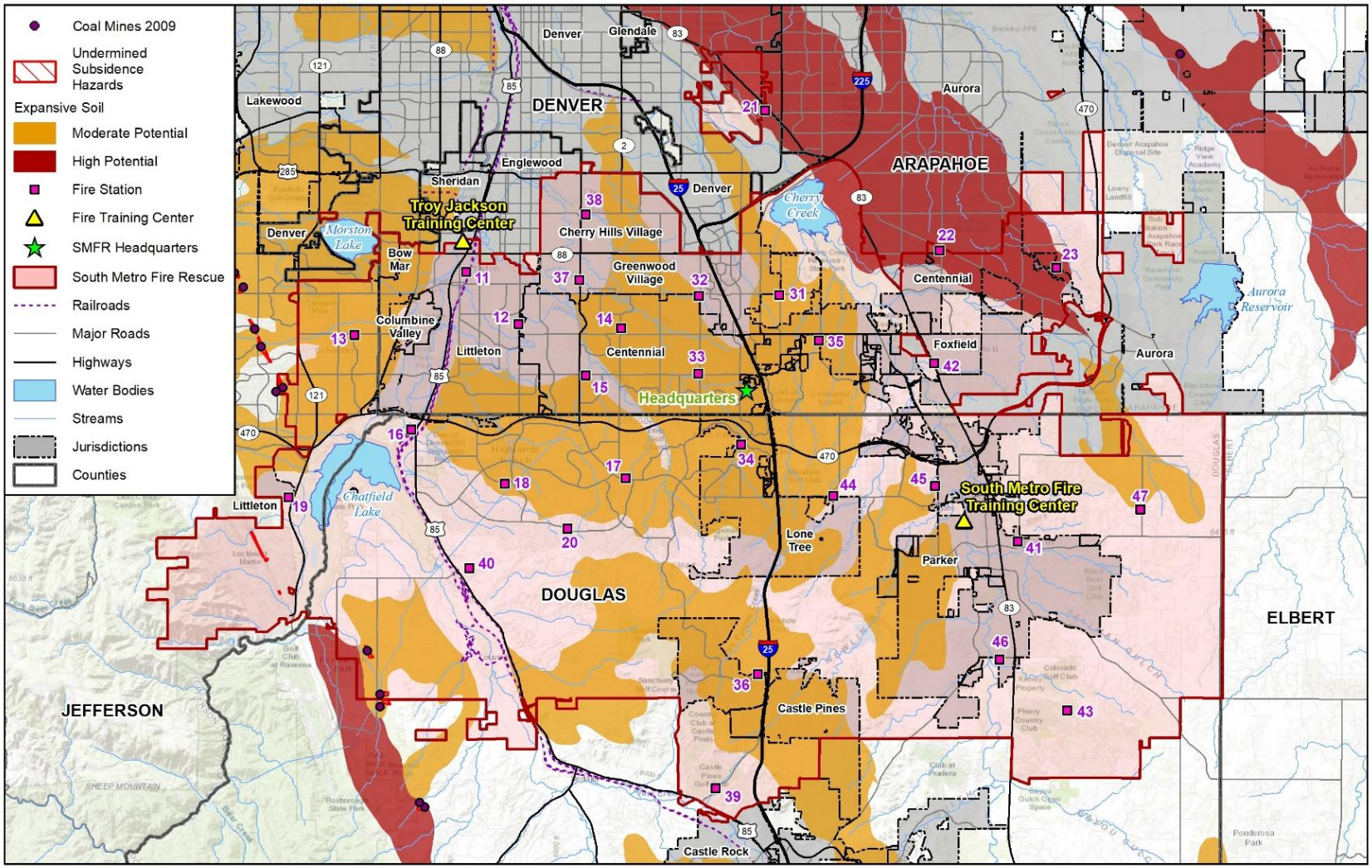


Figure H-2 South Metro Fire Rescue Expansive Soil and Subsidence



APPENDIX I: PAST HAZARD EVENTS

The following tables show data from the National Centers for Environmental Information Storm Events Database. Table I-1 through table Table I-3 below have information for the following hazards: lightning, hail, and floods. These tables include the date the event occurred, fatalities, injuries, property damage, and crop damage, along with a description of the event.

