Pueblo County 2024 Hazard Mitigation Plan

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Professional planning services for this plan update provided by:

SYNERGY DISASTER RECOVERY

2 Executive Summary

The Disaster Mitigation Act (DMA) mandates proactive, pre-disaster hazard mitigation planning as a condition for specific funding under the Robert T. Stafford Act. This legislation promotes collaboration between state and local governments in disaster preparedness. The planning framework established by the DMA enables local authorities to define precise mitigation needs, leading to quicker funding allocation and more efficient risk reduction initiatives.

Hazard mitigation encompasses both long- and short-term tactics aimed at minimizing loss of life, injury, and property damage during disasters. This involves planning, policy adjustments, programs, projects, and other measures to lessen the impacts of hazards. While it's impossible to precisely forecast the timing, location, or severity of disasters, strategic planning and cooperative efforts among governmental bodies, stakeholders, and the public can reduce disaster-related losses. Various parties, including homeowners, businesses, and governmental entities at all levels, bear responsibility for implementing hazard mitigation measures.

In Pueblo County, a coalition of local governments and organizations has sustained a hazard mitigation plan (HMP) to mitigate risks from natural disasters and align with DMA requirements. The 2024 update of this plan extends prior community efforts and outlines the mitigation tactics that Pueblo County and its local governments will implement over the ensuing five years.

Hazard Mitigation is a sustained action taken to reduce or eliminate long-term risk to people and property from hazards and their effects.

3 Mitigation Strategy

3.1 Mitigation Goals

The Hazard Mitigation Planning Committee (HMPC) has identified the following hazard mitigation goals as the overarching framework for Pueblo County's hazard mitigation strategy. These goals are broad and express the overall, long-term vision for mitigating natural hazards throughout the county.

1. Protect people, property, and natural resources from the impacts of hazards.
2. Increase public awareness of natural hazards and their mitigation.
3. Strengthen communication and coordination among public agencies, non- governmental organizations, businesses, and private citizens.
4. Coordinate and integrate natural hazard mitigation activities with local land development planning activities and emergency operations planning.
5. Recognize and reduce or eliminate the exposure to damage, destruction, and other losses from natural hazards.
6. Protect and maintain critical infrastructures.
7. Build and sustain resiliency across the whole community.
8. Support implementation of mitigation measures to reduce impacts from primary climate change hazards (drought, extreme heat, wildfire, flooding, vector-borne disease).

3.2 2017 Mitigation Actions

As part of the plan update process, the HMPC reviewed and reported on the status of all mitigation actions (i.e. – projects) identified in the 2017 HMP. **Table 1** provides a summary of progress made towards making Pueblo County more resilient to the impacts of those hazards.

As important as acknowledging projects that were accomplished, actions in a community that are on-going are often overlooked as examples of positive implementation of the mitigation strategy. On-going projects are those without a timeline and that may not have deliverables that bring closure to a project but rather continued milestones. Examples include education and outreach efforts, maintenance activities, continual work on updating plans and organizational coordination, and constant work to improve processes and infrastructure.

A number of 2017 actions did not see any progress made, but these projects retain community support and are being carried forward in this 2024 HMP ("No Progress – Continue Action).

Outside of those actions identified in the previous HMP, local governments did report on other mitigation successes that were accomplished since 2017. A summary of these efforts included:

- The Pueblo County Sheriff's Office Wildland Fire Mitigation Team is now 3 years old and have begun (2023) conducting wildland mitigation on private property in conjunction with local fire districts. In order to be eligible, citizens must be elderly, disabled, or meet income thresholds. In which case the team will do Zone 1 fire mitigation on their property, free of charge, in order to decrease the likelihood of catastrophic loss during a wildland fire.
- The slash collection site located at Beulah Fire has brought in an estimated 96,000 tons of natural debris cleaned up around properties.
- The Colorado City Metro District has replaced water filters in the past 3 years with new and recycled old filters and has been alternating them every 6 months. Continual testing on an increased schedule has occurred to ensure compliance of water quality. The district is currently looking at different alternatives for internet connectivity to help with redundancy for communication with SCADA.

