ADAMS COUNTY
COLORADO

Adams County Hazard Mitigation Plan

2026-2031

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1 Introduction

1.1 Executive Summary

The purpose of hazard mitigation is to reduce or eliminate long-term risk to people and property from disasters or hazardous events. The impacts of hazards can often be lessened or even avoided if appropriate actions are taken before events occur. To that end, the following jurisdictions have prepared and adopted this 2026 update to the Adams County Hazard Mitigation Plan (HMP):

- Adams County
- Town of Bennett
- City of Brighton
- City of Commerce City
- Denver Water

This Plan was developed to guide county and city officials and staff to coordinate and implement activities that will protect the people and property of the County from the effects of natural and human-caused hazards. It provides a list of mitigation goals and related actions that may assist the participating jurisdictions in reducing risk and preventing loss from future hazard events. By reducing exposure to known hazard risks, communities will save lives and property, and minimize the social, economic, and environmental disruptions that commonly follow hazard events.

The goals of the 2026 Adams County Hazard Mitigation Plan are:

Goal 1: Increase community awareness of Adams County's vulnerability to natural and human-caused hazards

Goal 2: Reduce vulnerability and protect people, property, and the environment from natural and human-caused hazards

Goal 3: Increase internal capabilities and coordination to reduce the impacts of natural and human-caused hazards

Goal 4: Strengthen communication and coordination among public agencies, NGO's, businesses, and residents

This Plan was also developed to maintain Adams County's and participating jurisdictions' eligibility for federal disaster assistance, specifically the FEMA Hazard Mitigation Assistance (HMA) grants and the Rehabilitation of High Hazard Potential Dams (HHPD) grant program.

Chapter 1 Introduction contains this Executive Summery along with 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 Adams County and its municipalities, with updated information on demographics, social vulnerability, and changes in development. It includes an assessment of programs and policies currently in place across the County to reduce hazard impacts or that could be used to implement hazard mitigation activities and identifies opportunities to enhance those capabilities.

Chapter 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. The hazards profiled in the 2026 Plan and their overall significance are shown in Table 1-1.

Table 1-1 Adams County Hazard Significance

Hazard	Geographic Location	Probability of Future Occurrence	Magnitude/ Severity	Overall Significance
Thunderstorms	Extensive	Highly Likely	Limited	High
Tornado/Damaging Wind	Extensive	Highly Likely	Limited	High
Winter Weather	Extensive	Highly Likely	Limited	High
Flood	Significant	Likely	Critical	High
Dam Incident	Limited	Unlikely	Critical	Medium
Drought/Extreme Heat	Extensive	Likely	Negligible	Medium
Hazardous Materials Incident	Limited	Likely	Limited	Medium
Earthquake	Limited	Occasional	Limited	Low
Soil Hazards	Limited	Occasional	Limited	Low
Wildfire	Limited	Likely	Negligible	Low
Terrorism/Active Shooter	Limited	Unlikely	Limited	Low
Cyber Incident	Limited	Likely	Limited	Low

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 80 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.

Details of how the risk and vulnerability varies for the Town of Bennett, the Cities of Brighton and Commerce City, and Denver Water, along with their mitigation capabilities and proposed mitigation actions, are included in **Jurisdictional Annexes**.

This plan demonstrates the County's commitment to reducing risks from hazards and serves as a tool to help decision makers direct mitigation activities and resources. Full implementation of this Plan will take time and resources. While this plan identifies a number of viable strategies and activities to reduce vulnerability to hazard events, it does not constitute a commitment of resources. It remains up to each jurisdiction to implement these activities as time and funding becomes available.

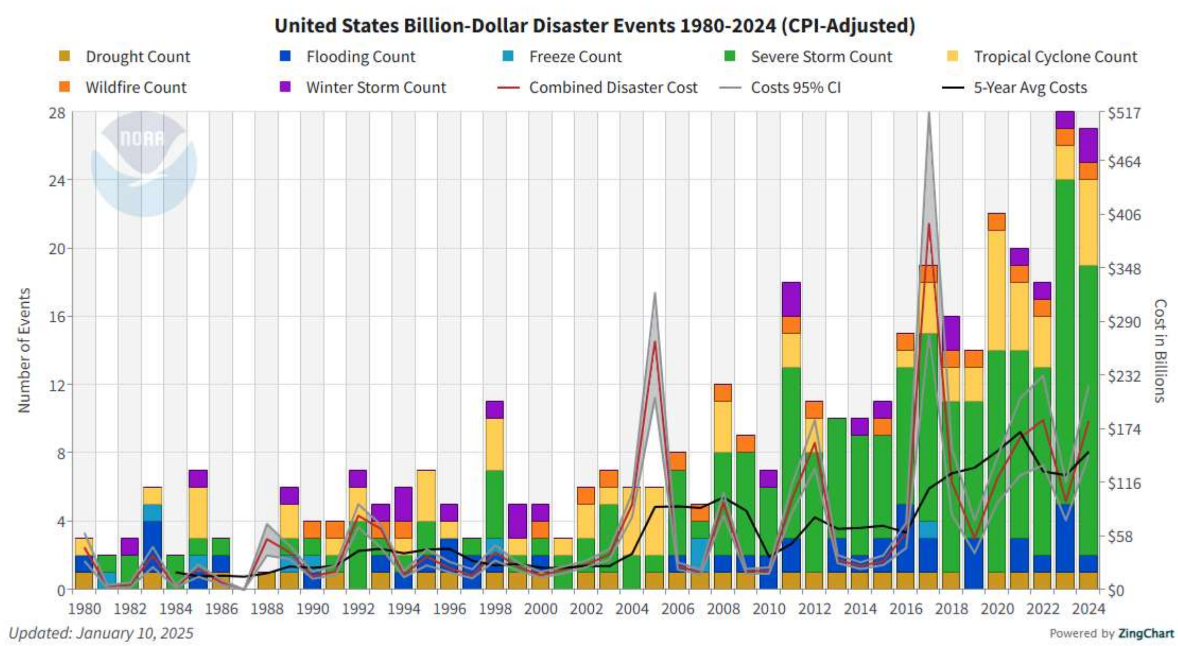
It is important that local decision-makers stay involved in mitigation planning to ensure it remains a priority. Coordination and communication within the planning partnership will be key to the successful implementation of this Plan. This effort will continue to require dedication and hard work, and to this end, this Plan update continues efforts to further strengthen the resiliency of Adams County.

1.2 Background & Scope

DMA Requirements §201.6
The local mitigation plan is the representation of the jurisdiction's commitment to reduce risks from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards. Local plans will also serve as the basis for the State to provide technical assistance and to prioritize project funding.

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, as illustrated in Figure 1-2.

Figure 1-2 Financial Benefits of Hazard Mitigation

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

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

This Plan was prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 (Public Law 106-390, also known as the DMA). The DMA and its implementing regulations establish the requirements local HMPs must meet for a local jurisdiction to be eligible for certain federal disaster assistance and hazard mitigation funding under the Robert T. Stafford Disaster Relief and Emergency Act (Public Law 93-288). This includes FEMA's Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance (FMA) program, and Building Resilient Infrastructure and Communities (BRIC) grant program, as well as the Rehabilitation of High Hazard Potential Dams (HHPD) grant program.

The following additional jurisdictions in the planning area participated in the planning process as stakeholders but are not formally adopting this HMP. These jurisdictions are already included in other FEMA-approved hazard mitigation plans, and therefore chose not to fully participate in this plan update as defined by FEMA. Information from these stakeholder jurisdictions has been into the 2026 Adams County Plan wherever feasible.

- City of Arvada (covered by the 2021 Jefferson County HMP)
- City of Aurora (covered by the 2021 City of Aurora HMP)
- City of Federal Heights (covered by the 2021 Thornton, Federal Heights, and Northglenn HMP)
- City of Northglenn (covered by the 2021 Thornton, Federal Heights, and Northglenn HMP)
- City of Thornton (covered by the 2021 Thornton, Federal Heights, and Northglenn HMP)
- City of Westminster (covered by the 2023 City of Westminster HMP)

The plan is meant to be a living document with ongoing implementation and regular updates, as described in Section 6.

2 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.*

2.1 Background on Mitigation Planning in Adams County

This plan builds on previous mitigation planning in Adams County going back more than 20 years, first with the 2004 Denver Regional Council of Governments (DRCOG) Regional Hazard Mitigation Plan and the 2011 update of that plan. The 2014 Imagine Adams County Comprehensive Plan incorporated mitigation planning throughout the document. In 2020 the County created this HMP as a standalone document.

The 2020 Adams County HMP underwent a comprehensive update in 2024-2026, to comply with the five-year update cycle required by the DMA. A FEMA Building Resilient Infrastructure and Communities (BRIC) award was used to hire a consultant, WSP Environment and Infrastructure (WSP) of Denver, Colorado, to facilitate the 2026 update. The planning process used a similar planning process to that used in 2020, coordinated by a multi-jurisdictional Hazard Mitigation Planning Committee (HMPC). The plan update process is described in detail below and documented in Appendix C.

2.1.1 What's New in the Plan Update

The updated HMP complies with Federal Emergency Management Agency (FEMA) guidance for Local Hazard Mitigation Plans. The update followed the requirements noted in the Disaster Mitigation Act (DMA) of 2000 and FEMA's 2023 Local Hazard Mitigation Planning Handbook.

This multi-jurisdictional, multi-hazard mitigation plan update involved a comprehensive review and update of the 2020 HMP including an assessment of Adams County's success in evaluating, monitoring, and implementing the mitigation strategy outlined in that Plan. The HMPC determined that there were no significant changes in jurisdictional priorities since 2020. All sections of the 2020 HMP were reviewed and updated to reflect new data and methodologies on hazards and risk, risk analysis processes, capabilities, participating jurisdictions, and mitigation strategies. The plan was 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 the County and jurisdictions. Information and data still valid from the 2020 plan were carried forward as applicable to this plan update.

2.1.2 Implementation and Maintenance of the 2020 HMP

The 2020 Plan included a general process for implementation and maintenance, which was generally followed over the past five years. Implementation of the plan including the status of mitigation actions and success stories are captured in Chapter 5. In general, the County has made considerable progress on the implementation of the plan, and on decreasing the County's vulnerability to hazards.

2.2 Local Government Participation

Adams County invited every incorporated city, town, and special district in the County to participate in the 2026 Plan update. The Disaster Mitigation Act requires that each jurisdiction 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 the following:

- Designate a representative to serve on the HMPC
- Participate in HMPC meetings
- Complete and return updates on Mitigation Actions from the 2020 HMP
- 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

The City of Brighton, the City of Commerce City, the Town of Bennett, and Denver Water all committed to participating in the plan update and met all of these participation requirements. These four jurisdictions developed their own annexes during the 2020 plan, with updates and feedback integrated into the 2026 plan. These provide a more detailed assessment of the jurisdiction's unique risks as well as their mitigation strategy to reduce long-term losses. Each jurisdictional annex contains the following:

- Hazard information on location, previous occurrences, probability of future occurrences, climate change considerations, and magnitude/severity (extent) for each hazard.
- Hazard map(s) at an appropriate scale for the jurisdiction, if available.
- Number and value of buildings, critical facilities, and other community assets located in hazard areas, if available.
- Vulnerability information in terms of future growth and development in hazard areas.
- A capability assessment describing existing regulatory, administrative, technical, and fiscal resources and tools as well as outreach efforts and partnerships and past mitigation projects. Includes an assessment of opportunities to enhance existing capabilities as well.
- Mitigation actions specific to the jurisdiction, including a review of previous actions from the 2014 plan and progress made on implementation.

Other jurisdictions in Adams County chose not to be full participants in this plan, but still took part in the process as stakeholders. Many of these other jurisdictions are already covered by other existing HMPs, as shown in Table 2-3 in Section 2.3.1. Appendix B shows the attendance of representatives at each HMPC meeting; sign-in sheets are included in Appendix C Planning Process Documentation.

2.3 The 10-Step Planning Process

The Adams County Office of Emergency Management and WSP worked together to establish the framework and process for this planning effort using FEMA's 2023 Local Multi-Hazard Mitigation Planning Guidance. The guidance and this plan are structured around a four-phase process:

1) Organize resources
2) Assess risks

3) Develop the mitigation plan
4) Implement the plan and monitor progress

Into this four-phase process, WSP integrated a more detailed 9-step process laid out in the 2023 Local Mitigation Planning Handbook, along with 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, High Hazard Potential Dams grant, Community Rating System, and the flood control projects authorized by the U.S. Army Corps of Engineers (USACE). Table 2-1 shows how the modified 10-step process fits into FEMA's four-phase process.

Table 2-1 2026 Hazard Mitigation Planning Process

FEMA 4-PHASE PROCESS	FEMA PLANNING HANDBOOK TASKS WITH CFR REFERENCES	CRS 10-STEP PROCESS
1) Organize Resources	1: Determine the planning area and resources - 44 CFR 201.6 (C)(1)	1) Organize the Planning Effort
	2: Build the Planning Team - 44 CFR 201.6 (C)(1)	
	3: Create an outreach strategy - 44 CFR 201.6(b)(1)	2) Involve the Public
	4: Review community capabilities - 44 CFR 201.6 (b)(2)&(3)	3) Coordinate with Other Departments & Agencies
2) Assess Risks	5: Conduct a risk assessment - 44 CFR 201.6 (C)(2)(i); & 44 CFR, 201.6(C)(2)(ii)&(iii)	4) Identify the Hazards
		5) Assess the Risks
3) Develop the Mitigation Plan	6: Develop a mitigation strategy - 44 CFR 201.6(c)(3)(i); 44 CFR 201(c)(3)(ii); & 44 CFR 201.6(c)(3)(iii)	6) Set Goals
		7) Review Possible Activities
		8) Draft an Action Plan
4) Implement the Plan and Monitor Progress	7: Review and adopt the Plan - 44 CFR 201.6(c)(5)	9) Adopt the Plan
	8: Keep the Plan current - 44 CFR 201.6(c)(4)	10) Implement, Evaluate, and Revise the Plan
	9: Create a safe and resilient community - 44 CFR 201.6(c)(4)	

WSP worked with Adams County Office of Emergency Management (OEM) to establish the framework and organization for the update of this Plan. Together, they identified the key county, municipal, and stakeholder representatives, and OEM formally invited them to participate in the planning process.

Throughout the plan update, the planning team strove to engage with groups or organizations that work with and represent underserved communities and vulnerable populations. This allowed for a more comprehensive understanding of the diverse needs and perspectives of vulnerable populations, such as the elderly, veterans, homeless population, and low-income families, facilitating the development of more equitable and effective interventions and policies. Community-based organizations that participated in the planning process were asked to pass information on to the communities they serve, including encouraging participation in the public survey as a method to directly provide feedback into the planning process.

2.3.1 Phase 1 Organize the Resources

Step 1: Organize the Planning Effort

This section describes the planning process used during the 2026 update. A planning committee 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. Adams County OEM took the lead on coordinating and reconvening the HMPC, identifying the key county, municipal, and other local government and initial stakeholder representatives. An email invitation was sent to them with a request to participate as a member of the HMPC and to attend a kickoff meeting. Representatives from a wide range of County and municipal departments and special districts participated on the HMPC and the update of the plan. A wide range of stakeholders were also invited to participate, as described in Step 3 below.

The HMPC contributed to this planning process by:

- Providing facilities for meetings
- Attending meetings
- Collecting data
- Managing administrative details
- 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

The HMPC communicated during the planning process with a combination of face-to-face meetings, phone and online conversations, and email correspondence. The HMPC met in person three times during the planning process as shown in Table 2-2. Sign-in sheets and agendas for each meeting are included in Appendix C.

Table 2-2 Schedule of HMPC Meetings

Meeting	Date	Topic
1	July 10th, 2024	Kickoff Meeting. Introduction to DMA and the planning process. Identification of hazards impacting Adams County
2	September 25th, 2024	Review of updated risk assessment
3	November 7th, 2024	Review of goals and objectives. Review of status updates of 2020 mitigation actions. Development of new mitigation actions.

HMPC Meeting #1 — Kickoff Meeting

The plan update process officially began with a kickoff meeting held virtually on July 10th, 2024. Thirty-six HMPC members and stakeholders attended. The Colorado Division of Homeland Security and Emergency Management (DHSEM) gave a presentation on hazard mitigation planning and the benefits of creating a hazard mitigation plan and getting FEMA funding. The HMPC reviewed the specific planning requirements necessary for FWEMA approval and the key elements for the plan update. The HMPC discussed project timeline with a predicted final approval date in 2026. The different roles of the HMPC team were also discussed, with participation outlined for members, jurisdictions, and stakeholders. Each jurisdiction provided updates on past events since 2020, existing capabilities and ongoing mitigation efforts were provided.

HMPC Meeting #2 — Risk Assessment Update

On September 24th, 2024, the HMPC convened in person at the Adams County Administration Building as well as virtually to review and discuss the results of the risk and vulnerability assessment update. Sixteen members of the HMPC and stakeholders were present for the discussion. The general risk requirements were outlined before turning to a detailed discussion of each hazard. Changes to the hazards profiled were discussed, since several hazards from the 2020 HMP were removed from the plan due to their minimal impacts on Adams County. The HMPC 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. The HMPC also discussed the preliminary significance rankings given to each hazard during the risk assessment process. The group were all in agreement that the significance rankings best reflected the risk as is, and that the rankings should remain. The capability assessment update .

HMPC Meeting #3 — Mitigation Strategy Update

The HMPC convened on November 7th, 2024, with ten people in attendance to discuss goals and objectives for this planning process. WSP reviewed the hazard significances discussed at meeting #2 WSP then shared the results of the public survey and reviewed the hazards the public identified as the highest concern. The group was provided handouts that summarized federal grants, mitigation action criteria, and new mitigation action worksheets. The HMPC reviewed the previous mitigation actions for both the county and jurisdictions to determine if they were still valid, comprehensive, and reflect current priorities and updated risk assessments. Revisions to the goals can be found in Chapter 5 Mitigation Strategy. The mitigation actions for each jurisdiction from the 2020 plan were presented. Climate change considerations, examples of projects eligible for FEMA funding, and potential funding sources were also available. The meeting ended with a review of the next steps and planning process schedule.

Step 2: Involve the Public

At the kickoff meeting, the HMPC discussed options for soliciting public input on the mitigation plan and developed an outreach strategy by consensus. The outreach strategy focused on two primary opportunities for public engagement: an online public survey early in the planning process, and public review of the draft plan near the end of the process. A second public survey specifically focused on social vulnerability was also developed and circulated.

On December 17th, 2024, Adams County OEM participated in a County open house that highlighted various plans the county was working on. OEM handed out fliers and provided information on the HMP update, to include links to the public survey.

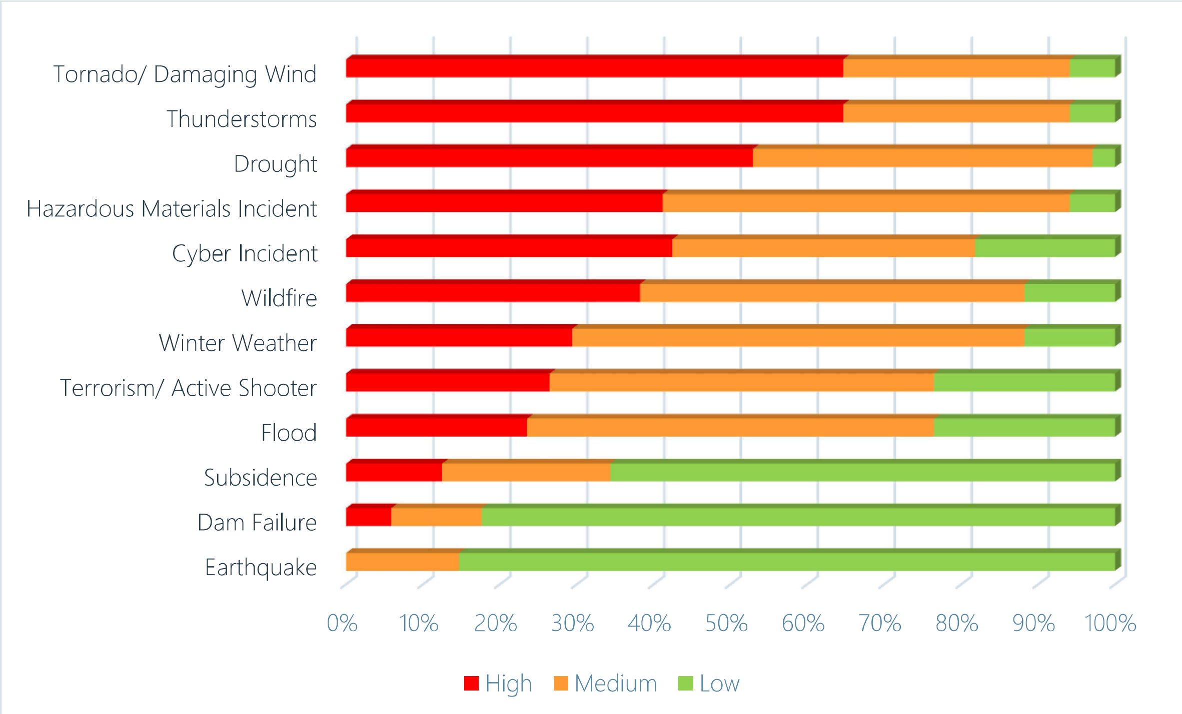
In all, Adams County OEM participated in more than 60 community preparedness events and presentations during the course of this plan update.

Online Public Survey

As part of the initial data collection stage, an online public survey was used to gather public input to the HMPC. The survey provided an opportunity for public input during the planning process, prior to finalization of the plan update. The survey gathered public feedback on concerns about hazards and input on mitigation strategies to reduce their impacts. The HMPC provided links to the public survey by distributing it using social media, email, and posting the link on websites. It was also advertised in the County employee newsletter. The survey ran from June 20th to July 20th, 2024, and was completed by thirty-four members of the public.

The survey asked people how significant they consider each of the hazards listed in the HMP. As show in Figure 2-1, results showed that the public perceives the most significant hazards to be tornado/damaging winds tied with thunderstorms, followed by drought. Earthquake, dam failure, and land subsidence ranked lowest.

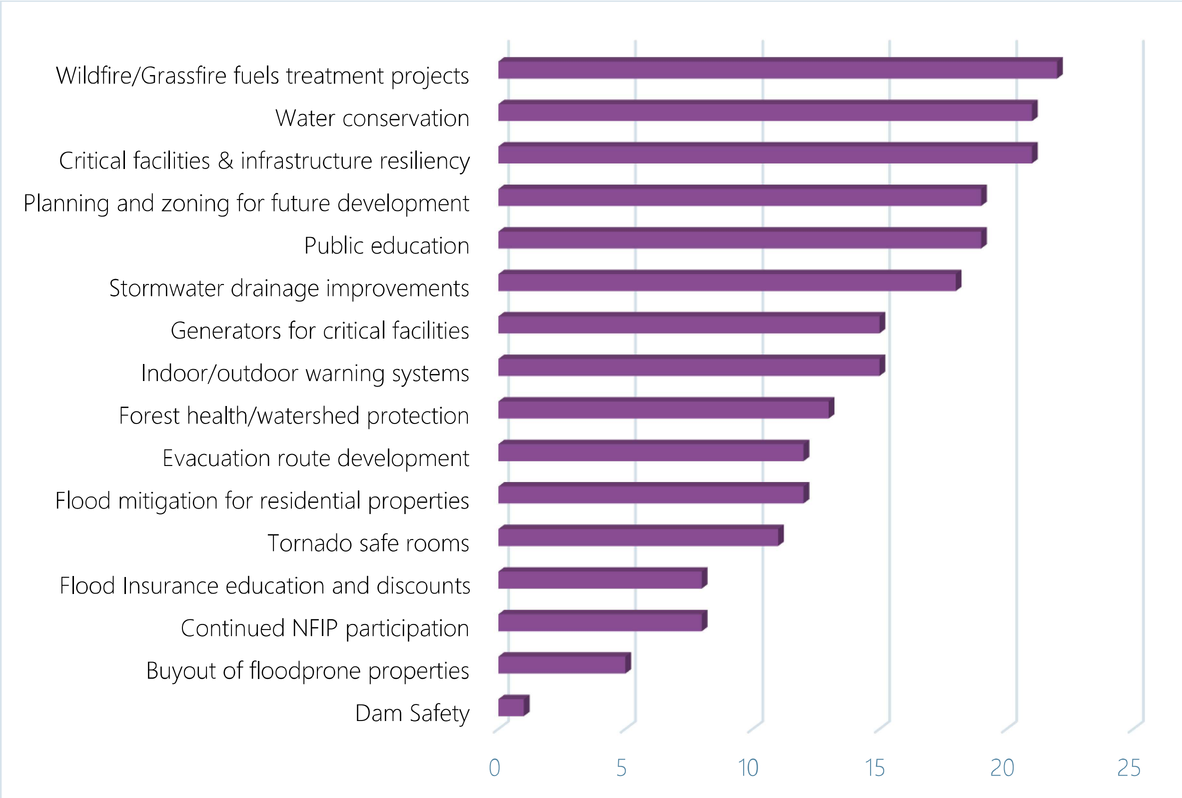
Figure 2-1 Adams County Public Survey Responses, Hazard Significance



Source: Online survey conducted by WSP

The survey also asked people what mitigation actions should have high priority in the planning area. Figure 2-2 shows the results; wildfire/grassfire fuels treatment projects, water conservation, and critical facilities & infrastructure resiliency were the most popular actions, with dam safety and buyout of flood prone properties being the least popular.

Figure 2-2 Adams County Public Survey Responses, Mitigation Actions



Source: Online survey conducted by WSP

The full results of the public survey can be found in Appendix D. These results were shared with the HMPC, who took public opinion into account when prioritizing hazards and mitigation actions.

Social Vulnerability Survey

An additional survey was conducted focusing on social vulnerabilities and extra assistance needed within the community during emergency and disaster situations. The survey asked 30 questions pertaining to mental and physical disabilities that might hinder a household's ability to respond quickly to an emergency, as well as questions about language and cultural barriers. The survey was open from February 15th through March 15th, 2024, and received 28 responses.

Results found that the biggest issue residents face is concerns about mobility. Multiple respondents indicated they would need help evacuating their home if required. Other respondents mentioned that they have medical equipment that requires electricity, with 100% of respondents saying they do not have access to a backup power generator. Other respondents mentioned they can identify a neighbor or family friend that they would need to divert their own household's time and resources to help. Questions surrounding social and cultural considerations mentioned the need for free and easy to access information that comes from one source. Respondents suggested an Adams County app for updates, others mentioned the need for translated information as well as information in other formats outside of social media as not every person has access to internet, especially during a power outage.

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. Adams County provided the plan draft for review and comment on the County website from September 30th to October 15th, 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 D. An online form to collect comments was posted with the plan. No public comments were received.

Step 3: Coordinate with Other Departments

There are numerous organizations whose goals and interests' interface with hazard mitigation in Adams County. Coordination with these organizations and other community planning efforts is vital to the success of this plan update. Adams County OEM invited a wide range of stakeholders to the kickoff meeting to learn about and participate in the hazard mitigation planning initiative. This included federal and state agencies, neighboring communities, and owners of key infrastructure. A list of government and stakeholder representatives invited to participate can be found in Appendix B.

Those who attended the kickoff meeting and other planning meetings are described above in Step 1: Organize the Planning Effort.

In addition, the HMPC developed a list of neighboring communities and local and regional agencies involved in hazard mitigation activities, as well as other interested parties to keep informed on the plan update process. This included local and regional agencies involved in hazard mitigation activities or those beyond the County and local government that have the authority to regulate development. Other invited stakeholders included the owners of high potential hazard dams (HHPDs) with the potential to impact Adams County.

Stakeholders could participate in various ways, either by contributing input at HMPC meetings, being aware of planning activities through an email group, providing information to support the effort, or reviewing and commenting on the draft plan.

Many of these groups found it beneficial to participate on the committee. As part of the HMPC and public outreach processes, stakeholders were invited to review and comment on the plan prior to submittal to Colorado DHSEM and FEMA.

As part of the public review and comment period for the draft plan, key agencies were again specifically solicited, as well as the neighboring jurisdictions of Arapahoe, Weld, and Denver counties and the incorporated jurisdictions not participating in this HMP update:

- City of Arvada
- City of Aurora
- City of Federal Heights
- City of Northglenn
- City of Thornton
- City of Westminster

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 HMPC to discuss any outstanding issues and to provide input on the draft document and final mitigation strategies. This met the requirements of planning steps 2 and 3 in the 2023 FEMA Local Mitigation Planning Handbook.

Incorporation of Existing Plans and Other Information

Coordination and synchronization with other community planning mechanisms and efforts are vital to the success of hazard mitigation planning. Existing plans, policies, regulations, codes, tools, and other actions designed to reduce a community's risk and vulnerability from natural hazards should be identified and reviewed to have a thorough evaluation of hazard mitigation practices already in place. Adams 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, holistic 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 Adams County and participating municipalities related 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.

Table 2-3 Summary of Review of Key Plans, Studies and Reports

Plan, Study, Report Name	How Plan informed LHMP
Adams County Community Report (2019)	Informed the Community Profile (Chapter 2)
Adams County Comprehensive Plan (2014) and Appendix C: Hazard Identification and Risk Assessment	Provided background information on the county including some information related to jurisdictions. Informed the Community Profile in Chapter 2 and Chapter 4 Risk Assessment.
Adams County Flood Insurance Study (2024)	Reviewed for information on past floods and flood problems to inform risk assessment (Chapter 4) Utilized Digital Flood Insurance Rate Maps effective September 2018 to update maps and flood risk assessment in Chapter 4.
Adams County Land Use and Development Code. Chapter 3 Zone District Regulations	Informed the County's capabilities assessment and provided information for the parcel analysis.
Adams County Transportation Plan (2022)	Informed Chapter 2 Community Profile
Arapahoe County Hazard Mitigation Plan (2021)	Provided information on past events and vulnerabilities specific to the Town of Bennett.
Cities of Thornton, Federal Heights, and Northglenn Natural Hazard Mitigation Plan (2023)	Informed the risk and vulnerability assessment in Chapter 4.
City of Aurora Hazard Mitigation Plan (2022)	Informed the risk and vulnerability assessment in Chapter 4.
City of Brighton Comprehensive Plan (2016)	Provided background information on the City, including potential areas for future development.
City of Brighton Sustainability Plan (2024)	Addressed vulnerabilities identified in the 2019 Adams County HMP and provided background information on the City of Brighton.
City of Westminster Hazard Mitigation Plan (2023)	Informed the risk assessment (Chapter 4).
Colorado Division of Water Resources, High Hazard Dam Release - Downstream Floodplain Impacts Study (2020)	Provided data on high and significant hazard dams in and near the County.
Colorado Division of Water Resources, Dam Inundation Mapping	Provided data on high and significant hazard dams in and near the County.
Colorado Flood Mitigation Plan (2018 Update)	Reviewed information on past flood events and risk analysis for the planning area to inform the risk assessment
Colorado State Drought Response and Mitigation Plan (2018)	Informed the drought hazard profile and vulnerability assessment in Chapter 3 risk assessment.

Plan, Study, Report Name	How Plan informed LHMP
Colorado State Hazard Mitigation Plan (2023)	Informed the HIRA (Chapter 4) with risk information specific to Adams County and hazard profile information for each of the hazards.
Colorado Water Conservation Board – Colorado Water Availability Study (2019)	Informed the drought hazard vulnerability assessment in Chapter 4 risk assessment.
Commerce City 2045 Plan (Comprehensive Plan) 2024	Provided background information on the City, including potential areas for future development.
Commerce City Energy, Equity, and Environment Plan (2023)	Provided information on past events and background information on the City of Commerce City.
Flood Insurance Rate Maps (FIRMs) (1987 and 2024)	Informed the Flood section
Middle South Platte-Cherry Creek Hydrologic Unit Code 10190003 Rapid Assessment (2009)	Informed the flood profile and risk assessment in Chapter 4.
Sustainable Adams County 2030 Plan (2015)	Informed the Capability Assessment (Chapter 5) and was referenced during the goals and objectives development workshop.
Town of Bennett Comprehensive Plan (2021)	Provided background information on the Town of Bennett, including potential areas for future development.
Town of Bennett Draft CAIMP Master Plan (2021)	Informed the flood risk analysis for the Town of Bennett and was used in the discussion on developing new mitigation actions for the Town.
Weld County Hazard Mitigation Plan (2021)	Provided information on past events and vulnerabilities specific to the City of Brighton.

Additional data, reports and studies consulted during the 2024-2026 planning process can be found in Appendix E.

2.3.2 Phase 2 Assess Risk

Step 4: Identify the Hazards

WSP led the HMPC in a review of the list of hazards identified in the 2020 plan and document all the hazards that have impacted or could impact the planning area, including documenting recent events. The HMPC refined the list of hazards to make it more relevant to Adams County. The profile of each of these hazards was then developed and updated in 2024 with information from the HMPC 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, previous occurrences, probability of future occurrences, and magnitude/severity of each hazard. Information on the methodology and resources used to identify and profile hazards is provided in Chapter 4.

Step 5: Assess the Risks

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

Vulnerability Assessment—Participating jurisdictions inventoried their assets at risk to natural and human-caused hazards—overall and in the 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 HMPC also analyzed development trends in hazard areas. The County's Digital Flood Insurance Rate and Map Database (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. This information is included in the jurisdictional annexes. Refer to Section 3.12 Capabilities Assessment for the results of the existing capabilities as well as the jurisdictions identified opportunities for enhancing capabilities.

A more detailed description of the risk assessment process and the results are included in Chapter 4 Risk Assessment.

2.3.3 Phase 3 Develop the Mitigation Plan

Step 6: Set Goals

WSP facilitated a brainstorming and discussion session with the HMPC during their third meeting to identify goals and objectives for the overall multi-jurisdictional mitigation plan update. The HMPC discussed definitions and examples of goals, objectives, and actions; and considered the goals of the State Hazard Mitigation Plan and other relevant plans when forming their own goals and objectives. The goals and objectives from the 2020 Plan were reviewed and re-approved for 2026, as described in Chapter 5.

Step 7: Review Possible Activities

The HMPC identified and prioritized mitigation actions at their third meeting. The HMPC 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 HMPC 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 vote for their highest priority projects. Projects were then sorted into high, medium, or low priority based upon the number of votes they received. This process is described in more detail in Chapter 6 Mitigation Strategy.

The jurisdictions were also responsible for working with their local staff to submit additional mitigation actions unique to their jurisdiction. Each jurisdiction provided input on the progress made on actions identified in the 2020 plan.

Step 8: Draft the Plan

The first complete draft of the plan update, including annexes for each of the participating jurisdictions, were developed and submitted to the HMPC for review in March 2025. Once the committee's comments were incorporated, a complete draft of the plan was made available online and in hard copy for review and comment by the public and other agencies and interested stakeholders, 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. 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. Chapter 6 Plan Implementation and Monitoring describes how the plan will be implemented, monitored, evaluated, updated, and how it will be integrated into other planning mechanisms. A strategy for continued public involvement is also included in Chapter 6.

3 Community Profile

Located on the northern edge of the Denver metropolitan area, Adams County is the 5th most populous county in Colorado, and 39th largest in terms of size. Adams County is part of the Denver–Aurora–Lakewood, CO Metropolitan Statistical Area.

3.1 County History

In 1901, the Colorado General Assembly voted to split what was then Arapahoe County into three parts: a new Adams County, a new consolidated City and County of Denver, and the remainder of the old Arapahoe County to be renamed South Arapahoe County. Adams County was named after Alva Adams, a popular governor who was in office at the time. A ruling by the Colorado Supreme Court, subsequent legislation, and a referendum delayed the creation of Adams County until November 15, 1902. The first meeting of the Adams County Board of Commissioners was held Dec. 4, 1902, in Brighton. Governor James Bradley Orman designated Brighton as the temporary Adams County Seat; this was made permanent by popular vote on November 8, 1904.

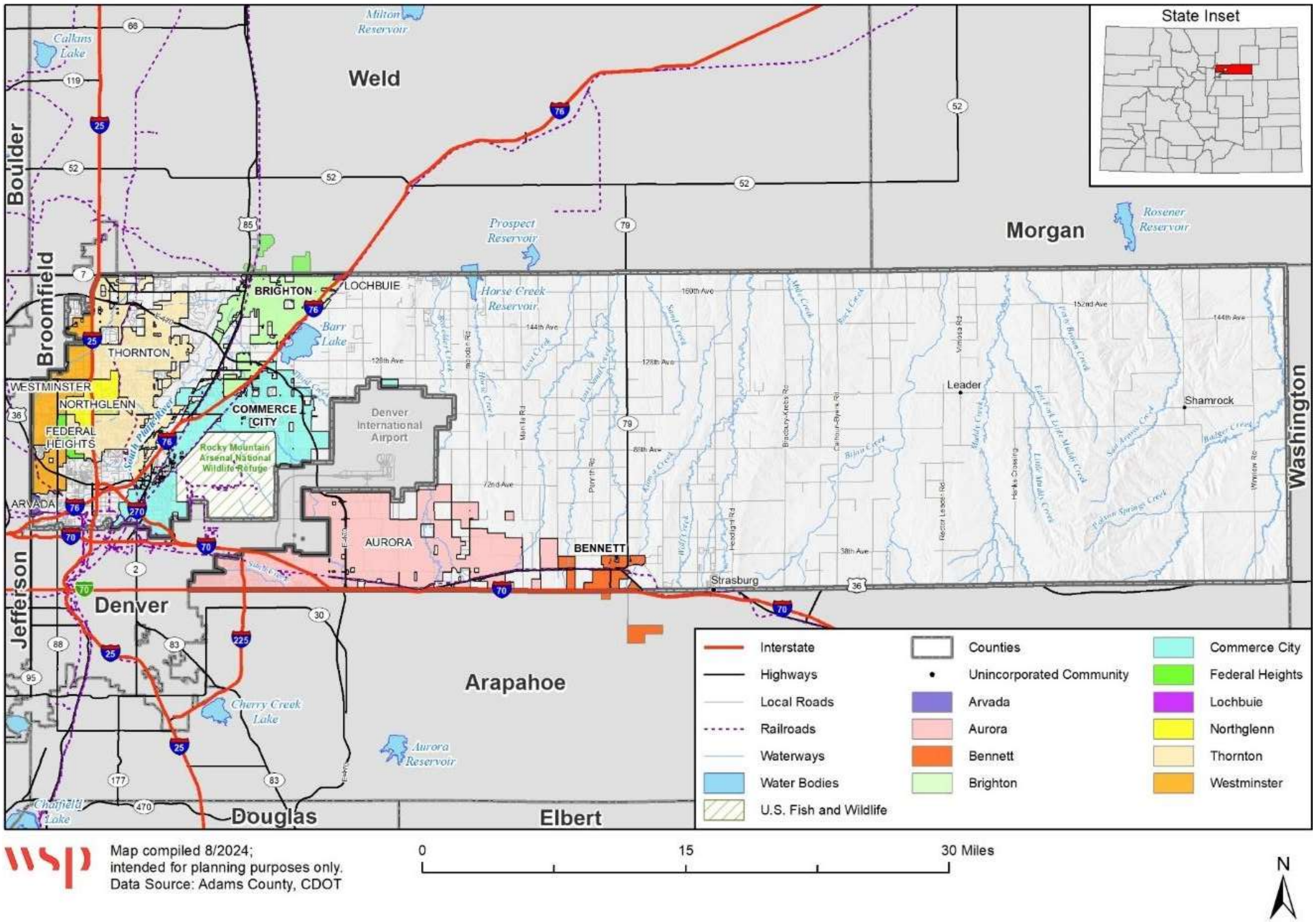
Adams County originally stretched 160 miles from present-day Sheridan Boulevard to the Kansas state border. On May 12, 1903, the eastern 88 miles of Adams County was transferred to the new Washington County and the new Yuma County, reducing the length of Adams County to the present 72 miles.

A 1989 vote transferred 53 square miles of Adams County to the City and County of Denver for the Denver International Airport, leaving the densely populated western portion of the county as two oddly shaped peninsulas. Adams County lost the tip of its northwest corner when the consolidated City and County of Broomfield was created on November 15, 2001.

3.2 Geography

Adams County contains a total of 1,185 square miles (759,000 acres). The County stretches approximately 17 miles in latitude (north to south) and is approximately 72 miles wide (east to west). Adams County is bordered to the south by the City & County of Denver and Arapahoe County; to the west by Jefferson County and the City & County of Broomfield, to the north by Weld County, and to the east by Morgan and Washington Counties. Figure 3-1 below shows the boundaries of the county as well as the participating jurisdictions.

Figure 3-1 Adams County



3.3 Cities and Communities

Eight incorporated cities and two towns are wholly or partially located in Adams County:

- City of Arvada (part in Jefferson County)
- City of Aurora (part in Arapahoe & Douglas Counties)
- City of Brighton (part in Weld County)
- City of Commerce City
- City of Federal Heights
- City of Northglenn (part in Weld County)
- City of Thornton (part in Weld County)
- City of Westminster (part in Jefferson County)
- Town of Bennett (part in Arapahoe County)
- Town of Lochbuie (part in Weld County)

Adams County also includes the following unincorporated communities:

- Berkley
- Derby
- Henderson
- North Washington
- Shaw Heights
- Sherrelwood
- Strasburg (mostly in Arapahoe Co.)
- Todd Creek
- Twin Lakes
- Watkins (mostly in Arapahoe Co.)
- Welby

The County is served by 10 fire districts, 12 school districts, and 45 water and sanitation districts.

Colleges and universities located within Adams County include:

- University of Colorado Denver Anschutz Medical Campus
- Colorado State University Extension
- Front Range Community College – Brighton Center
- Front Range Community College – Westminster Campus

3.4 Demographics

This section was updated using data from the U.S. Census Bureau's 2018-2023 American Community Survey (ACS) 5-Year Estimates, and the Colorado State Demography Office.

As of 2023, the U.S. Census Bureau estimated Adams County's total population at 533,365. This constitutes a 4% increase in population since 2018 (511,868), and a 185.1% increase since 1970 (187,062). In 2024, the County's growth came from natural change (45.2%) and from migration (54.8%). Table 3-1 below lists population estimates for each jurisdiction and shows how they have changed in the last five years.

Table 3-2 and Table 3-3Table 3-2 show several key demographic and social characteristics of Adams County, how those characteristics have changed over the last five years, and how those characteristics compare to the rest of the state and nation.

Table 3-1 Adams County Population Change, 2018-2023

Jurisdiction	2018	2019	2020	2021	2022	2023	Growth 2018-2023
Adams County	511,868	517,421	519,572	522,140	527,575	533,365	4%
Arvada	120,127	121,095	124,402	123,829	121,672	123,517	2.82%
Aurora	373,487	379,312	386,261	389,675	393,319	394,701	5.68%
Bennett	2,202	2,358	2,603	2,964	3,299	3,472	58%
Brighton	39,053	39,836	39,355	39,895	40,569	41,196	24.5%
Commerce City	54,795	55,891	62,418	63,050	66,115	68,245	24.5%
Federal Heights	12,645	12,745	13,537	14,111	14,173	14,160	11.98%
Lochbuie	6,036	6,388	6,795	7,730	7,963	8,142	34.89%
Northglenn	38,918	38,973	39,201	37,899	37,948	37,953	-2.48%
Thornton	139,430	141,454	141,867	142,599	143,279	144,889	3.92%
Westminster	113,473	113,179	116,317	114,573	114,539	114,882	1.24%
Colorado	5,695,564	5,758,736	5,773,714	5,812,069	5,839,926	5,877,610	3%

Source: U.S. Census Bureau American Community Survey, www.census.gov

Table 3-2 Adams County Demographic and Social Characteristics, 2018-2023

Adams County	2018	2023	% Change
Population	511,868	533,365	4.2%
Median Age	34	35.1	3.24%
Total Housing Units	175,623	192,742	9.75%
Housing Occupancy Rate	95.87%	96.3%	.45%
% of Housing Units with no Vehicles Available	3.3%	4.55%	37.88%
Median Home Value	$342,400	$512,000	49.53%
Unemployment	2.5%	2.3%	26%
Mean Travel Time to Work (minutes)	29.9	28.9	-3.34%
Median Household Income	$95,187	$132,489	38.27%
Per Capita Income	$31,072	$43,548	40.15%
% of Individuals Below Poverty Level	8.8%	9.6%	9.09%
% Without Health Insurance	8.3%	8.9%	7.23%
# of Households	168,361	192,742	14.48%
Average Household Size	3.02	2.75	-8.94%
% of Population Over 25 with high school diploma	84.4%	86.8%	2.84%
% of Population Over 25 with bachelor's degree or higher	25.7%	29.8%	15.95%
% with Disability	10.3%	10.8%	4.85%
% Speak a language other than English	58.2%	60.8%	4.47%

Source: U.S. Census Bureau American Community Survey www.census.gov

Table 3-3 Demographic and Social Characteristics Compared to the State and Nation (2023)

Demographic & Social Characteristics (as of 2017)	County	Colorado	U.S.
Median Age	35.1	37.9	39.2
Housing Occupancy Rate	95.7%	92.04%	90.4%
% of Housing Units with no Vehicles Available	4.5%	5.4%	8.4%
Median Home Value	$512,100	$550,300	$340,200
Unemployment	3.1%	5%	2.7%
Mean Travel Time to Work (minutes)	28.99	25.5	26.8
Median Household Income	$132,489	$563,000	$112,834
Per Capita Income	$43,548	$51,768	$43,414
% of Individuals Below Poverty Level	9.6%	9.3%	12.5%
% Without Health Insurance	8.9%	6.7%	7.9%
Average Household Size	2.75	2.37	2.49
% of Population Over 25 with high school diploma	86.8%	93.31%	89.8%
% of Population Over 25 with bachelor's degree or higher	29.8%	46.3%	36.2%
% with Disability	10.8%	11.7%	13.6%
% Speak a language other than English at home	29%	16.0%	22.5%

Source: U.S. Census Bureau American Community Survey www.census.gov

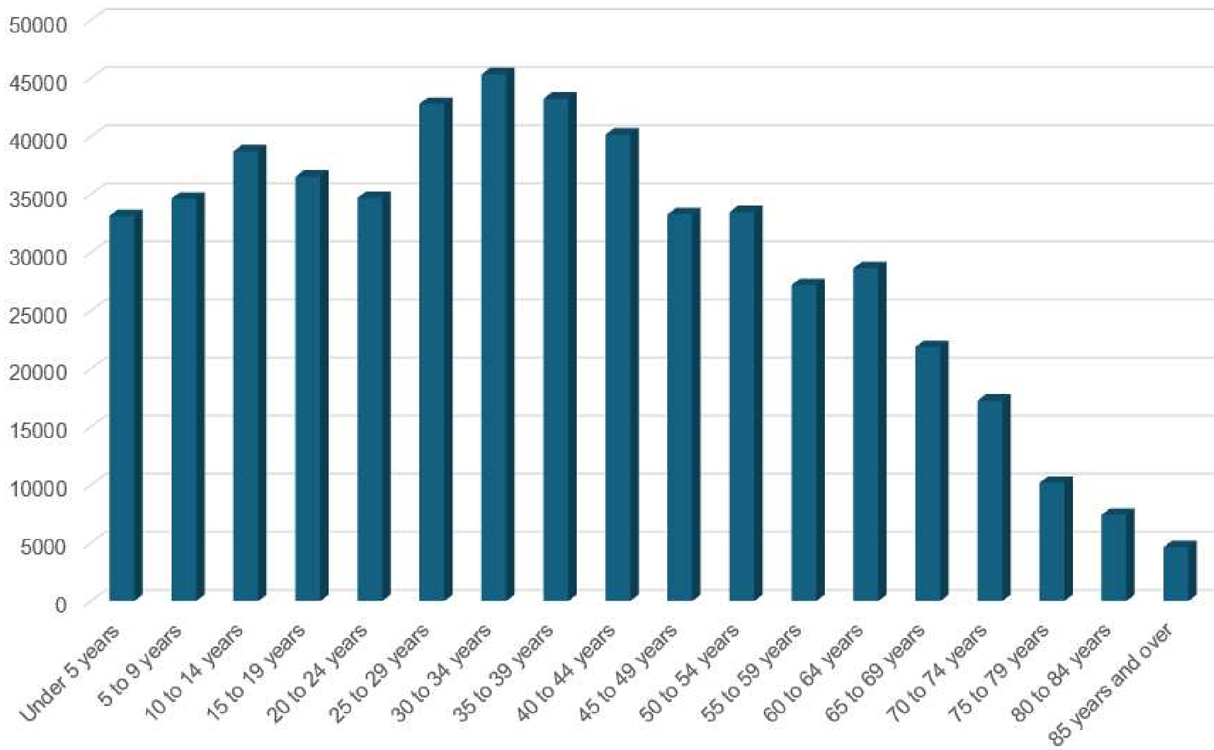
Table 3-4 and Figure 3-2 break down the demographics of the county by sex, race, and age.

Table 3-4 Demographics by Race and Sex

Adams County	Population	%
Total Population	533,365	
Male	271,126	50.8%
Female	262,239	49.2%
White, not Hispanic	283,828	53.2%
Hispanic or Latino	230,296	43.2%
Black	18,258	3.4%
Asian	22,285	4.2%
American Indian and Alaska Native	7,479	1.4%
Native Hawaiian and Other Pacific Islander	497	0.1%
Some other race	77,841	14.6%
Two or more races	123,177	23.1%

Source: U.S. Census Bureau American Community Survey www.census.gov

Figure 3-2 Adams County Population by Age



Source: U.S. Census Bureau American Community Survey www.census.gov

Figure 3-3 Western Adams County Census Block Population Density

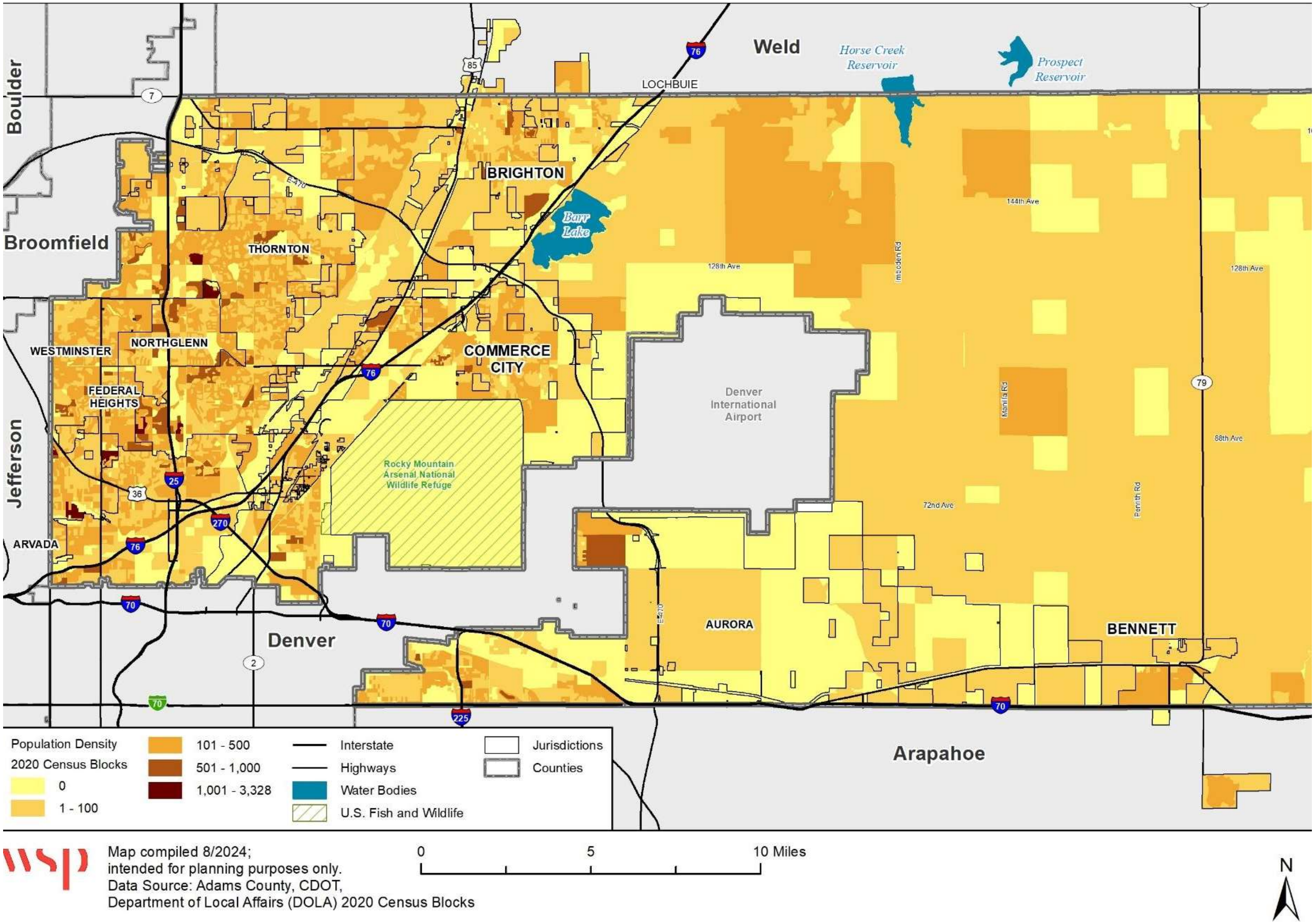
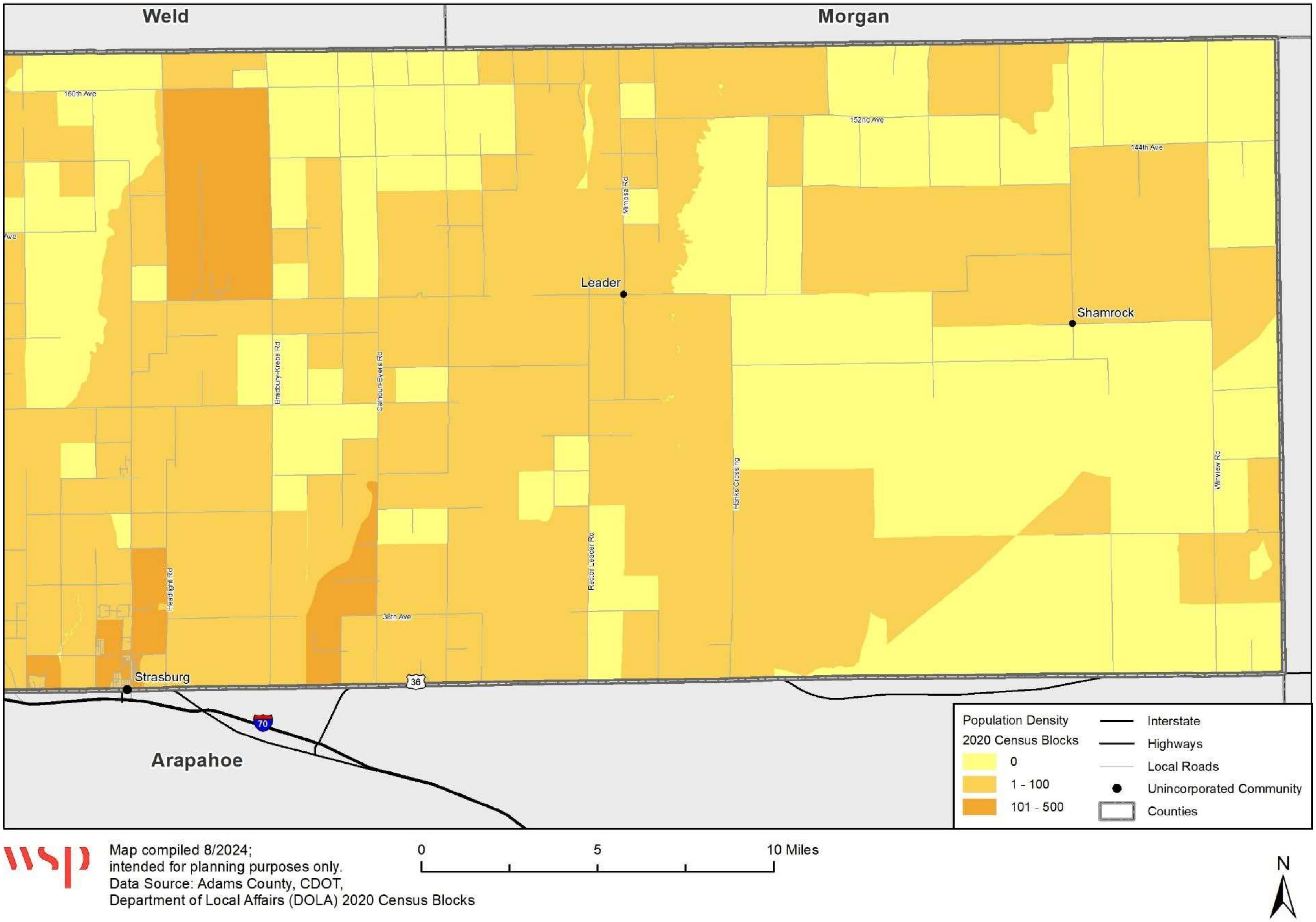


Figure 3-4 Eastern Adams County Census Block Population Density



Housing Characteristics

Table 3-5 below presents the 2023 American Community Survey estimates for types of housing units.

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

Type of Housing	Total	Percentage
Total housing units	200,085	
1-unit detached	129,653	64.8%
1-unit attached	17,105	8.5%
2 units	1,028	0.5%
3 or 4 units	6,764	3.4%
5 to 9 units	11,238	5.6%
10 to 19 units	26,324	13.2%
Mobile home	9,630	4.8%
Boat, RV, van, etc.	102	0.1%

Source: U.S. Census Bureau American Community Survey www.census.gov

According to the 2023 American Community Survey, Adams County had 200,085 total housing units, of which 197,742 (98.8%) were occupied. 68.3% of the occupied housing units were owner-occupied and 31.7% renter-occupied. More than half the total housing units (65.5%) were built in 1980 or later, and more than a quarter (39.1%) were built in 2000 or later. Only 4.5% of occupied housing units have no vehicles available for private use, which is below the state and national averages (5.4% and 8.4% respectively). 73.6% of occupied housing units use utility gas for heating, with another 23.8% using electric heating.

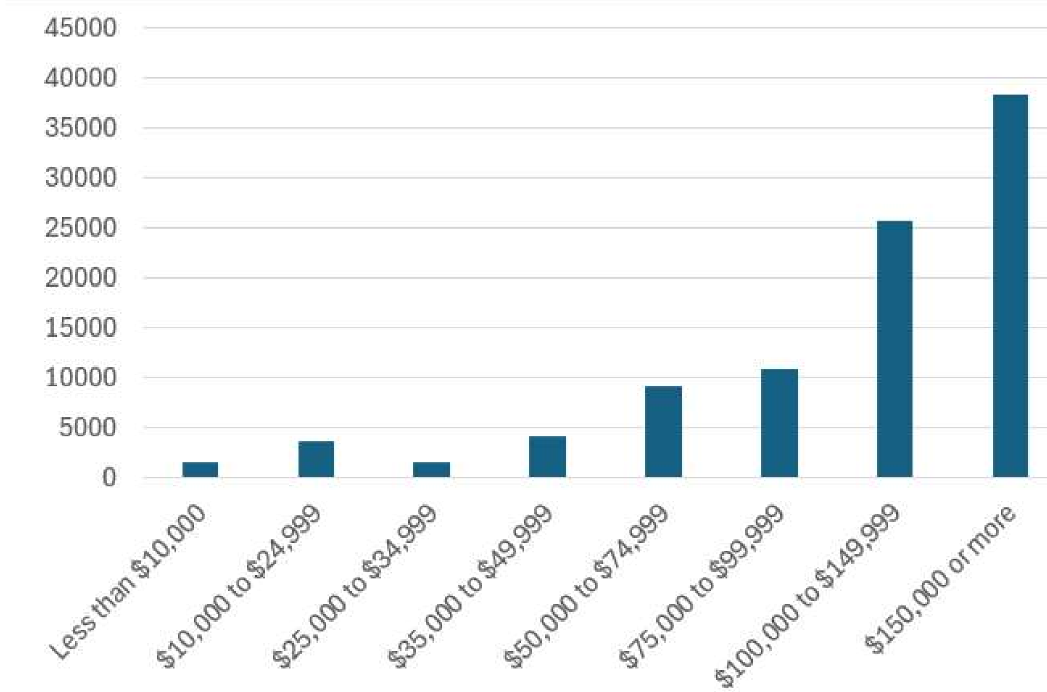
Housing Costs: The median value of owner-occupied housing units in 2023 was $512, a 49.53% increase since 2018; this is below the statewide average for Colorado ($563,000) but well above the national average ($112,834). More than 81% of owner-occupied units were valued between $300,000 and $749,999. Most owner-occupied units had a mortgage (71.8%), with a median mortgage payment of $2,378 per month. 31.2% of owner-occupied mortgaged homes paid more than 30% of their household income on housing.

The median rent cost in 2023 was $1,811 with 78% falling between $1,000 and 2,500 a month. 55.4% of renters were paying 30% or more of their income on housing.

***Households and Families*:** Out of 192,742 total households in 2023, 131,366 (68%) were family households. The average household size was 2.75 persons, although the average family size was 3.29.

***Income and Employment*:** The median household income in 2023 was $132,489, a 38.27% increase over 2018; this is below the statewide average of $563,000. Per capita income increased similarly during this period, from $31,072 to $43,548 (40.15%). There were 301.568 people in the labor force with an unemployment rate of 2.3%, down from 2.5% in 2018. Figure 3-5 shows the breakdown of households earning different income levels in the County as of 2023.

Figure 3-5 2023 Income Distribution in Adams County



Source: U.S. Census Bureau American Community Survey www.census.gov

***Poverty*:** In 2023, 9.6% of Adams County residents lived in poverty, an increase of 9.9% since 2018. 13.7% of children under 18 were below the poverty level, compared with 9.9% of people 65 years old and over. 7.4% of families had incomes below the poverty level, although that number increases to 10.7% for families with a female householder and no adult male present.

***Language*:** Among people at least five years old living in Adams County in 2017, 71% spoke primarily English at home. Spanish was spoken in 24.1% of homes, followed by Asian and Pacific Islander languages (2.5%) and other Indo-European languages (1.9%). 11.5% of households reported they spoke English less than "very well", which is above the statewide and national averages (6.0% and 8.5% respectively).

Education: In 2017, 86.8% of people 25 years and over had at least graduated from high school, and 29.8% had a bachelor's degree or higher; both of these are increases since 2018 (2.4% and 4.1% respectively) but are still below average for Colorado and the Nation. The total school enrollment in Adams County was 126,702. Nursery school and kindergarten enrollment was 6,757 and elementary through high school enrollment was 94,942 children. College or graduate school enrollment was 19,104.

People with Disabilities: 57,201 persons (10.8%) were living with some form of disability in 2023. This was a 4.85% increase from 2018 and is close to statewide averages (11.7%) and slightly below the national average (13.6%).

Health Insurance Coverage: As of 2023, 8.9% of residents had no health insurance coverage, including 10.9% of employed individuals and 29.9% of unemployed individuals. Of those with health insurance, 65.6% had private insurance and 33.1% had public insurance.

3.5 Social Vulnerability

Social vulnerability refers to a community's capacity to prepare for and respond to the stress of hazardous events ranging from natural disasters, such as tornadoes or disease outbreaks, to human caused threats, such as toxic chemical spills. Social vulnerability considerations were included in this plan update to identify areas across the County that might be more vulnerable to hazard impacts based on a number of factors.

The Center for Disease Control and Prevention (CDC) has developed a social vulnerability index (SVI) as a way to measure the resilience of communities when confronted by external stresses such as natural or human-caused disasters or disease outbreaks. The SVI is broken down to the census tract level, and provides insight into particularly vulnerable populations to assist emergency planners and public health officials identify communities more likely to require additional support before, during, and after a hazardous event. The SVI index combines four main themes of vulnerability, which are in turn broken down into subcategories for a total of 15 vulnerability factors. Table 3-6 displays those 15 factors and shows how Adams County compares to other counties in Colorado and nationally. The rankings show the percentage of counties that Adams County is more vulnerable than, i.e. – high numbers are worse.

Table 3-6 Social Vulnerability in Adams County

Theme	Variable	Value	Ranking Compared to Colorado Counties	Ranking Compared to US Counties	Vulnerability
Socioeconomic status			83%	68%	Above Average
	Below poverty	16.9%	38%	20%	Low
	Unemployment	4.6%	56%	47.4%	Below Average
	Income	29.1%	89%	91.6%	High
	No high school diploma	15.2%	94%	68%	Above Average
Household composition and disability			76%	67.4%	Above Average
	Age 65 or older	10.8%	0%	1.7%	Low
	Age 17 or younger	25.6%	90%	89%	High
	Disability	11.1%	37%	10%	Low
	Single-parent households	7.2%	89%	77%	High
	Speaking English "less than well"	5.5%	94%	94%	High
Minority status			95%	88%	High
	Minority	52.5	95%	88%	High
Housing and transportation			68%	55%	Above Average
	Multiunit structures	15%	81%	94%	High
	Mobile homes	6%	35%	31%	Below Average
	Crowding	4.5%	92%	90%	High
	No vehicle	4.6%	56%	36%	Below Average
	Group quarters	0.7%	21%	6.9%	Low
Overall Social Vulnerability			**81%**	**73%**	Above Average

Source: U.S. CDC https://svi.cdc.gov (using data from U.S. Census Bureau American Community Survey, 2022) NRI

Adams County's social vulnerability is above average overall compared to the rest of the United States, and high compared to the rest of Colorado:

- Socioeconomic vulnerability is generally below average, but the County has a relatively high number of people who do not have high school diplomas.
- Adams County has a low percentage of elderly and people with disabilities. However, it has a high percentage of children and single-parent households.

- Adams County has a high percentage of racial minorities, who historically are hardest hit by disasters, as well as people who speak English "less than well," complicating disaster communications.
- A high percentage of Adams County residents live in multi-unit structures, or in housing units with more people than rooms, which can complicate evacuations.

Figure 3-6 ***through***

Figure 3-9 Minority Status and Language Vulnerability in Adams County

Figure 3-10 display SVI data for Adams County by census tract. These figures are zoomed into the western half of the county due to the eastern half being one census tract in every figure, with the color shown on the eastern part of the map continuing east to the County line. The areas with the highest level of social vulnerability are located in the western portion of the County, in and around the incorporated jurisdictions of Aurora, Brighton, Arvada, and Federal Heights.

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

Figure 3-6 Overall Social Vulnerability in Western Adams County

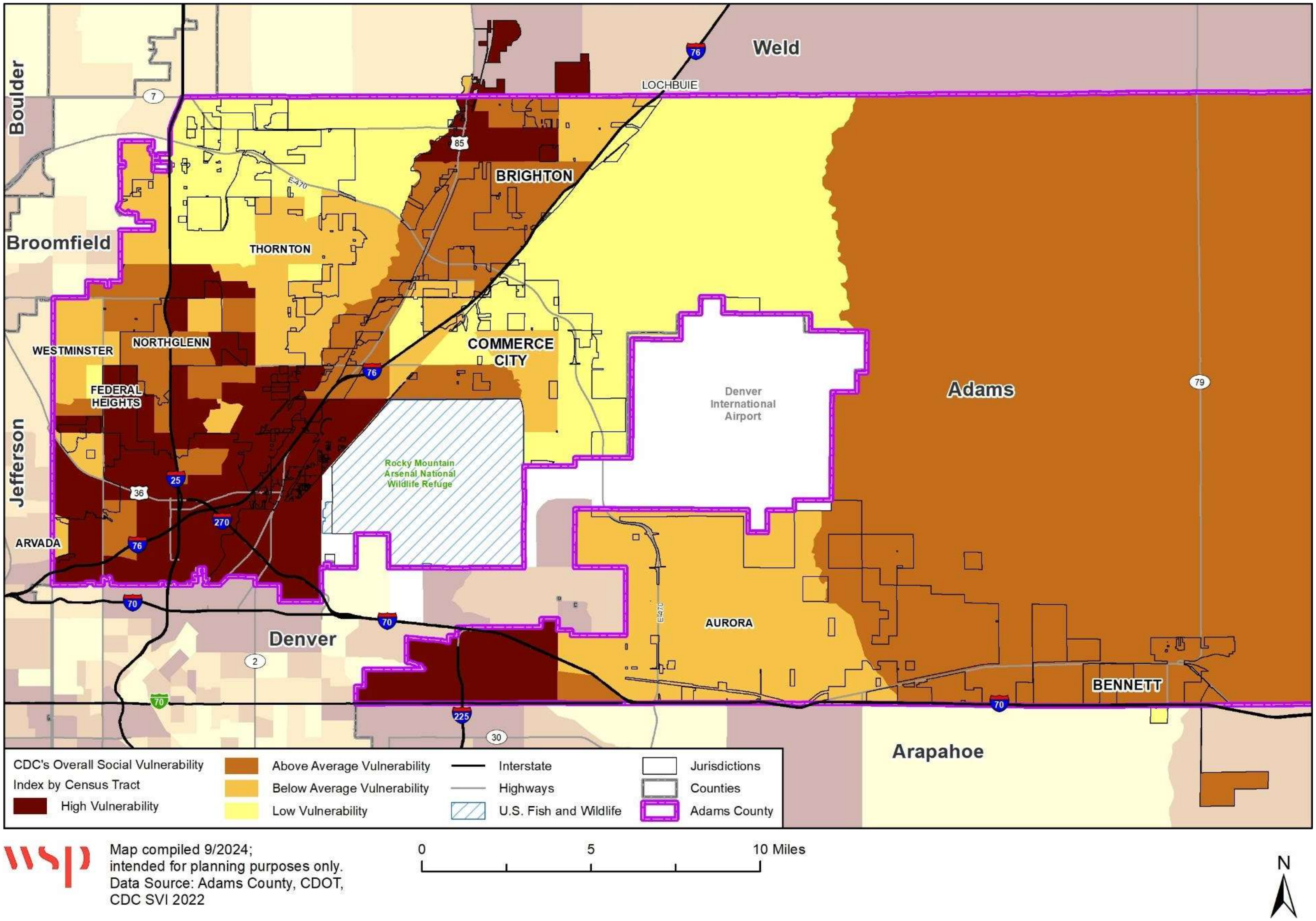


Figure 3-7 Socioeconomic Status Vulnerability in Adams County

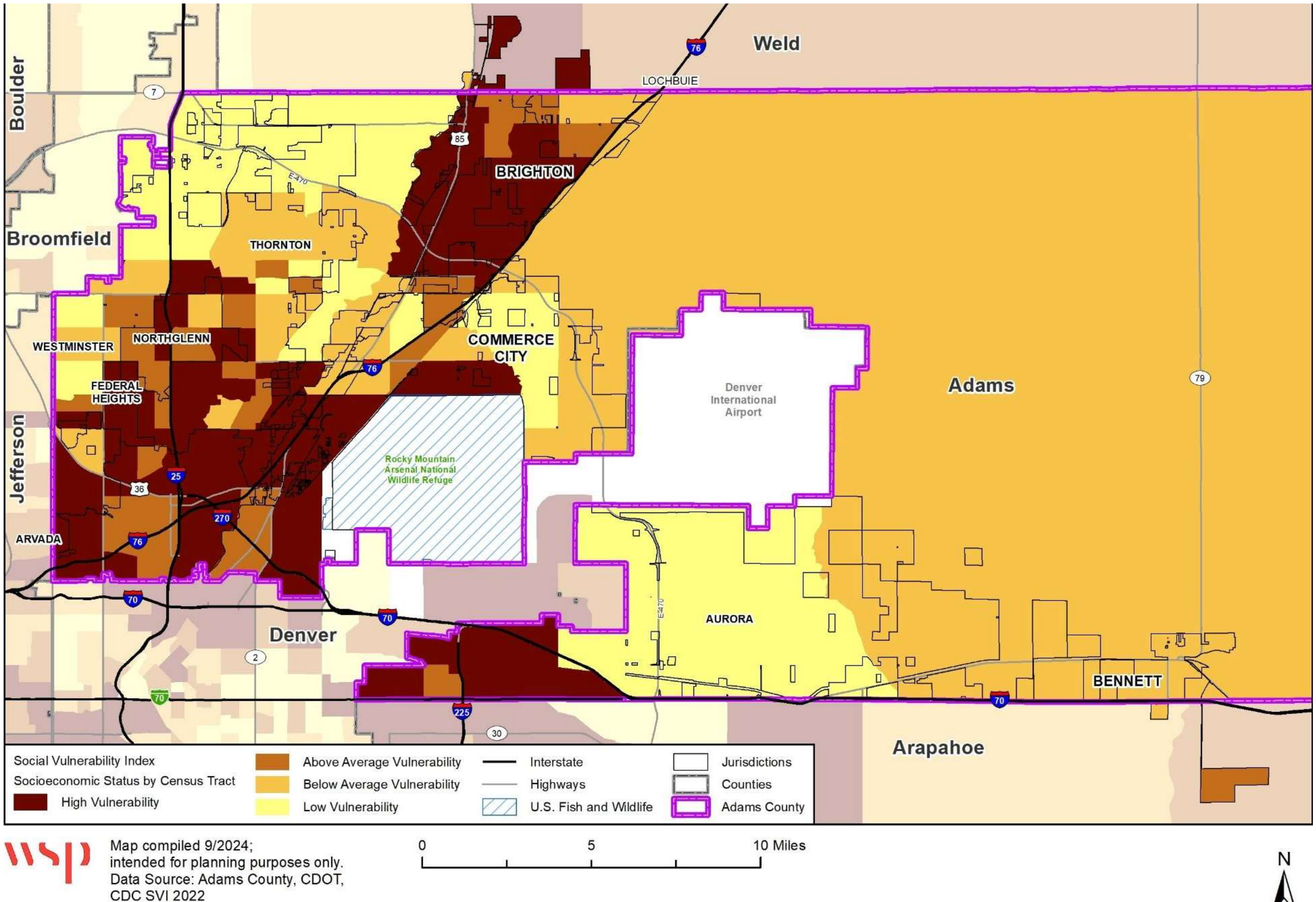


Figure 3-8 Household Composition in Adams County

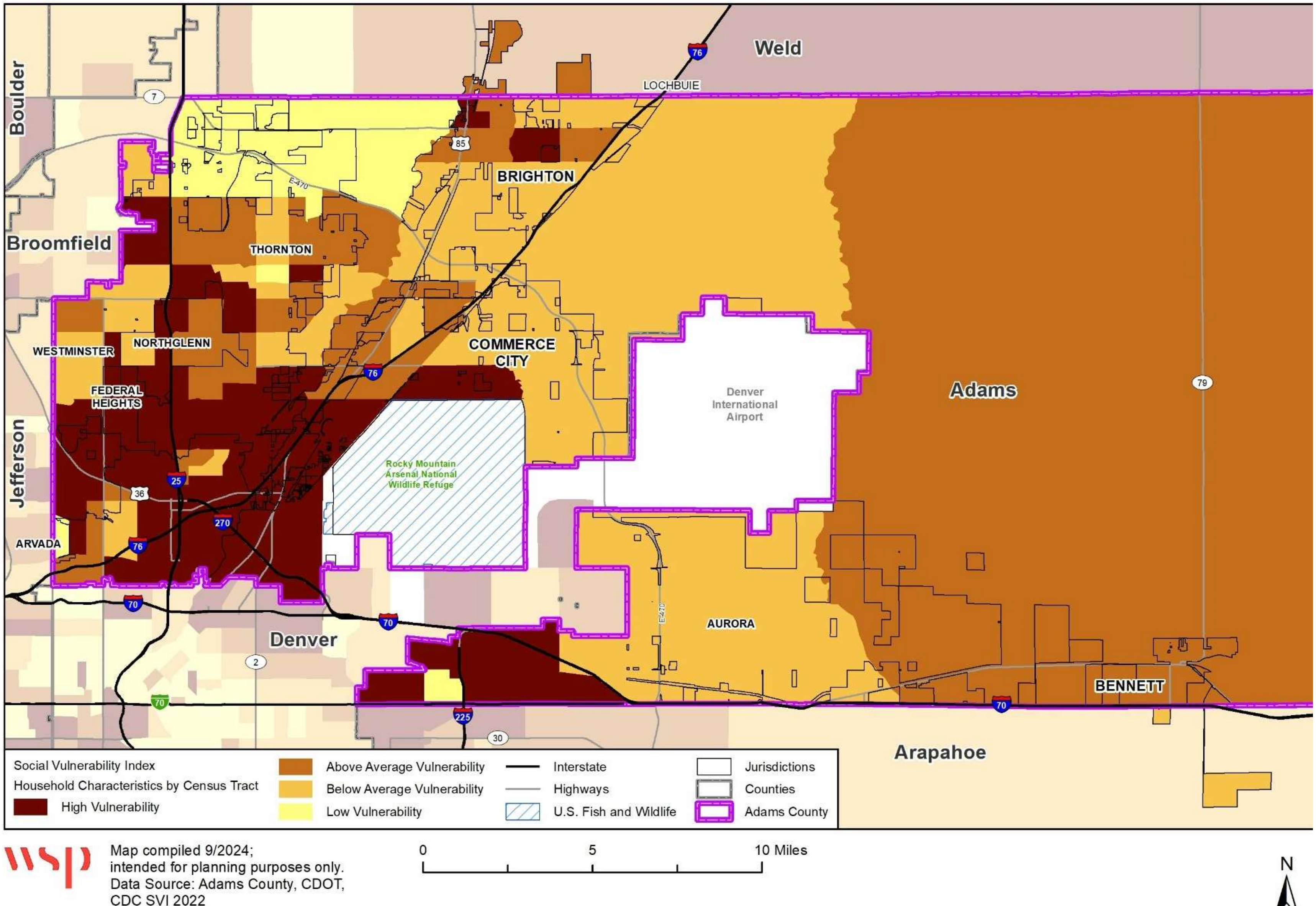


Figure 3-9 Minority Status and Language Vulnerability in Adams County

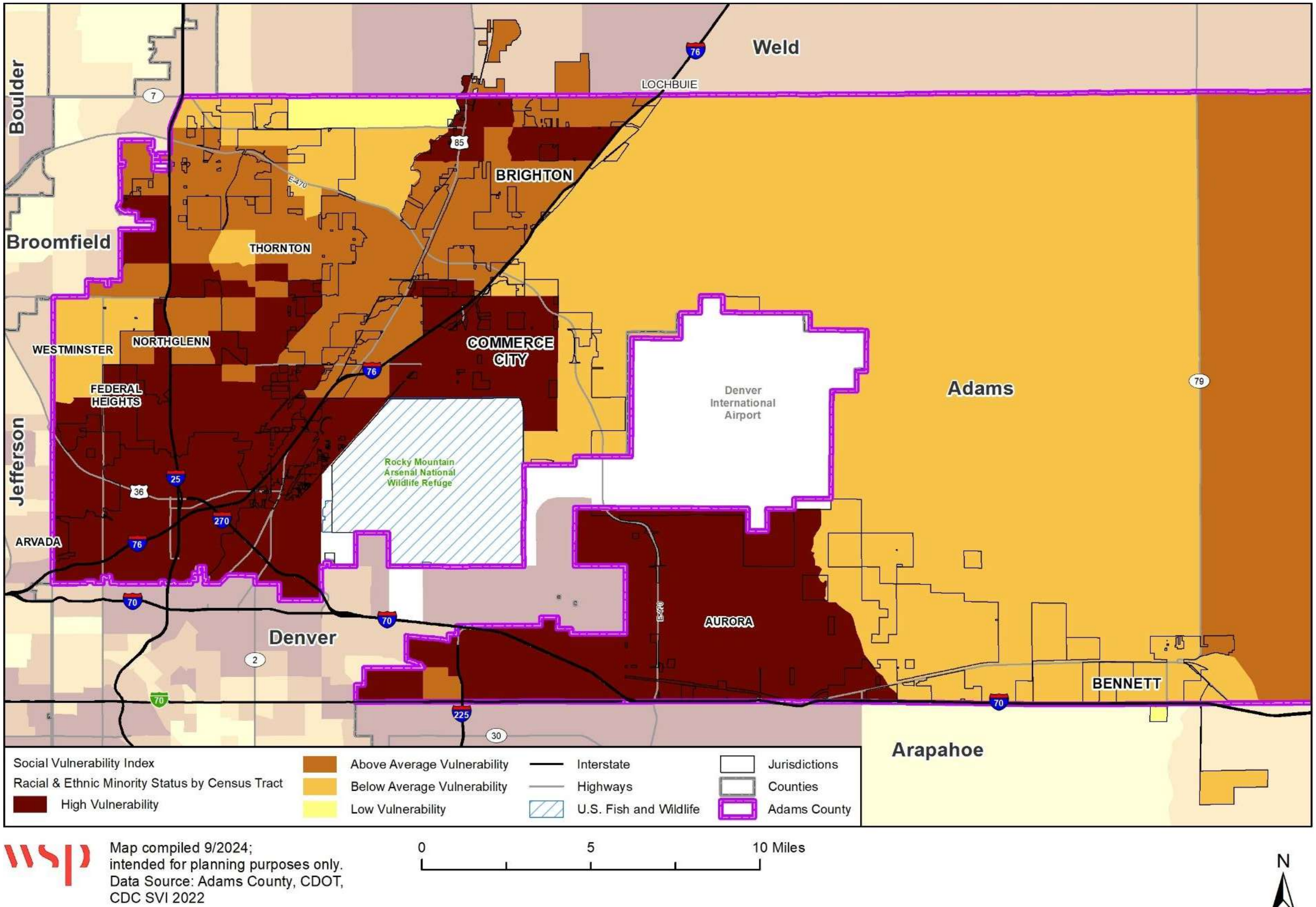
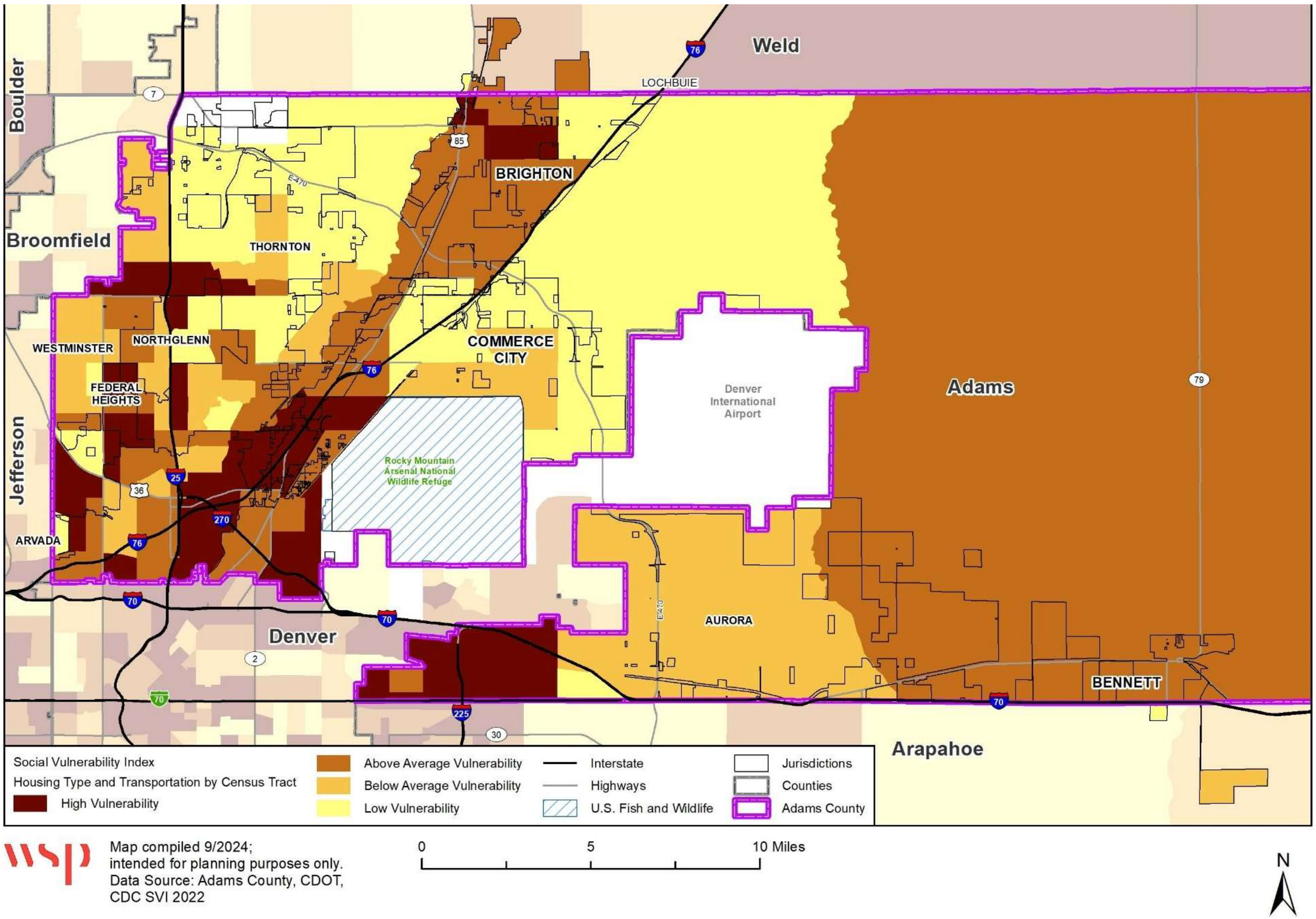


Figure 3-10 Housing and Transportation Vulnerability in Adams County

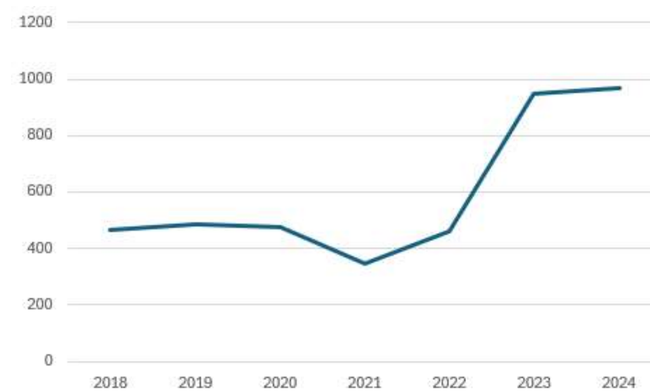


Homeless Population

The Metro Denver Homeless Initiative (MDHI) releases annual Point In Time estimates of the homeless population in the Denver metropolitan area; these are only snapshot estimates, and MDHI cautions against placing too much stock in exact numbers. Nevertheless, they can show broad trends over time.

For 2024 MDHI estimated Adams County's homeless population at 970, a 108% increase since the 2018 estimate of 466 persons. (Data from before 2018 is not included due to changes in counting methodology.) This represents 9.7% of the homeless population in the Denver metropolitan area, which was estimated at 9,977 in 2024. It is worth noting that the homeless population across the Denver metro area has remained relatively consistent since 2018; the increased homeless population in Adams County seems to be primarily the result of people moving from neighboring counties.

Figure 3-11 Adams County Homeless Population, 2018-2023



Source: Metro Denver Homeless initiative https://www.mdhi.org/pit

Note: 2021 only had data for sheltered populations

Table 3-7 Adams County Homeless Population Characteristics (2024)

Characteristic	#
Total estimated homeless population	970
Unsheltered	363
Emergency Shelter	607
Transitional Housing	41
Newly Homeless	298
Chronically Homeless	375
Veterans	49
Families	253
Unaccompanied Youth (<25)	31
Fleeing Domestic Violence	83

Source: Metro Denver Homeless initiative https://www.mdhi.org/pit

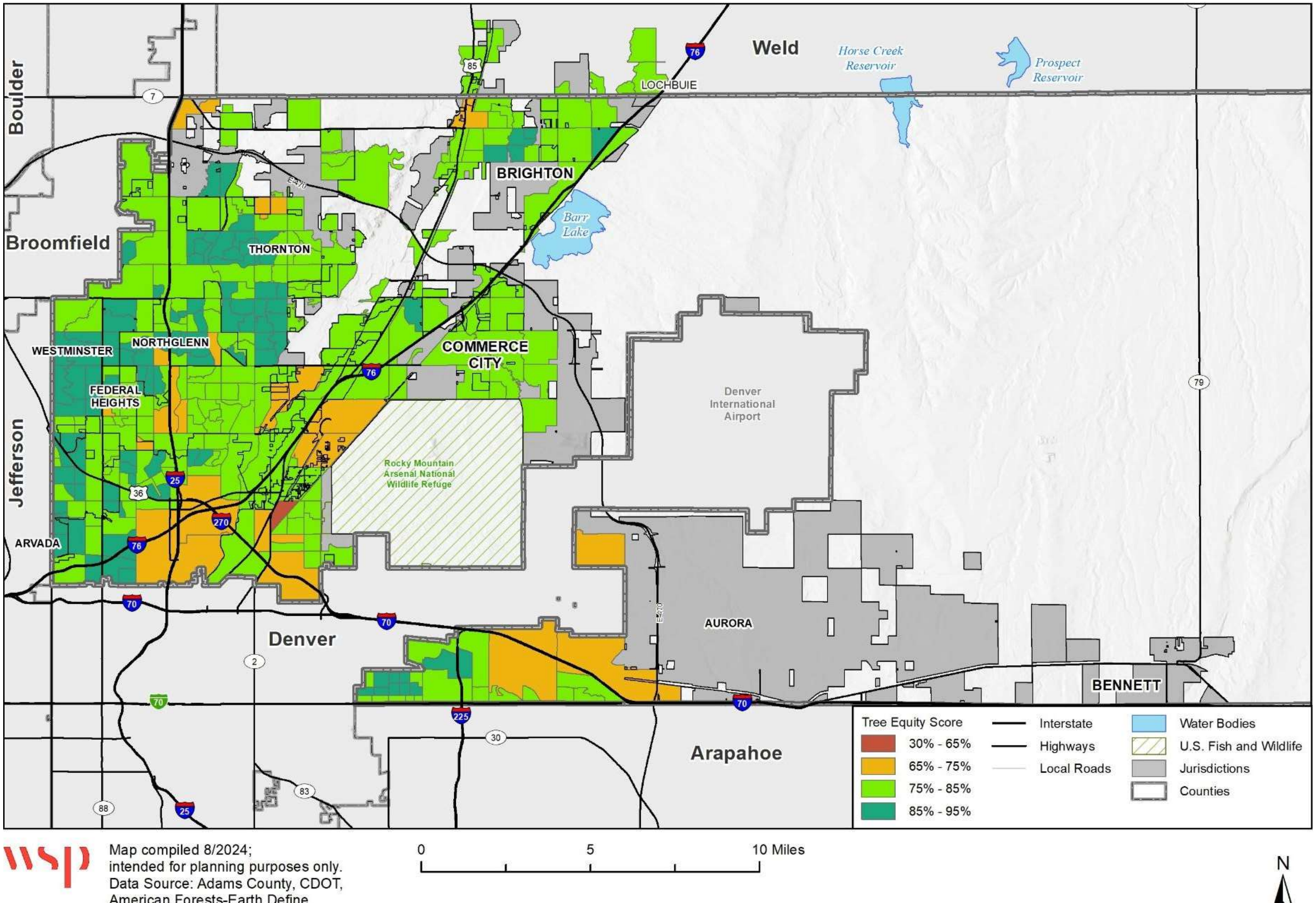
Tree Equity Score

The urban heat island effect is exacerbated when cities replace natural land cover with dense concentrations of pavement, buildings, and other surfaces that absorb and retain heat; thus urban heat islands correlate closely to the extent of tree canopy and green spaces in cities. Unfortunately, in many cities, lack of tree canopy and green spaces often correlates with race, income, and other social vulnerability factors.