Table I-1 Arapahoe County Historical Flood Events (1979-2023)

Date of Event	Flood Type	# Fatalities	# Injuries	Property Damage	Crop Damage	Description
6/7/1979		0	0	$793	$0	
7/18/1985		0	0	$5,555	$5,555	
7/30/1985		0	0	$555	$5,555	
7/20/1990		0	0	$5,000	$0	
5/21/1997	Flash Flood	0	0	$0	$0	Heavy rain and small hail associated with a stationary line of thunderstorms developed over eastern Arapahoe County. Several basements were flooded in the Town of Deer Trail as well as pastures and fields around town. Some streets and intersections in the downtown area were covered by 18 inches of standing water. A storm spotter located 2 miles northeast of Deer Trail recorded nearly 4 inches of rainfall in less than 2 hours.
6/1/1997		0	0	$35,000	$0	
6/13/1997	Flash Flood	0	0	$0	$0	Heavy rain and hail caused Little Comanche Creek to overflow its banks. The areal extent of the flooding was roughly 50 feet wide and 1 mile long. A flatbed trailer was carried 1/2 mile downstream.
7/27/1997	Flash Flood	0	0	$0	$0	Highwaters from swollen creeks and streams washed out bridges and several sections of road in southeast Aurora. A 200-300 foot section of road was washed away where Picadilly Street dipped across Coal Creek. Three youths had to be rescued when they became stranded by rapidly rising water in another normally small creek.
7/29/1997	Flash Flood	0	0	$30,000	$0	Heavy rain caused flooding and flash flooding problems in central portions of Adams and Arapahoe Counties. Two homes were extensively damaged when water flooded their basements and adjacent pasture area in Strasburg. Highwaters, 4 to 5 feet deep, had pooled in the lower lying areas of town. In addition, Quincy Road had to be blocked off between County Roads 129 and 137 in Arapahoe County. Up to 4 feet of water reportedly covered the roadway.
8/11/1997	Flash Flood	0	0	$0	$0	Intense thunderstorm winds, accompanied by very heavy rain, damaged a barn, and snapped several trees. In addition, flooding and flash flooding was reported along several county roads as 2.5 inches of rain fell in the area.
7/23/1998	Flash Flood	0	0	$0	$0	Heavy rain flooded some local arroyos as they swelled to 5 feet in depth. Some cattle were caught in the high water and carried downstream.
7/24/1998	Flash Flood	0	0	$0	$0	Heavy rain caused flooding and flash flooding problems along small creeks and streams near Deer Trail. Some local roads and bridges were covered by the highwaters. A trained spotter, 3 miles north of Deer Trail, measured 3.5 inches of rainfall.
7/25/1998		0	0	$0	$0	

Date of Event	Flood Type	# Fatalities	# Injuries	Property Damage	Crop Damage	Description
4/28/1999	Flood	0	0	$0	$0	A steady southeasterly upslope flow brought rainfall. The combination of a persistent upslope and increased runoff allowed for several creeks, rivers, and streams to jump their banks. Rainfall totals over 4 days ranged from 4 to over 6 inches in the hardest hit areas.
8/4/1999	Flood	0	0	$0	$0	Flooding and flash flooding problems developed over portions of the Urban Corridor as slow-moving thunderstorms dumped anywhere from 2 to 3.5 inches of rainfall in approximately 3 hours.
8/19/1999	Flood	0	0	$0	$0	Heavy rain, up to 5 inches in two hours, caused East Tollgate Creek to jump its banks. The bike path adjacent to the creek was underwater at several locations. Several underpasses were also flooded, halting traffic. In addition, an unfinished playground was completely flooded at a local elementary school.
7/16/2000	Flood	0	0	$0	$0	Very moist and unstable conditions, combined with upslope during the late afternoon and evening hours, triggered widespread urban and small stream flooding in and around the Denver metropolitan area. Rainfall amounts generally ranged from 1 to 3 inches, with the heaviest rainfall occurring during the evening hours. Since the rain fell in a relatively open area, no flood damage was reported. In Greenwood Village however, near Peoria and Belleview, the road was closed for several hours as 2 feet of standing water covered the roadway.
8/17/2000	Flash Flood	0	0	$0	$0	Thunderstorms producing very heavy rain, up to 3.5 inches in spots, caused flooding and flash flooding problems in and around the Denver Metropolitan area. Extensive flooding was also reported throughout Littleton.
7/8/2001	Flash Flood	0	0	$0	$0	Up to 4.5 inches of rain fell across portions of western Arapahoe County. The underpass of Interstate 225 and Parker Road was inundated with 5 feet of water. Several other streets and underpasses in Aurora were also closed due to the high water. Heavy rain caused extensive damage to several exhibits on display at the Cherry Creek Arts Festival.
7/13/2001	Flash Flood	0	0	$0	$0	Three inches of rain reportedly fell near the Greenwood Village Police Department in the span of 15 minutes. Heavy rainfall caused Toll Gate Creek to jump its banks, flooding low lying areas of Parker Road.
7/18/2003	Flash Flood	0	0	$0	$0	Heavy rain producing thunderstorms caused flash flooding across parts of western Arapahoe County. Automated rain gages indicated 2 to 3 inches of rain had fallen in less than one hour. The heavy rainfall caused many intersections and underpasses to flood, stranding motorists. As a result, sections of Interstates 25 and 225 had to be closed until the floodwaters could recede.
7/23/2004	Flash Flood	0	0	$0	$0	Heavy rain, up to 2 inches in 45 minutes, caused flash flooding problems east of Aurora. Floodwaters, ranging from 2 to 3 feet deep, forced the closure of Powhaten, Gun Club and Picadilly Roads.
8/18/2004	Flash Flood	0	0	$0	$0	Several intersections in Centennial and southern Aurora were impassable due to floodwaters. Two feet of water covered portions of the roadway near Park Meadows Mall. One person had to be rescued near the intersection of Arapahoe Road and Liverpool.