Table 1 Status of 2017 Mitigation Actions

ID	Organization	Title	Description	2024 Status	2024 Notes
Pueblo County - 1	Pueblo County	Continue NFIP Participation	Continue with the current membership in the National Flood Insurance Program (NFIP). The City has approximately 120 flood insurance policies currently in force. The County has approximately 93 in force.	On-Going Action	
Pueblo County - 2	Pueblo County	Digitize Flood Maps / Update Flood Hazard Data	Reduce potential flooding by developing up-to-date flood hazard data, by digitizing the flood maps and by working with the Fountain Creek Watershed Flood Control and Greenway District to prevent and mitigate flooding, sedimentation, and erosion.	No Progress - Continue Action	
Pueblo County - 3	Pueblo County	HMPC Progress Status Meetings	Convene Mitigation Planning Committee meeting for progress reports	No Progress - Continue Action	
Pueblo County - 4	Pueblo County	Tumbleweed Management	Reduce the potential of wildland fire and flooding on existing and future structures by controlling tumbleweeds along roadways, waterways, fences, etc.	No Progress - Continue Action	
Pueblo County - 5	Pueblo County	Drainage Criteria Manual Adoption	Update, adopt and implement Drainage Criteria Manual for the health, welfare, and safety of the public and properties.	On-Going Action	
Pueblo County - 6	Pueblo County	Food, Water, Shelter Education and Oversight	Increase public safety through inspection of food facilities for safe food and water procedures.	On-Going Action	This is ongoing and conducted by Environmental Health, and Emergency Preparedness and Response.

ID	Organization	Title	Description	2024 Status	2024 Notes
Pueblo County - 7	Pueblo County	Public Awareness of Zoonotic Diseases	Educate populace concerning food and water (well disinfection) safety in emergency situations; such as flooding, no electrical power, drought, etc. Inspect public housing, shelters, fire camps, etc. concerning safe procedures for food and water."	On-Going Action	Communicable Disease monitors reported cases and conducts case interviews. Environmental Health collects specimens for testing. Most education and outreach occurs May-Oct.
Pueblo County - 8	Pueblo County	Public Awareness of Zoonotic Diseases	Continue to protect the public and increase public awareness on Rabies, Plague, and Tularemia.	On-Going Action	PDPHE does not conduct trapping, but does conduct surveillance through receiving test results from a third party conducting testing of mosquito pools. Communicable Disease team monitors reported cases and conducts case interviews. Most education and outreach occurs May-Oct.
Pueblo County - 9	Pueblo County	Public Awareness of Stormwater Regulations / Use / Impacts	Increase public awareness on West Nile Virus, St. Louis and Western Equine Encephalitis prevention by means of trapping and identification of mosquito species.	On-Going Action	PDPHE conducts education as needed.
Pueblo County - 10	Pueblo County	Tree Removal	Increase public awareness of stormwater regulations, usage and impact on water quality by disseminating public information as defined above.	In Progress	

ID	Organization	Title	Description	2024 Status	2024 Notes
Pueblo County - 11	Pueblo County	Continue NFIP Participation	Continue to implement sound floodplain management practices through participation in the National Flood Insurance Program (NFIP). Issue and monitor Floodplain Development Permits for development within the floodplain. Said program addresses management of the floodplain as it affects development within the City and County.	On-Going Action	
Pueblo County - 12	Pueblo County	Maintain Oldham Road	Maintain Oldham Road (Beulah area) to serve as access for emergency responders and public use as an emergency evacuation route	On-Going Action	
Pueblo County - 13	Pueblo County	Replace Bridge 216a on Apache City Rd	Replace Bridge 216a on Apache City Road	No Progress - No Longer a Mitigation Priority	
Pueblo County - 14	Pueblo County	Drainage Improvements - 3 R Rd at Spring Branch Gulch	Design and reconstruct drainage improvements on 3 R Road at Spring Branch Gulch	Complete	
Pueblo County - 15	Pueblo County	Drainage Improvements - South Park Road	Design and reconstruct drainage improvements on South Park Road	Complete	
Pueblo County - 16	Pueblo County	Drainage Improvements - Lane 27 to Lane 30 on Gale Road	Reconstruction and drainage improvements from Lane 27 to Lane 30 on Gale Road	On-Going Action	
Pueblo County - 17	Pueblo County	Drainage Improvements - Phase 2- Lime Road and Comanche Road	Reconstruction and widening from end of overlay on Comanche south to railroad tracks- Phase 2- Lime Road and Comanche Road	On-Going Action	