The non-profit organization American Forests has mapped tree coverage in metropolitan areas across the US, and evaluated tree cover against factors such as population density, income, employment, race, age, and health to achieve a “tree equity score” by census tract. This tool can help anticipate the areas of Adams County which can anticipate more severe impacts during extreme heat events, as well as where to potentially focus additional tree planting.

Figure 3-12 shows tree equity scores in Western Adams County. Higher numbers indicate areas that are close to achieving tree equity, while low numbers represent less-equitable areas. Unfortunately, data is not available for the rest of the County.

Figure 3-12 Western Adams County Tree Equity Score



3.6 Economy

The civilian workforce in Adams County, defined as all employed residents 16 years or older, was 417,273 in 2023. This is an increase of 6.38% since 2018, which exceeds the County's population growth of 4%. The breakdown of workers by class of work is shown in

Table 3-8 while Table 3-9 shows the breakdown by industry.

Table 3-8 Civilian Employed Population in Adams County by Class of Work

CLASS OF WORKER	2018	2023	% Increase	% of Total
Civilian employed population 16 years and over	274,062	291,245	5.93%	100%
Private wage and salary workers	230815	242,600	5.12%	83.3%
Government workers	32145	32,977	2.59%	11.3%
Self-employed in own not incorporated business workers	10677	15,668	46.75%	5.4%
Unpaid family workers	425	0	-100%	0%

Source: U.S. Census Bureau American Community Survey www.census.gov/

Table 3-9 Civilian Employed Population in Adams County by Industry

INDUSTRY	2012	2017	% Increase	% of Total
Civilian employed population 16 years and over	274,062	291,245	6.27%	100%
Educational services, and health care and social assistance	49,213	48,446	-1.56%	16.6%
Construction	34,631	35,512	2.54%	12.2%
Retail trade	36,987	31,172	-15.72%	10.7%
Professional, scientific, and management, and administrative and waste management services	30,349	39,016	28.56%	13.4%
Arts, entertainment and recreation, and accommodation and food services	24,880	28,204	13.36%	9.7%
Manufacturing	22,114	23,676	7.06%	8.1%
Transportation and warehousing, and utilities	18,982	24,391	27.97%	8.4%
Other services, except public administration	12,007	14,809	23.34%	5.1%
Finance and insurance, and real estate and rental and leasing	14,933	16,174	8.31%	5.6%
Public administration	11,929	10,700	-10.30%	3.7%
Wholesale trade	6,644	7,483	11.95%	2.6%
Information	6,257	6,252	-.08%	2.1
Agriculture, forestry, fishing and hunting, and mining	5,136	5,410	5.33%	1.9%

Source: U.S. Census Bureau American Community Survey www.census.gov/

Data from "On the Map" a tool through the US Census shows that 70.9% of employed County residents worked outside of Adams County. The median commuting time (whether employed inside or outside the County) was 28.9 minutes, an increase of -3.34% since 2018, and slightly above both Colorado and National averages (25.5 minutes and 26.8 minutes respectively).

32,977 workers (11.3%) were classified as government workers, of which 27,274 were employed in state or local government, 5,703 were employed by the federal government, and 909 were in the armed forces.

3.7 Climate

Adams County lies within the semi-arid, continental climate zone. It has four distinct seasons and receives most of its precipitation from April through August. Due to its inland location on the High Plains at the foot of the Rocky Mountains, the County can be subject to sudden changes in weather. Similarly, the weather can vary widely in different parts of the County.

May is the wettest month in Adams County with 19 days of precipitation and an average of 2.69 inches of rainfall, and January is the driest month with only 12 precipitation days and .61 inches of rainfall. There were 182 rainy days in 2024 in Adams County, which is about average compared to other places in Colorado. The wettest months are May through August when it rains 31% of the time and the driest are October through February with only a 18% chance of precipitation.

An annual snowfall of 34.12 inches in Adams County for 2024 means that it is about average compared to other places in Colorado. December is the snowiest month in Adams County with 7.57 inches of snow, and 7 months of the year have recorded snowfall.

Table 3-10 Adams County Climate

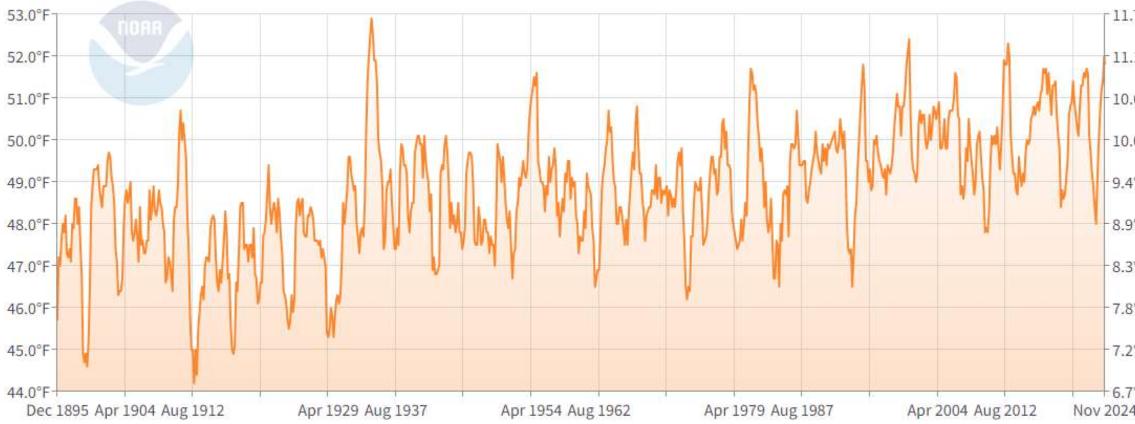
	Adams County
Rainfall, annual average	14″
Snowfall, annual average	45″
Sunny Days, annual average	300
Days with some precipitation (≥0.1″), annual average	79.5
Summer High, average (July)	87˚
Days with highs above 90˚, annual average	75
Winter Low, average (December)	22˚
Nights with lows below 32˚, annual average	113
Nights with lows below 0˚, annual average	6
Wettest month (May)	2.35″
Driest month (January)	0.61″
Snowiest month (December))	7.57″

Source: Weather Trends (2024)

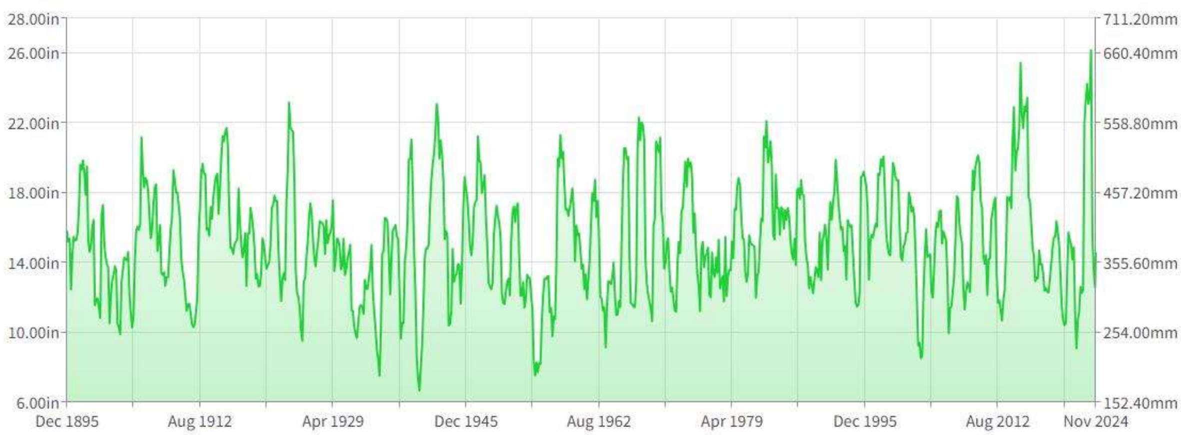
The following charts from the National Oceanic and Atmospheric Administration show the annual average temperature, average precipitation, average maximum temperature, and average minimum temperature for Adams County from 1895 to 2024.

Figure 3-13 Temperature and Precipitation Trends for Adams County, 1895-2024

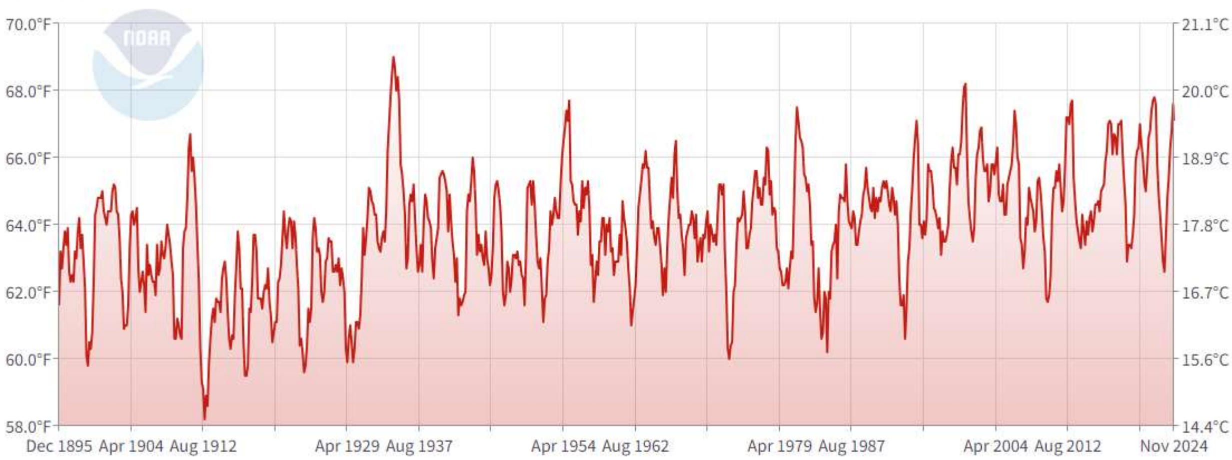
Adams County, Colorado Average Temperature
12-Month Period

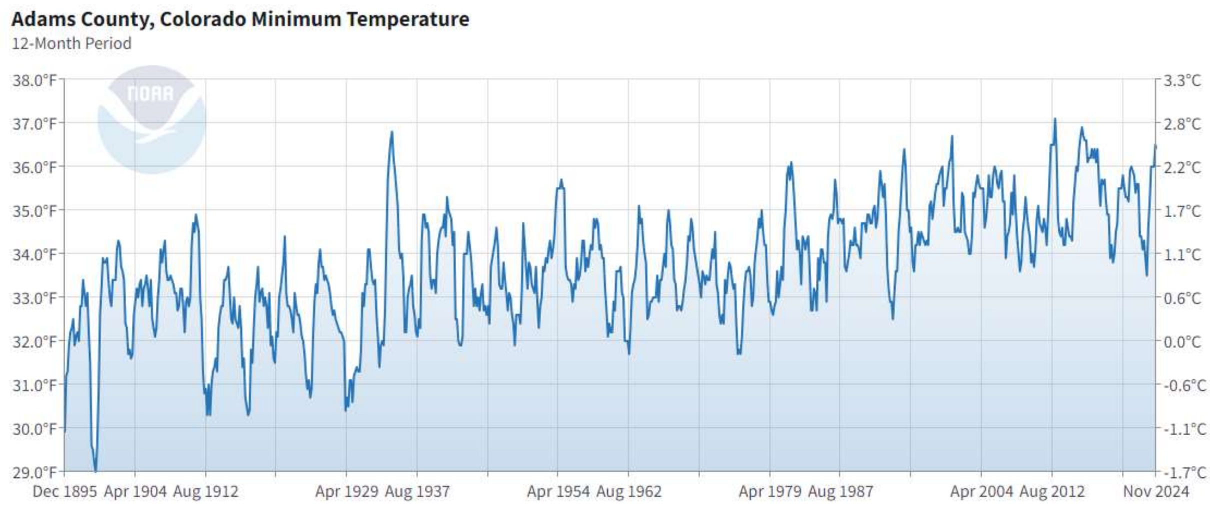


Adams County, Colorado Precipitation
12-Month Period



Adams County, Colorado Maximum Temperature
12-Month Period





Source: National Oceanic and Atmospheric Administration, Climate at a Glance: https://www.ncdc.noaa.gov/cag/

3.8 Governing Body

The Board of County Commissioners consists of five constitutional officers who act collectively as the governing board. The board manages the affairs of the County as authorized by the state. Powers granted to the board by the state are broad, which allows the board independence in judgment.

The County Manager implements the policies and priorities of the Board of County Commissioners and oversees the day-to-day operations of the county.

Other County elected officials include the County Assessor, Clerk and Recorder, Coroner, District Attorney (17th Judicial District), Sheriff, Surveyor, and Treasurer.

3.9 Transportation Systems

Several transportation systems including interstate and state highways, freight and commuter rail lines, as well as a regional and an international airport are located in and/or traverse through Adams County. The following is a breakdown of the major transportation systems that serve the County and the region.

Major Highways

The County's roadway network follows one-mile section lines in the western portion while the eastern portion network is sparse and predominately unpaved roads (Adams County 2012). The following are the major interstate highways that traverse the County and provide regional and statewide connections:

- I-25
- I-70
- I-76
- I-225
- I-270

All of these major interstates also serve as hazardous material and nuclear material routes. Refer to Chapter 4 Risk Assessment for additional information of the County's vulnerability to hazardous material incidents.

Additional highway routes in the County include:

- E-470 – Tollway and part of Denver metropolitan area's beltway.
- U.S. 36 – Extends from I-25 in Adams County to City of Boulder.
- U.S. 85 – Travels through Adams County north to City of Greeley and south to City and County of Denver.
- SH 79 –Travels north through the Town of Bennett. Also known as Kiowa-Bennett Road.

Rail Lines

Fright railroad lines for Union Pacific Railroad (UPRR) and Burlington Northern Santa Fe Railway (BNSF) traverse through Adams County. The UPRR mainline tracks run parallel to U.S. 85; according to the County's 2012 Transportation Plan, these mainline averages 11 to 15 trains per day. As of January 2025, the most recent Transportation Plan is the plan from 2012. Another UPRR line travels through the County parallel to Smith Road/Colfax Avenue and averages 6 to 8 trains per day (Adams County 2012). The BNSF mainline tracks run parallel to State Highway 2 and north of the I-76 interchanges and averages 28 to 30 trains per day. The BNSF also has a railroad line in the southwest corner of the County traveling from Denver to Boulder that averages 1 to 3 trains per day (Adams County 2012).

Regional Transportation District

The Regional Transportation District (RTD) provides commuter rail services around the Denver metropolitan area. Currently the G, A, and N Lines are the only constructed commuter lines that traverse portions of western Adams County. The A Line runs from Denver's Union Station to Denver International Airport, while the G Line runs from Union Station in downtown Denver to Arvada. Both of these rail lines were part of RTD's FasTracks project, a multi-billion dollar comprehensive transit expansion plan to build 122 miles of new commuter rail and light rail services as well as 18 miles of rapid bus transit for convenient bus and rail connections across the eight-counties RTD serves (RTD 2016). As part of FasTracks, RTD constructed the N Line which takes passengers from Union Station to Thornton, bringing services to Commerce City, Northglenn, Thornton, Westminster, and north unincorporated Adams County.

As commuter and light rail services expand throughout the County, both RTD, Adams County and several jurisdictions in the County including, Commerce City, Northglenn, Westminster and Thornton are promoting transit-oriented development (TOD) along and around these new rail lines through Station Area Master Plans. In 2021 Westminster, Federal Heights, and Adams County collaborated on the Federal Boulevard Multi-modal Transportation Study to complete a multimodal study for north Federal Boulevard. Also in 2021 Arapahoe County, the City of Aurora, and the Colorado Department of Transportation completed the I-70 Airpark-Watkins Interchange Study, which assessed the transportation demand impacts generated by proposed developments near I-70/Airpark and I-70/Watkins interchanges.

In addition to providing rail services, RTD also provides local and regional bus services with several stops located throughout the western portion of Adams County. RTD is planning expansion and service improvements along many of the existing bus lines that serve the County.

Airports

There are two commercial airports located within or adjacent to Adams County. Denver International Airport (DEN) is the 5th busiest airport in the U.S. with 1600 flights per day on average and a total of 82.4 million passengers in 2024. While DEN is located in the City and County of Denver, it is surrounded by Adams County and all flights cross over Adams County.

The Colorado Air and Space Port (CASP), formerly known as Front Range Airport, is a general aviation airport averaging 207 flights per day. Originally owned by the Front Range Airport Authority, it has been owned and operated by Adams County since 2014. CASP serves as the base of several flying schools, flight clubs, maintenance services, and air rescue training facilities, as well as a Colorado Army National

Guard Armory. In 2018, the Federal Aviation Administration (FAA) approved CASP's designation as a spaceport for sub-orbital horizontal takeoff flights.

Future Transportation Systems and County Transportation Priorities

The following are the County's transportation priorities and transportation systems that are planned for future service for Adams County.

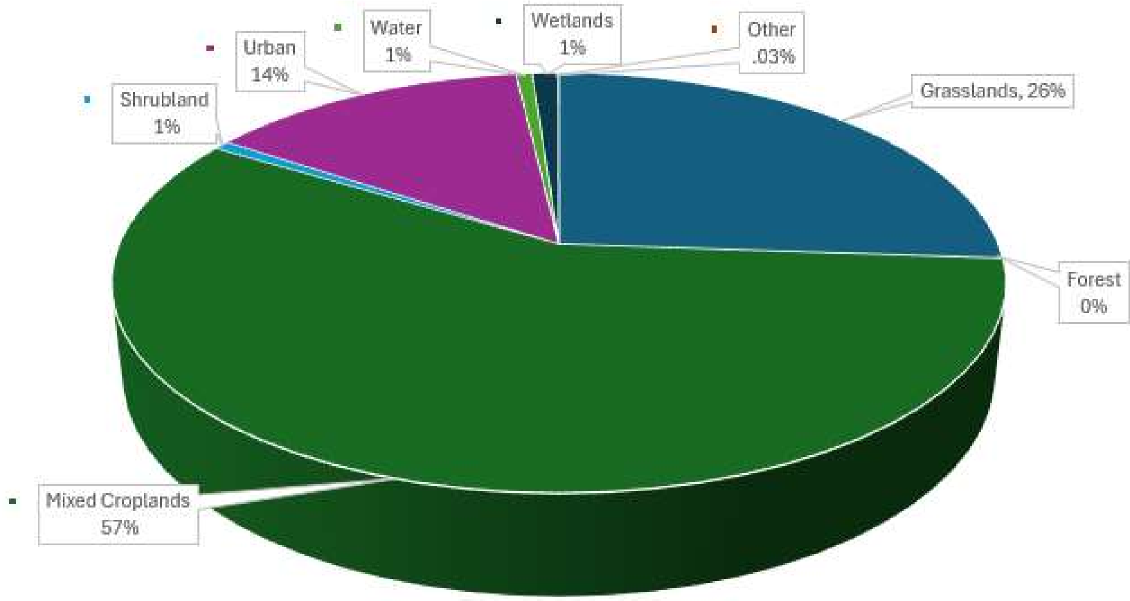
- Denver Regional Council of Governments (DRCOG) Multimodal Freight Plan – Seeks to create a shared vision, a feasible action plan, and identify strategies to improve freight and the movement of goods throughout the Denver region.
- 88th Avenue Widening Environmental Assessment – County is participating in the Commerce City's evaluation of environmental impacts for the 88th Ave project which proposes to widen and make improvements to E. 88th Ave between I-76 and State Highway 2.
- I-270 Managed Lanes and Bridge Replacement Projects led by the Colorado Department of Transportation
- SH 7 – Boulder to Brighton Corridor
- US 85 at 120th Avenue project led by Commerce City

The County has Collaborative Transportation Planning Intergovernmental Agreements (IGAs) with all the incorporated jurisdictions in Adams County as well as the City and County of Broomfield. Through the IGAs, the County works with each of the municipalities to prioritize regional transportation improvements.

3.10 Land Use

Land uses range from intensive urban activities in the western County, to crop and grazing land in the central and eastern County. Eight incorporated cities and two towns are wholly or partially located in Adams County, comprising 13.82% of the County's total land area. Agricultural activities are the single largest land use throughout the County, accounting for 58% of the land area. An extensive network of canals in the northwest part of the County supports most of the irrigated farmland. The central portion of the County primarily produces wheat, while the eastern area is primarily pasture. A breakdown of land use in the County by type is shown in Figure 3-14.

Figure 3-14 Adams County Land Use By Type



Source: Multi-Resolution Land Characteristics (MRLC), National Land Cover Database (NLCD), WSP GIS Analysis, 2024.

Figure 3-15 and Figure 3-16 below show zoning code maps for Adams County.

Figure 3-15 Western Adams County Zoning

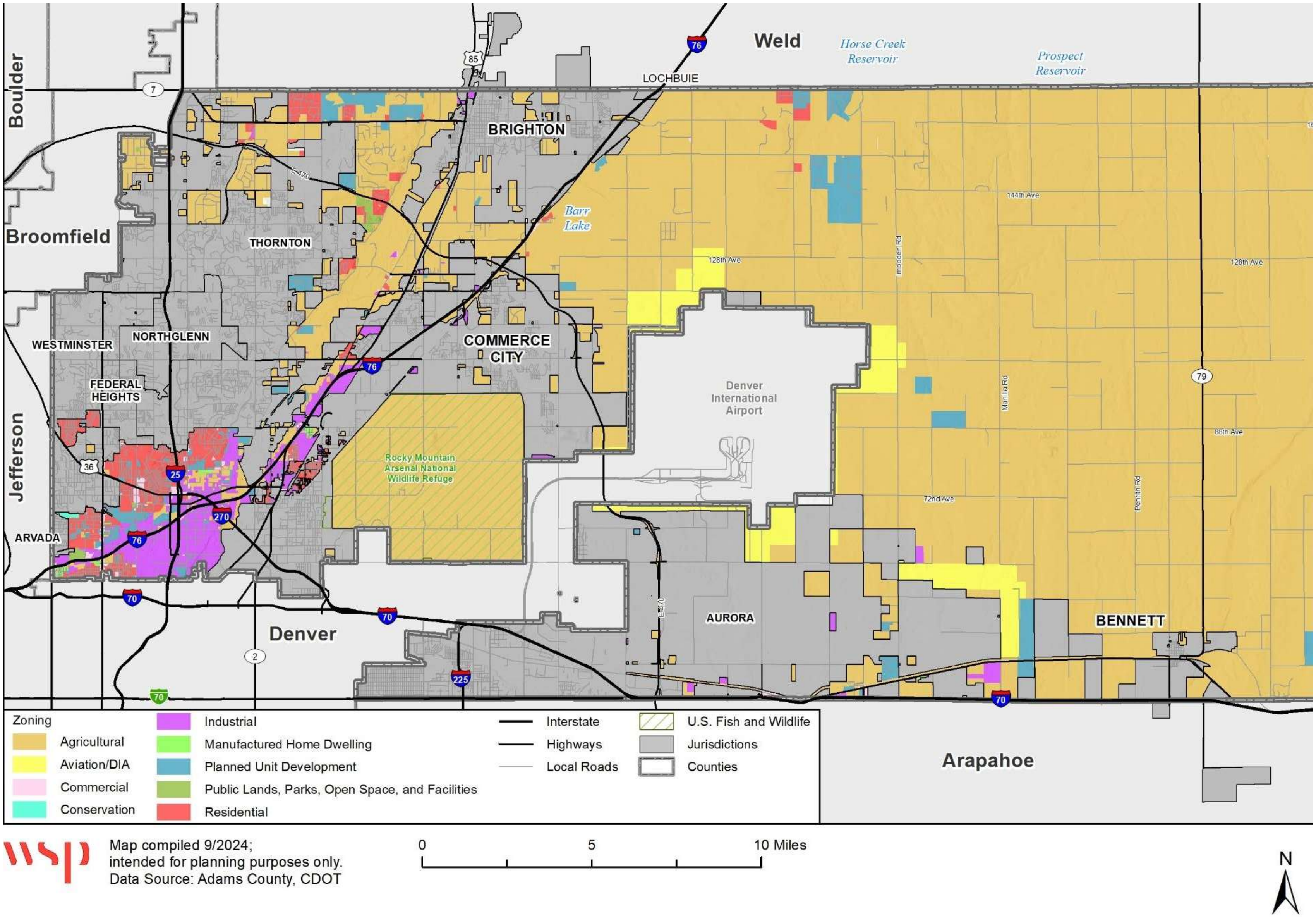
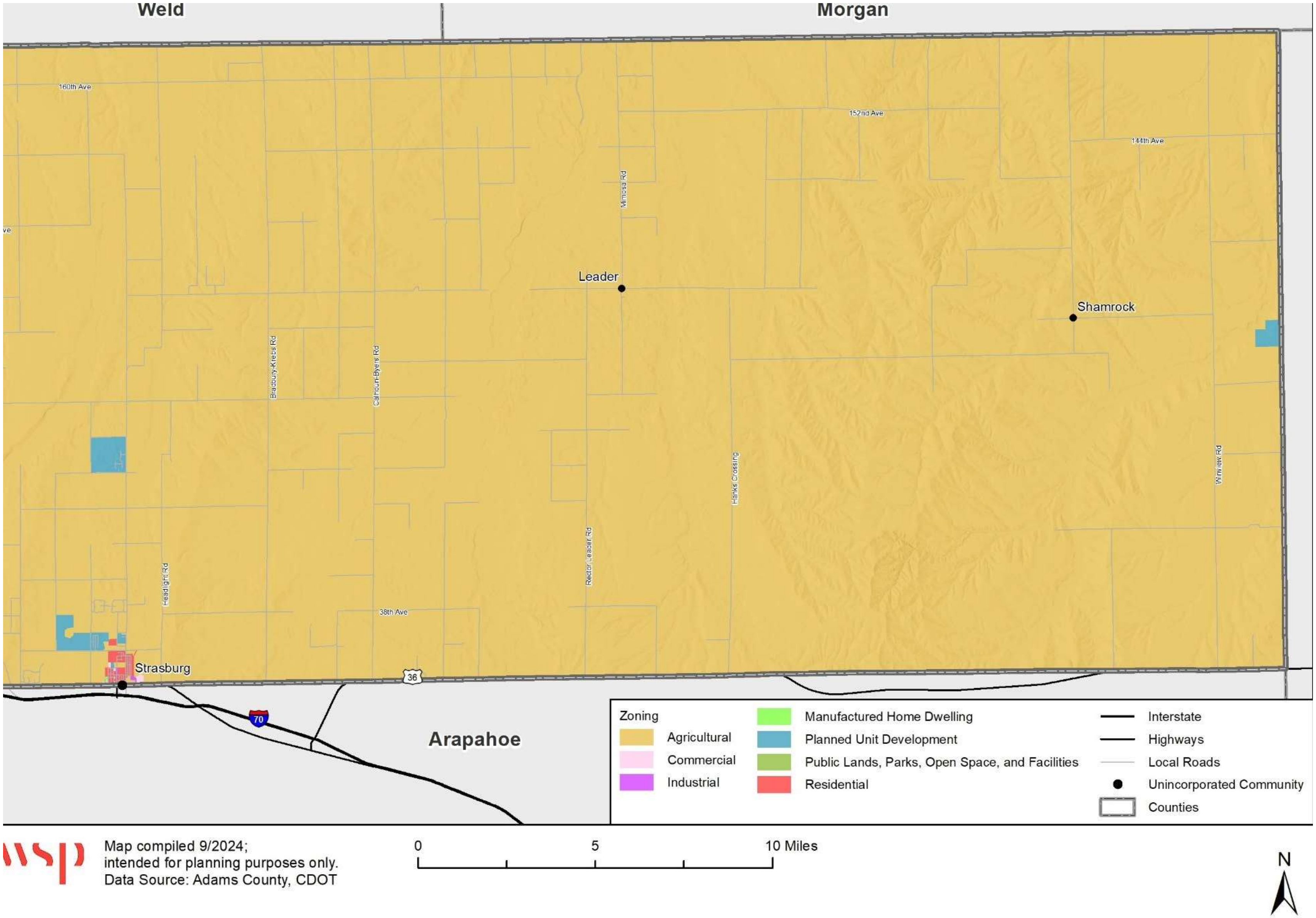


Figure 3-16 Eastern Adams County Zoning



3.10.1 Brownfield Sites

In 2023 the City of Brighton was awarded $500,000 by the Environmental Protection Agency (EPA) for a Brownfield Assessments Grant. The purpose of the grant is to conduct environmental site assessments, develop cleanup plans, and conduct community outreach activities at contaminated properties at Brighton's downtown core.

Sites prioritized for assessment and cleanup include the former Tortilleria Cuauhtemoc, the Brighton Grain Elevator, the Midland Cereal Building, the Wilmore Canning Factory (The Cannery), Petroleum Wholesale Inc., and other properties in the downtown area. Most targeted properties are adjacent to the railroad, resulting in persistent concerns about arsenic and other potential contaminants, including heavy metals, asbestos, polycyclic aromatic hydrocarbons, dioxins and furans, polychlorinated biphenyls, polyfluorinated compounds and petroleum compounds.

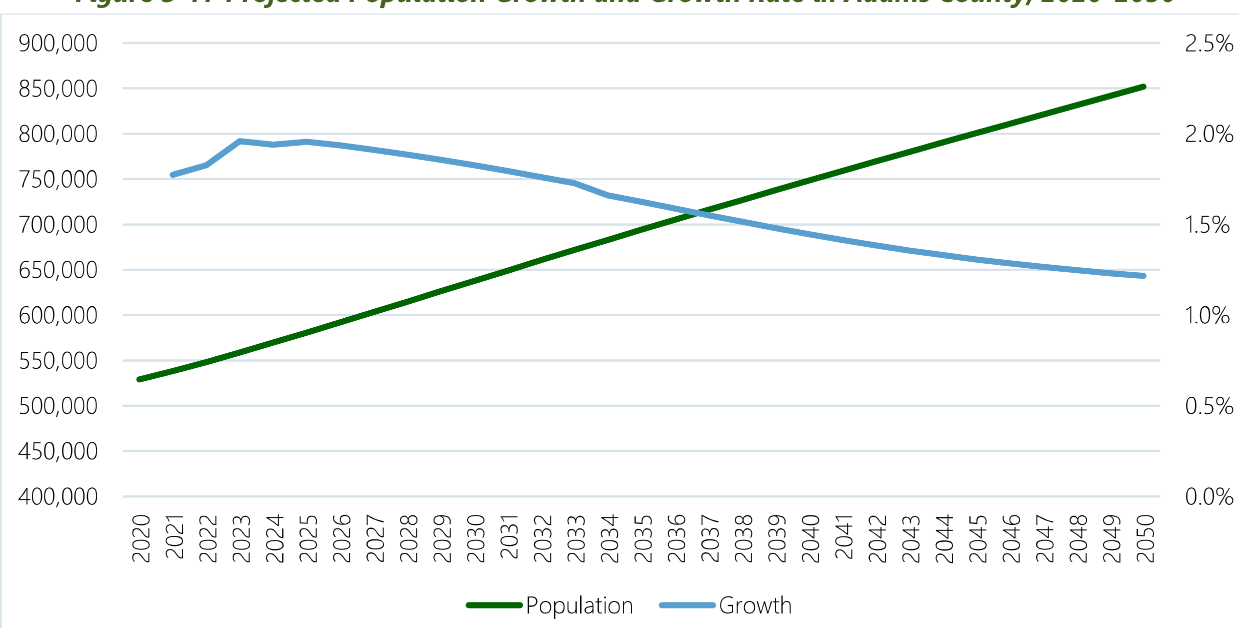
Revitalization plans for these properties include new housing, mixed-use development, industrial space, marketplaces, restaurants, breweries, community gathering and event spaces, and artisan locations.

3.11 Development Trends

DMA Requirements §201.6(c)
[The plan shall include] a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

According to the Colorado State Demography Office, between 2020 and 2050 Adams County's population is projected to grow at an average of 1.6% a year; this is above the State's projected growth rate of 1.1% over the same time period. As shown in Figure 3-17, the County's growth rate is forecasted to average 1.9% per year through 2030, after which it is projected to fall off to an average of 1.3% in the 2040s. The County's population is projected to exceed 600,000 by the year 2027, 700,000 by 2036, and 500,000 by 2045.

Figure 3-17 Projected Population Growth and Growth Rate in Adams County, 2020-2050



Source: Colorado State Demography Office https://demography.dola.colorado.gov/

As mentioned in Section 2.9, in August 2018, the Federal Aviation Administration granted a site operator license to Colorado Air and Space Port (CASP), located six miles southeast of Denver International Airport. CASP will serve as America's hub for commercial space transportation, research, and development and will also provide a boost to the state's economy by keeping the nearly 200,000 aerospace jobs in Colorado and creating new employment opportunities. County representatives have been working hard to pave the way for business expansion.

Adams County is a popular location for notable new commercial development. Maxar Technologies, Inc., Denver Premium Outlets, and Gaylord Rockies Resort & Convention Center have all become part of the Adams County landscape within the past five years. Much of the open land surrounding Denver International Airport, the fifth-busiest airport in the U.S., is in Adams County. A regional aerotropolis concept is in the works, bringing a boon of commercial development to that corner of the county.

The county's increased economic prosperity has also directly benefited its educational prospects. In 2024, 68 Adams County high school students were awarded scholarships totaling more than $1 million to attend Colorado public higher education institutions. The scholarships were funded with a voter-approved three percent sales tax on retail marijuana sales in unincorporated Adams County, and the Colorado Opportunity Scholarship Initiative matched the sales tax funds to increase the scholarship pool.

Assessor's Office data shows that 14,478 buildings have been constructed in the planning area since 2018, 13,904 of which were residential. See Table 4-6 for a breakdown of this recent construction. The impact of new construction on risk from hazards can be found in the vulnerability section (Development Patterns subsection) of each hazard profile.

3.12 Capability Assessment

DMA Requirements §201.6(c)(3)
[The plan shall describe the jurisdiction's] existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

This section summarizes Adams County's existing mitigation capabilities, which are the policies and programs in place that are used to reduce hazard impacts or that can be used to implement hazard mitigation activities. Operational or training capabilities were not assessed. The purpose of conducting a capability assessment is to understand the County's capacity for implementing mitigation activities. With a complete understanding of current capabilities, the County can better develop feasible mitigation activities and can identify opportunities to enhance capability in support of future mitigation. This assessment evaluates planning and regulatory capabilities, administrative and technical capabilities, financial capabilities, and other mitigation partnerships.

As part of the 2026 HMP update, County and jurisdiction staff completed a Plan Update Guide to identify key regulatory, administrative, technical, fiscal, and other policies, programs, and resources for mitigation. Based on this input as well as additional staff research, this section was revised to capture changes since 2019 and reflect current capabilities. Revisions were also made to the organization of this section to focus on pre-disaster mitigation priorities.

This update process afforded the County and its participating jurisdictions the opportunity to review their previous capabilities and note the ways in which these capabilities have improved or expanded since the adoption of 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. Section 6 Mitigation Strategy includes mitigation actions aimed at improving community capability to reduce hazard risk and vulnerability.

Capability assessment information for the participating jurisdictions can be found in their annexes.

3.12.1 Planning and Regulatory Capabilities

Table 3-11 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 Adams County. Excerpts from applicable policies, regulations, and plans and program descriptions follow to provide more detail on existing mitigation capabilities. 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 3-11 Planning and Regulatory Resources

Regulatory Tool (ordinance, code, plans)	Yes/No	Comments
Building Codes	Yes	2012 IBC. The County is exploring adopting the 2015 IBC.
Comprehensive Plan	Yes	2022. Contains the previous Hazard Mitigation Plan.
Capital Improvements Program (CIP) or Plan	Yes	Town of Lake City Capital Improvements Plan, May 2013
Comprehensive, Master, or General Plan	Yes	Lake City and Hinsdale County Community Plan (Revised Sept. 2018).
Zoning ordinance	Yes	Adams County Development Standards and Regulations
Subdivision ordinance	Yes	Chapter 5 of the Adams County Development Standards and Regulations (linked above)
Hazard-Specific Ordinance or Plan (Floodplain, Steep Slope, Wildfire)	Yes	(County) 8.9-11.A. General Standards – "Land subject to hazardous conditions such as landslides, mud flows, rock falls, snow avalanches, possible mine subsidence, shallow water table, open quarries, floods and polluted or non-potable water supply shall be identified and shall not be subdivided until the hazards have been eliminated or will be eliminated by the subdivision and construction plans."
Growth Management ordinance	Yes	Adams County abides by the Denver Regional Council on Government's Metro Vision regional plan
Site Plan Review Requirements	Yes	Entered 1987 (both communities)
Floodplain ordinance	Yes	C.R.S. 32-11-218
Stormwater Program, Plan, or Ordinance	Yes	
Zoning Ordinance	Yes	
Building codes	Yes	2021 International Building Code (IBC)
Fire department ISO rating	NA	Adams County is served by multiple Fire Districts including: Adams County Fire Protection District, Bennett Fire Protection District, Brighton Fire District, Byers Fire District, Deer Trail Fire District, North Metro Fire District, Sable-Altura Fire District, South Adams County Fire District, Southeast Weld County Fire District, Strasburg Fire District
Erosion or sediment control program	Yes	Stormwater Quality (SWQ) Permit for Construction Activities
Storm water management program	Yes	Adams County Stormwater Utility
Site plan review requirements	Yes	Our site plans, other than planned unit developments, are reviewed at the building permit stage by planning staff.
Capital improvement plan	Yes	Adams County Public Works 5-Year Capital Improvement Program (CIP), 2018 – 2022
Economic development plan	Yes	2018 Updates "Bottom-up Plan".
Elevation Certificates	Yes	

Regulatory Tool (ordinance, code, plans)	Yes/No	Comments
Emergency Operations Plan	Yes	
Erosion/Sediment Control Program	Yes	
Local emergency operations plan	Yes	2014 Emergency Management and Recovery Plan is currently being updated to a Disaster Management Plan
Other special plans	Yes	Adams County has subarea plans, housing plans, and open space/parks plans that are available on the following webpages: http://www.adcogov.org/long-range-planning, http://www.adcogov.org/master-plans-maps
Flood insurance study or other engineering study for streams	Yes	2021. Mile High Flood District master drainage studies, flood hazard area delineations, and design reports
Elevation certificates (for floodplain development)	Yes	Yes, required for the Community Rating System managed under FEMA

Source: Plan Update Guide

1.1.1.1 Adams County Comprehensive Plan

Since adopting its first Comprehensive Plan in 1968, the County has conducted regular amendments and updates to address changing conditions and needs. Targeted updates to the County's original plan were conducted in 1975 and 1984, followed by a major update in 1999. Targeted updates to the 1999 Plan were made in 2004 to address the completion of E-470, the formation of the City and County of Broomfield, and rapid growth in the north Metro area.

The most recent update to the Comprehensive Plan in 2022 was titled "Imagine Adams County" and includes four distinct, but closely integrated components:

- Comprehensive Plan Update
- Transportation Plan Update
- Open Space, Parks, and Trails Master Plan
- Hazard Mitigation Plan

Integrating these four efforts, both in terms of the overall process and the resulting plans, represented a significant departure from previous planning efforts in Adams County and around the country. While the integration of land use and transportation efforts has become increasingly common in comprehensive plans, incorporating hazard mitigation was relatively new. This level of integration reflects Adams County's commitment to a more resilient and sustainable future.

In addition, the Imagine Adams County process was closely coordinated with the County's concurrent Open Space, Parks, and Trails Master Plan process, which provides direction for the future of the program.

The County is preparing for another update to the Comprehensive Plan in 2030.

1.1.1.2 Disaster Management Plan

The Adams County Office of Emergency Management (OEM) is responsible for maintaining a County disaster management plan. The plan identifies the roles, responsibilities and actions required of elected officials, county departments, and partner agencies in preparing for, responding to, and recovering from emergencies and disasters. The plan establishes fundamental policies, strategies, and assumptions for a county-wide program that is guided by an all-hazards approach, the principles of the National Incident Management System (NIMS), and the planning guidance in FEMA's Comprehensive Preparedness Guide (CPG) 101. Additionally, the National Preparedness Guidelines (2007) and the National Response Framework (January 2008) were referenced to ensure that the Adams County EORP would be aligned with state and federal guidelines.

The plan approval process required review with each agency identified within the EORP, allowing for each agency to meet one-on-one with OEM; discuss plan components, roles and responsibilities; and provide input on the plan. Additionally, an EORP workshop allowed stakeholders the ability to clarify their roles and responsibilities and ensure a common understanding of the planning goals and objectives.

The base plan and supporting annexes are not developed and updated simultaneously. While the base plan serves as the foundation and legal basis for an emergency management program, much of the material pertaining to the actions taken to respond to disasters is located in the Emergency Support Function (ESF) Annexes. Annexes are developed and implemented through coordination of the lead and support agencies, but do not require Board of County Commissioners approval.

The plan sets the procedures for emergency management within Adams County, and exemplifies the administrative collaboration necessary for effective response, recovery, and mitigation.

1.1.1.3 Local Emergency Planning Commission

As noted in Section 4.3, Adams County's risk from hazardous materials incidents is among the highest in the state. Despite this risk, the legal and regulatory capabilities of the County to mitigate the additional risk created by hazardous materials facilities in the County are uncertain. State statute requires that the primary governing body having jurisdiction over the local emergency planning district, the County Commissioners, shall provide nominations for membership on the Local Emergency Planning Committee (LEPC), at the request of the Colorado Emergency Planning Commission (CEPC) (24-32-2604, C.R.S.). Alternatively, the CEPC shall appoint members of the LEPC for each emergency planning district in accordance with the federal act. For local emergency planning districts for which no nominations have been submitted by the governing body, the commission may designate either the County commissioners or city council to serve as the local emergency planning committee (24-32-2604, C.R.S.).

Adams County formally nominates and appoints LEPC members through the Board of County Commissioners. The mission of the LEPC is to enhance and create plans directing the response to hazardous materials incidents, increase compliance with hazardous materials reporting requirements, and continue to offer access to information on the storage of such materials for the benefit of the County's residents, businesses, and industries.

As the coordinating entity, OEM must satisfy all requirements mandated by the County, state, and federal governments including regulations pertaining to Tier II facilities. This includes records requests, emergency planning responsibilities, and appropriate data management. The OEM has developed partnerships with numerous industries in the area to serve as members on the LEPC including Conoco Phillips, Suncor, Sinclair Oil, BASF, Atlas Roofing, Denver Water, Xcel Energy, and many of the local fire districts serving the area.

As shown on the EPA's website, "if a tank, drum, container, pipe, or other process at your facility contains any of the extremely hazardous toxic and flammable substances listed in the Code of Federal Regulations (CFR) at 40 CFR 68.130 in an amount above the threshold quantity specified for that substance, you are required to develop and implement a risk management program under a rule issued by the EPA." This is known as the Risk Management Program (RMP) rule and in Colorado, RMP information is submitted to CDPHE, but not necessarily the LEPC. In other words, without proper governance, expertise, and integration, both the Planning Commission and the LEPC may not have knowledge of the permitted use and effects of facilities within their own jurisdiction.

Information on Tier II facility locations is housed separately from the County planning function and the Planning Commission as required by state statute. A key goal of integrating comprehensive planning and hazard mitigation planning is to address future incorporation of the LEPC with the existing Planning Commission. The incorporation of these two commissions should help in the creation of an integrated planning process that addresses how hazardous materials facilities are impacted by the natural hazards in Adams County as well as how they impact current and future land use development.

1.1.1.4 Land Development Standards and Regulations

Zoning District Regulations

Zoning Districts are defined in Chapter 3 of the Adams County Development Standards and Regulations, which also includes a use chart outlining use categories that are permitted, conditionally permitted, and prohibited within each defined Zoning District. Zoning Districts were reviewed with a focus on spatially defined hazards that can be mitigated through growth management and development regulations, including hazardous materials incidents, flood, and subsidence.

With regard to hazardous materials incidents, uses that are permitted within Industrial, Institutional, Commercial, and Residential areas were reviewed. The Zone District definitions include three industrial zones:

- Industrial-1 District - general commercial and restricted industrial district designed to provide for a variety of compatible business, warehouse, wholesale, offices, and very limited industrial uses.
- Industrial-2 District - light manufacturing, processing, fabrication, assembly, and storage of non-hazardous and/or non-obnoxious material and products as well as allowing service facilities for industries and their employees.
- Industrial-3 District - heavy industrial district designed to accommodate most industrial enterprises.

According to the use chart, accessory dwelling units; institutional care facilities such as boarding houses, nursing homes, and hospitals; neighborhood indoor uses such as libraries, community centers, and recreation centers; and outdoor public uses such recreation areas, parks, and picnic areas are all permitted within the Industrial-3 Zoning District. This potentially allows facilities that house or serve vulnerable populations, including young children, elderly individuals, and others, to be constructed in areas where hazardous materials may be stored.

Aside from accessory dwelling units, residential uses are prohibited from Zone District I-3, preventing the ability for most residential units to be constructed in an area where toxic chemicals could be stored. Additionally, Industrial uses such as heavy industry, heavy manufacturing or processing, light industry, light manufacturing or processing, moderate industry, and moderate manufacturing or processing are not permitted in any residential or commercial zones. This prevents the ability for industries that may store toxic chemicals to be constructed in residential or commercial areas where citizens unfamiliar with the dangers would live and work.

The County's Development Standards and Regulations include the following Overlay Zoning Districts which impact hazard mitigation in Adams County:

Flammable Gas Overlay (FGO) District

It is the purpose of the Flammable Gas Overlay District to establish reasonable and uniform limitations, safeguards, and controls over uses of land designated as and/or adjacent to an operating or former solid waste disposal site. Any building, excavation, construction, or other use proposed in the FGO District shall require testing and/or mitigation related to flammable gas prior to obtaining a building permit and after receiving a certificate of occupancy. This Overlay District intended to ensure the protection of life and property from such related hazards as flammable gas, gas migration, asphyxiation, and explosion.

Flood Control Overlay (FCO) District

The FCO District is intended to limit land uses and thus reduce potential damages within the high risk flood zones. The FCO District incorporates the minimum requirements of the National Flood Insurance Program (NFIP) as well as some higher regulatory standards for additional protection.

The regulations encourage maximizing the FCO areas for open space and recreational/wildlife preservation uses outside of the urban developed areas of the County. Within urbanized areas, channelization is encouraged, however restrictions are established to limit potential associated problems including erosion and channel migration and to require no rise in the base flood elevation within floodway areas. Additionally, any proposed development must be shown not to reduce floodway capacity or increase base flood elevation.

Throughout the FCO, building restrictions are established to limit flood damages, including floodproofing and elevation requirements. With some exceptions, proposed development within the FCO requires a floodplain use permit and a certificate of occupancy.

Natural Resources Conservation Overlay (NRCO) District

Also relevant to flood hazard reduction, the NRCO District requires proposed development within the District to provide an open space set aside based on the acreage of floodplains, riparian areas, wetlands, lakes/reservoirs, and hydric soils within the site.

Mineral Conservation Overlay (MCO) District

The MCO District is relevant to mitigation of subsidence and undermined areas hazards. The MCO District establishes limitations and controls for the conservation and wise utilization of natural resources and for rehabilitation of excavated land. Land within this classification is designated as containing commercial mineral deposits in sufficient size parcels and in areas where extraction and rehabilitation can be undertaken while still protecting the health, safety, and welfare of the inhabitants of the area and the County. In cases where the location of the district or use abuts other zoning or use of land, structures, excavation, and rehabilitation may be restricted to be compatible with and protect the adjoining area. The MCO prohibits excavation within 125 feet of existing residential development and prohibits excavation using rock crushers within 250 feet of residential development. It also sets slope stabilization and revegetation requirements.

Cluster Development and Transfer of Development Rights

Section 3-30 of the Development Standards and Regulations details provisions for Planned Unit Development (P.U.D.) which encourages development of land as a single unit and allows for greater flexibility in design. Among these provisions, P.U.D. standards allow for cluster development and transfer of development rights (TDR). Cluster development allows for increased density on one portion of a site in exchange for placing the undeveloped land on the site in a Conservation Easement.

Transfer of Development Rights allows for a similar trade in density but is accomplished across multiple sites, where certain areas intended to be preserved as open space are designated as sending areas and areas that can accommodate increased density are designated as receiving areas. Through TDR, a property owner may establish a Conservation Easement on a site in a sending area and use the development rights of that property to increase density of a development in a receiving area. The degree to which density can be increased in a receiving area is dictated by the acreage set aside in a Conservation Easement and the sending area ratio for development rights. The following areas are designated as sending areas in the Adams County TDR program:

- Airport Influence Zone: Includes the noise overlay for Denver International Airport and the Airport Influence Zone surrounding the Colorado Air and Space Port. Sending area ratio = 5:1.

- Important Farmlands: Includes farmlands of national or state importance and ranches and grazing lands of local or regional importance. The areas are based on geographic data from the 1999 Metro Vision Open Space Plan (DRCOG). Sending area ratio = 10:1.
- Natural Resource Conservation Overlay: Includes mapped floodplains in the western area of the County and areas east of the Barr Lake Buffer Zone. Sending area ratio = 15:1.
- Barr Lake/South Platte River: Includes the floodplain and important habitat area around the South Platte River as well as the Barr Lake Buffer Zone. Sending area ratio = 25:1.

Floodplain Management

Adams County has been a regular participant in the NFIP since February 1, 1979, which is also the date of the County's first Flood Insurance Rate Map (FIRM). Adams County joined the Community Rating System (CRS) on October 1, 2016 and is currently rated as a Class 8 community, which provides policyholders in the County with a ten percent discount on their flood insurance premiums. The County is credited under the CRS program for a variety of flood hazard reduction activities, including maintaining elevation certificates, providing flood hazard map information, conducting outreach, providing flood protection information, preserving open space in high risk flood areas, adopting higher regulatory standards, and maintaining stormwater management activities. Adams County's higher standards, which go beyond the minimum requirements of the NFIP, include adoption of the International Building Code, local drainage protection requirements, protection of critical facilities, and a freeboard requirement.

Building Regulations

Adams County has adopted the 2018 IBC. The 2018 IBC specifically references the ASCE 7-16 Chapter 13 Seismic Design Requirements for Nonstructural Components Criteria. Colorado has traditionally been listed in the lowest seismic zone with wind and snow loads controlling building design. Buildings designed to meet the requirements of the 2018 IBC standards are expected to be adequate to withstand the severity of an earthquake in Colorado.

Additional Land Development Standards and Regulations

Table 3-12 describes additional specific codes/standards related to hazard mitigation.

Table 3-12 Land Development Codes Applicable to Hazard Mitigation

Code	Language
4-10-02-03 Extraction And Disposal Uses	Compliance with Colorado Department of Natural Resources. Requirements contained in this section shall not exempt the owner or operator of an extractive industry from compliance with the requirements of the Colorado Department of Natural Resources. Prior to the approval of a Conditional Use Permit by the Board of County Commissioners, a reclamation contract shall be signed and approved by the owner or operator and the Colorado Department of Natural Resources.
4-10-02-03-02 Oil And Gas Well Drilling And Production	1. Purpose: The purpose of these oil and gas regulations is to protect the health, safety, and welfare of Adams County residents, to provide for sound environmental practices through the control of all oil and gas operations in the unincorporated areas of Adams County, and to prevent damage to County roads and bridges.

Code	Language
4-10-02-03-02 Oil And Gas Well Drilling And Production	4. Special Performance Standards: a. When Special Performance Standards Apply: Special Performance Standards may be imposed if a proposed oil or gas well location is not compatible with the surrounding area or if a proposed oil or gas well would have an adverse effect on the future development of the area. b. Incompatible Well: The oil or gas well is not compatible with the surrounding area when one (1) or more of the following occur: (1) Well Within 1,000 Feet of Dwelling .... (2) Well Within ½ Mile of Public Facility .... (3) Impact on Health, Safety and Welfare: The proposed facility would have an adverse impact on the health, safety, and welfare of the local inhabitants.
4-10-02-03-03 Solid And Hazardous Waste Disposal	1. General Operating and Performance Standards: The following General Operating and Performance Standards are applicable to all Solid Waste Disposal Sites and/or Processing Facilities: a. Compliance with Colorado Solid Waste Act b. Compliance with State Standards and Regulations....
4-10-02-04-03 Chemical, Petroleum, And Explosive Manufacturing	2. Fire District Review.... 4. Outdoor Activities Prohibited .... 5. Security Fence and Fire Proof Building ..... 6. Prohibited Accessory Uses: Service stations, dwellings, or research laboratories are not considered accessory uses involved in the manufacture and storage of chemicals, petroleum products, or explosives
4-11-01-08 Prioritization Of Open Space Types	The following list represents the relative desirability of different types of open space/conservation areas, and should be used as the basis for determining the optimum location for open space/conservation areas within a proposed Open Space Subdivision: 1. Critical areas including riparian areas and floodplain.
4-11-02-04 Individual Protected Resources And NRCO District	PURPOSE: Waterbodies and wetlands provide critical functions in controlling floodwaters, providing wildlife habitat, cleansing water resources and contributing to the special scenic quality of Adams County. Reserving the one hundred year (100) year floodplain protects against the loss of life and property during flood events. The purposes of this Section are to define critical resources, and establish protection standards for waterbodies, floodplains, and wetlands.
4-11-02-04-02 Individual Protected Resources	1. Purpose: This Section establishes the protection standards for waterbodies, floodplains, and wetlands in order to protect the community as a whole from potential negative impacts caused by development which may affect these resources or their functions. This Section prohibits development on and within a certain distance of these resources.
5-02-07 Required Improvements Prior To The Issuance Of Building Permits	The following improvements shall be required, completed, and have preliminary acceptance granted by the Department of Public Works prior to issuance of a building permit for construction of residential, commercial, or industrial structures: 7. Utilities (including communications, electric power, gas, water, sewer).
5-03-02-04 Hazardous Conditions To Be Avoided Or Eliminated	Land subject to hazardous conditions such as landslides, mud or debris flows, flooding, subsidence, shallow water tables, geologic hazards, open quarries, floods, and non-potable water supply shall be identified and shall not be subdivided until the hazards have been eliminated or will be eliminated by the subdivision construction plans. ....
5-03-02-06 Design To Not To Encroach Into Floodplains	No developable lots shall be subject to inundation by a 100-year (1% frequency) flood unless an acceptable plan is submitted to alleviate the flooding condition...

Code	Language
5-03-02-08 Designed To Be Protected From Water Hazards	If a subdivision includes a water hazard such as an irrigation canal, water body or other water channel, necessary design precautions shall be taken to minimize any hazard to life or property, and additional measures such as fencing, water depth indicators, and erection of warning signs shall be taken, to the extent reasonably feasible.
5-04-05-01 Water Supply Approval	New water supply systems for irrigation, fire protection or other purposes required by the Board of County Commissioners shall be reviewed and approved by the appropriate Fire Protection District, Tri-County Health Department, Colorado Division of Water Resources, and the Colorado Department of Public Health and Environment Water Quality Control Division.
5-04-06-01 Individual Wastewater System Approval	New individual wastewater systems for sanitation or other purposes required by the Board of County Commissioners shall be reviewed and approved by the Tri- County Health Department.
9-01-03-09 Floodplain Management Floodplain Management	As part of its zoning resolutions, the County has adopted floodplain regulations necessary to preserve and promote the general health, welfare, and economic wellbeing of the region. The general purposes of floodplain regulations are summarized as follows: To reduce the hazard of floods to life and property;
9-01-03-10 Retention	In those areas of the County where no outlet presently exists for positive drainage to a major drainage system, the County will require retention of the runoff from a 24-hour, 100-year storm event plus one foot of freeboard until such connection becomes available…
9-01-11 Bridges	The hydraulic and hydrologic design of bridges within the County shall be in accordance with the Urban Drainage Criteria Manual Volume 2, Structures, Section 4 Bridges for this section. The Federal Highway Administration Hydraulics of Bridge Waterways or other County-approved resources shall also be used to determine the possible impacts on the drainage way (both upstream and downstream), scour potential and mitigation techniques for a proposed bridge structure. Based upon federal and state requirements, all new and replacement bridges shall comply with the floodplain regulations.

1.1.1.5 Sustainable Adams County 2030 Plan

In April 2015, Adams County completed the Sustainable Adams County 2030 Plan, which identifies four cornerstones of sustainability and sets 16 goals for ensuring long-term environmental, social, and fiscal sustainability in Adams County. The four cornerstones identified by the plan are Responsible and Innovative Regional Leadership, Waste Management and Reduction, Conservation of Energy and Resources, and Respect for Adams County's Heritage. Within the Conservation of Energy and Resources cornerstone, the following goals align with hazard mitigation efforts pertinent to drought:

- Reduce the use of potable water at county buildings and parks by 30%
- Support policies and provide incentives to reduce water used by residential and commercial buildings throughout the county

By aiming to reduce baseline water use, the County can limit the impact of drought conditions including reducing the probability of socioeconomic drought by lowering the overall demand for water.

Within the Respect for Adams flood Heritage cornerstone, the following two goals align with hazard mitigation efforts pertinent to drought:

- Maintain the conservation of acres of high quality agricultural lands
- To protect water quantity and quality, increase the number of publicly accessible acres conserved with reservoirs or within water corridors by 10%

By conserving land, especially near water corridors or reservoirs, the County can limit potential increases in hazard extent and property exposure caused by increased development.

The most recent update was in 2022 and focused on making the Sustainability Plan more measurable and actionable while aligning with industry best practices, market trends, and State of Colorado climate action goals.

1.1.1.6 Transportation Plan

The Adams County Transportation Plan (2012) profiles the existing transportation systems as well as planned future regional transportation priorities that traverse through the County. The Plan also identifies the hazardous and nuclear material routes and the main railroad lines that traverse through the County. The Plan is closely tied to the County's Capital Improvement Plan (CIP) with many of the identified projects in the Transportation Plan being funding through the CIP budgets. The Transportation Plan element of the County's Comprehensive Plan went through an update in 2022. This update was designed to address the County's continued growth, particularly in areas north of Commerce City and Thornton, around Brighton, and along the 104th Avenue, 120th Avenue, and E-470 corridors. Refer to Section 2.9 of the Community Profile for information on the County's transportation systems.

3.12.2 Administrative and Technical Capabilities

Adams County OEM is the primary agency responsible for emergency management and hazard mitigation in the County. However, mitigation is an interdisciplinary effort that requires collaboration across numerous departments and individuals. Administrative and technical resources are summarized in Table 3-13. Per this assessment, the County is well-staffed and equipped to assess and mitigate hazards, and to manage exposure through land management and building requirements. Additionally, the County has grant specialists to support efforts to pursue and manage outside funding for mitigation projects.

Table 3-13 Administrative and Technical Resources

Personnel Resources	Yes/No	Department/Position
Planner/engineer with knowledge of land development/land management practices	Yes	All of Community & Economic Development Department (CEDD) trained staff
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Yes	County Building Official
Planner/engineer/scientist with an understanding of natural hazards	Yes	County Planning Commission; Town Planning Commission.
Personnel skilled in GIS	Yes	IT Department - GIS group. County is implementing GIS capabilities in a 2019/2020 grant.
Full time building official	Yes	CEDD / building reviewers and chief building official. Shared Position.
Floodplain manager	Yes	Floodplain Administrator in CEDD
Floodplain Administrator		Building Official (County) provides administration for both the County and the Town of Lake City.
Emergency manager	Yes	Position being filled in 2019; Town Manager (Lake City).
Grant writer	Yes	Grant Specialists within the Finance Department
GIS Data Resources (Hazard areas, critical facilities, land use, building footprints, etc.)	Yes	GIS system has layers for environmental hazards – i.e. brownfields, floodplains, etc./Maintained by data provided from outside agencies to GIS staff in IT
Warning Systems/Services (Reverse 911, cable override, outdoor warning signals)	Yes	CodeRed administered by AdCom911
Other Key personnel	Yes	Extensive County department resources headed by Department Directors and the Executive Leadership Team.

Source: Plan Update Guide

1.1.1.7 Office of Emergency Management

The Adams County Office of Emergency Management (OEM), located within the Sheriff's Department, is the primary County agency responsible for the planning and coordination of local disaster services, including disaster prevention, mitigation, preparedness, response, and recovery. OEM is the lead agency for ensuring the County has a Hazard Mitigation Plan, Emergency Response Plan along with supporting functional annexes, a Recovery Plan, and Continuity of Operations Plans. OEM is responsible for public outreach related to hazards, including educating the public on preparedness and mitigation actions.

OEM is also tasked with coordinating and supporting the Hazard Mitigation Planning Committee (HMPC), making them a key player in the implementation and maintenance of this Plan, as described in Section 7.

1.1.1.8 Community & Economic Development Department

The Community & Economic Development Department (CEDD) is the County's primary land use and planning agency. This department is responsible for a wide variety of programs and activities related to planning, zoning, permits, water conservation, stormwater, energy and housing for the unincorporated portion of the County. Staff often take hazards into consideration when reviewing development applications and updating the County land use plans, as the Department is responsible for applying the County's Land Use Code, Comprehensive Plan, and Building Code to each land use and construction permit application.

1.1.1.9 Public Works Department

The Public Works Department administers all construction activities within County public rights-of-way, and maintains and improves the County's infrastructure, including roadways, bridges and drainage facilities. The Department manages the development and implementation of the County's Capital Improvement Plan.

One of the programs run by the Public Works Department is the snow and ice control program. During storm events, snow and ice control takes precedence over all other operations division activities. Snow and ice control is one of the most cost and labor-intensive programs managed by the operations division and includes not only plowing activities, but also the application of a liquid deicer both pre- and post-storm event, and disbursal of solid deicer and anti-skid material. Adams County has assigned three priority levels to roadways based upon road classification, emergency vehicle routes, and traffic volume. During storm events where snow accumulation is less than eight inches, only priority routes 1 and 2 will be cleared. For storm events with greater than eight inches of snow accumulation, all routes will be served.

1.1.1.10 Parks, Open Space & Cultural Arts Department

The Parks, Open Space & Cultural Arts Department provides planning, management and maintenance of the county parks system that includes developed parks, open space, public park buildings, regional park / fairgrounds, trails, and the memorial bench program. The Department administers the Open Space Sales Tax, a 0.25% sales tax that goes to benefit parks, recreation, trails, and open space projects countywide.

1.1.1.11 Local Boards, Commissions, Committees

Adams County has several boards, commissions, and committees that are or could be involved in hazard mitigation activities. A few are described briefly below:

- **Adams County Foundation:** supports and strengthens programs and activities that improve the health, welfare, mobility and independence of Adams County Citizens.
- **Board of Fire Code Appeals:** this five-member Board interprets provisions of the International Fire Code in instances where it is alleged that the code has been incorrectly interpreted, provisions of the code do not fully apply, or an equivalent method of protection or safety is proposed.

- **Building Code Board of Appeals:** this five-member Board interprets the County's building codes in instances where it is alleged that the true intent of the code has been incorrectly interpreted, the provisions of the code do not fully apply, or the requirements of the code are adequately satisfied by other means. The Board has no authority to waive the provisions of the code.
- **Community Services Block Grant Advisory Council:** this nine-member board represents low-income, private and public sectors in the use of Community Services Block Grant funds and makes recommendations to the Board of Commissioners regarding grant awards.
- **Planning Commission:** a statutorily authorized board, appointed by the Board of County Commissioners, the commission prepares and adopts a county master plan, and reviews and makes recommendations concerning development applications within the county.
- **Adams County Board of Health:** The mission of the Adams County Board of Health is to promote and protect the health of people and the communities where they live, work, and play. The board promotes policies to improve public health, hires and supervises the ACHD's Executive Director, approves the agency's budget, and provides oversight of agency operations.

3.12.3 Financial Capabilities

The Finance Department provides all necessary accounting, budget, payroll, and purchasing and sales tax support and information to all County departments and the citizens of Adams County.

Table 3-14 details a variety of financial tools that can be used for mitigation and their availability to Adams County. Per this assessment, many of these funding mechanisms are eligible in Adams County but would require additional development to be accessible to use. For example, new taxes would require voter approval, CDBG funding would require further collaboration with CEDD staff, and withholding spending in hazard areas would require developing a formal program to manage.

Table 3-14 Financial Resources

Financial Resources	Accessible/ Eligible to Use	Has Been Used in the Past	Comments
Community Development Block Grant	Yes	Yes	
Levy Taxes for Specific Purposes with Voter Approval	Yes	No	
Utilities Fee	Yes	Yes	
System Development/ Impact Development Fees	Yes	Yes	
General Obligation Bonds to Incur Debt	Yes	No	
Special Tax Bonds to Incur Debt	Yes	No	(Lake City) Drainage District
Capital Improvements Project funding	Yes	Yes	Projects go through a CIP committee for recommendation to the County Manager for inclusion in the budget.
Authority to levy taxes for specific purposes	Yes	Unknown	Requires voter approval
Fees for water, sewer, gas, or electric services	Yes	Yes	County provides a Stormwater Utility to portions of Unincorporated Adams County.
Impact fees for new development	Yes	Yes	Traffic Impact fees for Roads & Bridges. public land dedication fee for Parks.
Incur debt through general obligation bonds	Yes	Unknown	Requires voter approval

Financial Resources	Accessible/ Eligible to Use	Has Been Used in the Past	Comments
Incur debt through special tax bonds	Yes	Unknown	Requires voter approval
Incur debt through private activities	Yes	Unknown	Provided that the County could/would not be responsible for debt.
Withhold spending in hazard prone areas	Yes	No	For items where County controls the appropriation. Would need to have a program in place to withhold funding where hazards are identified.
Other			(Lake City) DAC funds for water and sewer projects

Source: Plan Update Guides

With regard to mitigation and emergency management, the Finance Department is responsible for the following:

- Providing emergency procedures for purchasing supplies and/or equipment necessary for response and recovery operations in the disaster or emergency situation.
- Maintaining detailed financial records of all Adams County incident payroll accrued during an emergency or disaster and preparing reports for reimbursement accounting purposes.
- Providing County financial information to state and federal governments for emergency and recovery disaster relief.
- Coordinating with the elected officials, appointed officials, and department heads on fiscal policy, records, and expenditures.
- Providing necessary financial documentation for local, state, and federal damage assessment activities.
- Supply all appropriate forms and organizational items necessary for tracking costs per FEMA requirements.
- Coordinating disaster reimbursement where such state and federal disaster reimbursement policy requires such coordination.

3.12.4 Other Mitigation Programs and Partnerships

1.1.1.12 Public 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 Adams County. In 2012, OEM created a Public Education and Outreach position to address this issue. As of this plan update, OEM's outreach activities include giving a number of community presentations on community preparedness and hazard specific events, including tornado and winter storm, as well as providing educational information through social media.

1.1.1.13 Storm Ready

Adams County and the City of Arvada are currently certified as StormReady communities by the National Weather Service, which established the StormReady program to help local governments handle extreme weather and improve the timeliness and effectiveness of hazardous weather-related warnings for the public. To be officially StormReady, a community must:

- Establish a 24-hour warning point and emergency operations center
- Have more than one way to receive severe weather warnings and forecasts and to alert the public
- Create a system that monitors weather conditions locally
- Promote the importance of public readiness through community seminars, and

- Develop a formal hazardous weather plan, which includes training severe weather spotters and holding emergency exercises

1.1.1.14 Firewise

Firewise USA® is a voluntary program that provides a framework to help neighbors get organized, find direction, and take action to increase the ignition resistance of their homes and community. The program is co-sponsored by the USDA Forest Service, the U.S. Department of the Interior, and the National Association of State Foresters. Adams County and its jurisdictions do not currently participate in the FireWise program.

1.1.1.15 National Flood Insurance Program (NFIP) and the Community Rating System (CRS)

Adams' County's participation in the National Flood Insurance Program (NFIP) and the Community Rating System (CRS) are described in detail below in Table 3-15 and Table 3-16. The potential benefits of increased CRS participation are discussed in Section 3.12.5 Opportunities for Enhancement.

Table 3-15 Adams County Floodplain Management and NFIP Participation

NFIP Topic	Comments
NFIP policies in the community	90
Total premium of NFIP policies	$72,619
Total coverage of NFIP policies	$30,958,000
Number of claims paid out in the community	45
Total amount of paid claims	$216,447
Repetitive loss or severe repetitive loss structures in the community	19 structures
Community Rating System (CRS) participation and class	Yes – Class 8
Date community entered the NFIP	2/1/1979
Date of current FIRMs	12/2/2021
Areas of flood risk with limited NFIP policy coverage.	N/A
How does the community teach property owners or others about the importance of flood insurance?	2021 Floodplain Brochure provides residents with information regarding flood insurance purchase requirements and preparation tips.
How does the community identify substantially damaged/improved structures? What is the process to make sure these structures are brought into compliance after a hazard event?	County uses CrisisTrack damage assessment software and works in conjunction with Assessors Office for safety inspections.

Source: FEMA as of 6/24/2024, HMPC

Table 3-16 NFIP and CRS Participation and Summary Information

Community	Current Rating	Policies	Total Premiums	% Discount
Adams County	8	90	$72,619	10%
Arvada	5	236	$141,798	25%
Aurora	7	147	$62,153	N/A
Bennett	None	0	$0	N/A
Brighton	None	5	$2,541	N/A
Commerce City	None	10	$4,692	N/A
Federal Heights	None	4	$1,546	N/A
Northglenn	None	11	$4,588	N/A

Community	Current Rating	Policies	Total Premiums	% Discount
Thornton	5	30	$10,453	25%
Watkins	None	0	$0	N/A
Westminster	6	59	$19,974	20%

Source: FEMA, as of 6/24/2024

3.12.5 Opportunities for Enhancement

Adams County has a number of financial tools that could potentially fund mitigation but many of these tools require further development before they can be used to fund a project. The County may want to consider further investigating the ability to use CDBG funds for mitigation projects so that projects can be proposed for any available funds. Additionally, the County may want to regularly develop a backlog of projects that could be submitted for CIP funding in order to anticipate and budget for future funds available for mitigation action implementation.

Jurisdictions other than Adams County and Arvada could join the Storm Ready program described previously. This would help local governments handle extreme weather and improve the timeliness and effectiveness of hazardous weather-related warnings for the public.

The Sustainable Adams County 2030 Plan, originally completed in 2015, was last reevaluated in 2020, and updated in 2022. This planned update offers an opportunity to consider the ways in which building resiliency and mitigating hazards to prevent future losses may support the County's vision of environmental and financial sustainability. By integrating the Sustainable Adams County 2030 Plan with this Hazard Mitigation Plan, the County can identify and prioritize actions that meet goals of both plans.

Another opportunity to reduce flood losses in Adams County would be for the County to increase its CRS rating, and for other jurisdictions to join the CRS program or increase their ratings. Source: FEMA as of 6/24/2024, HMPC

Table 3-16 and Table 3-17 show the potential annual savings to flood insurance policy holders for each CRS Rating, with current ratings and savings highlighted in red. The direct financial benefits for Bennett, Brighton, and Commerce City are relatively low, due to the small number of policies. However, the annual benefit of the County increasing its CRS rating would be approximately $3,000 per year; and for the City of Arvada the annual benefit would be nearly $6,000 per step.

Table 3-17 Potential Annual Savings of CRS Program by Ratings

Community	Class 9	Class 8	Class 7	Class 6	Class 5	Class 4	Class 3	Class 2	Class 1
Adams County	$3,947	**$6,316**	$8,685	$12,632	$15,001	$17,370	$19,739	$22,108	$24,477
Arvada	$8,878	$14,877	$20,876	$29,754	**$35,753**	$41,753	$47,652	$53,751	$59,751
Aurora	$3,349	$4,083	**$4,817**	$8,166	$8,900	$9,635	$10,369	$11,104	$11,838
Bennett	$0	$0	$0	$0	$0	$0	$0	$0	$0
Brighton	$254	$254	$254	$254	$254	$254	$254	$254	$254
Commerce City	$235	$290	$345	$580	$635	$690	$745	$800	$855
Federal Heights	$77	$77	$77	$155	$155	$155	$155	$155	$155
Northglenn	$229	$398	$567	$796	$965	$1,133	$1,302	$1,470	$1,639
Thornton	$588	$656	$723	$1,311	**$1,379**	$1,446	$1,514	$1,581	$1,649
Watkins	$0	$0	$0	$0	$0	$0	$0	$0	$0
Westminster	$1,115	$1,164	$1,213	**$2,328**	$2,377	$2,426	$2,475	$2,524	$2,573

Source: FEMA 2024

4 Risk Assessment

DMA Requirement §201.6©(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.*

Risk, for the purposes of this plan and as defined by FEMA, is a combination of hazard, vulnerability, and exposure. It is the impact that a hazard would have on people, services, facilities, and structures in a community, and refers to the likelihood of a hazard event resulting in an adverse condition that causes injury or damage.

The risk assessment process identifies and profiles relevant hazards and assesses the exposure of lives, property, and infrastructure to these hazards. Potential losses from hazards are evaluated by assessing the vulnerability of the county's population, built environment, critical facilities, and other assets. The process allows for a better understanding of a jurisdiction's potential risk to hazards and provides a framework for developing and prioritizing mitigation actions to reduce risk from future hazard events.

This risk assessment builds upon the methodology described in the 2023 FEMA Local Mitigation Planning Handbook, which recommends a four-step process for conducting a risk assessment:

1. Describe Hazards
2. Identify Community Assets
3. Analyze Risks
4. Summarize Vulnerability

Table 4-1 summarizes overall hazard significance, based on a combination of geographic area, probability of future occurrence and potential magnitude/severity as defined below.

Table 4-1 Adams County Hazard Significance

Hazard	Geographic Location	Probability of Future Occurrence	Magnitude/ Severity (Extent)	Overall Significance
Thunderstorms	Extensive	Highly Likely	Limited	High
Tornado/Damaging Wind	Extensive	Highly Likely	Limited	High
Winter Weather	Extensive	Highly Likely	Limited	High
Flood	Significant	Likely	Critical	High
Dam Incident	Limited	Unlikely	Critical	Medium
Drought/Extreme Heat	Extensive	Likely	Negligible	Medium
Hazardous Materials Incident	Limited	Likely	Limited	Medium
Earthquake	Limited	Occasional	Limited	Low
Soil Hazards	Limited	Occasional	Limited	Low
Wildfire	Limited	Likely	Negligible	Low
Terrorism/Active Shooter	Limited	Unlikely	Limited	Low
Cyber Incident	Limited	Likely	Limited	Low

Geographic Location
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Probability of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years or has a recurrence interval of greater than every 100 years.

Magnitude/Severity (Extent)
Catastrophic: More than 50% of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical: 25-50% of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited: 10-25% of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible: Less than 10% of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

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

The risk assessment is organized into the following subsections:

Section 4.1: Hazard Identification – identifies the hazards that threaten the Planning Area and describes why some hazards have been omitted from further consideration.

Section 4.2: Assets Summary – describes the methodology for inventorying assets as the basis for determining vulnerability of the planning area to the identified hazards.

Sections 4.3 to 4.13: Hazard Profiles – discuss the hazards relevant to the Planning Area, and describe previous occurrences of hazard events and the likelihood of future occurrences. They include vulnerability assessments considering property, critical facilities, and historic/cultural/natural assets at risk, as well as possible effects to the economy and recent development trends.

This risk assessment covers the entire geographical area of Adams County. Since this plan is a multi-jurisdictional plan, the HMPC also evaluated how the hazards and risks vary from jurisdiction to jurisdiction. While these differences are noted in this section, they are expanded upon in the annexes of the participating jurisdictions. If no additional data is provided in an annex, the risk and potential impacts to the affected jurisdiction are similar to those described here for the entire Adams County planning area.

4.1 Hazard Identification

The first step in developing a risk assessment is identifying the hazards. The Adams County HMPC conducted a hazard identification study to determine the hazards that threaten the planning area. Table 4-1 above shows overall hazard significance, based on a combination of geographic area, probability of future occurrence and potential magnitude/severity as defined below. The individual ratings are based on or interpolated from the analysis of the hazards in the sections that follow. During the 2026 Plan update process, the individual ratings and significance of the hazards were revisited and updated. Public concern was also considered via input at public meetings and an online survey.

4.1.1 Disaster Declaration History

One part of identifying hazards is to look at past events that led to federal and/or state disaster declarations. These declarations are issued when the severity and magnitude of an event exceed the capacity of local governments to effectively respond and recover. Disaster assistance is designed to be supplemental and sequential. If the resources of a local government are overwhelmed, a state disaster declaration may be issued, enabling state-level support. In cases where both local and state capacities are exceeded, a federal emergency or disaster declaration may be issued, allowing for the provision of federal assistance. This process ensures that aid is provided at the appropriate level to address the needs of the affected community.

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

A USDA disaster declaration certifies that the affected county has suffered at least a 30% loss in one or more crop or livestock areas and provides affected producers with access to low-interest loans and other programs to help mitigate the impact of the disaster. In accordance with the Consolidated Farm and Rural Development Act, all counties neighboring those receiving disaster declarations are named as contiguous disaster counties and, as such, are eligible for the same assistance. Table 4-2 lists state and federal disaster declarations received by Adams County. Many of the disaster events were regional or statewide; therefore, reported costs are not accurate reflections of losses to Adams County.

Table 4-2 Disaster Declaration History in Adams County, 1953-Present

Year	Hazard	Declaration Type	Disaster No.
2024	Drought	USDA Disaster	S5737
2024	Drought	USDA Disaster	S5755
2024	Drought	USDA Disaster	S5765
2024	Drought	USDA Disaster	S5792
2024	Drought	USDA Disaster	S5817
2023	Drought	USDA Disaster	S5372
2022	Drought	USDA Disaster	S5147
2021	Drought	USDA Disaster	S4917
2020	Drought	USDA Disaster	S4742

Year	Hazard	Declaration Type	Disaster No.
2020	Drought	USDA Disaster	S4798
2020	Drought	USDA Disaster	S4848
2020	Covid-19 Pandemic	Presidential Emergency Presidential Disaster	EM-3436 DR-4498
2019	Flooding (declaration amendment/extension)	State Declaration	D 2019-001
2018	Hail, high winds, rain, and tornadoes	USDA Disaster	S4404
2018	Cybersecurity	State Declaration	D 2018-001
2017	Wildfire	State Declaration	D 2017-017
2017	Drought	USDA Disaster	S4145
2016	Blizzard	State Declaration	
2016	Flooding (declaration amendment/extension)	State Declaration	D 2016-005
2015	Severe storms, tornadoes, flooding, landslides, and mudslides	Presidential Disaster	DR-4229
2015	Severe Weather, Flooding, Landslides (amendment/extension)	State Declaration	D 2015-006
2015	Severe Weather, Flooding, Landslides (amendment/extension)	State Declaration	D 2015-008
2014	Extreme weather	State Declaration	
2014	Flooding (declaration amendment/extension)	State Declaration	D 2014-001
2014	Flooding (declaration amendment/extension)	State Declaration	D 2014-002
2014	Flooding (declaration amendment/extension)	State Declaration	D 2014-006
2014	Flooding (declaration amendment/extension)	State Declaration	D 2014-012
2013	Flooding	Presidential Emergency Presidential Disaster	EM-3365 DR-4145
2013	Drought	USDA Disaster	S3548
2013	Drought	USDA Disaster	S3456
2013	Winter storm	State Declaration	
2012	Hail, high winds, and flash flooding	USDA Disaster	S3347
2012	Drought, excessive heat, high winds	USDA Disaster	S3260
2009	Severe blizzard	State Declaration	
2009	Severe spring snowstorm	State Declaration	
2006	Drought, fire, heat and high winds	USDA Disaster	
2006	Snow	Presidential Emergency	EM-3270
2003	Snow	Presidential Emergency	EM-3185
2003	Snow emergency	State Declaration	
2002	Wildfires	Presidential Disaster	DR-1421
2002	Wildfires	State Declaration	
2002	Drought	USDA Disaster	
2002	Drought	State Declaration	
2001	Severe winter storms	State Declaration	
2000	Drought	USDA Disaster	
1982	Severe winter storm	State Declaration	
1982	Dam safety	State Declaration	
1981	Tornadoes	State Declaration	
1973	Dam failure	Presidential Disaster	DR-385
1969	Heavy rains, snowmelt and flooding	Presidential Disaster	DR-261
1965	Tornadoes, severe storms & flooding	Presidential Disaster	DR-200

Source: State of Colorado Hazard Mitigation Plan 2018; fema.gov; usda.gov; Colorado Governor Executive Orders 2014-2019

Out of 32 declared disasters, ten have been for severe winter storms, blizzards, or snow; this includes three Presidential declarations. There have been eight declarations for drought, all but one of which was a

USDA declaration. Seven disasters have been declared for severe weather (non-winter), including flooding, tornadoes, hail, and high winds. The most damaging disaster in Colorado's history was the severe flooding in 2013 (EM-336 & DR-4145), which led to over $26M in damage and Public Assistance funds in Adams County.

4.1.2 Climate Change Considerations Summary

The 2026 Adams County Hazard Mitigation Plan update takes into account considerations of how changing climate conditions may impact the frequency of, intensity, and distribution of specific hazards within the County. Because many impacts of climate induced hazards across the county boundaries, some of the discussion looks at impacts on regional scale. Rather than identify climate change as a standalone hazard in itself, this plan examines how climate change is expected to influence the severity, frequency, or impacts of various individual hazards which are profiled, based on available science. As climate science evolves, future mitigation plan updates may consider including climate change projections in the risk rankings and vulnerability assessments of the hazards included in the Plan.

Climate is determined by the long-term pattern of oceanic and atmospheric conditions at a location. Climate is described by statistics, such as means and extremes of temperature, precipitation, and other variables, and by the intensity, frequency, and duration of weather events. Climate plays a fundamental role in shaping natural ecosystems, and the human economies and cultures that depend on them. It is generally perceived that climate change has had and will continue to have measurable impacts on the occurrence and severity of natural hazards around the world. Impacts include the following:

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

Additional discussion of how climate change is likely to impact individual hazards are found in each hazard profile.

4.1.3 Methodology and Results

Colorado's Front Range region is susceptible to a number of hazards. This HMP profiles the most significant of these hazards. Historical data, catastrophic potential, relevance to the jurisdiction, and the probability and potential magnitude of future occurrences were all used to reduce and prioritize the list of hazards to those most relevant to Adams County. Hazards data was obtained from various federal, state, and local sources such as FEMA, the Colorado Geological Survey (CGS), the National Oceanic and Atmospheric Administration (NOAA) National Center for Environmental Information (NCEI), the United States Geological Survey (USGS), and others. Local and national news reports were also used to research historic events. Together, these sources were examined to assess the significance of these hazards to the County. The hazards selected for inclusion in this plan include those that have occurred historically or have the potential to cause significant human and/or monetary losses in the future.

The update process included a comprehensive, parcel-level risk analysis with GIS where available data permitted. Many new maps and tables were added that capture the potential losses. Additional details on the loss analysis at the jurisdictional level, including a breakdown of hazard losses by community and property type, can be referenced in Appendix E and the jurisdictional annexes.

Table 4-3 shows the hazards profiled in 2026 compared to the 2020 Plan. The only changes made were adding additional information on extreme heat to the drought profile, and expanding the land subsidence profile to address other ground mobility and soil stability issues.

Table 4-3 2020-2026 Updates to Hazards Profiled

2020 Adams County Hazards	2026 Adams County Hazards
Cyber Incident	Cyber Incident
Dam Failure/Incident	Dam Incident
Drought	Drought/Extreme Heat
Earthquake	Earthquake
Flood	Flood
Hazardous Materials	Hazardous Materials Incident
Severe Winter Weather	Winter Weather
Subsidence	Soil Hazards
Terrorism/Active Shooter	Terrorism/Active Shooter
Thunderstorms	Thunderstorms
Tornado/Damaging Wind	Tornado/Damaging Wind
Wildfire	Wildfire

While not profiled as a separate hazard, the potential impacts of climate change were incorporated into all hazard profiles.

The HMPC also reviewed the list of hazards profiled in the 2023 Colorado State Hazard Mitigation Plan. Several of those hazards were deemed to not be a significant risk in Adams County. The HMPC decided not to include the following hazards in the Adams County Hazard Mitigation Plan due to little to no exposure or due to them being addressed in other planning mechanisms:

- Animal Disease Outbreak
- Avalanche
- Erosion/Deposition
- Pandemic
- Landslide/ Debris Flow/ Rockfall
- Pest Infestation
- Wildfire Vehicle Collision

The HMPC discussed adding pandemic and related biological hazards but concluded that profiling them in this plan would be redundant with existing pandemic plans maintained by the County and by Adams County Health Department.

The HMPC also discussed adding airplane crash as an additional hazard, due to the County's proximity to DIA as well as the Colorado Air and Space Port. However, the HMPC decided to include airplane crashes as a component of hazardous materials incidents rather than profiling it separately.

4.1.4 Overview of Hazard Identification and Risk Assessment

The hazards identified in Section 4.1 Hazard Identification are profiled individually in this section. The section will conclude by summarizing the probability of future occurrence and potential magnitude of each hazard for each jurisdiction, 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 2-3, 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, such as 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 the Adams County GIS Department
- 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
- Adams County Plan Update Guides completed by each participating jurisdiction

Hazard profiles are organized into eth following subsections:

Hazard 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 affected areas as isolated, small, medium, or large.

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

Past Occurrences
This section includes information on historic incidents, including impacts and costs, if known. A historic incident worksheet was used to capture information from participating jurisdictions on past occurrences. Information from the HMPC was combined with other data sources, including those previously mentioned.

Probability of Future Occurrence
The frequency of past events is used to gauge the likelihood of future occurrences. Based on historical data, the Probability of Future Occurrence is categorized as follows:

- Highly Likely: Near 100% chance of occurrence next year or happens every year
- Likely: 10-100% chance of occurrence in the next year or has a recurrence interval of 10 years or less
- Occasional: 1-10% chance of occurrence in the next year or has a recurrence interval of 11 to 100 years
- Unlikely: Less than 1% chance of occurrence in the next 100 years or has a recurrence interval of greater than every 100 years

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.

Magnitude/Severity
This section summarizes the magnitude/severity or extent of a hazard event in terms of deaths, injuries, property damage, and interruption of essential facilities and services. Magnitude and severity are classified in the following manner:

- Catastrophic: Multiple deaths; property destroyed and severely damaged; and/or interruption of essential facilities and service for more than 72 hours
- Critical: Isolated deaths and/or multiple injuries and illnesses; major or long-term property damage that threatens structural stability; and/or interruption of essential facilities and services for 24-72 hours
- Limited: Minor injuries and illnesses; minimal property damage that does not threaten structural stability; and/or interruption of essential facilities and services for less than 24 hours
- Negligible: No or few injuries or illnesses; minor quality of life loss; little or no property damage; and/or brief interruption of essential facilities and services

Climate Change Considerations

As summarized in Section 4.1.3 above, this sub-section will discuss the known or potential impacts of climate change on the specific hazard.

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:

- People (including vulnerable populations)
- Property
- Critical Facilities and Infrastructure
- Economy
- Historic, Cultural, and Natural Resources
- Development Patterns
- Risk Summary

Risk Summary

Summarizes key information for the hazard profiled.

4.2 Assets Summary

4.2.1 People

The number of people potentially exposed to hazards were calculated using 2023 U.S. Census Bureau estimates, as detailed in Section 3.4. Colorado Demographer's Office data was used to supplement census data were needed. For hazards with a geospatial component, and for which GIS data was available, populations at risk were estimated by multiplying total census populations by the percentage of residential structures determined to be at risk, as detailed in the next section. A limitation in this methodology is that multi-family residences such as apartment buildings are counted as one residence, thus potentially undercounting the number of people in those structures at risk.

4.2.2 General Property

General property exposure to hazards is based on Adams County parcel data containing assessor information such as total number of parcels, improvement values, and parcel type classification by jurisdiction. Data for Arapahoe and Weld Counties was also included so that a complete exposure analysis could be conducted for the cities of Brighton and Bennett, both of which extend into those neighboring counties.

The 2020 HMP used assessed values to determine property values at risk. For this update additional data was available that permitted using actual values, which provides a more accurate estimate. As a result, the total property exposure has increased significantly from the 2020 Plan, from $6 billion to $92.8 billion. This is the result of a change in methodology, not an actual increase in value.

Parcel Improved values and parcel type attributes were joined to the address point geometries in GIS to allow spatial analysis and mapping. Parcels with an improved value greater than zero were assumed to have a building on them for the purposes of this plan. County Assessor's data lists many exempt properties as having $0 improved values because they are exempt from county taxes. To ensure these properties were included in the analysis, critical facility and building footprint layers were reviewed to identify exempt parcels with structures on them. These properties were counted in the parcel and building count analysis and if an exempt improved value was provided, they were included in the value analysis as well.

For mobile home parks that didn't have improved values, a standard estimated value of $50,000 per home was multiplied by the number of mobile homes in the parcel. Content values were estimated as a percentage of the improvement value based on parcel type based on standard FEMA Hazus guidelines: 50% for residential structures, 100% for agricultural, commercial, and exempt parcels, and 150% for industrial parcels.

Table 4-4 shows the total number of improved parcels, structures, and their improvement and content values by jurisdiction. Data for municipalities not participating in this HMP are included for completeness.