Date of Event	Flood Type	# Fatalities	# Injuries	Property Damage	Crop Damage	Description
6/3/2005	Flash Flood	0	0	$0	$0	Thunderstorms brought heavy rain to parts of Arapahoe County. Up to 3 feet of standing water was reported over East Orchard Road. Several motorists were stranded in their vehicles and needed to be rescued. Ten vehicles were stranded on Grand Ave; and most had to be towed once the floodwaters receded. Water was also reportedly chest deep at one location on Girard Ave.
7/2/2006	Flash Flood	0	0	$0	$0	Heavy rainfall caused minor flooding along Murphy and Sand Creeks, just east of Buckley Air Force Base. Gun Club Road was closed between Alameda and Mississippi Avenues, where three feet of standing water reportedly covered the road.
8/1/2006	Flash Flood	0	0	$0	$0	Heavy rain forced the closure of Arapahoe Road as it was inundated with high water between Holly and Quebec. Flooding was also reported near Park Meadows Mall and Greenwood Village.
8/8/2008	Flash Flood	0	0	$10,000	$0	Extensive flooding was reported; with several motorists stranded in standing water. Heavy rain caused flash flooding over south Denver and its nearby suburbs. Heavy rain, from 2.5 to 4 inches, fell in less than 90 minutes. Firefighters rescued 20 people as water quickly rose along creeks, flooded roadways, and stranded motorists. Three people had to be rescued along Cherry Creek when the bike path flooded.
7/6/2010	Flash Flood	0	0	$10,000	$0	Heavy rain caused flash flooding near Interstate 70 at Byers. Two feet of water was observed moving across the exit ramp. One car was washed into a tree, but no one was injured.
7/14/2011	Flash Flood	1	0	$10,000	$0	Severe thunderstorms in the Denver Metropolitan area produced very heavy rain, large hail, and damaging winds. The strong winds toppled a few trees and the heavy rain caused street flooding and minor flash flooding. Several cars were stranded at the intersection of Santa Fe Drive and Oxford, and near Broadway and U.S. Highway 285. A 16-yr old teenager was seriously injured when he tried to retrieve a ball along the banks of West Toll Gate Creek. He was pulled from the swollen creek and died several days later.
6/6/2012	Flash Flood	0	0	$50,000	$50,000	Severe thunderstorms broke late in the evening, striking areas hardest from Denver southward. Locations impacted by the storms included but were not limited to: Aurora, and Centennial. Heavy rain produced flash flooding in parts of Arapahoe Counties, as thunderstorms brought up to 3.35 inches of rain to some areas within 90 minutes. A water rescue took place on South Gun Club Road in Arapahoe County, where floodwaters were rushing to depth of 3 feet. Flash flooding forced the closure of Quincy Road; South Gun Club Road, between East Exposition Avenue and East Alameda Avenue; South Picadilly Road, between State Highway 30 and East 6th Avenue; and County Road 50, between Delbert Road and County Road 17.
8/3/2013	Flash Flood	0	0	$5,000	$0	Severe thunderstorms brought heavy rain and flash flooding to portions of the Urban Corridor and Northeast Plains. Road closures were set up in both directions on both Picadilly Road and Gun Club Road, just north of Buckley AFB. A man had to be rescued when his car was trapped in flood waters at the intersection of 6th Ave. and Picadilly Road. Flash