ID	Organization	Title	Description	2024 Status	2024 Notes
Pueblo County - 18	Pueblo County	Drainage and Safety Improvements - Purcell Blvd	Reconstruction and widening including drainage and safety improvements from Platteville to Fairbanks on Purcell Blvd.	Complete	
Pueblo County - 19	Pueblo County	Drainage Upgrades - Beulah	Reduce potential of flooding and effects on existing and future structures and infrastructure by upgrading drainage structures in Beulah area	Complete	
Pueblo County - 20	Pueblo County	Drainage Upgrades - Rye and Colorado	Reduce potential of flooding and effects on existing and future structures and infrastructure by upgrading drainage structures in Rye and Colorado	Complete	
Pueblo County - 21	Pueblo County	Drainage Improvements - Lane 29 to Lane 30 on Gale Road	Reconstruction and drainage improvements from Lane 29 to Lane 30 on Gale Road	No Progress - Continue Action	
Pueblo County - 22	Pueblo County	Drainage Improvements Aspen Rd to Eagle St	Reconstruction and drainage improvements from Aspen Road to Eagle Street. Including north-south streets: Bent Street, Carson Street, Delta Street and Eagle Street.	No Progress - Continue Action	
Pueblo County - 23	Pueblo County	Drainage Improvements - Lane 21 to Lane 23 on Gale Road	Reconstruction and drainage improvements from Lane 21 to Lane 23 on Gale Road	No Progress - Continue Action	
Pueblo County - 24	Pueblo County	Drainage Improvements on Lane 23 on Hwy 50 to Everett Road	Reconstruction and drainage improvements from Hwy 50 to Everett Road on Lane 23.	No Progress - Continue Action	

ID	Organization	Title	Description	2024 Status	2024 Notes
Pueblo County - 25	Pueblo County	Drainage Improvements on Lane 21 on Hwy 50 to Everett Road	Reconstruction and drainage improvements from Hwy 50 to Everett Road on Lane 21.	No Progress - Continue Action	
Pueblo County - 26	Pueblo County	Snow Fence Installation	Reduce livestock and road damage by Installing snow fence in areas that have high potential for blowing snow.	No Progress - No Longer a Mitigation Priority	
Pueblo County - 27	Pueblo County	Upgrading Drainage Structures in St. Charles Mesa	Reduce potential of flooding and effects on existing and future structures and infrastructure by upgrading drainage structures in St. Charles Mesa.	No Progress - Continue Action	
Pueblo County - 28	Pueblo County	Drainage and Safety Improvements - Hwy 50 E to River on Frontier St	Reconstruction and widening including drainage and safety improvements from Hwy 50 E to River on Frontier Street	No Progress - Continue Action	
Pueblo County - 29	Pueblo County	Drainage and Safety Improvements - Hwy 50 E to McHarg Park on James St	Reconstruction and widening including drainage and safety improvements from Hwy. 50 E to McHarg Park on James Street	No Progress - Continue Action	
Pueblo County - 30	Pueblo County	Wildland Fire Mitigation	Reduce the potential for wildland fire and effects on existing and future structures and infrastructure through mitigation efforts.	In Progress	
Pueblo County - 31	Pueblo County	Wildland Fire Mitigation	Reduce the potential of wildland fire and flooding on existing and future structures by cutting back vegetation growth along roadways	In Progress	
Pueblo County - 32	Pueblo County	RAWS Station	Install a RAWS Station in Beulah	Complete	