Table 4-4 Improved Parcel Exposure Values by Jurisdiction

Jurisdiction	Improved Parcel Count	Building Count	Improved Value	Content Value	Total Value
Arvada	1,198	1,258	$584,125,154	$360,330,468	$944,455,622
Aurora	12,593	17,479	$11,321,263,514	$9,044,283,330	$20,365,546,844
Bennett	1,523	1,608	$607,836,905	$337,289,019	$945,125,924
Brighton	12,659	15,212	$7,397,492,398	$4,603,280,255	$12,000,772,653
Commerce City	21,425	24,474	$11,488,440,521	$7,273,110,878	$18,761,551,399
Federal Heights	1,466	5,310	$1,070,833,879	$629,840,406	$1,700,674,285
Lochbuie	151	151	$57,699,019	$29,721,270	$87,420,289
Northglenn	10,454	13,855	$5,774,055,253	$3,291,030,235	$9,065,085,488
Thornton	41,542	48,325	$23,404,017,430	$12,898,723,924	$36,302,741,354
Westminster	20,678	25,771	$13,722,759,894	$7,949,942,875	$21,672,702,769
Unincorporated	30,526	37,833	$17,378,012,656	$11,126,597,839	$28,504,610,495
Total	**154,215**	**191,276**	**$92,806,536,623**	**$57,544,150,496**	**$150,350,687,119**

Source: Adams, Arapahoe, and Weld County Assessor Data 2024, WSP GIS Analysis

Table 4-5 summarizes the same information as above, but this time by parcel type. The below information indicates that most properties in Adams County are residential in nature, followed by commercial, exempt, agricultural, and industrial. A total of 154,215 parcels were summed up for this exposure summary, with a total value of parcels available for assessment is over $150 billion including both improvement values and content values.

For the vulnerability analyses to follow in Section 4.3 Hazard Analysis and Risk Assessment, the total parcels exposed to the hazards available in geospatial format were obtained by overlaying the hazard threat layers with address points and spatially joined parcel layer in GIS. The following hazards will have vulnerability summaries at the parcel level, due to the availability of hazard data for the geospatial overlay analysis: Dam Failure/Incidents, Flood, Hazardous Material incidents, and Wildfire. Earthquake also includes damage and loss estimates to general property based on the Hazus-derived information (see Section 4.6 Earthquake for details).

Table 4-5 Improved Parcel Exposure Values by Parcel Type

Parcel Type	Improved Parcels	Building Count	Improved Values	Content Values	Total Values
Agricultural	1,193	2,242	$422,316,702	$422,316,702	$844,633,404
Commercial	5,159	7,712	$10,949,964,446	$10,949,964,446	$21,899,928,892
Exempt	1,392	4,138	$5,937,415,847	$5,937,415,847	$11,874,831,694
Industrial	452	818	$2,486,033,687	$3,729,050,531	$6,215,084,218
Residential	146,019	176,366	$73,010,805,941	$36,505,402,971	$109,516,208,912
Total	**154,215**	**191,276**	**$92,806,536,623**	**$57,544,150,496**	**$150,350,687,119**

Source: Adams, Arapahoe, and Weld County Assessor Data 2024, WSP GIS Analysis

Analyzing the Year Built field in the assessor's data (where available) shows 14,478 buildings have been constructed in the planning area since 2018, 13,904 of which were residential. Note there was no record of structures being built in Arvada since 2018, although this is most likely a reporting issue. The impact of new construction on risk from hazards can be found in the vulnerability section of the Flood, Dam Incident, Hazardous Materials, and Wildfire hazard profiles.

Table 4-6 Properties Built Since 2018

Jurisdiction	Property Type	Improved Parcels	Buildings	Improved Value
Aurora	Commercial	39	55	$856,375,448
Aurora	Exempt	3	13	$57,152,389
Aurora	Industrial	23	23	$555,660,853
Aurora	Residential	2,498	2,532	$1,657,578,055
	Total	**2,563**	**2,623**	**$3,126,766,745**
Bennett	Commercial	7	25	$9,831,875
Bennett	Residential	515	516	$209,077,513
	Total	**522**	**541**	**$218,909,388**
Brighton	Commercial	28	32	$284,079,973
Brighton	Exempt	1	1	$1,482,056
Brighton	Industrial	1	1	$951,306
Brighton	Residential	1,680	1,685	$965,548,935
	Total	**1,710**	**1,719**	**$1,252,062,270**
Commerce City	Commercial	40	47	$317,570,088
Commerce City	Exempt	3	3	$28,488,900
Commerce City	Industrial	43	43	$132,886,153
Commerce City	Residential	4,173	4,181	$2,015,530,798
	Total	**4,259**	**4,274**	**$2,494,475,939**
Federal Heights	Commercial	2	2	$5,207,344
Federal Heights	Residential	44	44	$12,957,000
	Total	**46**	**46**	**$18,164,344**
Lochbuie	Commercial	1	1	$1,270,136
Lochbuie	Residential	149	149	$55,955,499
	Total	**150**	**150**	**$57,225,635**
Northglenn	Commercial	10	10	$14,122,343
Northglenn	Residential	273	293	$177,415,377
	Total	**283**	**303**	**$191,537,720**
Thornton	Commercial	73	77	$283,539,255

Jurisdiction	Property Type	Improved Parcels	Buildings	Improved Value
Thornton	Exempt	3	3	$125,168,680
Thornton	Residential	3,092	3,191	$2,265,348,873
	Total	**3,168**	**3,271**	**$2,674,056,808**
Westminster	Commercial	21	23	$55,663,115
Westminster	Exempt	1	1	$60,736,615
Westminster	Residential	290	291	$201,818,301
	Total	**312**	**315**	**$318,218,031**
Unincorporated	Agricultural	122	123	$72,070,922
Unincorporated	Commercial	69	77	$429,977,521
Unincorporated	Exempt	1	5	$20,600,153
Unincorporated	Industrial	8	9	$33,312,054
Unincorporated	Residential	1,006	1,022	$567,613,234
	Total	**1,206**	**1,236**	**$1,123,573,884**
	Grand Total	**14,219**	**14,478**	**$11,474,990,764**

Source: Adams, Arapahoe, and Weld County Assessor Data 2024, WSP GIS Analysis

4.2.3 Critical Facilities and Infrastructure

A critical facility may be defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. Critical facilities were identified based on data provided by the Adams County GIS Department and supplemented by CDOT, Denver Water, EPA, Division of Water Resources, National Bridge Inventory, CERC, and the Homeland Infrastructure Foundation-Level Data (HIFLD), a federal resource for open geospatial data geared towards supporting community preparedness, resiliency, and research.

For this analysis, critical facilities were grouped together using FEMA Lifeline categories, shown in Figure 4-1. Lifelines are defined as providing indispensable services that enable the continuous operation of critical business and government functions, and are critical to human health and safety, and/or economic security. These categorizations are useful as they:

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

Figure 4-1 Lifeline Categories

Source: FEMA

Table 4-7 summarizes the inventory of critical facilities by jurisdiction. The locations of these facilities are displayed in Figure 4-2 and Figure 4-3 below. Specific information on facilities, names, and other key details by community can be found in the jurisdictional annexes.

Table 4-7 Critical Facilities and Infrastructure in Adams County By FEMA Lifeline and Jurisdiction

Jurisdiction	Communications	Energy	Food, Hydration, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Water Systems	Total Count
Arvada	-	-	-	1	-	2	2	-	**5**
Aurora	2	14	4	120	11	26	70	4	**251**
Bennett	-	-	5	4	-	14	4	8	**35**
Brighton	1	4	9	16	9	34	35	7	**115**
Commerce City	2	6	7	90	7	45	61	8	**226**
Federal Heights	-	1	2	4	1	7	-	-	**15**
Northglenn	-	3	7	5	12	28	10	5	**70**
Thornton	2	4	12	45	31	75	57	22	**248**
Westminster	-	1	8	11	19	42	38	6	**125**
Unincorporated	66	24	11	223	10	77	290	37	**738**
Total	**73**	**57**	**65**	**519**	**100**	**350**	**567**	**97**	**1,828**

Source: Adams County, CDOT, Denver Water, EPA, HIFLD, Division of Water Resources, National Bridge Inventory, SERC, WSP Analysis

Figure 4-2 Critical Facilities in West Adams County

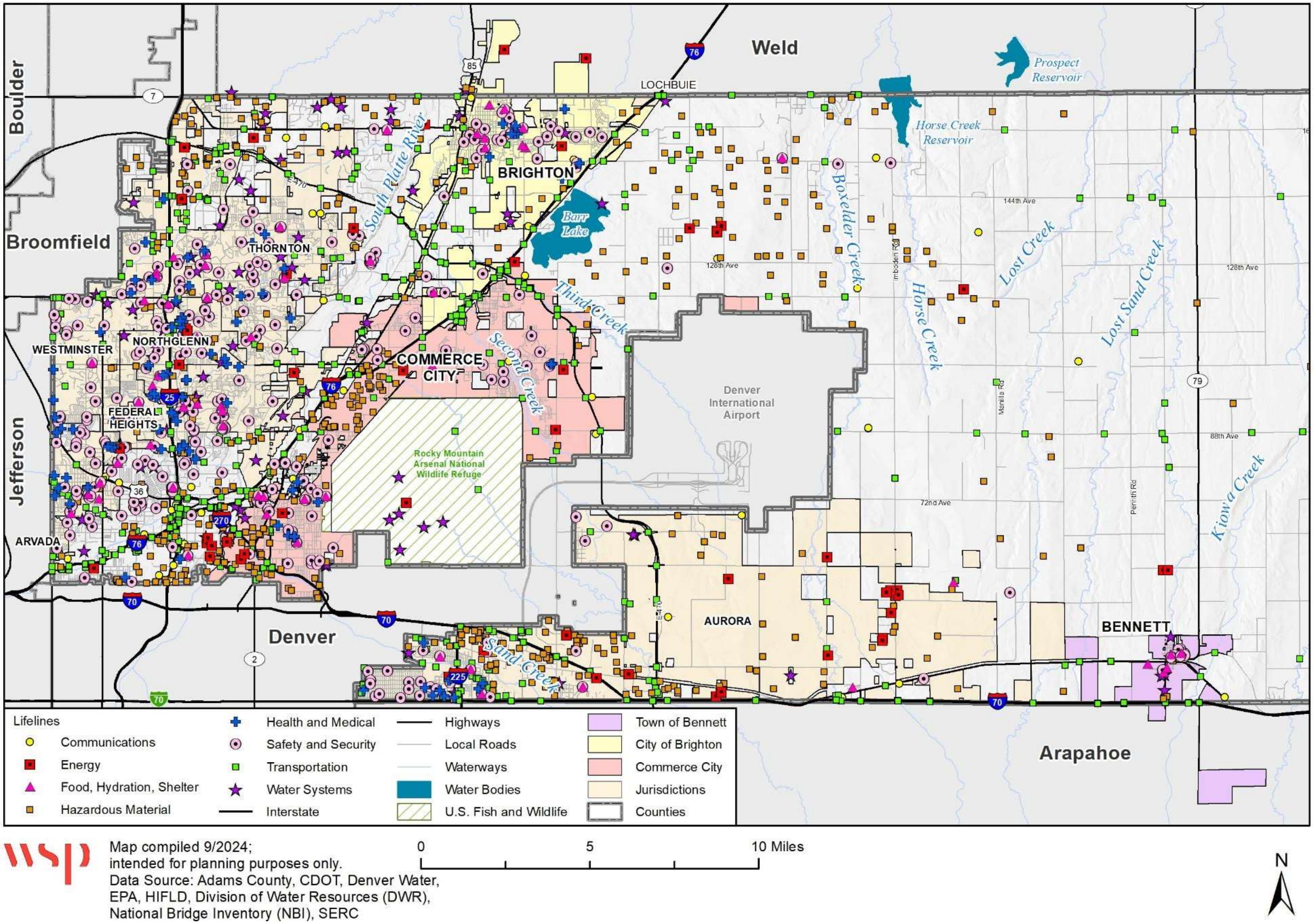
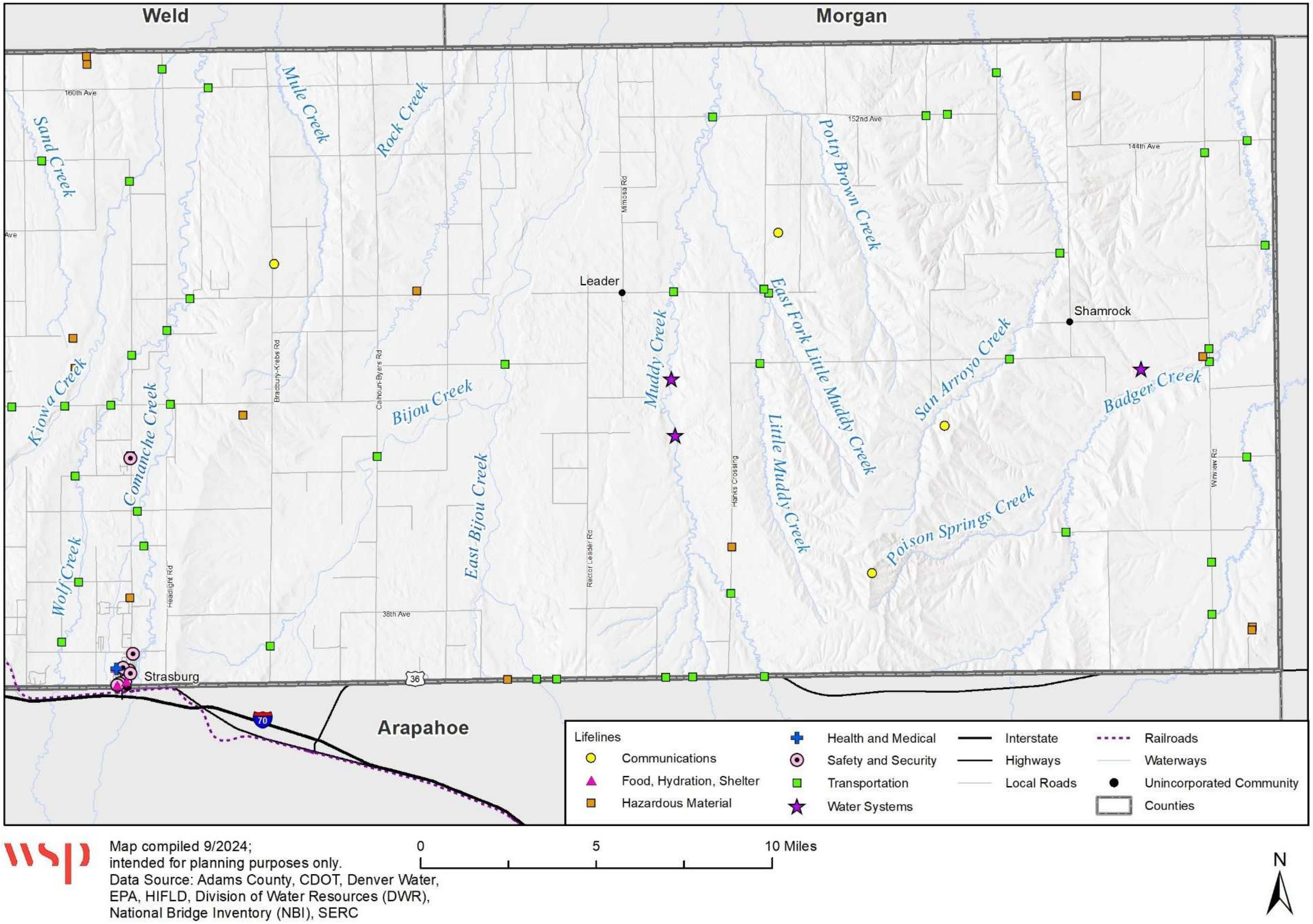


Figure 4-3 Critical Facilities in East Adams County



4.2.4 Historic, Cultural, and Natural Resources

Assessing the vulnerability of Adams 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.

Historical 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; some are inventoried and listed in this plan and used in appropriate GIS analyses to determine potential vulnerability to hazards.

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 Adams County was obtained from the National Register of Historic Places (NRHP). The NRHP database 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 National Register is administered by the National Park Service (NPS), which is part of the U.S. Department of the Interior.

Based on this NRHP database and the Adams County GIS Department-provided data used throughout this plan, there are 19 historic resources as summarized in the following table:

Table 4-8 Historic and Cultural Resources Noted by the NRHP and Adams County HMPC

Location	Historic Place Name	Date Entered into Register	Data Source
Aurora	Wilson, Blanche A., House	11/7/1996	NRHP
	Robidoux, M.J. Lavina, House	9/15/2011	NRHP
	Fuller, Granville, House	3/16/2012	NRHP
Brighton	Bromley Farm--Koizuma Hishinuma Farm	8/16/2007	NRHP
	Brighton High School	1/23/1998	NRHP
	Colorado Sanitary Canning Factory	3/15/2016	NRHP
	Adams County Courthouse	10/4/2006	NRHP
Commerce City	64th/Colorado Fast Track Station	Unknown	Adams County GIS
Northglenn	Deza Estates	11/27/2023	NRHP
	St. Stephen's Lutheran Church	7/12/209	NRHP
	Thede Farmhouse	1/30/1998	NRHP

Location	Historic Place Name	Date Entered into Register	Data Source
Strasburg	Engelbrecht Farm	12/10/2014	NRHP
Thornton	Eastlake Farmers' Co-Operative Elevator Company	5/17/2010	NRHP
Westminster	Bowles House	11/3/1988	NRHP
	Harris Park School	8/30/1990	NRHP
	Gregory, William J., House	2/23/1996	NRHP
	Metzger Farm	3/20/2013	NRHP
	Union High School	1/14/2000	NRHP
	Westminster University	8/10/1979	NRHP

Note: NRHP = National Register of Historic Places

Source: NPS NRHP; Adams County GIS

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, Adams County contains an additional eight existing resources (not including those also listed in the NRHP) deemed historic preservation-worthy:

Table 4-9 Adams County Historic and Cultural Resources in the Colorado Historic Register

Historic Place Name	Location	Date Entered into Register
Brannan Sand and Gravel Pit #8, Lake Sangraco and Boat Complex	Address restricted, Denver vicinity	8/16/2011
Bruderlin House	Barr Lake State Park, 13401 Picadilly Rd., Brighton	9/11/1996
Denver Tramway Streetcar #0.04	W 58th Pl and Tennyson St	6/14/2000
First Presbyterian Church (Brighton)	147 S. 1st Ave., Brighton	6/9/1999
Fitzsimons General Hospital, Main Hospital Building	12101 E. Colfax Ave., Aurora	3/10/1999
Gottlieb & Rose Egli House	72nd & Quebec St., Rocky Mountain Arsenal National Wildlife Refuge, Commerce City vicinity	8/14/2002
Riverside Cemetery	5201 Brighton Blvd., Commerce City vicinity	10/28/1994
Savery Savory Mushroom Farm Water Tower	110th Ct. and Federal Blvd., Westminster	12/16/2005

Source: State of Colorado Register Listed Historic Properties; https://www.historycolorado.org/national-state-register-listed-properties

The National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) consider any property over 50 years of age a historic resource that is potentially eligible for the National Register. Before any such property can be altered as the result of a major federal action, it must be evaluated under NEPA and NHPA guidelines. 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" (A Citizen's Guide to Section 106 Review, 2016). Structural mitigation projects are considered alterations for the purpose of these NEPA/NHPA regulations, if they affect historic 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 protects sensitive habitat as well as attenuates and stores floodwaters.

A number of natural resources exist in Adams County including parks, open spaces, wetlands, and endangered or threatened species, for example. According to the 2022 Adams County Parks, Open Space, and Trails Master Plan, there are 772 publicly accessible parks and open spaces totaling almost 28,000 acres located in the county. 31 of these, totaling 2,166 acres, are owned and managed by the county. There are a further 14,132 acres throughout the county held in conservation easements. A summary of parks, open spaces, and trails is included in the table below:

Table 4-10 Park Types in Adams County

Type	Number of Properties	Acres	%
Community Park	34	477	1.72%
Open Space	332	5,106	18.4%
Regional Park	13	18,573	66.92%
Trail/Trailhead	68	978	3.53%
Neighborhood Park	321	2,206	7.95%
School Facility	4	9	0.03%
Total	772	27,754	100%

Source: 2022 Advancing Adams – Parks, Open Space, and Trails Master Plan; https://adcogov.org/parks-open-space-and-trails-plan

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 reduce flood peaks and slowly release 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).

The U.S. Fish and Wildlife National Wetlands Inventory recently updated wetlands data applicable to Adams County, under the Colorado Eastern Plains Riparian Metadata Addendum effort. This data is current as of 2025 and contains studied wetlands of two types for the planning area: Forested/Shrub Riparian, the most widely available throughout the county, and an Herbaceous Riparian type, more prevalent in the western portions of the county, especially north and east of the Commerce City/Rocky Mountain Arsenal National Wildlife Refuge area. The acreage for the two mapped wetland types for Adams County is listed below. The amount of wetlands of various kinds is helpful to note because these areas may require special attention during future development efforts across the county.

- Forested/Shrub Riparian: 3,433 acres
- Herbaceous Riparian: 234 acres

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 13 federally endangered, threatened, or candidate/proposed/under/other status review species in Adams County (as of January 2025). These are listed in Table 4-11.

Table 4-11 At-Risk Wildlife in Adams County

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

Source: USFW ECOS, 2025

4.3 Cyber Incident

Table 4-12 Cyber Incident Risk Summary

Jurisdiction	Geographic Location	Probability of Future Occurrence	Magnitude/ Severity	Overall Significance
Adams County	Limited	Likely	Limited	Low
Bennett	Extensive	Likely	Critical	High
Brighton	Limited	Likely	Limited	Low
Commerce City	Limited	Likely	Limited	Medium
Denver Water	Limited	Likely	Limited	Low

4.3.1 Hazard Description

The 2023 Colorado State Hazard Mitigation Plan defines cyber-attacks as “deliberate exploitation of computer systems, technology-dependent enterprises, and networks.” Cyber-attacks use malicious code to alter computer operations or data. The vulnerability of computer systems to attacks is a growing concern as people and institutions become more dependent upon networked technologies. The Federal Bureau of Investigation (FBI) reports that, “cyber intrusions are becoming more commonplace, more dangerous, and more sophisticated,” with implications for private- and public-sector networks.

There are many types of cyber-attacks. Among the most common is a **direct denial of service**, or **DDoS** attack. This is when a server or website will be queried or pinged rapidly with information requests, overloading the system and causing it to crash.

Phishing is a technique employed in many of the above attacks and involves sending fraudulent emails purporting to be from known contacts or reputable companies to induce individuals to reveal personal information, such as passwords and credit card numbers, or to click on links that put the user at risk.

Malware, or malicious software, can cause numerous problems once on a computer or network, from taking control of users’ machines to discreetly sending out confidential information. **Ransomware** is a specific type of malware that blocks access to digital files and demands payment to release them. Hospitals, school districts, state and local governments, law enforcement agencies, businesses, and even individuals can be targeted by ransomware. A 2017 study found ransomware payments over a two-year period totaled more than $16 million. Even if a victim is perfectly prepared with full offline data backups, recovery from a sophisticated ransomware attack typically costs far more than the demanded ransom. However, according to a 2016 study by Kaspersky Lab, roughly one in five ransomware victims who pay their attackers are still not able to retrieve their data.

Cyber spying or espionage is the act of illicitly obtaining intellectual property, government secrets, or other confidential digital information, and often is associated with attacks carried out by professional agents working on behalf of a foreign government or corporation. According to cybersecurity firm Symantec, in 2016 “…the world of cyber espionage experienced a notable shift towards more overt activity, designed to destabilize and disrupt targeted organizations and countries.”

A major **data breach** is when hackers gain access to large amounts of personal, sensitive, or confidential information and have become increasingly common. A 2018 report from the security firm Symantec found that more than seven billion identities have been exposed in data breaches over the last eight years. In addition to networked systems, data breaches can occur due to the mishandling of external drives.

Cyber-crime can refer to any of the above incidents when motivated primarily by financial gain or other criminal intent.

The most severe type of attack is **cyber terrorism**, which aims to disrupt or damage systems in order to cause fear, injury, and loss to advance a political agenda.

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."

4.3.2 Location

Cyber-attacks can and have occurred in every location regardless of geography, demographics, and security posture. Incidents may involve a single location or multiple geographic areas. A disruption can have far-reaching effects beyond the location of the targeted system; disruptions that occur far outside the state can still impact people, businesses, and institutions within Adams County. Therefore, the location of cyber incidents is **limited** in the planning area.

4.3.3 Past Occurrences

According to the FBI's 2023 Internet Crime Report, the FBI received 880,418 complaints with $12.5 billion in losses over the last five years due to cyber-attacks. The Crime Report also noted a trend of increasing cyber-crime complaints and losses each year. According to the 2023 Report, Colorado ranked 16/57 among U.S. territories in the total number of victims, with 4,178 victims of cyber-crime and $123,104,339 in total losses.

The Privacy Rights Clearinghouse, a nonprofit organization based in San Diego, maintains a timeline of 7,130 data breaches resulting from computer hacking incidents in the United States from 2005-2023. The database lists 262 data breaches potentially affecting Colorado, totaling over 2 million impacted records. While none of those breaches involved servers in Adams County, it is probable that some County residents were affected; similarly, some Adams County residents were likely affected by national and international data breaches.

In February 2018, the Colorado Department of Transportation (CDOT) server was breached as part of a ransomware attack. The following narrative describes the incident.

> Between February 21st and the 23rd, malware began encrypting CDOT workstations and servers. This was a ransomware attack which denied user access to their e-mail, electronic files, data, and computer applications. This attack impacted approximately 3,800 laptops (~50% infected), 200 desktops, 354 servers (~40% infected), and a host of other electronic devices and applications. Each device needed to be individually assessed and have multiple security patches applied.
>
> Upon the completion of an initial situational assessment, the CDOT Executive Director activated a Departmental Incident Management Team on February 26th, with the sole responsibility of being the central entity to direct all internal activities related the ransomware virus incident. This included: the reassignment of departmental resources (as needed); establish prioritized lists of actions to be taken; coordination with the Office of Information Technology (OIT) on technical measures to confine and eradicate the virus as well as restore the network; and provide a public information message for staff, vendors, the media and the public. There were no previous incidents (nationwide) to draw upon to assist in identifying our actions to respond to or recover from an event of this scale or scope.
>
> On February 28th, the CDOT network had been assessed as clean and authorization was given for non-infected workstations to be brought back online following a second assessment and remediation. By March 1st, new infections had been detected along with unexplained activity on the network. All recovery efforts were halted, and additional computer security resources were requested. The entire network was shut down, which included commercial vendors as well as the

Colorado National Guard Cyber Team and other federal assets. The Recovery process restarted on March 7th.

While the technological side of the incident was being resolved, the prioritization of business functions continued. The first priority was to enable the appropriate software package(s) to process invoices and payments. Then, a move onto the other 55 computer applications that the department utilizes on a daily basis. By March 11th, small portions of the network were turned on to staff.

On March 19th, the formal recovery phase began with the goal of reconstituting the entire network.

4.3.4 Probability of Future Occurrence

Cyber-attacks occur daily, but most have minor impacts at the local or regional level. 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. The means that a cyber-attack probability of future attack is rated as likely. Minor attacks against business and government systems have become a commonplace occurrence but are usually stopped with minimal impact. Similarly, data breaches impacting the information of residents of Adams County are almost certain to happen in coming years. Major attacks specifically targeting systems or infrastructure in the County are less likely but cannot be ruled out. Additionally, the FBI Internet Crime Report 2022 found that there is a trend of increasing cyber-attacks over the past 5-years. These trends are shown in Figure 4-4.

Figure 4-4 Trends of the Frequency of Cyber-Attacks

Source: FBI Internet Crime Report 2022

4.3.5 Magnitude/Severity

The extent or magnitude/severity of a cyber disruption event is variable depending on the nature of the event and is rated as limited for the planning area. A disruption affecting a small, isolated system could impact only a few functions or processes. Disruptions of large, integrated systems could impact many functions or processes, as well as many individuals that rely on those systems. Data breaches are often described in terms of the number of records or identities exposed.

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

4.3.6 Climate Change Considerations

Climate change is not projected to have an impact on the threat, vulnerability, and consequences of a cyber-attack.

4.3.7 Vulnerability

As discussed above, the impacts of cyber-attack can differ significantly depending on the type, scope, and effectiveness of the attack. A large-scale cyber-attack has the potential to severely erode public trust, causing people to question their government's ability to safeguard critical systems and protect them from harm. This loss of confidence can be especially damaging if the attack disrupts essential services, compromises sensitive information, or results in significant financial or operational damage.

People

Injuries or fatalities from cyber-attacks would generally only be possible from a major cyber-terrorist attack against critical infrastructure. More likely impacts on the public are financial losses and an inability to access systems such as public websites and permitting sites. Indirect impacts could include interruptions to traffic control systems or other infrastructure. The FBI Internet Crime Reports on the victims of cyber-attack by age group. While the number of cyber-attack complaints is comparable across age groups, the losses increase significantly as age group increases, with individuals 60 years and older experiencing the greatest losses.

Property

Most cyber-attacks affect primarily target data and computer systems, and their impacts are often limited to the digital realm, resulting in minimal damage to physical property. These types of attacks usually involve data breaches, ransomware, or malware that disrupts business operations, leaks sensitive information, or compromises individual privacy. In these cases, the effects, though potentially costly and disruptive, do not directly affect physical assets like buildings or equipment.

However, in more sophisticated and coordinated attacks, the stakes can be significantly higher. Cyber-attacks targeting Supervisory Control and Data Acquisitions (SCADA) Systems, which control critical infrastructure, have the potential to cause widespread and devastating effects. These systems manage essential utilities such as water supply, electricity, transportation networks, and natural gas pipelines. A successful breach of SCADA systems could lead to the malfunctioning or shutdown of vital services, bringing entire sectors to a standstill.

Critical Facilities and Infrastructure

Agencies that rely on electronic backup of critical files are vulnerable. The delivery of services can be impacted since governments rely largely upon electronic delivery of services. An attack could raise questions regarding the security of using electronic systems for government services.

While most cyber-attacks affect only data and computer systems, sophisticated attacks against utilities and infrastructure sites have occurred. Such attacks typically target the Supervisory Control and Data Acquisition (SCADA) systems of critical infrastructure, which can potentially result in system failures on a scale equal with natural disasters. Facilities and infrastructure, such as the electrical grid, could become unusable as a result of a cyber-attack.

Economy

Large scale cyber-attacks can greatly affect the economy. These attacks can disrupt business operations, halt financial transactions, and cause significant losses in revenue. In critical sectors like banking, healthcare, and energy, a cyber-attack can paralyze daily activities, leading to costly downtime and loss of productivity. Furthermore, the resources needed to recover from such attacks, including cybersecurity upgrades, legal fees, and regulatory fines, can place a heavy financial burden on organizations. On a broader scale, cyber-attacks can undermine investor confidence, slow economic growth, and affect global trade, creating ripple effects that harm both local and international markets. According to FBI Internet Crime Report, the State of Colorado lost nearly $187,621,731 due to cyber-attacks in 2023.

Historic, Cultural, and Natural Resources

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

Development Patterns

Changes in development have little direct impact on the threat, vulnerability, and consequences of a cyber-attack. However, as more systems become more reliant on technology, this will likely increase the community's vulnerability. For example, a cyber-attack on self-driving vehicles could be a mass casualty event.

4.3.8 Risk Summary

The overall significance of cyber-attacks in Adams County is **Low**.

- Most data breaches and hacking incidents only impact a few individuals or businesses at a time and have minimal broader impact.
- Cyber-attacks can occur anywhere and on any computer network, therefore, this is rated as **limited** location.
- There is an increasing trend in the number of cyber-attacks in the U.S. each year, therefore, the frequency of cyber-attack is rated as **likely**.
- Ransomware attacks, particularly against state and local governments, have increased significantly in recent years and could have major impacts on County services.
- Major cyber-attacks against infrastructure and systems are also happening with more frequency worldwide, but there is no data to suggest that Adams County is likely to be targeted.
- Cyber-attacks can impact personal data and accounts. Injuries or fatalities could potentially result from a major cyber terrorist attack against critical infrastructure.
- Short of a major cyber terrorist attack against critical infrastructure, property damage from cyber-attacks is typically limited to computer systems.
- Could greatly affect the economy. In an electronic-based commerce society, any disruption to daily activities can have disastrous impacts on the economy. It is difficult to measure the true extent of the impact.
- Sabotage of utilities and infrastructure from a major cyber terrorist attack could potentially result in system failures that damage property on a scale equal with natural disasters. Facilities and infrastructure could become unusable as a result of a major cyber-attack.
- Related hazards: Terrorism, Dam Failure/Incident, and Hazardous Materials incident.

4.4 Dam Incident

Table 4-13 Dam Incident Risk Summary

Jurisdiction	Geographic Location	Probability of Future Occurrence	Magnitude/ Severity	Overall Significance
Adams County	Limited	Unlikely	Critical	Medium
Bennett	None	NA	NA	NA
Brighton	Significant	Occasional	Catastrophic	High
Commerce City	Significant	Occasional	Limited	Medium
Denver Water	Significant	Unlikely	Critical	Medium

4.4.1 *Hazard Description*

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. 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.

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

- Prolonged periods of rainfall and flooding, which result 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 or foundation leakage or piping or rodent/wildlife activity
- Improper design
- Improper maintenance
- Negligent operation
- Failure of upstream dams on the same waterway

Dam inundation can also occur from non-failure events, such as overtopping due to heavy rains. Controlled releases to allow water to escape when a reservoir is overfilling actually can help prevent future overtopping or failure, and is an important strategy to consider when dealing with significant and high hazard dams.

The Colorado Department of Natural Resources' Dam Safety Program developed a tool to support public awareness, planning, and emergency preparedness and response involving high hazard dams across the state. This tool evaluates dams and their capabilities regarding operational and flood release functions to prevent or minimize potential future damages

Hazard Classification of Dams

- <u>High Hazard Potential Dams:</u> 12 total
  - 8 in Adams County
  - 4 outside the County
- <u>Significant Hazard Potential Dams:</u> 33 total
  - 12 in Adams County
  - 21 outside the County

It is important to keep in mind that hazard potential classifications refer to the consequences of failure, not the likelihood of failure. High hazard dams have potential for loss of life, while significant hazard dams can cause major economic or infrastructure impacts.

As discussed in Section 2.3.1, owners and operators of high and significant hazard dams with the potential to impact Adams County were invited to participate in the planning process and/or to comment on the draft plan. These organizations and individuals are listed in Appendix B. However, participation was light; this was identified as an area for future improvement.

4.4.2 Location

The geographic extent of dam failure risk in Adams County is considered **significant**, based on both the number of high-and significant-hazard dams and the extent of their mapped inundation areas, with 12% of structures potentially at risk. While the likelihood of failure is low, the potential downstream impacts, especially for high hazard dams, can be severe.

Colorado DWR tracks dam conditions and hazard classifications across the State. To determine dams relevant to Adams County, DWR-provided inundation mapping was intersected with the County boundary. This approach identified both:

- Dams physically located in Adams County
- Dams located outside the County whose modeled inundation areas extend into it

Based on this analysis, a total of 126 dams of concern were identified as relevant to Adams County's hazard profile. These include:

- 20 dams located within Adams County
- 106 dams located in upstream or adjacent counties with inundation that intersects Adams County

Ownership and Mapping Notes

- Five (5) High Hazard Federal dams (including Chatfield and Cherry Creek) are located outside Adams County but have large inundation footprints that cross into the county boundary. DWR does not provide inundation data for federally owned dams.
- All High and Significant hazard dams are required to maintain Emergency Action Plans (EAPs). Non-jurisdictional or lower-risk dams may not be subject to these requirements.

This list, drawn from DWR's 2024 dam safety database and inundation shapefiles, forms the foundation for assessing potential cascading impacts from dam failure within Adams County. Table 4-14, below, shows the complete list of DWR dams of concern affecting Adams County. Dams that may be eligible for Rehabilitation of High Hazard Potential Dams (HHPD) funding are marked with asterisks.

Table 4-14 High and Significant Hazard Potential Dams Affecting Adams County

Dam Name	County	Class	Overall Condition	Type
Antero	Park	High	Satisfactory	Jurisdictional
Barr Lake	Adams	High	Satisfactory	Jurisdictional
Bear Creek	Jefferson	High	Satisfactory	Federal
Bear Creek Dam (South)	Jefferson	High	N/A	Federal
Bergen East	Jefferson	High	Satisfactory	Jurisdictional
Blunn	Jefferson	High	Satisfactory	Jurisdictional
Bull Canal (Main Reservoir)	Weld	High	Satisfactory	Jurisdictional

Dam Name	County	Class	Overall Condition	Type
Chambers Reservoir	Douglas	High	Conditionally satisfactory	Jurisdictional
Chase Gulch	Gilpin	High	Satisfactory	Jurisdictional
Chatfield	Jefferson	High	Satisfactory	Federal
Cheesman	Douglas	High	Satisfactory	Jurisdictional
Cherry Creek	Arapahoe	High	N/A	Federal
Clear Lake	Clear Creek	High	N/A	Jurisdictional
Dunes	Adams	High	Satisfactory	Jurisdictional
East	Jefferson	High	Satisfactory	Jurisdictional
Eleven Mile Canyon	Park	High	Satisfactory	Jurisdictional
Englewood	Arapahoe	High	N/A	Jurisdictional
Evergreen	Jefferson	High	Conditionally satisfactory	Jurisdictional
Exposition Park	Arapahoe	High	Satisfactory	Jurisdictional
Fairmount Reservoir	Jefferson	High	Satisfactory	Jurisdictional
Fall River	Clear Creek	High	Conditionally satisfactory	Jurisdictional
Fortune	Jefferson	High	Satisfactory	Jurisdictional
Franktown Parker Fpb-1	Douglas	High	Conditionally satisfactory	Jurisdictional
Franktown Parker Fpp-1	Douglas	High	Satisfactory	Jurisdictional
Genesee No. 2	Jefferson	High	Satisfactory	Jurisdictional
Georgetown	Clear Creek	High	Satisfactory	Jurisdictional
Great Western	Broomfield	High	Conditionally satisfactory	Jurisdictional
Guanella	Clear Creek	High	Satisfactory	Jurisdictional
Harriman	Jefferson	High	Satisfactory	Jurisdictional
Holly	Arapahoe	High	N/A	Jurisdictional
Hyatt*	Jefferson	High	Unsatisfactory	Jurisdictional
Idaho Springs	Clear Creek	High	Satisfactory	Jurisdictional
James Tingle	Park	High	Satisfactory	Jurisdictional
Jefferson Lake	Park	High	Satisfactory	Jurisdictional
Kalcevic	Adams	High	Satisfactory	Jurisdictional
Kelly Road Detention	Denver	High	Satisfactory	Jurisdictional
Ketner	Jefferson	High	Satisfactory	Jurisdictional
Leyden	Jefferson	High	Satisfactory	Jurisdictional
Loch Lomond	Clear Creek	High	Conditionally satisfactory	Jurisdictional
Lookout Mountain	Jefferson	High	Satisfactory	Jurisdictional
Lower Beaver Brook	Clear Creek	High	Satisfactory	Jurisdictional
Lower Cabin Creek	Clear Creek	High	N/A	Jurisdictional
Lower Chinns	Clear Creek	High	Satisfactory	Jurisdictional
Lower Long Lake*	Jefferson	High	Unsatisfactory	Jurisdictional

Dam Name	County	Class	Overall Condition	Type
Magic Mountain #1	Jefferson	High	Satisfactory	Jurisdictional
Main	Jefferson	High	Satisfactory	Jurisdictional
Maple Grove	Jefferson	High	Satisfactory	Jurisdictional
Marston Lake - East Dam	Denver	High	Satisfactory	Jurisdictional
Marston Lake - North Dam	Denver	High	Satisfactory	Jurisdictional
Marston Lake - Northwest Dike	Denver	High	Satisfactory	Jurisdictional
Marston Lake - South Dam	Denver	High	Satisfactory	Jurisdictional
Mclellan	Arapahoe	High	Conditionally satisfactory	Jurisdictional
Mckay Lake - East	Adams	High	Satisfactory	Jurisdictional
Mckay Lake - South	Adams	High	Satisfactory	Jurisdictional
Montgomery	Park	High	Conditionally satisfactory	Jurisdictional
Morrison Raw Water	Jefferson	High	Satisfactory	Jurisdictional
Nissen #2	Broomfield	High	Satisfactory	Jurisdictional
Niver Creek Detention	Adams	High	Satisfactory	Jurisdictional
Polly A. Deane*	Jefferson	High	Unsatisfactory	Jurisdictional
Quincy	Arapahoe	High	Satisfactory	Jurisdictional
Ralston	Jefferson	High	Satisfactory	Jurisdictional
Rueter Hess	Douglas	High	Satisfactory	Jurisdictional
Senac	Arapahoe	High	N/A	Jurisdictional
Siena	Broomfield	High	Satisfactory	Jurisdictional
Skeel	Denver	High	Conditionally satisfactory	Jurisdictional
Smith*	Jefferson	High	Unsatisfactory	Jurisdictional
Smith Irrigation	Adams	High	Satisfactory	Jurisdictional
South Platte Reservoir	Arapahoe	High	Satisfactory	Jurisdictional
South Tani Reservoir	Adams	High	Satisfactory	Jurisdictional
Spinney Mountain	Park	High	Satisfactory	Jurisdictional
Standley Lake	Jefferson	High	Satisfactory	Jurisdictional
Strontia Springs	Jefferson	High	Satisfactory	Jurisdictional
Tarryall*	Park	High	Unsatisfactory	Jurisdictional
Terminal	Broomfield	High	Satisfactory	Jurisdictional
Tucker Lake - North Dam	Jefferson	High	Satisfactory	Jurisdictional
Tucker Lake - South Dam	Jefferson	High	Satisfactory	Jurisdictional
Upper Beaver Brook	Clear Creek	High	Satisfactory	Jurisdictional
Upper Cabin Creek	Clear Creek	High	N/A	Jurisdictional
Upper Long Lake	Jefferson	High	Conditionally satisfactory	Jurisdictional
Wagon Tongue	Park	High	Satisfactory	Jurisdictional
Wellington	Jefferson	High	Conditionally satisfactory	Jurisdictional
Westerly Creek	Denver	High	Satisfactory	Jurisdictional

Dam Name	County	Class	Overall Condition	Type
Willow Springs #1	Jefferson	High	Conditionally satisfactory	Jurisdictional
Windsor*	Denver	High	Unsatisfactory	Jurisdictional
Woman Creek	Jefferson	High	Satisfactory	Jurisdictional
Woodland Park	El paso	High	Conditionally satisfactory	Jurisdictional
Arapahoe Lake	Arapahoe	Significant	Satisfactory	Jurisdictional
Aurora-Rampart	Douglas	Significant	Satisfactory	Jurisdictional
Badding	Adams	Significant	Conditionally satisfactory	Non-jurisdictional
Beers Sisters Lake	Jefferson	Significant	Satisfactory	Jurisdictional
Belisle	Arapahoe	Significant	N/A	Jurisdictional
Bergen West	Jefferson	Significant	Conditionally satisfactory	Jurisdictional
Bowles #1	Jefferson	Significant	Satisfactory	Jurisdictional
Burgess #1	Teller	Significant	Conditionally satisfactory	Jurisdictional
Carmody	Jefferson	Significant	Satisfactory	Jurisdictional
Derby	Adams	Significant	N/A	Jurisdictional
Devinney	Jefferson	Significant	Satisfactory	Jurisdictional
East Lake #2	Adams	Significant	Satisfactory	Jurisdictional
Georgetown Forebay	Clear Creek	Significant	Conditionally satisfactory	Jurisdictional
Green Lake	Clear Creek	Significant	Satisfactory	Non-jurisdictional
Harris Park Estates #1	Park	Significant	Satisfactory	Jurisdictional
Harwood S Storage Reservoir	Jefferson	Significant	Satisfactory	Jurisdictional
J. O. Hill	Douglas	Significant	Satisfactory	Jurisdictional
Joe Blake Water Treatment Plant Forebay	Douglas	Significant	Satisfactory	Jurisdictional
Johnston	Jefferson	Significant	Satisfactory	Jurisdictional
Kendrick	Jefferson	Significant	Satisfactory	Jurisdictional
La Dore	Adams	Significant	N/A	Jurisdictional
Lake George	Park	Significant	Satisfactory	Jurisdictional
Lockport	Jefferson	Significant	Satisfactory	Jurisdictional
Lower Urad	Clear Creek	Significant	Satisfactory	Jurisdictional
Meadowview	Jefferson	Significant	Satisfactory	Jurisdictional
Memorial Dam	Denver	Significant	Satisfactory	Jurisdictional
Million Dollar	Douglas	Significant	Conditionally satisfactory	Jurisdictional
Northglenn Terminal	Adams	Significant	Satisfactory	Jurisdictional
Pinery	Douglas	Significant	Satisfactory	Jurisdictional
Pomona No. 2 And No. 3	Jefferson	Significant	Conditionally satisfactory	Jurisdictional
Signal #1	Adams	Significant	Unsatisfactory	Jurisdictional

Dam Name	County	Class	Overall Condition	Type
Spring Gulch	Douglas	Significant/high	Conditionally satisfactory	Federal
St. Marys Lake	Clear Creek	Significant	Unsatisfactory	Non-jurisdictional
The Ranch	Adams	Significant	Satisfactory	Jurisdictional
Upper Tule Lake	Arapahoe	Significant	Satisfactory	Jurisdictional
Wadley #1	Adams	Significant	Satisfactory	Non-jurisdictional
Ward #5	Denver	Significant	Satisfactory	Non-jurisdictional
Wauconda	Douglas	Significant	Conditionally satisfactory	Jurisdictional
Webster Lake East	Adams	Significant	Satisfactory	Non-jurisdictional
Westminster Lake	Adams	Significant	Satisfactory	Jurisdictional

Source: Colorado DWR. (2024). Dam Safety. Provided to Adams County for hazard mitigation planning.

Figure 4-6 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.

Figure 4-5 Dams of Concern in Adams County

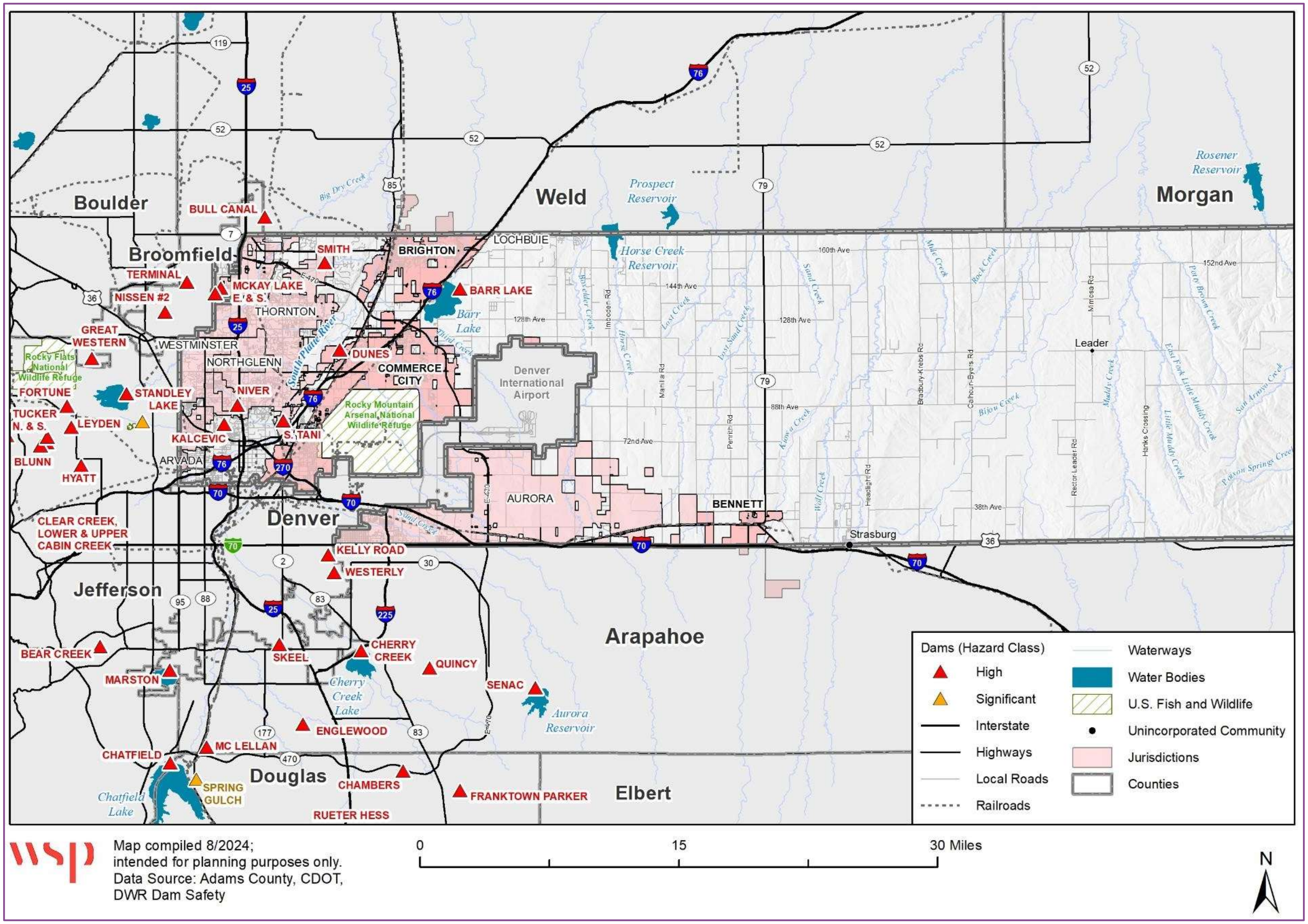
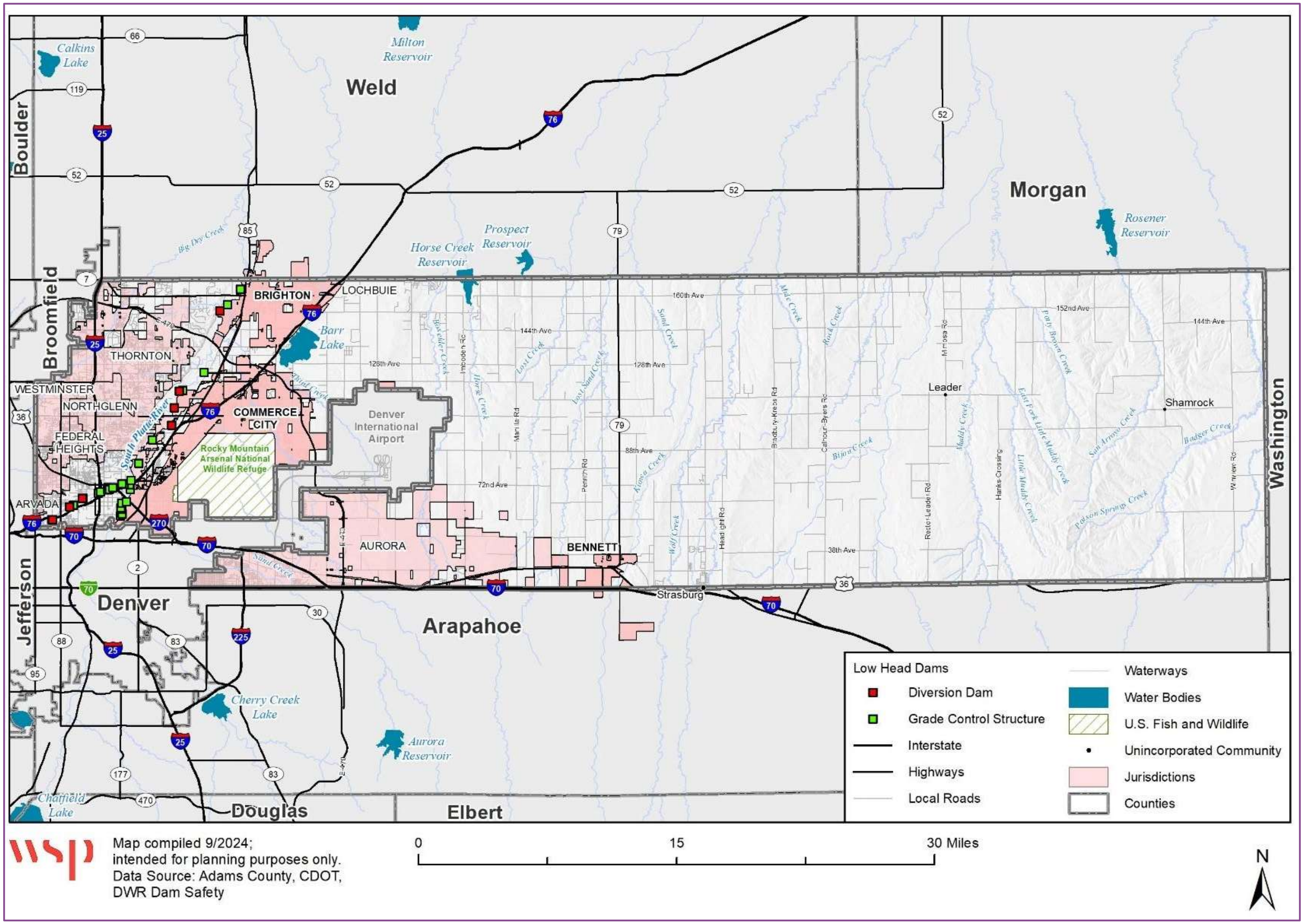


Figure 4-6 Adams County Low Head Dams



Dam incidents can range from a small, uncontrolled release to a catastrophic failure making this hazard a critical level of severity. The communities of Arvada, Aurora, Brighton, Commerce City, Lochbuie, Thornton, and Westminster are all exposed to the risk of dam inundation. The main affected areas would be those along the South Platte River, Clear Creek, Bijou Creek, Big Dry Creek, Beebe Draw, Sand Creek, Little Dry Creek, Toll Gate Creek, Westerly Creek, and smaller portions of other waterways in the western portion of Adams County such as Second and Third Creeks.

Dams as far west as the Clear Lake Dam and the Upper and Lower Cabin Creek Dams in Clear Creek County have the potential to affect Adams County based on the inundation mapping available. If one of the more upstream dams were to fail and cause flooding along Clear Creek, it would potentially overload others downstream, leading to compound overflow and hence additional inundation from other structures until reaching the planning area.

Mapping of potential dam inundation areas are located in Appendix H: Dam Inundation Data, which is not available for public release.

4.4.3 Previous Occurrences

September 12, 2013 – Record-shattering rain in the Denver metro area led to a dam breach at Rocky Mountain Arsenal National Wildlife Refuge as shown in Figure 4-7. The release damaged a road and wastewater pipe, but no one was injured.

Figure 4-7 Dam Breach at Rocky Mountain Arsenal National Wildlife Refuge, September 12th, 2013

Source: The Denver Post, 2013

January 3, 1996 - The Standley Lake Dam had a non-failure incident in 1996, due to wind waves on the Standley Lake reservoir along Big Dry Creek. While this dam is located in Jefferson County, its proximity to Adams County and present-day inundation mapping makes it possible that inundation took place within the planning area (NPDP 2019).

April 15, 1994 - The Leyden Dam, located in Jefferson County northeast of the Blunn as well as the Tucker Lake North and South Dams had a non-failure incident on April 15, 1994. This incident took place due to inadequate dam spillway capacity, though no additional details are available. While the dam is not within Adams County boundaries, based on present-day inundation mapping, it is possible that flooding occurred within the planning area (NPDP 2019).

4.4.4 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.

4.4.5 Probability of Future Occurrence

Unlikely — meaning there is a low chance of occurrence in the next year, though this is a mere estimation of potential occurrence based on the presence of significant and high hazard dams. Because dam failure is a human-caused hazard, it is difficult to accurately predict when or how a dam will fail and cause inundation downstream. Using the methodology adopted for natural hazards in this plan, only two past events near the planning area represents an occasional probability of future occurrence in Adams County.

4.4.6 Magnitude/Severity

Critical—Failure of a significant or high hazard dam could lead to multiple deaths; property destroyed and severely damaged; and/or interruption of essential facilities and services for more than 72 hours.

Water released by a failed dam generates tremendous energy and can cause a flood that is catastrophic to life and property located in the inundation area (downstream). The largest three dams in terms of maximum storage in or upstream of Adams County are: the Chatfield Dam in Douglas County along the South Platte River (with a capacity of 355,000 acre-feet); the Cherry Creek Dam in Arapahoe County along the Cherry Creek River (with a capacity of 134,470 acre-feet); and the Bear Creek Dam in Jefferson County, along Bear Creek (with a capacity of 75,000 acre-feet).

Based on the data available and the mapping provided in Figure 4-5, the worst possible dam-based flooding could take place in the western portions of Adams County, where structures such as the Chatfield and Cherry Creek Dams could affect large areas in major population centers in the county. A total of just over 156 square miles of potential land in the County would be at risk of dam inundation, based on best available mapping.

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

Four dams in Adams County were evaluated in this analysis: McKay Lake East, Niver Creek Detention, Barr Lake, and Kalcevic.

- McKay Lake East and Niver Creek Detention both received High outlet release rankings, indicating significant downstream consequences in the event of outlet failure or misoperation.
- Barr Lake and Kalcevic were rated Moderate, with less critical, but still notable, flood release potential.

This analysis provides an additional layer of risk insight beyond traditional hazard classifications. While all four 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 4-15, below, shows the outlet release rankings for four high hazard dams in Adams County, based on a 2020 analysis conducted by DWR. The table includes maximum outlet release capacities, composite impact rankings, and the corresponding outlet release tier (High or Moderate), which reflect the relative severity of downstream flood impacts in the event of dam failure or uncontrolled discharge.

Table 4-15 Outlet Release Impact Rankings for High Hazard Dams in Adams County

County	Dam Name	Outlet Description	Max Outlet Release Capacity (cfs)	Composite Ranking	Outlet Release Ranking
Adams	McKay Lake - east	2.5' CONC. ENC. STEEL	175	56	High
Adams	Niver Creek Detention	Outlet/Principal Spillway; 36" RCP	95	92	High
Adams	Barr Lake	Neres Canal Outlet: 2-48" diameter steel Speer Canal Outlet: 2-48" diameter steel	1,568	149	Moderate
Adams	Kalcevic	ungated 18" CIP with flow limiting plate, flow restricted to 5 cfs	5	172	Moderate

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

4.4.7 *Vulnerability*

A dam incident can range from a small, uncontrolled release to a catastrophic failure. Vulnerability to dam failures is confined to the areas and populations subject to inundation downstream of the structure. Secondary losses could include loss of the multi-use functions of the dam itself and associated revenues that accompany those functions, as well as damage to roads, utilities, and other infrastructure. GIS analysis was carried out using dam inundation extents from the DWR Dam Safety Program as well as the Adams County parcel data (from the Assessor’s Office), and the critical facility/infrastructure inventory. In this process, asset data was overlaid with the dam inundation layers to arrive at total units or facilities at risk.

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, to include earthquake, flooding, landslides, severe weather, tornadoes/high wind, and wildfire, as well as human caused hazards such as human conflict or cyber-attacks. Any of these hazards have the potential to damage a dam, potentially triggering a dam failure and a 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 4-16 shows dams in Adams County located in areas at risk of other hazards. There are twelve dams located in FEMA 1% annual chance floodplains, and one in the 0.2% floodplain. Twenty-nine are in areas at high or moderate risk of expansive soils. Six are located in Wildfire Urban Interface (WUI) areas at moderate or greater risk. There are no dams located within 150m of a highway or rail line or within 1000’ of an RMP hazmat facility.

Additionally, all dams in Adams County should be considered at risk of damage from earthquakes. 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 4-16 Adams County Dams At Risk To Other Hazards

Hazard Class	1% Flood	0.2% Flood	Exp. Soil High Risk	Exp. Soil Mod Risk	WUI Highest	WUI High	WUI Mod	Hazmat
High	2	0	0	4	0	0	0	0
Significant	0	0	0	6	1	0	0	0
Low	10	1	2	17	2	1	2	0
Total	**12**	**1**	**2**	**27**	**3**	**1**	**2**	**0**

Source: Adams, Arapahoe, and Weld County Assessor Data 2024, DWR Dam Safety, WSP GIS Analysis

People

People located underneath or downstream of a dam are at risk of a dam failure, though the level of risk can be tempered by topography, amount of water in the reservoir/dam, and time of day of the breach. Injuries and fatalities can occur from debris, bodily injury, and drowning. Once a dam has breached, standing water presents all the same hazards to people as floodwater from other sources. People in the inundation area may need to be evacuated, cared for, and possibly permanently relocated. Injuries and even fatalities are possible.

As shown in Table 4-17, there are 59,376 Adams County residents living in areas at risk of dam inundation.

Property

Analysis of dam inundation extents intersecting with parcel data reveals that 16,916 improved parcels and 23,328 buildings are potentially exposed to dam-related flooding within the County. The total estimated exposure value is $21.3 billion, combining improvement and content values based on FEMA Hazus methodology. Approximately 12.2% of buildings countywide fall within a mapped dam failure inundation zone, representing over 59,000 residents.

The largest exposures by jurisdiction are found in:

- Aurora, with more than 5,200 buildings and $4.5 billion in estimated value exposed, affecting over 14,000 people
- Brighton, with over 6,100 buildings, $4.4 billion in value, and nearly 15,500 people at risk

- Unincorporated Adams County, which has 4,500 buildings and over $5.3 billion in exposure, with 10,200 residents at risk

Other cities with notable exposure include Westminster, Thornton, and Commerce City, each with over $1.7 billion in potential losses. Smaller jurisdictions like Lochbuie and Arvada also show concentrated risk in commercial and industrial zones.

Exposure also varies by property type, with residential parcels making up the majority of buildings and people at risk, while commercial and industrial properties contribute heavily to the overall value at risk. In cities like Brighton and Aurora, industrial and commercial zones show significant concentrations of exposure.

Dam-Specific Exposure Patterns

Table 4-18 provides a dam-by-dam summary of exposure. The following dams pose the greatest overall risk based on total property value and number of buildings intersecting with their inundation zones:

- Cherry Creek Dam and Smith Irrigation Dam each impact nearly 10,000 buildings and over 23,000 to 30,000 residents, with asset values over $5.7 to 7 billion
- Chatfield Dam and Senac (Franktown Parker system) each affect over 10,000 people, with property values exceeding $2–5 billion
- Quincy, Ralston, and Standley Lake each effect between 2,000 to 3,000 buildings, with over $1 billion in exposed value
- Niver Creek Detention, McKay Lake, East, and Bear Creek all show mid-sized but important risk concentrations, with hundreds of buildings exposed in each case

Several federal and state-owned dams located outside Adams County have inundation areas extending into the county, notably Cherry Creek, Chatfield, and Bear Creek. These dams account for some of the largest individual risk footprints due to the dense urban areas affected downstream. Table 4-17 below, shows risk to all dam inundation hazards.

Table 4-17 Adams County Parcel at Risk to Dam Inundation

Jurisdiction	Property Type	Improved Parcel Count	Building Count	Improved Value	Estimated Content Value	Total Value	Buildings At Risk %	Population At Risk
Arvada	Commercial	21	22	$42,904,938	$42,904,938	$85,809,876	28.9%	0
Arvada	Exempt	2	2	$2,651,333	$2,651,333	$5,302,666	13.3%	0
Arvada	Industrial	8	13	$26,542,386	$39,813,579	$66,355,965	100.0%	0
Arvada	Residential	1	1	$389,000	$194,500	$583,500	0.1%	3
Arvada	**Total**	**32**	**38**	**$72,487,657**	**$85,564,350**	**$158,052,007**	**3.0%**	**3**
Aurora	Agricultural	1	5	$729,270	$729,270	$1,458,540	35.7%	0
Aurora	Commercial	308	461	$966,054,217	$966,054,217	$1,932,108,434	45.2%	0
Aurora	Exempt	29	42	$110,021,381	$110,021,381	$220,042,762	8.6%	0
Aurora	Industrial	23	42	$127,963,266	$191,944,899	$319,908,165	33.6%	0
Aurora	Residential	2,676	4,664	$1,355,710,252	$677,855,126	$2,033,565,378	29.5%	14,497
Aurora	**Total**	**3,037**	**5,214**	**$2,560,478,386**	**$1,946,604,893**	**$4,507,083,279**	**29.8%**	**14,497**
Brighton	Agricultural	3	4	$1,537,803	$1,537,803	$3,075,606	12.9%	0
Brighton	Commercial	422	512	$580,726,516	$580,726,516	$1,161,453,032	75.2%	0
Brighton	Exempt	102	335	$245,553,723	$245,553,723	$491,107,446	62.5%	0
Brighton	Industrial	23	33	$60,669,218	$91,003,827	$151,673,045	94.3%	0
Brighton	Residential	4,319	5,230	$1,747,396,847	$873,698,424	$2,621,095,271	37.5%	15,440
Brighton	**Total**	**4,869**	**6,114**	**$2,635,884,107**	**$1,792,520,293**	**$4,428,404,400**	**40.2%**	**15,440**
Commerce City	Commercial	302	456	$502,554,030	$502,554,030	$1,005,108,060	38.3%	0
Commerce City	Exempt	34	95	$138,870,656	$138,870,656	$277,741,312	15.0%	0
Commerce City	Industrial	78	265	$182,884,026	$274,326,039	$457,210,065	65.3%	0
Commerce City	Residential	1,560	1,868	$615,968,659	$307,984,330	$923,952,989	8.4%	5,458
Commerce City	**Total**	**1,974**	**2,684**	**$1,440,277,371**	**$1,223,735,055**	**$2,664,012,426**	**11.0%**	**5,458**
Lochbuie	Agricultural	1	1	$473,384	$473,384	$946,768	100.0%	0
Lochbuie	Commercial	1	1	$1,270,136	$1,270,136	$2,540,272	100.0%	0

Jurisdiction	Property Type	Improved Parcel Count	Building Count	Improved Value	Estimated Content Value	Total Value	Buildings At Risk %	Population At Risk
Lochbuie	**Total**	**2**	**2**	**$1,743,520**	**$1,743,520**	**$3,487,040**	**1.3%**	**0**
Thornton	Agricultural	1	1	$148,793	$148,793	$297,586	8.3%	0
Thornton	Commercial	24	24	$36,864,973	$36,864,973	$73,729,946	2.2%	0
Thornton	Exempt	15	27	$127,256,585	$127,256,585	$254,513,170	3.5%	0
Thornton	Residential	1,947	2,174	$940,424,425	$470,212,213	$1,410,636,638	4.7%	6,731
Thornton	**Total**	**1,987**	**2,226**	**$1,104,694,776**	**$634,482,564**	**$1,739,177,340**	**4.6%**	**6,731**
Westminster	Agricultural	1	1	$14,285	$14,285	$28,570	50.0%	0
Westminster	Commercial	39	64	$97,275,843	$97,275,843	$194,551,686	8.7%	0
Westminster	Exempt	22	39	$295,839,006	$295,839,006	$591,678,012	6.2%	0
Westminster	Residential	2,038	2,405	$1,155,198,317	$577,599,159	$1,732,797,476	9.9%	7,025
Westminster	**Total**	**2,100**	**2,509**	**$1,548,327,451**	**$970,728,293**	**$2,519,055,744**	**9.7%**	**7,025**
Unincorporated	Agricultural	68	128	$29,558,786	$29,558,786	$59,117,572	5.9%	0
Unincorporated	Commercial	429	844	$797,651,201	$797,651,201	$1,595,302,402	38.6%	0
Unincorporated	Exempt	59	105	$962,909,579	$962,909,579	$1,925,819,158	16.4%	0
Unincorporated	Industrial	63	102	$179,864,996	$269,797,494	$449,662,490	56.7%	0
Unincorporated	Residential	2,296	3,362	$852,477,045	$426,238,523	$1,278,715,568	10.3%	10,223
Unincorporated	**Total**	**2,915**	**4,541**	**$2,822,461,607**	**$2,486,155,583**	**$5,308,617,190**	**12.0%**	**10,223**
--	**Grand Total**	**16,916**	**23,328**	**$12,186,354,875**	**$9,141,534,549**	**$21,327,889,424**	**12.2%**	**59,376**

Source: Adams, Arapahoe, and Weld County Assessor Data 2024, DWR Dam Safety, WSP GIS Analysis

Table 4-18 summarizes dam inundation risk by dam.

Table 4-18 Dam Inundation Risk by Dam

Dam Name	Improved Parcel Count	Building Count	Improved Value	Buildings At Risk %	Population At Risk
Barr Lake	22	47	$260,570,409	0.02%	24
Bear Creek	2,026	2,594	$1,210,856,299	1.4%	6,279
Blunn	281	1,073	$505,060,067	0.6%	1,751
Chatfield	8,621	10,457	$5,248,607,294	5.5%	26,287
Cherry Creek	11,117	14,504	$7,068,490,363	7.6%	30,370
Clear Creek	172	864	$364,679,946	0.5%	1,456
Dunes	27	64	$11,921,651	0.03%	155
Englewood	60	69	$66,611,193	0.04%	73
Fortune	73	77	$96,253,284	0.04%	193
Great Western	44	45	$28,429,896	0.02%	132
Kalcevic	18	19	$7,831,233	0.01%	52
Kelly Road Detention	257	638	$323,603,196	0.3%	1,921
Leyden	30	109	$49,886,921	0.1%	216
Lower Cabin Creek	172	864	$364,679,946	0.5%	1,456
Marston Lake - North	43	73	$90,056,933	0.04%	0
McKay Lake - East	260	346	$660,704,478	0.2%	483
McLellan	13	14	$31,560,300	0.01%	3
Niver Creek Detention	551	869	$256,940,274	0.5%	2,472
Pomona #2 & #3*	4	4	$1,446,682	0.002%	3
Quincy	1,703	2,938	$2,232,311,117	1.5%	7,310
Ralston	1,215	2,357	$1,150,916,779	1.2%	4,724
Senac	3493	4914	2873617497	2.6%	11,755
Smith Irrigation	6,993	9,835	$5,750,279,582	5.1%	23,519
South Tani Reservoir	10	16	$4,813,047	0.01%	40
Spring Gulch*	228	258	$82,224,232	0.1%	594
Standley Lake	2,350	2,766	$1,438,130,406	1.4%	7,862
Tucker Lake - North	1	1	$4,535	0.001%	0
Tucker Lake - South	1	1	$4,535	0.001%	0
Upper Cabin Creek	172	864	$364,679,946	0.5%	1,456
Westerly Creek	323	890	$409,724,033	0.5%	2,322

Source: Adams, Arapahoe, and Weld County Assessor Data 2024, DWR Dam Safety, WSP GIS Analysis

Critical Facilities and Infrastructure

A total dam failure can cause catastrophic impacts to areas downstream of the water body, including critical facilities and infrastructure. Any critical asset located under the dam in an inundation area would be susceptible to the impacts of a dam failure. Of particular risk would be roads and bridges that could be vulnerable to washouts, further complicating response and recovery by cutting off impacted areas.

A total of 481 critical facilities in Adams County are located within mapped dam failure inundation zones. These include public safety infrastructure, utilities, medical facilities, and transportation systems that support both local residents and regional economic activity.

Highest Risk Categories

- Transportation systems are the most frequently affected, with 213 facilities at risk. These include major road crossings, bridges, and corridors essential to emergency access, freight movement, and business continuity.
- Hazardous materials sites are the second-most impacted, with 143 facilities located in dam inundation zones. This poses compounding risks if flooding were to breach containment systems or disrupt industrial operations.
- Safety and security facilities (e.g., police, fire, emergency operations) represent 52 critical points of exposure, which could reduce response capacity following a dam-related incident.
- Water systems (28 sites) and energy facilities (10 sites) round out the lifeline infrastructure at risk, with potential cascading impacts on utility service restoration following flooding.

Jurisdictional Breakdown

- Unincorporated Adams County contains the largest number of at-risk facilities (193 total), including 104 transportation assets, and 45 hazardous material sites, many of which are tied to agricultural, industrial, or rural road networks.
- Commerce City follows with 91 facilities, driven by dense concentrations of industrial operations and major transportation corridors, such as rail crossings and I-270/I-76 interchanges.
- Aurora (76 facilities) and Brighton (44 facilities) also show significant exposure across multiple categories.
- Other jurisdictions with elevated risk to transportation and public safety systems include Thornton (44 facilities) and Westminster (31 facilities).

Transportation Infrastructure at Risk

Transportation assets, particularly bridges, collector roads, and interchanges, are disproportionately exposed across jurisdictions. This includes both local routes and regional connectors that enable freight, workforce mobility, and tourism into the County. Notable exposure exists along:

- The I-76 corridor and US-85, especially near Commerce City and Brighton
- Arterial routes like 120th Avenue, Tower Road, and E-470
- Rail infrastructure and surface crossings in Commerce City, Aurora, and Unincorporated areas

Disruption to these routes could significantly impair emergency response, supply chain logistics, and evacuation capabilities during a dam-related flood event.

Dam-Specific Observations

Several dams intersect with particularly high concentrations of critical infrastructure:

- Cherry Creek, Chatfield, and Ralston each impact 40-plus critical facilities, including water, safety, and transportation systems across multiple jurisdictions.

- Senac, part of the Franktown Parker system, places 55 facilities at risk, spanning Commerce City, Thornton, and Unincorporated areas.
- Blunn, Bear Creek, and Clear Lake affect both urban and unincorporated areas, with particular overlap in water and transportation sectors.
- Standley Lake and McKay Lake East impact key systems in Thornton and Westminster, including energy, transportation, and water infrastructure.

Table 4-19 below shows critical facilities at risk to overall dam inundation by jurisdiction.

Table 4-19 Critical Facilities at Risk to Overall Dam Inundation Hazards by Jurisdiction

Jurisdiction	Communications	Energy	Food, Hydration, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Water Systems	Total Count
Arvada	-	-	-	1	-	-	1	-	**2**
Aurora	-	1	1	39	2	6	24	3	**76**
Bennett	-	-	-	-	-	-	-	-	**0**
Brighton	-	-	5	7	2	14	13	3	**44**
Commerce City	-	4	3	37	1	12	26	8	**91**
Federal Heights	-	-	-	-	-	-	-	-	**0**
Northglenn	-	-	-	-	-	-	-	-	**0**
Thornton	-	-	-	11	1	2	27	3	**44**
Westminster	-	-	-	3	1	6	18	3	**31**
Unincorporated	18	5	1	45	-	12	104	8	**193**
Total	**18**	**10**	**10**	**143**	**7**	**52**	**213**	**28**	**481**

Source: DWR Dam Safety, Adams County, CDOT, Denver Water, EPA, HIFLD, National Bridge Inventory, CERC, WSP Analysis

Table 4-20 through Table 4-25 show jurisdictional risk to damn inundation by dam name and count:

Table 4-20 Arvada Facilities at Risk to Dam Inundation by Dam Name and Count

Dam Name	Communications	Energy	Food, Hydration, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Water Systems	Total Count
Blunn	-	-	-	1	-	-	-	-	**1**
Clear Lake	-	-	-	1	-	-	-	-	**1**
Leyden	-	-	-	1	-	-	-	-	**1**
Lower Cabin Creek	-	-	-	1	-	-	-	-	**1**
Ralston	-	-	-	1	-	-	1	-	**2**

Dam Name	Communications	Energy	Food, Hydration, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Water Systems	Total Count
Upper Cabin Creek	-	-	-	1	-	-	-	-	**1**
Total	**0**	**0**	**0**	**6**	**0**	**0**	**1**	**0**	**7**

Source: DWR Dam Safety, Adams County, CDOT, Denver Water, EPA, HIFLD, National Bridge Inventory, CERC, WSP Analysis

Table 4-21 Brighton Facilities at Risk to Dam Inundation by Dam Name and Count

Dam Name	Communications	Energy	Food, Hydration, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Water Systems	Total Count
Bear Creek	-	-	-	-	-	-	3	3	**6**
Chatfield	-	-	5	7	2	12	13	3	**42**
Cherry Creek	-	-	5	7	2	14	13	3	**44**
Quincy	-	-	-	-	-	-	1	2	**3**
Ralston	-	-	-	-	-	-	1	2	**3**
South Tani Reservoir	-	-	-	-	-	-	1	-	**1**
Spring Gulch	-	-	-	-	-	-	1	2	**3**
Total	**0**	**0**	**10**	**14**	**4**	**26**	**33**	**16**	**112**

Source: DWR Dam Safety, Adams County, CDOT, Denver Water, EPA, HIFLD, National Bridge Inventory, CERC, WSP Analysis

Table 4-22 Commerce City Facilities at Risk to Dam Inundation by Dam Name and Count

Dam Name	Communications	Energy	Food, Hydration, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Water Systems	Total Count
Bear Creek	-	1	1	5	-	2	9	8	**26**
Blunn	-	-	-	-	-	-	-	2	**2**
Chatfield	-	3	2	16	-	7	17	8	**53**
Cherry Creek	-	4	3	34	1	11	23	8	**84**
Englewood	-	-	-	-	-	-	1	-	**1**
Kelly Road Detention	-	-	-	1	-	-	3	-	**4**
Marston Lake - North Dam	-	1	-	1	-	-	2	4	**8**

Dam Name	Communications	Energy	Food, Hydration, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Water Systems	Total Count
Mc Lellan	-	-	-	-	-	-	1	1	**2**
Quincy	-	1	-	9	-	-	8	4	**22**
Ralston	-	-	-	-	-	-	2	2	**4**
Senac	-	3	1	25	1	4	15	6	**55**
Spring Gulch	-	1	-	-	-	-	1	5	**7**
Westerly Creek	-	1	-	4	-	-	8	3	**16**
Total	**0**	**15**	**7**	**95**	**2**	**24**	**90**	**51**	**284**

Source: DWR Dam Safety, Adams County, CDOT, Denver Water, EPA, HIFLD, National Bridge Inventory, CERC, WSP Analysis

Table 4-23 Thornton Facilities at Risk to Dam Inundation by Dam Name and Count

Dam Name	Communications	Energy	Food, Hydration, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Water Systems	Total Count
Bear Creek	-	-	-	3	-	1	3	2	**9**
Blunn	-	-	-	1	-	-	1	-	**2**
Bull Canal (Main Reservoir)	-	-	-	-	-	-	1	-	**1**
Chatfield	-	-	-	4	-	2	4	2	**12**
Cherry Creek	-	-	-	4	-	2	5	2	**13**
Englewood	-	-	-	1	-	-	1	-	**2**
Great Western	-	-	-	2	-	-	12	-	**14**
Kelly Road Detention	-	-	-	-	-	-	1	-	**1**
Mc Lellan	-	-	-	-	-	-	1	1	**2**
Mckay Lake - East	-	-	-	4	-	-	14	-	**18**
Niver Creek Detention	-	-	-	-	1	-	4	-	**5**
Quincy	-	-	-	3	-	-	3	1	**7**
Ralston	-	-	-	3	-	1	1	2	**7**
Senac	-	-	-	-	-	-	1	1	**2**
Smith Irrigation	-	-	-	-	-	-	-	1	**1**
South Tani Reservoir	-	-	-	1	-	-	1	1	**3**

Dam Name	Communications	Energy	Food, Hydration, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Water Systems	Total Count
Spring Gulch	-	-	-	1	-	-	1	1	**3**
Standley Lake	-	-	-	7	-	-	18	-	**25**
Westerly Creek	-	-	-	2	-	-	1	1	**4**
Total	**0**	**0**	**0**	**36**	**1**	**6**	**73**	**16**	**131**

Source: DWR Dam Safety, Adams County, CDOT, Denver Water, EPA, HIFLD, National Bridge Inventory, CERC, WSP Analysis

Table 4-24 Westminster Facilities at Risk to Dam Inundation by Dam Name and Count

Dam Name	Communications	Energy	Food, Hydration, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Water Systems	Total Count
Fortune	-	-	-	1	-	1	8	1	**11**
Great Western	-	-	-	-	-	1	6	-	**7**
Mckay Lake - East	-	-	-	-	-	-	1	1	**2**
Mckay Lake - South	-	-	-	-	-	-	1	-	**1**
Nissen #2	-	-	-	-	-	-	2	1	**3**
Pomona No. 2 And No. 3	-	-	-	-	-	-	6	-	**6**
Standley Lake	-	-	-	3	1	6	11	2	**23**
Terminal Storage Reservoir	-	-	-	-	-	-	2	-	**2**
Total	**0**	**0**	**0**	**4**	**1**	**8**	**38**	**5**	**55**

Source: DWR Dam Safety, Adams County, CDOT, Denver Water, EPA, HIFLD, National Bridge Inventory, CERC, WSP Analysis

Table 4-25 Unincorporated Facilities at Risk to Dam Inundation by Dam Name and Count

Dam Name	Communications	Energy	Food, Hydration, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Water Systems	Total Count
Barr Lake	-	-	-	1	-	-	4	1	**6**
Bear Creek	3	3	1	17	-	9	24	4	**61**
Blunn	5	-	-	9	-	-	43	2	**59**
Chatfield	9	5	1	25	-	10	42	4	**96**

Dam Name	Communications	Energy	Food, Hydration, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Water Systems	Total Count
Cherry Creek	10	4	1	31	-	12	55	4	**117**
Clear Lake	6	-	-	9	-	-	40	1	**56**
Englewood	1	1	-	7	-	-	6	-	**15**
Great Western	1	-	-	1	-	-	1	-	**3**
Hyatt	-	-	-	-	-	-	1	-	**1**
Kalcevic	-	-	-	-	-	-	-	1	**1**
Kelly Road Detention	-	-	-	-	-	-	3	-	**3**
Leyden	2	-	-	2	-	-	13	-	**17**
Lower Cabin Creek	6	-	-	9	-	-	40	1	**56**
Marston Lake - North Dam	1	1	-	8	-	-	-	1	**11**
Mc Lellan	-	1	-	2	-	-	1	-	**4**
Mckay Lake - East	1	-	-	1	-	-	1	-	**3**
Niver Creek Detention	-	-	-	-	-	1	4	-	**5**
Pomona No. 2 And No. 3	-	-	-	1	-	-	-	-	**1**
Quincy	1	-	-	3	-	2	17	3	**26**
Ralston	11	-	1	15	-	7	68	4	**106**
Senac	-	-	-	2	-	-	5	3	**10**
Smith Irrigation	-	-	-	-	-	-	4	-	**4**
South Tani Reservoir	-	-	-	-	-	-	7	-	**7**
Spring Gulch	1	1	-	6	-	-	12	1	**21**
Standley Lake	1	-	-	6	-	-	1	-	**8**
Tucker Lake - North Dam	-	-	-	-	-	-	4	-	**4**
Tucker Lake - South Dam	-	-	-	-	-	-	4	-	**4**
Upper Cabin Creek	6	-	-	9	-	-	40	1	**56**
Westerly Creek	-	-	-	-	-	-	5	-	**5**
Total	65	16	4	164	0	41	445	31	**766**

Source: DWR Dam Safety, Adams County, CDOT, Denver Water, EPA, HIFLD, National Bridge Inventory, CERC, WSP Analysis

Economy

Extensive and long-lasting economic impacts could result from a major dam failure or inundation event, including the long-term loss of water in a reservoir, which may be critical for potable water needs 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.

Historic, Cultural, and Natural Resources

A GIS analysis of historic properties and resources based on dam inundation mapping was also conducted, using the historic asset inventory discussed under Section 4.2 Asset Summary of this document. Based on the available data, it was found that three properties are located in dam inundation areas in Adams County, as shown in Table 4-26.

Table 4-26 Historic Properties in Dam Inundation Extents in Adams County

Jurisdiction	Historic Place Name	Historic Source Date	Data Source
Brighton	Brighton High School	1/23/1998	National Register of Historic Places
	Adams County Courthouse	10/4/2006	National Register of Historic Places
Commerce City	64th/Colorado Fast Track Station	Unknown	Adams County GIS

Source: Adams County GIS, National Register of Historic Places, Colorado Dam Safety Program, WSP Analysis

In addition, there are many other natural resources potentially exposed to dam inundation based on best available mapping. For example, 18 known parks, trails, and open spaces were found to be in inundation areas in Adams County, and are listed below:

- 55th & Lowell Trailhead
- Big Dry Creek Greenway (Coday) Open Space
- Brighton Road Trailhead
- Clear Creek Bottomlands Open Space
- E-470 Open Space
- Elaine T Valente Open Space
- Engineer Lake Open Space
- Jim Baker Reservoir Open Space
- Kalcevic Gulch
- Little Dry Creek Lake
- Lowell Ponds Open Space
- Pelican Ponds Open Space
- Regional Park
- Riverdale Bluffs Open Space
- Siegrist Lake
- Steele Street Park
- TRI Property/Big Dry Buffer Open Space
- Twin Lakes Park

Development Patterns

Of the 14,478 structures built since 2018 (see Section 4.2.2), 409 are located in mapped dam inundation areas. This represents a 1.8% increase in exposure to dam incidents. The increased risk is greatest in Commerce City and Thornton, which had 154 and 140 new buildings respectively constructed in dam inundation areas. Increased outreach in these areas might help ensure residents and businesses in dam inundation areas understand the risks involved and can prepare accordingly.

Flooding due to a water related dam failure event is likely to exceed the Special Flood Hazard Areas (SFHAs), regulated through local floodplain ordinances and usually mapped by FEMA's National Flood Hazard Layer (NFHL) dataset. The County and jurisdictions should consider a dam failure hazard when permitting development downstream of the high hazard and significant hazard dams, in particular. Regular monitoring of dams, exercising and updating of EAPs, and rapid response to problems when detected at dams are ways to mitigate the potential impacts of these rare but potentially catastrophic events, especially given the compounding effect one dam failure could have on additional downstream structures based on the local built environment and growing populations.

4.4.8 Risk Summary

- The overall significance of dam failure and incident hazards is assessed as Medium for Adams County due to the scale of exposure and number of critical systems located in inundation zones.

- A total of 126 High and Significant Hazard dams have been identified as potentially impacting Adams County:
    - 20 dams are physically located within the County
    - 106 additional dams are located outside the County but have mapped inundation areas that intersect Adams County
    - Of these, 85 are classified as High Hazard, and 41 as Significant Hazard
    - No Low Hazard dams were included in this dataset

- Over 16,900 improved parcels and 23,300 buildings are located within dam failure inundation zones, with a combined exposed value of $21.3 billion and nearly 59,400 people potentially at risk.
- A total of 481 critical facilities are located in dam inundation zones. The most impacted categories include:
    - Transportation infrastructure (213 assets)
    - Hazardous materials facilities (143 assets)
    - Water, safety, and energy systems essential for emergency response and continuity of operations
- Transportation corridors affected by dam failure could severely disrupt emergency access, freight movement, and economic activity, particularly in areas like Commerce City, Unincorporated Adams County, 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.

4.5 Drought/Extreme Heat

Table 4-27 Drought Risk Summary

Jurisdiction	Geographic Location	Probability of Future Occurrence	Magnitude/ Severity	Overall Significance
Adams County	Extensive	Likely	Negligible	Medium
Bennett	Extensive	Likely	Critical	High
Brighton	Extensive	Likely	Negligible	Medium
Commerce City	Limited	Occasional	Negligible	Low
Denver Water	Extensive	Likely	Negligible	Medium

4.5.1 Hazard Description

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

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

Drought is a slow-onset hazard, generally defined by a long-term deficiency in precipitation resulting in water shortages causing adverse impacts on vegetation, animals, and/or people. Droughts occur gradually, which often makes it difficult to define when a drought begins and ends. Per the National Drought Mitigation Center, there are four basic approaches to defining a drought based on its effects:

- **Meteorological drought** is based on the degree and duration of dryness, usually defined by a period of below average precipitation.
- **Agricultural drought** links dryness to agricultural impacts and occurs when there is an inadequate water supply to meet the needs of crops, livestock, and other agricultural operations. It is measured by precipitation shortages, differences between actual and potential evapotranspiration, soil water deficits, reduced groundwater or reservoir levels, and other factors. Agricultural drought is dependent on the variable needs of different crops during different stages of development.
- **Hydrological drought** concerns deficiencies in surface and subsurface water supplies and is typically defined on a watershed scale. It is generally measured as streamflow, snowpack, and as lake, reservoir, and groundwater levels. Measuring drought with this approach may result in a slower recognition of drought conditions compared to meteorological and agricultural drought because the impacts of precipitation deficiencies can take a while to be seen in the hydrologic system.
- **Socioeconomic drought** is associated with the supply and demand of water or other related goods. It occurs when a drought impacts health, well-being, and quality of life, or when a drought starts to have an adverse economic impact on a region.

Each of the above definitions of drought can be measured on different scales and scopes and by a variety of metrics, such as precipitation, soil moisture, streamflow, and surface water and groundwater levels. Additionally, each definition can provide a different point of view or understanding of drought severity and impacts. Several unique indices have been developed to describe drought and measure its severity.

It's important to understand that each of these indices measures drought as it occurs but does not predict future drought conditions.

The **Palmer Drought Severity Index** (PDSI) devised in 1965, was the first drought indicator to assess moisture status comprehensively. The PDSI uses temperature and precipitation data to calculate water supply and demand, incorporates soil moisture, and is considered most effective for unirrigated cropland. It primarily reflects long-term drought and has been used extensively to initiate drought relief.

The **Standardized Precipitation Index** (SPI), like the PDSI, index is negative for drought, and positive for wet conditions. However, the SPI is a probability index that considers only precipitation.

The **U.S. Drought Monitor** provides a summary of drought conditions across the United States and Puerto Rico. Often described as a blend of art and science, the Drought Monitor map is updated weekly by combining a variety of data-based drought indices and indicators as well as local expert input into a single composite drought indicator.

Colorado has a Drought Mitigation and Response Plan that encompasses drought monitoring, assessment, response, and mitigation statewide. Additionally, the Colorado Water Conservation Board (CWCB) maintains a Drought Response page that encompasses the above definitions of drought and supports both local and state drought planning as well as water supply planning. The CWCB also provides a Drought Planning Toolbox designed to assist with planning and responding to drought.

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's useful to consider the 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.

Heat conditions are a product of ambient air temperature and relative humidity. Humidity increases the feeling of heat as measured by heat index. The Heat Index Chart in Figure 4-8 shows how ambient temperature and relative humidity impact the relative intensity of heat conditions. The shaded zone above 105°F corresponds to a heat index that may cause increasingly severe heat disorders with continued exposure and/or physical activity.

Figure 4-8 Heat Index Chart

Temperature (°F)

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

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution   Extreme Caution   Danger   Extreme Danger

Source: National Weather Service (NWS) http://www.nws.noaa.gov/os/heat/heat_index.shtml
Note: Exposure to direct sun can increase Heat Index values by as much as 15°F.