Date of Event	Flood Type	# Fatalities	# Injuries	Property Damage	Crop Damage	Description
						Flooding was also observed at the junction of E-470 and I-70 with water running over the road.
8/8/2013	Flash Flood	0	0	$50,000	$0	Heavy rain caused localized flash flooding in Aurora. An underground parking garage at an apartment complex was inundated with 3 to 4 feet of water. Flash flooding forced a road closure at East Mississippi Ave. and Alton St. Also, several people had to be rescued when three vehicles stalled in flood waters at Alameda Ave. and Havana St.
9/12/2013	Flood	0	0	$3,300,000 *	$0	Continuous heavy rainfall produced flash flooding. East Alameda Parkway between South Chambers Road and South Sable Boulevard was completely underwater. Heavy rain continued to produce widespread flash flooding. Aurora's Prairie Waters, a water recycling and purification system, was shut down due to flooding. Four of the facility's 17 wells where water is siphoned from the South Platte River in Brighton were flooded. Prairie Waters provides up to 20 percent of the city's water. Heavy rain, ranging from 4 to 12 inches through the entire storm event, caused widespread flooding along the entire drainage systems of East Tollgate and Coal Creeks. The areas around Parker Road and Piney Creek were flooded as several holding ponds did overflow their banks. Some of the worst flooding in Centennial occurred along Arapahoe Road near Cottonwood. According to FEMA, 2,138 households were impacted by flooding. Road closures included: East Fitzsimons Pkwy. and North Peoria, East 26th Ave and Fulton St., East 17th Ave and Dayton St., East Colfax and Peoria St., East 12th Ave. between Xanthia St. and Xenia St, East 12th Ave. and Yosemite St., East 11th Ave. and Willow St., East 11th Ave. and Xanthia St., East 11th Ave. and Xenia St., Del Mar Pkwy. and North Havana St., East 1st Ave and Moline St., East Alameda Ave. and South Havana St., South Peoria St. just North of East Ford Ave., South bound 225 and East Alameda Ave., East Alameda Ave. and East Alameda Dr., East Florida Ave. and South Galena St.
9/14/2013	Flash Flood	0	0	$0	$0	The combination of heavy rain, coupled with extremely saturated ground conditions, produced additional flash flooding. Significant flooding was reported at the intersections of Jordan Road and Broncos Parkway, and at Jordon Road and Bluebell. Cars were stalled in several inches of standing water at the intersections of Alameda Ave. and Havana as well as Mississippi Ave. and Kalispell.
5/9/2015	Flash Flood	0	0	$15,000	$5,000	Areal flooding developed along the Cache La Poudre and South Platte River Basins as a combination of heavy rainfall and spring runoff inundated the region. The South Platte rose above flood stage at Kersey from the 9th to the 15th. The hardest hit areas included: Elbert County, along Bijou Creek; eastern portions Adams and Arapahoe Counties. Floodwaters damaged Arapahoe County Road 42 at the Kings burrow Bridge. Water overtopped the road at several locations. The Byers Fire and Rescue ambulance was attempting to cross an intersection at Morgan County Roads 4 and D to transfer a patient when it was carried into the normally dry creek. Fast water carried the ambulance, with the patient, one passenger and three firefighters, about 100 yards downstream, no injuries due to the accident were reported.

Date of Event	Flood Type	# Fatalities	# Injuries	Property Damage	Crop Damage	Description
6/11/2015	Flash Flood/ Flood	0	0	$15,000	$0	Thunderstorms producing heavy rainfall caused flooding and flash flooding across parts of the Urban Corridor and adjacent plains. Major flooding occurred in the westbound lane of Arapahoe Road near the Colorado E470 bridge. In Aurora, water was reportedly flowing over the roads at East 6th Ave. and South Picadilly Road. Additional flooding was reported on South Gun Club Road between East Alameda Ave. and East Exposition Avenue, forcing the closure of the road.
8/10/2015	Flash Flood	0	0	$50,000	$0	Heavy rain quickly flooded several intersections. Vehicles stalled in the flooded intersections and two motorists had to be rescued from the flooded roadways at University Blvd and County Line Road and the other, at University Blvd and Dry Creek Rd. At Centennial Airport, a hangar partially collapsed when 2.20 inches of rain fell in one hour. At the Denver Broncos training facility in Dove Valley, the storm left the practice fields and parking lot flooded, and the viewing area near the field house damaged by strong winds. The fields, the team said, received 3.5 inches of rain in an hour during the storm. As a result, the practice facility was closed to the public the following day due to storm damage.
7/24/2018	Flash Flood	1	0	$500,000	$0	Thunderstorms produced very heavy rainfall, 1 to 2 inches in less than 30 minutes. In Englewood, the floodwaters quickly inundated a basement apartment and trapped a woman inside. Near South Acoma, the floodwaters quickly inundated a basement apartment and trapped a 32-year-old woman inside. She was rescued but died several hours later. Several homes in the immediate area suffered severe flood damage. The floodwaters also stalled vehicles and forced the closure of several intersections. Floodwaters stalled several vehicles and forced the closure of several intersections including: East Iliff Ave. and South Chambers Road, Santa Fe Drive and West Oxford Ave., South Buckley Road and East Bates Ave., East 6th Ave. and South Picadilly Road, East Hampden Ave and South Uravan Way.
8/15/2022	Flash Flood	0	0	$10,000	$0	Torrential rainfall, up to 2.6 inches was observed from southeast Denver and Aurora, and extended south southwest to Castle Pines, west of Castle Rock and into Roxborough State Park. Most of the rainfall fell in less than 45 minutes. A storm drain at Quincy and Parker was clogged up by rocks that got pulled out from near the sidewalk by running water. Several cars were towed out of the flooded area. Minor flooding was reported on the Dry Creek exit of I-25 with standing water on Iliff Ave. near Buckley Rd. Parker and Quincy Roads and Dartmouth and Chambers Roads also were impassable. Multiple accidents occurred due to the rain and flooding. A few severe storms brought large hail up to quarter size, and strong winds from 60 to 65 mph in Arapahoe, Douglas and Elbert counties.
5/12/2023	Flood	0	0	$50,000	$10,000	A slow-moving storm system produced flooding and flash flooding across the urban corridor and northeast plains, with heavy snowfall in the higher mountains of the Front Range. Storm total rainfall during the 3-day event ranged from 4 to 7 inches across the urban corridor and Palmer Divide, with 2 to 5 inches across the plains. The heaviest rainfall occurred over Arapahoe, Denver, Douglas, Elbert and southern Jefferson counties. Consequently, swollen creeks and streams produced flooding and flash flooding. The heavy rainfall has caused road