ID	Organization	Title	Description	2024 Status	2024 Notes
Pueblo County - 33	Pueblo County	San Isabel Lake Helipad	Create a helipad at the San Isabel Lake	Complete	
Pueblo County - 34	Pueblo County	Continue StormReady Participation	Continue to be a Storm Ready Community	Complete	
Pueblo County - 35	Pueblo County	NOAA Weather Radio Distribution	Encourage purchase and use of NOAA weather radios to include the possibility of grant funds to help purchase radios for distribution.	Complete	
Pueblo County - 36	Pueblo County	RAWS Station Upgrade - Lake Beckwith	Upgrade the RAWS Station at Lake Beckwith	Complete	
Pueblo County - 37	Pueblo County	New Municipal Separate Storm Sewer System (MS4) Permit	Adopt and implement New Municipal Separate Storm Sewer System (MS4) permit to reduce contaminants entering receiving waters through enforcement of permit standards.	In Progress	
Pueblo County - 38	Pueblo County	Drainage Maintenance	Reduce potential flooding and disease prevention and effects on existing and future structures and infrastructure through drainage maintenance as defined above.	In Progress	
Pueblo County - 39	Pueblo County	Erosion Control Planning and Drainage Structures Upgrades	Reduce the potential for flooding and effects on existing and future structures and infrastructure through erosion control planning and upgrading drainage structures.	In Progress	
Pueblo County - 40	Pueblo County	Tornado Shelter Promotion	Encourage design and use of tornado shelters in new or remodeled buildings through public awareness.	In Progress	

ID	Organization	Title	Description	2024 Status	2024 Notes
Pueblo County - 41	Pueblo County	East-Central Wet Mountains Project	The project will complete the following vegetation treatments: thinning, creating openings, prescribed burning and fuel breaks on approximately 16,700 acres within the East- Central Wet Mountains Project Area.	In Progress	
Pueblo County - 42	Pueblo County	Beulah Watershed Wildfire Mitigation	Partnering with the USFS, Beulah FPD, Beulah Water Dist., and Pine Drive Water Dist. to mitigate wildfire risk to the Beulah Watershed.	Complete	
Pueblo County - 43	Pueblo County	Tree Maintenance to Protect Infrastructure	Reduce damage to property on existing and future infrastructure through tree removal and trimming within their right-of-ways.	In Progress	
Pueblo County - 44	Pueblo County	Education and Services for Historic Preservation Efforts	Working with business owners and private citizens to promote historic preservation through advocacy, education, outreach and preservation services to communities and individuals.	In Progress	
Pueblo County - 45	Pueblo County	Wildland Fire Public Education	Provide wildland fire, mitigation and evacuation information to citizens through community outreach venues. Partner with Red Cross, Pueblo County Emergency Services Bureau, local, state and federal agencies.	In Progress	
Pueblo County - 46	Pueblo County	Mitigation Measures on Private Property	Encourage mitigatint wildland fire hazards and create defensible space on private property	In Progress	

ID	Organization	Title	Description	2024 Status	2024 Notes
Pueblo City - 1	City of Pueblo	Low Impact Development (LID) Techniques Implementation	Lessen the need and expense for the upgrade of existing undersized storm sewer systems in older neighborhoods by implementation of Low Impact Development (LID) Techniques which reduces the potential of flooding due to source control of run-off.	In Progress	
Pueblo City - 2	City of Pueblo	Property Removal from Floodplain	Remove commercial and residential properties from the floodplain as a result of certification of the existing levees through attrition.	In Progress	
Pueblo City - 3	City of Pueblo	Peppersauce Bottoms Drainage Improvements	Reduce potential of flooding by the addition of detention ponds upstream of the impacted neighborhood of Peppersauce Bottoms Drainage Improvements	Complete	
Pueblo City - 4	City of Pueblo	Stormwater Detention-Lake Minnequa Park and Open Space	Reduce potential of flooding through stormwater detention; enhanced water quality at Lake Minnequa Park and Open Space	In Progress	
Pueblo City - 5	City of Pueblo	Floodplain Drainage Management	Maintain and update drainage outfalls into flood plain to reduce potential flooding and damage to properties.	In Progress	
Pueblo City - 6	City of Pueblo	Fountain Creek River Bottom / levee maintenance	Remove debris, additional sediment, and vegetation from Fountain Creek river bottom to help maintain levee capacity and reduce flooding potential.	In Progress	
Pueblo City - 7	City of Pueblo	Trail Maintenance in Floodplain	Remove debris and sediment from trails within the flood plains to provide safe passage for pedestrians.	In Progress	