Although lower relative humidity contributes to a lower overall heat index, excessively dry and hot weather can also be dangerous. These conditions can cause dust storms and low visibility and can contribute to more severe drought as well as dangerous fire conditions.

4.5.2 Location

Drought is regional in nature and can occur anywhere in Adams County, and its impacts can vary depending on the extent and duration of the event. While the entire county is susceptible to drought, certain areas may be more vulnerable due to the nature of their land use and economic reliance on water-intensive activities. The central and eastern portions of Adams County, where much of the agricultural production is concentrated, are especially at risk. These areas support crop cultivation and livestock farming, both of which are highly dependent on consistent water supplies. Prolonged drought conditions can severely limit the availability of water for irrigation and livestock, leading to reduced crop yields, lower livestock productivity, and significant financial losses for farmers.

Areas most vulnerable to extreme heat conditions are mapped in Figure 4-9. Note that heat island data is only available for the southwest corner of Adams County.

Figure 4-9 Western Adams Urban Heat Island Vulnerability

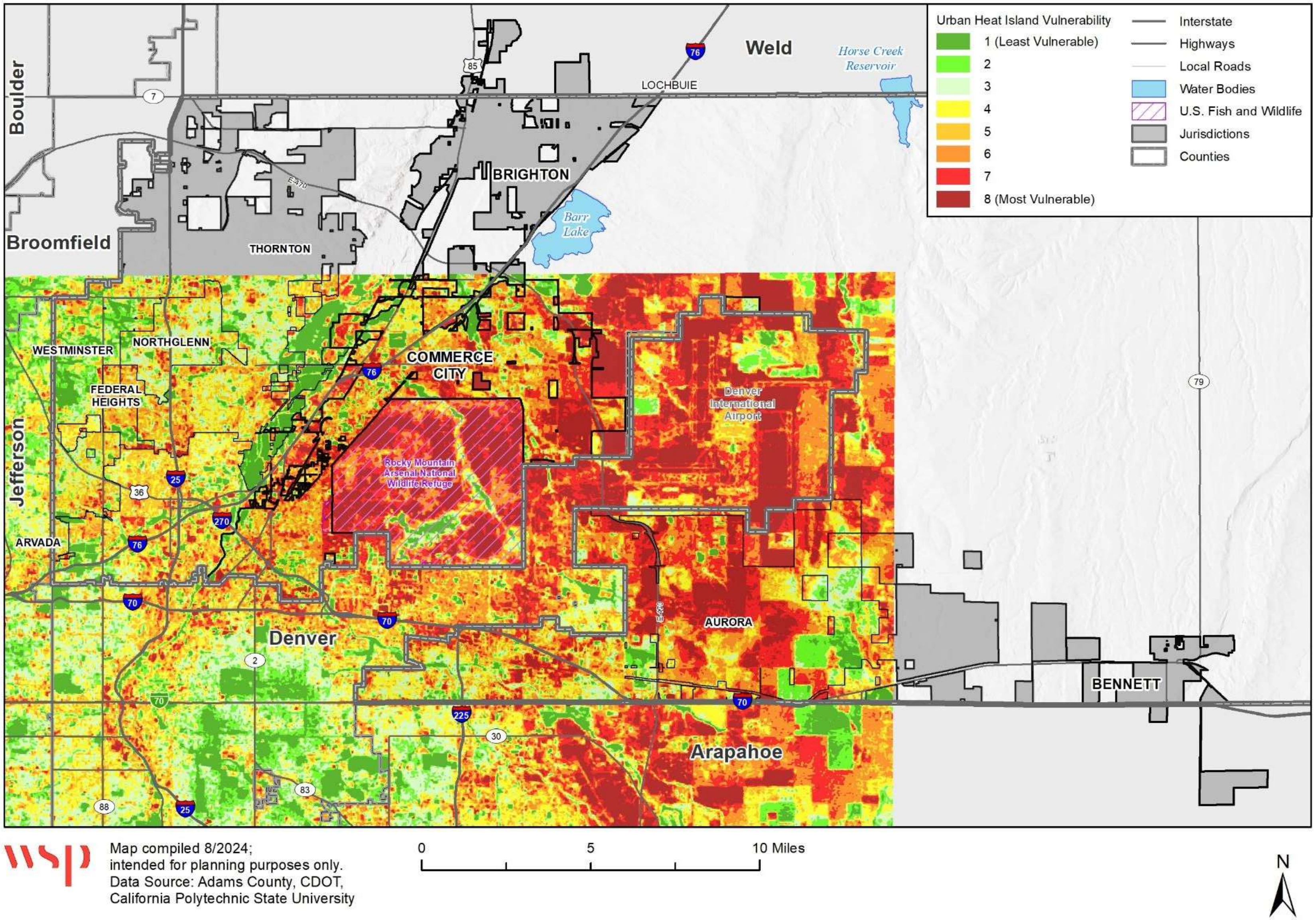
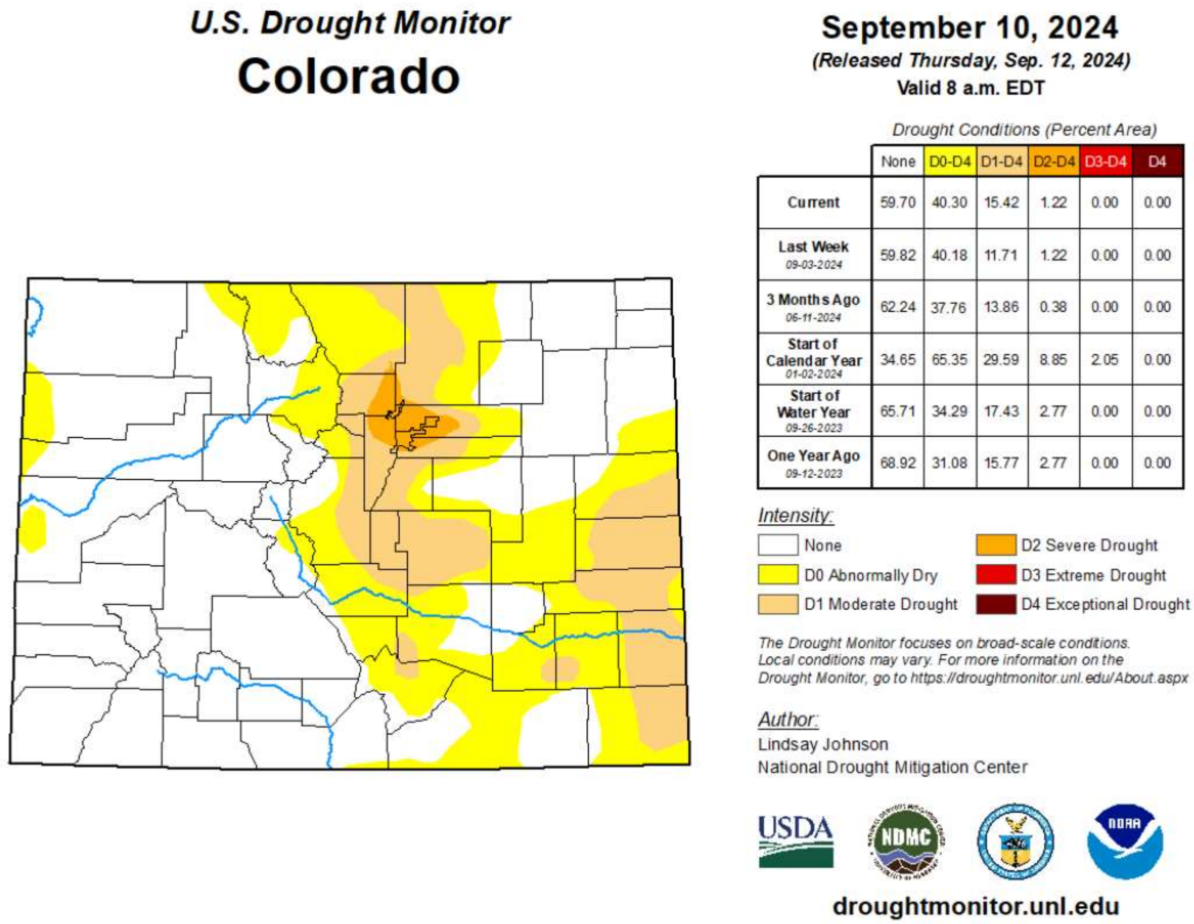


Figure 4-10 shows the U.S. Drought Monitor for Colorado as of September 12, 2024, illustrating the regional nature of drought.

Figure 4-10 U.S. Drought Monitor



Source: US Drought Monitor

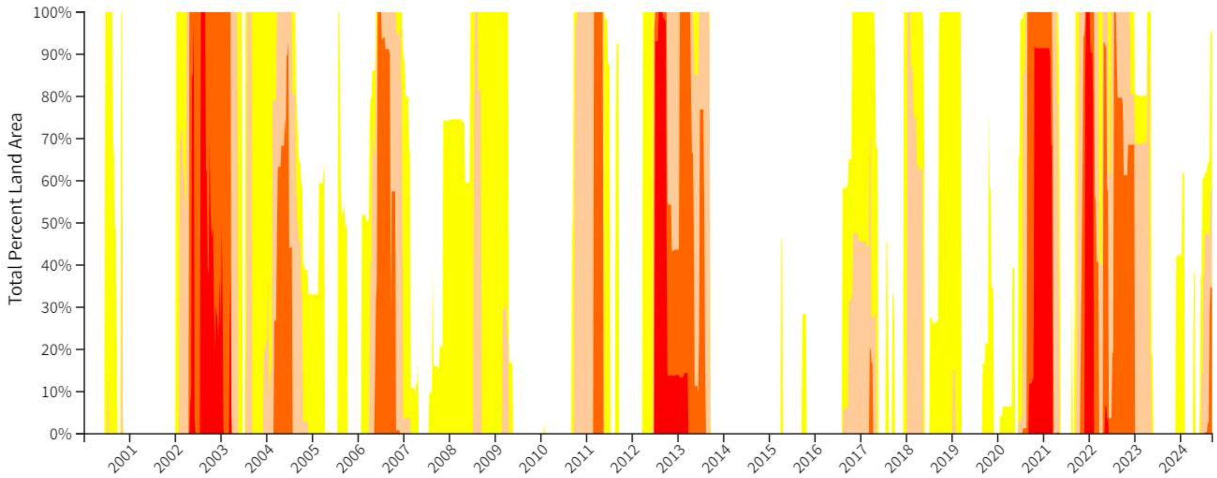
Extreme heat is also regional in nature; however, urbanized areas can experience pockets of heightened temperatures where surfaces such as pavement and roofs become hotter than the air temperatures, a phenomenon known as the urban heat island effect. These hot surfaces also retain heat, causing high 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).

4.5.3 Past Occurrences

As reported in Table 4-2, Adams County has received nine USDA disaster declarations and one State disaster declaration due to drought.

The U.S. Drought Monitor maintains weekly records of drought by county. Per these records, during the period from January 2000 through September 2024, all or portions of Adams County spent 803 weeks in some level of drought, defined as Abnormally Dry (D0) or worse conditions. Figure 4-11 illustrates the severity and duration of drought conditions during this time, using the same color coding for each category of drought intensity as shown in Figure 4-10 above. This period includes 280 weeks of Severe Drought (D2) or worse and 114 weeks reaching Extreme Drought (D3). The most significant droughts on record during this period were between 2002-2003 and 2012-2013. During the 2012 drought, over 90% of the County was in Extreme Drought for 13 consecutive weeks.

Figure 4-11 U.S. Drought Monitor Drought Intensity in Adams County, 2000-2024



Source: U.S. Drought Monitor

Another source of data on previous drought occurrences is the National Drought Mitigation Center (NDMC), located at the University of Nebraska in Lincoln, which provides a clearinghouse for information on the effects of drought based on reports from media, observers, impact records, and other sources.

According to the NDMC's Drought Impact Reporter, during the period from January 2000 through December 2023, 855 drought impacts were recorded for the State of Colorado, of which 40 were reported to affect Adams County. Table 4-28 summarizes the number of impacts reported by category and the years impacts were reported for each category, where available. Note that the Drought Impact Reporter assigns multiple categories to each impact.

Table 4-28 NDMC Drought Impact Reporter, 1999-2023

Impact Category	Count of Impacts	Years Reported
Agriculture	5	2023, 2020, 2012, 2011
Business & Industry	4	2018, 2010, 2003
Fire	1	2002, 2003
Plants & Wildlife	9	2023, 2020, 2018, 2013, 2012, 2011, 2010
Relief, Response & Restrictions	6	2023, 2018, 2013, 2012
Tourism & Recreation	7	2020, 2018, 2013, 2012, 2003
Water Supply & Quality	8	2023, 2020, 2018, 2013, 2012

Source: National Drought Mitigation Center Drought Impact Reporter (https://droughtreporter.unl.edu/map/)

The United States Department of Agriculture (USDA) Risk Management Agency (RMA) maintains a database of all crop insurance claims across the country by location and cause of loss. This data helps to quantify the economic impact of drought on agriculture. In Adams County, crop insurance claims as a result of drought are shown below between 2007 and 2024. In total, over 647,000 acres were affected and over $48 million in losses were claimed.

Table 4-29 Crop Insurance Claims Paid Due to Drought, 2007-2022

Year	Determined Acres	Indemnity Amount
2007	12,817.84	$503,968
2008	49,030.74	$3,529,313
2009	10,719.54	$723,133

Year	Determined Acres	Indemnity Amount
2010	7,246.27	$216,685
2011	33,110.91	$2,822,833
2012	40,674.43	$2,776,135
2013	72,746.57	$4,950,549
2015	660.03	$20,521
2016	2,390.87	$96,626
2017	31,607.78	$1,519,018
2018	71,199.82	$3,486,813
2019	13,587.64	$437,838
2020	80,614.55	$5,286,440
2021	99,333.09	$6,694,219
2022	121,623.54	$15,560,844
Total	**647,363.62**	**$48,624,935**

Source: USDA RMA

The USDA also tracks disaster declarations issued due to drought as part of its disaster assistance programs. Adams County has been listed in nine USDA Disaster Declarations resulting from drought since 2012, detailed in Table 4-30.

Table 4-30 USDA Secretarial Disaster Declarations for Adams County due to Drought, 2012-2024

Designation Number	Begin Date	Crop Year	Description
S3260	1/1/2012	2012	Drought, excessive heat, high winds
S3456	11/1/2012	2013	Drought-FAST TRACK
S3548	5/1/2013	2013	Drought-FAST TRACK
S4145	11/15/2016	2017	Drought-FAST TRACK
S4742	7/21/2020	2020	Drought- FAST TRACK
S4798	9/11/2020	2020	Drought- FAST TRACK
S4848	10/16/2020	2020	Drought- FAST TRACK
S4917	11/1/2020	2021	Drought- FAST TRACK
S5147	11/1/2021	2022	Drought- FAST TRACK
S5372	11/1/2022	2023	Drought- FAST TRACK
S5737	8/6/2024	2024	Drought- FAST TRACK
S5755	9/3/2024	2024	Drought- FAST TRACK
S5765	9/9/2024	2024	Drought- FAST TRACK
S5792	9/30/2024	2024	Drought- FAST TRACK
S5817	10/15/2024	2024	Drought- FAST TRACK

Source: USDA Farm Service Agency2024

NOAA’s National Centers for Environmental Information (NCEI) reports five heat events between 1999 and 2023. There are no deaths, injuries, property damages, or crop damages recorded in association with these events. Event narratives from NCEI are detailed below:

- **June-July 2000:** July 15th marked the end of a near record hot streak for the Denver area. The maximum high temperature at Denver International Airport equaled or exceeded the 90 degree mark for 17 consecutive days, from June 29th-July 15th; one day short of tying the all-time record. The record of 18 consecutive days was set in two different years, July 1st-July 18th, 1874, and July 6th-23rd, 1901.

- **September 2000:** On September 17th, the record high temperature of 95 at Denver International Airport broke three record extremes. The afternoon maximum temperature broke the previous record for the day of 94 set in 1895. It also marked the warmest it has been so late in the month of September, which incidentally was set the previous day. Also, the afternoon high temperature marked the 61st time during the year that the 90 degree mark was met or exceeded, breaking the record of 60 days set in 1994 and then tied the previous day.
- **June 2012:** June 2012 was the hottest June in Denver since weather records began back in 1872. There was a total of seventeen 90°F days in the month of June. The highlight of the month was a stretch of five consecutive 100°F days from the 22nd to the 26th. This was only the third time in Denver weather history in which this happened. Two of the high temperatures during the stretch peaked at 105°F, which set the all-time record for the month of June and also tied the all-time maximum temperature for Denver.

Additionally, the National Weather Service Denver/Boulder Forecast Office maintains summer heat records from 1872 to the present. Per these records, during 10 of the last 20 years the Denver area experienced 2 or more days per year with high temperatures at or above 100°F. The greatest number of 100+ degree days occurred in 2012, with 13 days, followed by 2005 with 7 days.

4.5.4 Probability of Future Occurrence

The State of Colorado has a frequent history of droughts and extreme heat due to its semi-arid climate. This means that the likelihood of future occurrences for Adams County drought exposure is **likely**.

Historical drought occurrence and intensity data reported by the U.S. Drought Monitor indicates that over the period from January 2000 through September 2024 Adams County experienced 280 weeks of Severe Drought or worse conditions. If future occurrences continue to follow this trend, Adams County is likely to experience severe drought conditions in any given week. Short duration droughts are likely, but longer periods of intense drought are less common.

Based on NCEI records of five heat-related events over the 24-year period from 1999 through 2023, Adams County has at least a 20% annual chance of experiencing heat-related hazards.

Drought and extreme heat probability may increase in the future due to climate change, discussed in greater detail below.

4.5.5 Magnitude/Severity

The potential magnitude/severity in Adams County is rated as **negligible**. Drought severity can be defined in terms of intensity using the U.S. Drought Monitor scale. The U.S. Drought Monitor Scale measures drought episodes with input from the Palmer Drought Severity Index, the Standardized Precipitation Index, the Keetch-Byram Drought Index, soil moisture indicators, and other inputs as well as information on how drought is affecting people. Figure 4-12 details the classifications used by the U.S. Drought Monitor. A category of D2 (severe) or higher on the U.S. Drought Monitor Scale can likely result in crop or pasture losses, water shortages, and the need to institute water restrictions. Adams County can and has experienced droughts up to category D4.

Figure 4-12 U.S. Drought Monitor Classifications

			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: US Drought Monitor

The National Weather Service Heat Index (HI) Program provides a measure of the extent of typical health impacts of exposure to heat, summarized in Table 4-31, and Adams County is susceptible to all of these HI ranges. During these conditions, the human body has difficulties cooling through the normal method of the evaporation of perspiration, and health risks rise.

Table 4-31 Typical Health Impacts of Extreme Heat by Heat Index

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

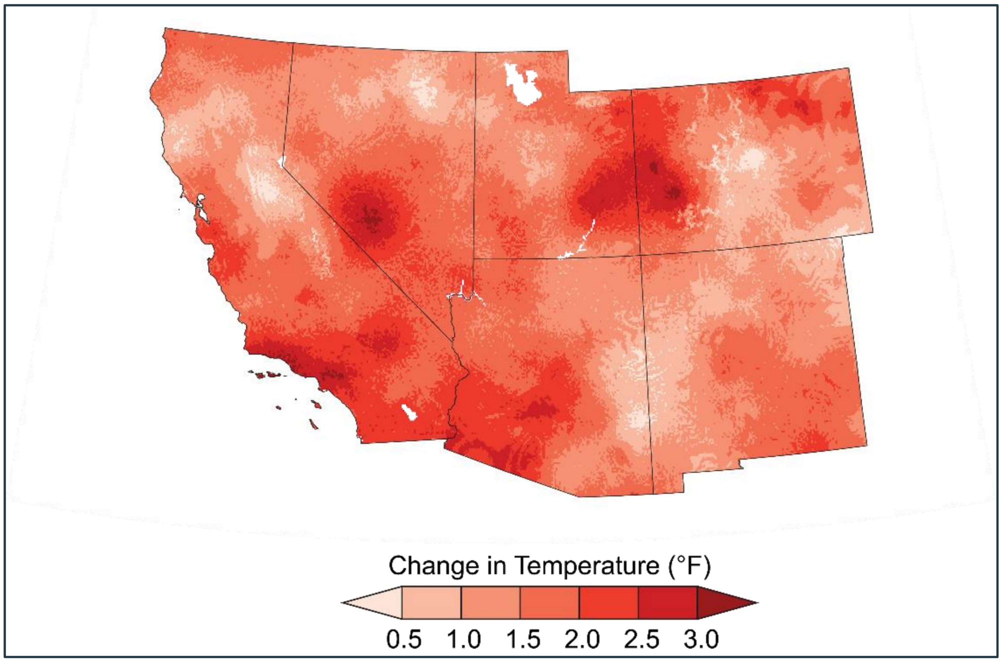
Source: National Weather Service Heat Index Program, www.weather.gov/os/heat/index.shtml

4.5.6 Climate Change Considerations

Current climate change projections indicate that drought conditions are expected to become increasingly frequent and severe in the future due to several interconnected factors. One significant driver is the rise in global temperatures, which leads to higher rates of evaporation and evapotranspiration. As temperatures climb, most moisture is lost from soil, plants, and eater bodies, exacerbating the dryness in already acid regions. This effect is especially pronounced in states like Colorado, where semi-arid conditions make the landscape highly sensitive to temperatures fluctuations. Reduced snowpack from less snowfall and earlier spring melt is also an exacerbating factor.

Research cited in the Fourth National Climate Assessment indicates that average temperatures have already increased across the Southwest and will likely continue to rise. Figure 4-13 shows the difference between the 1986-2016 average temperature and the 1901-1960 average temperature. This trend toward higher temperatures is expected to continue and would cause more frequent and severe droughts in the Southwest as well as drier future conditions and an increased risk of megadroughts—dry periods lasting 10 years or more. Additionally, current models project decreases in snowpack, less snow and more rain, shorter snowfall seasons, and earlier runoff, all of which may increase the probability of future water shortages (Gonzalez et al., 2018).

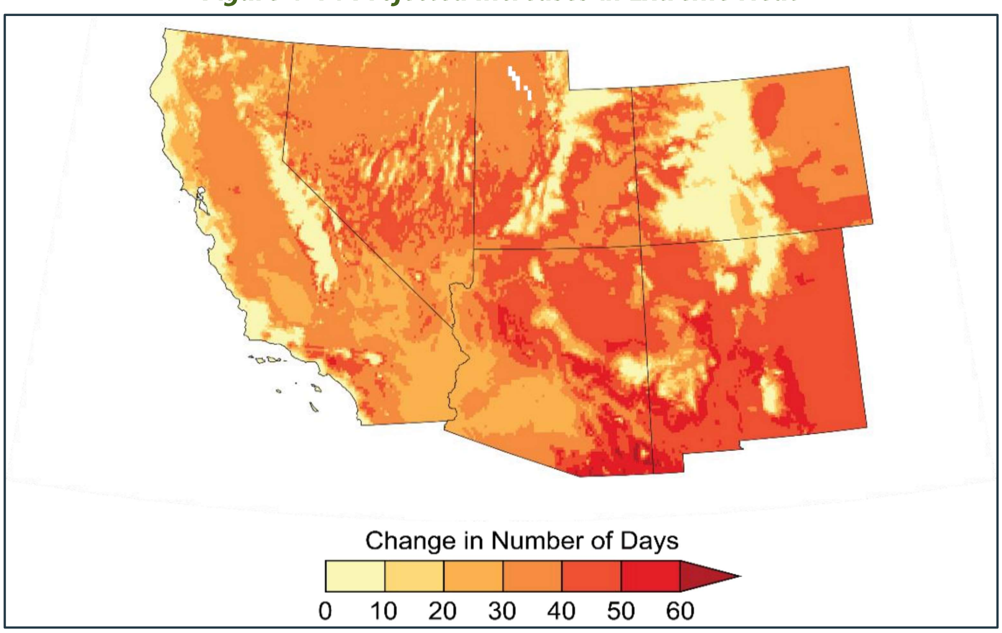
Figure 4-13 Change in Average Temperature Across the Southwest, 1901-1960 to 1986-2016



Source: Fourth National Climate Assessment

In conjunction with rising average temperatures and their projected impact on drought, extreme heat is also expected to increase in frequency. Figure 4-14 shows projected increases in extreme heat as an increase in the number of days per year when the temperature exceeds 90°F by the period 2036-2065 compared to the period 1976-2005. Under the high emissions scenario, the number of days of extreme heat would increase in Adams County by 30 to 50 days.

Figure 4-14 Projected Increases in Extreme Heat



Source: Fourth National Climate Assessment

4.5.7 Vulnerability

People

Drought can affect people's physical and mental health. For those economically dependent on a reliable water supply, drought may cause anxiety or depression about economic losses, reduced incomes, and other employment impacts. Adams County has a large agricultural sector that is particularly vulnerable to these impacts. Drought may also cause health problems due to poorer water quality from lower water levels.

Though physical injury or death are not typically a result of drought, extreme heat can cause heat stroke or even fatality. The most dangerous place to be during an extreme heat incident is in a permanent home, with little or no air conditioning. Those most vulnerable to heat-related illnesses include people 65 years of age and older, young children, people with chronic health problems such as heart disease, people who are obese, people who are socially isolated, and people who are on certain medications. Low-income families are less likely to have air conditioning and may be disproportionately impacted by rising water costs. Even young and healthy individuals are susceptible if they participate in strenuous physical activities during hot weather or are not acclimated to hot weather.

Those who are homeless and are limited in their ability to seek shelter from extreme temperatures are also more vulnerable to extreme heat. Their limited access to shelter often leaves them exposed to hazardous outdoor conditions for prolonged periods. Without adequate means to escape high temperatures, they face heightened risk of heat-related illnesses such as heat exhaustion and heat stroke. Factors such as lack of air-conditioned spaces, hydration, and proper medical care compound their vulnerability.

Aside from direct health impacts, in extreme cases of drought, conflicts may arise over water shortages. People may be forced to pay more for water, food, and utilities affected by increased water costs.

Property

Direct structural damage from drought is rare, though it can happen. Drought can affect soil shrinking and swelling cycles and can result in cracked foundations and infrastructure damage. Droughts can also have significant impacts on landscapes, which could cause a financial burden to property owners. There is a greater threat of structure damage in a drought-affected area due to secondary hazards because of drought. For example, drought increases the risk of wildfire and may create water shortages that inhibit adequate fire response. Additionally, heavy rains after prolonged drought conditions can result in significant flooding, which can damage property.

Critical Facilities and Infrastructure

Buildings and infrastructure are not vulnerable to direct impact from drought; however, critical systems related to water supply can be affected. Decreased water levels in dams can cause structural damage. Low water levels can also affect wildfire protection capability.

Secondary hazards exacerbated by drought, such as wildfire and expansive soils, can cause direct structural impacts on critical facilities and infrastructure.

Prolonged heat exposure can have devastating impacts on infrastructure. Prolonged high heat exposure increases the potential of pavement deterioration, as well as railroad warping or buckling. High heat also puts a strain on energy systems and consumption, as air conditioners are run at a higher rate and for longer. Extreme heat can also reduce transmission capacity over electric systems.

Economy

Economic impact will be largely associated with industries that depend on water for their business. The main industry to experience the effects of drought and extreme heat is agriculture. Agriculture accounts for only a small percentage of employment in Adams County. But over 94% of all land use. Farmers may face crop losses or increased livestock costs. Businesses that depend on farming may experience secondary impacts. Drought can exacerbate the risk of wildfires and flooding, increase the cost of municipal water usage, and deplete water resources used for recreation.

The Risk Management Agency (RMA) reported that from 2007-2024 $48,624,935 was lost in indemnity payments to farmers due to lost crops from drought and $1,043,324.12 lost in indemnity payments from heat in Adams County.

Environmental and Cultural Resources

Drought can affect local wildlife by shrinking food supplies and damaging habitats. Sometimes this damage is only temporary, and other times it is irreversible. Wildlife may face increased disease rates due to limited access to food and water. Increased stress on endangered species could cause extinction. Reduced food supply can also drive wildlife into greater proximity with humans. Extreme heat can have similar direct health impacts on natural resources such as plants, wildlife, and livestock.

Drought and extreme heat conditions can also provide a substantial increase in wildfire risk. As plants and trees die from a lack of precipitation, increased insect infestations, and diseases—all of which are associated with drought—they become fuel for wildfire. Long periods of drought can result in more intense wildfires, which bring additional consequences for the economy, the environment, and society. Drought may also increase the likelihood of soil erosion by wind and water.

Development Patterns

Drought vulnerability in Adams County is likely to be significantly affected by future development trends. As the population grows and urban areas expand, the demand for water increases, straining the available water resources. This heightened public demand for water not only depletes water levels in reservoirs, rivers, and aquifers, but also exacerbates the region's susceptibility to drought. In periods of drought, when natural water supplies are already diminished, increased consumption for residential, agricultural, and industrial needs can lead to more severe water shortages. Since the previous plan update, as mentioned, there has been growth in population throughout the county. Urbanization leads to more pavement and buildings, which reduces natural groundwater recharge and increased surface runoff.

According to the State of Colorado's Drought Mitigation and Response Plan, the entire state, including Adams County, depends heavily on precipitation for its water supply with snowpack in the mountains playing a crucial role in replenishing reservoirs and rivers. Additionally, public water supply is or may soon become inadequate for much of Adams County and its incorporated areas, especially in the face of development plans and pressures (Adams County http://www.adcogov.org/news/h2-ohh%E2%80%A6, 2019). A 2011 gap analysis done for the Colorado Water Conservation Board, shown in Figure 4-15, indicates that water demand may surpass supply as soon as 2025 in the South Platte Basin and 2030 in the Metro Basin (CDM, 2011). As the gap between water supply and water demand shrinks, departures from normal hydrologic conditions may be felt more easily in Adams County. Water rights issues further complicate this matter.

Figure 4-15 Water Supply Gap Analysis

Municipal and Industrial Gap and Estimated Beginning Year for 100%, Inter basin Compact Committee (IBCC) Alternative Portfolio (Optimistic), and Status Quo Portfolio (Realistic) Scenarios

Basin/Area	Gap under 100% Scenario (AF)	Gap Begins	Gap when IPPs at IBCC Alternative Portfolio (Optimistic) Scenario (AF)	Gap Begins	Gap when IPPs at Status Quo Portfolio (Realistic) Scenario (AF)	Gap Begins
South Platte Basin	55,000	2040	110,000	2025	130,000	2025
Metro Basin	66,000	2045	130,000	2030	150,000	2030
Arkansas Basin	54,000	2040	64,000	2035	78,000	2035
Front Range [1]	150,000	2040	270,000	2030	320,000	2030
Colorado Basin	27,000	2040	33,000	2040	33,000	2040
Gunnison Basin	3,600	2045	5,200	2040	5,200	2040
Yampa - White Basin	36,000	2020	37,000	2020	37,000	2020
Southwest Basin	7,600	2040	12,000	2035	12,000	2035
Rio Grande Basin	2,800	2040	3,500	2040	3,500	2040
North Platte Basin	0	2055	0	2050	0	2050
Statewide	**250,000**	**2040**	**390,000**	**2030**	**450,000**	**2030**

1) Front Range includes South Platte Northern, Denver Metro, South Metro, Arkansas Urban Counties

Source: CWCB

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 Adams County from drought for each of the climate and population scenarios.

Table 4-32 Potential Future Economic Losses from Drought in Adams County

	Population Scenarios		
Climate Scenarios	**Low Growth (~1,200)**	**Medium Growth (~1,600)**	**High Growth (~2,000)**
Current Conditions	Total Damages: $11M Total Damages per person: $10	Total Damages: $11M Total Damages per person: $10	Total Damages: $11M Total Damages per person: $10
Moderately Warmer Climate by 2050	Total Damages: $11M Total Damages per person: $10	Total Damages: $11M Total Damages per person: $10	Total Damages: $11M Total Damages per person: $10
Severely Warmer Climate by 2050	Total Damages: $11M Total Damages per person: $10	Total Damages: $11M Total Damages per person: $10	Total Damages: $11M Total Damages per person: $10

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

4.5.8 Risk Summary

In summary, drought and extreme heat is considered to be medium significance for Adams Counties.

- Adams County spent 803 weeks in some level of drought, defined as Abnormally Dry (D0) or worse conditions, meaning the probability of future occurrence of drought is rated as **likely** throughout Adams County.
- Due to historic economic losses from drought and extreme heat, the magnitude of drought is ranked as **negligible**.

- Drought, like other climate hazards, occurs on a regional scale and can impact every county in the State; therefore, geographic extent is rated as **extensive**.
- Drought impacts to people include public health issues such as impaired drinking water quality, increased incidence of mosquito-borne illness, an increase in wildlife-human confrontations and respiratory complications because of declined air quality in times of drought.
- Most common impacts to property from drought are damage from secondary hazards caused by drought such as flooding and wildfire, however, a direct impact from drought is structural damage resulting from lack of moisture in the soil.
- Related hazards: Wildfire, Flooding, Severe Summer Weather

4.6 Earthquake

Table 4-33 Earthquake Risk Summary

Jurisdiction	Geographic Location	Probability of Future Occurrence	Magnitude/ Severity	Overall Significance
Adams County	Limited	Occasional	Limited	Low
Bennett	Limited	Occasional	Limited	Low
Brighton	Limited	Occasional	Limited	Low
Commerce City	Limited	Occasional	Limited	Low
Denver Water	Limited	Occasional	Limited	Low

4.6.1 Hazard Description

An earthquake is the motion or trembling of the ground produced by a sudden slip on a fault in the Earth's crust. Stress builds up and rocks slip suddenly, releasing energy in waves that travel through the earth’s crust and cause the shaking that is felt during an earthquake. Earthquake seismicity may stem from *triggered* events, meaning that the causes are natural reasons (e.g. tectonic movement, volcanism, ground instability issues such as natural landslides), or *induced* by human activity, such as mining-related explosions or blasting, collapse of mines and caverns, and potentially even extreme changes in aquifer depths attributed to over-pumping water. This source of seismicity has been documented in places like California, with groundwater depletion, and even here in Colorado, such as with pumping of fluid waste back in the 1960s. Specific to Adams County, induced seismicity has been the source of the largest earthquakes recorded in the County. More detail on this is provided in the Previous Occurrences section. .

Most earthquakes are caused by the release of stresses accumulated as a result of the rupture of rocks along opposing fault planes in the Earth’s outer crust. These fault planes are typically found along borders of the Earth's tectonic plates. These plate borders generally follow the outlines of the continents, with the North American plate following the continental border with the Pacific Ocean in the west but following the mid-Atlantic trench in the east. As earthquakes occurring in the mid-Atlantic trench usually pose little danger to humans, the greatest earthquake threat in North America is along the Pacific Coast. The areas of greatest tectonic instability occur at the perimeters of the slowly moving plates because these locations are subjected to the greatest strains from plates traveling in opposite directions and at different speeds.

Earthquakes can affect large areas of land, cause damage to property measured in the tens of billions of dollars, result in injury or death to hundreds of thousands of persons, and disrupt the social and economic functioning of the affected area. Negative impacts and losses incurred will also depend on secondary effects and hazards such as dam failure, wildfire, seiches, avalanche, and land subsidence. The severity of earthquakes is site-specific and influenced by proximity to the earthquake epicenter and soil type (including liquefaction potential), among other factors.

Liquefaction occurs when ground shaking causes the mechanical properties of some fine grained, saturated soils to liquefy and act as a fluid. It is the result of a sudden loss of soil strength due to a rapid increase in soil pore water pressures caused by ground shaking. In order for liquefaction to occur, three general geotechnical characteristics should be present: 1) ground water should be present within the potentially liquefiable zone, 2) the potentially liquefiable zone should be granular and meet a specific range in grain-size distribution, and 3) the potentially liquefiable zone should be of low relative density. If those criteria are present and strong ground motion occurs, then those soils could liquefy. Liquefaction that produces surface effects generally occurs in the upper 40 to 50 feet of the soil column, although the phenomenon can occur deeper than 100 feet. The duration of ground shaking is also an important factor in causing liquefaction to occur. The larger the earthquake magnitude, and the longer the duration of strong ground shaking, the greater the potential there is for liquefaction to occur.

4.6.2 Location

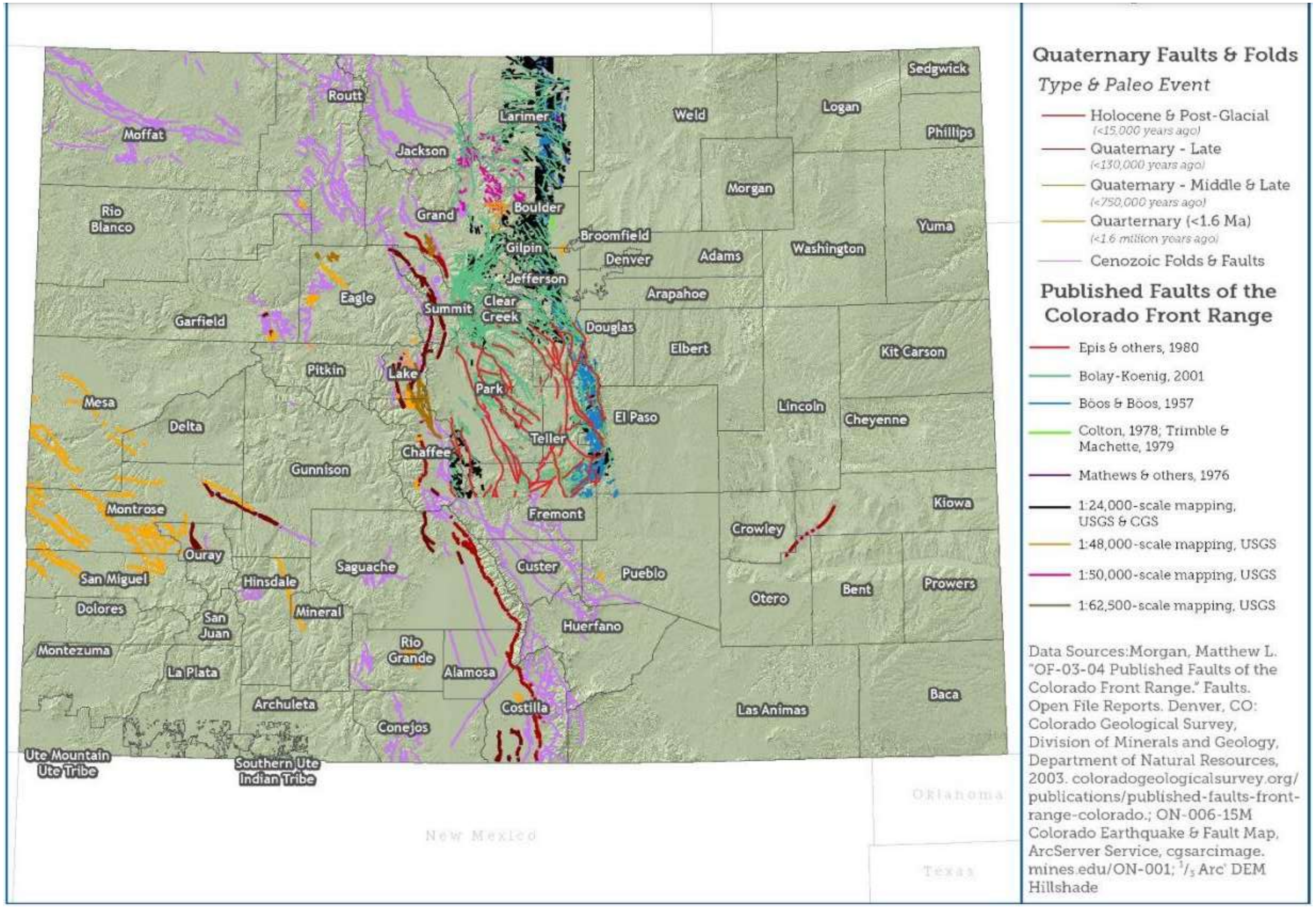
The geographic extent of this hazard in Adams County is considered **limited**. Faults with capacity for large magnitude seismic events are located in central and western Colorado, so the northeastern portion of the state, where Adams County is located, has lower earthquake activity potential. Thousands of faults have been mapped in Colorado, but scientists believe only about 90 of these faults are quaternary faults. Quaternary faults are those recognized to have moved in the past 1,600,000 or so years, during a portion of the quaternary geologic epoch (more details on faults and geologic periods in the following bullets). Peak ground acceleration is used to portray relative ground motion of seismic activity, and it represents the maximum ground acceleration which took place during an earthquake shaking event at the mapped location.

Faults are classified based on the geologic time frame of their latest suspected movement (in order of activity occurrence, with the most recent is listed first):

- H—Holocene (within past 15,000 years)
- LQ—Late Quaternary (15,000-130,000 years)
- MLQ—Middle to Late Quaternary (130,000 - 750,000 years)
- Q—Quaternary (approximately past 1.6-2 million years)
- LC—Late Cenozoic (approximately past 23.7 million years)

As portrayed in the map below, there are no quaternary faults located near or within Adams County. The closest such fault to Adams County is the Golden Fault, which is about 10 miles south-southwest of the county and crosses Interstate 70 in a north-south fashion. This fault is a west-dipping, high-angle, range-front thrust fault, and forms the east flank of the Front Range near the City of Golden in Jefferson County. It was last active around 23.03 million years ago. (USGS, 1998).

Figure 4-16 Earthquake Faults in Colorado



Source: State of Colorado Enhanced Hazard Mitigation Plan, 2023-2028

4.6.3 Past Occurrences

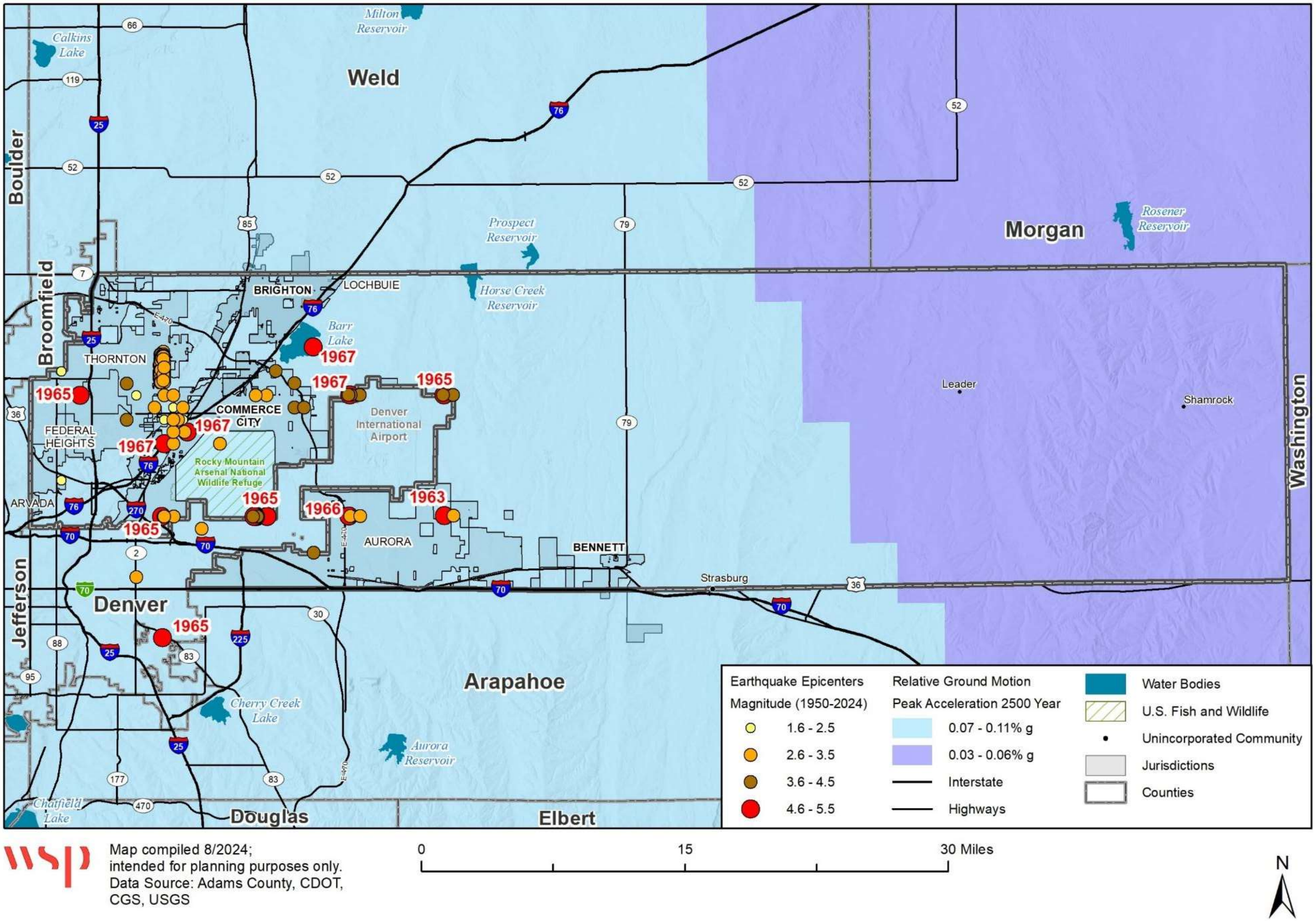
More than 500 earthquake tremors of magnitude 2.5 or higher have been recorded in Colorado since 1867. More earthquakes of magnitude 2.5 to 3 probably occurred during that time but were not recorded because of the sparse distribution of population and limited instrumental coverage in much of the state. For comparison, more than 20,500 similar-sized events have been recorded in California during the same period. However, high magnitude earthquakes have only occurred a few times in the last 150 years.

Adams County's earthquake history is unique in that most of its recent quakes have been triggered by human-caused activity. In the 1960s there was a U.S. Army Corps of Engineers project where injection of contaminated wastewater took place into the Precambrian crystalline bedrock underneath the Rocky Mountain Arsenal (now a wildlife refuge). This waste fluid matter pumping, which was drilled to a depth of over 3,600 meters, led to critical pressure buildup which in turn triggered seismic activity in the area shortly after. From April of 1962 until August of 1967 there were an estimated 1,500+ earthquakes recorded at the Bergen Park seismograph station. Five of these recorded earthquakes were greater than magnitude 4.8, and they are also the only recorded earthquakes in Adams County to exceed magnitude 4.8.

- 11/27/1967 (Magnitude 5.2)
- 8/9/1967 (Magnitude 5.3)
- 4/10/1967 (Magnitude 4.9)
- 1/5/1966 (Magnitude 5.0)
- 2/16/1965 (Magnitude 4.9)

In large part due to the Rocky Mountain Arsenal earthquakes, historical earthquake activity for Adams County is above the average occurrence in Colorado. Figure 4-17 below shows earthquake epicenters available from the Colorado Geological Survey (CGS), in and around Adams County. The most recent earthquakes in or around Adams County took place on November 8, 1989 and February 25, 1984; these were registered as 2.5 magnitude events.

Figure 4-17 Adams County Earthquake History



4.6.4 Climate Change Considerations

Climate change is not expected to have any impact on earthquakes.

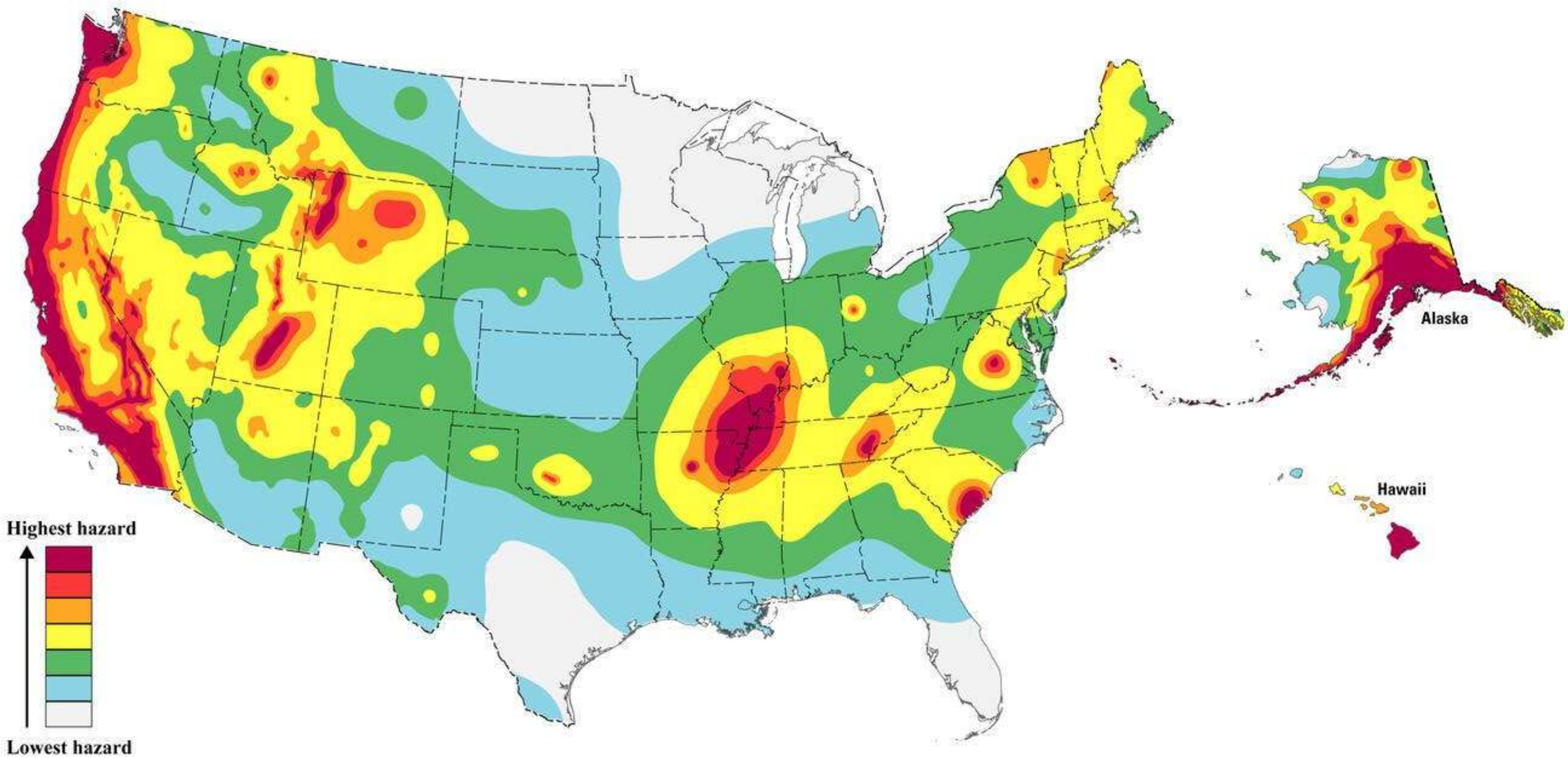
4.6.5 Probability of Future Occurrence

Future probability of this hazard is **occasional**. Based on all documented events since the year 1962, the probability of future occurrences of small magnitude earthquakes within Adams County is high, though larger and damaging event probability is rather low. The smaller magnitude events that are most likely to occur are unlikely to lead to damages or injuries or even be felt by the general public. A 5+ magnitude quake could be expected near or in Adams County once or twice per decade based on historic records.

Probabilistic ground motion maps are typically used to assess the magnitude and frequency of seismic events. These maps measure the probability of exceeding a certain ground motion, expressed as percent Peak Ground Acceleration (%PGA), over a specified period of years. Figure 4-18 also shows levels of horizontal shaking that have a 2% chance of being exceeded in a 50-year period. The blue shaded areas on western Adams County indicate the risk of shaking from an earthquake relates to the range of 0.07 to 0.11% G (gravitational force), with the eastern county portion falling in the lowest category of relative ground motion potential at 0.03-0.06% G. Overall, this means Adams County's risk based on the relative ground motion potential falls within the lower two ranges of recorded values.

Figure 4-18 below displays the 2023 update of the US National Seismic Hazard Model from USGS, displaying the same data described above on a national scale. As shown on the map, much of Adams County is located in the lower ends of the seismic hazard scale.

Figure 4-18 Long Term Probabilistic Seismic Hazard Map – 2023



Source: USGS

4.6.6 Magnitude/Severity

The potential magnitude/severity of earthquake hazards in Adams County is **limited**, based on the estimation of potential damages, mass fatalities, impacts to critical lifelines, and the impact to the county's government ability to provide service or respond to an event due to seismic activity/earthquakes.

Earthquakes are measured in terms of their magnitude and intensity, but other helpful characteristics used to describe and categorize them include the effects felt on people and property, and the frequency of occurrence. *Magnitude* is measured using the Richter Scale, an open-ended logarithmic scale that describes the energy release of an earthquake through a measure of shock wave amplitude (Table 4-34). Each unit increase in magnitude on the Richter Scale corresponds to a 10-fold increase in wave amplitude, or a 32-fold increase in energy. The Richter Scale has largely been replaced by the similar Moment Magnitude Scale. *Intensity* is most commonly measured using the Modified Mercalli Intensity (MMI) Scale based on direct and indirect measurements of seismic effects. This scale's levels are typically described using Roman numerals in increasing order based on destruction potential (from less catastrophic to most catastrophic). More detailed descriptions of the MMI Scale of earthquake intensity and correspondence to the Richter Scale, as well as descriptions of effects and frequency intervals are given in Table 4-34 below.

Table 4-34 Earthquake Magnitude, Intensity Measurements, and Associated Characteristic

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

Source: USGS

The destructiveness of an earthquake depends on a number of factors, including the magnitude of the tremor, direction of the fault, distance from the epicenter, regional geology, and the design characteristics of buildings and infrastructure.

Ground shaking can lead to the collapse of buildings and bridges and disrupt gas lines, electricity, and phone service. Most property damage and earthquake-related deaths are caused by the failure and collapse of structures due to ground shaking. The level of damage depends upon the amplitude and duration of the shaking, which are directly related to the earthquake size, distance from the fault, site, and regional geology. Death, injuries, and extensive property damage are possible vulnerabilities from this hazard. Some secondary hazards caused by earthquakes in the Adams County area may include fire, hazardous material release, landslides, ground subsidence, flash flooding, and dam failure.

4.6.7 Vulnerability

As noted above, earthquakes strike with little to no warning and can have multiple impacts on an area. Aftereffects from an earthquake can include impacted roadways, downed power and communication lines, fires, and damage to structures (especially poorly built, or those already in disrepair).

In Colorado, earthquakes are considered low probability, but potentially high-consequence events. Ground shaking can lead to the collapse of buildings and bridges, disrupt gas, electricity, and phone service. Deaths, injuries, and extensive property damage are possible vulnerabilities from this hazard. Consequently, buildings in these regions are seldom designed to resist strong earthquakes, making them more vulnerable.

This section offers specifics on loss estimation potential to life, property, critical facilities/infrastructure, the economy, historical/natural/cultural resources, and development trends in Adams County. Earthquake vulnerability data was generated during the 2024 update using a Level 1 Hazus-MH analysis Hazus is a GIS based, standardized, nationally applicable multi-hazard loss estimation methodology and software. Local, state, and federal government officials use Hazus for preparedness, emergency response, and mitigation planning. The Hazus-MH earthquake scenario used was a 2,500-year Probabilistic earthquake, representing a very strong earthquake with a 2% chance of exceedance in 50 years; this can essentially be considered a worst-case ground shaking for the planning area from a variety of seismic sources. The International Building Code uses this level of ground shaking for building design in seismic areas. Note that this version of Hazus (6.1) provides estimates based on U.S. Census data from 202, and so the mentioned structure inventory or population results may be different than today's actual estimates. As with any model, there are uncertainties in the resulting data; results should be considered approximate for planning purposes.

People

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

The model estimates that 311 households will be displaced due to the earthquake, with 183 people seeking temporary shelter in public shelters.

Hazus also estimates the number of people that will be injured or killed by the earthquake scenario modeled. Ground movement during an earthquake is seldom the direct cause of death or injury. Most earthquake-related injuries result from collapsing walls, flying glass, and falling objects as a result of the ground shaking, or people trying to move more than a few feet during the shaking. The casualties are broken down into four severity levels that describe the extent of the injuries. The levels are as follows:

- Severity Level 1: Injuries will require medical attention, but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening.

- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are given for three times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent several periods of the day when different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is at its maximum (i.e. most people are asleep at home). The 2:00 PM estimate considers that the educational and business sector loads, including commercial and industrial occupancies, are at their maximum (i.e. schools in session and office or other personnel working during the standard workweek). The 5:00 PM estimate represents peak commute time (i.e. in transit populations via cars and other transportation mediums). These estimates report that 1 or more casualties in all the three scenarios would be expected, and risk to populations would be highest from a 2 am modeled scenario (as this scenario yields 123 minor injuries, 19 hospitalizations, 2 life-threatening injuries, and 4 deaths). The casualty estimates are summarized in Table 4-35 below.

Table 4-35 Hazus Earthquake Injury and Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	0.53	0.06	0.00	0.01
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.50	0.05	0.00	0.00
	Other-Residential	28.71	3.79	0.32	0.61
	Single Family	93.70	14.98	1.58	3.04
	Total	**123**	**19**	**2**	**4**
2 PM	Commercial	34.63	4.24	0.28	0.53
	Commuting	0.00	0.00	0.00	0.00
	Educational	11.35	1.03	0.01	0.02
	Hotels	0.00	0.00	0.00	0.00
	Industrial	3.66	0.36	0.01	0.02
	Other-Residential	8.81	1.21	0.11	0.20
	Single Family	28.39	4.70	0.52	0.96
	Total	**87**	**12**	**1**	**2**
5 PM	Commercial	24.34	3.04	0.21	0.39
	Commuting	0.00	0.00	0.00	0.00
	Educational	1.75	0.17	0.00	0.01
	Hotels	0.00	0.00	0.00	0.00
	Industrial	2.29	0.23	0.01	0.01
	Other-Residential	11.16	1.53	0.14	0.25
	Single Family	37.46	6.17	0.68	1.26
	Total	**77**	**11**	**1**	**2**

Source: Hazus 6.1, WSP analysis

The impacts of earthquakes on vulnerable populations can be more severe. Three population groups may be particularly vulnerable to earthquake hazards:

- **Linguistically Isolated Populations**—Problems arise when there is an urgent need to inform non-English speaking residents of an earthquake event. They are vulnerable because of difficulties in understanding hazard-related information from predominantly English-speaking media and government agencies.
- **Population below Poverty Level**—Families with incomes below the poverty level may lack the financial resources to improve their homes to prevent or mitigate earthquake damage. Poorer residents are also less likely to have insurance to compensate for losses in earthquakes.
- **Population over 65 Years Old**—This population group is vulnerable because they are more likely to need special medical attention, which may not be available due to isolation caused by earthquakes. Elderly residents also have more difficulty leaving their homes during earthquake events and could be stranded in dangerous situations.

Families and individuals with greater social vulnerability may have fewer financial resources to prepare for or recover from an earthquake and may be more likely to be uninsured or underinsured. 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 earthquake, especially if transportation or utility services are disrupted.

Property

Potential for the highest losses is in western Adams County just north of Denver, as well as south of Denver International Airport in the City of Aurora. This is largely due to the combination of the greatest degree of infrastructure, housing, and other development being located in this part of the county, combined with western Adams County also being exposed to a greater degree of possible ground movement from earthquakes.

Table 4-36 summarizes the scenario results for Adams County based on the various assets assessed.

Table 4-36 Earthquake Loss Estimates in Adams County Based on the 2,500-Year Hazus Scenario

Type of Impact	Hazus-Derived Impacts to County
Total Buildings Damaged (out of 159,000 estimated buildings in the county)	Slight: 10,489 Moderate: 3,712 Extensive: 637 Complete: 71
Building and Income Related Losses	$621.62 million 51% of damage related to residential structures 18% of loss due to business interruption
Total Economic Losses (includes building, income and lifeline/critical facility losses)	$799 million
Casualties (based on 2 a.m. time of occurrence)	Not requiring hospitalization (Level 1): 124 Requiring hospitalization (Level 2): 19 Life threatening (Level 3): 2 Fatalities (Level 4): 4
Casualties (based on 2 p.m. time of occurrence)	Not requiring hospitalization (Level 1): 87 Requiring hospitalization (Level 2): 12 Life threatening (Level 3): 1 Fatalities (Level 4): 2
Casualties (based on 5 p.m. time of occurrence)	Not requiring hospitalization (Level 1): 77 Requiring hospitalization (Level 2): 11 Life threatening (Level 3): 1 Fatalities (Level 4): 2

Type of Impact	Hazus-Derived Impacts to County
Damage to Transportation Systems	$3.15 million in economic losses to transportation systems
Damage to Essential Facilities	No damages categorized as moderate or worse to essential facilities. Facilities include hospitals, schools, Emergency Operation Centers, Police Stations, and Fire Stations
Damage to Utility Systems	$174.2 million in economic losses to utility systems (from potable water, wastewater, natural gas, and communication components)
Households without Power/Water Service (Based on 153,764 Total Households)	No households without power or water service after event
Expected Utility System Pipeline Damages	22 Leaks and 6 Breaks on Potable Water Pipelines 11 Leaks and 3 Breaks on Wastewater Pipelines 0 Leaks and 0 Break on Natural Gas Pipelines 0 Leaks and 0 Breaks on Oil Pipelines
Displaced Households	311
Persons Seeking Temporary Shelter	183
Debris Generation	152,000 tons

Source: Hazus 6.1, WSP analysis

The results of the earthquake scenario analysis show moderate damages and losses, especially with regards to economic losses from loss of income, and damaged buildings, lifelines, or critical facilities.

According to this probabilistic scenario, the majority of properties affected are expected to be residential in nature (about 51% of the total number of buildings damaged across the county), followed by Commercial and Industrial properties. Other occupancy types including are religious, agricultural, education, and government structures).

Building codes reduce the risk of structural damage, especially when considering potential impacts from earthquakes which heavily test building safety and integrity, particularly older structures constructed with materials like wood and masonry. Historic buildings constructed of unreinforced masonry are most vulnerable to seismic ground shaking; based on the Hazus analysis, Adams County's buildings made of wood, unreinforced masonry, and reinforced masonry are the top three categories that will see the highest damages. Jurisdictions most vulnerable to seismic events will likely be those with many historic or older buildings (such as Arvada, which was established in 1870) not retrofitted or mitigated to sustain ground shaking.

Critical Facilities and Infrastructure

General Critical Facility Inventory: Hazus breaks critical facilities into several groups. For the purposes of this particular scenario, the following types of facilities will be discussed: essential facilities, transportation systems, and utility system lifelines.

Essential Facility Damage: Essential facilities include hospitals (8 in the county), schools (185 in the county), emergency operations centers (7 in the county), fire stations (42 in the county), and police stations (1 in the county). The model did not result in any expected damages to these facilities from the earthquake event.

Transportation Systems Inventory: There are 7 transportation systems that include highways, railways, light rail, bus, ports, ferry, and airports; the replacement value for this critical facility category would be around $9.9 billion. The transportation systems inventory related expected damage from the earthquake would be moderate, at $3.15 million. More details are summarized in Table 4-37 Transportation System Economic Losses in Millions of Dollars below.

Utility Lifeline Systems Inventory: There are 6 utility systems that include approximately 5,913 linear miles of potable water, wastewater, natural gas, and crude & refined oil pipelines. Utility Lifeline Systems also include electric power and communications lines. The replacement value of the utility lifeline systems is estimated to be $5.012 billion. These utility system facility damages in terms of economic losses in millions of dollars are summarized in Table 4-38. Site-specific expected utility system pipeline damages (including their inventory) are included in Table 4-39. The model did not predict potable water or electric power system performance limitations or damage that could affect household availability post-earthquake.

Table 4-37 Transportation System Economic Losses in Millions of Dollars

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	3181.5611	0.0000	0.00
	Bridges	2099.7896	0.0608	0.00
	Tunnels	0.0000	0.0000	0.00
	Subtotal	**5281.3507**	**0.0608**	
Railways	Segments	4061.7591	0.0000	0.00
	Bridges	282.2400	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	23.9670	1.4265	5.95
	Subtotal	**4367.9661**	**1.4265**	
Light Rail	Segments	204.9412	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	22.8400	1.4256	6.24
	Subtotal	**227.7812**	**1.4256**	
Bus	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Ferry	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Port	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Airport	Facilities	5.3000	0.2378	4.49
	Runways	20.3078	0.0000	0.00
	Subtotal	**25.6078**	**0.2378**	
	Total	**9,902.71**	**3.15**	

Source: Hazus 6.1, WSP analysis

Table 4-38 Utility System Economic Losses in Millions of Dollars

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	32.3010	0.5580	1.73
	Distribution Lines	116.5585	0.1010	0.09
	Subtotal	**148.8595**	**0.6590**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	1332.7020	19.7586	1.48
	Distribution Lines	69.9351	0.0507	0.07
	Subtotal	**1402.6371**	**19.8093**	
Natural Gas	Pipelines	466.6716	0.0000	0.00
	Facilities	316.1258	3.9267	1.24
	Distribution Lines	46.6234	0.0174	0.04
	Subtotal	**829.4208**	**3.9441**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	0.9700	0.0242	2.49
	Subtotal	**0.9700**	**0.0242**	
Electrical Power	Facilities	2629.5270	149.7293	5.69
	Subtotal	**2629.5270**	**149.7293**	
Communication	Facilities	0.7760	0.0294	3.79
	Subtotal	**0.7760**	**0.0294**	
	Total	**5,012.19**	**174.20**	

Source: Hazus 6.1, WSP analysis

Table 4-39 Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	3,621	22	6
Waste Water	2,173	11	3
Natural Gas	119	0	0
Oil	0	0	0

Source: Hazus 6.1, WSP analysis

Economy

Hazus estimates the long-term economic impacts to the County post-earthquake. The model quantifies this information in terms of income and employment changes within the County. The total economic loss from the earthquake is estimated at $798.96 million, which includes building and lifeline related losses based on the county's available inventory.

Building losses are broken into two categories: direct building losses and business interruption losses. Building related losses, which summarize estimates costs to fix or replace structures and damages to properties and their contents, are discussed in more detail in the General Property section of this chapter. Business interruption losses are summarized in more detail below (Table 4-40). They included the temporary living expenses (relocation based) for people displaced from their homes because of the earthquake event. Income losses amounted to $109/3 million, while capital stock losses were about $621.62 million.

Table 4-40 Business-Related Economic Loss Estimates in Millions of Dollars

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	0.7387	14.6537	0.6138	2.5089	18.5151
	Capital-Related	0.0000	0.3141	12.4957	0.3656	0.5652	13.7406
	Rental	6.2191	6.6847	10.3680	0.3304	0.7546	24.3568
	Relocation	22.3763	5.1883	16.3652	1.8869	6.9070	52.7237
	Subtotal	**28.5954**	**12.9258**	**53.8826**	**3.1967**	**10.7357**	**109.3362**
Capital Stock Losses							
	Structural	44.2853	9.3277	27.9370	4.4766	6.6802	92.7068
	Non_Structural	118.1068	53.6480	70.9087	18.0198	22.7744	283.4577
	Content	35.5094	15.3443	42.0343	12.1085	16.2281	121.2246
	Inventory	0.0000	0.0000	11.3112	2.2667	1.3131	14.8910
	Subtotal	**197.9015**	**78.3200**	**152.1912**	**36.8716**	**46.9958**	**512.2801**
	Total	**226.50**	**91.25**	**206.07**	**40.07**	**57.73**	**621.62**

Source: Hazus 6.1, WSP analysis

Historic, Cultural, and Natural Resources

Earthquake effects on the environment, natural resources, and historic and cultural assets could be very destructive depending on the actual type of seismic activity experienced and secondary/cascading effects from seismic activity (e.g. wildfire). The biggest impacts would likely be on older historic properties and facilities in older cities such as Arvada, which may contain vulnerable structures built out of wood, unreinforced masonry, or manufactured housing materials. However, it is worth noting that only a small portion of Arvada actually falls within Adams County boundaries, so vulnerabilities may not be as pronounced within the planning area examined in this plan.

Development Patterns

All participating jurisdictions within the County have adopted either building codes or some sort of design and construction standards to ensure structural stability and the longevity of the built environment as exposed to natural hazards. Adams County enforces the 2018 International Building Codes; Commerce City, Brighton, and Bennett have adopted the 2012 International Building Codes. As previously stated, building codes substantially reduce the potential for loss of life from earthquakes, helping to reduce damage to future structures by introducing strict requirements, which indirectly safeguard the populations in or near those structures. Growth since the last plan update and continued growth of population in the County could potentially expose more people to earthquakes and their related hazards, though again this hazard was deemed to pose an overall Low Significance in the county.

4.6.8 Risk Summary

- The overall significance of this earthquake hazard is **Low**.
- There have been 5 recorded earthquakes of a magnitude exceeding 4.8 with epicenters within the boundaries of Adams County since 1962, with the majority located north-northeast of Denver. These all were the result of induced seismicity.
- The majority of recorded earthquakes in Adams County were quite small in terms of intensity; a future large, damaging earthquake is relatively unlikely in the county.
- The Hazus 2,500-year probabilistic scenario assessment conducted to estimate Adam County's earthquake vulnerability yielded the following:
  - Total economic losses would be around $799 million
  - At least 4,418 buildings would be at least moderately damaged.
  - Building- and income-related losses in the county would amount of $621.6 million
  - The most destructive scenario modeled in terms of injuries and casualties to people would be the 2 am scenario, with a total of 148 people affected.
  - The model estimates that 311 households would be displaced due to earthquake activity, with 183 persons seeking temporary shelter.
  - The damages to transportation systems would equal $3.15 million; damages to essential facilities would not be expected; damages to utility systems would amount to $174.2 million
  - An estimated 152,000 tons of debris would be generated with this earthquake event.
- Related hazards: wildfire, dam failure/incident, flood, hazardous material incident, subsidence.

4.7 Flood

Table 4-41 Flood Risk Summary

Jurisdiction	Geographic Location	Probability of Future Occurrence	Magnitude/ Severity	Overall Significance
Adams County	Significant	Likely	Critical	High
Bennett	Extensive	Likely	Catastrophic	High
Brighton	Limited	Likely	Limited	Medium
Commerce City	Significant	Highly Likely	Limited	Medium
Denver Water	Limited	Likely	Limited	Medium

4.7.1 Hazard Description

Floods involve inundation of normally dry land or other areas. Common types of flooding applicable to Adams County include riverine flooding, localized or flash flooding (including storm generated flash floods), stormwater drainage flooding, and dam or levee failure inundation (see Section 4.4).

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 because 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.

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 occurs most often in Adams County 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.

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 known as stormwater flooding. Stormwater flooding and ponding can carry debris, dirt, chemicals, and pollutants from impervious surfaces, leading to health issues as briefly described above.

Dam inundation flooding can occur as a result of structural failure, overtopping, seismic activity, or other reasons, as described in detail in Section 4.4 Dam Incident.

The area adjacent to a river or stream channel is its floodplain. In its common usage, the term floodplain most often refers to that area that is inundated by the 100-year flood, or the flood that has a 1% chance in any given year of being equaled or exceeded. The 100-year flood is the national standard to which communities regulate their floodplains through FEMA's National Flood Insurance Program (NFIP).

Adams County is one of the richest irrigated and dry land farming areas across the U.S., with a hydrography characterized by a majority of intermittent flowing streams. According to the latest Adams County Flood Insurance Study (FIS), dated December 02, 2021, principal flood problems on the major waterways stem from the South Platte River and its tributaries' snow melt and summer weather front (e.g. thunderstorms) flooding characteristics, especially when coupled with the tributary basins' structure as they are narrow, hydraulically steep, and composed of highly erodible clay and loam soils. Almost all major floods from the South Platte River have been generated near the river's headwaters near Monument Divide, between Castle Rock and Colorado Springs. But significant snowmelt and intensive rainstorms over the tributaries can often spread to Adams County, reaching waterways such as Sand Creek.

According to the FIS report, most flooding events on the South Platte and major streams like Sand Creek have occurred due to cloudbursts of intensive rainstorms which normally take place late spring though late summer (May-August). The South Platte River is often aggravated by snowmelt runoff during these key wet periods.

4.7.2 Location

The geographic coverage potential of this flooding hazard in Adams County is **Significant.**

Adams County entirely falls within the South Platte River Basin, which has Hydrologic Unit Code 6 (HUC 6) 101900. The South Platte basin encompasses all or part of 25 counties in Colorado and is about 24,151 square miles in area. Elevation in the basin ranges from 14,000 feet at the Continental Divide to 3,400 feet at the Colorado-Nebraska state line. The South Platte River is the major stream in the basin. Some of the State's most devastating floods have taken place in the South Platte basin. The major sub-basins in the South Platte River Basin, which are classified as HUC 8, are listed and briefly described in the bullet points below; these are displayed in Figure 4-19 along with major water features in and near Adams County:

- Middle South Platte-Cherry Creek (HUC 10190003) **–** This watershed encompasses about 45% of Adams County, and runs north-south through the majority of its western portion. Some vegetation and land cover/land use types in this watershed within Adams County include irrigated agriculture, dryland agriculture, general grasses, and rangeland (among others) (USDA 2009).
- Clear (HUC 10190004) – Clear crosses very slightly into Adams County, from its western-most edge, reaching into Arvada and Westminster. The main waterway in this watershed is Clear Creek, which runs west-east.
- Kiowa (HUC 10190010) – Kiowa Creek is the main waterway in this watershed, though Wolf Creek and Comanche Creek contribute to the overall drainage and catchment of water in this watershed.

The Kiowa watershed cuts Adams County north-south and is located immediate to the east of the Middle South Platte-Cherry Creek watershed, and to the west of the Bijou watershed.

- Bijou (HUC 10190011) – The Bijou watershed also cuts Adams County north-south, and its main waterway is Bijou Creek. Other major streams in the watershed include East Bijou Creek, West Bijou Creek, and Muddy Creek.
- Middle South Platte-Sterling (HUC 10190012) – The Middle South Platte-Sterling watershed is located on the eastern portion of Adams County, encompassing its northeast corner and south-southeast area (along with the Beaver watershed). It is located immediate east of the Bijou watershed, and its major waterways within Adams County include Badger Creek and Sand Arroyo Creek.
- Beaver (HUC 10190013) – This watershed only crosses Adams County slightly, on its southeastern-most corner. The main waterway present in the County from this watershed is Wetzel Creek.

To accurately assess the risk of flooding, it is necessary to know what areas of a community may be the most susceptible to flooding. FEMA's NFHL depicts high flood risk areas, referred to as SFHAs, as well as other components such as Base (1%-annual-chance) Flood Elevations (BFEs), 0.2% annual chance floodplains (i.e. where the 500-year flood event would occur based on studied water features), and even built levee structures.

The SFHA extent for Adams County and the surrounding area is displayed in Figure 4 19. As the map shows, most of the higher risk areas are located in the western portion of the county, especially along the South Platte River which runs between the Thornton/Northglenn and Commerce City/Brighton areas, as well as along major river tributaries. Some of these high population areas where floodplains are present are covered by levees, as displayed by the yellow lines. Other floodplains posing risk to the planning area are located along the middle portion of Adams County, to the west and east of Highway 79, with other flood hazard areas along Bijou Creek and Muddy Creek farthest east of the county. The main waterways of concern in terms of flooding risk as mapped by FEMA are listed below:

- South Platte River
- Clear Creek
- Niver Creek
- Sand Creek
- First Creek
- Second Creek
- Third Creek
- Todd Creek
- Big Dry Creek
- Brantner Gulch
- Boxelder Creek
- Lost Sand Creek
- Kiowa Creek
- Bijou Creek
- Wolf Creek
- Comanche Creek
- Muddy Creek

Figure 4-19 Basins and General Water Features in Adams County

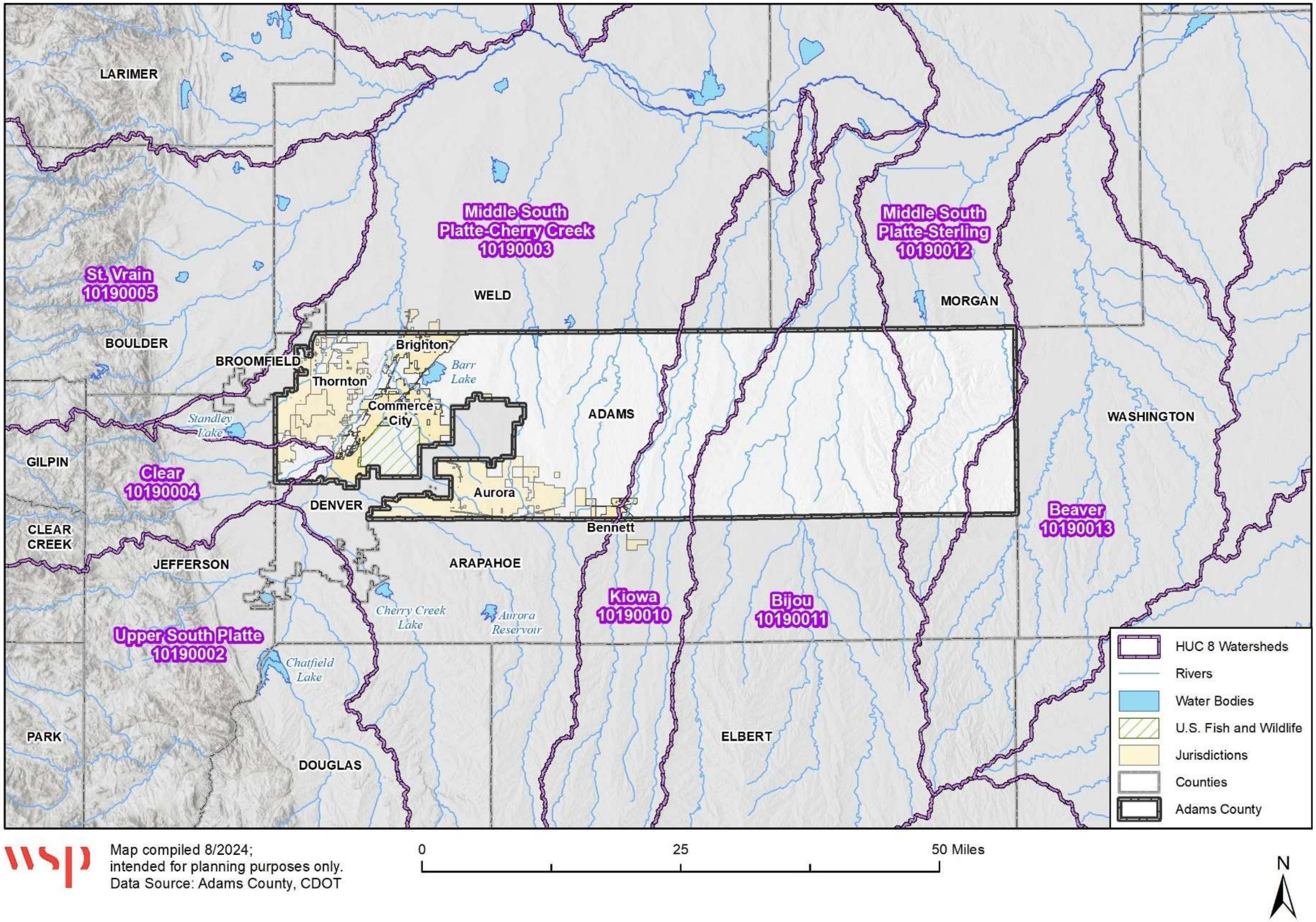
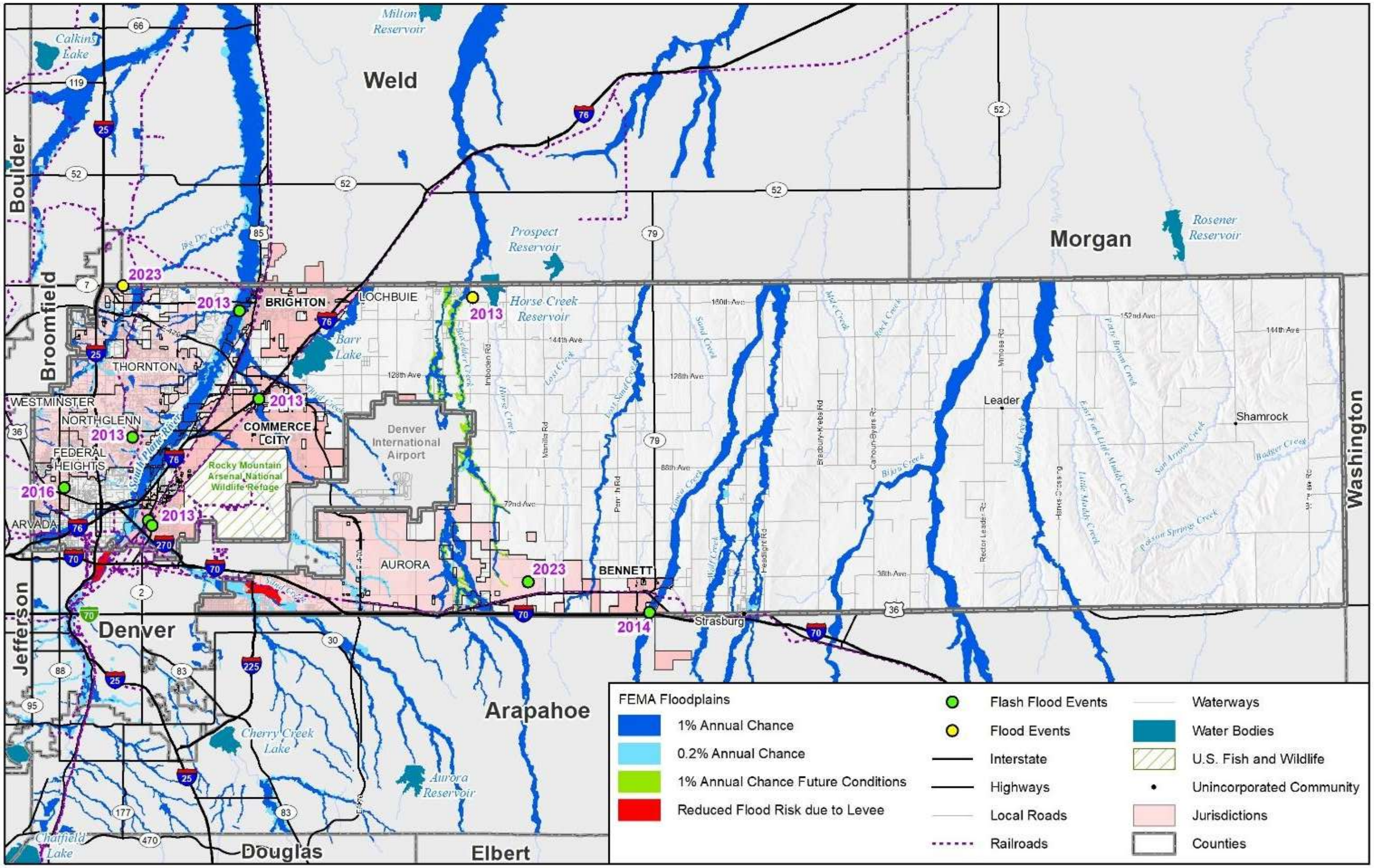


Figure 4-20 FEMA Special Flood Hazard Areas in Adams County

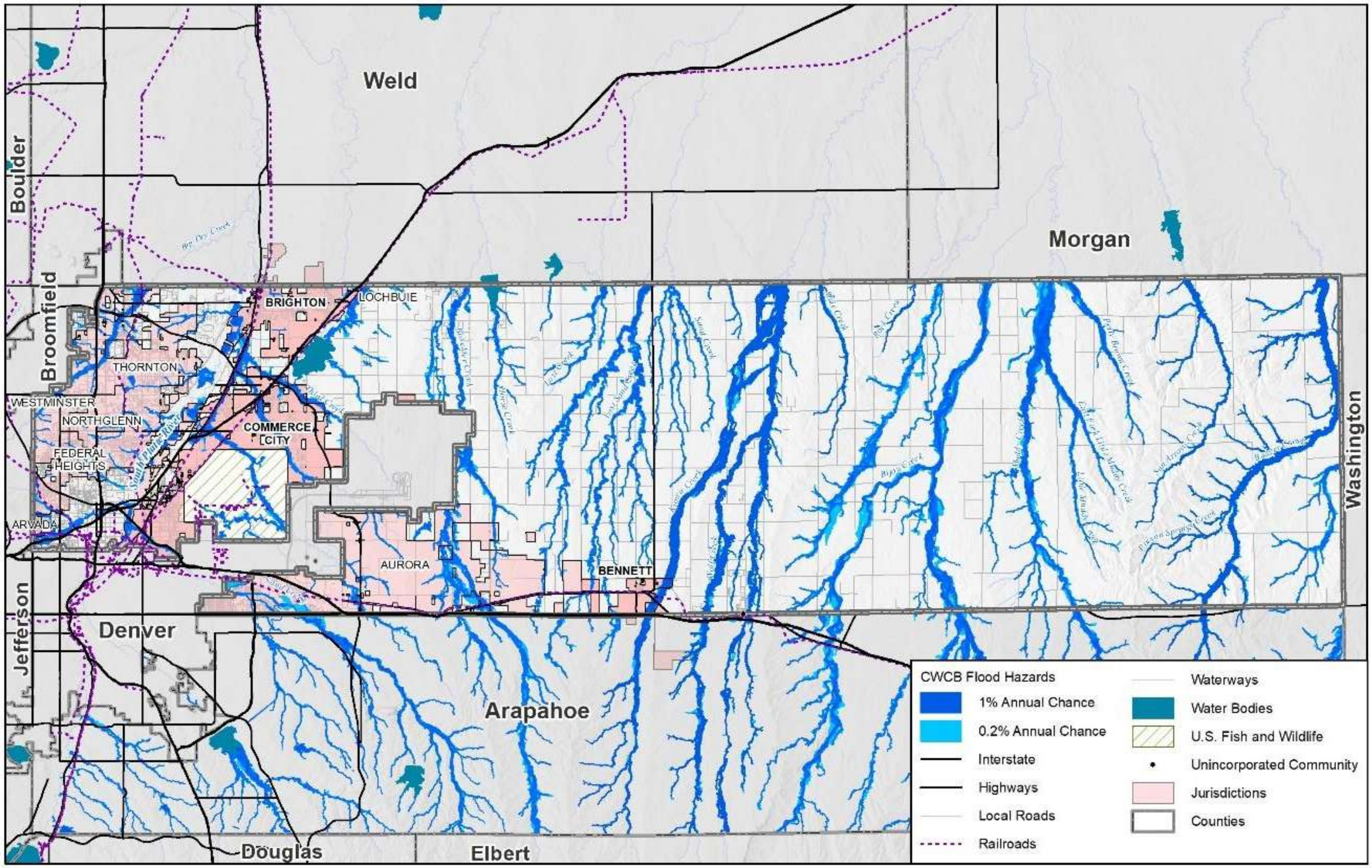


Map compiled 9/2024;
intended for planning purposes only.
Data Source: Adams County, CDOT, NCEI Storm Events, FEMA NFHL: Adams Effective 12/2/2021,
Arapahoe Effective 4/11/2024, Denver Effective 1/19/2024, Jefferson Effective 8/2/2022, Weld Effective 8/15/2024

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 finalized 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 Adams County, CWCB BLE mapping includes 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 4-21 below shows the CWCB mapping for the County. Additionally, Figure 4-22 and Figure 4-23 show zoomed in visuals for the eastern and western portions of the County.