Date of Event	Flood Type	# Fatalities	# Injuries	Property Damage	Crop Damage	Description
						damage in Cherry Creek State Park, along East Lake View Road. This resulted in the closure of the east and west boat ramps at Cherry Creek Reservoir.
6/21/2023	Flash Flood	1	0	$50,000 ($1.34 Million in PA Funding)	$0	This was a series of storms resulting in a Federal Disaster Declaration, DR4731 June Severe Storms, Flooding and Tornadoes. Significant flooding and flash flooding occurred in portions of the plains, including Elbert, Arapahoe, Adams, Logan, Washington and Morgan counties. There were likely several rural roads that flooded due to the heavy rainfall. In Arapahoe County specifically, 20+ roads were closed during the storm period; including permanent and/or long duration temporary detours that added 17 miles to some commutes. Traffic control devices, personnel, and vehicles required to implement closures. 13 of the road closures required some degree of repair or debris removal before reopening, with shoulder washouts, culverts damaged, debris clean up needed, and erosion under bridges. The City of Englewood also reported localized urban flooding and a sinkhole appearing in Rotolo Park during the event. The largest single project was replacing CR 38 Bridge ($278k). This event also resulted in 1 fatality, as water rescues were conducted between North Watkins Road near East 6th Ave south of Watkins where several vehicles were discovered swept into fields by flood waters. An occupant in one of the vehicles drowned.
7/8/2023	Flood	0	0	$0	$0	Severe thunderstorms produced large hail and intense winds over parts of the urban corridor and northeast plains and included: Adams, Arapahoe, Denver, Elbert, Jefferson, Lincoln, Phillips and Weld counties. The hail ranged in size from 1 to 2 inches in diameter, with peak wind gusts of 60 to 70 mph. In addition, heavy rain flooded an underpass along Highway 36, with 3 feet of standing water which closed the roadway for several hours. Heavy rainfall flooded the underpass along Highway 36 with up to 3 feet of standing water. Traffic was diverted away from the underpass until the water receded.
Total Events: 42		**3**	**0**	**$851,903**	**$76,110**	

*Source: NCEI, Plan Update Guides. * Other sources list the damage from this storm at over $50 million, including $10,000 in crop losses.*

Table I-2 Hail Events Causing Damage Reported in Arapahoe County, 1996-2024

Date	Magnitude (Inches)	Deaths	Injuries	Property Damage	Crop Damage	Description
10/16/1998	2	0	0	$87,800,000	$0	A potent late season hailstorm struck portions of Denver and the surrounding metro area. The storm began dumping torrential hail, mostly pea sized, over portions of Arvada and Wheat Ridge, northwest of Denver. Hail, heaviest near Interstate 70, reportedly piled up to 6 inches deep. Several accidents were attributed, at least in part, to the hailstorm. Snowplows had to be called out to clear several city streets. As the storm moved southeast, into the Denver and