ID	Organization	Title	Description	2024 Status	2024 Notes
Pueblo City - 8	City of Pueblo	Wildhorse Dry Creek Channel Improvements	Reduce potential of flooding by increasing the capacity of the channel with Wildhorse Dry Creek Channel Improvements	In Progress	
Pueblo City - 9	City of Pueblo	West 11th Street Bridge Replacement	Increase flood capacity in Wildhorse Dry Creek and improved emergency evacuation route for Pueblo's Westside with West 11th Street Bridge replacement.	In Progress	
Pueblo City - 10	City of Pueblo	I-25 Dillon Interchange - Mile Marker 103.4 Upgrade	Reduce potential of flooding and improve emergency evacuation routing at I-25 Dillon Interchange; Mile Marker 103.4 by upgrading	In Progress	
Pueblo City - 11	City of Pueblo	Pueblo Mountain Park Fuel Maintenance	Maintain 180 acres of shaded fuel breaks and other areas where hazardous fuels have been thinned in the Pueblo Mountain Park using federal grant funds since 2004 through continual mitigation efforts.	No Progress - Continue Action	The Lake needs to be dredged a min. of 3 feet to improve the water quality. Parks is trying to find funding (this will also help control the invasive Phragmites).
Pueblo West - 1	Pueblo West	Culvert Installation - Pueblo West	Eliminate the "trapping" of homeowners and/or emergency responders blocked by stormwater through the Installation of culverts on the two dead end cul-de-sacs of Bear Gulch and Bat Masterson in Pueblo West as defined above.	In Progress	

ID	Organization	Title	Description	2024 Status	2024 Notes
Pueblo West - 2	Pueblo West	Groundwater Incursion Analysis	Provide planning and mitigation guidance as a result of ground water incursions in the Pueblo West Golf Course area for residents by conducting an analysis.	In Progress	Parks and Public Works have removed debris/trash from drainage, Fountain Creek Watershed District has continued Flood Plain mitigation. City did receive a COSWAP Grant for fire mitigation performed work south of Colo 47 behind the Goodwill Store.
Pueblo West - 3	Pueblo West	Upgrade and Install Drainage Structures	Reduce potential of flooding and effects on existing and future structures and infrastructure by upgrading and constructing new drainage structures in Pueblo West as defined above.	On-Going Action	Parks has maintained trails in the drainage and continues to do so. Also, the removal of invasive plants is on going.
St Charles - 1	St. Charles Mesa Water District	Re-channel Storage Reservoir	Mitigate the potential of damage to their existing 2,000 acre-feet, raw water storage reservoir, the St. Charles Mesa Water District by rechanneling of the St. Charles River	No Progress - Continue Action	Carried over to 2024 Mitigation Actions. Additional details provided in the following section.
Beulah - 1	Beulah	RAWS Station	Install a RAWS station in Buelah	Complete	

3.3 2024 Mitigation Actions

As part of the HMP update, the HMPC developed a refreshed list of mitigation actions (i.e. – projects) to work towards accomplishing over the HMP's next five-year lifespan. Throughout the plan update process, the HMPC was informed of the comprehensive range of mitigation action types to consider. These types of actions can include: natural systems protection, education & awareness programs, structure & infrastructure projects, and local plans & regulations. Additionally, it was acknowledged that nature-based solutions can be incorporated into many of these mitigation types.