Figure 4-21 Adams County Colorado Water Conservation Board Flood Hazards



Map compiled 8/2024;
intended for planning purposes only.
Data Source: Adams County, CDOT,
Colorado Water Conservation Board

Figure 4-22 Eastern Adams County Colorado Water Conservation Board Flood Hazards

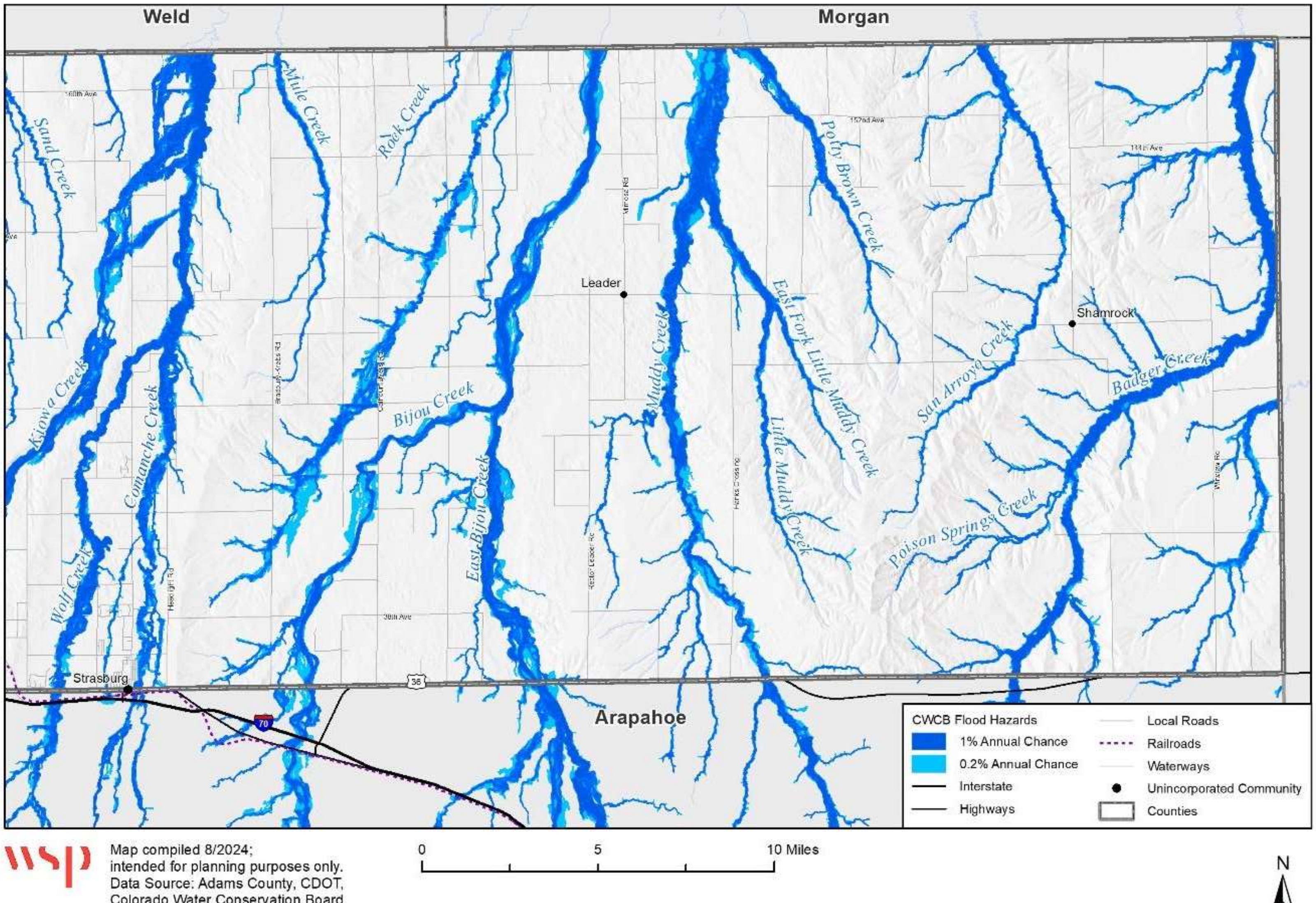
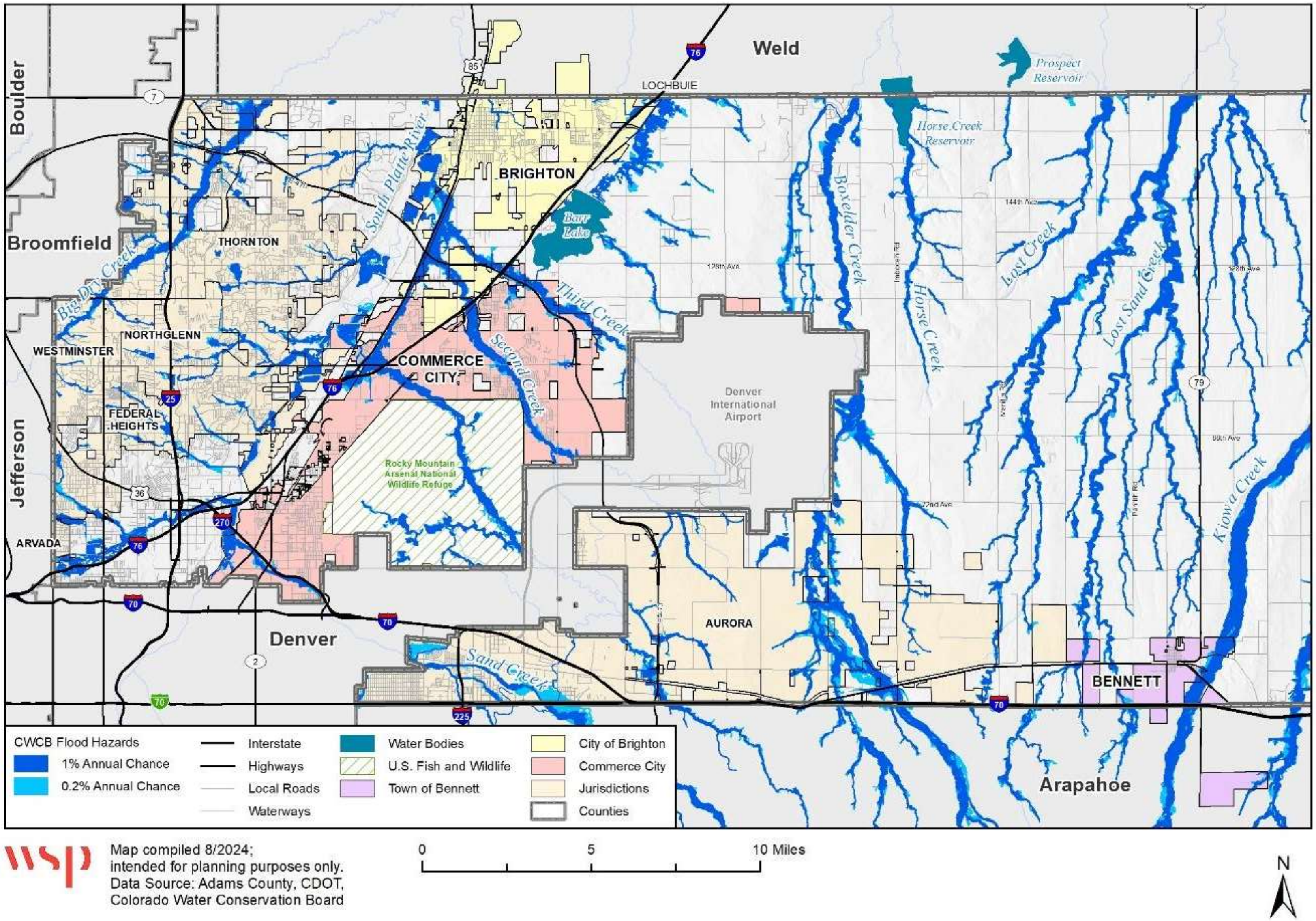


Figure 4-23 Western Adams County Colorado Water Conservation Board Flood Hazards



4.7.3 Past Occurrences

There have been a number of 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, per the record set below, some events can definitely lead to injuries and death, as well as thousands or millions of incurred damages. Notable flood events from 1997 to 2024 are summarized in the bullet list below. These events include event-related injuries, deaths, and property or crop damages as applicable.

- **June 6, 1997** – A nearly stationary line of thunderstorms dumped 4.6 inches of rain onto portions of Thornton. Extensive flooding of streets, underpasses and other low lying areas was reported. Several businesses were flooded and basements in the area damaged.
- **July 29, 1997** - Heavy rain caused flooding to occur in the Rancho Pecos apartment building, in Westminster. Several residents had to be evacuated from their apartments, and property damages were around $20,000. Flooding in that area, as well as near Strasburg on the eastern portion of the county, occurred on and off until August 4th of that year.
- **July 25, 1998** – A newspaper source indicated there was flash flooding in Aurora starting late afternoon on the 25th of July 1998. That same day, a trained spotter reported flood and flash flooding occurring north of Strasburg, on the eastern portion of Adams County, as 2.51 inches of rain fell in an hour. The deluge resulted in considerable flooding of local streets and county roads.
- **August 4, 1999** - Flooding and flash flooding problems developed over portions of the Urban Corridor on western Adams County, as slow moving thunderstorms dumped 2 to 3.5 inches of rainfall in approximately 3 hours. Near the junction of Interstate 25 and State Highway 36, up to 4 feet of water flooded an auto dealership, and approximately 45 cars were ruined. Sections of Interstate 25 and State Highway 36 near the interchange were closed due to floodwaters. Damage estimates to the dealership alone were approximately $500,000. Floodwaters up to 5 feet deep forced the evacuation of two mobile home parks in Federal Heights. In addition, railroad tracks were washed out near Federal Blvd. and 64th Avenue. Numerous outages were reported with widespread blackouts in Thornton and Littleton. Along Massey Draw, near Carr Street and Chatfield Reservoir, 4 homes were flood damaged and portions of their backyards washed out.
- **August 5, 1999** - A dog kennel east of Denver International Airport was flooded when a small dam, upstream in Elbert County, reportedly breached. The floodwaters, up to 4 feet deep, washed away some 6-foot fences and other small buildings. Ten of the 70 dogs boarded at the kennel drowned.
- **July 16, 2000** - 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.
- **August 17, 2000** - Thunderstorms producing very heavy rain of up to 3.5 inches in areas caused flooding and flash flooding problems in and around the Denver Metropolitan area. In Commerce City, a 37-yr old firefighter drowned while attempting to rescue a stranded motorist. According to a fire department spokesman, the firefighters were wading through the water when one of the men lost his footing and was sucked into a 10-ft deep culvert. He

was swept away before anyone could reach him. One death was therefore reported from this flash flood incident.

- **August 2, 2001** - Severe thunderstorms producing heavy rain and hail either washed out or damaged several county roads in the Watkins and Bennett areas (on the south-central portions of Adams County).
- **June 6, 2003** - Thunderstorms producing heavy rain caused flash flooding across extreme eastern sections of Adams County. Approximately 11 to 12 miles south of Leader, there was 1 to 2 feet of water covering the roadway. The highway department reportedly conducted major work on the road the following day to fix the damage caused by the flooding.
- **June 18, 2003** - Heavy rain caused flash flooding east of Leader, on the central-eastern portion of Adams County. Water up to 6 inches deep ran over bridges. In addition, several locations along Irondale Road (near East 88th Ave) had water flowing over them.
- **July 23, 2004** - Heavy rain caused flooding and flash flooding problems in and around the Federal Heights and Thornton areas. Several streets were inundated with anywhere from 2 to 4 feet of water including: 84th Ave. and Grant St., Conifer St. and Huron Blvd., 102nd St. and Melody as well as 83rd St. and Washington. Several cars were stranded in the floodwaters.
- **September 12-14, 2013** (known as the "2013 Colorado Floods") - Continuous heavy rainfall produced flash flooding, and floodwaters were reportedly breaking through basement windows west of Brighton, as well as impacting the Barr Lake area, Thornton, residences in Commerce City, and Henderson (in the unincorporated area between Thornton and Commerce City). A deep southerly flow over Colorado, ahead of a near stationary low pressure system over the Great Basin, pumped copious amounts of monsoonal moisture into the area. Commerce City officials ordered about 400 residents to leave a neighborhood near the Rocky Mountain Arsenal National Wildlife Refuge due to potential retention pond breaches. Homes, roads, and other properties were often covered under several feet of standing water across impacted communities. The storm headwaters then moved down the South Platte River and caused widespread flooding with record flood stages in northeastern Colorado counties. The floodwaters from the torrential rain hence resulted in widespread evacuations, road closures, and numerous water treatment facilities were contaminated and had to be shut down. Governor Hickenlooper declared a disaster emergency on September 13th in 11 counties across northeast Colorado including: Adams, Arapahoe, Broomfield, Boulder, Denver, Jefferson, Larimer, Logan, Morgan, Washington and Weld. By September 15th, federal emergency declarations covered those counties as well as Clear Creek County. Overall property damages for the Adams County area were estimated to be $2,140,000.
- **May 22, 2014** - A severe thunderstorm in the Denver area produced nickel to quarter size hail in parts of Adams and Denver Counties. The line of stationary thunderstorms causing heavy rainfall also produced localized flash flooding near Bennett. Over one foot of water was observed rushing over the junction of US 36 and Kiowa-Bennett Road. An estimated $10,000 was incurred in property damages.
- **August 30, 2016** - A wet microburst produced an intense thunderstorm with very heavy rain and hail in Westminster (with up to 3.6 inches of radar-estimated rainfall). Several vehicles were stranded in 2 to 3 feet of moving water at the intersection of 72nd Ave. and Pecos St. Street, and flooding was also reported on U.S. 36 at Pecos St.
- **July 1, 2021** - The NWS has issued a Flood Advisory for South Central Adams County until 5:30 p.m. this evening and a Flash Flood Watch for western Adams County until 12 a.m. Friday, July 2.

- **Spring 2023** – Flash flooding event across the County to include three rescues. Figure 4-24 depicts the aftermath of this flooding event and the damage to infrastructure and personal property.

Figure 4-24 Spring 2023 Flooding Aftermath

Source: Adams County Government, 2024.

Table 4-42 summarizes the flood events recorded in the NOAA NCEI storm events database for Adams County, since 1997. Of the 23 flood events, 18 have been categorized as flash flood events while 5 have been categorized as general flood events, with one event leading to a human death, and three resulted in property damages being incurred. All these were described in more detail in the bullet points above.

Notably, the largest single property loss resulting from a flood event was $2,140,000 in 2013. During this event, heavy rain hit Colorado due to monsoonal moisture, leading to major flooding along the South Platte River. Floodwaters broke records, causing widespread damage to homes, roads, and farmland from Boulder to Nebraska. Over 11,000 people had to evacuate, and losses totaled over $3 billion.

The second largest property loss flood event was as recently as May 11, 2023. A slow-moving storm caused flooding and flash flooding across the urban corridor and northeast plains, with 4-7 inches of rain and up to 2 feet of snow in higher elevations. The worst flooding hit Arapahoe, Denver, Douglas, Elbert, and southern Jefferson counties, damaging roads and washing out trails. Many roads, including those in Adams and Weld counties, were closed due to flood damage. In Denver, a record 2.92 inches of rain fell in one day. Rescuers spent 21 hours helping three men stranded in snow in Douglas County after fallen trees blocked their path.

Table 4-42 Flood Related Deaths and Damages in Adams County, 1997-2024

Event Type	Number of Events	Deaths	Property Damage	Crop Damage
Flash Flood	18	1	$560,000	$0
Flood	5	0	$3.160,000	$250,000
TOTAL	**23**	**1**	**$3,720,000**	**$250,000**

Source: NOAA NCEI, 2019

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 Adams County were pulled from the County's September 28, 2021 Flood Insurance Study report:

- Major recorded floods have occurred on the South Platte River and its tributaries since 1844 in the Adams County area.
  - Specifically, 11 devastating floods occurred on the South Platte River, 3 on Clear Creek, and 3 each on Box Elder, Comanche Creek, and Bijou Creek.
- Major flooding in the Town of Bennett has been well documented back to 1875, where a major flood along Kiowa Creek overflowed the channel banks and destroyed the Town. After that flooding event, the Town was moved to its present-day location.
- 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. Clear Creek experienced flood discharges of 8,700 cfs, 5,390 cfs, and 5,250 cfs in 1888, 1933, and 1956, respectively recorded at the Golden gauge. 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. The net results of these conditions were six people drowned, two other deaths caused by flood-related activities, and estimated damages of $500 million in the South Platte River Basin, of which $300 million occurred in the Denver area.
- Severe flood runoff is transported through the City of Federal Heights as both overland shallow flow and as channel flow. The steep slope of the land, the close proximity of mobile homes to Tributary M of Niver Creek, and the presence of several culverts that are inadequate to convey major storm runoff combine to create flooding problems.
- The first major contribution to flood control in Adams County streams took place in the late 1800s, when Castlewood Dam was completed with the primary intention being irrigation uses. However, in August of 1933, this dam burst under pressure of water from severe thunderstorms in the upper Cherry Creek Basin.
- Throughout the study segment of the South Platte River in Adams County, levees have also been constructed as flood protection measures. However, past evidence shows these levees to be ineffective against 1-percent-annual-chance floods. On large segments of the South Platte River, historical records indicate that the 1965 and 1973 floods were of the 1-percent-annual-chance magnitude or greater.
- Nonstructural measures of flood protection are also used to aid in the prevention of future flood damage. These are the result of regulations of the Mile High Flood District.

Urban and stormwater drainage within the County has largely been associated with flooding of roadways during storm events. Adams County currently monitors several problem areas and is proactive in clearing the areas and closing the roads.

4.7.4 Climate Change Considerations

The 2014 Climate Change Assessments from the Western Water Assessment program (part of the NOAA Rise Team) includes an increase in intensity of heavy precipitation events, which could affect the nature and frequency of future floods. Additionally, with wildfires already being a problem in many parts of Colorado, increasing periods of drought and lack of precipitation are expected to exacerbate conditions for fires to occur, and in turn likely worsen the potential for runoff and flooding associated with burned areas. While Adams County fire history has not been significant in recent years, the potential for added development in the Wildland Urban Interface (WUI) could worsen risks to this hazard, in turn affecting future flooding due to changing climate conditions. For more information on fire hazards and WUI issues, refer to Section 4.3.13 Wildfire.

4.7.5 Probability of Future Occurrence

The probability of future occurrence of this flooding hazard in Adams County is **Likely**.

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

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

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

For context, the main flood recurrence intervals used in planning, floodplain studies, and other regulatory contexts are summarized in Table 4-43, and more detailed descriptions of FEMA special flood hazard zones applicable to Adams County are contained in Table 4-44. 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 4-20 under the Geographic Location subsection of this chapter.

Table 4-43 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 4-44 Flood Hazard Zones

Flood Zone	Definitions
FEMA Special Flood Hazard Areas (SFHAs) Subject to Inundation by the 100- or 500-Year Floods	
Zone A	100-year floodplain, or areas with a 1% annual chance of flooding. Because detailed analyses are not performed in these areas, no depths or base flood elevations are shown in Zone A.
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.

Flood Zone	Definitions
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.
Area Protected by Levee	Areas that are within the 100-year floodplain but are protected from flooding by an accredited levee system. These areas are still considered at residual risk if the levee were to fail or be overtopped.

Source: FEMA Flood Map Service Center, 2024

Based on the details provided in this chapter, flooding remains a likely occurrence throughout the identified flood hazard areas in the county. Smaller floods caused by heavy rains or inadequate drainage capacity in urbanized areas may be more frequent, but not as costly as the large-scale floods, which may occur at much less frequent intervals. In addition, dam or flood control structure failure could additionally take place and lead to flooding in an unexpected manner, in which likelihood of occurrence estimations would be more difficult to obtain.

4.7.6 Magnitude/Severity

The magnitude, or severity, of flooding hazards in Adams County is **Significant**.

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 induce property damages that threaten structural integrity, result in death and injuries, 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, damages, 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.

A number of 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.

- **Flood depth:** The greater the depth of flooding, the higher the potential for significant damages due to larger availability of flooding waters.
- **Flood duration:** The longer duration of time that floodwaters are in contact with building components, such as structural members, interior finishes, and mechanical equipment, the greater the potential for damage.

- **Velocity:** Flowing water exerts forces on the structural members of a building, increasing the likelihood of significant damage (e.g. such as scouring).
- **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.
- **Construction Type:** Certain types of construction and materials are more resistant to the effects of floodwaters than others. Typically, masonry buildings, constructed of brick or concrete blocks, are the most resistant to damages simply because masonry materials can be in contact with limited depths of flooding without sustaining significant damage. Wood frame structures are more susceptible to damage because the construction materials used are easily damaged when inundated with water.

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 4.3.2 Dam Failure/Incident.

4.7.7 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 Adams County. 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).

FEMA Flood Mapping Analysis

Table 4-45 and Table 4-46 show the risk to FEMA 1% and 0.2% annual chance flood hazards. Table 4-47 shows risk to FEMA 1% annual chance future conditions flood hazards and Table 4-48 shows risk to FEMA areas protected by levee flood hazards.

Table 4-45 Adams County Risk to FEMA 1% Annual Chance Flood Hazards

Jurisdiction	Property Type	Improved Parcels	Building Count	Improved Value	Estimated Content Value	Total Value	Estimated Loss	Buildings At Risk %	Population At Risk
Arvada	Commercial	17	17	$24,840,572	$24,840,572	$49,681,144	$12,420,286	22.4%	0
Arvada	Exempt	1	1	$261,333	$261,333	$522,666	$130,667	6.7%	0
Arvada	Industrial	6	10	$16,457,331	$24,685,997	$41,143,328	$10,285,832	76.9%	0
Arvada	**Total**	**24**	**28**	**$41,559,236**	**$41,559,236**	**$83,118,472**	**$20,779,618**	**2.2%**	**0**
Aurora	Commercial	3	4	$6,824,099	$6,824,099	$13,648,198	$3,412,050	0.4%	0
Aurora	Exempt	3	9	$27,306,294	$27,306,294	$54,612,588	$13,653,147	1.8%	0
Aurora	Residential	19	122	$48,679,810	$24,339,905	$73,019,715	$18,254,929	0.8%	379
Aurora	**Total**	**25**	**135**	**$82,810,203**	**$82,810,203**	**$165,620,406**	**$41,405,102**	**0.8%**	**379**
Bennett	Agricultural	1	1	$24,048	$24,048	$48,096	$12,024	25.0%	0
Bennett	**Total**	**1**	**1**	**$24,048**	**$24,048**	**$48,096**	**$12,024**	**0.1%**	**0**
Brighton	Exempt	2	2	$230,869	$230,869	$461,738	$115,435	0.4%	0
Brighton	**Total**	**2**	**2**	**$230,869**	**$230,869**	**$461,738**	**$115,435**	**0.01%**	**0**
Commerce City	Commercial	10	19	$42,639,308	$42,639,308	$85,278,616	$21,319,654	1.6%	0
Commerce City	Exempt	2	2	$1,224,782	$1,224,782	$2,449,564	$612,391	0.3%	0
Commerce City	Industrial	2	6	$9,456,908	$14,185,362	$23,642,270	$5,910,568	1.5%	0
Commerce City	Residential	1	1	$480,000	$240,000	$720,000	$180,000	0.004%	3
Commerce City	**Total**	**15**	**28**	**$53,800,998**	**$53,800,998**	**$107,601,996**	**$26,900,499**	**0.1%**	**3**
Federal Heights	Exempt	1	1	$415,001	$415,001	$830,002	$207,501	2.4%	0
Federal Heights	Residential	6	120	$89,000,000	$44,500,000	$133,500,000	$33,375,000	2.4%	343
Federal Heights	**Total**	**7**	**121**	**$89,415,001**	**$89,415,001**	**$178,830,002**	**$44,707,501**	**2.3%**	**343**
Northglenn	Commercial	1	1	$2,888,879	$2,888,879	$5,777,758	$1,444,440	0.3%	0
Northglenn	Exempt	1	1	$48,528	$48,528	$97,056	$24,264	0.3%	0

Jurisdiction	Property Type	Improved Parcels	Building Count	Improved Value	Estimated Content Value	Total Value	Estimated Loss	Buildings At Risk %	Population At Risk
Northglenn	Industrial	1	1	$3,452,365	$5,178,548	$8,630,913	$2,157,728	5.6%	0
Northglenn	Residential	4	4	$1,728,000	$864,000	$2,592,000	$648,000	0.03%	12
Northglenn	**Total**	**7**	**7**	**$8,117,772**	**$8,117,772**	**$16,235,544**	**$4,058,886**	**0.1%**	**12**
Thornton	Agricultural	1	1	$148,793	$148,793	$297,586	$74,397	8.3%	0
Thornton	Commercial	2	2	$1,146,383	$1,146,383	$2,292,766	$573,192	0.2%	0
Thornton	Exempt	5	6	$9,213,688	$9,213,688	$18,427,376	$4,606,844	0.8%	0
Thornton	Residential	6	6	$1,702,000	$851,000	$2,553,000	$638,250	0.01%	19
Thornton	**Total**	**14**	**15**	**$12,210,864**	**$12,210,864**	**$24,421,728**	**$6,105,432**	**0.03%**	**19**
Westminster	Exempt	7	9	$8,634,912	$8,634,912	$17,269,824	$4,317,456	1.4%	0
Westminster	Residential	8	8	$3,782,000	$1,891,000	$5,673,000	$1,418,250	0.03%	23
Westminster	**Total**	**15**	**17**	**$12,416,912**	**$12,416,912**	**$24,833,824**	**$6,208,456**	**0.1%**	**23**
Unincorporated	Agricultural	47	75	$15,006,946	$15,006,946	$30,013,892	$7,503,473	3.5%	0
Unincorporated	Commercial	50	100	$67,728,056	$67,728,056	$135,456,112	$33,864,028	4.6%	0
Unincorporated	Exempt	20	32	$27,345,634	$27,345,634	$54,691,268	$13,672,817	5.0%	0
Unincorporated	Industrial	8	8	$25,367,512	$38,051,268	$63,418,780	$15,854,695	4.4%	0
Unincorporated	Residential	183	338	$122,714,697	$61,357,349	$184,072,046	$46,018,011	1.0%	1,028
Unincorporated	**Total**	**308**	**553**	**$258,162,845**	**$209,489,253**	**$467,652,098**	**$116,913,024**	**1.5%**	**1,028**
	Grand Total	**417**	**906**	**$558,724,700**	**$510,051,108**	**$1,068,775,808**	**$267,193,952**	**0.5%**	**1,807**

Source: Adams, Arapahoe, and Weld County Assessor Data 2024, FEMA Effective NFHL: Adams 12/2/2021, Arapahoe 4/11/2024, Weld 8/15/2024, WSP GIS Analysis

Table 4-46 Adams County Risk to FEMA 0.2% Annual Chance Flood Hazards

Jurisdiction	Property Type	Improved Parcels	Building Count	Improved Value	Estimated Content Value	Total Value	Estimated Loss	Buildings At Risk %	Population At Risk
Aurora	Commercial	83	178	$188,178,422	$188,178,422	$376,356,844	$94,089,211	17.5%	0
Aurora	Exempt	11	15	$64,998,923	$64,998,923	$129,997,846	$32,499,462	3.1%	0
Aurora	Industrial	8	8	$50,173,577	$75,260,366	$125,433,943	$31,358,486	6.4%	0
Aurora	Residential	841	2,244	$454,677,715	$227,338,858	$682,016,573	$170,504,143	14.2%	6,975
Aurora	**Total**	**943**	**2,445**	**$758,028,637**	**$555,776,568**	**$1,313,805,205**	**$328,451,301**	**14.0%**	**6,975**
Brighton	Commercial	2	4	$5,238,693	$5,238,693	$10,477,386	$2,619,347	0.6%	0
Brighton	Exempt	2	2	$78,008	$78,008	$156,016	$39,004	0.4%	0
Brighton	Residential	82	169	$77,648,209	$38,824,105	$116,472,314	$29,118,078	1.2%	499
Brighton	**Total**	**86**	**175**	**$82,964,910**	**$44,140,806**	**$127,105,716**	**$31,776,429**	**1.2%**	**499**
Commerce City	Commercial	10	71	$10,201,904	$10,201,904	$20,403,808	$5,100,952	6.0%	0
Commerce City	Exempt	2	44	$0	$0	$0	$0	7.0%	0
Commerce City	Industrial	4	10	$11,077,041	$16,615,562	$27,692,603	$6,923,151	2.5%	0
Commerce City	**Total**	**16**	**125**	**$21,278,945**	**$26,817,466**	**$48,096,411**	**$12,024,103**	**0.5%**	**0**
Federal Heights	Residential	1	6	$16,450,000	$8,225,000	$24,675,000	$6,168,750	0.1%	17
Federal Heights	**Total**	**1**	**6**	**$16,450,000**	**$8,225,000**	**$24,675,000**	**$6,168,750**	**0.1%**	**17**
Northglenn	Commercial	1	1	$5,264,185	$5,264,185	$10,528,370	$2,632,093	0.3%	0
Northglenn	Exempt	2	3	$3,049,089	$3,049,089	$6,098,178	$1,524,545	0.9%	0
Northglenn	Residential	64	64	$25,699,928	$12,849,964	$38,549,892	$9,637,473	0.5%	188
Northglenn	**Total**	**67**	**68**	**$34,013,202**	**$21,163,238**	**$55,176,440**	**$13,794,110**	**0.5%**	**188**
Thornton	Exempt	2	4	$14,142,822	$14,142,822	$28,285,644	$7,071,411	0.5%	0
Thornton	Residential	113	141	$230,781,974	$115,390,987	$346,172,961	$86,543,240	0.3%	437
Thornton	**Total**	**115**	**145**	**$244,924,796**	**$129,533,809**	**$374,458,605**	**$93,614,651**	**0.3%**	**437**

Jurisdiction	Property Type	Improved Parcels	Building Count	Improved Value	Estimated Content Value	Total Value	Estimated Loss	Buildings At Risk %	Population At Risk
Westminster	Exempt	3	3	$12,595,842	$12,595,842	$25,191,684	$6,297,921	0.5%	0
Westminster	Residential	9	9	$5,314,000	$2,657,000	$7,971,000	$1,992,750	0.04%	26
Westminster	**Total**	**12**	**12**	**$17,909,842**	**$15,252,842**	**$33,162,684**	**$8,290,671**	**0.05%**	**26**
Unincorporated	Agricultural	3	4	$521,232	$521,232	$1,042,464	$260,616	0.2%	0
Unincorporated	Commercial	22	45	$29,296,470	$29,296,470	$58,592,940	$14,648,235	2.1%	0
Unincorporated	Exempt	2	13	$1,143,300	$1,143,300	$2,286,600	$571,650	2.0%	0
Unincorporated	Industrial	2	3	$2,952,426	$4,428,639	$7,381,065	$1,845,266	1.7%	0
Unincorporated	Residential	215	226	$72,119,973	$36,059,987	$108,179,960	$27,044,990	0.7%	687
Unincorporated	**Total**	**244**	**291**	**$106,033,401**	**$71,449,628**	**$177,483,029**	**$44,370,757**	**0.8%**	**687**
	Grand Total	**1,484**	**3,267**	**$1,281,603,733**	**$872,359,356**	**$2,153,963,089**	**$538,490,772**	**1.7%**	**8,828**

Source: Adams, Arapahoe, and Weld County Assessor Data 2024, FEMA Effective NFHL: Adams 12/2/2021, Arapahoe 4/11/2024, Weld 8/15/2024, WSP GIS Analysis

Table 4-47 Adams County Risk to FEMA 1% Annual Chance Future Conditions Flood Hazards

Jurisdiction	Property Type	Improved Parcels	Building Count	Improved Value	Estimated Content Value	Total Value	Estimated Loss	Buildings At Risk %	Population At Risk
Unincorporated	Agricultural	4	6	$1,313,633	$1,313,633	$2,627,266	$656,817	0.3%	0
Unincorporated	Exempt	1	2	$359,115	$359,115	$718,230	$179,558	0.3%	0
Unincorporated	Residential	15	22	$10,230,202	$5,115,101	$15,345,303	$3,836,326	0.1%	67
	Total	**20**	**30**	**$11,902,950**	**$6,787,849**	**$18,690,799**	**$4,672,700**	**0.1%**	**67**

Source: Adams County Assessor Data 2024, FEMA Effective NFHL: Adams 12/2/2021, WSP GIS Analysis

Table 4-48 Adams County Risk to FEMA Areas Protected by Levee Flood Hazards

Jurisdiction	Property Type	Improved Parcels	Building Count	Improved Value	Estimated Content Value	Total Value	Estimated Loss	Buildings At Risk %	Population At Risk
Aurora	Commercial	47	49	$46,151,916	$46,151,916	$92,303,832	$23,075,958	4.8%	0
Aurora	Exempt	6	7	$12,308,768	$12,308,768	$24,617,536	$6,154,384	1.4%	0
Aurora	Industrial	4	23	$25,620,547	$38,430,821	$64,051,368	$16,012,842	18.4%	0
Aurora	Residential	383	383	$134,523,000	$67,261,500	$201,784,500	$50,446,125	2.4%	1,190
	Total	**440**	**462**	$218,604,231	$164,153,005	$382,757,236	**$95,689,309**	**2.6%**	**1,190**

Source: Adams County Assessor Data 2024, FEMA Effective NFHL: Adams 12/2/2021, WSP GIS Analysis

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 Adams County. Results are summarized in the following tables.

The CWCB BLE floodplain analysis identifies substantial parcel-level exposure throughout Adams County. Within the draft 1% annual chance floodplain, nearly 245 improved parcels and 440 structures are located in high-risk areas, representing over $875 million in total value. Of that, estimated potential damages reach $219 million, with approximately 839 residents at risk. Unincorporated Adams County contains the largest share of exposed parcels, followed by Aurora and Commerce City.

In the 0.2% annual chance floodplain, the exposure increases significantly. Over 540 improved parcels and 920 structures fall within this broader risk zone, representing more than $1.7 billion in total value, with potential damages exceeding $427 million. The population at risk nearly triples, reaching 2,158 residents. Aurora again leads in both building and population exposure, followed by Unincorporated areas and Westminster.

Across both flood scenarios, commercial and residential parcels account for the largest concentration of risk, especially in jurisdictions like Thornton, Aurora, Commerce City, and Northglenn. The data reinforces the importance of incorporating CWCB BLE results into long-term floodplain management and mitigation planning, especially as the data reflects evolving topography and future hydrologic modeling that FEMA has not yet adopted.

Table 4-49 and Table 4-50 show Adams County risk to CWCB 1% and 0.2% annual chance flood hazards, below.

Table 4-49 Adams County Risk to CWCB 1% Annual Chance Flood Hazards

Jurisdiction	Property Type	Improved Parcels	Building Count	Improved Value	Estimated Content Value	Total Value	Estimated Loss	Buildings At Risk %	Population At Risk
Arvada	Commercial	5	5	$2,665,637	$2,665,637	$5,331,274	$1,332,819	6.6%	0
Arvada	Industrial	1	4	$1,036,850	$1,555,275	$2,592,125	$648,031	30.8%	0
Arvada	**Total**	**6**	**9**	**$3,702,487**	**$4,220,912**	**$7,923,399**	**$1,980,850**	**0.7%**	**0**
Aurora	Commercial	13	13	$65,914,107	$65,914,107	$131,828,214	$32,957,054	1.3%	0
Aurora	Exempt	2	2	$56,294	$56,294	$112,588	$28,147	0.4%	0
Aurora	Residential	25	80	$49,661,686	$24,830,843	$74,492,529	$18,623,132	0.5%	249
Aurora	**Total**	**40**	**95**	**$115,632,087**	**$90,801,244**	**$206,433,331**	**$51,608,333**	**0.5%**	**249**
Bennett	Agricultural	1	1	$24,048	$24,048	$48,096	$12,024	25.0%	0
Bennett	**Total**	**1**	**1**	**$24,048**	**$24,048**	**$48,096**	**$12,024**	**0.1%**	**0**
Brighton	Commercial	4	4	$3,811,894	$3,811,894	$7,623,788	$1,905,947	0.6%	0
Brighton	Exempt	2	2	$103,909	$103,909	$207,818	$51,955	0.4%	0
Brighton	Residential	28	28	$9,599,000	$4,799,500	$14,398,500	$3,599,625	0.2%	83
Brighton	**Total**	**34**	**34**	**$13,514,803**	**$8,715,303**	**$22,230,106**	**$5,557,527**	**0.2%**	**83**
Commerce City	Commercial	10	12	$17,369,618	$17,369,618	$34,739,236	$8,684,809	1.0%	0
Commerce City	Exempt	2	25	$1,224,782	$1,224,782	$2,449,564	$612,391	4.0%	0
Commerce City	Industrial	5	5	$58,039,393	$87,059,090	$145,098,483	$36,274,621	1.2%	0
Commerce City	Residential	1	2	$296,525	$148,263	$444,788	$111,197	0.01%	6
Commerce City	**Total**	**18**	**44**	**$76,930,318**	**$105,801,752**	$182,732,070	**$45,683,018**	**0.2%**	**6**
Federal Heights	Residential	6	53	$89,000,000	$44,500,000	$133,500,000	$33,375,000	1.1%	152
Federal Heights	**Total**	**6**	**53**	**$89,000,000**	**$44,500,000**	$133,500,000	**$33,375,000**	**1.0%**	**152**
Northglenn	Commercial	1	1	$1,846,592	$1,846,592	$3,693,184	$923,296	0.3%	0
Northglenn	Industrial	1	1	$3,452,365	$5,178,548	$8,630,913	$2,157,728	5.6%	0

Jurisdiction	Property Type	Improved Parcels	Building Count	Improved Value	Estimated Content Value	Total Value	Estimated Loss	Buildings At Risk %	Population At Risk
Northglenn	Residential	6	9	$34,284,528	$17,142,264	$51,426,792	$12,856,698	0.1%	26
Northglenn	**Total**	**8**	**11**	**$39,583,485**	**$24,167,404**	**$63,750,889**	**$15,937,722**	**0.1%**	**26**
Thornton	Commercial	6	8	$25,796,054	$25,796,054	$51,592,108	$12,898,027	0.7%	0
Thornton	Exempt	3	5	$9,167,484	$9,167,484	$18,334,968	$4,583,742	0.6%	0
Thornton	Residential	5	5	$1,541,000	$770,500	$2,311,500	$577,875	0.01%	15
Thornton	**Total**	**14**	**18**	**$36,504,538**	**$35,734,038**	**$72,238,576**	**$18,059,644**	**0.04%**	**15**
Westminster	Commercial	1	1	$138,250	$138,250	$276,500	$69,125	0.1%	0
Westminster	Exempt	5	6	$6,266,779	$6,266,779	$12,533,558	$3,133,390	1.0%	0
Westminster	Residential	14	14	$38,877,706	$19,438,853	$58,316,559	$14,579,140	0.1%	41
Westminster	**Total**	**20**	**21**	**$45,282,735**	**$25,843,882**	**$71,126,617**	**$17,781,654**	**0.1%**	**41**
Unincorporated	Agricultural	29	43	$9,331,362	$9,331,362	$18,662,724	$4,665,681	2.0%	0
Unincorporated	Commercial	11	13	$8,979,692	$8,979,692	$17,959,384	$4,489,846	0.6%	0
Unincorporated	Exempt	8	9	$1,447,975	$1,447,975	$2,895,950	$723,988	1.4%	0
Unincorporated	Industrial	1	1	$212,761	$319,142	$531,903	$132,976	0.6%	0
Unincorporated	Residential	49	88	$50,458,406	$25,229,203	$75,687,609	$18,921,902	0.3%	268
Unincorporated	**Total**	98	154	**$70,430,196**	**$45,307,374**	**$115,737,570**	**$28,934,392**	**0.4%**	**268**
	Grand Total	245	440	**$490,604,697**	**$385,115,956**	**$875,720,653**	**$218,930,163**	**0.2%**	**839**

Source: Adams, Arapahoe, and Weld County Assessor Data 2024, Colorado Water Conservation Board, WSP GIS Analysis

Table 4-50 Adams County Risk to CWCB 0.2% Annual Chance Flood Hazards

Jurisdiction	Property Type	Improved Parcels	Building Count	Improved Value	Estimated Content Value	Total Value	Estimated Loss	Buildings At Risk %	Population At Risk
Arvada	Commercial	6	6	$15,926,638	$15,926,638	$31,853,276	$7,963,319	7.9%	0
Arvada	Industrial	1	1	$1,036,850	$1,036,850	$2,073,700	$518,425	7.7%	0
Arvada	**Total**	**7**	**7**	**$16,963,488**	**$16,963,488**	**$33,926,976**	**$8,481,744**	**0.6%**	**0**

Jurisdiction	Property Type	Improved Parcels	Building Count	Improved Value	Estimated Content Value	Total Value	Estimated Loss	Buildings At Risk %	Population At Risk
Aurora	Commercial	45	85	$188,893,465	$188,893,465	$377,786,930	$94,446,733	8.3%	0
Aurora	Exempt	2	2	$4,748,829	$4,748,829	$9,497,658	$2,374,415	0.4%	0
Aurora	Industrial	3	3	$9,261,346	$9,261,346	$18,522,692	$4,630,673	2.4%	0
Aurora	Residential	108	284	$79,161,721	$79,161,721	$158,323,442	$39,580,861	1.8%	883
Aurora	**Total**	**158**	**374**	**$282,065,361**	**$282,065,361**	**$564,130,722**	**$141,032,681**	**2.1%**	**883**
Brighton	Exempt	2	2	$392,093	$392,093	$784,186	$196,047	0.4%	0
Brighton	Residential	3	3	$1,545,000	$1,545,000	$3,090,000	$772,500	0.02%	9
Brighton	**Total**	**5**	**5**	**$1,937,093**	**$1,937,093**	**$3,874,186**	**$968,547**	**0.03%**	**9**
Commerce City	Commercial	9	15	$19,008,967	$19,008,967	$38,017,934	$9,504,484	1.3%	0
Commerce City	Exempt	2	13	$642,300	$642,300	$1,284,600	$321,150	2.1%	0
Commerce City	Industrial	5	15	$26,785,162	$26,785,162	$53,570,324	$13,392,581	3.7%	0
Commerce City	Residential	7	8	$1,988,019	$1,988,019	$3,976,038	$994,010	0.04%	23
Commerce City	**Total**	**23**	**51**	**$48,424,448**	**$48,424,448**	**$96,848,896**	**$24,212,224**	**0.2%**	**23**
Federal Heights	Residential	6	52	$89,000,000	$89,000,000	$178,000,000	$44,500,000	1.0%	149
Federal Heights	**Total**	**6**	**52**	**$89,000,000**	**$89,000,000**	$178,000,000	**$44,500,000**	**1.0%**	**149**
Lochbuie	Agricultural	1	1	$473,384	$473,384	$946,768	$236,692	100.0%	0
Lochbuie	**Total**	**1**	**1**	**$473,384**	**$473,384**	**$946,768**	**$236,692**	**0.7%**	**0**
Northglenn	Commercial	1	1	$1,178,713	$1,178,713	$2,357,426	$589,357	0.3%	0
Northglenn	Exempt	1	1	$494,574	$494,574	$989,148	$247,287	0.3%	0
Northglenn	Residential	20	23	$39,363,528	$39,363,528	$78,727,056	$19,681,764	0.2%	67
Northglenn	**Total**	**20**	**23**	**$39,363,528**	**$39,363,528**	**$78,727,056**	**$19,681,764**	**0.2%**	**67**
Thornton	Commercial	3	3	$29,885,395	$29,885,395	$59,770,790	$14,942,698	0.3%	0
Thornton	Residential	39	46	$98,069,257	$98,069,257	$196,138,514	$49,034,629	0.1%	142

Jurisdiction	Property Type	Improved Parcels	Building Count	Improved Value	Estimated Content Value	Total Value	Estimated Loss	Buildings At Risk %	Population At Risk
Thornton	**Total**	**42**	**49**	**$127,954,652**	**$127,954,652**	$255,909,304	**$63,977,326**	**0.1%**	**142**
Westminster	Commercial	6	11	$12,729,154	$12,729,154	$25,458,308	$6,364,577	1.5%	0
Westminster	Exempt	5	6	$38,448,689	$38,448,689	$76,897,378	$19,224,345	1.0%	0
Westminster	Residential	74	75	$47,439,888	$47,439,888	$94,879,776	$23,719,944	0.3%	219
Westminster	**Total**	**85**	**92**	**$98,617,731**	**$98,617,731**	**$197,235,462**	**$49,308,866**	**0.4%**	**219**
Unincorporated	Agricultural	20	27	$3,955,035	$3,955,035	$7,910,070	$1,977,518	1.2%	0
Unincorporated	Commercial	10	15	$11,377,133	$11,377,133	$22,754,266	$5,688,567	0.7%	0
Unincorporated	Exempt	4	5	$2,663,535	$2,663,535	$5,327,070	$1,331,768	0.8%	0
Unincorporated	Residential	167	219	$132,701,943	$132,701,943	$265,403,886	$66,350,972	0.7%	666
Unincorporated	**Total**	**201**	**266**	$150,697,646	**$150,697,646**	$301,395,292	**$75,348,823**	**0.7%**	**666**
	Grand Total	**548**	**920**	$855,497,331	**$855,497,331**	$1,710,994,662	**$427,748,666**	**0.5%**	**2,158**

Source: Adams, Arapahoe, and Weld County Assessor Data 2024, Colorado Water Conservation Board, WSP GIS Analysis

People

Across all FEMA-designated flood hazard zones in Adams County, an estimated 11,912 residents are located within areas with mapped flood risk. This includes the 1% annual chance floodplain, 0.2% annual chance floodplain, future conditions flood zones, and areas protected by levees. The breakdown is as follows:

- 1% Annual Chance Floodplain (100-year flood):
    - Approximately 1,807 people are within the effective FEMA 1% floodplain. The highest concentrations are in Unincorporated Adams County (1,028), Aurora (379), Federal Heights (343), and Thornton (19).
- 0.2% Annual Chance Floodplain (500-year flood):
    - Roughly 8,828 people are located within the broader 0.2% floodplain. The largest population exposures occur in:
        - Aurora: 6,975 people
        - Unincorporated areas: 687
        - Brighton: 499
        - Thornton, Northglenn, and Westminster each with smaller concentrations
- Future Conditions 1% Floodplain (Unincorporated only):
    - Approximately 67 people are projected to be at future flood risk as development and hydrologic conditions change.
- Areas Protected by Levee (Aurora only)
    - Despite levee protection, roughly 1,190 people live within these zones, indicating residual flood risk in the event of levee failure or overtopping.

Flood risk to population is notably highest in Aurora, Unincorporated Adams County, and Federal Heights, particularly due to residential exposure in both current and future 1% flood zones and levee-protected areas.

The impacts of flooding on vulnerable populations can be more severe. Compared with the social vulnerability maps in Section 3.5 shows that many of the areas at greatest risk of flooding also have higher social vulnerability stemming from socioeconomic status, household composition and disabilities, minority status and language proficiency, or housing and transportation resources. Families in this area may have fewer financial resources to prepare for or recover from a flood and 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.

Property

Vulnerability to flooding was determined by summing potential losses to Adams County's parcels in GIS, by using the latest FEMA NFHL data along with the County parcel layer the provided by the Assessor's Office. FEMA's NFHL data depicts the 1% annual chance (100-year) and the 0.2% annual chance (500-year) flood events. Flood zones A, AE, and AO are variations of the 1% annual chance event and were included in the analysis due to being present in Adams County. The "Shaded Zone X" along with the subtype 0.2% annual chance hazard zone were used to represent the 500-year flood event.

FEMA flood zones expose significant built infrastructure and economic value across Adams County, with a total of 3,267 buildings and $2.15 billion in total property value (improvements plus contents) at risk across all flood designations. Estimated losses across all zones exceed $538 million.

1% Annual Chance Floodplain:

- 906 buildings across all jurisdictions
- $1.07 billion in total exposed value
- $267 million in estimated losses
- Notable concentrations:
    - Unincorporated Adams County: 553 buildings, $467 million exposed
    - Aurora: 135 buildings, $165 million
    - Federal Heights: 121 buildings, $178 million

0.2% Annual Chance Floodplain:

- 3,267 buildings at risk
- $2.15 billion in total value
- $538 million in estimated losses
- Highest exposures:
    - Aurora: 2,445 buildings, $1.31 billion in value
    - Unincorporated areas: 291 buildings, $177 million
    - Thornton, Northglenn, and Brighton follow with smaller but significant assets in flood zones

Future Conditions Floodplain (Unincorporated only):

- 30 buildings
- $18.6 million in total value
- $4.67 million in estimated losses

Areas Protected by Levee (Aurora only):

- 462 buildings
- $183 million in total value
- $95.6 million in estimated losses
- Industrial and residential structures dominate this risk area, despite the presence of accredited levees

Critical Facilities and Infrastructure

Next, 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. A total of 285 critical facilities across the County are located within one or more FEMA-designated flood hazard zones. These facilities support vital lifeline functions such as transportation, hazardous materials management, safety and security, and utilities.

<u>1% Annual Chance Floodplain (100-Year Flood):</u>

- 208 critical facilities are located in the FEMA 1% floodplain.
- The most impacted categories are:
- Transportation: 152 facilities (73% of total)

- Hazardous Material Sites: 29 facilities
- Water Systems: 15 facilities
- Unincorporated Adams County contains more than half the at-risk facilities (112 total), driven by transportation (82 sites), hazardous materials, and water infrastructure.
- Thornton has the next-highest exposure (39 facilities), followed by Commerce City (18), Aurora (17), and Westminster (12).
- Most jurisdictions have at least one facility intersecting with the 1% annual chance floodplain.

<u>0.2% Annual Chance Floodplain (500-Year Flood):</u>

- An additional 58 critical facilities are located in the FEMA 0.2% flood zone.
- The most affected systems include:
- Transportation: 24 facilities
- Hazardous Material Sites: 17 facilities
- Water Systems: 9 facilities
- Exposure is more widely distributed, with smaller totals across Aurora (19), Commerce City (18), and Thornton (6).
- Unlike the 1% zone, the 0.2% floodplain also intersects safety/security and health/medical facilities, though in smaller numbers.

<u>Future Conditions Floodplain:</u>

- Only three critical facilities are located in the FEMA-modeled future 1% floodplain, all within Unincorporated Adams County and classified under communications infrastructure.
- While current mapped exposure is low, this still points to potential future vulnerabilities if climate or development patterns shift floodplain boundaries.

<u>Areas Protected by Levee:</u>

- 16 critical facilities are located in FEMA-designated areas protected by levees.
- All 16 are located in Arvada, and nearly all are hazardous material sites (13 total).
- This concentrated exposure highlights the residual risk to critical infrastructure even where levees offer protection from the 100-year flood.

Overall, transportation infrastructure is the most commonly exposed facility type across all FEMA flood zones in Adams County, with a significant concentration located within the 1% annual chance floodplain. Unincorporated Adams County and Thornton carry the greatest burden of flood-exposed facilities, accounting for the highest totals of at-risk infrastructure, particularly within the 100-year flood zone. Notably, areas protected by levees still contain a substantial number of hazardous material sites, especially in Arvada, highlighting the need for levee failure scenario planning as part of emergency preparedness. While current exposure in FEMA's future conditions floodplain is limited, the presence of even a few critical facilities underscores the potential for shifting floodplain boundaries to increase vulnerability over time.

Table 4-51 and Table 4-52 show critical facilities at risk to FEMA 1% and 0.2% flood hazards, while Table 4-53 shows critical facilities at risk to FEMA future condition flood hazards by jurisdiction and Table 4-54 shows critical facilities at risk to FEMA levee flood hazards by jurisdiction.

Table 4-51 Critical Facilities at Risk to FEMA 1% Flood Hazards by Jurisdiction

Jurisdiction	Communications		Energy	Food, Hydration, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Water Systems	Total Count
Arvada	-		-	-	1	-	-	-	-	1
Aurora	-		1	-	-	-	-	14	2	17
Bennett	-		-	-	-	-	-	1	-	1
Brighton	-		-	-	-	-	-	4	1	5
Commerce City	-		-	-	4	-	-	14	-	18
Federal Heights	-		-	1	-	-	-	-	-	1
Northglenn	-		-	-	1	-	-	-	1	2
Thornton	-		-	-	6	-	-	28	5	39
Westminster	-		-	-	1	-	-	9	2	12
Unincorporated	4		1	-	16	-	5	82	4	112
Total	4		2	1	29	0	5	152	15	208

Source: FEMA Effective NFHL: Adams 12/2/2021, Arapahoe 4/11/2024, Weld 8/15/2024, Adams County, CDOT, Denver Water, EPA, HIFLD, DWR, NBI, CERC, WSP Analysis

Table 4-52 Critical Facilities at Risk to FEMA 0.2% Flood Hazards by Jurisdiction

Jurisdiction	Communications	Energy	Food, Hydration, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Water Systems	Total Count
Arvada	-	-	-	-	-	-	-	-	**0**
Aurora	-	-	-	5	1	1	12	-	**19**
Bennett	-	-	-	-	-	-	-	-	**0**
Brighton	-	-	-	-	-	-	-	-	**0**
Commerce City	-	1	-	6	-	-	4	7	**18**
Federal Heights	-	-	-	-	-	-	-	-	**0**
Northglenn	-	-	-	1	2	1	-	-	**4**
Thornton	-	-	-	2	-	-	4	-	**6**

Jurisdiction	Communications	Energy	Food, Hydration, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Water Systems	Total Count
Westminster	-	-	-	-	-	1	1	-	**2**
Unincorporated	1	-	-	3	-	-	3	2	**9**
Total	**1**	**1**	**0**	**17**	**3**	**3**	**24**	**9**	**58**

Source: FEMA Effective NFHL: Adams 12/2/2021, Arapahoe 4/11/2024, Weld 8/15/2024, Adams County, CDOT, Denver Water, EPA, HIFLD, DWR, NBI, CERC, WSP Analysis

Table 4-53 Critical Facilities at Risk to FEMA Future Condition Flood Hazards by Jurisdiction

Jurisdiction	Communications	Energy	Food, Hydration, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Water Systems	Total Count
Arvada	-	-	-	-	-	-	-	-	**0**
Aurora	-	-	-	-	-	-	-	-	**0**
Bennett	-	-	-	-	-	-	-	-	**0**
Brighton	-	-	-	-	-	-	-	-	**0**
Commerce City	-	-	-	-	-	-	-	-	**0**
Federal Heights	-	-	-	-	-	-	-	-	**0**
Northglenn	-	-	-	-	-	-	-	-	**0**
Thornton	-	-	-	-	-	-	-	-	**0**
Westminster	-	-	-	-	-	-	-	-	**0**
Unincorporated	3	-	-	-	-	-	-	-	**3**
Total	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**

Source: FEMA Effective NFHL: Adams 12/2/2021, Arapahoe 4/11/2024, Weld 8/15/2024, Adams County, CDOT, Denver Water, EPA, HIFLD, DWR, NBI, CERC, WSP Analysis

Table 4-54 Critical Facilities at Risk to FEMA Levee Flood Hazards by Jurisdiction

Jurisdiction	Communications	Energy	Food, Hydration, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Water Systems	Total Count
Arvada	-	1	-	13	-	1	1	-	**16**
Aurora	-	-	-	-	-	-	-	-	**0**
Bennett	-	-	-	-	-	-	-	-	**0**
Brighton	-	-	-	-	-	-	-	-	**0**
Commerce City	-	-	-	-	-	-	-	-	**0**
Federal Heights	-	-	-	-	-	-	-	-	**0**
Northglenn	-	-	-	-	-	-	-	-	**0**
Thornton	-	-	-	-	-	-	-	-	**0**
Westminster	-	-	-	-	-	-	-	-	**0**
Unincorporated	-	-	-	-	-	-	-	-	**0**
Total	**0**	**1**	**0**	**13**	**0**	**1**	**1**	**0**	**16**

Source: FEMA Effective NFHL: Adams 12/2/2021, Arapahoe 4/11/2024, Weld 8/15/2024, Adams County, CDOT, Denver Water, EPA, HIFLD, DWR, NBI, CERC, WSP Analysis

Table 4-55 and Table 4-56 show critical facilities at risk to CWCB 1% and 0.2% annual chance flood hazards by jurisdiction.

Table 4-55 Critical Facilities at Risk to CWCB 1% Flood Hazards by Jurisdiction

Jurisdiction	Communications	Energy	Food, Hydration, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Water Systems	Total Count
Arvada	-	-	-	1	-	-	-	-	**1**
Aurora	-	-	-	1	-	-	25	-	**26**
Bennett	-	-	-	-	-	-	-	-	**0**
Brighton	-	-	-	1	-	-	5	1	**7**
Commerce City	-	1	-	6	-	-	16	3	**26**
Federal Heights	-	-	1	-	-	-	-	-	**1**
Northglenn	-	-	-	1	-	-	-	1	**2**
Thornton	-	-	-	3	-	-	28	2	**33**

Jurisdiction	Communications	Energy	Food, Hydration, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Water Systems	Total Count
Westminster	-	-	-	-	-	-	18	1	**19**
Unincorporated	2	-	-	6	-	1	88	5	**102**
Total	**2**	**1**	**1**	**19**	**0**	**1**	**180**	**13**	**217**

Source: CWCB, Adams County, CDOT, Denver Water, EPA, HIFLD, Division of Water Resources, National Bridge Inventory, CERC, WSP Analysis

Table 4-56 Critical Facilities at Risk to CWCB 0.2% Flood Hazards by Jurisdiction

Jurisdiction	Communications	Energy	Food, Hydration, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Water Systems	Total Count
Arvada	-	-	-	-	-	-	-	-	**0**
Aurora	-	1	-	4	1	-	1	-	**7**
Bennett	-	-	-	-	-	-	-	-	**0**
Brighton	-	-	-	-	-	-	-	-	**0**
Commerce City	-	-	-	-	-	-	6	2	**8**
Federal Heights	-	-	-	-	-	-	-	-	**0**
Northglenn	-	-	-	-	1	1	1	-	**3**
Thornton	-	-	-	3	-	-	5	-	**8**
Westminster	-	-	-	-	-	-	1	1	**2**
Unincorporated	2	-	1	5	-	-	15	-	**23**
Total	**2**	**1**	**1**	**12**	**2**	**1**	**29**	**3**	**51**

Source: CWCB, Adams County, CDOT, Denver Water, EPA, HIFLD, Division of Water Resources, National Bridge Inventory, CERC, WSP Analysis

The CWCB 1% annual chance floodplain intersects with 217 critical facilities across Adams County. The majority of at-risk infrastructure falls under the transportation category (180 facilities), highlighting potential disruptions to key corridors and evacuation routes. Unincorporated Adams County contains the highest concentration of exposed assets (102), followed by Thornton (33) and Commerce City (26). Notably, hazardous material sites appear in almost every jurisdiction, reinforcing potential environmental risk during flood events. Water systems and communications infrastructure are also present, though in smaller numbers.

In the broader 0.2% annual chance floodplain, exposure increases modestly to 51 critical facilities, with continued dominance of transportation-related assets (29). Aurora, Thornton, and Unincorporated Adams lead in facility exposure under the 0.2% flood scenario. 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.

Together, these datasets reinforce the vulnerability of transportation infrastructure and hazardous material facilities under both near- and long-term flood scenarios. CWCB BLE data—though not yet FEMA-approved—adds valuable context for jurisdictions aiming to preemptively mitigate flood-related critical infrastructure impacts.

National Flood Insurance Program (NFIP) Information

Adams County joined the NFIP on February 01, 1979. The current effective map date is December 02, 2021. Table 4-57, below, shows County-wide NFIP insurance information.

Table 4-57 NFIP Insurance Summary for Adams County

Community Name	Total Premium	A-Zone	No. Policies	Total Coverage	Total Claims Since 1978	Total Paid Since 1978
Adams County	$72,619	56	90	$30,958,000	45	$216,447
Arvada	$141,798	113	236	$66,292,200	74	$77,545
Aurora	$62,153	14	147	$41,102,000	93	$319,222
Brighton	$2,541	0	5	$1,730,000	3	$3,292
Commerce City	$4,692	1	10	$3,304,000	2	$0
Federal Heights	$1,546	0	4	$464,000	7	$25,692
Northglenn	$4,588	7	11	$4,281,000	4	$3,152
Thornton	$10,453	3	30	$7,953,000	11	$33,770
Westminster	$19,974	3	59	$16,818,000	40	$266,251
County Total	**$320,364**	**197**	**592**	**$172,902,000**	**279**	**$945,371**

Source: FEMA Community Information System (CIS), 6/24/2024

As of the latest FEMA National Flood Insurance Program (NFIP) report, Adams County has 592 active policies across unincorporated and municipal areas, with total coverage exceeding $172.9 million. Most policies are concentrated in Arvada (236 policies), Aurora (147), and Westminster (59), which collectively account for 74% of all policies in the county.

Across all communities, 197 policies are located in A Zones, meaning they lie within FEMA's mapped Special Flood Hazard Areas (SFHAs), which carry a 1% annual chance of flooding.

Arvada leads the county in both the number of A-Zone policies (113) and total premium paid ($141,798), but Aurora has the highest cumulative claims payout, totaling $319,222 since 1978. Interestingly, Commerce City has policies and historical claims but has received no payout, indicating low historical damage or potentially denied claims.

Despite a relatively modest number of total policies (592), there have been 279 claims since 1978, resulting in $945,371 in payouts. This suggests that, while the number of policyholders is limited, flood risk remains active across the region.

A notable insight is the discrepancy between premiums and payouts in some jurisdictions—Arvada, for example, has paid significantly more in premiums than it has received in claims, indicating either favorable loss history or conservative coverage behavior.

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 measure 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. FEMA defines a repetitive loss property 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 severe repetitive loss property is one for which the program has either made at least four payments of more than $5,000 or at least two building-only payments that exceeded the value of the property. Repetitive loss and severe repetitive loss properties may or may not be currently insured by the NFIP.

Ther are currently five repetitive loss properties and one severe repetitive loss property in Adams County, located in the following jurisdictions:

- Aurora: one repetitive loss property (residential)
- Thorton: two repetitive loss properties (residential)
- Westminster: one repetitive loss property and one severe repetitive loss property (both nonresidential)
- Unincorporated County: one repetitive loss property (residential)

Community Rating System (CRS)

The NFIP Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. The three main goals of the CRS are to (1) reduce flood damage to insurable property, (2) strengthen and support the insurance aspects of the NFIP, and (3) encourage a comprehensive approach to floodplain management. CRS offers flood insurance policy premium discounts for communities which develop and apply additional measures past minimum requirements related to floodplain management, and each community's eligibility is based on regular NFIP participation as well as maintaining full compliance with said program. Discounts range from 0% to 45% depending on given credits/scores, which assess the amount and degree of floodplain management measures and activities geared towards minimizing flood related damages, protecting the community and its resources, and developing according to best available codes (FEMA Appendix F: CRS, 2019).

There are 9 CRS classes that can qualify for discounts. Class 9, the lowest level, gives policy holders a 5% premium reduction. Class 1 is the highest level and gives premium discounts of 45% for properties located in the SFHA and 10% for properties outside the SFHA. There are many of activities recognized as measures for minimizing or eliminating exposure to floods. Credit points are assigned to each activity, and the activities are organized under 4 main categories:

- Public Information
- Mapping and Regulation
- Flood Damage Reduction
- Flood Preparedness

Table 4-58 and Table 4-59 show the CRS information and discounts by jurisdiction; currently Adams, Arvada, Aurora, Thornton and Westminster participate in the CRS.

Table 4-58 CRS Class and Discount by Jurisdiction Part 1

CRS Class	Discount	Adams County	Arvada	Aurora	Bennett	Brighton	Commerce City
1	45%	$24,477	$59,751	$11,838	$0	$254	$855
2	40%	$22,108	$53,751	$11,104	$0	$254	$800
3	35%	$19,739	$47,752	$10,369	$0	$254	$745

CRS Class	Discount	Adams County	Arvada	Aurora	Bennett	Brighton	Commerce City
4	30%	$17,370	$41,753	$9,635	$0	$254	$690
5	25%	$15,001	$35,753	$8,900	$0	$254	$635
6	20%	$12,632	$29,754	$8,166	$0	$254	$580
7	15%	$8,685	$20,876	$4,817	$0	$127	$345
8	10%	$6,316	$14,877	$4,083	$0	$127	$290
9	5%	$3,947	$8,878	$3,349	$0	$127	$235

Source: FEMA NFIP, 2024

Table 4-59 CRS Class and Discount by Jurisdiction Part 2

CRS Class	Discount	Federal Heights	Northglenn	Thronton	Westminster	Watkins
1	45%	$155	$1,639	$1,649	$2,573	$0
2	40%	$155	$1,470	$1,581	$2,524	$0
3	35%	$155	$1,302	$1,514	$2,475	$0
4	30%	$155	$1,133	$1,446	$2,426	$0
5	25%	$155	$965	$1,379	$2,377	$0
6	20%	$155	$796	$1,311	$2,328	$0
7	15%	$77	$567	$723	$1,213	$0
8	10%	$77	$398	$656	$1,164	$0
9	5%	$77	$229	$588	$1,115	$0

Source: FEMA NFIP, 2024

Historic, Cultural, and Natural Resources

There are significant historic, cultural, and natural resources and assets located throughout the County (e.g. trails and natural spaces, lakes). 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.

Development Patterns

Of the 14,478 structures built since 2018 (see Section 4.2.2), only 33 are located in FEMA 1% or 0.2% floodplains. The structures in the 1% floodplain are required to incorporate mitigation per local floodplain management regulations. This represents a 0.8% increase in flood exposure, and reflects the success of the jurisdictions' floodplain management programs in limiting development in floodplains. 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. Table 4-60 compares the estimated annual damages for Adams County from flooding for each of the climate and population scenarios.

Table 4-60 Potential Future Economic Losses from Flooding in Adams County

	Population Scenarios		
Climate Scenarios	**Low Growth (~1,200)**	**Medium Growth (~1,600)**	**High Growth (~2,000)**
Current Conditions	Total Damages: $20M Total Damages per person: $20	Total Damages: $20M Total Damages per person: $20	Total Damages: $20M Total Damages per person: $20
Moderately Warmer Climate by 2050	Total Damages: $30M Total Damages per person: $40	Total Damages: $30M Total Damages per person: $30	Total Damages: $30M Total Damages per person: $30
Severely Warmer Climate by 2050	Total Damages: $50M Total Damages per person: $60	Total Damages: $50M Total Damages per person: $60	Total Damages: $50M Total Damages per person: $50

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

Figure 4-25, below, shows flooding that occurred in 2013 in Commerce City.

Figure 4-25 Flooded site near the corner of 72nd Ave. and Fairfax Rd. in Commerce City, Colorado on Thursday, September 12, 2013

Source: The Denver Post, 2013

4.7.8 Risk Summary

- The overall significance of flood hazards in Adams County is **High**, given the widespread exposure of people, property, and infrastructure
- 906 buildings and 417 improved parcels are located within the FEMA 1% annual chance floodplain (SFHA), with an estimated 1,807 people at risk.
- An additional 3,267 buildings are within the FEMA 0.2% annual chance floodplain, affecting an additional 8,828 people.
- 30 buildings and 20 improved parcels are located within Future Conditions flood zones, with 67 people at risk.
- 462 buildings are found in levee-protected areas, including 1,190 residents, highlighting the importance of residual risk management.

- Across all FEMA-designated flood zones, total exposed population exceeds 11,800, and insured property value exceeds $1.7 billion, with estimated losses over $538 million.
- A combined 208 critical facilities are exposed in the 1% floodplain, with additional facilities identified in the 0.2% and levee zones.
- Related hazards: Dam Failure, Earthquake, Winter Weather, Thunderstorms

4.8 Hazardous Materials Incident

Table 4-61 Hazardous Materials Incident Risk Summary

Jurisdiction	Geographic Location	Probability of Future Occurrence	Magnitude/ Severity	Overall Significance
Adams County	Limited	Likely	Limited	Medium
Bennett	Significant	Likely	Limited	Medium
Brighton	Significant	Highly Likely	Critical	High
Commerce City	Significant	Highly Likely	Critical	High
Denver Water	Limited	Likely	Negligible	Low

4.8.1 Hazard Description

Generally, a hazardous material is 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. Hazardous materials may also pose a substantial present or potential hazard to human health or environment when improperly treated, stored, transported, disposed of, or otherwise managed.

Hazardous material incidents can occur while a hazardous substance is stored at a fixed facility, or while the substance is being transported along a road corridor or railroad line or via an enclosed pipeline or other linear infrastructure. In Adams County there are also environmentally contaminated properties also known as brownfields that pose a risk to residents as well as makes redeveloping the sites for future uses challenging. The Environmental Protection Agency (EPA) defines brownfields as, "abandoned, idled or under-used industrial and commercial facilities where expansion or redevelopment is complicated by real or perceived environmental contamination".

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 liquids: flammable (flashpoint below 141°F) combustible (flashpoint from 141 - 200°F)
- 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

Adams County Development Standards and Regulations defines a hazardous materials facility as a facility that produces or stores high volatile, flammable, explosive, toxic and/or water reactive materials (Adams County 2014). These facilities may include:

- Chemical and pharmaceutical plants (chemical plant, pharmaceutical manufacturing);
- Laboratories containing highly volatile, flammable, explosive, toxic, and/or water-reactive materials;
- Refineries;
- Hazardous waste storage and disposal sites; and
- Above ground gasoline or propane storage or sales center.

It is also common to see hazardous materials releases result as escalating incidents from other hazard incidents such as floods and wildfires. The release of hazardous materials can greatly complicate or even eclipse the response to the natural hazards disaster that caused the spill.

4.8.2 Location

Hazmat incidents can occur at fixed facilities or during transportation, as discussed below. Overall, the geographic coverage of this hazard in Adams County is **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.

Figure 4-26 and Figure 4-27 highlight hazardous material routes in Adams County.

Figure 4-26 Hazardous Materials Fixed Facilities and Routes in Adams County

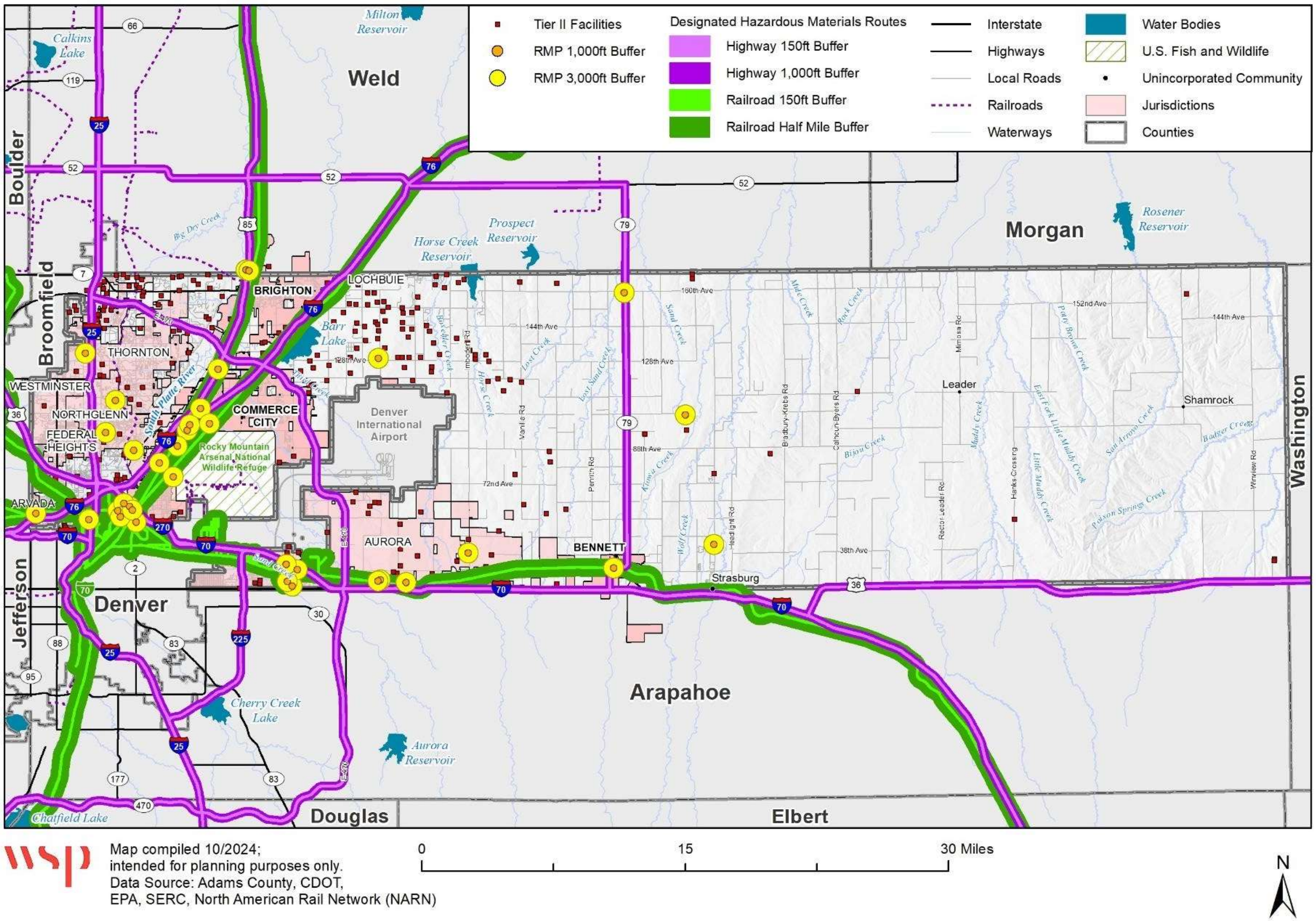
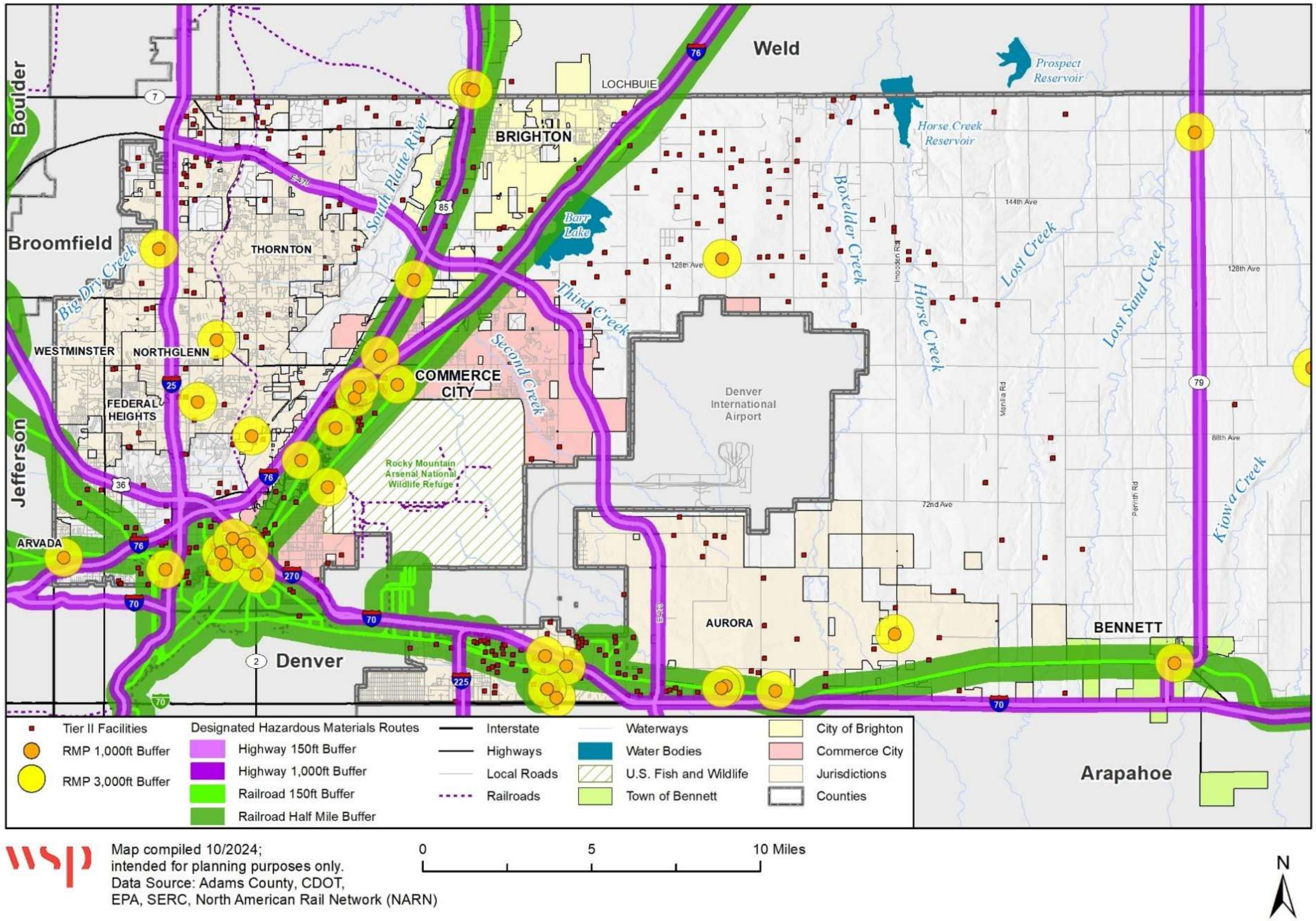


Figure 4-27 Hazardous Materials Fixed Facilities and Routes in Western Adams County



Fixed Facilities

Generally, with a fixed facility, the hazards are pre-identified. The U.S. Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986 requires industries to report on the storage, use, and releases of hazardous substances to federal, state, and local governments. Facilities in Colorado must submit an emergency and hazardous chemical inventory form (Tier II form) to the Colorado Department of Public Health and Environment (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. The EPA also requires facilities containing certain extremely hazardous substances to generate Risk Management Plans (RMPs) and resubmit these plans every five years.

The Adams County Office of Emergency Management administers the EPCRA program for the planning area through the Adams County LEPC. As of September 2024, there are 484 Tier II facilities and 35 RMP sites in Adams County, the most of any Colorado county. Of these, 308 Tier II facilities and 25 RMP sites are located within then participating jurisdictions; refer to Table 4-62**.** below for a breakdown of Tier II Facilities and RMP sites in each jurisdiction. This data was obtained from the Colorado Emergency Planning Commission (CEPC) and the Environmental Protection Agency (EPA).

Table 4-62 Total RMP and Tier II Facilities Counts by Jurisdiction

Jurisdiction	# of Tier II Facilities	# of RMP Sites
Arvada	0	1
Aurora	115	5
Bennett	3	1
Brighton	14	2
Commerce City	79	11
Federal Heights	4	0
Northglenn	4	1
Thornton	43	2
Westminster	10	1
Unincorporated	212	11
Total	**484**	**35**

Source: Environmental Protection Agency (EPA), CERC, Adams County, WSP Analysis

GIS analysis was used to overlay the location of each Tier II facility and RMP sites with dam inundation layers, expansive soil, wildland urban interface (WUI) risk layers and 100-year and 500-year floodplain layers for Colorado Water Conservation Board (CWCB) and FEMA.

Of the 519 RMP and Tier II facilities in Adams County, 29 are located in the FEMA 100-year floodplain, with 16 being located in unincorporated county; 18 are located in the FEMA 500-year floodplain, with five in Aurora and six in Commerce City; Arvada has13 within FEMA's Areas Protected by Levee zones; 0 facilities are located in high expansive soil areas however there are 101 within the moderate expansive soil areas; the WUI Risk areas have five in the highest, none in high, and four in moderate risk areas; and lastly, there are 143 RMP and Tier II facilities are located in a dam inundation path within the planning area.

Transportation

In transit, hazardous materials generally follow major transportation routes, including road, rail, and pipelines, creating a risk area immediately adjacent to these routes. There are five major interstates and highways that traverse Adams County, all of which have the potential for a hazardous materials incident. In particular concern for the western portion of the planning area is Interstate 70, and Interstate 25, both major corridors for the state and the nation and designated as Hazardous Materials routes. Closure on either Interstate due to a hazardous materials incident would significantly disrupt traffic flow between the Denver metropolitan area and the eastern plains leading to severe economic impacts to the Adams County area. State Highway (SH) 79 crosses north-south through the Town of Bennett and is also designated as a hazardous materials route. The County would be severely impacted if an incident were to occur on any of the routes, especially one that caused soil or water contamination.

There are two commercial airports located within and near Adams County, the Colorado Air and Space Port (formerly known as Front Range Airport) in unincorporated eastern Adams County, and Denver International Airport (DIA). DIA, although not part of Adams County jurisdictions, is surrounded by County lands and some flight paths from DIA are above Adams County and incorporated jurisdictions.

Both the Union Pacific Railroad (UPRR) and Burlington Northern Santa Fe Railway (BNSF) have mainline tracks that cross through Adams County, particularly in the western portion of the county. According to the Adams County Comprehensive Plan, the UPRR mainline track, which parallels US 85 averages 11 to 15 trains per day. The BNSF mainline track, adjacent to SH 2 and I-76 north of the interchange averages 28-30 trains per day. One of the UPRR rail lines bisects the Town of Bennett at-grade and has been a concern for the HMPC in the past.

While the western, industrialized portion of the county is where many of the hazardous materials facilities are located, hazardous material incidents can also occur in agricultural areas in the eastern portion of the county; these types of facilities typically use pesticides, fertilizers, and other agricultural chemicals that are potentially harmful to people and the environment if a spill or misuse was to happen. For example, agricultural pesticides and fertilizers are often transported daily around the planning area. Illegal drug operations and dumping sites have also been known to pose a hazardous materials threat.

Zoning

Zoning in the United States were originally developed to help keep residential properties away from the harmful outputs of industrial uses. Zoning allows the County to determine where certain uses (i.e. residential, commercial, industrial, agricultural) are located in their community. Zone districts are created by law in Adams County to control the use of land and development in the county. Current zoning was obtained through Adams County GIS parcel data from the County GIS Department. The following table show a breakdown of the location of Tier II facilities and RMP sites and the corresponding zone district in unincorporated Adams County only. Both Tier II and RMP facilities are most commonly found in agricultural and industrial zoned areas. A majority of hazardous material facilities in the unincorporated areas are located in the Agricultural-3 District (A-3), which primary purpose is to all for dryland or irrigated farming, pasturage, or other related food production uses. Single family dwellings are permitted in the A-3 district, where the majority of Tier II facilities are located.

Table 4-63 RMP and Tier II Facilities by Current Zoning Type (Unincorporated Zoning only)

Current Zoning[1]	# of Tier II Facilities	# of RMP Sites	Total
Agricultural-1	17	0	**17**
Agricultural-2	2	2	**4**
Agricultural-3	114	2	**116**

Current Zoning[1]	# of Tier II Facilities	# of RMP Sites	Total
Aviation	1	1	**2**
Commercial-0	3	0	**3**
Commercial-4	1	0	**1**
Industrial-1	6	0	**6**
Industrial-2	20	0	**20**
Industrial-3	22	6	**28**
Public Lands, Parks, Open Space, Facilities	1	0	**1**
Planned Unit Development	22	0	**22**
Planned Unit Development (Permitted)	6	0	**6**
Residential Estate	1	0	**1**
Total	**216**	**11**	**227**

Source: Environmental Protection Agency (EPA), Colorado Emergency Planning Commission (CEPC), Adams County Zoning, WSP Analysis

1 A-1: Agricultural-1 District – Purpose is to provide rural single-family dwelling district where the minimum lot area for a home site is intended to provide a rural living experience. Limited farming uses are permitted including the keeping of a limited number of animals for individual homeowner's use. This district is primarily designed for the utilization and enjoyment of the County's rural environment.

A-2: Agricultural-2 District - Purpose is to provide a district for rural subdivisions of at least ten (10) acres in size where adequate provisions are made for internal and external roads and access, water and sewer facilities, fire protection and other emergency services, and other public services and utilities. Farming uses are permitted, including the cultivation of land and the keeping of a limited number of animals.

A-3: Agricultural-3 District - Purpose is to provide land primarily in holdings of at least thirty-five (35) acres for dryland or irrigated farming, pasturage, or other related food production uses.

AV: Aviation District - intended to provide for non-residential land uses associated with aviation operations while minimizing risks to public safety and hazards to aviation users including those employed at public aviation facilities.

C-0: Commercial-0 District – Purpose is to provide an office district designed to provide administration and professional services, local employment and services, and provide a small local retail district designed to provide small convenient retail shopping and personal services for persons residing in adjacent residential areas.

C-4: Commercial-4 District - Purpose is to serve as a general retail and service district designed to provide services and products for both the general and traveling public in a regional context.

I-1: Industrial-1 District - Purpose is to provide a general commercial and limited industrial district designed to provide for a variety of compatible business, warehouse, wholesale, offices and very limited industrial uses.

I-2: Industrial-2 District: Purpose is to accommodate light manufacturing, processing, fabrication, assembly, and storage of non-hazardous and/or non-obnoxious material and products as well as allowing service facilities for industries and their employees.

I-3: Industrial-3 District - Purpose is to provide a heavy industrial district designed to accommodate most industrial enterprises.

PL: Public Lands, Parks, Open Space and Facilities District – Purpose is to protect established public lands and to provide an area in the County for location of parks, public open space, government buildings and facilities, schools and school grounds, quasi-public buildings and facilities, and related open space.

P.U.D: Planned Unit Development - The purpose and objective is to encourage the development of land as a single unit. Allows greater flexibility in the design of a development, more variety and diversification in the relationships between buildings, open spaces and uses, and conservation and retention of historical and natural topographic features while meeting the goals, policies and objectives of the comprehensive plan.

P.U.D (P): P.U.D. permitted

R-1-C: Residential -1-C District - The purpose of the Residential-1-C District is to serve exclusively as a single-family district for smaller home sites and smaller homes.

RE: Residential Estate - Purpose is to serve exclusively as a single family detached residential district for larger lots and larger homes in a spacious, open environment away from higher density uses and where agricultural uses and the keeping of livestock are substantially restricted.

4.8.3 Past Occurrences

Hazardous materials incidents occur regularly in Adams County. The 2018 Colorado State Hazard Mitigation Plan notes that Adams County has more transportation and fixed facility hazardous materials releases than any other Colorado county (excluding oil and gas well spills).

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, 1009hazardous materials incidents were reported in Adams County. This number almost certainly excludes a number of very small spills that were not reported to the NRC. This translates to an average of 29 incidents per year. The trend over the last 30 years shows fewer incidents in the 1990s (average of 17 incidents per year), with the number of incidents more than doubling during the 2000s (average of 39 incidents per year), followed by a slight decline during the 2010s (average of 30 incidents per year).

Figure 4-28 Hazardous Materials Incidents Reported in Adams County, 1990-2024

Source: National Response Center

As shown in Table 4-64, the most common types of hazardous material incidents are fixed, with nearly half of incidents taking place at a fixed facility followed by mobile incidents.

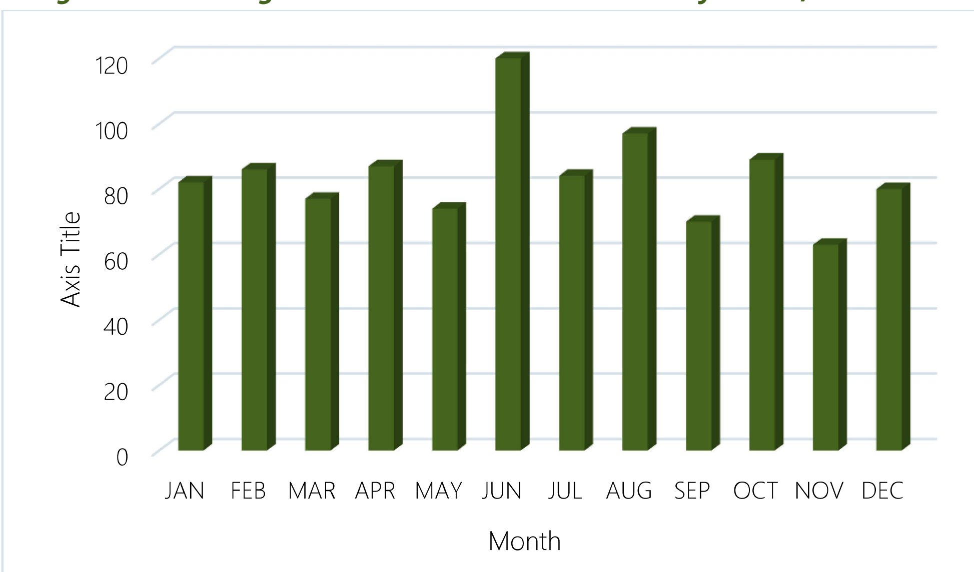
Table 4-64 Hazardous Materials Incidents by Type, 1990 – 2024

Type of Incident	Number of Incidents	Percentage
Fixed	488	48%
Mobile	294	29%
Storage Tank	100	10%
Pipeline	68	7%
Railroad	29	3%
Unknown	19	2%
Aircraft	6	0.6%
Continuous	5	0.5%
Total	**1009**	

Source: National Response Center

While hazardous materials incidents can happen any time of day the most common month for an incident to occur is in the summer months, particularly in June and August. The following figures show the average number of hazardous materials incidents in Adams County in a given month.

Figure 4-29 Average Hazardous Materials Incidents by Month, 1990-2024



Source: National Response Center

Of these 1009 reported incidents listed in the NRC data from 1990 through 2024, only 104 (10%) resulted in any reported injuries, fatalities, evacuations, or property damage. Those 104 incidents are listed as resulting in 11 fatalities, 123 injuries (105 requiring hospitalization), and $700,825 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.

4.8.4 Climate Change Considerations

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

4.8.5 Probability of Future Occurrence

It is almost certain that a hazardous material incident will occur in Adams County in the next 10 years. While the County experiences 29 hazardous materials incidents per year on average, only 2.7 incidents a year cause injuries, fatalities, damage, or evacuations. The probability of future occurrence may be more likely in the City of Commerce City as a majority of the fixed facilities are located in the City's planning area.

4.8.6 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 Adams County have been limited.

4.8.7 Vulnerability

As described above, GIS analysis was used to overlay the location of each Tier II facility and RMP site with CWCB and FEMA 1% and 0.2% floodplain layers, dam inundation layers, expansive soils, and wildland urban interface risk (WUI) hazards. Table 4-65 breakdown the number of Tier II facilities and RMP sites that are at risk to hazards. Of the County's 484 Tier II facilities and 35 RMP sites, a significant number are located in areas at risk of flooding, dam inundation, expansive soils, or wildfire.

Table 4-65 Hazardous Material Facilities and Potential Hazard Risk

Hazard	# of Tier II Facilities	# of RMP Sites	Total
FEMA Flood[1]	53	6	**59**
Dam Inundation[2]	129	14	**143**
Expansive Soil[3]	98	3	**101**
WUI Risk[4]	8	1	**9**

Source: Environmental Protection Agency (EPA), CERC, Adams County, CGS, CWCB, DWR, FEMA, CO Forest Atlas, WSP Analysis

[1]Includes 1%, 0.2%, and protected by levee flood risk
[2]Includes all modeled dam inundation areas
[3]Includes both high and moderate expansive soil risk
[4]Includes highest, high, and moderate WUI risk

People

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. People living near hazardous facilities and along transportation routes may be at a higher risk of exposure, particularly those living or working downstream and downwind from such facilities. For example, a toxic spill or a release of an airborne chemical near a populated area can lead to significant evacuations and have a high potential for loss of life. As shown in Table 4-58, most of the Tier II facilities and RMP sites in unincorporated Adams County many are located in zone districts which permit single family residential uses.

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.

The public's general vulnerability to hazardous materials incidents depends on the hazard. There are three primary exposure pathways for a person to encounter a hazardous material: inhalation, ingestion and skin contact. Effects to people can include burns, breathing problems, and contamination. According to the public survey results, 52.9% of respondents considered hazardous materials incidents a medium concern in Adams County.

Property

Impacts on the built environment are dependent on the site of the hazardous materials spill, weather and environmental conditions, and the material itself. Designated hazardous materials routes are designed to bypass large segments of the built environment as possible. Property located close to fixed facilities and along hazmat transportation routes are especially vulnerable to impacts of hazardous materials, which could include facility damage, cleanup costs, access issues and general interruptions in the ability of the facility to function.

Table 4-66 R, Table 4-67, Table 4-68, Table 4-69, and Table 4-72 summarize the number of properties within the planning buffers. Note that the larger buffer zones include the smaller buffer zones, i.e., the numbers for the 3000' buffer include people in the 1000' buffer. This can also be seen in Table 4-66.