Date	Magnitude (Inches)	Deaths	Injuries	Property Damage	Crop Damage	Description
						Aurora areas, it intensified. Large hail, up to 2 inches in diameter pounded the area. Damage estimates totaled $87.8 million ($27.3 million in homeowner claims and $60.5 million in automobile claims), making this the 7th costliest hailstorm to strike the Denver Metropolitan Area.
7/23/2001	1.5	0	0	$606,000	$6,000	The city of Littleton suffered $612,000 in damage to vehicles, roofs, buildings, landscaping, and computers. Almost every vehicle owned by visitors and employees in the Littleton Center parking lot sustained damage.
7/17/2008	1.75	0	0	$5,000	$0	A severe thunderstorm produced large hail, up to the size of golf balls, and damaging thunderstorm winds. The combination of hail and wind broke several windows of a residence. The windshield of their vehicle was also cracked.
6/7/2009	3	0	0	$161,000,000	$0	Severe thunderstorms in Denver and the surrounding metropolitan area produced five tornados, large hail, and damaging thunderstorm winds. The strongest of the tornados touched down near Southlands Mall, in southeast Aurora. Two men were injured, one seriously. Overall, the damage was rated mild to moderate, which translated to an EF1 rating. Four other tornados touched down, two of which caused minor damage. Another EF1 tornado damaged a home, several outbuildings, and injured some horses in unincorporated Elbert County. In addition to the tornados, large hail from 1 to 3 inches in diameter was observed. In parts of Aurora and Centennial, thunderstorm winds blew down power lines and caused electrical outages. Approximately 8,000 homes and businesses were left without power for nearly two hours. Most of the damage consisted of broken windows and roofs. This day was the first in a series of eight to cause damage along the Urban Corridor. Damage to homes and property along the Front Range totaled $161 million during the 8-day span, making it the state's fifth highest insurance loss. Most of the property damage was caused by hail; 21,000 automobile claims and 13,000 homeowner claims were filed.
8/10/2009	1.25	0	0	$0	$25,000	Another round of severe thunderstorms hammered the Northeast Plains with large hail up to the size of golf balls. Crop damage was reported in the immediate vicinity.
8/17/2009	1.5	0	0	$15,000	$0	Severe thunderstorms broke out across Arapahoe, Elbert, Lincoln, and Washington Counties. The hail piled up to a foot deep in spots along State Highway 71, south

Date	Magnitude (Inches)	Deaths	Injuries	Property Damage	Crop Damage	Description
						of Limon. The storms produced hail up to the size of tennis balls and one tornado. Some farm equipment and fiberglass structures were damaged by hail.
6/6/2012	1	0	0	$160,000,000	$0	Severe thunderstorms broke late in the evening, striking areas hardest from Denver southward. Locations impacted by the storms included but were not limited to: Aurora, Castle Rock, Centennial, Highlands Ranch, Lone Tree, Parker, Surrey Ridge. The storms produced a barrage of large hail, damaging straight line winds, flash flooding and several short lived tornados. The hail ranged in size from 1 to 2 inches in diameter and caused extensive damage to homes and automobiles. The hail inundated the roadways with several inches of hail in Douglas County. Consequently, snowplows had to be called out to clear the roadways. One tornado that touched down near Grover in Weld County ripped a tree from the ground and tossed it approximately twenty feet. The combination of torrential hail and heavy rain produced flash flooding in parts of Elbert, Douglas, and Arapahoe Counties, as thunderstorms brought up to 3.35 inches of rain to some areas within 90 minutes. In Aurora, Picadilly Road was closed from flooding north of 6th Avenue. A water rescue took place on South Gun Club Road in Arapahoe County, where floodwaters were rushing to depth of 3 feet. Flash flooding forced the closure of several streets and roads from Parker south to The Pinery, where the floodwaters inundated the roadway with up to 2 feet in several locations. At Centennial Airport in Arapahoe County, a historic B-17 Flying Fortress suffered extensive damage as hailstones as large as ping pong balls hit the aircraft. Although the airframe itself did not require repair, the fabric-covered ailerons and elevators were extensively damaged. The hail came straight down and punched holes in the fabric-covered control surfaces. The plane landed just hours before the storm hit to participate in the weekend tour stop. Lightning struck two homes, one in Lakewood and the other in Parker. Straight line winds downed trees and power lines in Aurora. As a result, scattered electrical outages affect approximately five thousand residents.
6/7/2012	2.5	0	0	$161,100,000	$0	Severe thunderstorms brought damaging wind and hail, heavy rain, along several tornados, one of which was rated an EF-2. The storms produced hail from 1.5 to 2.75 inches in diameter. In addition to the large hail, heavy rainfall from 1 to 2 inches also accompanied the storms. The combination of hail and heavy rain caused extensive street flooding across Aurora, Castle Rock, Centennial, Cherry

Date	Magnitude (Inches)	Deaths	Injuries	Property Damage	Crop Damage	Description
						Creek, Englewood, South Denver, Highlands Ranch, Lakewood, and Littleton. The hail was reportedly knee deep in several areas making roads impassable. As a result, snowplows had to be summoned to clear the streets. In Castle Rock, a King Soopers supermarket sustained extensive damage when roof partially collapsed under the weight of the hail. Total property damage estimates along the Front Range for the 6th and 7th combined was 321.1 million dollars. A tornado touched down in Elbert County Thursday evening, June 7th, producing considerable damage to homes and several farm buildings in south central Elbert County. The tornado was rated an EF-2 at its strongest point near Elbert County Road 82 and just west of Elbert County Road 97. The tornado initially touched down approximately at County Road 101 about 1 mile north of County Road 90, and then traveled south-southwest into El Paso County. It was approximately one half mile wide at one point and produced a debris width of 1.5 miles. One minor injury occurred due to broken glass. Two other tornados touched down but did no damage. In Elbert County alone, at least 136 homes were damaged: 32 sustained moderate to severe damage. Severe thunderstorms also produced large hail and damaging winds across parts of Larimer, Weld and Morgan Counties. In Weld County, a flash flood washed out a section of State Highway 392 just east of Lucerne. During the storm, a culvert underneath the road was washed out in addition to a section of the roadway, approximately a 30 foot by 30 foot section.
9/29/2014	1.75	0	0	$213,300,000	$0	A storm system that moved through the area produced large hail, up to golf ball size, and street flooding in parts of the metro area then spread east into the plains. The hailstorm was the costliest of the summer season with insured losses topping $213.3 million, according to the Rocky Mountain Insurance Information Association. Insurance claims included 29,297 automobile claims worth more than $87.2 million and 14,287 property claims for $126 million, ranking the storm as the eighth most expensive to hit the state. The storm also caused multiple accidents. A semi became detached from a trailer, blocking traffic on westbound Interstate 70 west of Tower Road. Downed power poles blocked a roadway on CO 79 near Bennett, at mile marker 10. In addition to the damaging winds, the storms produced large hail, from nickel to golf ball size. The intense thunderstorm winds also downed trees near Fort Morgan. Flash flooding was reported over parts of

Date	Magnitude (Inches)	Deaths	Injuries	Property Damage	Crop Damage	Description
						northern Washington County. The combination of flash flooding and an accident involving a semi-trailer forced the closure of CO 61 for a several hours.
6/19/2018	3	0	0	$276,400,000	$0	Very large hail, up to 3 inches in diameter, pummeled portions of the Front Range Urban Corridor and extended across the northeast plains of Colorado. Reports of collapsed roofs due to hail were reported, with major hail damage across northern portions of the Denver metro area. The Rocky Mountain Insurance Information Association estimated the property damage from the storm totaled $276.4 million, making it the 8th costliest hailstorm to strike the state to date. Frontage roads along Interstate 76 northeast of Denver were also flooded and washed out. In Lincoln County, large hail in the Arriba and Genoa areas damaged vehicles along Interstate 70. A total of four short-lived tornados touched down in the open country of Lincoln and Weld counties. Thunderstorms in Lincoln County also produced damaging wind gusts up to 70 mph. The property estimate value was the total storm damage summary for the event.
Total: 10			**4**	**$1.06 billion**	**$31,000**	

Source: NCEI

Table I-3 Lightning Strikes Causing Damage Reported in Arapahoe County, 1996-2024

Date of Event	# Fatalities	# Injuries	Property Damages	Crop Damages	Description
6/24/1996	0	0	$1,000	0	Lightning struck a home in Littleton which sparked a small fire on the roof.
6/13/1997	0	0	0	0	Lightning struck a home in Littleton. The house caught fire, but a damage estimate was not available.
7/30/1997	0	0	$75,000	0	Lightning struck a home in unincorporated Arapahoe County. The fire started in the electrical panel boxes causing extensive damage to the home.
7/22/1998	0	0	0	0	Lightning sparked a fire which caused extensive damage. Most of the second floor was destroyed.
7/25/1998	0	0	0	0	A telephone switchboard was damaged by lightning. Long distance service was knocked out for approximately 18 hours.
7/25/1998	0	1	0	0	A woman was injured when lightning struck a nearby telephone pole. She sustained burns to her head and right shoulder.