Table 4-66 Risk within 1,000-foot Buffers of a RMP Facility due to Hazmat Release by Property Type

Jurisdiction	Property Type	Improved Parcel Count	Building Count	Buildings At Risk %	Population At Risk
Arvada	Commercial	23	24	31.6%	0
	Exempt	2	6	40.0%	0
	Industrial	4	8	61.5%	0
	Residential	1	1	0.1%	3
	Total	**30**	**39**	**3.1%**	**3**
Aurora	Commercial	13	15	1.5%	0
	Exempt	1	1	0.2%	0
	Industrial	4	4	3.2%	0
	Residential	45	45	0.3%	140
	Total	**63**	**65**	**0.4%**	**140**
Bennett	Commercial	15	15	20.3%	0
	Exempt	5	5	12.5%	0
	Residential	127	127	8.5%	264
	Total	**147**	**147**	**9.1%**	**264**
Brighton	Commercial	7	12	1.8%	0
	Exempt	1	1	0.2%	0
	Industrial	3	3	8.6%	0
	Total	**11**	**16**	**0.1%**	**0**
Commerce City	Commercial	15	25	2.1%	0
	Exempt	6	18	2.8%	0
	Industrial	17	48	11.8%	0
	Residential	35	35	0.2%	102
	Total	**73**	**126**	**0.5%**	**102**
Northglenn	Commercial	8	11	2.8%	0
	Industrial	7	8	44.4%	0
	Residential	137	137	1.0%	401
	Total	**152**	**156**	**1.1%**	**401**
Thornton	Exempt	8	17	2.2%	0
	Residential	252	377	0.8%	1,167
	Total	**260**	**394**	**0.8%**	**1,167**
Westminster	Exempt	1	1	0.2%	0
	Residential	11	18	0.1%	53
	Total	**12**	**19**	**0.1%**	**53**
Unincorporated	Agricultural	2	9	0.4%	0
	Commercial	20	26	1.2%	0
	Exempt	2	2	0.3%	0
	Industrial	2	2	1.1%	0
	Residential	93	104	0.3%	316
	Total	**119**	**143**	**0.4%**	**316**
	Grand Total	**867**	**1,105**	**0.6%**	**2,446**

Source: Adams, Arapahoe, and Weld County Assessor Data 2024, Environmental Protection Agency (EPA), WSP GIS Analysis

Table 4-67 Risk within 3,000-foot Buffers of a RMP Facility due to Hazmat Release by Property Type

Jurisdiction	Property Type	Improved Parcel Count	Building Count	Buildings At Risk %	Population At Risk
Arvada	Commercial	30	43	56.6%	0
	Exempt	4	13	86.7%	0
	Industrial	8	13	100%	0
	Residential	390	398	34.5%	997
	Total	**432**	**467**	**37.1%**	**997**
Aurora	Agricultural	3	7	50.0%	0
	Commercial	74	96	9.4%	0
	Exempt	5	5	1.0%	0
	Industrial	18	25	20.0%	0
	Residential	782	1,190	7.5%	3,699
	Total	**882**	**1,323**	**7.6%**	**3,699**
Bennett	Commercial	37	37	50.0%	0
	Exempt	25	25	62.5%	0
	Residential	888	888	59.7%	1,848
	Total	**950**	**950**	**59.1%**	**1,848**
Brighton	Commercial	48	63	9.3%	0
	Exempt	6	7	1.3%	0
	Industrial	17	27	77.1%	0
	Residential	55	57	0.4%	168
	Total	**126**	**154**	**1.0%**	**168**
Commerce City	Commercial	193	390	32.7%	0
	Exempt	26	76	12.0%	0
	Industrial	116	313	77.1%	0
	Residential	1,345	1,909	8.6%	5,578
	Total	**1,680**	**2,688**	**11.0%**	**5,578**
Northglenn	Commercial	31	37	9.5%	0
	Exempt	13	13	3.9%	0
	Industrial	13	18	100%	0
	Residential	1,553	1,565	11.9%	4,585
	Total	**1,610**	**1,633**	**11.8%**	**4,585**
Thornton	Commercial	32	64	5.8%	0
	Exempt	17	31	4.0%	0
	Residential	2,232	2,479	5.3%	7,676
	Total	**2,281**	**2,574**	**5.3%**	**7,676**
Westminster	Commercial	11	11	1.5%	0
	Exempt	3	5	0.8%	0
	Residential	616	916	3.8%	2,676
	Total	**630**	**932**	**3.6%**	**2,676**

Jurisdiction	Property Type	Improved Parcel Count	Building Count	Buildings At Risk %	Population At Risk
Unincorporated	Agricultural	11	19	0.9%	0
	Commercial	188	303	13.9%	0
	Exempt	20	25	3.9%	0
	Industrial	16	18	10.0%	0
	Residential	1,701	2,093	6.4%	6,364
	Total	**1,936**	**2,458**	**6.5%**	**6,364**
	Grand Total	**10,527**	**13,179**	**6.9%**	**33,591**

Source: Adams, Arapahoe, and Weld County Assessor Data 2024, Environmental Protection Agency (EPA), WSP GIS Analysis

Table 4-68 Risk within 150-foot Buffers of Designated Highways due to Hazmat Release by Property Type

Jurisdiction	Property Type	Improved Parcel Count	Building Count	Buildings At Risk %	Population At Risk
Aurora	Residential	2	2	0.01%	6
	Total	**2**	**2**	**0.01%**	**6**
Bennett	Commercial	13	13	17.6%	0
	Exempt	4	5	12.5%	0
	Residential	3	3	0.2%	6
	Total	**20**	**21**	**1.3%**	**6**
Brighton	Commercial	4	5	0.7%	0
	Exempt	4	21	3.9%	0
	Residential	5	9	0.1%	27
	Total	**13**	**35**	**0.2%**	**27**
Commerce City	Commercial	4	4	0.3%	0
	Residential	66	66	0.3%	193
	Total	**70**	**70**	**0.3%**	**193**
Northglenn	Exempt	1	1	0.3%	0
	Residential	3	3	0.02%	9
	Total	**4**	**4**	**0.03%**	**9**
Thornton	Residential	1	31	0.1%	96
	Total	**1**	**31**	**0.1%**	**96**
Westminster	Exempt	1	1	0.2%	0
	Residential	37	38	0.2%	111
	Total	**38**	**39**	**0.2%**	**111**
Unincorporated	Agricultural	8	10	0.5%	0
	Commercial	10	19	0.9%	0
	Exempt	3	17	2.6%	0
	Industrial	2	2	1.1%	0
	Residential	138	222	0.7%	675
	Total	**161**	**270**	**0.7%**	**675**
	Grand Total	**309**	**472**	**0.2%**	**1,123**

Source: Adams, Arapahoe, and Weld County Assessor Data 2024, Environmental Protection Agency (EPA), WSP GIS Analysis

Table 4-69 Risk within 1,000-foot Buffers of Designated Highways due to Hazmat Release by Property Type

Jurisdiction	Property Type	Improved Parcel Count	Building Count	Buildings At Risk %	Population At Risk
Aurora	Agricultural	2	2	14.3%	0
	Commercial	109	165	16.2%	0
	Exempt	4	11	2.3%	0
	Industrial	16	17	13.6%	0
	Residential	563	1,190	7.5%	3,699
	Total	**694**	**1,385**	**7.9%**	**3,699**
Bennett	Commercial	51	71	95.9%	0
	Exempt	20	24	60.0%	0
	Residential	399	445	29.9%	926
	Total	**470**	**540**	**33.6%**	**926**
Brighton	Commercial	229	296	43.5%	0
	Exempt	33	167	31.2%	0
	Industrial	6	6	17.1%	0
	Residential	700	989	7.1%	2,920
	Total	**968**	**1,458**	**9.6%**	**2,920**
Commerce City	Agricultural	2	3	37.5%	0
	Commercial	108	231	19.4%	0
	Exempt	7	8	1.3%	0
	Industrial	35	47	11.6%	0
	Residential	1,363	1,543	6.9%	4,508
	Total	**1,515**	**1,832**	**7.5%**	**4,508**
Lochbuie	Agricultural	1	1	100%	0
	Commercial	1	1	100%	0
	Residential	80	80	53.7%	5
	Total	**82**	**82**	**54.3%**	**5**
Northglenn	Commercial	30	42	10.7%	0
	Exempt	10	144	42.7%	0
	Residential	1,017	1,571	12.0%	4,603
	Total	**1,057**	**1,757**	**12.7%**	**4,603**
Thornton	Commercial	266	311	28.1%	0
	Exempt	9	11	1.4%	0
	Industrial	1	1	7.1%	0
	Residential	218	417	0.9%	1,291
	Total	**494**	**740**	**1.5%**	**1,291**
Westminster	Commercial	52	58	7.9%	0
	Exempt	11	25	4.0%	0
	Residential	1,500	1,879	7.7%	5,489
	Total	**1,563**	**1,962**	**7.6%**	**5,489**
Unincorporated	Agricultural	52	122	5.6%	0

Jurisdiction	Property Type	Improved Parcel Count	Building Count	Buildings At Risk %	Population At Risk
	Commercial	351	643	29.4%	0
	Exempt	37	133	20.7%	0
	Industrial	43	72	40.0%	0
	Residential	2,408	4,044	12.4%	12,296
	Total	**2,891**	**5,014**	**13.3%**	**12,296**
	Grand Total	**9734**	**14,770**	**7.7%**	**35,737**

Source: Adams, Arapahoe, and Weld County Assessor Data 2024, Environmental Protection Agency (EPA), WSP GIS Analysis

Table 4-70 Risk within 150 foot Buffers of a Designated Railroads Due to Hamat Released by Property Type

Jurisdiction	Property Type	Improved Parcel Count	Building Count	Buildings At Risk %	Population At Risk
Arvada	Commercial	2	2	2.6%	0
	Industrial	1	3	23.1%	0
	Total	**3**	**5**	**0.4%**	**0**
Aurora	Agricultural	1	1	7.1%	0
	Commercial	30	34	3.3%	0
	Industrial	3	3	2.4%	0
	Total	**34**	**38**	**0.2%**	**0**
Bennett	Commercial	4	4	5.4%	0
	Total	**4**	**4**	**0.2%**	**0**
Brighton	Commercial	21	24	3.5%	0
	Exempt	2	2	0.4%	0
	Residential	6	6	0.04%	18
	Total	**29**	**32**	**0.2%**	**18**
Commerce City	Commercial	20	35	2.9%	0
	Exempt	1	1	0.2%	0
	Industrial	11	38	9.4%	0
	Residential	55	89	0.4%	260
	Total	**87**	**163**	**0.7%**	**260**
Westminster	Commercial	13	14	1.9%	0
	Exempt	6	8	1.3%	0
	Residential	90	93	0.4%	272
	Total	**109**	**115**	**0.4%**	**272**
Unincorporated	Commercial	24	34	1.6%	0
	Exempt	7	9	1.4%	0
	Industrial	8	9	5.0%	0
	Residential	49	52	0.2%	158
	Total	**88**	**104**	**0.3%**	**158**
	Grand Total	**354**	**461**	**0.2%**	**708**

Source: Adams, Arapahoe, and Weld County Assessor Data 2024, North American Rail Network, WSP GIS Analysis

Table 4-71 Risk within Half a Mile Buffers of a Designated Railroads Due to Hamat Released by Property Type

Jurisdiction	Property Type	Improved Parcel Count	Building Count	Buildings At Risk %	Population At Risk
Arvada	Commercial	30	43	56.6%	0
	Exempt	4	13	86.7%	0
	Industrial	8	13	100%	0
	Residential	421	429	37.2%	1,074
	Total	**463**	**498**	**39.6%**	**1,074**
Aurora	Agricultural	4	8	57.1%	0
	Commercial	350	468	45.9%	0
	Exempt	18	25	5.1%	0
	Industrial	65	105	84.0%	0
	Residential	1,610	2,298	14.5%	7,143
	Total	**2,047**	**2,904**	**16.6%**	**7,143**
Bennett	Agricultural	1	1	25.0%	0
	Commercial	37	57	77.0%	0
	Exempt	26	32	80.0%	0
	Residential	1,213	1,270	85.3%	2,643
	Total	**1,277**	**1,360**	**84.6%**	**2,643**
Brighton	Agricultural	4	5	16.1%	0
	Commercial	393	516	75.8%	0
	Exempt	83	282	52.6%	0
	Industrial	10	10	28.6%	0
	Residential	2,642	3,068	22.0%	9,057
	Total	**3,132**	**3,881**	**25.5%**	**9,057**
Commerce City	Agricultural	4	4	50.0%	0
	Commercial	520	851	71.4%	0
	Exempt	59	106	16.8%	0
	Industrial	136	350	86.2%	0
	Residential	7,217	8,268	37.2%	24,158
	Total	**7,936**	**9,579**	**39.1%**	**24,158**
Lochbuie	Agricultural	1	1	100%	0
	Commercial	1	1	100%	0
	Residential	82	82	55.0%	6
	Total	**84**	**84**	**55.6%**	**6**
Westminster	Commercial	209	294	40.2%	0
	Exempt	54	107	17.0%	0
	Industrial	3	21	87.5%	0
	Residential	2,924	3,103	12.7%	9,064
	Total	**3,190**	**3,525**	**13.7%**	**9,064**

Jurisdiction	Property Type	Improved Parcel Count	Building Count	Buildings At Risk %	Population At Risk
Unincorporated	Agricultural	44	79	3.6%	0
	Commercial	698	1,265	57.9%	0
	Exempt	71	106	16.5%	0
	Industrial	84	110	61.1%	0
	Residential	5,615	6,714	20.6%	20,415
	Total	**6,512**	**8,274**	**21.9%**	**20,415**
	Grand Total	24,641	**30,105**	**15.7%**	**73,559**

Source: Adams, Arapahoe, and Weld County Assessor Data 2024, North American Rail Network, WSP GIS Analysis

Critical Facilities and Infrastructure

Impacts of hazardous material incidents on critical facilities are 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 4-71, Table 4-72, Table 4-73, and Table 4-74 summarize the number of properties within planning buffers described above. Note the larger buffer zones include smaller buffer zones., i.e., the numbers for the 1000' buffer include people in the 150' buffer.

Table 4-72 Facilities within RMP Facility 1,000' buffer due to Hazmat Release by Jurisdiction

Jurisdiction	Communications	Energy	Food, Hydration, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Water Systems	Total Count
Arvada	-	-	-	1	-	-	1	-	**2**
Aurora	-	1	-	9	-	-	2	-	**12**
Bennett	-	-	-	1	-	4	-	2	**7**
Brighton	-	-	-	2	-	-	1	1	**4**
Commerce City	-	1	-	18	-	3	6	4	**32**
Federal Heights	-	-	-	-	-	-	-	-	**0**
Northglenn	-	-	-	3	-	-	-	-	**3**
Thornton	-	-	1	3	-	-	-	3	**7**
Westminster	-	-	-	2	-	-	2	1	**5**
Unincorporated	1	-	-	16	-	-	-	-	**17**
Total	**1**	**2**	**1**	**55**	**0**	**7**	**12**	**11**	**89**

Source: Environmental Protection Agency (EPA), Adams County, CDOT, Denver Water, HIFLD, Division of Water Resources, National Bridge Inventory, CERC, WSP Analysis

Table 4-73 Facilities within RMP Facility 3,000' buffer due to Hazmat Release by Jurisdiction

Jurisdiction	Communications	Energy	Food, Hydration, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Water Systems	Total Count
Arvada	-	-	-	1	-	1	2	-	**4**
Aurora	-	3	-	21	-	1	6	1	**32**
Bennett	-	-	4	2	-	14	-	6	**26**
Brighton	-	-	-	3	-	1	3	1	**8**
Commerce City	1	4	1	58	1	9	24	5	**103**
Federal Heights	-	-	-	-	-	-	-	-	**0**
Northglenn	-	-	1	4	2	2	-	-	**9**
Thornton	-	-	3	7	1	6	5	4	**26**
Westminster	-	-	-	3	1	-	3	1	**8**
Unincorporated	10	6	-	30	1	2	18	1	**68**
Total	**11**	**13**	**9**	**129**	**6**	**36**	**61**	**19**	**284**

Source: Environmental Protection Agency (EPA), Adams County, CDOT, Denver Water, HIFLD, Division of Water Resources, National Bridge Inventory, CERC, WSP Analysis

Table 4-74 Facilities within Designated Highway 150' buffers due to Hazmat Release by Jurisdiction

Jurisdiction	Communications	Energy	Food, Hydration, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Water Systems	Total Count
Arvada	-	-	-	-	-	-	-	-	**0**
Aurora	-	-	-	1	-	-	25	-	**26**
Bennett	-	-	-	-	-	-	2	2	**4**
Brighton	-	-	-	1	-	-	23	-	**24**
Commerce City	-	-	-	2	-	-	24	-	**26**
Federal Heights	-	-	-	-	-	-	-	-	**0**
Northglenn	-	-	-	-	-	-	5	-	**5**
Thornton	-	-	-	-	-	-	19	-	**19**
Westminster	-	-	-	-	-	-	2	-	**2**
Unincorporated	3	-	-	3	-	-	128	-	**134**
Total	**3**	**0**	**0**	**7**	**0**	**0**	**228**	**2**	**240**

Source: Environmental Protection Agency (EPA), Adams County, CDOT, Denver Water, HIFLD, Division of Water Resources, National Bridge Inventory, CERC, WSP Analysis

Table 4-75 Facilities within Designated Highway 1000' buffers due to Hazmat Release by Jurisdiction

Jurisdiction	Communications	Energy	Food, Hydration, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Water Systems	Total Count
Arvada	-	-	-	-	-	-	-	-	**0**
Aurora	-	2	-	18	-	-	31	-	**51**
Bennett	-	-	3	4	-	12	2	6	**27**
Brighton	1	1	-	6	-	1	26	3	**38**
Commerce City	1	-	-	20	-	3	34	1	**59**
Federal Heights	-	-	-	-	-	-	-	-	**0**
Northglenn	-	-	1	-	3	5	7	1	**17**
Thornton	-	1	1	6	3	3	25	2	**41**
Westminster	-	-	1	1	2	2	5	-	**11**
Unincorporated	27	1	1	31	1	11	154	3	**229**
Total	**29**	**5**	**7**	**86**	**9**	**37**	**284**	**16**	**473**

Source: Environmental Protection Agency (EPA), Adams County, CDOT, Denver Water, HIFLD, Division of Water Resources, National Bridge Inventory, CERC, WSP Analysis

Economy

The primary economic impact of hazardous material incidents results from lost business, delayed deliveries, property damage, and potential contamination. 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 Adams County but also for the entire Denver-metro region.

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.

Historic, Cultural, and Natural Resources

Hazardous material incidents may affect a small area at a regulated facility or cover a large area outside such a facility. Widespread effects occur when hazards contaminate the groundwater and eventually the municipal water supply, or they migrate to a major waterway or aquifer. Impacts on wildlife and natural resources can also be significant.

Development Patterns

Of the 14,478 structures built since 2018 (see Section 3.11), 508 are located within 3,000 feet of an RMP facility; 501 of which are residential, representing a 4.4% increase in exposure to RMP facilities. The biggest increase was in the Town of Bennett, where half of all new construction has been within the 3,000' RMP buffer, resulting in a 29% increase in exposure. The City of Westminster has also had 172 structures built within the 3,000' buffer, representing a 19% increase in their RMP exposure. Development along highways and rial lines has seen more modest increases, in part because there is already so much development in those areas.

While hazardous material sites are occasionally located near incompatible uses such as single-family homes, the County has set forth in their Comprehensive Plan to develop policies for the development of future hazardous materials facilities away from existing residential uses as well as a goal of increased coordination between the Planning Commission and the LEPC when reviewing development applications including changes to a parcels existing zone type.

4.8.8 Risk Summary

- The overall significance of hazardous materials is **medium**.
- There were 1009 hazardous materials incidents reported between 1990-2024, an average of 29 incidents per year. Roughly half of these incidents were at fixed facility sites.
- Only 104 incidents resulted in injuries, fatalities, or evacuations, an average of 3.25 per year. However, most of the fatalities or injuries were caused by the accident, rather than from exposure to a hazardous material.
- Incidents between 1990-2024 caused damages to property resulting in $700,825 in damages.
- There are 484 Tier II facilities and 35 RMP sites classified as Risk Management Plan facilities.
- *Related Hazards*: Cyber Incident, Dam Failure, Earthquake, Flood, Severe Thunderstorms, and Wildfire

4.9 Soil Hazards

Table 4-76 Soil Hazards Risk Summary

Jurisdiction	Geographic Location	Probability of Future Occurrence	Magnitude/ Severity	Overall Significance
Adams County	Limited	Occasional	Limited	Low
Bennett	Limited	Unlikely	Limited	Low
Brighton	Limited	Occasional	Limited	Low
Commerce City	Limited	Likely	Negligible	Low
Denver Water	Limited	Unlikely	Limited	Low

4.9.1 Hazard Description

Soil hazards refer to several related threats based on ground movement or instability.

Expansive soils, also called swelling soils, increase in volume as they get wet and shrink as they dry out. They contain a high percentage of certain kinds of clay particles capable of absorbing large quantities of water. Soil volume may expand 20 percent or more as the clay becomes wet. The powerful force of expansion is capable of exerting pressures of 30,000 pounds per-square-foot or greater on buildings, roads, and other infrastructure.

In many instances, soils do not regain their original dryness after construction, remaining moist and expanded due to the changed environment. However, drought cycles can dramatically increase the number of damages, as the contraction of the dry soils creates a "push and pull" effect on structures and infrastructure.

The more water swelling soils absorb the more and their volume increases. Irrigation of landscaping increases soil moisture as does covering soil with concrete and asphalt. Swelling soils also shrink when they dry out. This can remove support from building foundations, roads, utility lines, etc. Damages to buildings worsen over time due to repeated cycles of swelling and shrinkage.

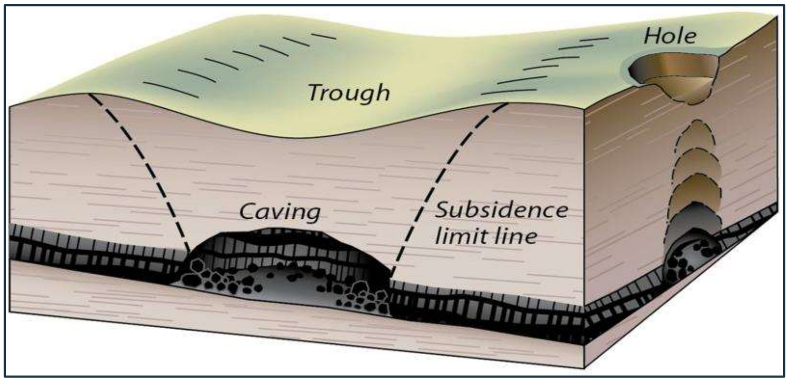
Subsidence is the gradual settling or sudden sinking of earth's surface due to removal or displacement of subsurface earth materials. Natural causes of subsidence include the development of sinkholes, rock sliding downward along faults, and natural sediment compaction. Subsidence often results from human activities such as underground mining or the removal of underground fluids. Principal causes of subsidence include aquifer-system compaction associated with groundwater withdrawals drainage of organic soils, underground mining, natural compaction or collapse such as with sinkholes, or thawing permafrost. Depending on the cause, subsidence can occur rapidly or gradually, and it can be highly localized or uniformly affect a wide area.

Collapsing and settling soils are relatively low-density materials that shrink in volume when they become wet, and/or are subjected to great weight such as from a building or road fill. The process of collapse with the addition of water is also known as hydrocompaction. Subsidence can be affected by periods of drought and precipitation. Collapsing soils are generally strong when dry but are subject to rapid collapse and can reduce in volume by 10 to 15% when wet.

Sinkholes occur where evaporite bedrock (gypsum, anhydrite, and rock salt) dissolves or in areas with karst morphology, which occurs when bedrock dissolves. Karst areas are characterized by underground drainage systems such as caverns or caves.

According to the 2023 Colorado Enhanced State Hazard Mitigation Plan, land subsidence is most common and of greatest concern in areas where the ground settles over undermined areas. Subsidence can manifest gradually over many years, forming sags, or depressions on the ground surface, or it can occur abruptly, creating dangerous ground openings. Over time, gravity and the weight of the rock overlying the mine cause the layers of rock to shift and fall downward into the mine area. As one-layer falls, the void moves upward toward the ground surface where it can cause holes, cracks, tilting, and sags. Even a few inches of settlement can cause significant damage to structures, roads, and utilities. Mine subsidence can occur abruptly or gradually over many years. Figure 4- illustrates the underground causes of coal mine subsidence and depicts how the impacts can manifest at the surface (CGS 2010).

Figure 4-30 Coal Mine Subsidence



Source: Colorado Geological Survey

The State plan notes that land subsidence can also happen where significant groundwater extraction occurs as well as where evaporite bedrock dissolves and forms areas with karst morphology, which are characterized by underground drainage systems such as caverns or caves.

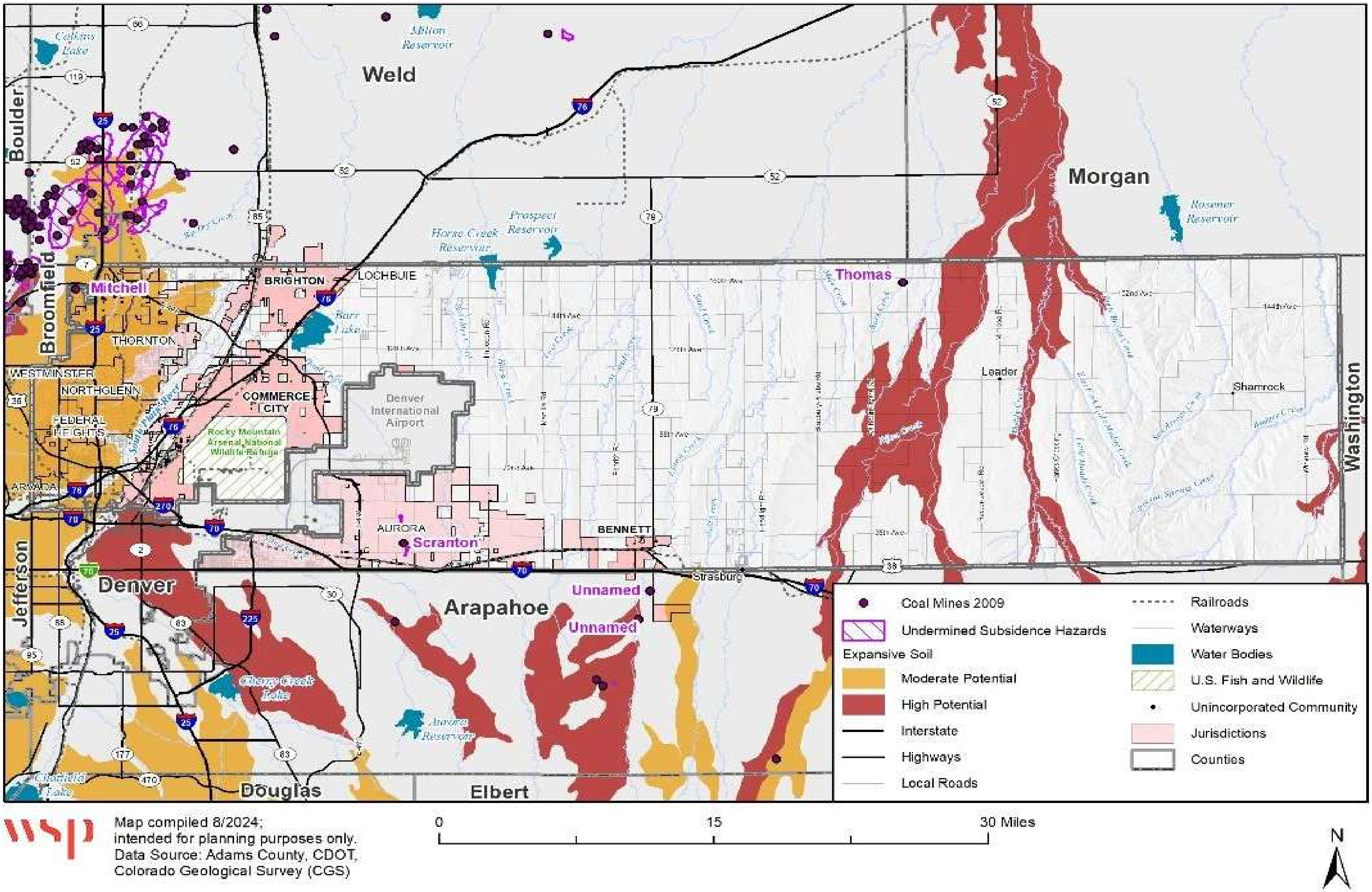
4.9.2 Location

Figure 4-30 shows several areas at moderate to high risk of expansive soil or ground subsidence, based on data from the Colorado Geological Survey. The map also shows areas that have been undermined or have had coal mining, increasing the risk of land subsidence.

Aquifer compaction from unsustainable groundwater extraction can also significantly increase the risk of subsidence. Areas identified as being at increased risk of subsidence due to aquifer compaction are shown in Figure 4-31

Adams County does not have any identified karst or evaporative rock areas, however there are significant karst or potential karst areas surrounding the County, as shown in Figure 4-32.

Figure 4-30 Adams County Expansive Soil & Subsidence



Map compiled 8/2024; intended for planning purposes only. Data Source: Adams County, CDOT, Colorado Geological Survey (CGS)

Figure 4-31 Areas of Potential Ground Subsidence Due to Aquifer Compaction

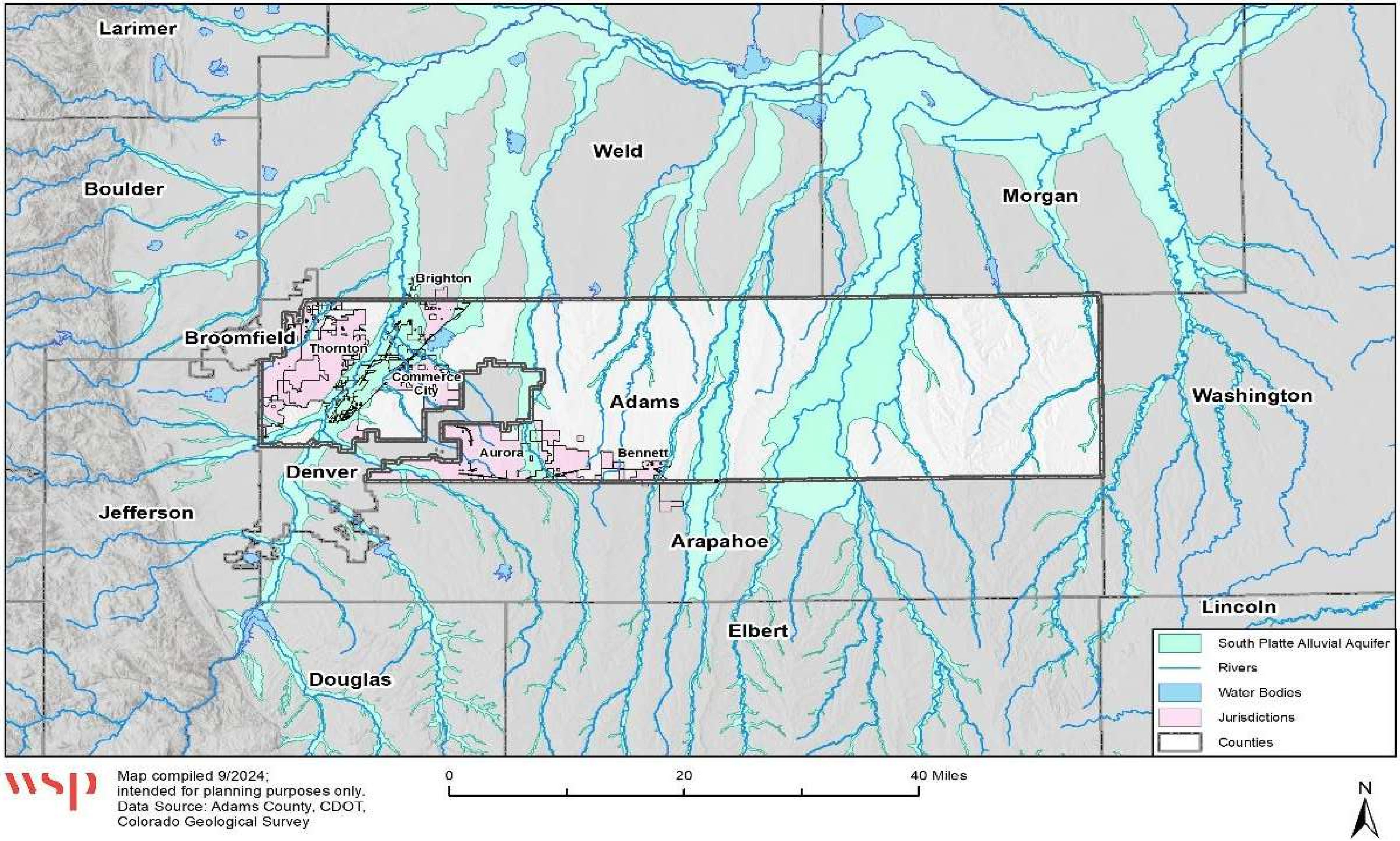
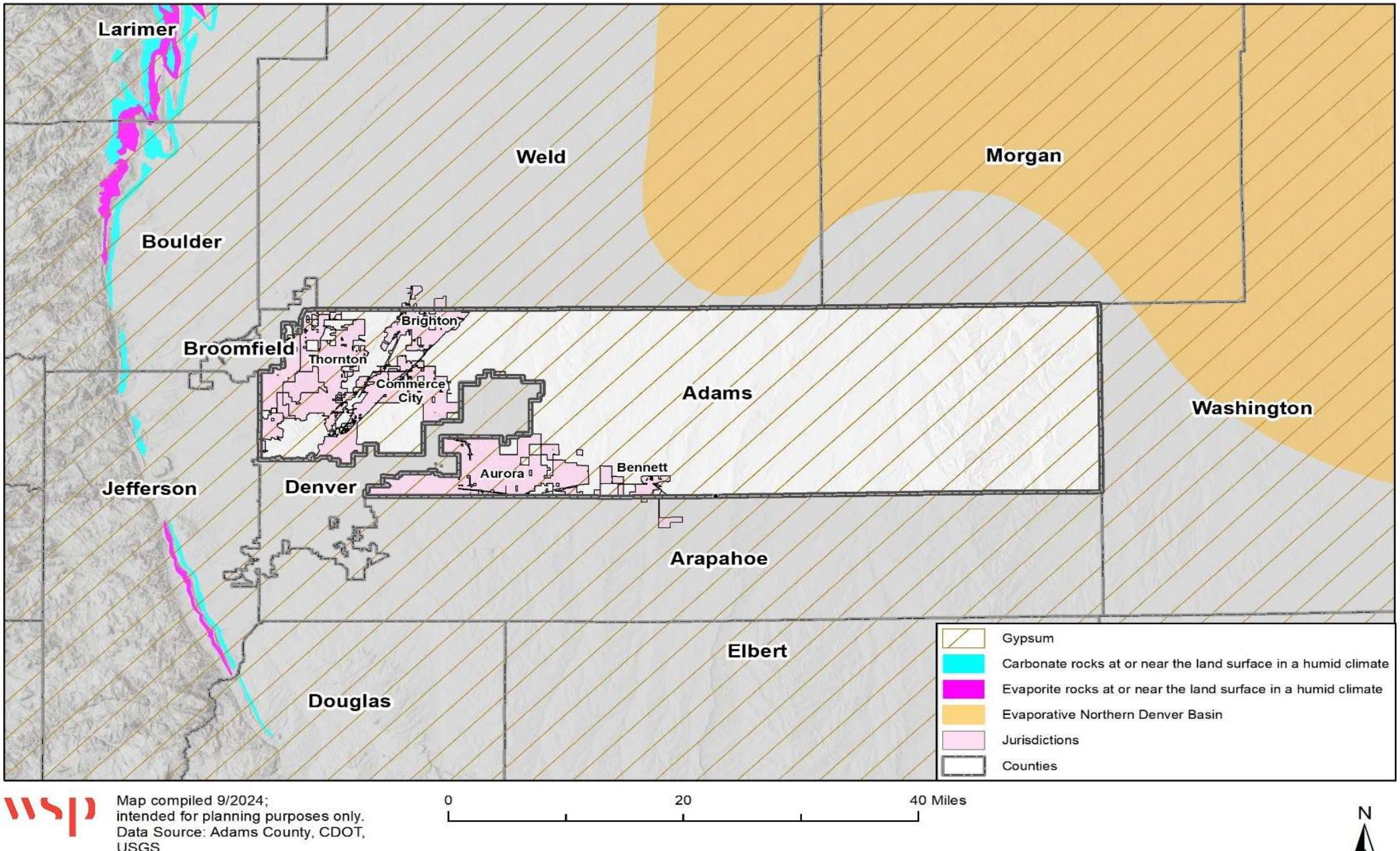


Figure 4-32 Adams County Karst and Potential Karst Areas



4.9.3 Past Occurrences

Subsidence has been an issue historically along the Front Range; however, Adams County has a limited case history of collapsible or expansive soil issues. The Colorado Geological Survey identifies several past collapsible soil incidents in the County, but event details are not available.

4.9.4 Climate Change Considerations

The future impacts of climate change are not expected to influence future subsidence or abandoned mine land hazard events. However, related hazards of drought and flood, which may affect subsidence occurrence and severity, are likely to be impacted by climate change. See Section 4.5. and Section 4.7 for greater discussions of climate change considerations for drought and flood, respectively.

4.9.5 Probability of Future Occurrence

Due to the presence of expansive and collapsible soils and historic coal mines in the planning area, future subsidence events are possible. However, without clear data on historic occurrences, future probability is difficult to predict.

The probability of subsidence is influenced by flood and drought, both of which are likely to occur. Periodic flooding and draining of abandoned mines can cause shifts in mine structures and increase the risk of subsidence. Development activities that cause ground vibrations may also accelerate ground movement, or expansive soils. Additionally, as development continues and expands into undermined areas, the probability of damaging subsidence events will increase. Similarly, with continued demand for mined materials, mining activities may expand and increase the area of exposure to subsidence and the probability of subsidence occurrences.

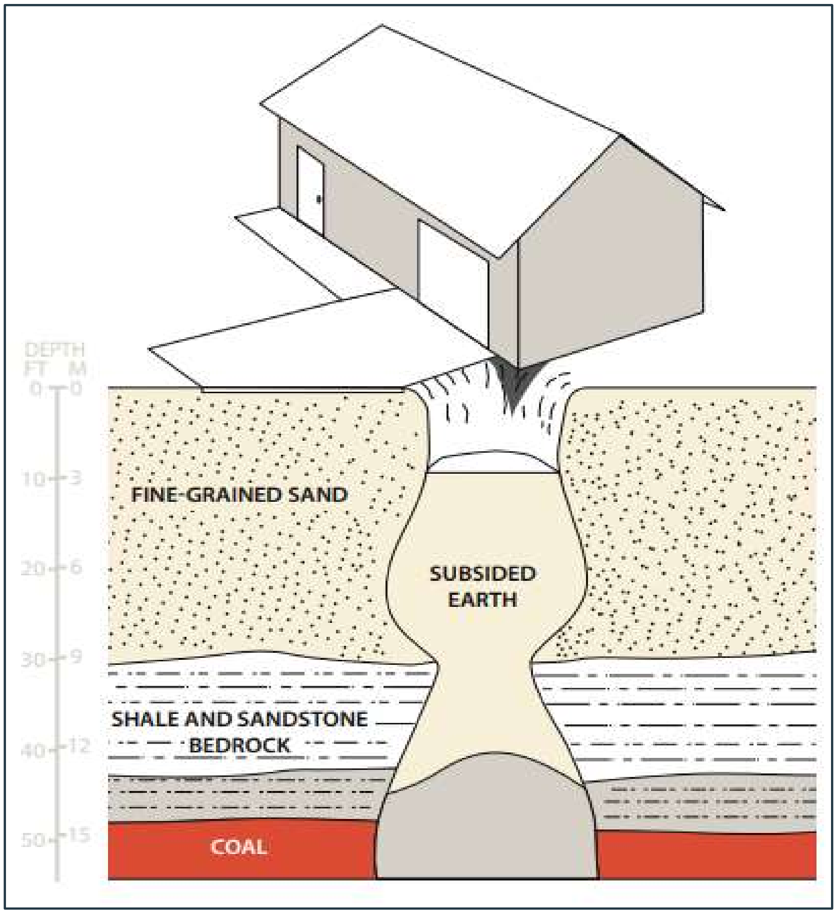
Given there is some limited evidence of past occurrences, it can be reasonably concluded that there is at least a 1% annual chance of some degree of subsidence within the County; therefore, future probability is considered occasional. On a smaller scale, an individual property can be examined for ground movement and expansive soil probability by performing site-specific investigations and exploratory drilling to determine whether the area is undermined. These tests can also allow for mitigation prior to construction.

4.9.6 Magnitude/Severity

The magnitude of a subsidence event can vary substantially, from a gradual settling to an abrupt ground opening. The extent of subsidence depends on the soil composition and susceptibility to collapse. In the case of subsidence related to undermined areas, the severity depends on the depth and geometry of the mine, how much coal was extracted, the overlying geology, and groundwater fluctuations (CGS 2010). Areas can appear to be free of subsidence for many years and then undergo renewed gradual or even drastic subsidence.

Figure 4-40 shows an example of how a subsidence hole might form under a structure.

Figure 4-40 Diagram of Subsidence Pit Under a Structure



Source: State of Colorado Department of Natural Resources Colorado Division of Reclamation, Mining & Safety and the Colorado Geological Survey; Turney, J.E., 1985, Special Publication 26, Subsidence Above Inactive Coal Mines: Information for the Homeowner

4.9.7 Vulnerability

Risk to subsidence is difficult to quantify for Adams County due to the limited data on undermined areas and expansive collapsible soils. Additionally, risk varies greatly depending on the magnitude of the event. The vulnerability information below is based on qualitative and anecdotal information.

People

In most cases of subsidence, injuries and fatalities are unlikely to occur. However, when abandoned mine lands or collapsible soils result in sinkholes, people may be injured if they are directly present at the event location or are in structures or infrastructure that are affected by the collapse. According to parcel analysis data, approximately 82 residents live in areas characterized as having highly expansive soils, where the potential for some form of impact from subsidence is greater. Additionally, an estimated 274,751 people are living in areas characterized as having moderate expansive soils risk areas that could experience some sort of impact from subsidence in varying degrees.

Property

Subsidence can cause anything from minor cracking in structures and building foundations to complete undermining of structural integrity and building collapse. Roads, bridges, irrigation ditches, underground utilities, and pipelines can also be impacted. It is possible that many homes have been built over undermined areas and may be at risk to subsidence. According to parcel analysis data, approximately 179 buildings are in areas characterized as having highly expansive soils, where the potential for some form of impact from subsidence is greater. Additionally, there are 97,078 buildings in areas characterized with having moderate expansive soils risk that could experience some sort of impact from subsidence in varying degrees.

Critical Facilities and Infrastructure

Damage to roads or utilities may cause interruptions in continuity to transportation networks, hospitals and emergency services, schools and public buildings, and water treatment facilities, and communication networks. There are 14 critical facilities at risk to subsidence in the high expansive soils areas and 54 critical facilities in the moderate expansive soil hazard areas.

Economy

Localized subsidence events are unlikely to affect the County's economy, however the repair costs for buildings, irrigation works, roads, utilities, and other infrastructure can be high. Additionally, remediation costs can be high due to costly foundation shoring or the cost of stabilization of the subsidence event itself.

Historic, Cultural, and Natural Resources

When subsidence occurs because of groundwater pumping it can have irreversible consequences for water supply. Excessive pumping can cause soil compaction that reduces the size and number of open pore spaces in the soil that previously held water, resulting in a permanent loss of storage in the aquifer system.

Development Patterns

Of the 14,478 structures built since 2018 (see Section 4.2.2), 3,099 are in areas at moderate risk of expansive soils, representing a 3.2% increase in exposure. In Federal Heights, Northglenn, and Westminster, 100% of new builds are at moderate expansive soils risk, along with 57% of new builds in Thornton and 47% in the unincorporated county. New development practices account for and mitigate expansive soils thus vulnerability has not necessarily increased due to recent development since the previous update of this plan.

Future growth and development throughout Adams County will increase demand for water. If this increased demand results in increases in groundwater extraction, land subsidence due to aquifer compaction may become more common.

Future development may also increase risk by increasing exposure to subsidence. Many old mines are located near present urban areas, and as urban areas grow and expand, development may occur over undermined areas. According to the 2018 Colorado State Hazard Mitigation Plan, as Colorado's population has grown in the past 25 years, many homes have been built over abandoned mines and many homeowners are unaware of this hazard.

4.9.8 Risk Summary

- Adams County is at low risk to subsidence from expansive soils, subsidence, and sink holes.
- Ground settlement can occur very slowly or rapidly, such as with sinkholes.
- The cost of remedial measures to existing buildings/structures is often high.
- Subsidence over abandoned coal mines is a potential hazard.
- Over 80% of known subsidence in the U.S. is due to groundwater extraction.
- The USGS reported that over the last 15 years, sinkholes have caused on average an estimated $300 million dollars per year.
- Related hazards: Flood, Drought, Earthquake

4.10 Terrorism/Active Shooter

Table 4-77 Terrorism Risk Summary

Jurisdiction	Geographic Location	Probability of Future Occurrence	Magnitude/ Severity	Overall Significance
Adams County	Limited	Unlikely	Limited	Low
Bennett	Limited	Unlikely	Limited	Low
Brighton	Limited	Unlikely	Limited	Low
Commerce City	Limited	Unlikely	Limited	Low
Denver Water	Limited	Unlikely	Limited	Low

4.10.1 Hazard Description

There is no single globally agreed-upon definition of terrorism. In a broad sense, terrorism is the use of violence and threats to intimidate or coerce, especially against civilians, in the pursuit of political aims. Terrorism is defined in the United States by the Code of Federal Regulations as "the unlawful use of force or violence against persons or property to intimidate or coerce a government, civilian population, or any segment thereof, in furtherance of political or social objectives."

Domestic terrorism is defined by the US Government Accountability Office as activities that involve acts dangerous to human life that are a violation of the criminal laws of the United States or of any State, appear to be intended to intimidate or coerce a civilian population, influence the policy of a government by intimidation or coercion, or to affect the conduct of a government by mass destruction, assassination, or kidnapping, and occur primarily within the territorial jurisdiction of the United States

A **terrorist attack** is an attack by terrorist groups or individuals against civilians. Another term sometimes used for these types of incidents is "violent extremist attacks." These may involve:

- Coordinated tactical assaults by multiple attackers, such as the 2008 attacks on Mumbai, India;
- Sniping attacks from a distance, as with the 2014 Pennsylvania State Police barracks attack;
- Use of explosives, such as the 2013 Boston Marathon bombing;
- Arson, as in the 1998 arson attack at Vail Ski Resort.

The term **CBRNE** is also sometimes used to refer to the malicious use of chemical, biological, radiological, nuclear, or explosive weapons and devices with the intent to cause significant harm or disruption. These weapons are detailed separately below.

Historically **explosives** have been the most common terrorist weapon, accounting for 51% of all attacks since 1970. Hazard impacts are typically instantaneous; secondary devices may be used, lengthening the duration of the hazard until the attack site is determined to be clear. The extent of damage is determined by the type and quantity of explosive used. Effects are generally static other than cascading consequences and incremental structural failures. Some areas could experience direct weapons' effects: blast and heat; others could experience indirect weapons' effect.

Biological terrorism is the use of biological agents against people or property. Liquid or solid contaminants can be dispersed using sprayers/aerosol generators or by point of line sources such as munitions, covert deposits and moving sprayers. Biological agents vary in the amount of time they pose a threat. They can be a threat for hours to years depending upon the agent and the conditions in which it exists.

A biological attack could also take the form of **agroterrorism**, directed at causing societal and economic damage through the intentional introduction of a contagious animal disease or fast-spreading plant disease that affects livestock and food crops and disrupts the food supply chain. Such an attack could require the agriculture industry to destroy livestock and food crops, disrupt the food supply both nationally and globally, and could also affect consumer confidence in the food supply resulting in tremendous economic damage for potentially extended periods.

Chemical terrorism involves the use or threat of chemical agents against persons or property. The effects of chemical contaminants are similar to biological agents.

Radiological terrorism is the use of radiological materials against people or property. Radioactive contaminants can be dispersed using sprayers/aerosol generators, or by point of line sources such as munitions, covert deposits and moving sprayers or by the detonation of a nuclear device underground, at the surface, in the air or at high altitude.

The U.S. Department of Homeland Security (DHS) defines an **active shooter** as "an individual engaged in attempting to kill people in a confined space or populated area." While many terrorist attacks can also be described as active shooter incidents, here the term is used to refer to non-politically motivated incidents such as recent tragic incidents at schools, places of worship, and workplaces. These attacks are also sometimes called mass shootings. Active shooters typically use firearms although for the purposes of this plan the definition of active shooter is broad and intended to include attacks such as vehicle and knife attacks.

The motivations for committing such acts range from retribution for a perceived injustice, to promoting a specific social or political goal, to acts of violence against racial minorities, LGBTQ persons, or others. Typically, active shooters are not interested in taking hostages or attaining material gain, and frequently aren't even interested in their own survival. Unlike organized terrorist attacks, most active shooter incidents are carried out by one or two individuals.

The U.S. State Department designates 63 groups as Foreign Terrorist Organizations around the world. There is no similar list of domestic terrorist groups. The Global Terrorism Database (GTD) maintained by the National Consortium for the Study of Terrorism and Responses to Terrorism (START) lists 241 groups known or suspected of carrying out terrorist attacks on U.S. soil since 1970.

In 2023, the Southern Poverty Law Center (SPLC) reports 30 active hate groups in Colorado, as shown in Table 4-78. The SPLC defines a hate group as any group with "beliefs or practices that attack or malign an entire class of people – particularly when the characteristics being maligned are immutable." It is important to note that inclusion on the SPLC list is not meant to imply that a group advocates or engages in violence or other criminal activity. None of the hate groups identified by the SPLC have a specifically identified footprint in Adams County, although several are located in the Denver metro area and any group with a statewide footprint may also have a presence in the area.

Table 4-78 Hate Groups Active in Colorado

Group	Ideology	City
American Freedom Network	Conspiracy Propagandists	Johnstown
Asatru Folk Assembly	Neo-Völkisch	Statewide
Colorado Alliance for Immigration Reform	Anti-Immigrant	Lakewood
Colorado Eagle Forum	Antigovernment General	Brighton
Colorado Parents Involved in Education	Antigovernment General	Statewide
Colorado State Assembly	Sovereign Citizens Movement	Statewide
Faith Education Commerce (FEC United)	Antigovernment General	Colorado Springs
Family Research Institute	Anti-LGBTQ	Colorado Springs
Freedom First Society	Antigovernment General	Colorado Springs
Front Range Active Club/Rocky Mountain Active Club	White Nationalist	Statewide

Group	Ideology	City
Generations	Anti-LGBTQ	Elizabeth
III% United Patriots	Militia Movement	Johnstown
Mass Resistance	Anti-LGBTQ	Statewide
Moms for Liberty - Boulder County, CO	Antigovernment General	Boulder County
Moms for Liberty - Garfield County, CO	Antigovernment General	Garfield County
Moms for Liberty - Mesa County, CO	Antigovernment General	Mesa County
Moms for Liberty - Weld County, CO Chapter	Antigovernment General	Weld County
National Justice Party - Colorado	White Nationalist	Statewide
National Socialist Resistance Front	Neo-Nazi	Statewide
Northern Kingdom Prophets	General Hate	Pueblo
Patriot Front	White Nationalist	Statewide
Proud Boys	General Hate	Statewide
Scriptures for America Worldwide Ministries	Christian Identity	Laporte
Team Law	Sovereign Citizens Movement	Grand Junction
The American States Assembly	Sovereign Citizens Movement	Statewide
The Jefferson County Assembly	Sovereign Citizens Movement	Jefferson County
The Pray in Jesus Name Project	Anti-LGBTQ	Colorado Springs
United Network News	Conspiracy Propagandists	Durango
We Are Change	Antigovernment General	Denver, Walsenburg

Source: Southern Poverty Law Center, www.splcenter.org/states/colorado

Terrorist attacks and active shooter incidents can happen anywhere and generally take place with no warning. Duration is dependent on the parameters of the incident; while the incidents themselves are usually relatively short, residual impacts on the community can be long-lasting. The threat of terrorism, both international and domestic, is ever present and an attack can occur when least expected.

4.10.2 Location

Terrorist attacks can occur at any location, but are more likely to target highly populated areas, critical infrastructure, or symbolic locations. Their geographic extent is generally **limited**.

Active shooter incidents can potentially happen at any mass gathering, including workplaces, schools, places of worship, or concerts and special events. A 2014 FBI study of 160 active shooter incidents between 2000 and 2013 found that 45.6% of the incidents took place in a commercial environment, followed by 24.3% in an educational location, with the remaining 30.1% divided between outdoors, military and other government properties, residential properties, houses of worship, and health care facilities.

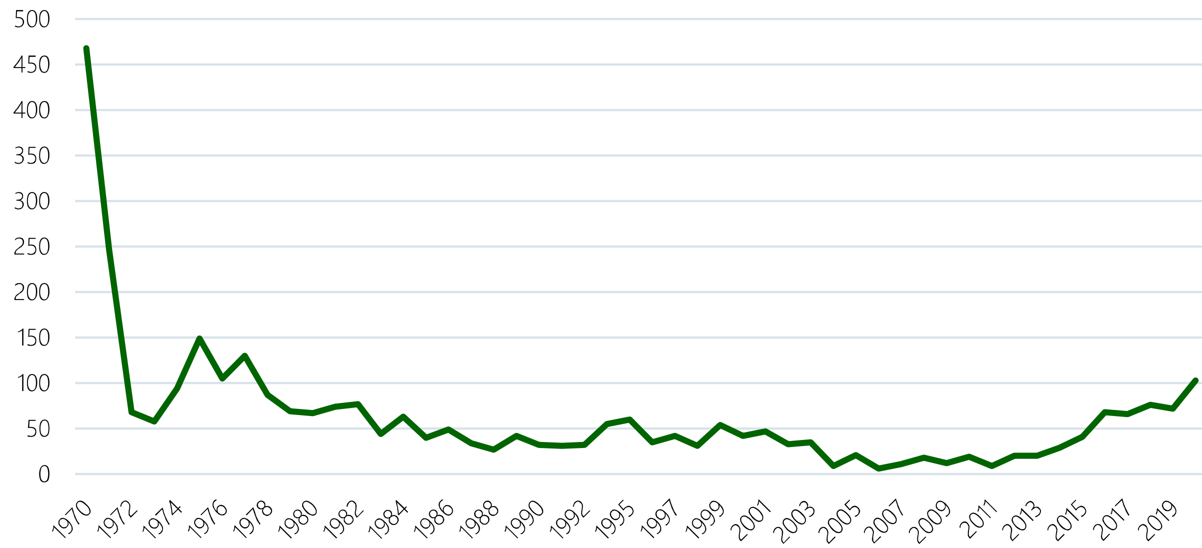
4.10.3 Past Occurrences

Terrorism

The GTD shows that the number of terrorist attacks on US soil has varied over the decades, shown in Figure 4-33. In the 1970s, there was an average of 147.5 incidents per year. This average decreased to 46 per year in the 1980s and 1990s and further declined to 23.4 per year in the 2000s. However, since 2011, there has been an increase, with the average rising to 42.0 per year for the period from 2010 to 2019. In 2020, the last year for which the GTD has data, there were a total of 103 attacks on US soil.

Between 1970 and 2020, the GTD recorded 48 attacks in Colorado, none of which occurred in Adams County.

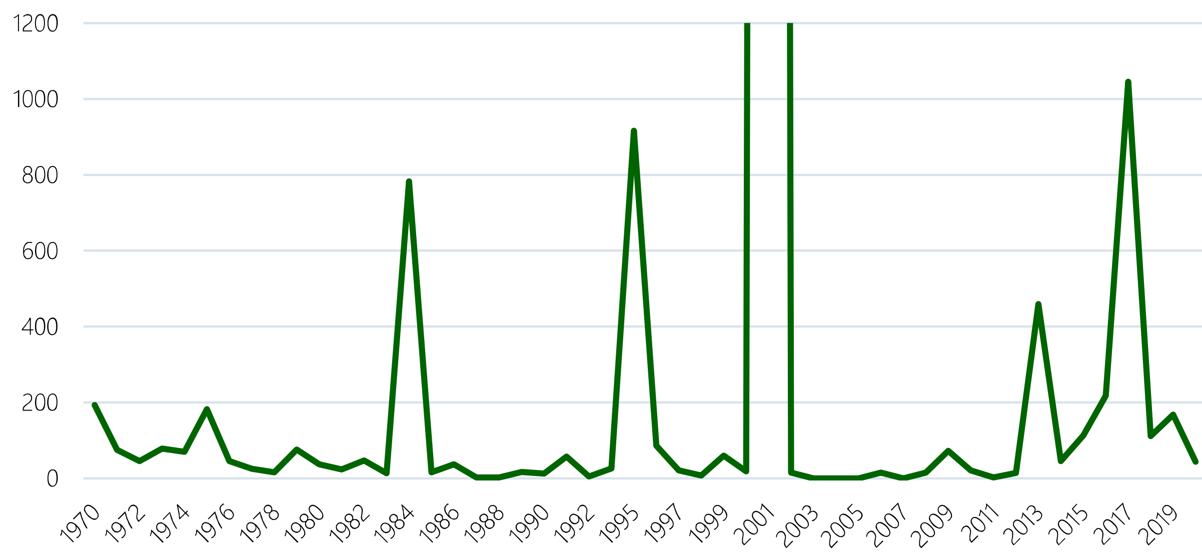
Figure 4-33 Terrorist Attacks in the U.S. 1970-2020



Source: START GTD, https://www.start.umd.edu/gtd/

The decline in the number of terrorist attacks in the U.S. has not been matched by a similar decline in the number of people injured or killed, as shown in Figure 4-34. (Note that the 12,645 people injured or killed in 2001 extends off the top of the graph to highlight differences between other years.) However, this data is significantly skewed by a few deadly attacks. Of the 50 years from 1970 to 2020, eleven years saw more than 100 injuries or fatalities nationally, and most years had fewer than 30 casualties.

Figure 4-34 Injuries and Fatalities from Terrorist Attacks in the U.S. 1970-2020



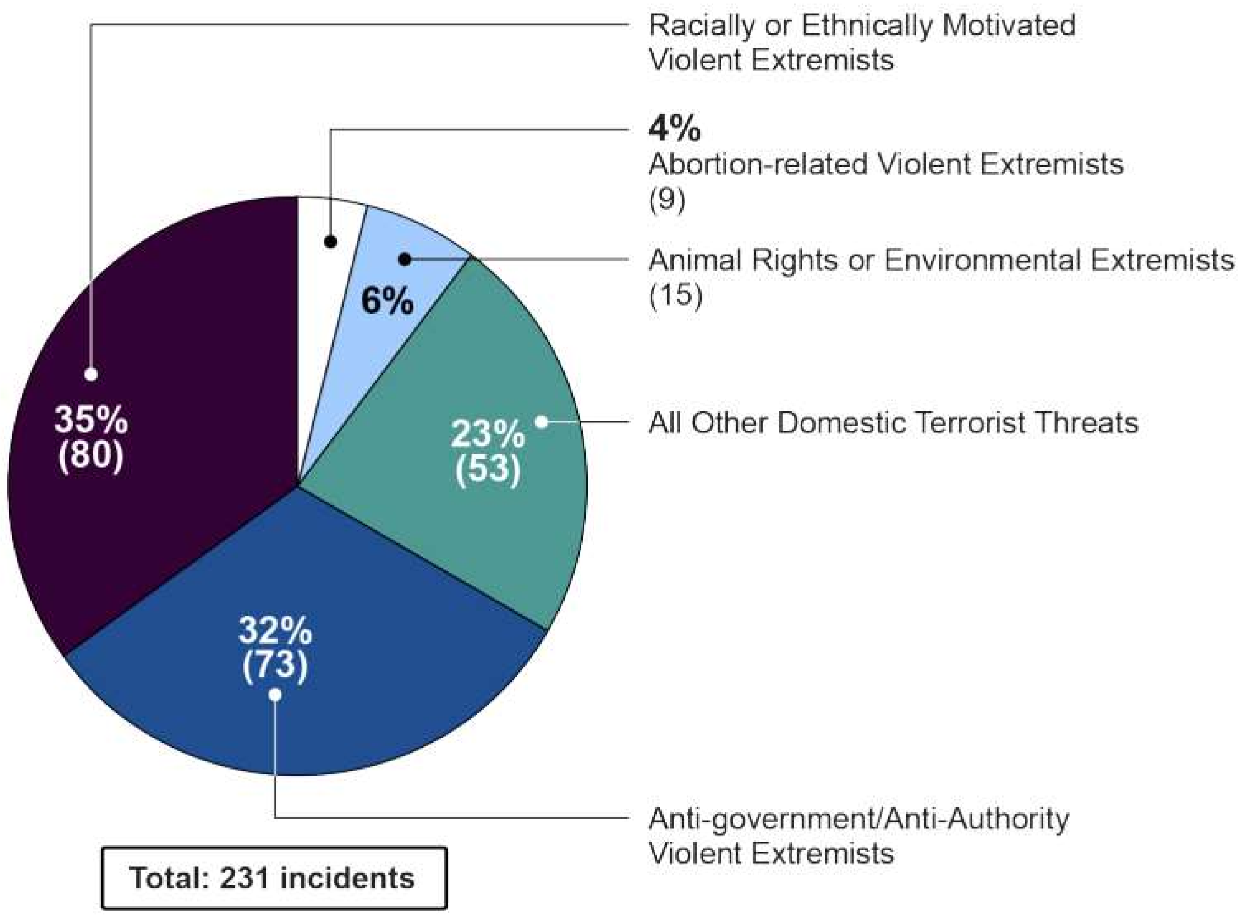
Source: Study of Terrorism and Responses to Terrorism (START) GTD, https://www.start.umd.edu/gtd/

The five deadliest terrorist attacks on U.S. soil in terms of total casualties are detailed below.

- The September 11, 2001, attacks on New York and Washington D.C., which killed 1,385 and injured 10,878 – more than all other terrorist attacks in the U.S. since 1970 combined.
- The October 1, 2017, shooting at the Route 91 Harvest Festival concert in Las Vegas, Nevada, which killed 59 and wounding 851.
- The April 4, 2013, Boston Marathon Bombing killed 3 and injured 264.
- The April 19, 1995, bombing of the Murrah Federal Building in Oklahoma City, killing 168 and injuring 650.
- The September – October 1984 salmonella food poisoning attack in Dalles, Oregon, which sickened 751 people.

According to a report by the US Government Accountability Office, the number of open domestic terrorism-related cases grew by 357%, rising from 1,981 to 9,049. From 2010 to 2021, The Office of Intelligence and Analysis tracked a total of 231 domestic terrorism incidents, as shown in Figure 4-35. Racially or ethnically motivated violent extremists were responsible for the largest number of incidents during that time period.

Figure 4-35 Portion of Domestic Terrorism-Related incidents Committed by Individuals by Threat Group Category, 2010-2021



Source: GAO, 2023, https://www.gao.gov/products/gao-23-104720

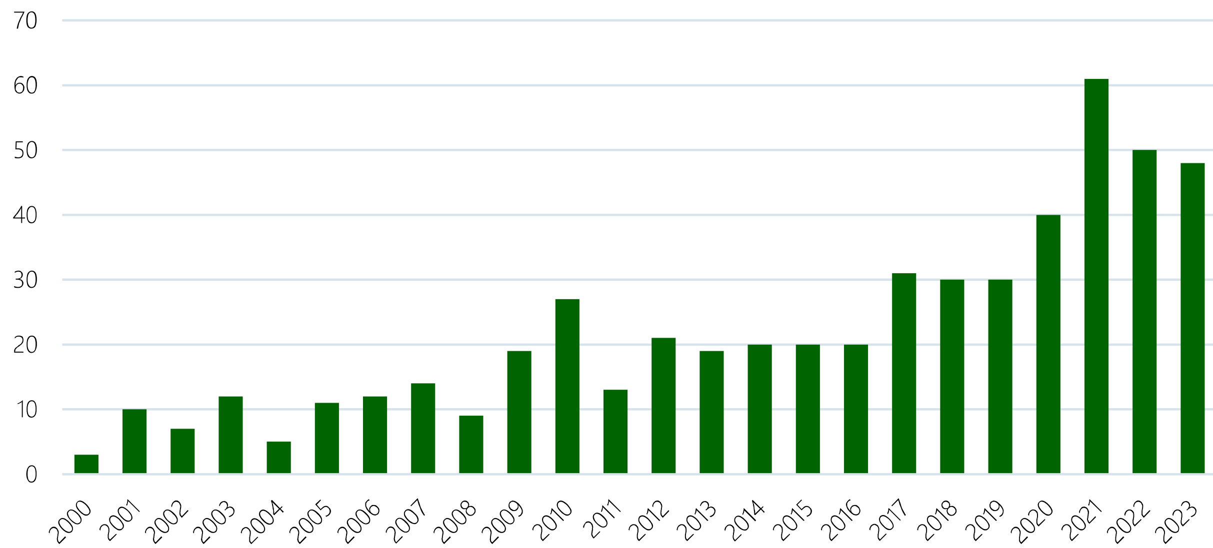
The threat from domestic terrorism is growing, as evidenced by several attacks in U.S. cities over the past decade. For example, in July 2016, a racially motivated individual killed five police officers in Dallas, Texas.

More recently, on January 6, 2021, thousands of demonstrators surrounded the U.S. Capitol Building, with some attacking law enforcement officers and breaching the building.

Active Shooter Incidents

The number of terrorist attacks in the U.S. has generally declined in recent decades, but active shooter incidents appear to be on the rise, see Figure 4-36. Although there is much uncertainty and debate around the definition of an active shooter incident, the FBI reported 532 such incidents between 2000 and 2023. The frequency of these attacks increased sharply, from an average of 7.4 incidents per year in the first five years of the twenty-first century to 45.8 incidents per year between 2019 and 2023.

Figure 4-36 Active Shooter Incidents in the U.S. 2000-2023

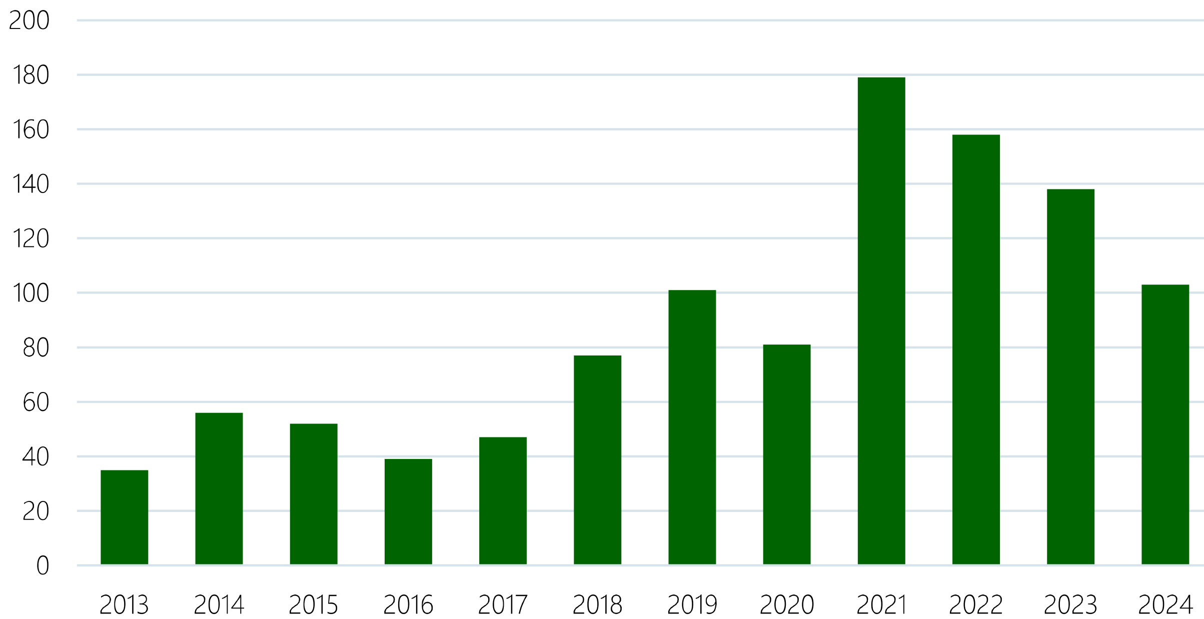


Source: FBI, "Active Shooter Incidents 20-Year Review, 2000-2019," and "Active Shooter Incidents in the United States in 2023"

Everytown for Gun Safety Support Fund began tracking gunfire on school grounds in 2013 to better understand how frequently children and teens are affected by gun violence at schools and colleges. Data collected over several years reveals that gunfire on school grounds takes various forms and mirrors the broader problem of gun violence in the U.S. It is most prevalent at schools with a high proportion of students of color, disproportionately affecting Black students.

Everytown tracks each instance of a firearm discharging a live round inside or into a school building or on school grounds, as reported by the press. Incidents where guns were brought into schools but not discharged are not included. Figure 4-37 summarizes incidents resulting in someone being shot and killed or wounded, as well as those where a gun was discharged but no one was shot. This information is primarily sourced from media reports and the K-12 School Shooting Database. An annual, comprehensive review of the database incorporates new information and identifies any previously unreported incidents.

Figure 4-37 Incidents of Targeted School Violence in the US, January 2013 - July 2024



Source: Everytown Research & Policy, 2024, https://everytownresearch.org/
Note: Numbers do not include accidental discharges or self-injury with no intent to harm others, but does include all attacks on others including unknown intention and legal interventions

Gunfire at schools represents only a small part of the broader issue of gun violence affecting children in the U.S. Each year, more than 4,000 children and teens are shot and killed, while over 17,000 are shot and wounded. Approximately 3 million children are exposed to shootings annually. Firearms are the leading cause of death for children and teens. Witnessing shootings—whether at schools, in communities, or at home—can have severe consequences. Children exposed to violence are more likely to experience drug and alcohol abuse, depression, anxiety, post-traumatic stress disorder, academic difficulties, and engage in criminal activities.

Colorado has not been immune to active shooter and school violence incidents, including:

- **May 7, 2019, STEM School Highlands Ranch, Littleton:** Two male students, 18 and 16 years old, armed with handguns and a rifle hidden in guitar cases opened fire in two separate areas of the school. One student was killed while trying to disarm one shooter, who was then restrained by other students. The other shooter injured eight students before police arrived and detained him.
- **August 17, 2021, Yeshiva Toras Chaim High School:** An 18-year-old boy was fatally shot outside of Yeshiva Toras Chaim, the religious school where he was studying, in what police believe was the end of a random string of crimes. Five men were arrested for the shooting and alleged to have committed additional burglaries and shooting a different man earlier in the night.
- **November 19, 2021, Hinkley High School:** Three 16 to 17-year-old students were shot in the school parking lot during lunch time. Two students attended Hickley High School, one attended a nearby school. The victims were transported to the hospital for care. Three 16-year-old boys were arrested and charged with attempted first-degree murder.
- **March 22, 2023, Denver East High School:** A 17-year-old student shot two administrators during a daily search for weapons and fled. The shooter was later found off-campus with a fatal gunshot wound.

- **February 16, 2024, University of Colorado, Colorado Springs:** Two students, aged 24 and 26, were shot and killed by another 25-year-old student as a result of a roommate dispute.

4.10.4 Probability of Future Occurrence

The unpredictable and highly variable nature of these incidents makes it difficult to accurately analyze the probability of future incidents. Based on the GTD data, since 2004 the U.S. has averaged 32 terrorist attacks a year, with an average of 1 person killed and 3 injured. It remains to be seen if the increase in terrorist attacks since 2013 will continue or not. Nevertheless, we can assume there is effectively a 100% chance that the nation will experience a terrorist attack in any given year for the foreseeable future, although the probability that an attack happens in Adams County is much lower.

The FBI determined that the U.S. had a five-year average of 45.8 active shooter incidents per year by 2023, and it is likely that we will continue to experience such attacks on a regular basis. The probability of an attack specifically in Adams County is difficult to estimate and depends on many different factors, not all of which are well understood. Assuming 45.8 active shooter incidents per year across all 3,142 US counties (or county-equivalents), there is roughly a 1.2% chance of an incident occurring in any given county in any given year, not controlling for factors like population density or gun availability.

The probability of a terrorism or active shooter incident happening in Adams County in the next year is therefore **unlikely**.

4.10.5 Magnitude/Severity

As seen above, the impact of a terrorist incident varies widely based on many factors, including the incident site, weapon(s), location, time of day, and the effectiveness of prevention/protection efforts, among other circumstances. On average, any single act of terrorism or single shooter incident would have a **limited** extent.

Active shooters have demonstrated the capability to kill or injure large numbers of people. The 160 incidents studied in the 2014 FBI report resulted in 1,043 casualties (486 killed and 557 wounded excluding the shooters), an average of 6.5 casualties per incident. A study of 41 school violence incidents conducted by the US Secret Service found these attacks injured 79 people and killed 19, an average of 1.9 persons injured and 0.5 killed per incident. The psychological impact of these types of incidents can impact a community for years.

The extent of damage caused by an explosive attack depends on many factors including the size, construction, composition, application, and placement of the explosive. The high-pressured blast caused by an explosion can send debris flying and lift people off the ground. The injuries that are most common to explosions are overpressure damage, fragmentation injuries, impact injuries, and thermal injuries. Some health effects caused by explosions such as eye injuries and abdominal injuries may not be apparent initially. An explosion near a building, public transportation center, or other facility could cause extensive damage to structures and infrastructure. An explosive attack could also cause disruption in services such as electricity, water, communications, and transportation.

Chemical attacks can cause injury or fatalities if inhaled or absorbed through the skin. The harm caused by these attacks ultimately depends on

1) their degree of toxicity,
2) the concentration of the chemical,
3) the route of exposure, and
4) the duration of the exposure.

Symptoms of exposure to most toxic chemicals would appear in minutes to hours. Different chemicals have varying effects on the body. Depending on the chemical agent, symptoms can appear either minutes or hours after exposure.

The severity of a biological attack would vary widely depending on the disease or agent used and how it is spread. Some biological agents can be easily disseminated or transmitted from person to person and could result in high mortality rates and potential for major public health impacts. Other agents are more difficult to disseminate and would likely result in only moderate morbidity rates.

Radioactive materials are commonly used throughout a host of different professions, including manufacturing, construction, health, and research, and are typically categorized based on the primary type of radiation they emit, such as alpha, beta, gamma, or neutron. Individuals can be exposed to radiation (energy), and/or become contaminated with radioactive materials, resulting in ongoing exposure. Internal contamination through inhaling or ingesting radioactive material is particularly dangerous.

A nuclear attack could have the most devastating and far-reaching consequences out of all the possible disasters and hazards. Direct effects would include intense heat, blast energy, and high-intensity nuclear radiation. Following an attack, residual radioactive material would be propelled into the atmosphere and return as radioactive fallout. Secondary effects could range from the destruction of critical infrastructure and systems to a shortage of adequate shelter, food, water, and other necessities.

4.10.6 Climate Change Considerations

There are no known climate change impacts relevant to this hazard.

4.10.7 Vulnerability

People

Most terrorist attacks are primarily intended to kill and injure as many people as possible. Physical harm from a firearms attack or explosive device is not completely dependent on location, but risk is greater in areas where higher numbers of people gather. If a biological or chemical agent were released indoors, it could result in exposure to a high concentration of pathogens, whereas an outdoors release could affect many more people but likely at a lower dose. People could also be affected by an attack on food and water supply. In addition to impacts on physical health, any terrorist attack would likely cause significant stress and anxiety.

Similarly, most active shooters primarily target people, attempting to kill or injure large numbers of individuals. The number of injuries and fatalities are highly variable, dependent on many factors surrounding the attack including the location, the number and type of weapons used, the shooter’s skill with weapons, the amount of people at the location, and law enforcement response time. Statistics indicate an average of 6.5 casualties per active shooter incident. The psychological effects of the incident, on not only victims and responders but also the general public, may last for years.

Property

The potential for damage to property is highly dependent on the type of attack. Terrorist attacks involving explosives or other CBRNE weapons, may damage buildings and infrastructure. For most attacks, impacts are highly localized to the target of the attack, although CBRNE attacks could potentially have much broader impacts.

Active shooter incidents rarely result in significant property damage, although crime scene measures may deny the use of targeted facilities for days after the incident.

Critical Facilities and Community Lifelines

Terrorists often target critical infrastructure, and attacks using explosives or other CBRNE weapons can potentially have devastating impacts.

While active shooter incidents rarely cause major property damage directly, indirect effects can be significant, such as the loss of critical facilities for days or weeks due to crime scene concerns.

Attacks on critical infrastructure such as power grids, water systems, and communication networks can result in widespread service disruptions, affecting public health and safety. If healthcare facilities are overwhelmed or sanitation systems are compromised, there may be an increased risk of communicable disease.

Economy

Terrorist attacks can have major economic impacts. As an extreme example, after the September 11, 2001, terrorist attacks in New York and Washington the U.S. stock market lost $1.4 trillion, the Gross Domestic Product of New York City lost an estimated $27 billion, and commercial air travel decreased by 20%. Smaller attacks can still have severe economic impacts, primarily by deterring people from certain areas or activities. Cleanup after a CBRNE attack could be lengthy and highly expensive. Terrorist attacks could also deter businesses from relocating to impacted areas, although there is not significant research to support this conclusion.

Over 45% of active shooter incidents in the FBI study took place at a commercial establishment. Nonetheless, most active shooter incidents have minimal impacts on the broader economy beyond the individual business affected. This can vary based on the location of the incident; an incident at a mall for example could cause temporary business interruption and closures for crime scene investigation.

Environmental and Cultural Resources

Most terrorist or active shooter attacks do not cause widespread damage to the environment. However, terrorists have been known to target sites with historic or cultural significance.

Development Patterns

The link between increased development and terrorist attacks is uncertain at best. Many terrorist attacks have targeted larger metropolitan areas, so a larger population could potentially make public events more attractive targets. Population growth and development could expose more people and property to the impacts of an explosive or CBRNE attack.

There is no clear link between increased development and active shooter incidents.

4.10.8 Risk Summary

- Overall significance of terrorism/active shooter rating is low.
- While the number of terrorist attacks on U.S. soil has been declining since the 1970s, active shooter incidents and school violence have risen in recent years.
- Effects on people: The primary aim of most active shooters is to injure and kill as many people as possible.
- Effects on property: Active shooter incidents rarely cause significant property damage.
- Effects on economy: Most active shooter incidents have minimal impacts on the economy.
- Effects on critical facilities and infrastructure: Crime scene concerns can lead to the loss of use of critical facilities for days or weeks.
- Related Hazards: Cyber Incident, Hazardous Materials

4.11 Thunderstorms

Table 4-79 Thunderstorms Risk Summary

Jurisdiction	Geographic Location	Probability of Future Occurrence	Magnitude/ Severity	Overall Significance
Adams County	Extensive	Highly Likely	Limited	High
Bennett	Extensive	Highly Likely	Limited	High
Brighton	Extensive	Highly Likely	Limited	High
Commerce City	Significant	Highly Likely	Limited	Medium
Denver Water	Limited	Highly Likely	Limited	Low

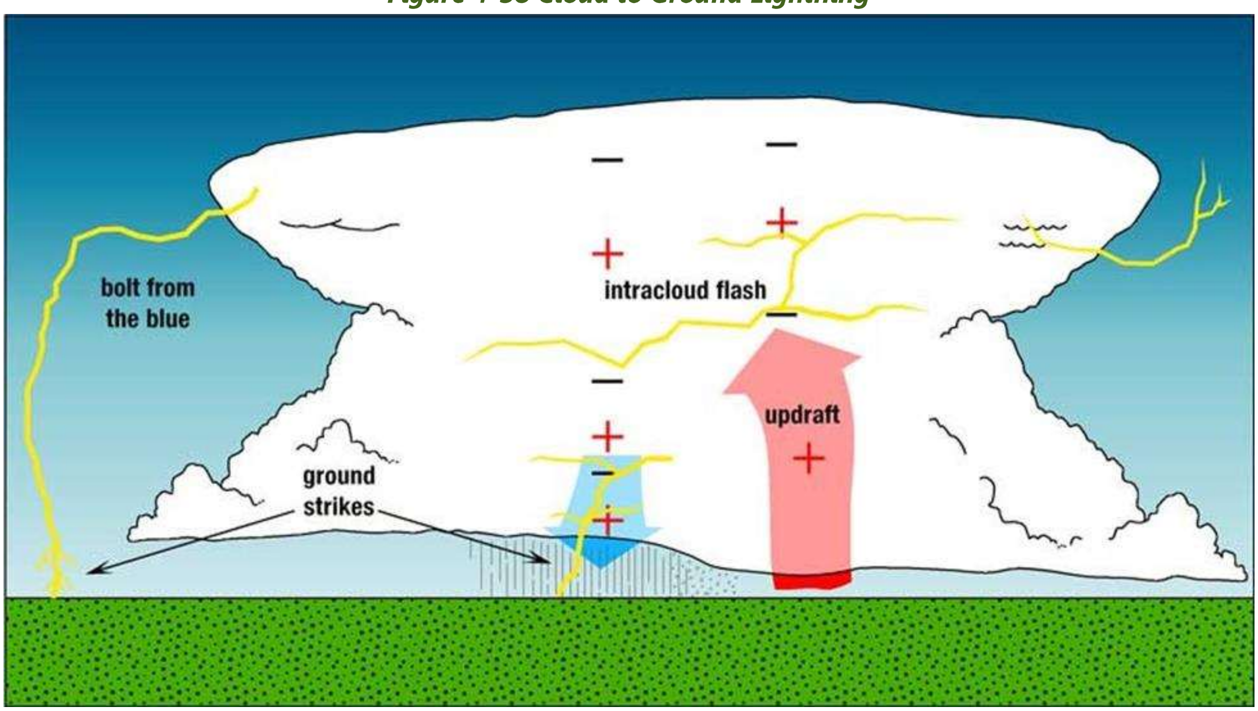
4.11.1 Hazard Description

The following phenomena characterize hazards presented from thunderstorm activity:

Hail forms when water droplets are repeatedly lifted into the upper atmosphere, freezing and thawing due to the storm's violent forces. In the Adams County area, hail is sometimes associated with severe storms, with hailstones often under two inches in diameter but falling at speeds up to 120 mph. Severe hailstorms can cause significant damage to buildings, vehicles, vegetation, livestock, and crops.

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 4-38 Cloud to Ground Lightning.

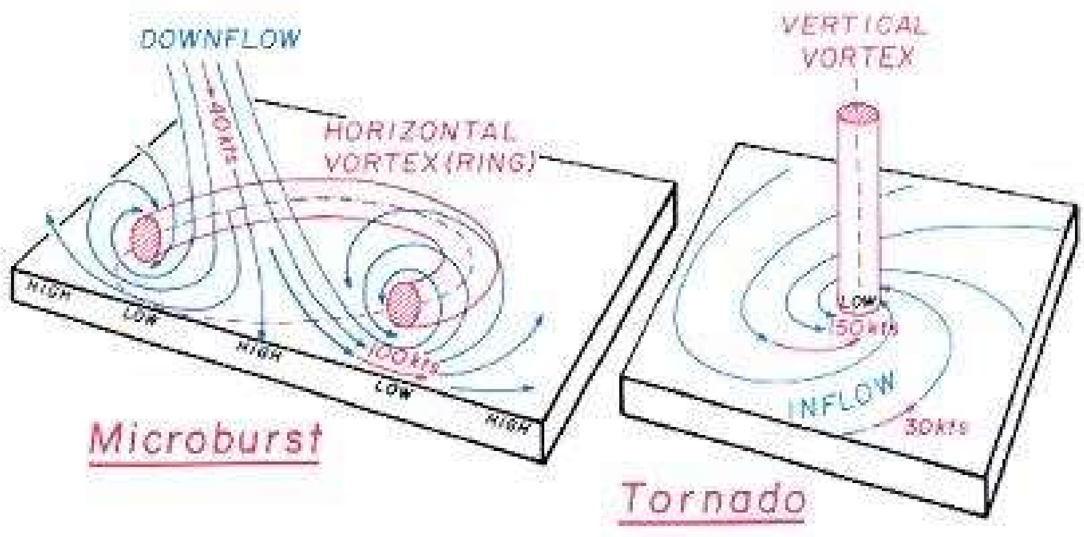
Figure 4-38 Cloud to Ground Lightning



Source: National Weather Service Pueblo Office

Severe thunderstorms can also bring **microbursts** and **tornadoes,** see Figure 4-39 Schema of Microburst and Tornado. Microbursts, a type of high wind event, last five to fifteen minutes and affect areas less than three miles wide. Wet microbursts include a combination of wind and rain or hail and can produce dangerous wind shears. The NWS defines **thunderstorm winds** as those produced by convection within 30 minutes of observed lightning. Winds must reach at least 50 knots (57.5 mph) or any speed that causes fatalities, injuries, or damage. Events with lower wind speeds are only recorded in the NWS/NOAA Storm Events Database if they cause serious harm.

Figure 4-39 Schema of Microburst and Tornado



Source: NOAA

A thunderstorm is classified as severe if it includes any of the following: hail of at least three-quarters of an inch, winds over 50 knots, or a tornado. About 10% of thunderstorms in the U.S. each year are classified as severe.

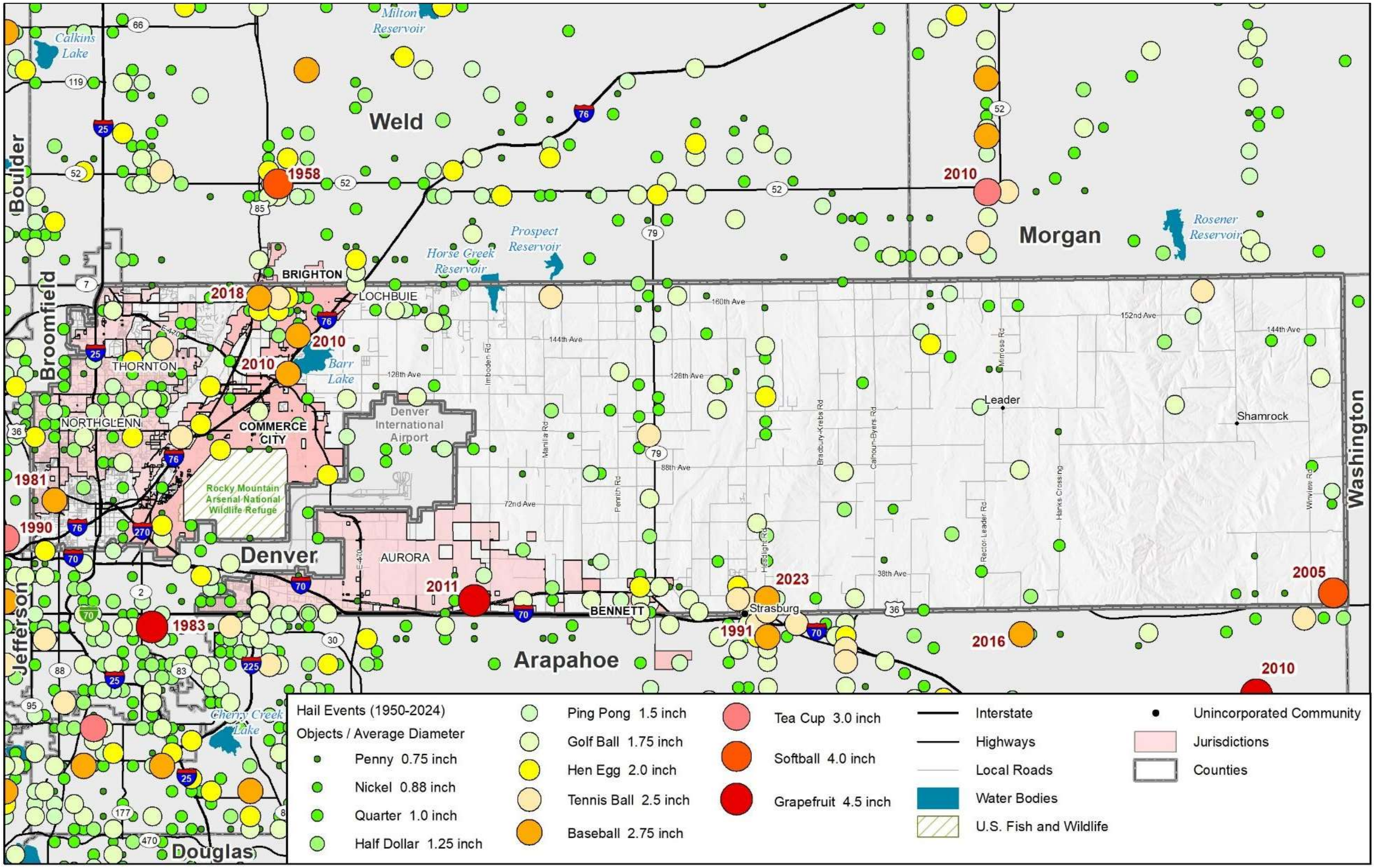
Intense thunderstorms can arise from a confluence of other hazard events, including high moisture levels, extreme temperatures, and high winds. Convective activity often occurs due to an abundance of moisture in the atmosphere combining with unstable conditions created by sharp temperature contrasts. Additionally, high winds can contribute to the intensification of thunderstorms.

The damage incurred by thunderstorms is more often the result of secondary and cascading hazards. Heavy rainfall can lead to flash flooding by overwhelming drainage systems. Similarly, saturated soils increase the risk of landslides and mudslides. Hail, lightning, strong winds, and tornadoes pose threats to crops, vehicles, and infrastructure. Lightning strikes can spark fires and cause electrical damage, while high winds can intensify potential fire threats. Continued infrastructure expansion can exacerbate these risks, although newer construction may be less vulnerable if built to the most recent International Building Code.

4.11.2 Location

Thunderstorms are generally **extensive** in size. The entire county is susceptible to any of the effects of a severe thunderstorm, including hail, lightning, heavy rain, and thunderstorm winds.

Figure 4-40 Hail Events in Adams County 1950-2023



Map compiled 8/2024;
intended for planning purposes only.
Data Source: Adams County, CDOT, NCEI Storm Events, NOAA, National Weather Service SRVGIS 2023

0 15 30 Miles

N

4.11.3 Past Occurrences

According to NOAA's NCEI Storm Events Database, Adams County experienced 149 days with severe thunderstorms and a total of 345 individual thunderstorm reports between 2003 and 2023, summarized in Table 4-80. This search included reports of hail, heavy rain, lightning, and thunderstorm wind. Out of these events, 10 resulted in property damage or injuries. summarizes these recorded events. Hail events recorded by NCEI between 1950 and 2023 are shown in Figure 4-40 Hail Events in Adams County 1950-2023.