Date of Event	# Fatalities	# Injuries	Property Damages	Crop Damages	Description
7/19/1999	0	0	0	0	Lightning struck two residences in Littleton but caused only minor damage.
7/19/1999	0	0	$30,000	0	Lightning triggered a fire at a residence in Cherry Hills. A small portion of the roof and ceiling were damaged before the fire could be extinguished.
8/19/1999	0	0	0	0	Lightning struck a vehicle at East Evans Avenue and Tower Road. The woman inside was not injured.
8/8/2000	0	0	$47,000	0	Lightning struck three homes in Arapahoe County.
8/16/2000	0	0	$250,000	0	Lightning ripped most of the roof off a home in southeast Aurora. The bolt sparked a fire which destroyed the residence.
4/28/2001	0	1	0	0	A 21-yr old man was struck by lightning, along the shoulder of Interstate 225 near Parker Road. His brother's car had broken down and he stopped to help. The bolt stopped the man's heart briefly and caused the right side of his body to go numb.
5/29/2001	0	0	$100,000	0	Lightning sparked a fire at an apartment complex, forcing the evacuation of 24 units. Most of the fire damage was confined to the attic.
6/13/2001	0	0	0	0	Lightning caused a small housefire, damaging the roof.
6/17/2003	0	0	0	0	Lightning struck a feeder line, knocking out electricity to approximately 3000 residents.
2/2/2008	0	0	$1,000	0	Lightning struck a home during an electrically charged snowstorm. A gas meter at the home was hit by lightning and burst into flames.
8/15/2008	0	0	$20,000	0	At least three homes were hit by lightning during the early morning hours in Arapahoe County. Lightning also struck two homes in Castle Rock, damaging the roofs.
8/25/2008	0	0	$75,000	0	Lightning struck a home. The ensuing fire caused extensive roof damage.
7/3/2009	0	0	0	0	Six children received minor injuries when lightning struck a nearby tree. The injuries occurred when they were knocked down by the blast. None of the children suffered burns or appeared to have been directly hit by the lightning.
8/3/2009	0	0	0	$1,000	Lightning sparked a fire which charred approximately 1000 acres of wheat stubble.
9/9/2009	0	1	0	0	A man was critically injured when he was struck by lightning while riding his bicycle. He was nearing a paramedic van when he was hit. His heart stopped but paramedics quickly responded and were able to resuscitate him.
8/8/2010	0	0	$100,000	0	Lightning sparked a fire in a restaurant shortly after midnight. It caused extensive damage.

Date of Event	# Fatalities	# Injuries	Property Damages	Crop Damages	Description
8/16/2010	0	1	0	0	A 14-year-old teenager was struck by lightning while washing her family's car. The bolt struck the street nearby; it then traveled up a stream of water flowing from the vehicle and hit the teenager. She received minor injuries.
6/20/2011	0	0	$50,000	$0	A severe thunderstorm produced golf ball size hail in Sedgwick County. A lightning strike caused significant damage to a home in Centennial.
6/29/2011	2	0	$0	$0	Isolated severe thunderstorms produced intense microburst winds in portions of Denver, Larimer, and Weld Counties. In Gill, a barn and farmhouse were damaged. A large tree was blown down near Galeton. Two airmen received minor injuries when they were struck by lightning at Buckley Air Force Base in Aurora. A church in Fort Morgan was also struck by lightning.
7/14/2011	0	0	$50,000	$0	Severe thunderstorms in the Denver Metropolitan area produced very heavy rain, large hail, and damaging winds. The strong winds toppled a few trees and the heavy rain caused street flooding and minor flash flooding. Several cars were stranded at the intersection of Santa Fe Drive and Oxford, and near Broadway and U.S. Highway 285. A 16-yr old teenager was seriously injured when he tried to retrieve a ball along the banks of West Toll Gate Creek. He was pulled from the swollen creek and died several days later. Hail up to quarter size was also reported around the area. The thunderstorms also produced frequent lightning. One strike sparked a fire at Aspen Academy, a private school in Greenwood Village. Most of the damage was confined to the roof and attic.
7/21/2011	0	0	$70,000	$0	Lightning struck a home and caused substantial fire damage. Five people were in the home, but no one was injured. There was structural damage to both the interior and exterior of the residence.
6/8/2014	0	0	$25,000	$1,000	Lightning struck a tree in a residential area which caused damage to the two surrounding homes. Parts of the tree went through the roof and basement of one of the homes as well as the driver-side window of the resident’s truck.
5/1/2015	1	0	$0	$0	A teenager was critically injured when he struck by lightning. He was standing on a hill in an open field near Town Center Mall.
9/6/2019	0	0	$50,000	$0	Lightning caused extensive damage to a home.
Total: 30	**7**	**0**	**$944,000**	**$2,000**	

Source: NCEI

ARAPAHOE COUNTY