Table 4-80 Severe Thunderstorm Events, 2003-2023

Event Type	# of Events	Property Damage	Crop Damage	Deaths	Injuries
Hail	270	$234,800,000	$0	0	2
Lightning	9	$100,000	$0	1	2
Thunderstorm Wind	66	$0	$0	0	0
Total	**345**	**$234,900,000**	**$0**	**1**	**4**

Source: NCEI, https://www.ncdc.noaa.gov/stormevents/

As discussed in Section 4.5 Drought, the USDA Risk Management Agency's Cause of Loss Database helps quantify the economic impact of various natural hazards on insured agriculture in the County. When compared to the NCEI Database which only includes uninsured crop losses, insured crop losses are much higher, as shown in Table 4-81. Between 2007 and 2021, Adams County experienced crop losses due to thunderstorm hazards, including excess moisture, rain, precipitation, and hail, every year. During this 15-year period, hail was responsible for the majority of the damage, affecting over 191,000 acres and resulting in over $16 million in losses. In total, over 225,000 acres were affected, with losses exceeding $18 million due to thunderstorm-related hazards.

Table 4-81 Crop Insurance Claims due to Thunderstorm Related Hazards, 2007-2021

Year	Cause of Loss	Determined Acres	Indemnity Amount
2007	Hail	18,419.1	$1,152,198
	Excess Moisture/Precipitation/Rain	97.8	$11,839
2008	Hail	15,216.7	$1,403,659
2009	Hail	13,411.5	$1,078,454
	Excess Moisture/Precipitation/Rain	882.4	$54,063
2010	Hail	14,919.8	$1,129,280
	Excess Moisture/Precipitation/Rain	2,975.1	$181,479
2011	Hail	2,009.23	$211,158
	Excess Moisture/Precipitation/Rain	361.9	$19,747
2012	Hail	1,045.2	$71,169
2013	Hail	14,944.8	$1,462,717
	Excess Moisture/Precipitation/Rain	1,973.2	$206,144
2014	Hail	17,160.5	$2,284,272
	Excess Moisture/Precipitation/Rain	934.3	$32,586
2015	Hail	9,593.6	$641,160
	Excess Moisture/Precipitation/Rain	16,193.9	$1,223,294
2016	Hail	28,365.0	$1,833,154
	Excess Moisture/Precipitation/Rain	3,572.7	$171,865
2017	Hail	1,927.9	$99,394
	Excess Moisture/Precipitation/Rain	4,954.2	$321,170

Year	Cause of Loss	Determined Acres	Indemnity Amount
2018	Hail	28,320.4	$1,670,586
2019	Excess Moisture/Precipitation/Rain	2,038.1	$190,106
	Hail	15,340.8	$737,003
2020	Hail	3,228.8	$227,010
2021	Excess Moisture/Precipitation/Rain	11.0	$13,860
	Hail	7,133.6	$2,244,629
Total		**225,031.5**	**$18,671,997**

Source: USDA RMA,

The National Weather Service has been tracking lightning casualties by county in Colorado since 1980. The NWS statistics only include lightning casualties through 2021. As shown in Table 4-82, Adams County has not experienced a documented casualty due to lighting since 2010. Most of the events took place in the afternoon and in the summer months between June and August.

Table 4-82 Lightning Casualties and Injuries in Adams County, 1980-2021

Year	Month	Fatalities	Injuries
1984	August	0	1
1986	June	0	5
1987	May	0	1
1988	April	1	1
1992	June	0	1
	August	0	1
1995	August	0	1
1997	August	0	1
2001	May	1	0
2006	June	2	0
	August	0	1
2010	May	0	1
	Total	**4**	**14**

Source: National Weather Service

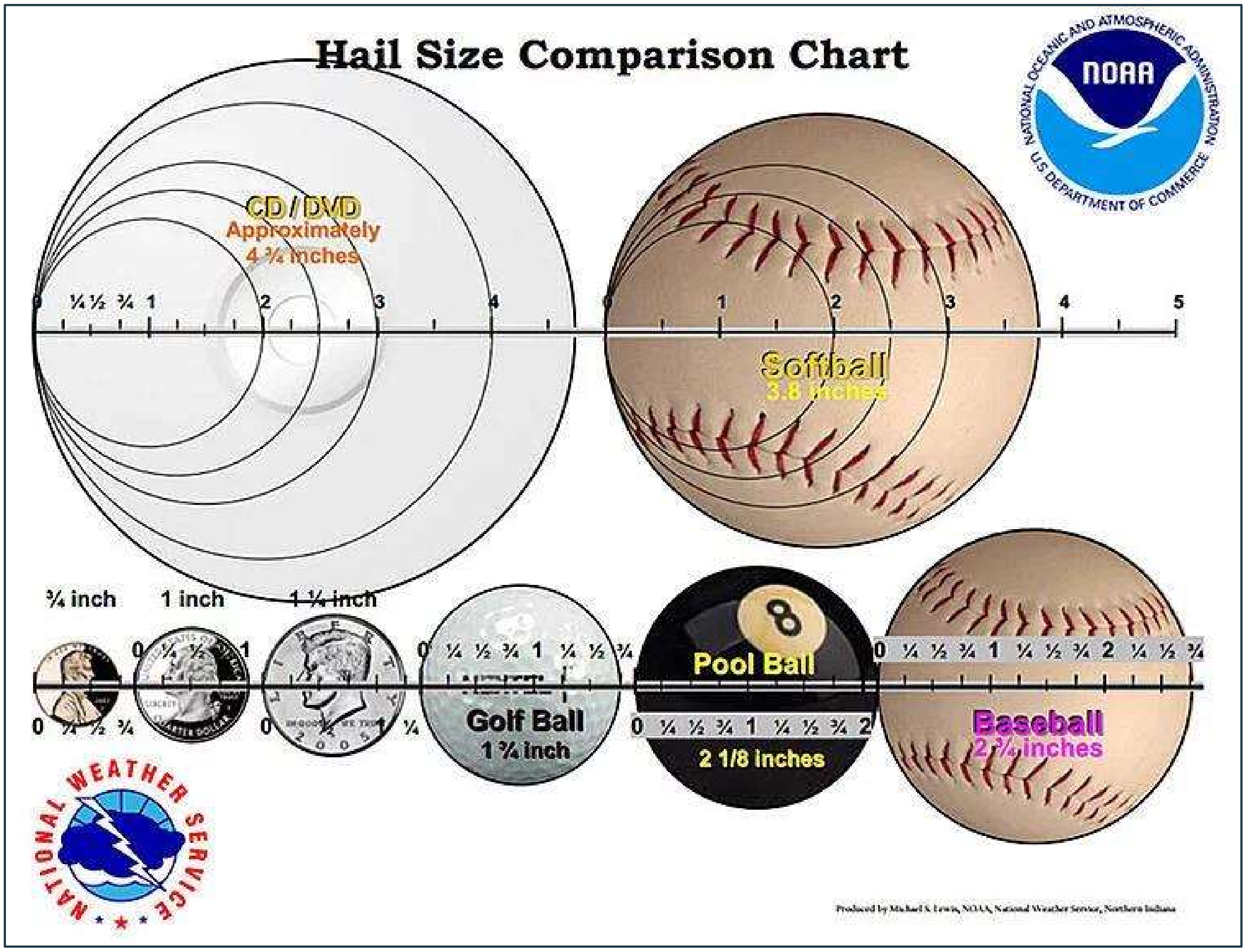
4.11.4 Probability of Future Occurrence

Thunderstorms regularly occur in Adams County from spring through late summer or early fall, with the most severe storms typically happening in midsummer. Tornadoes are more likely to occur during the months of March through May and tend to form in the late afternoon and early evening. These thunderstorms often produce lightning, heavy rain, and hail. These events are well-documented seasonal occurrences that are **highly likely** to continue annually in Adams County.

4.11.5 Magnitude/Severity

The severity of severe thunderstorms that involve lightning or hail can be measured according to hail by diameter sizes and lightning activity levels. The NWS classifies hail by diameter size, and corresponding everyday objects to help relay scope and severity to the population. Figure 4-41 below shows the hailstone measurements utilized by the NWS.

Figure 4-41 Hail Measurements



Source: National Weather Service

There is no clear distinction between storms that produce hailstones and those that do not. Nearly all severe thunderstorms likely produce hail aloft, although it may melt before reaching the ground. Multi-cell thunderstorms generate many hailstones, but not usually the largest ones, as their mature stage is relatively short, leaving little time for hailstone growth. In contrast, supercell thunderstorms have sustained updrafts that repeatedly lift hailstones into the very cold air at the top of the cloud, allowing for the formation of large hail. Generally, golf ball-sized hail or larger is associated with supercells, though non-supercell storms can also produce hail of this size.

Lightning is measured by the Lightning Activity Level (LAL) scale, created by the NWS to define lightning activity into a specific categorical scale. The LAL is a common parameter that is part of fire weather forecasts nationwide. Adams County is at risk to experience lightning in any of these categories. The LAL is reproduced in Table 4-83.

Table 4-83 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.

Level	Description
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: National Weather Service

Lightning can strike anywhere in Adams County, making it difficult to pinpoint specific hazard areas. Data to identify particular structures at risk was not available. One of the most significant risks associated with lightning is its potential to ignite wildland fires, which could lead to considerable losses, especially in the eastern part of the County. For more detailed information on losses and vulnerabilities related to wildland fires, please refer to the discussion on wildland fire vulnerability.

Severe thunderstorms can lead to several common issues, such as utility outages and restricted mobility. While fatalities are rare, they can occur. Roads may become impassable due to flooding, erosion, or fallen trees. Power outages often result from downed trees or damaged lines due to high winds or lightning. However, the overall severity of thunderstorms is typically **limited**.

4.11.6 Climate Change Considerations

The assessment of changes in smaller-scale, short-lived severe weather events like tornadoes and thunderstorms is challenging due to incomplete observations. Over the past two decades, thunderstorm complexes that bring heavy rain to the central U.S. during the warm season have become more frequent and longer lasting. In the late 21st century, more favorable conditions for thunderstorm activity may exist across the U.S. However, some factors may suppress thunderstorm formation, leading to less activity in the Great Plains but more in the Midwest and Southeast (Haberlie, 2022).

4.11.7 Vulnerability

People

Exposure is the greatest danger to people from severe thunderstorms. People can be hit by lightning, pelted by hail, and caught in rising waters due to heavy rain. Thunderstorms can have more severe impacts on vulnerable populations. Low-income families may live in poorly constructed homes that are more susceptible to damage. They are also more likely to be uninsured or underinsured, making recovery from hail or lightning events more difficult. Individuals with disabilities may need additional assistance after a major storm, especially if transportation or utility services are disrupted. Severe weather warnings must use methods that effectively reach people who are vision or hearing impaired and those with limited English proficiency.

Certain segments of the population are more vulnerable to lightning due to their reliance on constant, uninterrupted electricity. Elderly or disabled individuals, especially those with home health care services, depend heavily on a steady power supply. Residents in nursing homes, residential facilities, or other special needs housing are also at risk during prolonged electrical outages. Without a backup power source, rural residents and agricultural operations, which rely on electricity for heating, cooling, and water supplies, face significant vulnerability to power disruptions. According to data from the U.S. Department of Health and Human Service's emPOWER Program, about 12% of Medicare beneficiaries in the County, or 8,500 out of 68,880 beneficiaries, rely on medical equipment that depends on electricity for independent living.

Property

Severe thunderstorm events in Adams County are seasonal events that are most likely to occur during summer months. These thunderstorm events can include significant precipitation as well as high winds, hail, and lighting. These storms have resulted in injury and damages to property in several Adams County communities in the past. Lightning in particular can cause deaths, injuries, and property damage, including damage to buildings, communications systems, power lines, and electrical systems. Lightning strikes cause intense but localized damage. Structural fires, localized damage to buildings, damage to electrical powerlines and communications outages are typical consequences of a lightning strike. High winds in the planning area often result in downing of trees and damage to properties. Given the nature of these types of storms, the entire County is potentially at risk.

Critical Facilities and Community Lifelines

Because of the unpredictability of severe thunderstorm events strength and path, most critical infrastructure that is above ground is equally exposed to the storm's impacts. Due to the random and widespread nature of these hazards, a more specific risk assessment was not able to be conducted.

Economy

Economic impact of a severe thunderstorm is typically short term, although it can be significant. Lightning events can cause power outages and fires. Generally, long-term economic impacts center more around hazards that cascade from a severe thunderstorm, such as flooding, or wildfires ignited by lightning. In general, all severe thunderstorms pose a risk to the agricultural economy in the County. As noted in the Previous Occurrences subsection above, between 2007 and 2021, hail and heavy rain in Adams County led to over $18 million in crop insurance claims and have affected over 225,000 acres (refer to Table 4-82).

Environmental and Cultural Resources

Severe thunderstorms are a natural environmental process. Environmental impacts include the sparking of potentially destructive wildfires by lightning and localized flattening of plants by thunderstorm wind.

Development Patterns

New development over the past five years has not changed the planning area's vulnerability to thunderstorms. 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.

4.11.8 Risk Summary

- Overall significance rating of thunderstorms is rated high.
- Severe thunderstorms can include hail, lightning, wind, and heavy rain.
- 345 severe thunderstorm events have been reported in the County since 2003.
- Hail has been the most frequent (270 events) and most damaging hazard; resulting in $234 million in property damages since 2003.
- Between 2007-2021 hail and heavy rain events have caused damages to over 225,000 acres of crops and $18 million in crop loss.
- Heavy rain events have led to temporary closures of Kiowa-Bennett Road in the Town of Bennett.

- 12% of Medicare beneficiaries in the County rely on equipment that is electricity dependent and are at increased risk of losing electricity due to a severe thunderstorm event.
- Related Hazards: Flood, Tornado/Damaging Wind

4.12 Tornado/Damaging Wind

Table 4-84 Tornado/Damaging Wind Risk Summary

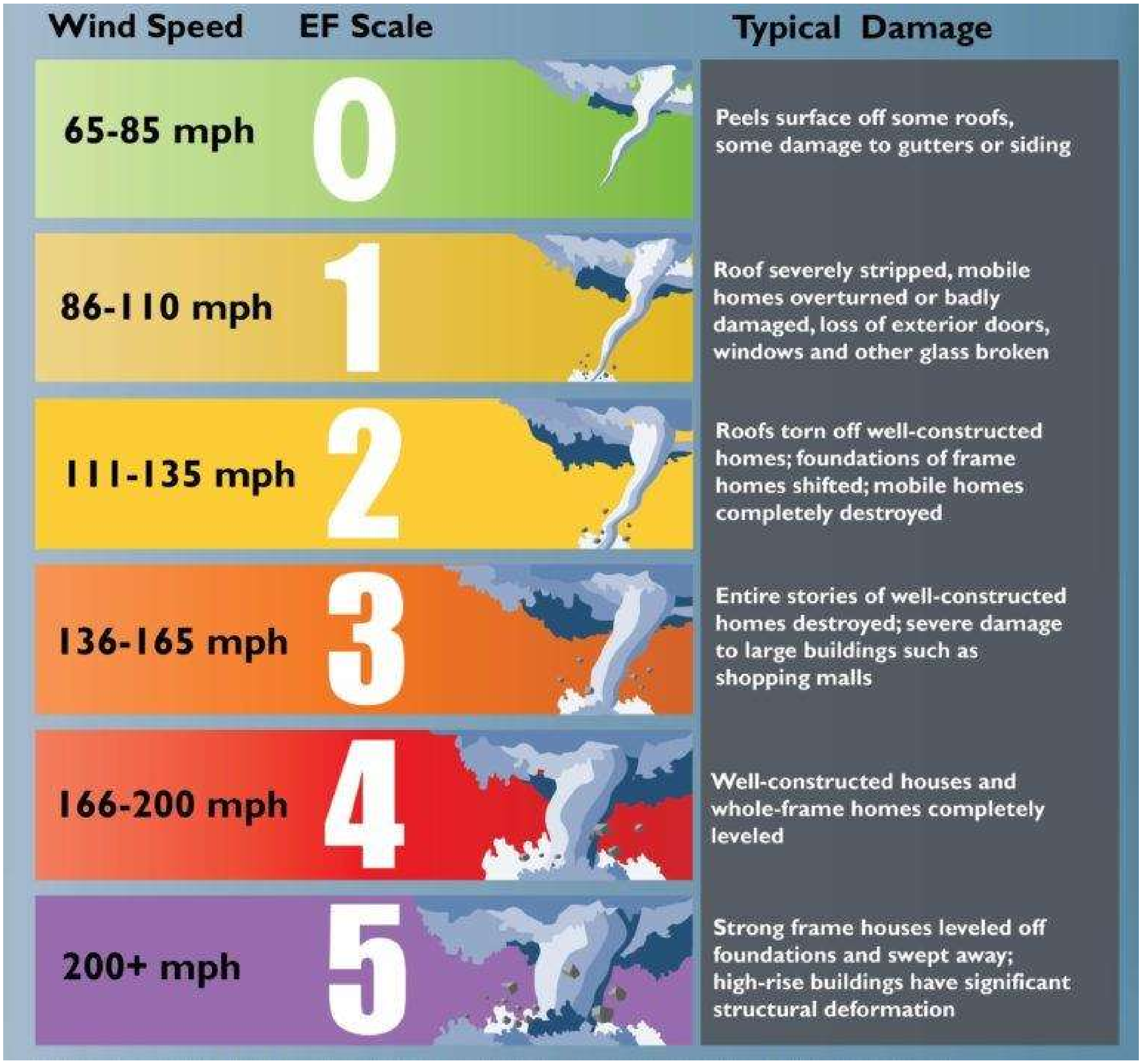
Jurisdiction	Geographic Location	Probability of Future Occurrence	Magnitude/ Severity	Overall Significance
Adams County	Extensive	Highly Likely	Limited	High
Bennett	Extensive	Highly Likely	Catastrophic	High
Brighton	Extensive	Highly Likely	Limited	High
Commerce City	Significant	Highly Likely	Limited	Medium
Denver Water	Limited	Highly Likely	Negligible	Low

4.12.1 Hazard Description

Tornadoes are another severe weather hazard that can affect Adams County. Tornadoes are rotating columns of air marked by a funnel-shaped downward extension of a cumulonimbus cloud whirling at destructive speeds of up to 300 mph, usually accompanying a thunderstorm. Tornadoes are the most powerful storms that exist. They can have the same pressure differential that fuels 300-mile-wide hurricanes across a path only 300-yards wide or less. Tremendous destruction can occur in paths over a mile wide and 50 miles long with winds reaching 300 mph. Figure 4-42 below illustrates the potential impact and damage from a tornado according to the Enhanced Fujita Scale ratings (refer to the Magnitude/Severity section below).

In the Colorado Front Range, tornadoes have been reported in nine months out of the year, with the peak season for tornados extending from mid-May through mid-August. June is by far the month with the most recorded tornadoes. Tornadoes have occurred every time of the day, with over half of them developing between 3 p.m. and 6 p.m., and 88% occurring between 1 p.m. and 9 p.m. MDT. They occur statewide, but by far the greatest number develop east of I-25. Since 1950, Weld and Adams counites are the two counties with the most tornadoes in the state.

Figure 4-42 The Enhanced Fujita Scale Ratings Potential Impact and Damage



Source: Weather Underground, www.wunderground.com/resources/severe/fujita_scale.asp

According to the National Severe Storms Laboratory (NSSL) there are several types of damaging winds including straight-line wind, downdraft, macroburst, microburst, downburst, and derecho. All of these can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. Damaging windstorms in Adams County are typically straight-line winds. Straight-line winds are generally any thunderstorm wind that is not associated with rotation (i.e., is not a tornado). It is these winds, which can exceed 100 mph and are responsible for most wind damage related to thunderstorms. These winds can overturn mobile homes, tear roofs off houses, topple trees, snap power lines, shatter windows, and sandblast paint from cars. Other associated hazards include utility outages, arcing power lines, debris blocking streets, dust storms, and an occasional structure fire.

4.12.2 Location

The entire county is susceptible to any of the effects of severe tornados and damaging winds.

4.12.3 Past Occurrences

Tornado season typically is March through August; however, a tornado can occur in any month. Between January 1, 2003, and December 31, 2023, the NCEI Storm Events Database recorded 127 high wind, strong wind, and tornado events over 91 days in Adams County. According to the NCEI, strong winds and high winds differ based on wind speed and severity. Strong winds typically refer to non-convective winds (not associated with thunderstorms) with speeds ranging from 39 to 57 mph. These winds, while impactful, are generally less intense and are often caused by weather systems such as pressure gradients or cold fronts. In contrast, high winds involve sustained speeds of 58 mph or higher, including gusts that meet or exceed this threshold. High winds are more severe, with a greater potential to cause significant damage, such as downed trees or power lines, and are often linked to strong storm systems or post-storm conditions like hurricanes.

Table 4-85 NCEI Recorded Tornado and Damaging Wind Events Summary, 2003-2024

Event Type	Count of Event Type	Deaths	Injuries	Property Damages	Crop Damages
High Wind	66	–	2	$15,000	$5,000
Strong Wind	3	–	–	$21,000	–
Tornado	58	–	–	$140,000	–
Grand Total	**127**	**0**	**2**	**$176,000**	**$5,000**

Source: NOAA NCEI Storm Events Database, https://www.ncdc.noaa.gov/stormevents/

Table 4-86 summarizes the events which resulted in injuries, property, or crop damages. Due to the widespread impact of damaging wind and tornado events, some summaries may reference damage outside of Adams County. However, the numbers given in Table 4-87 and Table 4-88 focus specifically on injuries and property damage that occurred within Adams County.

Table 4-86 Summary of NCEI Damaging Wind and Tornado Events, 2003-2025

Date	Damages	Event Summary
6/7/2007	1 injury	A powerful storm system brought winds up to 101 mph in North Central Colorado, downing hundreds of trees and causing widespread damage to homes, cars, and power lines. Aurora saw trees uprooted, and a driver was injured by falling debris. Denver International Airport canceled 60 flights due to strong winds.
6/11/2008	1 injury	High winds in the Urban Corridor damaged boats at Carter Lake and downed trees and power lines in Loveland and Denver, damaging homes and vehicles. A woman in Denver was injured by falling tree branches.
7/5/2008	$20,000 crop and property damage	Microburst winds in Denver downed a large tree and power lines near an apartment complex, damaging several vehicles.
2/25/2009	$10,000 property damage	Strong winds at a Colorado airport flipped a small aircraft onto its nose as it prepared for takeoff, though no injuries were reported.
6/7/2009	$25,000 property damage	Severe thunderstorms in Denver produced five tornadoes, large hail, and damaging winds. The strongest tornado (EF-1) hit southeast Aurora, injuring two men and causing property damage. Hail damaged homes, businesses, and vehicles, leaving 8,000 without power. During an eight-day period, storms along the Front Range caused $161 million in damage.
10/26/2010	$1,000 property damage	Strong winds in the Boulder area caused power outages, minor property damage, and sparked a brush fire. Wind gusts reached up to 70 mph in Berthoud.
11/10/2014	$10,000 property damage	Post-frontal high winds, with gusts up to 86 mph near Berthoud Pass, blew the roof off a mobile home in Thornton.

Date	Damages	Event Summary
5/15/2015	$15,000 property damage	Severe thunderstorms produced large hail and two brief tornadoes in Adams County. One tornado destroyed a storage shed. Later, hail up to ping-pong ball size hit Phillips and Sedgwick Counties
7/27/2018	$100,000 property damage	Five tornadoes touched down; three producing EF-1 damage. A tornado removed the roof of a manufactured home, destroyed an outbuilding, flipped a UPS truck, and injured the driver. Another tornado blew out home windows and tossed a cattle feeder a quarter mile. Severe thunderstorms also caused large hail and minor flooding in the area.
5/18/25	Not available	An EF2 damaged at least 17 structures, including six homes, in the Town of Bennett. There were no reports of deaths or injuries.

Source: NOAA NCEI Storm Events Database, https://www.ncdc.noaa.gov/stormevents/

The Storm Events Database compiles information on each event from various sources, including county, state, and federal emergency management officials, newspaper clipping services, the insurance industry, and other relevant stakeholders. According to the National Weather Service, crop damage data in the Database should be viewed as broad estimates. As mentioned in Section 4.5 on Drought, the USDA Risk Management Agency's Cause of Loss Database provides a more detailed account of the economic impact of natural hazards on agriculture in the County. It's important to note that the NCEI data only reflects uninsured crop losses. Insured crop losses due to damaging winds occurred annually in Adams County between 2007 and 2018, as shown in Table 4-88. Over the 15-year period, more than 63,000 acres were affected, resulting in losses exceeding $5 million. The most significant damage occurred in 2009, when over 20,000 acres were impacted, and claims exceeded $1 million.

Table 4-87 Crop Insurance Claims due to Damaging Wind, 2007-2021

Year	Damage Cause	Sum of Determined Acres	Indemnity Payments
2007	Wind/Excess Wind	711.3	$35,499
2008	Wind/Excess Wind	1,947.5	$151,677
2009	Wind/Excess Wind	20,682.4	$1,765,149
2010	Wind/Excess Wind	1,669.4	$68,351
2011	Hot Wind	350.9	$26,284
2011	Wind/Excess Wind	2,548.5	$401,011
2012	Hot Wind	2,096.0	$275,541
2012	Wind/Excess Wind	3,785.8	$504,004
2013	Hot Wind	2,020.1	$150,631
2013	Wind/Excess Wind	2,970.2	$249,744
2014	Wind/Excess Wind	791.8	$78,079
2015	Wind/Excess Wind	358.4	$9,483
2016	Wind/Excess Wind	3,513.3	$202,499
2017	Hot Wind	667.6	$16,994
2017	Wind/Excess Wind	2,062.4	$142,225
2018	Hot Wind	32.4	$2,125
2018	Wind/Excess Wind	2,081.8	$149,235
2019	Hot Wind	80.0	$23
2019	Wind/Excess Wind	877.5	$38,658
2020	Hot Wind	3,002.6	$210,296

Year	Damage Cause	Sum of Determined Acres	Indemnity Payments
2020	Wind/Excess Wind	4,667.7	$231,884
2021	Hot Wind	469.9	$28,029
2021	Wind/Excess Wind	5,999.4	$489,551
	Grand Total	**63,386.8**	**$5,226,972**

Source: USDA RMA

Figure 4-43 Tornado Events in Adams County 1950-2023 illustrates past tornado events in Adams County along with their associated Fujita or Enhanced Fujita Scale ratings, and Figure 4-44 Wind Events in Adams County, 1950-2023 illustrates past wind events in Adams County and associated wind speeds. Note both maps shows fewer and weaker events in the eastern half of the county, likely due to the lower population density in that area, which reduces both the likelihood of tornadoes being reported and the potential for damage.

4.12.4 Climate Change Considerations

By the end of the 21st century, wind speeds in the American Southwest are projected to decrease, particularly during the summer months of June and July. This reduction in wind speed is linked to changes in large-scale atmospheric circulation, including a northward shift of the mid-latitude jet stream, as analyzed using regional climate models under the continued high greenhouse gas emissions scenario (Tara et al, 2023; Pryor et al, 2020). The impact of these changes will vary across the region, with some areas experiencing more substantial decreases than others.

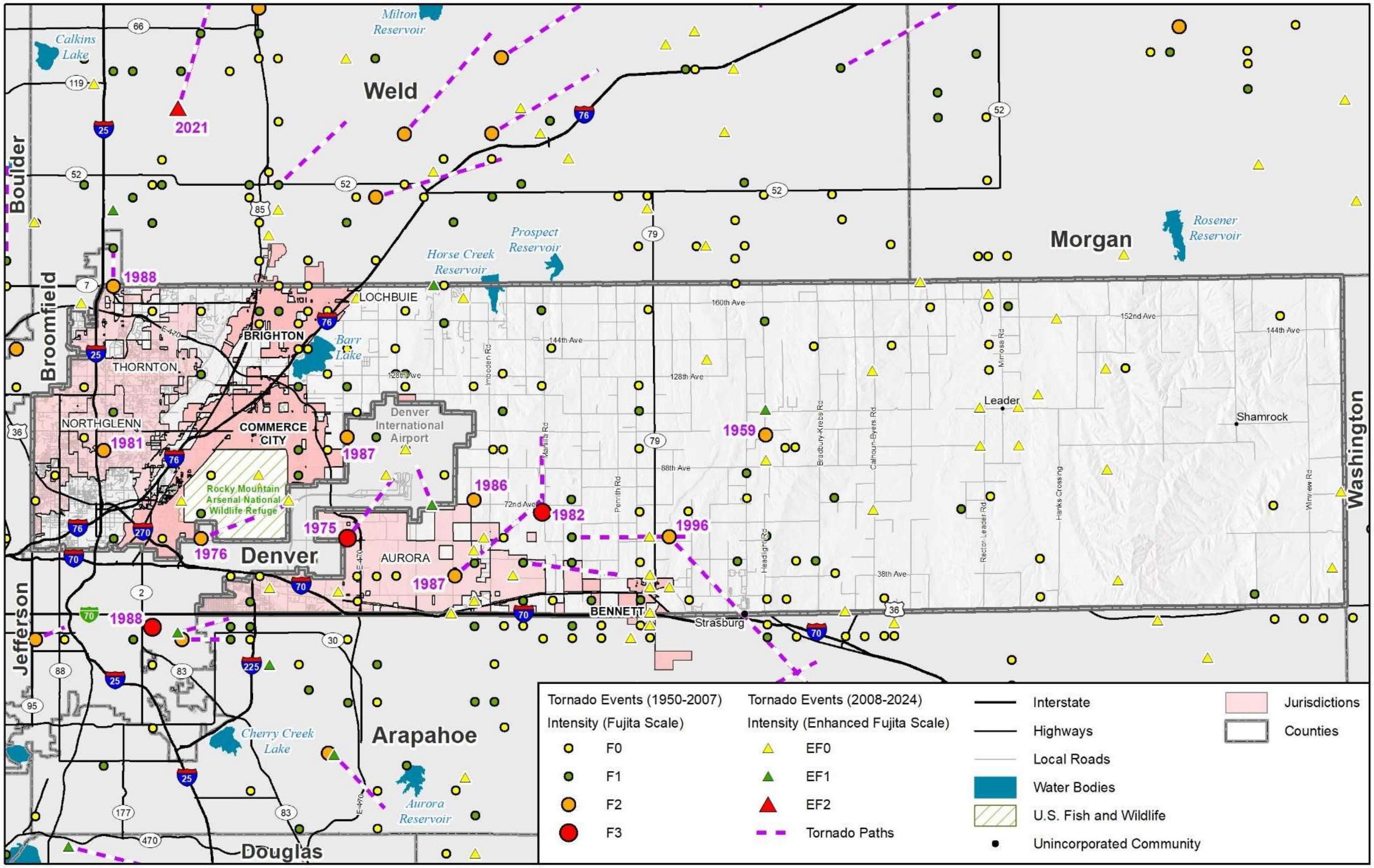
Research suggests that tornado activity in the United States is shifting eastward, with environments supportive of tornado formation expanding, particularly in the Southeast (Gensini and Brooks, 2018). While the impact on Colorado specifically is less clear, this expansion could potentially influence the Southwest. Tornado season may also be lengthening, with increased activity beyond the traditional peak months of March through May, potentially altering the timing of tornado risks in the Southwest. Some studies suggest that tornado intensity could increase due to climate change (Woods et al, 2023). However, linking climate change directly to changes in tornado behavior remains challenging due to incomplete historical data and the small scale of tornadoes.

Because of uncertainty with the influence of climate change on tornadoes, future updates to the mitigation plan should include the latest research on how the tornado hazard frequency and severity could change. The level of significance of this hazard should be revisited over time.

4.12.5 Probability of Future Occurrence

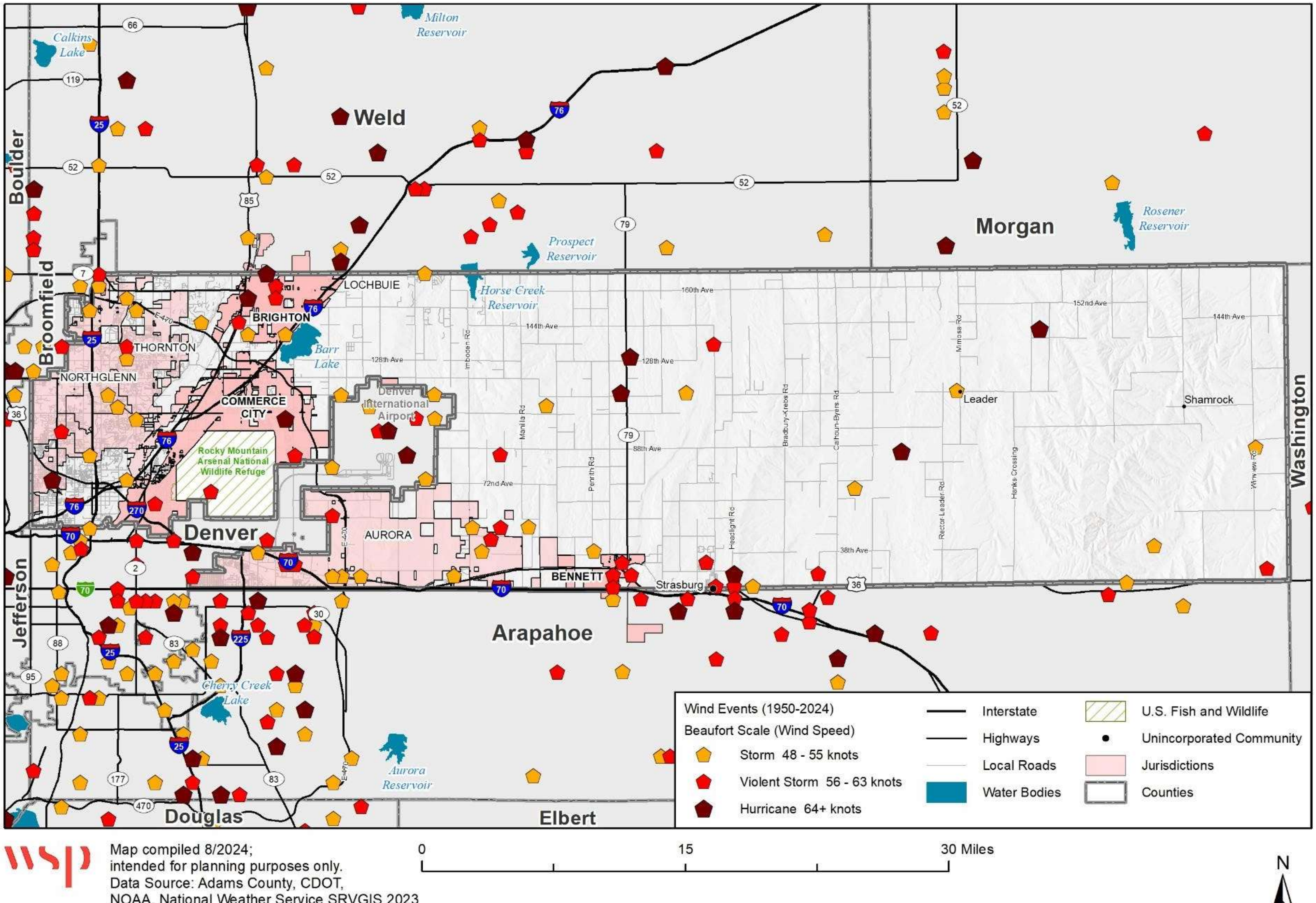
One hundred and twenty-seven (127) damaging wind and tornado events were recorded in Adams County between 2003 and 2023. Historical wind activity within the planning area indicates that the area is **highly likely** to continue to experience damaging wind during thunderstorm events with a potential of the formation of funnel clouds and low intensity tornadoes during adverse weather conditions.

Figure 4-43 Tornado Events in Adams County 1950-2023



Map compiled 8/2024;
intended for planning purposes only.
Data Source: Adams County, CDOT,
NOAA, National Weather Service SRVGIS 2023

Figure 4-44 Wind Events in Adams County, 1950-2023



4.12.6 Magnitude/Severity

Tornadoes can inflict severe property damage and loss of life. While the violent winds of a tornado primarily cause property damage, the majority of injuries and fatalities are typically due to flying debris. Tornadoes can damage buildings, down trees and power lines, break gas, sewer, and water mains, and ignite fires. They can also destroy agricultural crops and disrupt industries. Debris may block access roads and streets, hindering emergency response efforts.

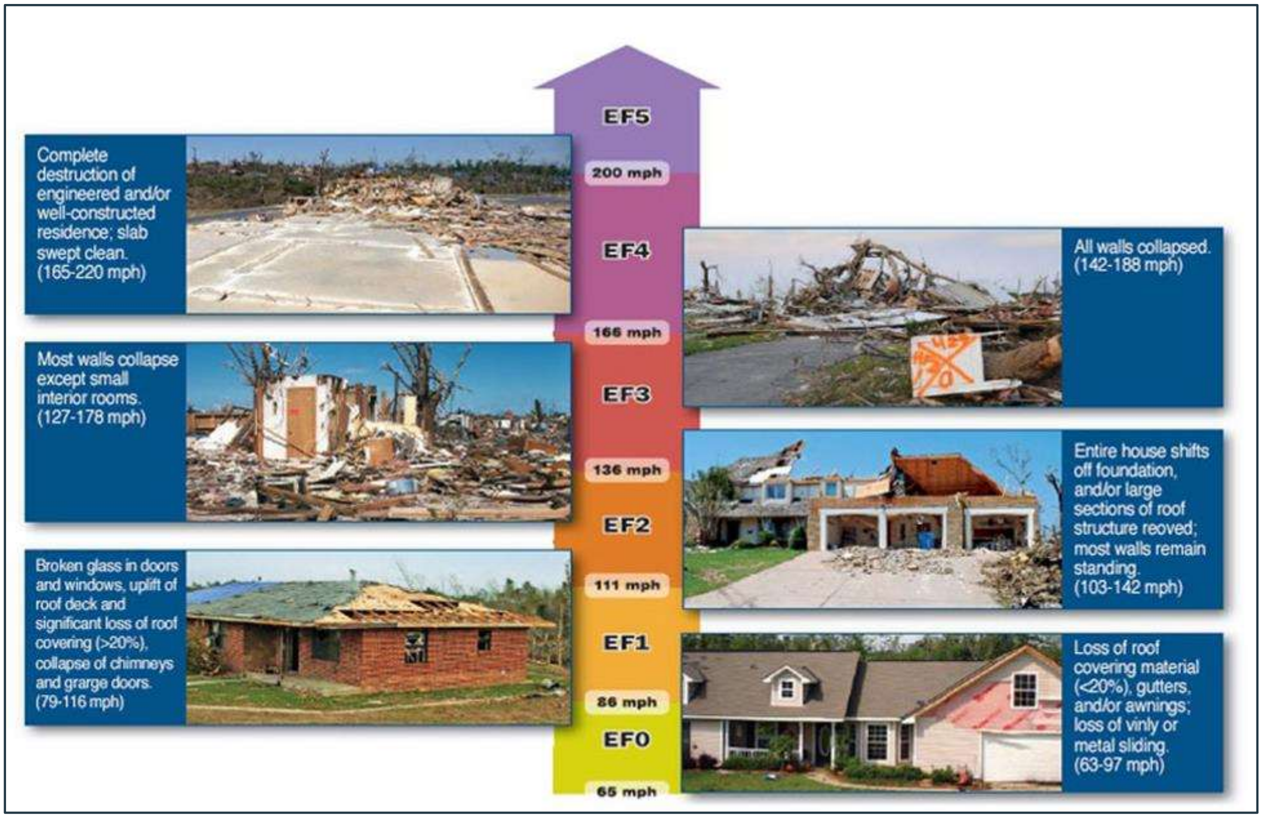
Before February 1, 2007, tornado intensity was assessed using the Fujita Scale, which has since been replaced by the Enhanced Fujita (EF) Scale. Both scales estimate wind speeds based on observed damage, but the EF Scale offers a more detailed analysis with 28 damage indicators and corresponding degrees of damage. It provides a more accurate correlation between wind speeds and the extent of damage by considering the materials and construction of affected structures. Table 4-88 outlines Enhanced Fujita Scale ratings, while Figure 4-45 Potential Impact and Damage from a Tornado visually represents the potential damage for each EF rating.

Table 4-88 Enhanced Fujita Scale

Enhanced Fujita (EF) Scale	Wind Speed Estimate (mph)	Potential Damage
EF0	65-85	Minor damage. Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over. Confirmed tornadoes with no reported damage (i.e., those that remain in open fields) are always rated EF0.
EF1	86-110	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 from 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 are badly damaged.
EF4	166-200	Devastating damage. Well-constructed and whole frame houses completely leveled; cars and other large objects thrown, and small missiles generated.
EF5	Over 200	Incredible damage. Strong-framed, well-built houses leveled off foundations are swept away; steel-reinforced concrete structures are critically damaged; tall buildings collapse or have severe structural deformations; some cars, trucks, and train cars can be thrown approximately 1 mile (1.6 km).

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

Figure 4-45 Potential Impact and Damage from a Tornado



Source: NOAA National Weather Service, Storm Prediction Center

Damaging wind is measured using the Beaufort Wind Scale as shown in Table 4-89. This scale only reflects land-based effects and does not take into consideration the effects of wind over water

Table 4-89 Beaufort Wind Scale

Beaufort Number	Description	Windspeed (MPH)	Land Conditions
0	Calm	<1	Calm. Smoke rises vertically.
1	Light air	1 – 3	Wind motion visible in smoke.
2	Light breeze	3 – 7	Wind felt on exposed skin. Leaves rustle.
3	Gentle breeze	8 – 12	Leaves and smaller twigs in constant motion.
4	Moderate breeze	13 – 17	Dust and loose paper raised. Small branches begin to move.
5	Fresh breeze	18 – 24	Branches of a moderate size move. Small trees begin to sway.
6	Strong breeze	25 – 30	Large branches in motion. Whistling heard in overhead wires. Umbrella use becomes difficult. Empty plastic garbage cans tip over.
7	High wind, Moderate gale, Near gale	31 – 38	Whole trees in motion. Effort needed to walk against the wind. Swaying of skyscrapers may be felt, especially by people on upper floors.
8	Gale, Fresh gale	39 – 46	Some twigs broken from trees. Cars veer on road. Progress on foot is seriously impeded.

Beaufort Number	Description	Windspeed (MPH)	Land Conditions
9	Strong gale	47 – 54	Some branches break off trees, and some small trees blow over. Construction/temporary signs and barricades blow over. Damage to circus tents and canopies.
10	Storm, Whole gale	55 – 63	Trees are broken off or uprooted, saplings bent and deformed. Poorly attached asphalt shingles and shingles in poor condition peel off roofs.
11	Violent storm	64 – 72	Widespread vegetation damage. Many roofing surfaces are damaged; asphalt tiles that have curled up and/or fractured due to age may break away completely.
12	Hurricane	≥ 73	Very widespread damage to vegetation. Some windows may break; mobile homes and poorly constructed sheds and barns are damaged. Debris may be hurled about.

Source: National Oceanographic and Atmospheric Association, http://www.spc.noaa.gov/faq/tornado/beaufort.html

The following table summarizes the magnitude of past tornado events as recorded in the NCEI Storm Events Database. There have been 58 tornado events with a recorded magnitude between 2003 and 2023 in Adams County. The highest recorded wind event in Adams County was 89 mph and the highest magnitude tornado recorded is an F3. The most commonly recorded tornado events in the Storm Events Data Base are F0/EF0 and F1/EF1 tornadoes.

Table 4-90 Summary of Magnitudes of Past Tornado Events in Adams County

Magnitude	# of Events
EFU*	3
F0	19
F1	1
F2	–
F3	–
F4	–
F5	–
EF0	32
EF1	3
EF2	–
EF3	–
EF4	–
EF5	–
Total	**58**

Source: NOAA NCEI Storm Events Database, https://www.ncdc.noaa.gov/stormevents/
* The rating category EF-unknown (EFU) is intended for tornadoes previously rated EF0 that are 1) without known damage, 2) so remote as to be inaccessible for surveying, and/or 3) damaging only nonstandard indicators to which a rating cannot be applied.

4.12.7 Vulnerability

People

Community members are particularly vulnerable to damaging wind and tornado events. Access to sheltered locations, such as basements, buildings constructed with tornado-resistant materials, and public storm shelters, helps reduce the population's exposure to these hazards. However, certain groups are especially vulnerable to the indirect effects, particularly power outages. The elderly, disabled individuals, and those with medical needs dependent on electricity face heightened risks. Nursing homes, community-based residential facilities, and other special needs housing are also at risk during prolonged outages, as backup power typically supports only minimal functions for a limited time.

The impacts on vulnerable populations can be more severe. Families with fewer financial resources may struggle to prepare for or recover from disasters and are more likely to be uninsured or underinsured. Low-income households are often located in poorly constructed homes that are more susceptible to damage. Individuals with disabilities may require additional assistance after an event, especially if transportation or utility services are disrupted. Severe weather warnings must be accessible to those with vision or hearing impairments, as well as people with limited English proficiency, to ensure everyone receives critical information.

Property

Damages from wind events can be categorized as both direct and indirect. Direct damage refers to physical destruction caused by wind or tornadoes, while indirect damage includes additional costs, losses, and impacts from secondary hazards triggered by wind or tornado events. Depending on the strength and path of a tornado or windstorm, it can cause widespread destruction. However, construction practices and building codes play a critical role in reducing vulnerability. The County's current building code, the 2018 International Building Code, requires structures to withstand winds up to 90 mph (equivalent to an EF1 tornado). However, many structures were built under older codes with potentially lower wind resistance standards.

Secondary impacts from wind and tornado-related damage often stem from damage to infrastructure. Downed power and communication lines, along with transportation disruptions, can complicate emergency reporting and response efforts. These indirect effects put significant strain on communities, particularly in the immediate aftermath when emergency services are most critical.

Critical Facilities and Infrastructure

Due to the unpredictability of the strength and path of wind and tornado events, most critical infrastructure that is above ground is equally exposed to potential impacts. The random nature of these hazards prevents a more precise risk assessment.

Economy

Winds and tornadoes can significantly impact exposed critical infrastructure, potentially leading to short-term economic disruptions. One of the most common issues caused by these events is the loss of utilities. Downed power lines can result in widespread power outages, leaving large portions of the county without electricity, water, and communication services. This damage may also hinder emergency response efforts and reduce available evacuation routes. Additionally, downed electrical lines pose a risk of lethal electrical shock and may trigger secondary hazards, such as wildfires.

Historic, Cultural, and Natural Resources

Damaging winds and tornadoes can cause massive damage to the natural environment, uprooting trees and other debris. Impacts to historic and cultural resources will be similar to that of general property.

Development Patterns

New development over the past five years has not changed the planning area's vulnerability to tornadoes and high wind. As the County continues to increase in population, the number of people and housing developments exposed to hazards increases. Adherence to current building codes, coupled with proper education on building techniques and the use of sturdy building materials, attached foundations, and other structural techniques may minimize the property vulnerabilities. Public shelters at parks and open spaces may help reduce the impacts of tornadoes and damaging wind events on the recreational populations exposed to storms.

4.12.8 Risk Summary

- 127 wind events have been recorded by the NCEI in Adams County between 2003 and 2023, including 58 tornados.
- These events have resulted in over $180,000 in property damages and 2 injuries recorded by the NCEI Storm Events Database.
- Between 2007 and 2021 over 63,000 federally insured acres were affected by damaging wind with over $5 million losses claimed.
- Vulnerable populations are at higher risk of power outages from wind events.
- Related Hazards: Thunderstorms, wildfire
- Overall significance is **High**

4.13 Wildfire

Table 4-91 Wildfire Risk Summary

Jurisdiction	Geographic Location	Probability of Future Occurrence	Magnitude/ Severity	Overall Significance
Adams County	Limited	Likely	Negligible	Low
Bennett	Limited	Highly Likely	Negligible	Low
Brighton	Limited	Likely	Negligible	Low
Commerce City	Limited	Occasional	Negligible	Low
Denver Water	Extensive	Highly Likely	Limited	Medium

4.13.1 Hazard Description

Wildfires are defined as unwanted or unplanned fires in wildland areas. They include unauthorized human caused fires, fires ignited by activity such as smoking, campfires, equipment use, or arson, escaped prescribed burn projects, and all other wildland fires where the objective is to put the fire out. In addition to forest fires, wildfires also include prairie fires or brushfires. Wildfires can consume large areas, including infrastructure, property, and resources. The most explosive conditions occur when dry, gusty winds blow across dry vegetation, causing the fire to spread rapidly.

Three main factors influence wildfire behavior – fuel, topography, and weather.

- **Fuel:** Fuel is the material that feeds a fire and is a key factor in wildfire behavior. Fuel is generally classified by type and by volume. Fuel sources are diverse and include everything from dead tree needles, leaves, twigs, and branches to dead standing trees, live trees, brush, and cured grasses; fuels can be both native and non-native species. Structures such as homes and associated combustibles are also potential fuel sources. The type of prevalent fuel directly influences the behavior of wildfire. Light fuels such as grasses burn quickly and serve as a catalyst for fire spread. "Ladder fuels" are fuels low to the ground that can spread a surface fire upward through brush and into treetops. These fires, known as crown fires, burin in the upper canopy of forests and are nearly impossible to control. The volume of available fuel is described in terms of fuel loading. Arrangement is another important aspect of fuel. 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.
- **Topography**: An area's terrain and land slopes affect its susceptibility to wildfire spread. Both the fire intensity and the rate of spread increase as slop increases due to the tendency of heat from a fire to rise via convection. The arrangement and types of vegetation throughout a hillside can also contribute to increased fire activity on slopes. In addition, topography impacts the ability of firefighters to combat the blaze by hampering access for equipment, supplies, materials, and personnel.
- **Weather**: Weather components such as temperature, relative humidity, wind, and lightning also affect the potential for wildfires. High temperatures and low relative humidity dry out the fuels that feed the wildfire, increasing the odds that fuel will more readily ignite and burn more intensely. Wind is the most treacherous weather factor. The greater the wind, the faster a fire will spread and more intense it will be. In addition to wind speed, wind shifts can occur suddenly due to temperature changes or the interaction of wind with topographical features such as slopes or steep hillsides. Lightning may also ignite wildfires, which are often in terrain that is difficult for firefighters to reach. Drought conditions contribute to wildfire vulnerability and susceptibility. During periods of drought, low fuel moisture and lack of precipitation increase the threat of wildfire. There is no known effective measure for human mitigation of weather conditions. Careful monitoring of weather conditions that drive the activation

and enforcement of fire-safety measures and programs, such as bans on open fires, are ongoing weather-related mitigation activities.

Most of the eastern half of the County is dominated by agricultural and grazing lands. Fuel loads on grazing lands are moderate to heavy, and large fires have occurred with this fuel type during springtime wind events. Cultivated agricultural lands include both irrigated and non-irrigated crop land. Typically, this category of land has very dynamic burning characteristics and seasons. The dynamic nature of the fuel locations and seasons of availability adds to the challenge of wildfire suppression and mitigation.

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

Other hazards can influence wildfire probability and severity. Damaging winds can down power lines, earthquakes can crack gas lines, and lightning can spark fires. Lightning is a major cause of structural fires and wildfires. Drought conditions increase wildfire potential by decreasing fuel moisture. Climate trends including warm winters, hot and dry summers, and severe drought, continue to increase wildfire risk and the potential for catastrophic wildland fires in Colorado. Forest insect epidemics and forest parasites also contribute to wildfire potential by increasing fuel loading.

Wildland fires also contribute to poor air quality in the planning area, again impacting human health and the environment. In addition, fires can severely damage forested areas and watersheds that are critical to the planning area's drinking water supply. Catastrophic wildland fires have a high probability of occurring in certain forest types that are unhealthy due to tree density. In 1996 and 2002, two major wildland fires occurred above Denver Water's reservoirs. Subsequent rain events resulted in significant erosion, transporting large volumes of sediment into these water supply reservoirs. The sediment impacted quality of the water supply that required increased water treatment and management costs, and a reduction in storage capacity.

4.13.2 Location

Historically, wildfires have been perceived as a hazard primarily for rural areas in the western part of the state; however, wildfires are a growing problem in the wildland-urban interfaces of eastern Colorado, including communities within the planning area. Wildland fires can occur anywhere that natural vegetation exists as a fuel source, including forests and grasslands. 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. Figure 4-46 and Figure 4-47 show the extent of WUI Intermix areas in Adams County.

The Colorado Forest Atlas (formerly called CO-WRAP) is the primary mechanism for the Colorado State Forest Service to collect, analyze, and deploy risk information about wildfire issues across the state. to the Forest Atlas helps create awareness about wildfire risk and is designed to provide data to support mitigation activity and wildfire prevention in diverse communities across Colorado. While traditionally associated with forested mountain areas, WUI areas are also present in grasslands, prairies, valleys, or in any area where sustained wildfire may occur and impact developed areas. The Colorado Forest Atlas defines the WUI using housing density data to delineate where people and structures meet and intermix with wildland fuels. While much of the planning area is built out, WUI areas do exist throughout the planning area as shown below.

Figure 4-48 and Figure 4-49 show the WUI risk for the County, which is a rating of the potential impact of wildfire on people and their homes. Figure 4-50 displays the wildfire risk to assets for western Adams County. Eastern Adams County is not included due to this area being at the lowest risk to assets. Wildfire risk to assets is a composite value created by combining the Burn Probability data with the actual value of what is at risk of destruction by fire. In this document, value is a measurement of the monetary worth of building and critical facility losses combined with the potential negative impacts to forested areas, riparian areas (wetlands, riverbanks, and their ecosystems), and watershed areas (land that drains water to rivers, lakes, etc.).

The wildland fire risk in the planning area is not particularly high compared to the mountain counties of Colorado. However, events such as the December 2021 Marshall Fire exhibit the damaging potential of grass fires in the plains and how quickly they can spread to urban areas. Overall, the geographic extent of the planning area at risk of wildfires is **limited** for most of the planning area, and **extensive** for Denver Water.

Figure 4-46 Wildland Urban Interface (WUI) Intermix Areas in West Adams County

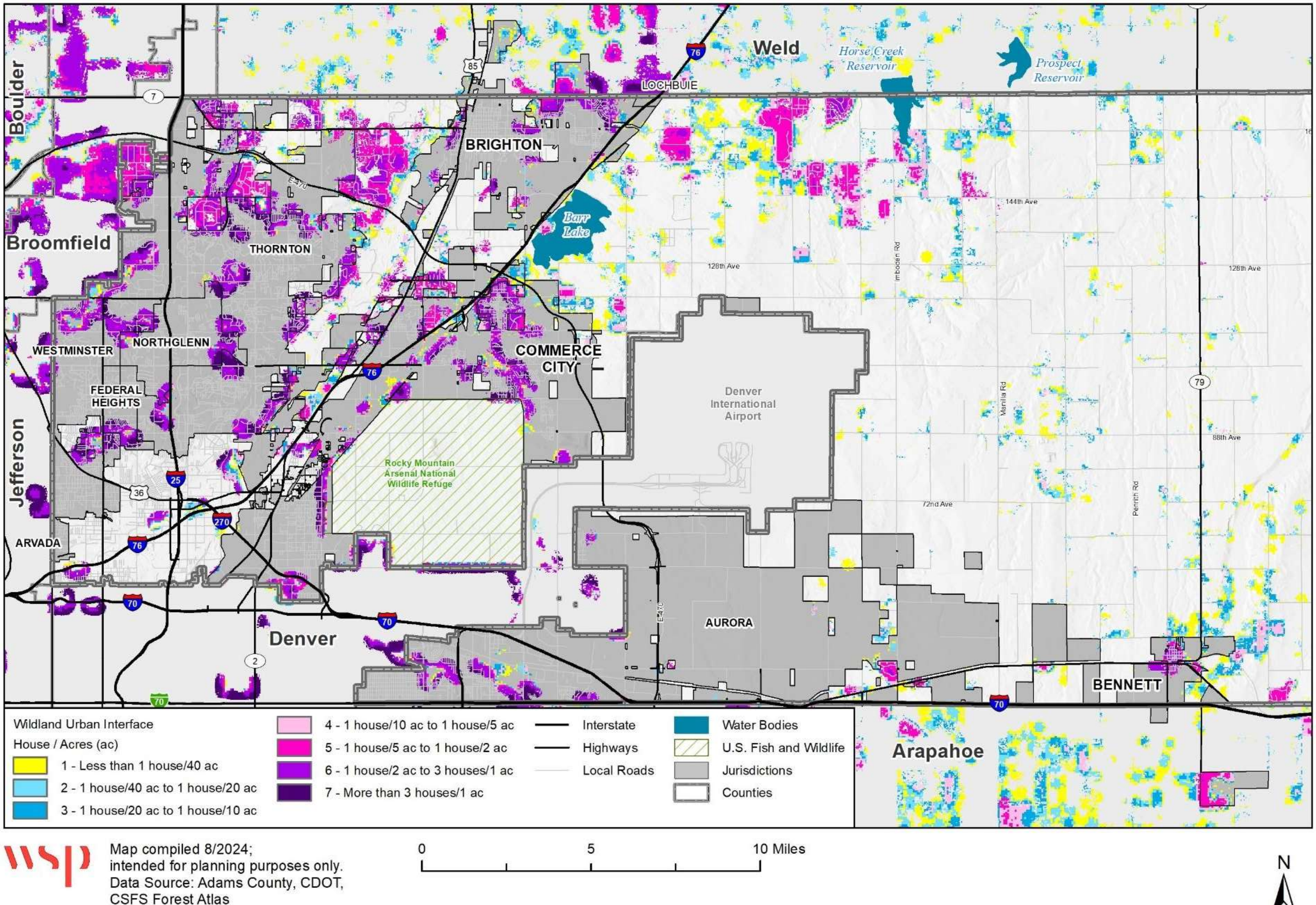


Figure 4-47 Wildland Urban Interface (WUI) Intermix Areas in East Adams County

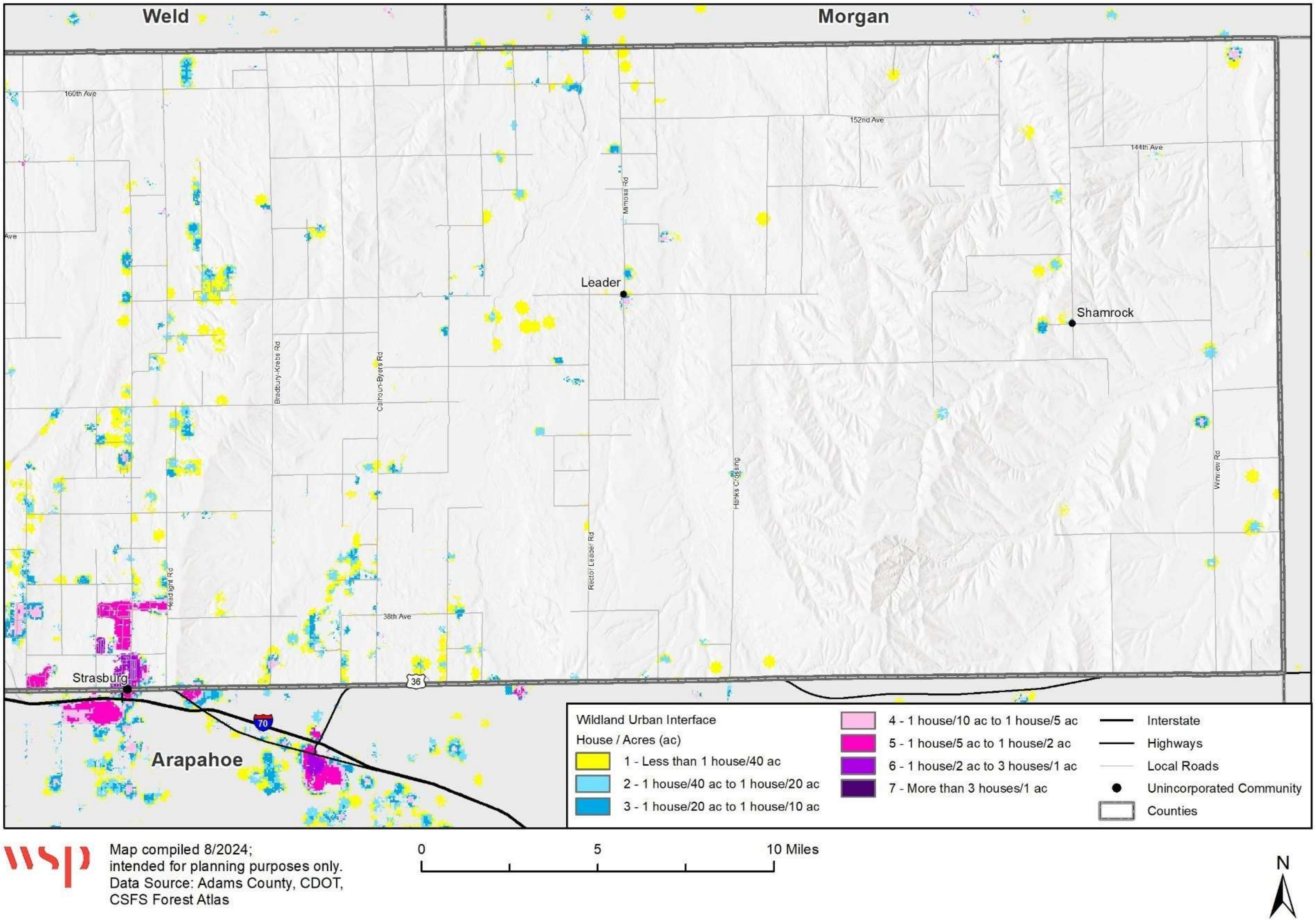


Figure 4-48 WUI Risk in West Adams County

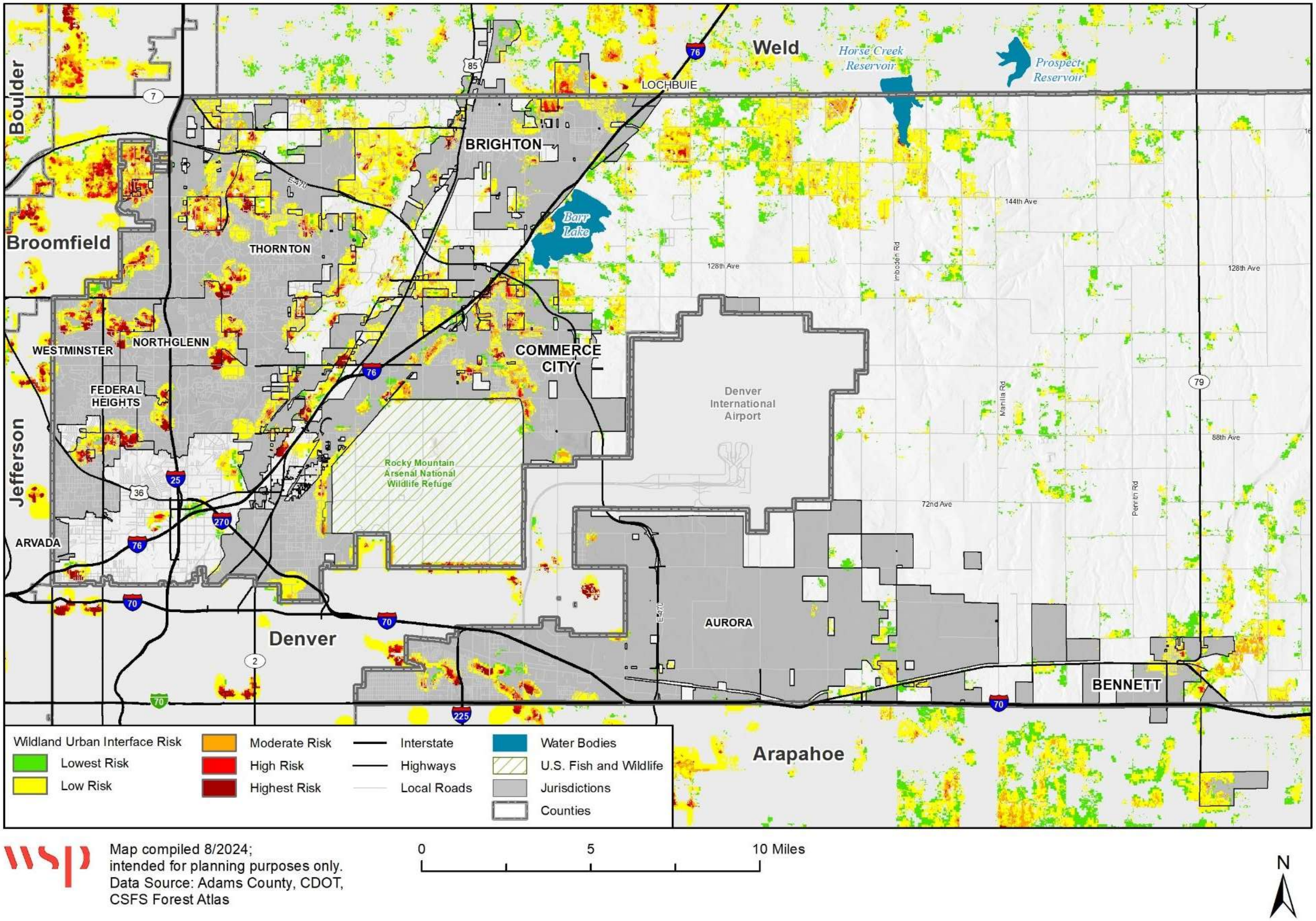


Figure 4-49 WUI Risk in East Adams County

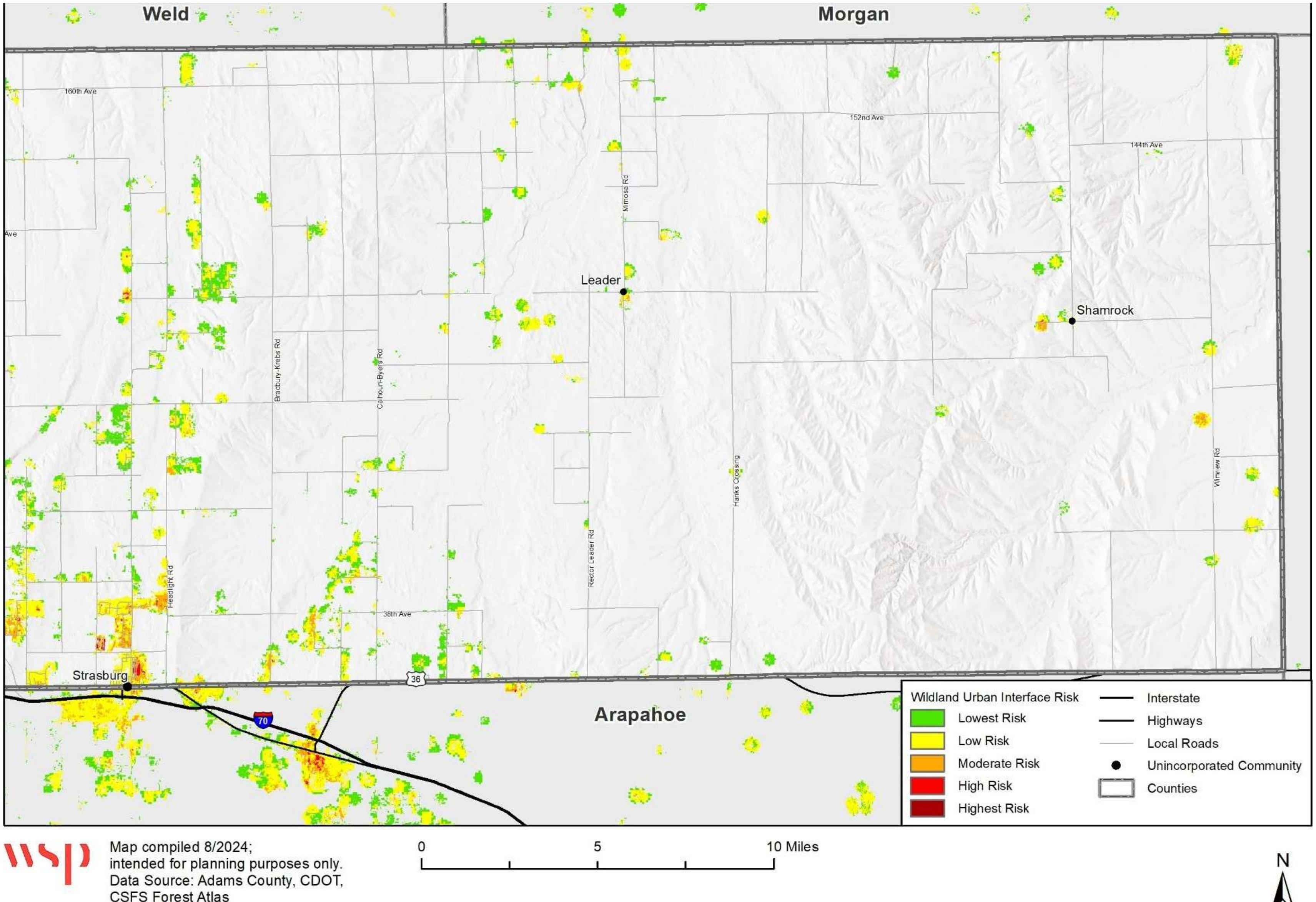
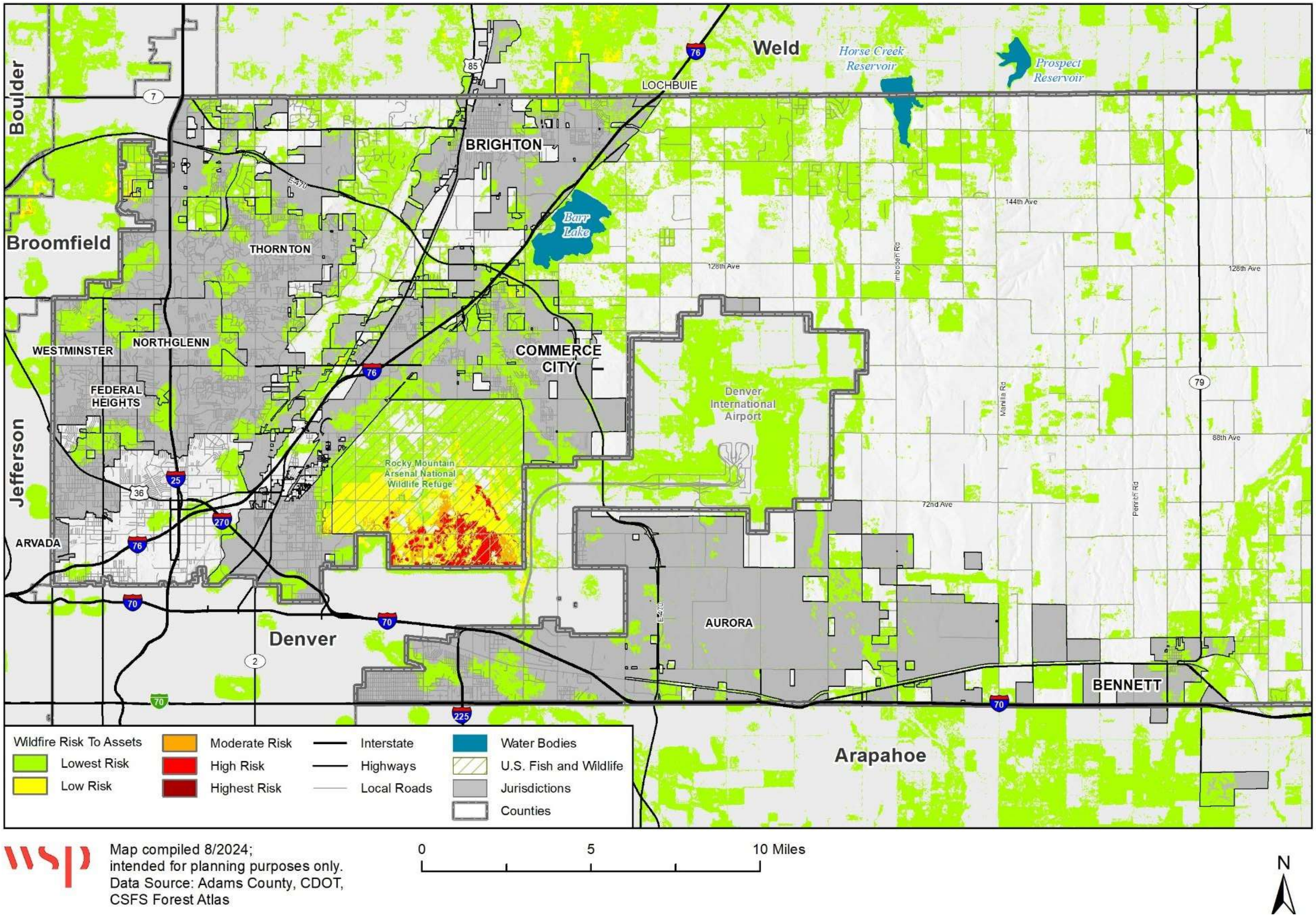


Figure 4-50 Wildfire Risk to Assets in West Adams County



4.13.3 Past Occurrences

Table 4-92 details past fire events in Adams County from 1995 through 2024 according to data from the National Interagency Fire Center (NIFC). During this timeframe, Adams County experienced 24 fire events that burned a total of 3,222 acres.

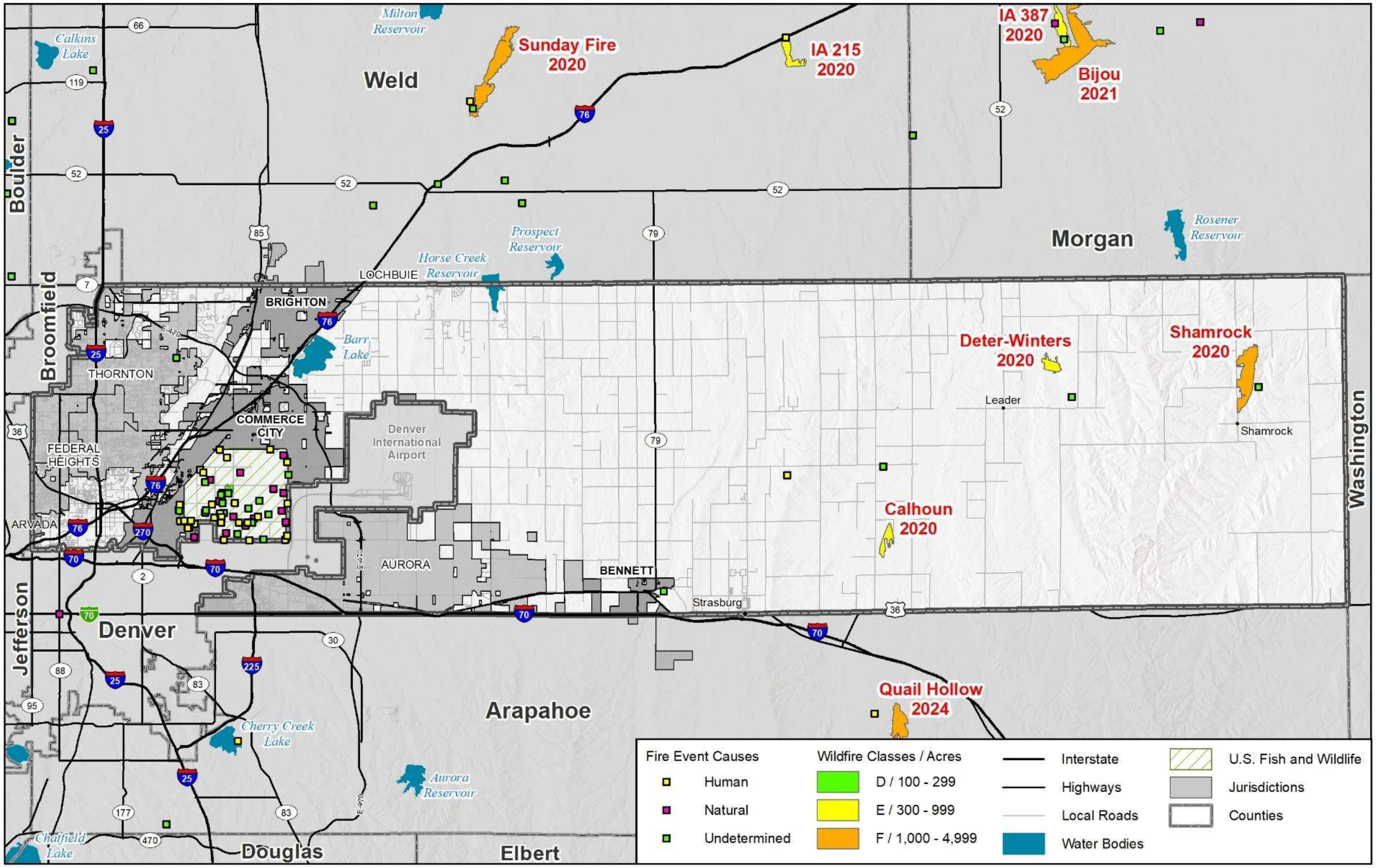
As shown in the table, the majority of recorded fires within Adams County have been small, primarily grassland fires not exceeding 100 acres in size. Half of these occurrences were 10 acres or less. However, several of the largest fires in the county were several hundred to over 1,000 acres in size. Three of these larger events, the Deter-Winters, Calhoun, and Shamrock fires, all occurred in the grasslands of Eastern Adams County during the 2020 Western United States Wildfire Season. This was a catastrophic wildfire season resulting in the three largest fires in state history and over 665,000 acres burned statewide.

Table 4-92 Adams County Fire History, 1995-2024

Year	Fire Name	Acres Burned
2020	Shamrock	1,525
1995	SEC23-95	443
2020	Calhoun	382
2020	Deter-Winters	347
2016	Rattlesnake Hill	134
2024	88th AVE	125
2006	SECTION 32 FIRE	99
1996	EW-SEC5-96	34
2024	Fishermens Lot	30
2018	Old Victory	21
2000	RMANES2000	11
2024	Sand Sage	10
1996	NPSECT2596	9
2023	Mozzarella	9
2024	Gateway	8
2006	JAMES FIRE	8
2011	ARSENAL FIRE	7
2001	WFSEC36	6
2000	WF07SEC08	5
2016	Quebec	4
2001	WFSEC11	2
2007	BISON FIRE	1
1996	NWSEC27-96	1
	Total	**3,222**

Source: National Interagency Fire Center (NIFC)

Figure 4-51 Wildfire History in Adams County, 1995-2024



Map compiled 8/2024;
intended for planning purposes only.
Data Source: Adams County, CDOT,
National Interagency Fire Center (NIFC)

As previously discussed, while wildfire has traditionally been considered more of a threat to forest and mountainous areas of the state, rather than more urbanized areas such as Adams County, changes in Colorado's fire regime may be shifting in such a way that this hazard could cause greater impact to the planning area in coming years. The 2021 Marshall Fire demonstrates how destructive grass fires can be when they spread to an urban area. 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.

4.13.4 Climate Change Considerations

Climate is a major determinant of wildland fire through its control of weather, as well as through its interaction with fuel availability, fuel distribution and flammability at the global, regional, and local levels. With hotter temperatures, drier soil and worsening drought conditions in the entire Western United States, wildland fires have the potential to become more extreme. Currently humans are the main cause of fire ignition globally, although lightning has been predominantly responsible for large fires nearby in the Front Range. Colorado and the Western United States have seen significant increases in forest area burned in recent years, and the risk of wildland fires in the future are expected to increase due to a lengthening fire season and drier conditions.

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

Land use, vegetation, available fuels, and weather conditions (including wind, low humidity, and lack of precipitation) are chief factors in determining the number and size of fires in Colorado each year. Generally, fires are more likely when vegetation is dry from a winter with little snow and/or a spring and summer with sparse rainfall. Conversely, an abnormally wet spring can increase the amount of available fuels, which then dry out in the summer. As a result, climate-induced hazards in Colorado (specifically, a pattern of extended drought conditions) have contributed to increased concern about wildland fire in Denver.

The frequency, intensity, and duration of wildland fires have increased across the WUS since the 1980s. The USDA's "Effects of Climate Variability and Change on Forest Ecosystems" General Technical Report, published in December 2012, found that the Colorado region, among others, will face an even greater fire risk over time. The report expects Colorado to experience up to a five-fold increase in acres burned by 2050. The report's findings are consistent with previous studies on the relationship between climate change and fire risk. Colorado landscapes, including those that characterize the planning area, are expected to become hotter and drier as the planet warms, which in turn is expected to increase regional wildland fire risk.

4.13.5 Probability of Future Occurrence

Wildfires can occur at any time of day and during any month of the year. Moreover, the length of a wildfire season and/or peak months may vary appreciably from year to year. Recent wildfires and brush fires across Colorado have forced school closures, disrupted telephone services by burning fiber optic cables, damaged railroads and other infrastructure, and adversely affected tourism, outdoor recreation, and hunting. The likelihood of one of those fires attaining significant size and intensity within the planning area is highly unlikely. That said, weather conditions, particularly drought events, increase the likelihood of wildfires occurring.

Based on the above record of past events, Adams County has an 83% annual chance of experiencing a wildfire event, but a much lower 5.6% chance of that wildfire being a significant event. Conditions that cause or exacerbate wildfire, including drought, fuel loading, a lengthening fire season, lightning strikes, and other human activities are expected to continue, and trends indicate they may be worsening. Locations such as the Town of Bennett may already be considered as more likely to experience fires due to the location surrounded by grasslands. However, as previously discussed, the more urbanized western half of the county could potentially see an increasing probability for an impactful wildfire should another scenario like the Marshall Fire occur. Figure 4-52 and Figure 4-53 below illustrate the burn probability in Adams County, according to COWRA data. As shown, the greatest likelihood for wildfire is in and around the Rocky Mountain National Arsenal Wildlife Refuge.

Figure 4-52 Wildfire Burn Probability in West Adams County

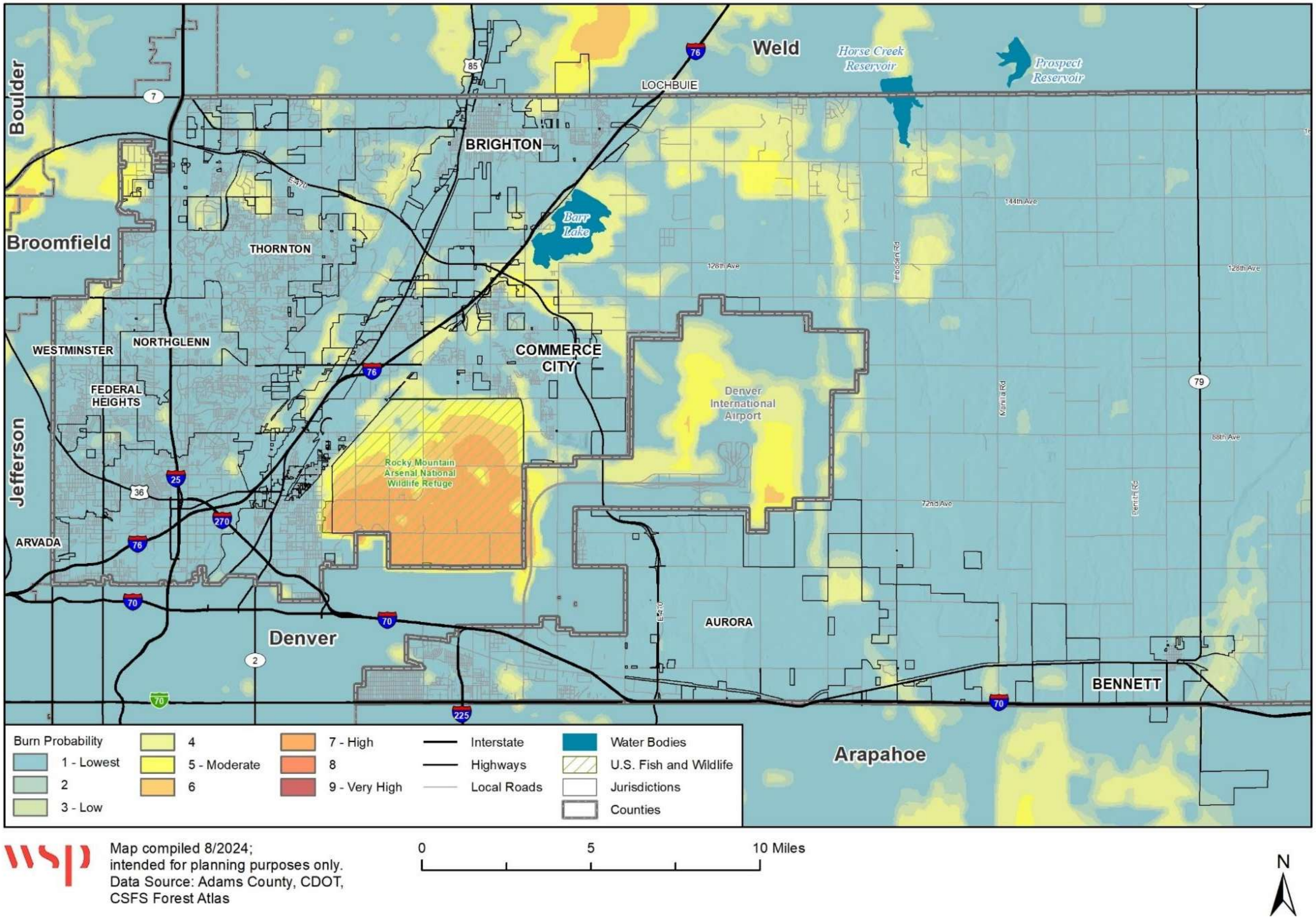
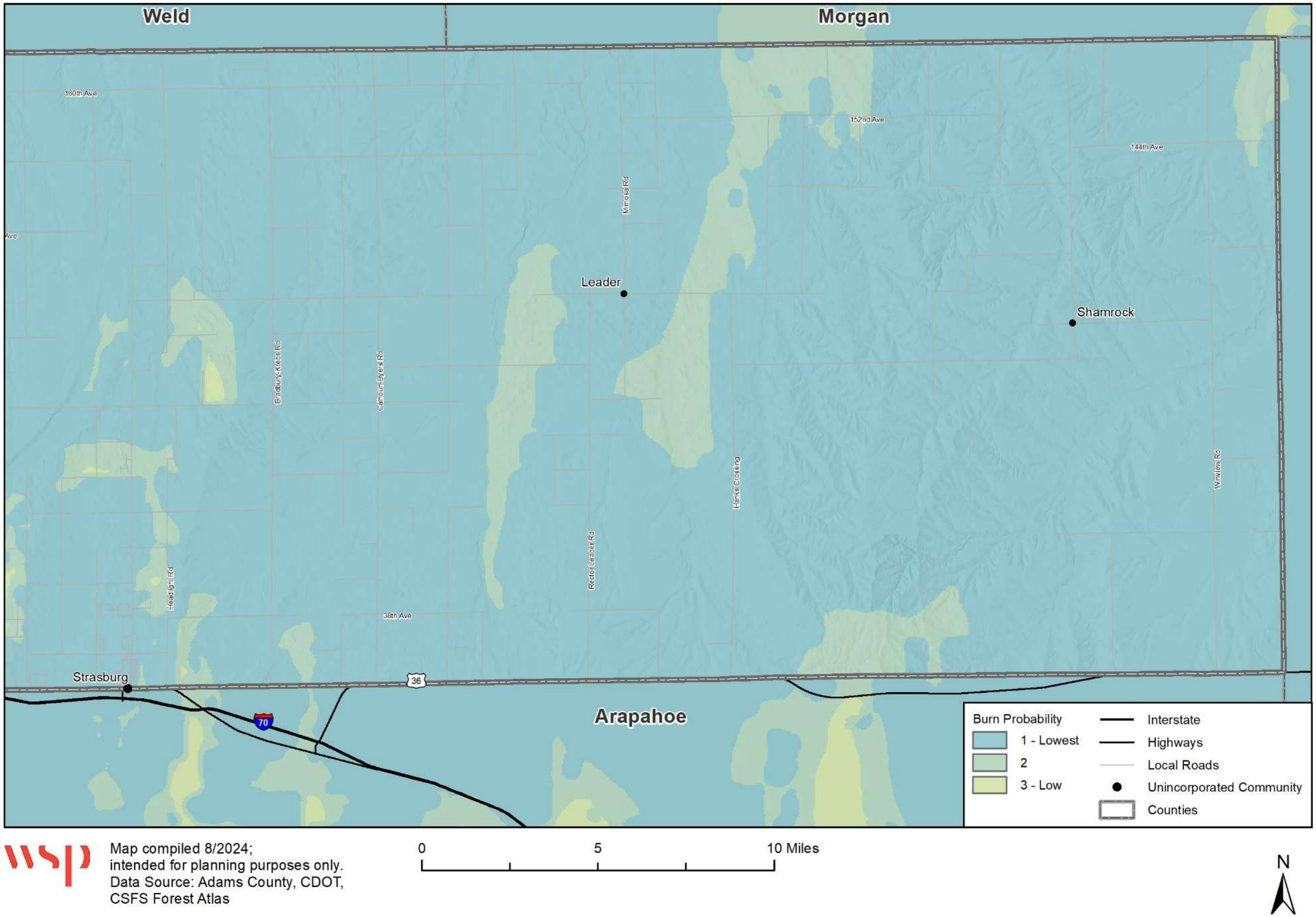


Figure 4-53 Wildfire Burn Probability in East Adams County



4.13.6 Magnitude/Severity

Local impacts from wildfire events are measured based on a variety of factors, including:

- Loss of life (human, livestock, wildlife)
- Damage to municipal watersheds
- Loss of property
- Evacuations
- Transportation interruption (closing highways)
- Reductions in air quality and human health
- Injuries – burns, smoke inhalation, etc.
- Coal seam or other energy facility ignitions
- Loss of vegetation (erosion, loss of forage and habitat for livestock and wildlife)
- Expense of responding (equipment, personnel, supplies, etc.)
- Loss of revenue from destroyed recreation and tourism areas

Predicting the intensity of a wildfire, its rate of spread, and its duration are important for wildfire mitigation activity, response, and firefighter safety. Three key factors affect wildfire behavior in the WUI:

1. ***Fuels:*** *The type, density, and continuity of surrounding vegetation and, sometimes, flammable structures, which provide fuel to keep a wildfire burning. Fuels consist of combustible materials and vegetation (including grasses, leaves, ground litter, plants, shrubs, and trees) that feed a fire.*
2. ***Weather:*** *Relative humidity, wind, and temperatures all affect wildfire threat and behavior.*
3. ***Topography:*** *The steepness and aspect (direction) of slopes, as well as building-site locations, are features that affect fire behavior.*

Very often the only factor that a community can have direct influence over is fuel.

The Colorado Forest Atlas provides a description of fire intensity potential based on the conditions within the planning area. The tool uses the Fire Intensity Scale (FIS), which uses fuels, topography, and weather as inputs to determine potential fire intensity for a given location. FIS consists of five classes, where the order of magnitude between classes is ten-fold. The minimum class (Class 1 represents very low wildfire intensities, and the maximum class (Class 5) represents very high wildfire intensities.

Descriptions of the FIS classes are listed below:

- **Class 1** – Lowest Intensity: Very small, discontinuous flames, usually less than 1 foot in length; very low rate of spread; no spotting. Fires are typically easy to suppress by firefighters with basic training and non-specialized equipment.
- **Class 2** – Low: Small flames, usually less than two feet long; small amount of very short-range spotting possible. Fires are easy to suppress by trained firefighters with protective equipment and specialized tools.
- **Class 3** – Moderate: Flames up to eight feet in length; short-range spotting possible. Trained firefighters find these fires difficult to suppress without support from aircraft or engines, but dozer and plows are generally effective. Increasing potential for harm or damage to life and property.
- **Class 4** – High: Large flames up to 30 feet in length; short-range spotting common; medium range spotting possible, Direct attack by trained firefighters, engines, and dozers is generally ineffective, indirect attack may be effective. Significant potential for harm or damage to life and property.
- **Class 5** – Highest Intensity: Very large flames up to 150 feet in length; profuse short-range spotting frequent long-range spotting; strong fire-induced winds. Indirect attack marginally effective at the head of the fire. Great potential for harm or damage to life and property.

The majority of the planning area is classified as low to moderate for fire intensity. Given the lack of history of damages from wildfires in the planning area and low to moderate fire intensity, severity is estimated to be **negligible**, although the possibility for more damaging fires does exist.

The Keetch-Byram Drought Index (KBDI) monitors fire danger using maximum daily temperature, and daily, antecedent, and annual precipitation. The index ranges from 0 (no drought) to 800 (extreme drought) (U.S. Forest Service Wildland Fire Assessment System 2019). Adams County considers an index of 400 to be minimum severity and an index of 600 to be a major severity for wildfire.

Table 4-93 Keetch-Byram Drought Index (KBDI)

KBDI	Description
0-200	Soil and fuel moisture are high. Most fuels will not readily ignite or burn. However, with sufficient sunlight and wind, cured grasses and some light surface fuels will burn in sports and patches.
200-400	Fires more readily burn and will carry across an area with no gaps. Heavier fuels will still not readily ignite and burn. Also, expect smoldering and the resulting smoke to carry into and possibly through the night.
400-600	Fire intensity begins to significantly increase. Fires will readily burn in all directions exposing mineral soils in some locations. Larger fuels may burn or smolder for several days creating possible smoke and control problems.
600-800	Fires will burn to mineral soil. Stumps will burn to the end of underground roots and spotting will be a major problem. Fires will burn through the night and heavier fuels will actively burn and contribute to fire intensity.

Source: U.S. Forest Service Wildland Fire Assessment System, 2019

4.13.7 Vulnerability

The following sub-sections discuss the results of the parcel and facility vulnerability analysis conducted for Adams County, using Wildland Urban Interface (WUI) risk data from the Colorado Forest Service and address point data from Adams County to determine the value and number of properties exposed to the various WUI Risk levels (Lowest, Low, Moderate, High, and Highest Risk) throughout Adams County. The same methodology was used for critical facility analysis by utilizing facility location data from 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.

People

The greatest risk to people from direct wildland fires is to those within the moderate, high, or highest wildland fire risk areas in the Unincorporated areas of Adams County (with 6,528 people), followed closely by the City of Thornton (6,332 people) in the northwestern portions of the planning area. The rest of the municipalities in the county are rounded out by the City of Westminster (with 4,904), Aurora (1,719), Northglenn (with 1,316), Federal Heights (23), Brighton (121), Commerce City (119), and Bennett (with 2 people exposed). As described in Section 4.2.1, populations exposed to wildfire were calculated using 2023 U.S. Census Bureau estimates and data from the Colorado Demographer's Office data. Much of the urbanized areas of the planning area have limited wildland fire risk, but there are still an estimated 21,271 residents countywide residing in these wildland fire risk areas as broken down in the last column of Table 4-95 below.

Fire can cause direct physical impacts to people, including physical injuries and burns, and breathing issues from smoke inhalation. Indirect impacts, such as widespread smoke from wildland fires occurring outside of the planning area boundaries 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 metro polytan 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.

Property

Any flammable materials are vulnerable during a wildland fire, including structures and personal property. The vulnerability of general property increases with proximity to wildland fire-prone areas. These structures receive an even higher level of vulnerability if the properties surrounding them are not properly mitigated for fire. Appropriate mitigation techniques include using non-flammable materials such as ignition-resistant construction, leaving appropriate spaces between buildings and vegetation, landscaping with non-flammable materials (such as decorative rock or stone), and clearing of underbrush and trees. If a wildland fire were to cross completely into an urban zone, the damage could be extensive and there would likely be a higher loss as property and homes themselves become fuel in extreme fire weather conditions.

Results of the spatial analysis are summarized by WUI zone as well as jurisdiction in Table 4-94 through Table 4-96 below. Based on this analysis, the vast majority of exposed property in Adams County is residential property types.

Table 4-94 Parcels Found in Moderate WUI Risk Areas by Jurisdiction and Property Type

Jurisdiction	Property Type	Improved Parcels	Building Count	Improved Value	Estimated Content Value	Total Value	Buildings At Risk %	Population At Risk
Aurora	Commercial	4	9	$7,625,235	$7,625,235	$15,250,470	0.9%	0
	Exempt	1	1	$8,186,115	$8,186,115	$16,372,230	0.2%	0
	Residential	109	113	$64,120,874	$32,060,437	$96,181,311	0.7%	351
	Total	**114**	**123**	**$79,932,224**	**$47,871,787**	**$127,804,011**	**0.7%**	**351**
Bennett	Exempt	3	3	$3,027,625	$3,027,625	$6,055,250	7.5%	0
	Residential	50	50	$24,684,025	$12,342,013	$37,026,038	3.4%	104
	Total	**53**	**53**	**$27,711,650**	**$15,369,638**	**$43,081,288**	**3.3%**	**104**
Brighton	Exempt	2	3	$67,613,923	$67,613,923	$135,227,846	0.6%	0
	Residential	120	120	$59,879,011	$29,939,506	$89,818,517	0.9%	354
	Total	**122**	**123**	**$127,492,934**	**$97,553,429**	**$225,046,363**	**0.8%**	**354**
Commerce City	Agricultural	1	1	$29,629	$29,629	$59,258	12.5%	0
	Commercial	4	5	$5,053,168	$5,053,168	$10,106,336	0.4%	0
	Exempt	3	3	$1,530,404	$1,530,404	$3,060,808	0.5%	0
	Residential	520	522	$245,697,649	$122,848,825	$368,546,474	2.3%	1,525
	Total	**528**	**531**	**$252,310,850**	**$129,462,026**	**$381,772,876**	**2.2%**	**1,525**
Federal Heights	Commercial	1	12	$2,761,660	$2,761,660	$5,523,320	4.8%	0
	Exempt	3	5	$428,906	$428,906	$857,812	12.2%	0
	Residential	1	1	$319,000	$159,500	$478,500	0.02%	3
	Total	**5**	**18**	**$3,509,566**	**$3,350,066**	**$6,859,632**	**0.3%**	**3**
Northglenn	Commercial	2	2	$5,813,459	$5,813,459	$11,626,918	0.5%	0
	Exempt	2	3	$40,048,528	$40,048,528	$80,097,056	0.9%	0
	Residential	43	43	$21,196,000	$10,598,000	$31,794,000	0.3%	126
	Total	**47**	**48**	**$67,057,987**	**$56,459,987**	**$123,517,974**	**0.3%**	**126**
Thornton	Commercial	1	4	$6,188,304	$6,188,304	$12,376,608	0.4%	0
	Exempt	2	2	$7,958,450	$7,958,450	$15,916,900	0.3%	0
	Residential	382	410	$276,867,810	$138,433,905	$415,301,715	0.9%	1,269
	Total	**385**	**416**	**$291,014,564**	**$152,580,659**	**$443,595,223**	**0.9%**	**1,269**
Westminster	Commercial	11	11	$23,830,927	$23,830,927	$47,661,854	1.5%	0

Jurisdiction	Property Type	Improved Parcels	Building Count	Improved Value	Estimated Content Value	Total Value	Buildings At Risk %	Population At Risk
	Exempt	5	12	$2,280,612	$2,280,612	$4,561,224	1.9%	0
	Residential	217	289	$248,403,827	$124,201,914	$372,605,741	1.2%	844
	Total	**233**	**312**	**$274,515,366**	**$150,313,453**	**$424,828,819**	**1.2%**	**844**
Unincorporated	Agricultural	53	78	$21,702,363	$21,702,363	$43,404,726	3.6%	0
	Commercial	6	8	$5,451,158	$5,451,158	$10,902,316	0.4%	0
	Exempt	5	5	$2,613,541	$2,613,541	$5,227,082	0.8%	0
	Industrial	1	1	$3,537,297	$5,305,946	$8,843,243	0.6%	0
	Residential	1,253	1,395	$835,936,689	$417,968,345	$1,253,905,034	4.3%	4,242
	Total	**1,318**	**1,487**	**$869,241,048**	**$453,041,352**	**$1,322,282,400**	**3.9%**	**4,242**
	Grand Total	**2,805**	**3,111**	**$1,992,786,189**	**$1,106,002,395**	**$3,098,788,584**	**1.6%**	**8,819**

Source: Adams, Arapahoe, and Weld County Assessor Data 2024, Colorado Forest Atlas, WSP GIS Analysis

Table 4-95 Parcels Found in High WUI Risk Areas by Jurisdiction and Property Type

Jurisdiction	Property Type	Improved Parcels	Building Count	Improved Value	Estimated Content Value	Total Value	Buildings At Risk %	Population At Risk
Aurora	Commercial	1	1	$214,718	$214,718	$429,436	0.1%	0
	Exempt	1	1	$0	$0	$0	0.2%	0
	Industrial	1	1	$21,880,022	$32,820,033	$54,700,055	0.8%	0
	Residential	103	166	$102,229,282	$51,114,641	$153,343,923	1.0%	516
	Total	**106**	**169**	**$124,324,022**	**$84,149,392**	**$208,473,414**	**1.0%**	**516**
Bennett	Exempt	2	2	$7,681,795	$7,681,795	$15,363,590	5.0%	0
	Residential	7	7	$2,285,225	$1,142,613	$3,427,838	0.5%	15
	Total	**9**	**9**	**$9,967,020**	**$8,824,408**	**$18,791,428**	**0.6%**	**15**
Brighton	Exempt	3	3	$645,125	$645,125	$1,290,250	0.6%	0
	Residential	126	130	$59,043,860	$29,521,930	$88,565,790	0.9%	384
	Total	**129**	**133**	**$59,688,985**	**$30,167,055**	**$89,856,040**	**0.9%**	**384**
Commerce City	Commercial	2	3	$3,933,399	$3,933,399	$7,866,798	0.3%	0
	Industrial	3	3	$7,317,920	$10,976,880	$18,294,800	0.7%	0
	Residential	398	434	$181,056,921	$90,528,461	$271,585,382	2.0%	1,268

Jurisdiction	Property Type	Improved Parcels	Building Count	Improved Value	Estimated Content Value	Total Value	Buildings At Risk %	Population At Risk
	Total	**403**	**440**	**$192,308,240**	**$105,438,740**	**$297,746,980**	**1.8%**	**1,268**
Federal Heights	Commercial	2	3	$966,323	$966,323	$1,932,646	1.2%	0
	Exempt	1	2	$415,001	$415,001	$830,002	4.9%	0
	Residential	33	104	$105,134,267	$52,567,134	$157,701,401	2.1%	297
	Total	**36**	**109**	**$106,515,591**	**$53,948,458**	**$160,464,049**	**2.1%**	**297**
Northglenn	Commercial	2	2	$6,153,060	$6,153,060	$12,306,120	0.5%	0
	Residential	121	163	$221,907,650	$110,953,825	$332,861,475	1.2%	478
	Total	**123**	**165**	**$228,060,710**	**$117,106,885**	**$345,167,595**	**1.2%**	**478**
Thornton	Agricultural	1	2	$272,280	$272,280	$544,560	16.7%	0
	Exempt	2	3	$30,074,393	$30,074,393	$60,148,786	0.4%	0
	Residential	426	468	$407,266,022	$203,633,011	$610,899,033	1.0%	1,449
	Total	**429**	**473**	**$437,612,695**	**$233,979,684**	**$671,592,379**	**1.0%**	**1,449**
Westminster	Commercial	4	7	$8,584,662	$8,584,662	$17,169,324	1.0%	0
	Exempt	8	12	$39,080,588	$39,080,588	$78,161,176	1.9%	0
	Residential	407	589	$440,600,489	$220,300,245	$660,900,734	2.4%	1,721
	Total	**419**	**608**	**$488,265,739**	**$267,965,495**	**$756,231,234**	**2.4%**	**1,721**
Unincorporated	Agricultural	11	15	$3,648,704	$3,648,704	$7,297,408	0.7%	0
	Commercial	4	5	$1,567,138	$1,567,138	$3,134,276	0.2%	0
	Exempt	4	4	$872,256,734	$872,256,734	$1,744,513,468	0.6%	0
	Industrial	1	1	$3,537,297	$5,305,946	$8,843,243	0.6%	0
	Residential	428	449	$272,133,463	$136,066,732	$408,200,195	1.4%	1,365
	Total	**448**	**474**	**$1,153,143,336**	**$1,018,845,253**	**$2,171,988,589**	**1.3%**	**1,365**
	Grand Total	**2,102**	**2,580**	**$2,799,886,338**	**$1,920,425,368**	**$4,720,311,706**	**1.3%**	**7,492**

Source: Adams, Arapahoe, and Weld County Assessor Data 2024, Colorado Forest Atlas, WSP GIS Analysis

Table 4-96 Parcels Found in Highest WUI Risk Areas by Jurisdiction and Property Type

Jurisdiction	Property Type	Improved Parcels	Building Count	Improved Value	Estimated Content Value	Total Value	Buildings At Risk %	Population At Risk
Aurora	Commercial	2	12	$3,663,585	$3,663,585	$7,327,170	1.2%	0
	Exempt	1	1	$5,227,815	$5,227,815	$10,455,630	0.2%	0
	Residential	65	274	$82,567,336	$41,283,668	$123,851,004	1.7%	852
	Total	**68**	**287**	**$91,458,736**	**$50,175,068**	**$141,633,804**	**1.6%**	**852**
Bennett	Residential	1	1	$354,000	$177,000	$531,000	0.1%	2
	Total	**1**	**1**	**$354,000**	**$177,000**	**$531,000**	**0.1%**	**2**
Brighton	Exempt	1	1	$7,220	$7,220	$14,440	0.2%	0
	Residential	77	78	$28,306,313	$14,153,157	$42,459,470	0.6%	230
	Total	**78**	**79**	**$28,313,533**	**$14,160,377**	**$42,473,910**	**0.5%**	**230**
Commerce City	Commercial	1	1	$880,131	$880,131	$1,760,262	0.1%	0
	Exempt	2	2	$3,183,833	$3,183,833	$6,367,666	0.3%	0
	Industrial	2	3	$4,852,664	$7,278,996	$12,131,660	0.7%	0
	Residential	163	163	$68,802,700	$34,401,350	$103,204,050	0.7%	476
	Total	**168**	**169**	**$77,719,328**	**$45,744,310**	**$123,463,638**	**0.7%**	**476**
Federal Heights	Commercial	4	4	$5,585,562	$5,585,562	$11,171,124	1.6%	0
	Industrial	1	1	$11,430,502	$17,145,753	$28,576,255	100%	0
	Residential	80	408	$128,322,972	$64,161,486	$192,484,458	8.1%	1,167
	Total	**85**	**413**	**$145,339,036**	**$86,892,801**	**$232,231,837**	**7.8%**	**1,167**
Northglenn	Commercial	26	27	$45,178,120	$45,178,120	$90,356,240	6.9%	0
	Exempt	2	2	$1,242,761	$1,242,761	$2,485,522	0.6%	0
	Residential	173	243	$416,049,766	$208,024,883	$624,074,649	1.9%	712
	Total	**201**	**272**	**$462,470,647**	**$254,445,764**	**$716,916,411**	**2.0%**	**712**
Thornton	Commercial	16	19	$15,298,968	$15,298,968	$30,597,936	1.7%	0
	Exempt	5	130	$52,041,986	$52,041,986	$104,083,972	16.7%	0
	Residential	716	1,167	$675,322,128	$337,661,064	$1,012,983,192	2.5%	3,613
	Total	**737**	**1,316**	**$742,663,082**	**$405,002,018**	**$1,147,665,100**	**2.7%**	**3,613**
Westminster	Agricultural	1	1	$579,505	$579,505	$1,159,010	50.0%	0
	Commercial	5	9	$36,473,516	$36,473,516	$72,947,032	1.2%	0

Jurisdiction	Property Type	Improved Parcels	Building Count	Improved Value	Estimated Content Value	Total Value	Buildings At Risk %	Population At Risk
	Exempt	7	20	$36,285,839	$36,285,839	$72,571,678	3.2%	0
	Residential	671	801	$404,257,609	$202,128,805	$606,386,414	3.3%	2,340
	Total	**684**	**831**	**$477,596,469**	**$275,467,665**	**$753,064,134**	**3.2%**	**2,340**
Unincorporated	Agricultural	3	3	$518,051	$518,051	$1,036,102	0.1%	0
	Commercial	5	6	$9,874,823	$9,874,823	$19,749,646	0.3%	0
	Exempt	6	7	$1,263,373	$1,263,373	$2,526,746	1.1%	0
	Industrial	1	5	$3,537,297	$5,305,946	$8,843,243	2.8%	0
	Residential	291	303	$160,841,803	$80,420,902	$241,262,705	0.9%	921
	Total	**306**	**324**	**$176,035,347**	**$97,383,094**	**$273,418,441**	**0.9%**	**921**
	Grand Total	**2,328**	**3,692**	**$2,201,950,178**	**$1,229,448,096**	**$3,431,398,274**	**1.9%**	**10,314**

Source: Adams, Arapahoe, and Weld County Assessor Data 2024, Colorado Forest Atlas, WSP GIS Analysis

Critical Facilities and Infrastructure

Wildfires frequently damage community infrastructure, including roadways, communication networks and facilities, power lines, and water distribution systems. Efforts to restore roadways include the costs of maintenance and damage assessment teams, field data collection, and replacement or repair costs. Direct impacts to municipal water supply may occur through contamination of ash and debris during the fire, destruction of aboveground distribution lines, and soil erosion or debris deposits into waterways after the fire. Utilities and communications repairs are also necessary for equipment damaged by a fire. This includes power lines, transformers, cell phone towers, and phone lines.

Based on the GIS analysis performed, 64 critical facilities were found to be located within Moderate, High, or Highest WUI Risk areas. These facilities are detailed by jurisdiction and FEMA lifeline in Table 4-97 through Table 4-99.

Table 4-97 Critical Facilities in Moderate WUI Risk Areas by FEMA Lifeline and Jurisdiction

Jurisdiction	Communications	Energy	Food, Hydration, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Water Systems	Total Count
Arvada	-	-	-	-	-	-	-	-	**0**
Aurora	-	-	-	1	-	-	2	-	**3**
Bennett	-	-	-	-	-	1	-	-	**1**
Brighton	-	-	-	-	-	-	2	1	**3**
Commerce City	-	-	-	-	-	-	1	-	**1**
Federal Heights	-	-	-	-	-	-	-	-	**0**
Northglenn	-	-	-	-	-	-	-	-	**0**
Thornton	-	-	-	-	-	-	2	-	**2**
Westminster	-	-	-	-	-	1	2	1	**4**
Unincorporated	-	-	1	3	-	2	7	1	**14**
Total	**0**	**0**	**1**	**4**	**0**	**4**	**16**	**3**	**28**

Source: Colorado Forest Atlas, Adams County, CDOT, Denver Water, EPA, HIFLD, Division of Water Resources, National Bridge Inventory, CERC, WSP Analysis

Table 4-98 Critical Facilities in High WUI Risk Areas by FEMA Lifeline and Jurisdiction

Jurisdiction	Communications	Energy	Food, Hydration, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Water Systems	Total Count
Arvada	-	-	-	-	-	-	-	-	**0**
Aurora	-	-	-	-	-	-	2	-	**2**
Bennett	-	-	1	-	-	2	-	-	**3**
Brighton	-	-	-	-	-	-	-	-	**0**
Commerce City	-	-	-	-	-	-	1	-	**1**
Federal Heights	-	-	-	-	-	-	-	-	**0**

Jurisdiction	Communications	Energy	Food, Hydration, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Water Systems	Total Count
Northglenn	-	-	-	-	-	-	-	-	**0**
Thornton	-	-	-	-	-	-	-	-	**0**
Westminster	-	-	-	-	-	-	2	-	**2**
Unincorporated	-	1	-	-	-	-	5	1	**7**
Total	**0**	**1**	**1**	**0**	**0**	**2**	**10**	**1**	**15**

Source: Colorado Forest Atlas, Adams County, CDOT, Denver Water, EPA, HIFLD, Division of Water Resources, National Bridge Inventory, CERC, WSP Analysis

Table 4-99 Critical Facilities in Highest WUI Risk Areas by FEMA Lifeline and Jurisdiction

Jurisdiction	Communications	Energy	Food, Hydration, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Water Systems	Total Count
Arvada	-	-	-	-	-	-	-	-	**0**
Aurora	-	-	-	-	-	1	2	-	**3**
Bennett	-	-	-	-	-	-	-	-	**0**
Brighton	-	-	-	-	-	-	-	-	**0**
Commerce City	-	-	-	1	-	-	-	-	**1**
Federal Heights	-	-	-	2	-	-	-	-	**2**
Northglenn	-	-	-	2	-	1	-	-	**3**
Thornton	-	-	-	-	1	-	1	2	**4**
Westminster	-	-	-	-	-	1	3	-	**4**
Unincorporated	-	-	-	-	-	-	2	2	**4**
Total	**0**	**0**	**0**	**5**	**1**	**3**	**8**	**4**	**21**

Source: Colorado Forest Atlas, Adams County, CDOT, Denver Water, EPA, HIFLD, Division of Water Resources, National Bridge Inventory, CERC, WSP Analysis

Economy

A major wildland fire can cause devastating economic impacts, depending on the parameters and size of the fire. Economic impacts could include direct fire damage to buildings and facilities, additional strain on the healthcare system and first responders, cascading impacts to industries and supply chains, road closures and the accumulation of fire suppression and water treatment costs.

Historic, Cultural, and Natural Resources

Fire is a keystone process in the natural environment, providing many benefiting impacts to the surrounding habitat. Some natural resources and natural areas may benefit from wildland fire, as at some level they must also be exposed to wildland fire for a healthy ecological development of the area. However, extremely hot fires can result in habitat loss, watershed damage and increased erosion, and other impacts that could take decades to recover.

Development Patterns

Of the 14,478 structures built since 2018 (see Section 4.2.2), 408 are located in WUI risk areas, representing a 4.3% increase in WIU exposure. 84% of the new development has been residential. This increase has been distributed between areas of highest risk (166), high risk (121), and moderate risk (121). Significant increases in areas or highest WUI risk occurred in Thornton (126, 9.6% increase) and Northglenn (25, 9.2% increase). Commerce City also saw an 11% increase in WUI risk, with 71 buildings at high risk and 44 at moderate risk.

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 Adams County from wildfire for each of the climate and population scenarios.

Table 4-100 Potential Future Economic Losses from Wildfire in Adams County

	Population Scenarios		
Climate Scenarios	**Low Growth (~1,200)**	**Medium Growth (~1,600)**	**High Growth (~2,000)**
Current Conditions	Total Damages: $3.5M Total Damages per person: <$10	Total Damages: $3.5M Total Damages per person: <$10	Total Damages: $3.6M Total Damages per person: <$10
Moderately Warmer Climate by 2050	Total Damages: $3.8M Total Damages per person: <$10	Total Damages: $3.9M Total Damages per person: <$10	Total Damages: $4.0M Total Damages per person: <$10
Severely Warmer Climate by 2050	Total Damages: $3.8M Total Damages per person: <$10	Total Damages: $3.9M Total Damages per person: <$10	Total Damages: $4.0M Total Damages per person: <$10

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

4.13.8 Risk Summary

- Overall significance is **low**.
- 24 wildfire events have been recorded by the NIFC over the last 29 years in Adams County, burning a cumulative 3,222 acres.
- There is a total of $4.2 billion in exposed property values to Moderate, High, and Highest WUI Risk Areas throughout the County.
- There are a total of 64 critical facilities exposed to Moderate, High, and Highest WUI Risk Areas throughout the County, the majority of these are Transportation and Hazardous Materials lifelines.
- Vulnerable populations are at higher risk of power outages from wind events.
- Related Hazards: Drought, Thunderstorm (Lighting), Damaging Wind, Flood

4.14 Winter Weather

Table 4-101 Winter Weather Risk Summary

Jurisdiction	Geographic Location	Probability of Future Occurrence	Magnitude/ Severity	Overall Significance
Adams County	Extensive	Highly Likely	Limited	High
Bennett	Extensive	Highly Likely	Critical	High
Brighton	Significant	Highly Likely	Limited	Medium
Commerce City	Significant	Highly Likely	Limited	Medium
Denver Water	Limited	Highly Likely	Negligible	Low

4.14.1 Hazard Description

Winter storms can include heavy snow, ice, blizzard conditions, and extreme cold temperatures. Heavy snow can immobilize a region, stranding commuters, stopping the flow of supplies, and disrupting emergency and medical services. Accumulations of snow can collapse roofs and knock down trees and power lines. Severe winter storms can cause homes and farms to be isolated for days, and unprotected livestock may be lost. The cost of snow removal, damage repair, and business losses can have a tremendous impact on communities.

Heavy accumulations of ice can bring down trees, electrical wires, telephone poles and lines, and communication towers. Communications and power can be disrupted for days until damage can be repaired. Even small accumulations of ice may cause extreme hazards to motorists and pedestrians.

Some winter storms are accompanied by strong winds, creating blizzard conditions with blinding wind-driven snow, severe drifting, and dangerous wind chills. Strong winds with these intense storms and cold fronts can knock down trees, utility poles, and power lines. Blowing snow can reduce visibilities to only a few feet in areas where there are no trees or buildings. Serious vehicle accidents can cause injuries and deaths.

Extreme cold often accompanies a winter storm or is left in its wake. Prolonged exposure to the cold can cause frostbite or hypothermia and can become life-threatening. Infants and the elderly are most susceptible. Pipes may freeze and burst in homes or buildings that are poorly insulated or without heat. Extreme cold is most likely to occur in the winter months of December, January, and February. What constitutes extremely cold temperatures varies across different areas of the United States, based on normal climate temperatures for the time of year. In Colorado, cold temperatures are normal during the winter. When temperatures drop at least 20 degrees below normal winter lows, the cold is considered extreme and begins to impact the daily operations of a community. Extreme cold/wind chill impacts inanimate objects, plants, animals, and water supplies.

The effects of extremely cold temperatures are amplified by strong to high winds that can accompany winter storms. Wind-chill measures how wind and cold feel on exposed skin and is not a direct measurement of temperature. Animals are also affected by wind-chill.

Winter storms in Adams County, including intense winds and blizzard conditions, can result in property damage, localized power and phone outages, and closures of streets, highways, schools, businesses, and nonessential government operations. People can also become isolated from essential services in their homes and vehicles. A winter storm can escalate, creating life threatening situations when emergency response is limited by severe winter conditions. Other issues associated with severe winter weather include hypothermia and the threat of physical overexertion that may lead to heart attacks or strokes. Snow removal costs can also impact budgets significantly. Heavy snowfall during winter can also lead to flooding or landslides during the spring if the area snowpack melts too quickly.

4.14.2 Location

Extensive - The entire County is susceptible to severe winter storms, and winter storms typically affect significant portions of the County.

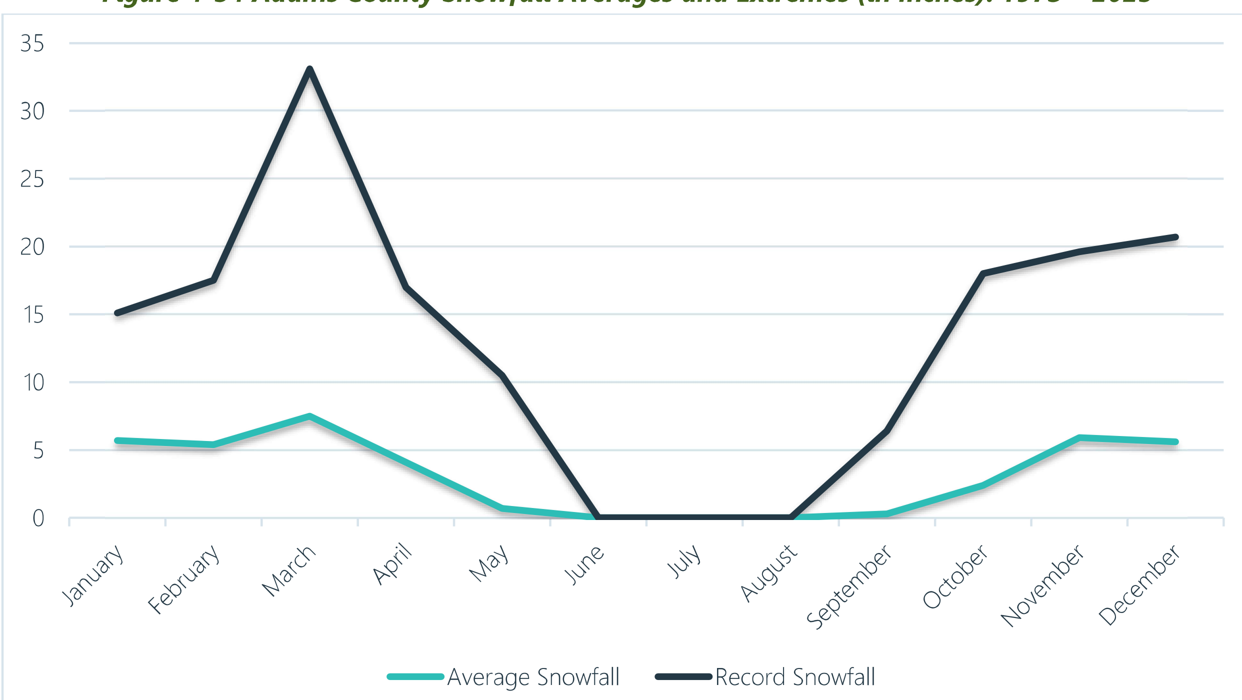
Adams County weather can be severe during the spring and winter months. There can be long periods of sub-degree temperatures in the winter. Blizzards can occur in late spring. Wind and snow blizzards cause whiteouts and drifting snow of 2 to 3 feet and more. Winds can be extremely strong, up to 100 miles per hour (mph) in the spring.

Adams County is uniformly exposed to severe winter storms. Winter storms occur in many forms and can vary significantly in size, strength, intensity, duration, and impact. High winds create snowdrifts, which can block roads and create dangerous wind chill factors. Storms or freezing temperatures are not needed for wind chill conditions to become dangerous. The NWS issues a wind chill advisory when wind and temperature combine to produce wind chill values of 20 degrees from zero to 35 degrees below zero. Hypothermia and frostbite are two consequences of wind chill. Hypothermia is the most common winter weather killer in Colorado. Ice accumulation becomes a hazard by creating dangerous travel conditions. When ice accumulates on roadways, the risk of losing control of a vehicle becomes much greater.

4.14.3 Past Occurrences

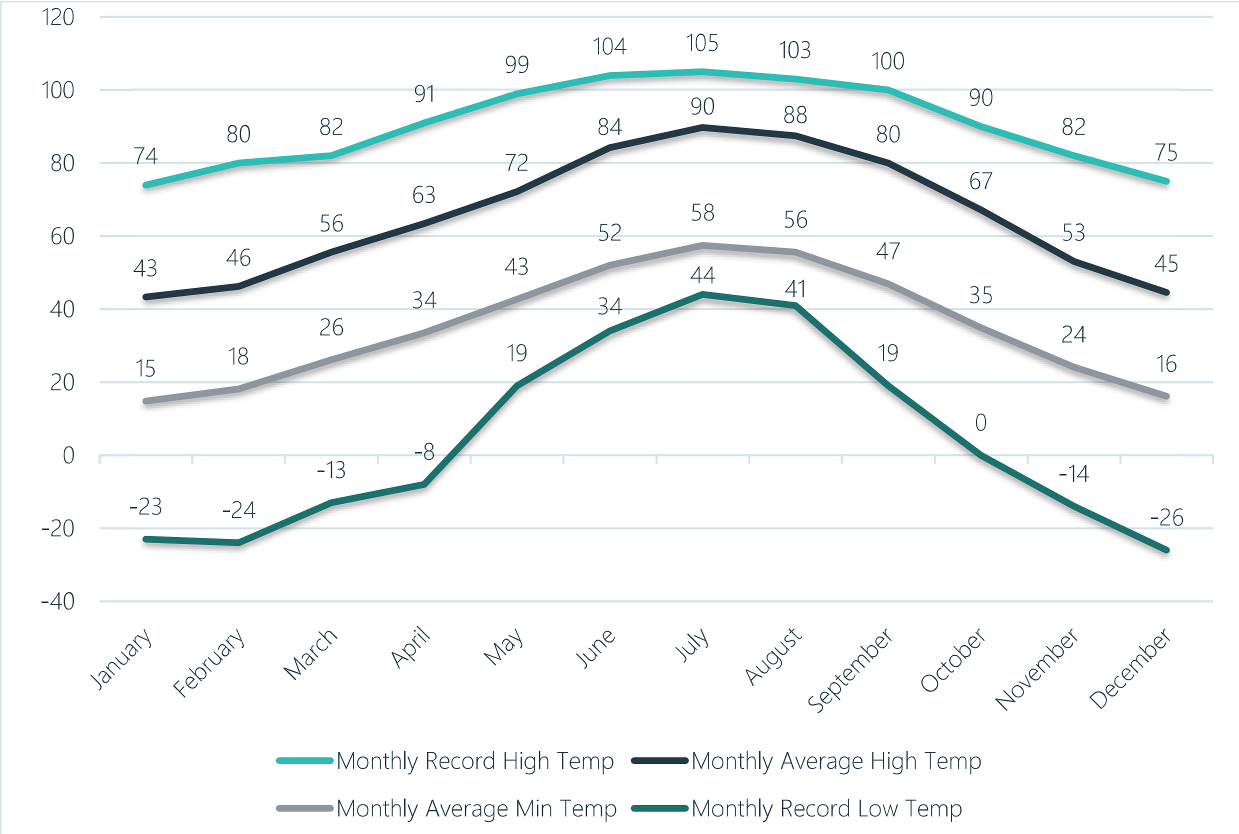
September through April is primary season for significant snowfalls, with December/January producing colder and dryer snowstorms and March/April producing wet and heavy snowfall. The Western Regional Climate Center reports data from weather stations in and around Adams County. The data reported here is from the Brighton 3 SE weather stations with a period of record from October 1, 1973 to February 28, 2025. According to data recorded at this station, Adams County sees an average of 36.9 inches of snowfall annually, with the months of October through April each seeing more than 1 inch of snowfall on average. March typically has the highest average snowfall. Contains winter weather summaries for this weather station. Figure 4-54 and Figure 4-55 show daily snowfall and temperature averages and extremes.

Figure 4-54 Adams County Snowfall Averages and Extremes (in Inches): 1973 – 2025



Source: Western Regional Climate Center

Figure 4-55 Adams County Temperature Averages and Extremes (in °F): 1973 – 2025



Source: Western Regional Climate Center

Several major winter storms and blizzards have occurred in the planning area over the past several decades. Profiles of some of the more severe storms were obtained from the NCEI Storm Events Database. According to the Database there have been 216 severe winter storm events (includes blizzard, heavy snow, winter storm and winter weather events) between January 1, 1950, and December 31, 2023 that have impacted Adams County. Of those 216 events resulted in four deaths, all of which were a result of extreme cold, and 17 injuries as a result of a blizzard event or extreme cold. The following table summarizes the events recorded in the Storm Events Database.

Table 4-102 NCEI Severe Winter Storm Event Reports for Adams County, 1950-2023

Event Type	# of Events	Property Damage ($)	Crop Damage ($)	Deaths	Injuries
Winter Storm	90	0	0	0	0
Winter Weather	78	0	0	0	0
Heavy Snow	46	0	0	0	0
Blizzard	32	$18,600,000	0	0	2
Extreme Cold/Wind Chill	3	0	0		
Cold/Wind Chill	7			5	15
Frost/Freeze	2	0	$10,000,000	0	0
Totals	**216**	**$18,600,000**	**$10,000,000**	**5**	**17**

Source: National Center for Environmental Information Storm Events Database, www.ncdc.noaa.gov/stormevents/
*Hazards with wide extents have losses which reflect larger zones that extend beyond Adams County

The Storm Events Database collects information on each event from a variety of sources including but not limited to, county, state and federal emergency management officials, newspaper clipping services, the insurance industry and the general project. Crop damages recorded in the Database should be considered broad estimates according to the National Weather Service. The Cause of Loss Database maintained by the USDA Risk Management Agency helps to quantify the economic impact different natural hazards have on the agriculture in the County.

Crop losses as a result of winter weather events including cold wet weather, cold winter, freeze and frost events, occurred in Adams County every year between 2007 and 2018. Freeze was the most common cause of loss, occurring in all 11 years. While the year 2015 experienced the most crop losses with over $2 million in losses claimed and over 44,000 acres affected. In total, over 57,000 acres were affected, and over $3 million losses claimed in that 11-year period due to winter weather related hazards.

Table 4-103 Crop Insurance Claims Due to Winter Weather Related Hazards, 2007-2023

Year	Cause of Loss	Determined Acres	Indemnity Amount
2007	Frost	25.3	$462
2007	Freeze	373.3	$35,635
2007	Cold Winter	63.0	$11,264
2008	Frost	31.3	$2,885
2008	Freeze	760.2	$59,440
2008	Cold Winter	261.8	$67,228
2009	Freeze	297.8	$15,214
2009	Cold Wet Weather	1,252.7	$34,191
2010	Cold Winter	120.3	$1,121
2011	Freeze	148.4	$14,048
2011	Cold Winter	243.3	$23,331
2012	Freeze	88.4	$22,607
2013	Freeze	1,472.8	$107,775
2013	Cold Winter	110.7	$8,178
2013	Cold Wet Weather	380.5	$13,799
2014	Freeze	165.1	$8,604
2015	Freeze	33,544.2	$1,523,813
2015	Cold Winter	8,057.1	$620,256
2015	Cold Wet Weather	3,101.3	$176,386
2016	Freeze	77.7	$5,191
2016	Cold Winter	105.9	$9,818
2017	Frost	281.8	$89,804
2017	Freeze	850.9	$46,388
2017	Cold Winter	5,960.6	$204,478
2018	Freeze	0.0	$9,977
2019	Frost	87.7	$4,155
2019	Freeze	11,948.0	$509,018
2019	Cold Wet Weather	3,165.0	$178,325

Year	Cause of Loss	Determined Acres	Indemnity Amount
2020	Cold Winter	62.2	$6,622
2020	Freeze	5,096.0	$367,728
2020	Cold Wet Weather	36.3	$2,119
2021	Cold Winter	375.5	$45,230
2022	Freeze	1,700.0	$16,457
2023	Freeze	4,897.5	$36,772
2023	Cold Wet Weather	7,080.0	$14,493
2023	Cold Winter	18,682.9	$97,094
Total		**110,906**	**$4,389,905**

Source: USDA RMA

The following event narratives were recorded in the Storm Events Database:

December 18, 1998 - An Arctic air mass settled in over northeastern Colorado dropping overnight temperatures well below zero for 6 consecutive days. Overnight temperatures bottomed out at 19 degrees below zero on the morning of the 22nd. At least 15 people, mostly homeless, were treated for hypothermia at area hospitals. The bitter cold weather was responsible, either directly or indirectly, for at least 5 fatalities. Three of the victims died directly from exposure. The cold weather also caused intermittent power outages. Following the cold snap, thawing water pipes cracked and burst in several homes and businesses causing extensive damage. No estimate of the damage, however, was available.

March 17, 2003 - A very moist, intense and slow moving Pacific storm system made its way across the four corners area and into southeastern Colorado from March 17th to the 19th, allowing for a deep easterly upslope flow to form along the Front Range. The storm dumped 31.8 inches of snow at the former Stapleton International Airport, good enough for second place in the Denver weather history record book. The storm also managed to vault March 2003 into first place for the snowiest March in Denver history and fifth place for the wettest March on record. In addition, the storm allowed the month of March to break a streak of 19 consecutive months of below normal precipitation in Denver. The Mayor of Denver said, "This is the storm of the century a backbreaker, a record breaker, a roof breaker." The heavy wet snow caused roofs of homes and businesses to collapse across the Urban Corridor. The snow also downed trees, branches, and power lines. Up to 135,000 people lost power at some point during the storms and it took several days in some areas to restore power. Avalanches in the mountains and foothills closed many roadways including Interstate 70 in both directions stranding hundreds of skiers and travelers. Denver International Airport (D.I.A.) was also closed stranding approximately 4000 travelers. In all the estimated cost of the damage to property alone (not including large commercial buildings) was $93 million making it easily the costliest snowstorm ever in Colorado. The second costliest snowstorm was the 1997 blizzard where damage totaled $10.5 million.

The HMPC shared the following severe winter storm event:

March 13 -14, 2019 – A "bomb" cyclone including extreme cold and blizzard conditions lasting for two days impacted the Denver metro area in March 2019. The Town of Bennett reported the Town's tornado siren was damaged as well as the roofs of several buildings. Businesses, schools and government operations, with the exception of Public Works in Bennett were closed for two days. Interstate 70 was also closed during the event leaving drivers stranded and vehicles abandoned. The Bennett Recreation Center was opened as a shelter for stranded drivers.

The City of Commerce City was also impacted by the severe winter storm and reported downed trees and power outages because of downed electrical lines. The City experienced minor damage to some of the City's buildings and roofs. Businesses and schools were closed for two days and government buildings for one day. East 96th Avenue was closed for the duration of the storm.

March 13-15th, 2021-Bands of snow developed over northeast Colorado into the northern mountains and foothills on the 13th, which then intensified overnight. The heavy snow then gradually shifted southward on the 14th and covered much of the area. North winds increased to 25 to 35 mph, on the 14th, with gusts up to 50 mph. This produced blizzard conditions along the I-25 Corridor from Palmer Divide north to the Wyoming border. Denver International Airport runways were closed, from noon on 14th until 2 pm on the 15th, with over 2000 flights canceled. All major Interstates were closed. The official snow for Denver was 27.1 which was the 4th largest storm on record since 1882.

December 13th, 2022-Snow and blowing snow reduced the visibilities to zero across much of the Interstate 76 and Interstate 70 corridors east of Denver. Strongest winds gusting from 45 to 65 mph across the plains extended northeast of line from Fort Collins to Limon. The snow and blowing snow caused widespread blizzard conditions. Storm totals ranged from two to ten inches, and produced whiteout conditions and snow drifts five to ten feet deep. Nearly every road across northeast Colorado was closed or shutdown including the I-76 and I-70 corridors east of Denver to the state-line. Dozens of school closures were also implemented. Blowing and drifting snow stranded motorists, with dozens of rescues reported. At Denver International Airport, 116 flights were cancelled and approximately 800 flights delayed. After the snow ended, strong winds and areas of blowing and drifting snow continued through the remainder of the week, which forced some extended road closures.

January 17th, 2023- A wet winter storm produced widespread blowing and drifting snow across much of the urban corridor and northeast plains of Colorado. Much of the region received a prolonged period of light to moderate snow, with bands of heavy wet snow from the 17th through the 18th. At Denver International Airport, 9.2 inches of snowfall was observed along with 0.87 inches of precipitation. This was the 8th largest 2-day snow event for Denver in the month of January to date. At Denver International Airport, there were 263 flight cancellations and 134 delayed flights.
Snow and blowing snow caused whiteout conditions, along with drifting snow up to 3 feet deep. Along the Interstate 70 corridor east of Denver to the Kansas state line, several 20 to 80 car pile ups were reported. Numerous road closures were implemented across the northeast plains of Colorado, outside of the metro area including Interstate 76.

4.14.4 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.

4.14.5 Probability of Future Occurrence

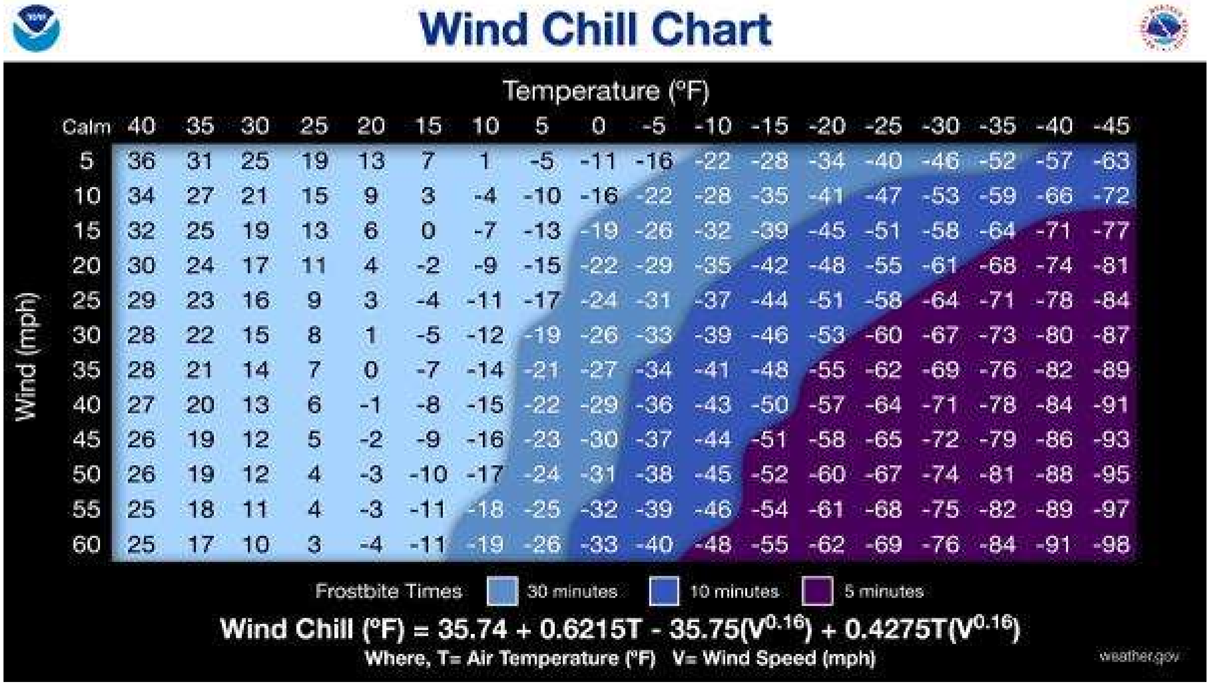
More damaging severe storms may have a slightly lower frequency of occurrence. Based on the data presented above, it is likely that a damaging winter storm will occur every 2.7 years. Based on the data presented above, there have been 216 winter storm events in the past 73 years that have occurred within the planning area. It is highly likely that in a given year the planning area will experience a severe winter storm.

4.14.6 Magnitude/Severity

Overall, severe winter storm impacts could be limited, but the potential for heavy snow and blizzard events as defined by the National Weather Service are possible. Snow removal costs can impact budgets significantly. High snow loads also cause damage to buildings and roofs. Most property damage with winter storms are related to heavy snow loads and vehicle accidents. The highest risk will be for travelers that attempt to drive during adverse conditions. People can also become isolated from essential services in their homes and vehicles. Economic impacts occur because of power outages and closures of Interstate 70 due leaving residents and visitors stranded as well as interrupting the transport of supplies and services into the area for an extended period. A winter storm can escalate, creating life threatening situations when emergency response is limited by severe winter conditions. Extreme cold associated with a severe winter storm can lead to frozen pipes as well as physical risks of hypothermia and the threat of physical overexertion that may lead to heart attacks or strokes.

In 2001, the National Weather Service (NWS) implemented an updated Wind Chill Temperature index, which is reproduced in Figure 4-56. 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 4-56 Wind Chill Temperature Chart



Wind Chill Chart

Temperature (°F)

Wind (mph)	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes, 10 minutes, 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

weather.gov

Source: National Weather Service

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

4.14.7 Vulnerability

People

The threat to public safety is typically the greatest concern when it comes to impacts of winter storms. While virtually all aspects of the population are vulnerable to the potential indirect impacts of a winter storm, others may be more vulnerable, such as the elderly, particularly if there is a loss of electrical power.

The weight of heavy continued snowfall and/or ice accumulating on power lines often brings them to the ground causing service disruptions for thousands of customers. According to data from the U.S. Department of Health and Human Services empower Map site, 8,533 of the 69,738 Medicare Beneficiaries in the Adams County rely on electric-dependent medical equipment such as ventilators, to live independent in their homes. In addition, prolonged power outages can also have economic impacts if there is a loss of food in grocery stores and other facilities such as restaurants.

Cold and extreme cold temperatures have caused the majority of winter weather related causalities in the County. Infants, the elderly, and the homeless population are most vulnerable to the impacts of extreme cold. Exposure to extreme cold can cause frostbite or hypothermia and, in some cases, even death.

The region can experience high winds and drifting snow during winter storms that can occasionally isolate individuals and entire communities and lead to serious damage to infrastructure. Travelers on I-70 in the eastern portions of the planning area and residents of the Town of Bennett, can become isolated and visitors can become stranded, requiring search and rescue assistance and shelter provisions.

The impacts of winter weather on vulnerable populations can be more severe. As noted above, senior citizens in particular are much more vulnerable to cold temperatures, and slipping on ice can lead to severe injuries. People with disabilities or those who rely on home health care may be at increased risk if travel becomes difficult; similarly, individuals who need regular dialysis treatments can become medical emergencies if roads are impassible.

Property

Structural losses to buildings are possible and structural damage from winter storms in Colorado have resulted from severe snow loads on rooftops. Older buildings are more at risk, as are buildings with large flat rooftops (often found in public buildings such as schools). Vulnerability is influenced both by architecture and type of construction material and should be assessed on a building-by-building basis.

Critical Facilities and Infrastructure

Roads are especially susceptible to the effects of a winter storm, which can temporarily hinder transportation and require resources for snow removal. Interstate 70 is the only through road in eastern Adams County and closure of the highway would leave the Town of Bennett isolated from emergency services. As noted under the people section, heavy snow accumulation may also lead to downed power lines not only causing disruption to customers but also have potentially negative impacts on critical facilities in the county which may have cascading impacts on the County government's ability to operate.

Economy

Closure of Interstate 70 in eastern Adams County during winter storms could temporarily isolate the Town of Bennett. Depending on the length of the closure it could also hinder the local economy and the movement of goods through the county.

Historic, Cultural, and Natural Resources

Natural resources may be damaged by the severe winter weather, including broken trees and death of wildlife. Unseasonable storms may damage or kill plants and wildlife, which may impact natural food chains until the next growing seasons. Most of these impacts would be short-term. As noted previously, older, historic buildings could potentially be more vulnerable to roof and structural damage from heavy snow.

Development Patterns

Future buildings that conform to local building codes should be able to withstand snow loads from severe winter storms. Given building and population trends in the planning area, it is not anticipated that more people will be exposed to the winter storm hazard since the last plan update or in the future.

4.14.8 Risk Summary

- The overall significance of winter weather hazards is **High**.
- Winter storms often bring heavy snow and sometimes blizzard conditions to the County.
- In the past 73 years the County has experienced 216 winter storm events.
- Exposure to extreme cold has led to the majority of casualties (19) in Adams County.
- 8,533 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 $3 million in crop insurance claims and affected over 57,000 acres between 2007-2018. Freeze was the most common cause of loss.
- Severe winter weather can isolate residents and travelers by closing 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: Damaging wind

5 Mitigation Strategy

DMA Requirement §201.6(c)
[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 HMPC for Adams County. It describes how the County and participating jurisdictions met the following requirements from the 10-step planning process:

- Planning Step 6: Set Goals
- Planning Step 7: Review Possible Activities
- Planning Step 8: Draft an Action Plan

Up to this point in the planning process, the Hazard Mitigation Planning Committee (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 Adams 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

The goals and objectives of the 2026 Adams County Hazard Mitigation Plan are:

Goal 1: Increase community awareness of Adams County's vulnerability to natural and human-caused hazards

Objective 1.1: Inform and educate the community about the types of hazards Adams County is exposed to, where they occur, and recommended responses.

- Continue the OEM outreach programs
- Coordinate public education preparedness programs and delivery
- Maintain OEM social media (Facebook, Twitter, Nextdoor, workplace) platforms
- Coordinate with County Communications Department for internal & external messaging

Goal 2: Reduce vulnerability and protect people, property, and the environment from natural and human-caused hazards

Objective 2.1: Provide mechanisms to enhance life safety

Objective 2.2: Reduce impacts to critical facilities and services

- Identify and protect critical facilities
- Protect hazardous materials facilities

Objective 2.3: Reduce impacts to existing buildings to the extent possible

Objective 2.4: Reduce impacts to future development to the extent possible

Objective 2.5: Reduce impacts to County natural resources

Objective 2.6: Reduce impacts to public health

Goal 3: Increase internal capabilities and coordination to reduce the impacts of natural and human-caused hazards

Objective 3.1: Improve planning coordination

Objective 3.2: Improve funding coordination

Objective 3.3: Improve response coordination

Goal 4: Strengthen communication and coordination among public agencies, NGO's, businesses, and residents

Objective 4.1: Strengthen community and regional partnerships at all levels

Based upon the risk assessment and goal setting process, the HMPC re-assessed the goals and objectives from the 2020 plan, and determined they were all still valid as written. These goals and objectives were evaluated on their ability to address the results of the updated risk assessment, particularly the inclusion of human-caused hazards.

For the purpose of this plan goals were defined as broad-based public policy statements that:

- Represent basic desires of the community;
- Encompass all aspects of community, public and private;
- Are nonspecific, in that they refer to the quality (not the quantity) of the outcome;
- Are future-oriented, in that they are achievable in the future; and
- Are time-independent, in that they are not scheduled events.

Goals are stated without regard for implementation, that is, implementation cost, schedule, and means are not considered. Goals are defined before considering how to accomplish them so that the goals are not dependent on the means of achievement.

5.2 Progress on Previous Mitigation Actions

During the 2026 plan update process the County reported on the status of the 2020 actions through the use of a reporting tool, describing if the action had been completed, was deferred (not yet implemented, but still relevant for the updated plan), was in progress, or should be deleted.

The 2020 mitigation strategy contained 48 mitigation actions, five of which have been completed. The completed actions address flood, thunderstorm, tornado as well as multiple hazards, and many relate to increasing coordination between County departments or between the County and incorporated jurisdictions. Refer to Table 5-1 for more information on the completed actions. Twenty of the 2020 actions are implemented annually or are currently in progress, and sixteen have not been completed and are being carried forward into the 2026 Mitigation Strategy.

Across all jurisdictions, five mitigation actions from their previous mitigation plans have been completed and thirty three actions are ongoing, in progress, or have not started. Table 5-1 provides a summary of the mitigation actions that have been completed and deleted. More details on in-progress ongoing and new actions can be found in Section 5.4.

Table 5-1 Completed and Deleted Mitigation Actions

Jurisdiction	Hazard(s)	Mitigation Action	Priority	Comments
Adams County	Thunderstorm, Tornado, Flood	Regional Park Access: Develop at least one alternative point of ingress and egress into the regional facility to ensure the safe movement of personnel, visitors, and vehicles during an emergency event. Provide additional access to the Adams County Regional Park to improve emergency vehicle access.	Medium	**Completed.** Ingress/egress point through the heritage site located west of main entrance.
Adams County	Thunderstorm, Drought, Flood, Tornado, Wildfire, Winter Weather, Dam Failure, Subsidence, Earthquake	Develop Recovery Plan and Integrate Emergency Planning and County Comprehensive Plan Activities: Assess the update cycle of the County Emergency Operation Plan and associated annexes as they support the County Comprehensive Plan. Determine activities to ensure that all plans are current and coordinated with the hazard mitigation hazard identification and risk assessment process and the Comprehensive Plan.	Low	**Completed.** County Disaster Management Plan was updated and adopted in 2023. Annexes are updated on an annual schedule. Next update is scheduled for 2026.
Town of Bennett	Flood	Develop Stormwater Drainage Master Plan	Medium	**Completed.** Town Board approved plan 9/24/2024
Town of Bennett	Hazmat	Stoplight and Intersection Infrastructure at Marketplace Drive and Hwy 79. This is a high traffic intersection right off I-70 with multiple businesses including King Soopers, Love's Travel w/truck stop, McDonalds, and a Tractor Supply. Redesign and installation of a stoplight area will assist with traffic safety for commercial vehicles as well as residential vehicles.	Medium	**Completed.** Project finished construction in spring of 2023.
Town of Bennett	Flood, Winter Weather	Replacement of Culverts of on Kiowa-Bennett Road and Hwy 36. When Bennett experiences heavy rains and/or snowfall in this area, the Kiowa-Bennett Road has experienced flooding and erosion issues. Replacement of culverts is expected to reduce and/or eliminate the flooding and erosion.	High	**Completed.** Project completed in June 2025.
City of Brighton	Flood	North Outfall Phase III: Complete engineering civil drawings and construct the outfall system. Design and construct a larger outfall system to convey flows to South Platte River. Add additional inlets and piping network to more efficiently collect storm runoff.	Medium	**Completed.** Project was successfully completed in 2022.
City of Brighton	Flood	Second and Egbert Drainage Improvements: An undersized drainage pipe and lack of inlet do not provide appropriate drainage at this intersection. Design and construct drainage infrastructure to alleviate flooding at this intersection.	Medium	**Completed.** Drainage improvements installed in 2023 have effectively eliminated this concern.
Commerce City	Winter Weather, Thunderstorm,	Sustain mobile fleet by providing internal fuel storage dispensing capability: Install a permanent fuel storage/dispensing facility. Commerce City doesn't have internal fuel storage/dispensing capability	Low	**Completed.** Temporary Fuel Storage Tanks have been purchased, and are operational

Jurisdiction	Hazard(s)	Mitigation Action	Priority	Comments
	Tornado, Flood, High Wind	to maintain the city's fleet vehicles. Currently the city uses public retail vendors such as gas stations to provide fuel for its vehicles. In the events of blizzards, major flooding and power outages public gas stations maybe be closed or out of fuel which will severely decrease the city's capability in maintaining their fleet and operational readiness. Two critical fleet sections are first responder vehicles and snowplow trucks which if these vehicles don't have fuel will create a public safety emergency.		at the MSC as backup fuel for City vehicles.
Adams County	Thunderstorm, Tornado, Earthquake, Winter Weather, Flood, Wildfire, Hazardous Materials	Redundant Emergency Operations Center Communication System: Develop an internal county team to identify current and potential fail points in the current system as well as to assess and develop recommendations to implement a secondary communication system to assure redundancy. Investigate the implementation of a redundant communication system in the Adams County EOC and the County Government Center where the EOC is located. Phone system currently utilized is VOIP. Cell phone coverage is limited or non-existent in some areas and land lines into the government center do not currently exist. While ARES capabilities are present in the EOC, they are not sufficient to manage the volume that may be necessary to support Type I or II Incident support.	Low	**Deleted**. Communications needs met with new radio equipment, new phone systems for ARES & Rampart SAR. Plans to install 800 mghtz base units in EOC and pac-set cradles in OEM vehicles in 2026.
City of Brighton	Tornado	Expansion of Outdoor Warning System: Expand the City's siren system to cover portions of unincorporated Adams and Weld Counties. Several areas within the Brighton Fire Rescue District and the north area (Weld County) of the City of Brighton are without outdoor warning sirens. Installation of additional warning sirens in the locations lacking coverage to warn residents of potential hazards.	High	**Deleted.** It has been determined that outdoor warning sirens are no longer an effective and efficient way to notify the public of imminent danger. We will not be further contributing funds to this project nor seeking grant funding to support this program and it should be removed.

5.2.1 Continued Compliance with NFIP

Recognizing the importance of the NFIP in mitigating flood losses, an emphasis will be placed on continued compliance with the NFIP by Adams County and its participating communities including the City of Brighton, Commerce City, and the Town of Bennett. 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. Other details related to NFIP participation are discussed in the flood vulnerability discussion in Section 4.3.5, in the capability assessment in Section 5, and the individual jurisdictional annexes.

5.3 Identification and Analysis of New Mitigation Actions

The natural and human-caused hazards identified in Section 4 Risk Assessment were evaluated to identify and select mitigation actions to support the mitigation goals and objectives described in Section 5.2. While the HMPC focused primarily on addressing high and medium priority hazards, individual mitigation actions were also suggested for the low priority hazards.

Once it was determined which hazards warranted the development of specific mitigation actions, the HMPC analyzed viable mitigation options that supported the identified goals and objectives. The HMPC was provided with the following list of categories of mitigation actions, which originate from the NFIP 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 the 3rd planning meeting, the HMPC was provided with a matrix showing examples of potential mitigation action alternatives for each of the above categories, for each of the identified hazards. The HMPC was also provided a handout that explains the categories and provided further examples. Other reference documents included FEMA's 2013 Mitigation Ideas publication, and FEMA's 2020 Mitigation Action Portfolio. The HMPC was instructed to consider both future and existing buildings in considering possible mitigation actions. Attendees were then asked to submit mitigation action worksheets prior to the next meeting.

5.3.1 Prioritization Process

The Planning Team discussed a wide range of possible mitigation actions and employed the STAPLEE methodology (se description below) to evaluate and prioritize each proposed action. For each recommended action, the Planning Team developed a project summary that included a description of the action, the department or agency responsible for implementing it, and an estimated timeframe for completion. The HMPC 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:

- **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?

Other criteria used to assist in evaluating the benefit-cost of a mitigation action included:

- Does the proposed action protect lives or vulnerable populations?
- Does the proposed action address hazards or areas with the highest risk?
- Does the proposed action protect critical facilities, infrastructure, or community assets?
- Does the proposed action meet multiple objective (multi-objective management)?
- Is there a strong advocate for the action or project that will support the action's implementation?

At the mitigation strategy meeting, the HMPC reviewed and discussed the STAPLEE considerations to determine which of the identified actions were most likely to be implemented and effective. Mitigation actions from the 2020 HMP that are continuing in the updated Plan were reviewed, and their priorities were updated where needed. New actions identified for 2026 were prioritized based on discussions and review with the STAPLEE considerations in mind.

Overall, a total of 39 new mitigation actions were developed for all of the participating jurisdictions in the 2026 Mitigation Strategy for Adams County.

5.4 Mitigation Action Plan

This action plan was developed to present the recommendations developed by the HMPC for how the Adams County planning area will reduce the vulnerability of people, property, infrastructure, and natural and cultural resources to future disaster losses. Over time the implementation of these projects will be tracked as a measure of demonstrated progress on meeting the plan's goals.

The total number of actions identified by each jurisdiction is summarized in Table 5-2, including those actions completed, deleted, or continued from the 2020 HMP.

Table 5-2 Mitigation Actions Summary by Jurisdiction

Hazard	# of Actions in 2020 HMP	# of Actions Completed	# of Actions Deleted	# of Actions Continued	New Actions Added	# of Actions in 2026 HMP
Adams County	23	2	1	20	3	23
Bennett	7	0	0	7	0	7
Brighton	10	2	1	7	26	33
Commerce City	3	1	0	2	6	8
Denver Water	5	0	0	5	4	9
Total	**48**	**5**	**2**	**41**	**39**	**80**

Table 5-3 identifies the updated mitigation actions for Adams County. Actions for other participating jurisdictions are detailed in the jurisdictional annexes. 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.

Each action summary also includes a discussion of the benefit-cost review conducted to meet the regulatory requirements of the Disaster Mitigation Act. The projects are organized by jurisdiction and include notes about the department and partners necessary to implement the project, estimated cost, potential funding sources, timeline, which goal(s) that the projects support, and their relative level of priority high, medium, and low. The tables also provide status and implementation notes that describe progress made on the actions so far, using the following categories, and where applicable, notes if there were changes in the priority level from the previous Plan:

- Not Started: Work has not begun but is still a priority
- In Progress: Work has started but not yet completed
- Annual: Work is ongoing on an annual basis with no specific end date.
- Completed: The action has been finished.
- Deleted: Action is no longer relevant or no longer a priority

Cost estimates are categorized as follows:

- Little to no cost
- Low: Less than $10,000
- Moderate: $10,000-$100,000
- High: $100,000-$1,000,000
- Very High: More than $1,000,000

The estimated timeframe for completing actions is categorized as:

- Short Term: 1-3 years
- Mid Term: 3-5 years
- Long Term: 5 years or more

The participating jurisdictions have numerous existing, detailed action descriptions in other planning documents, such as general plan elements, community wildfire protection plans and capital improvement budgets and reports. These actions are considered to be part of this plan; refer to their original source documents for additional details. The Adams County planning area also realizes that new needs and priorities may arise as a result of a disaster or other circumstances and reserves the right to support new actions as necessary, as long as they conform to the overall goals of this plan.

There are actions in the table that mitigate impacts to existing as well as new buildings and infrastructure. Actions that mitigate losses to future development are denoted by an '*' in the table on the action ID.

Table 5-3 Adams County 2026 Mitigation Action Plan

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
AD 1	**Develop a Communications Plan for Critical Facilities within the County:** Investigate options and develop a communications plan for critical facilities with input and assistance from County personnel including but not limited to: County Emergency Management, Emergency Medical Services (EMS), Tri-County Health Department, care facilities & hospitals, and Adams County schools. 1) Investigate and develop a communication plan with the at-risk population facilities. More specifically, facilities with large numbers of residents currently are not effectively connected to receive notification, warning and information from the County EOC. A communications plan and system are required to provide proper situational information and resources for public health needs. 2) Investigate improved emergency communications systems with Adams County schools. County schools own their own communications systems to connect internally within their district. School districts within Adams County sit within multiple different municipal jurisdictions and are not effectively connected to receive notification, warning, and information from the County EOC. A communications plan and system are required to provide proper situation information and resources to the schools and the communities they serve. 3) Emergency Medical Services (EMS) lead is needed for proper Public Health/Hospital Coordination. EMS Agencies are a part of the Public Health Plan, but due to statutory provisions there is no lead EMS agency at the state or local level. While legislation is needed to rectify on a state scale, Adams County requires a communications plan to effectively coordinate EMS agencies during any event where multiple EMS agencies are involved.	Drought/Extreme Heat, Earthquake, Flood, Hazmat, Thunderstorm, Tornado, Wildfire, Winter Weather	3,4	**Adams County OEM**, Adams County Health	$15,000	County General Fund, Adams County Health, EMPG	Low	Annual	Annual. Since 2021 Adams County initiated a Community Preparedness Program which has delivered more than 60 education and outreach programs. We also hosted a County Safety Fair in 2023. We launched a CodeRed sign-up campaign that resulted in a 200% increase in opt-ins. We use multi-lingual educational materials in the form of booklets and pamphlets.

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
AD 2	**Public Education and Awareness Campaign:** Initiate with municipalities and businesses a collaborative emergency management public education and information program. Investigate effective marketing strategies needed to provide education and information. 1) Design a program to encourage residents and businesses to take preparedness actions on their own behalf. The program should utilize and build upon communication platforms such as YouTube and Webinars, to educate the public on hazards of greatest risk to the community. 2) Work with county businesses to develop disaster resistant business programs. 3) Develop public education & outreach to address ADA requirements for those who have access and functional needs. 4) Develop multi-lingual disaster education and functional needs preparedness into the community. 5) Develop public outreach materials addressing drought and water conservation.	Drought/Extreme Heat, Earthquake, Flood, Hazmat Soil Hazards, Thunderstorm, Tornado, Wildfire, Winter Weather	1,2,4	**Adams County OEM**	Little to no cost	County General Fund, FEMA HMA Grants, EMPG	Medium	Annual	Ongoing. OEM continues to provide community preparedness and outreach programs throughout the year. We have one staff member dedicated to public outreach and education to include both individual and private sector. We are also working with our Stormwater department to educate the public on flood hazards and the NFIP.
AD 3	**Regional Park Secondary Power:** Investigate the implementation of a backup generator to help power the pump to the water supply.	Earthquake, Flood, Thunderstorm, Tornado, Wildfire, Winter Weather	2	**Adam County Parks**	$3,000	County Parks Budget	Low	2026	In Progress. HMP steering committee for 2026 HMP in place. Plan to incorporate bi-annual meetings to receive updates on projects.
AD 4	**Hazard Mitigation Steering Committee:** Broaden and formalize the participation of the Mitigation Steering Committee to include City representatives and partner organizations. Educate them on the importance of their participation in the plan development process, updates and other periphery endeavors.	Dam Failure, Drought/Extreme Heat, Earthquake, Flood, Soil Hazards, Thunderstorm, Tornado, Wildfire, Winter Weather	2,3,4	**Adams County OEM**	Little to no cost	County General Fund, EMPG	Low	Annual	Annual.
AD 5	**96th Avenue Bridge Repair Project**: Repair the 96th Avenue bridge over Bijou Creek located approximately 2.3 miles west of Rector-Leader Road in unincorporated Adams County. This project	Flood, Thunderstorm, Wildfire	2	**Adams County Public Works**	$662,000	HMA Grants, County CIP Funds	Low	2025-2027	In Progress.

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
	will rehabilitate the existing bridge to address critical structural problems. Phase 1 work will include repairs to the abutments, piers, girders, and approach roadways.								
AD 6	**ADA Five Areas Project:** Project will assist with evacuation and post-event mobility by providing better access in compliance with Americans with Disabilities Act improvements (curb, gutter, and sidewalks) in the following areas: • Area 1: 68th Ave – Washington St – York St • Area 2: E. 66th Ave – Washington St – York St • Area 3: Steele St – Niver Creek Tr – E. 86th Ave • Area 4: E 56th Ave – Lincoln St.- Washington St. • Area 5: E 55th Ave – Lincoln St. – Washington St.	Dam Failure, Earthquake, Flood, Hazmat, Soil Hazards, Terrorism, Thunderstorm, Tornado, Wildfire, Winter Weather	2	**Adams County Public Works**	Areas 1-4: $5,360,000 Area 5: $680,000	County CIP Budget	Medium	2026	In Progress.
AD 7	**E 88th Ave and Welby Road Intersection Improvements:** This project will make improvements to E. 88th and Welby Road to address localized flooding at intersection. Project will also include traffic signals and ADA-compliant curb ramps to improve access and evacuation routes.	Flood, Thunderstorm, Winter Storm,	2	**Adams County Public Works**	$613,978	County CIP Budget	Medium	2026	In Progress.
AD 8	**Steele Street Project:** Extension of Steele St north of 86th Avenue to 88th Avenue to improve evacuation routes for hazmat incidents and during winter storms	Hazmat, Winter Storm,	2	**Adams County Public Works,** Thornton Public Works, RTD	$1,700,000	County CIP Budget	Medium	2026	In Progress.
AD 9	**Broadway at 59th Ave:** Improve storm water drainage and flood control.	Flood, Thunderstorm, Winter Storm	2	**County Storm Water Utility,** CDOT	$8,000,000	HMA grants, County CIP Budget	Medium	2026	In Progress.
AD 10	**Clear Creek Drop Structure:** Work with County Parks and MHFD to complete a flood hazard mitigation study. Currently flooding is impacting BNSF railroad. Working with BNSF to get structure out of floodway.	Flood, Thunderstorm	2	**County Storm Water Utility,** County Parks, MHFD, BNSF	$3,000,000	HMA grants, County CIP Budget, BNSF, MHFD	Medium	2026	Annual.
AD 11	**Video Inspection and Maintenance of Stormwater Infrastructure.** Will help with getting more accurate GIS data on infrastructure and better flood mitigation efforts, as well as stormwater management following thunderstorms and winter storms	Flood, Thunderstorm, Winter Storm,	2	**County Storm Water Utility**	$900,000	HMA grants, County CIP Budget	Medium	2026	Not Started.

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
AD 12	**Regional Park Sheltering:** Review funding options as well as storm shelter alternatives (retro fitting or new construction) to provide Safe Rooms at the Regional Park. Provide adequate sheltering for severe storms and tornados. Currently the Regional Park is identified as the secondary location for an Alternate Care Facility and local transfer point for a public health event. Additionally, the park is the largest event center in unincorporated Adams County and frequently hosts events where thousands of people are in attendance. The Regional Park does not have adequate structures or facilities to shelter citizens during a significant weather event requiring immediate sheltering for life safety.	Thunderstorm, Tornado	2	**Adams County Parks**	$100,000	Grants, County General Fund	Low	2026	In Progress. New construction is on-going at the Fairgrounds to include new parking areas and new emergency access as well as new structures.
AD 13	**Acquisition Projects:** Purchase land located in problematic flood areas. Remove flood hazard via acquisition in the following areas thereby having the ability to limit or prohibit future land development in these areas: 1) Big Dry Creek Acquisition 2) South Platte River Acquisition 3) Second Creek Acquisition 4) Clear Creek Acquisition 5) Third Creek Acquisition 6) Beebe Seep Canal Acquisition 7) Box Elder Creek Acquisition 8) Coyote Run Acquisition 9) Horse Creek Acquisition 10) Kiowa Creek Acquisition	Flood	2	**Adams County Parks,** MHFD	$1,000,000	Lottery Monies, Open Space Sales Tax, HMA Grants	Medium	Annual	In Progress.
AD 14	**Flood Plans and Studies:** Conduct the following plans and studies. (1) Major drainageway planning and flood hazard delineation for Little Dry Creek, Second Creek (downstream from DIA), Brantner Gulch, and DFA0054 (2) Flood Hazard Delineation Studies for Grange Hall Creek, South Platte River, and Clear Creek (3) Update Outfall Systems Plans for Basin 4100 & DFA 0056, Pecos & 54th, and Third Creek	Flood	2	**Adams County Storm Water Utility,** MHFD	$14,000-$30,000	HMA Grants, RiskMAP grants, County General Funds, MHFD	Medium	2026	In Progress. Storm water has been working on updating our Community Rating System and implementing those requirements.

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
AD 15	**Dahlia Outfall System:** Enlarge Dahlia Pond at southwest corner of I-76 to accept more stormwater. Dahlia St Project (Dahlia St from Hwy 224-I76).	Flood	2	**County Public Works,** MHFD	$25,000,000	HMA Grants, County CIP Budget, MHFD	Medium	2026	In Progress.
AD 16	**York Street Phase II:** E. 78th -E. 88th Ave. This project includes roadway widening, including sidewalks, curbs, and gutter improvements. Project to include design of roadway improvements, structure replacement or modifications and construction of those improvements. The overall objective of this project is to improve roadway capacity, safety, mobility, pedestrian access facilities, multi-use trail, drainage system, structure replacement or modification, and median/landscaping amenity and street lighting.	Flood	2	**County Public Works**	$14,500,000	HMA grants, County CIP Budget, MHFD	High	2026	In Progress.
AD 17	**York Street Phase III:** Coordination with Union Pacific Railroad (UPR) on bridge replacement.	Flood	2	**County Public Works,** UPR	$14,500,000	UPR, HMA grants, County CIP Budget	High	2026	In Progress.
AD 18	**Provide zoning and future land use guidance to map vulnerable populations:** Create a toolkit to assist and educate owners/developers on development concerns related to planning and design related to vulnerable populations (senior facilities, low income, special needs) and ways to mitigate those concerns.	Flood	1,2,3	**County Community Development,** Municipal Planning Departments	Little to no cost	Staff Time/ Dept Budget	Low	2023-2026	In Progress.
AD 19	**Dam Safety Alerting System:** Coordination with internal and external agencies to enhance the County's alerting capabilities. • Inventory of high hazard dams • Status of high hazard dams • Rainfall thresholds to fill/spill • Process to notify warning decision makers	Dam Failure/ Incident	2,3,4	**County OEM,** MHFD, DWR Dam Safety, Denver Water	$50,000	HMA Grants	Low	2026	Not Started. OEM has strong relationships with dam operators and MHFD. Also partnering with storm water department for FIP program and community rating.
AD 20	**Hazardous Materials Facilities Planning and Regulation:** Investigate the various methods of regulating incompatible land uses. 1) Review of existing zoning regulations 2) Investigate a new zoning classification, performance standards, buffering requirements for critical facilities from schools, special needs facilities, and critical infrastructure 3) Develop policies for a coordinated review process internal to the County for all Tier II Facilities	Hazmat	2,3	**County Community Development**	Little to no cost	County General Fund	Low	2026-2028	In Progress. LEPC has strong connections with County regulatory departments and commissions.

ID	Description	Hazard(s) Mitigated	Related Goals	Lead Agency and Partners	Cost Estimate	Potential Funding	Priority	Timeline	Status & Implementation Notes
	4) Develop integration opportunities between the LEPC and the Adams County Planning Commission								
AD 21	**Community Outreach & Education:** OEM will participate in various community preparedness events to educate the public on local hazards/threats and to provide mitigation resources. These events will be held throughout the County to include the municipal jurisdictions. The benefit of these events is to have a better prepared and more resilient population.	Dam Incident, Extreme Heat, Flood, Hazmat, Thunderstorms, Tornado/ Wind , Wildfire, Winter Weather	1,2	**Adams County OEM**	$5000 - $8000	BRIC, County General Fund	Low	2026-2027	New in 2026. Budget item was requested for $8000 to support program.
AD 22	**Evacuation Modeling:** Contract with a service to provide evacuation modeling and geographic evacuation zones throughout Adams County to enhance the evacuation process.	Flood, Hazmat, Wildfire,	2, 3, 4	**Adams County OEM**	$5-$15,000	County General Fund, EMPG	Medium	2026-2027	New in 2026
AD 23	**CIP Road and Bridge Improvement Projects.** • Broadway and 62nd Avenue Drainage Improvements • East 58th Avenue Washington to York Improvement Project • East 62nd Avenue from Pecos Street to Washington Street • East 73rd Avenue from Washington Street to York Street • Explorador Calle Bridge Replacement Over Niver Creek • Goat Hill Drainage and Roadway Improvements • Goat Hill East Roadway Improvements Design • West 70th Avenue from Pecos Street to Broadway • Zuni Street and West 70th Avenue Project • Little Dry Creek Diversion Structure Cleaning • 2022 Vegetation Management for Drainage Maintenance	Dam Incident, Flood, Hazmat, Thunderstorms	1,2,3	**Adams County Public Works**	Varies, over $1M	County CIP Budget	Medium	2025-2035	New in 2026

6 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.*

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 to ensure continued public involvement in mitigation planning.

6.1 Implementation

The governing board for each participating jurisdiction has formally adopted the 2026 Adams County HMP; adoption records can be found in Appendix A. With adoption of this plan Adams County, Commerce City, the City of Brighton, the Town of Bennett, and Denver Water will be tasked with plan implementation and maintenance. While this Plan contains many projects, the HMPC will need to decide which actions to undertake first. Two factors will help with making that decision: 1) the priority assigned to the actions in the planning process; and 2) funding availability. Completion of low or no-cost projects most easily demonstrates progress toward successful Plan implementation.

Implementation will be accomplished by adhering to the schedules identified for the mitigation actions in Section 5 and the jurisdictional annexes, as well as through pervasive efforts to network and highlight the multi-objective, win-win benefits of each project to the Adams County community and its stakeholders. These efforts include the routine actions of monitoring agendas, attending meetings, and promoting a safe, sustainable community.

Implementation will also 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.

6.2 Role of the Hazard Mitigation Planning Committee in Implementation and Maintenance

The participating jurisdictions will keep the HMPC active throughout the lifecycle of the plan and 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 when other community goals, plans, and activities overlap, influence, or directly affect 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.

The HMPC will constantly monitor funding opportunities that could be leveraged to implement some of the costlier actions. This will include creating and maintaining a bank of ideas on how to meet required local match or participation requirements. When funding does become available, the HMPC will be in a position to capitalize on the opportunity. Funding opportunities to be monitored include special pre- and post-disaster funds, special district budgeted funds, state and federal earmarked funds, and other grant programs, including those that can serve or support multi-objective applications.

Other duties include reviewing and promoting mitigation proposals, considering stakeholder concerns about hazard mitigation, passing concerns on to appropriate entities, and posting relevant information on the County and municipal websites, in the local newspaper, and on social media. Other Adams County jurisdictions not participating in this plan may nevertheless be integrated into mitigation implementation where possible.

6.3 Plan Maintenance

The Adams County Hazard Mitigation Plan is a living document that may be adjusted or updated as conditions change, actions progress, or new information becomes available. The HMPC, at the direction of the Adams County Emergency Manager, is responsible for plan maintenance. This section describes the method and schedule for monitoring, evaluating, and updating the Plan over the next five years.

6.3.1 Monitoring

Monitoring refers to tracking the implementation of the plan over time. The Adams County Emergency Manager 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 HMPC members at least annually in October to identify and track any significant changes in their agencies' mitigation efforts.

OEM will use the following process to track progress, note changes in vulnerabilities, and consider changes in priorities as a result of project implementation:

- A representative from the responsible entity identified in each mitigation action will be responsible for tracking and reporting to the HMPC when project status changes. The representative will provide input on whether the project as implemented meets the defined goals and objectives, and is likely to be successful in reducing vulnerabilities.
- If the project does not meet identified goals and objectives, the HMPC may select alternative projects for implementation.
- Projects that were not ranked high priority but were identified as potential mitigation strategies will be reviewed periodically to determine feasibility of future implementation.
- New mitigation projects identified will require an individual assigned to be responsible for defining the project scope, implementing the project, monitoring 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.

6.3.2 Evaluating

Evaluating refers to assessing the effectiveness of the plan at achieving its stated purpose and goals. Evaluation of progress can be achieved by monitoring changes in vulnerabilities identified in the plan, such as:

- Decreased vulnerability because of implementing recommended actions,
- Increased vulnerability because of failed or ineffective mitigation actions, and/or
- Increased vulnerability because of new development (and/or annexation).

The HMPC will meet at least annually or following every declared disaster or significant hazard event to evaluate the implementation of the plan and consider any changes in priorities that may be warranted. 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.

6.3.3 Updating

The Adams 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 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.

6.4 Integration Into Other Planning Mechanisms

An important implementation mechanism is to incorporate the recommendations and underlying principles of the HMP into community planning and development such as capital improvement budgeting, building and zoning codes, general plans and regional plans. Mitigation is most successful when it is incorporated within the day-to-day functions and priorities of the jurisdiction attempting to implement risk reducing actions. This information on hazards, risk, vulnerability, and mitigation contained in this Plan is based on the best science and technology available at the time this Plan was prepared. The Plan update provides an opportunity to incorporate this hazard information and mitigation principles and practices into other existing planning mechanisms.

Based on this Plan's capability assessment and progress made on mitigation actions noted in Chapter 5, the participating jurisdictions continue to implement policies and programs to reduce losses to life and property from natural and human-caused hazards. The HMPC will be responsible for integrating the data, goals and objectives, and other elements of this Plan into other plans, as appropriate.

The following section provides some guidance on how Adams County will use the updated HMP to inform and improve other state plans, procedures, and programs.

6.4.1 Comprehensive Plans

The Adams County Comprehensive Plan was last updated in 2022, and the 2020 Hazard Mitigation Plan was integrated throughout that document. However, this complicated the plan update process because hazard mitigation plans are required to be updated every five years, whereas comprehensive plans are updated less frequently. Although this Plan update is being developed as a standalone plan, the County plans to adopt it as an annex to the Comprehensive Plan replacing the previous mitigation plan sections.

The City of Brighton Comprehensive Plan was last updated in 2019. Brighton OEM will work with the Town Planning Department to ensure that hazards data and mitigation goals and objectives inform the next comprehensive plan update.

The Commerce City 2045 Comprehensive Plan went into effect on November 1st, 2024. The Commerce City 2045 Comprehensive Plan is the City's primary guiding document that will assist with planning-related decision-making and direct official policy in the community. Commerce City OEM will work with the City Planning Department to ensure that hazards data and mitigation goals and objectives inform the comprehensive plan update.

The Town of Bennett Comprehensive Plan was last updated in 2021. Bennett OEM will work with the Town Planning Department to ensure that hazards data and mitigation goals and objectives inform the next comprehensive plan update.

6.4.2 Threat and Hazard Identification and Risk Assessment (THIRA)

Adams County maintains 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 (Section 4) contains a section analyzing the probability of future events, which provides a data-driven answer to Factor #1. Similarly, the vulnerability assessment section of the hazard profiles address what impacts can realistically be expected from both routine and extreme events of each hazard, which specifically addresses Factor #2.

Step 2 of CPG 201 is to "Give the Threats and Hazards Context" by creating a scenario for each hazard of concern, with specifics like time of day, area, and magnitude of the event, which are then used to establish capability targets for each of the 32 core capabilities. All the hazards profiled in the HIRA contain detailed information to ensure the hazard scenarios are plausible. For some hazards, such as flood or earthquake, detailed Hazus modeling runs have been done that can easily be incorporated as THIRA scenarios. Other hazards include details on the most extreme historical events on record that can quickly be updated to modern scenarios.

6.4.3 Long-Term Recovery and Resiliency Strategic Plan

Adams County implemented the long-term recovery and resiliency strategic plan on May 6th, 2025, with the planning process starting early 2024. This plan brings together the county's existing projects, programs, and partnerships into a single coordinated framework, helping to identify available resources, address service gaps, and ensure essential services remain operational during emergencies. The plan integrates quantitative data with contextual insights, providing a critical foundation for understanding how the County's diverse population, economic momentum, and environmental variability interact. This will strengthen the county's ability to anticipate, respond to, and recover from disruptions such as natural disasters, health crises, and economic challenges.

The plan implemented and is organized around five core themes:

1. Data utilization
2. Organizational capacity
3. Communication, education, and awareness
4. Stakeholder engagement
5. Funding and finance

There are 14 overarching goals within the above 5 categories, and 59 specific actions designed to improve the county's ability to manage disruption and build long-term resilience.

Adams County Disaster Management Plan

The County wrote an updated version of their disaster management plan in 2023. This plan is updated around the cycle of mitigating, preparing for, responding to and recovering from disasters that affect community and government functions. It is built on the same concepts identified in the National Incident Management System and is designed to align key roles across local, county, state, and federal agencies. The goal of the plan is to lay a foundation for the collaborative approach between the government, citizens, non-profit, and faith-based organizations, and involved agencies of the County. The Adams County Office of Emergency Management is responsible for coordinating the development and maintenance of this base plan and supporting annexes.

The Disaster Management Plan is supplemented by the:

- County Comprehensive Plan (2020)
- Annual Operating Plan (2022)
- County Disaster Policies (2020)
- Emergency Support Annexes
- Continuity of Operations Plan

The Disaster Management Plan along with the plans listed above will be supplementing this hazard mitigation plan by using their descriptions of the core functional outcomes that must be addressed by government operations to provide successful emergency response and recovery to the community. This descriptions of responsibilities for each stakeholder in the Disaster Management Plan provides us with information on the capabilities of the departments within this county.

Other Emergency Operations Plans

The City of Brighton Emergency Operations Plan (EOP) was last updated in 2023 and the Commerce City EOP was last updated in 2021. The Town of Bennett does not currently have an Emergency Operations Plan or Recovery Plan.

6.4.4 Continuity of Operations Plans (COOP)

All departments and agencies of Adams 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 or interruptions are most likely to occur. Critical facilities and assets located in hazard areas in Section 4.2 should be prioritized for COOP planning.

6.4.5 Training and Exercise Plans

Training on hazard mitigation principles and procedures should be included in the County's training and exercise planning. Any training and exercise needs identified in the Capabilities Assessment (Section 3.12) and Mitigation Strategy (Section 5) should also be included in the County's training and exercise planning.

6.4.6 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.

6.4.7 Community Preparedness Strategy

The County's ongoing public education and outreach efforts should reflect the hazards and vulnerabilities described in this Plan. In addition to preparing for disasters, public education should include ways in which the public can reduce their vulnerability to natural and human caused hazards. Furthermore, mitigation activities and success stories should be communicated to the public to show the benefits of effective mitigation planning.

6.4.8 Capital Improvements Plan

Many of the mitigation actions listed in the Mitigation Strategy (5.4) 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.

6.4.9 Drainage and Stormwater Plans

The Stormwater Quality Division in the Adams County Public Works Department has completed multiple drainage projects and plans, which are referenced in the mitigation strategy.

6.4.10 Sustainability Plan

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 Adams 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.

As noted previously, the Sustainable Adams County 2030 Plan (dated 2015) helped inform the Capability Assessment (Chapter 5), and was included in the list of goals and objectives reviewed when developing the mitigation goals in Section 6-2. A potential follow-on action would be to review the goals and target actions contained in that plan for their potential impacts on hazard mitigation.

6.4.11 Disaster Management Plan

The Adams County Disaster Management Plan 2021 establishes the framework for how the county will respond to and recover from various disasters, incorporating concepts from the National Incident Management System and coordinating roles across local, county, state, and federal agencies. Adams County ensures that its disaster response and recovery efforts are informed by a thorough understanding of potential hazards and are supported by strategies aimed at reducing risks before disasters occur.

6.5 Continued Public Involvement

The jurisdictions' 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, local mitigation activities being undertaken and success stories of completed should be communicated to the public to show the benefits of effective mitigation planning.

Continued public involvement is also imperative to the overall success of the Plan's implementation. The best way to drive mitigation in the community is to keep the community informed and engaged in the hazard mitigation process. The participating jurisdictions have identified the following actions as ways they plan to actively involve the public during planning and implementation of mitigation actions:

Adams County:

- The 2026 HMP will be posted on the County's website for reference.
- The HMP will 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.
- OEM will continue to host community outreach and education events to educate the public on threats/hazards and preparedness.
- OEM will use their social media platform to update the public on OEM activities and events.
- OEM will work with the State Dam Safety Bureau to conduct targeted outreach to dam owners, with the goal of improving coordination and HMPC participation.

List of Jurisdictional Annexes

Annex A:

Town of Bennett

Annex B:

City of Brighton

Annex C:

City of Commerce City

Annex D:

Denver Water

Appendices

Appendix A:

Plant Processing Documentation

Appendix B:

Hazard Mitigation Planning Committee

Appendix C:

Adoption Resolutions

Appendix D:

Mitigation Action Worksheets

Appendix E:

References

Appendix F:

Glossary

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