HMPC workshops held over the course of the planning process focused on educating committee members of the multitude of mitigation idea resources available. Emphasis was placed on identifying actions that would help to mitigate the vulnerabilities of both new and existing structures, and infrastructure. As a final resource, the HMPC was also provided a "Mitigation Strategy Action Idea" document which was developed over the course of the planning process (**Annex C - Mitigation Strategy Action Ideas**). This document presented a number of suggested actions based on community input received, conversations amongst the HMPC over the course of the plan's development, and existing community plans.

Following the identification of the 2024 mitigation actions, prioritization of each action was conducted by each local government. According to the Federal Emergency Management Agency (FEMA) mitigation planning requirements, any prioritization system should have a special emphasis on the extent to which benefits are maximized. The HMPC reviewed FEMA's STAPLEE methodology, in addition to a number of additional criteria, to determine those that the county would utilize. Ultimately, it was decided that the following criteria would be considered when prioritizing mitigation efforts, following a determination of positive cost-benefit:

- Social considerations – life / safety impact
- Administrative considerations – administrative / technical capability
- Economic considerations – project cost / reductions in future disaster costs
- Alignment with other local objectives
- Environmental considerations
- Lifeline protection
- Legal considerations
- Benefits to underserved communities

During the planning process, it was decided by the HMPC that mitigation actions would ultimately be prioritized by each government using a three-tiered High, Moderate, or Low methodology.

"High" priority was primarily designated to those actions with a:

- Moderate to High risk ranking
- Potential high risk to life safety, property, or the environment
- Consideration for the impacts of new development and growth

"Moderate" priority was in general designated to actions for hazards that were:

- Slow onset
- Localized impact events
- Larger impact hazards with a sporadic occurrence

A "Low" priority was assigned to those remaining actions that typically address low probability or low impact hazards, ensuring they are not prioritized above or compete with other more practical actions.

To ensure this updated HMP meets FEMA policy, one primary mitigation action has been identified, per natural hazard (as defined by FEMA), for all participating local governments. **Table 2** and **Table 3** include the full details of all new mitigation actions included in this updated 2024 HMP. It should be noted that for potential funding source(s), reference to a "general fund" includes staff time. For any multi-jurisdictional actions, each local government will implement independently, so there is no overarching lead organization.

Additionally, **Table 4** contains a listing of additional auxiliary mitigation actions and other relevant projects identified by the HMPC to be considered in future years.

Table 2 New 2024 Mitigation Actions

ID	Action Title	Local Government	Lead Organization	Partner Organization(s)	Primary Hazard Mitigated	Relevant Goal(s)	Action Details / Benefits
County - 2	Pueblo Dam / Arkansas River Levee Incidents	Pueblo County	PCSO OEM	City of Pueblo, Bureau of Reclamation, State of Colorado Dam Safety, other local governments	Dam / Levee Incident	1, 3, 4, 5, 6, & 7	Work with the Partnering Organizations to develop a plan for the catastrophic failure of the Pueblo Dam (High Hazard Potential) or Arkansas River levee system.
Pueblo City - 6	Fountain Creek River Bottom / levee maintenance	City of Pueblo	City of Pueblo Stormwater / Parks and Recreation		Dam / Levee Incident	1	Remove debris, additional sediment and vegetation from Fountain Creek river bottom to help maintain levee capacity and reduce flooding potential.
n/a	n/a	Pueblo West Metro District			Dam / Levee Incident		Per the risk assessment, this hazard does not present a known risk
CCMD - 14	Beckwith Dam Improvements	Colorado City Metro District	CCMD District Manager	County	Dam / Levee Incident	1, 5, 6, 7, & 8	Lake Beckwith Dam is a main water storage structure for the residents of the city. It was constructed in late 1890's for irrigation and is under a compliance order due to safety and property loss concerns if it were to fail. The district is going to address all safety concerns resulting from an on-going design/engineering project. Specific mitigation actions include: installation of a new outlet and siphon, and shoring of the structure. Additionally, this project will make the base wider for an additional growth opportunity in the future to raise storage for future growth of city and the city's water rights that are presently owned and unable to be captured. Colorado City is a

ID	Action Title	Local Government	Lead Organization	Partner Organization(s)	Primary Hazard Mitigated	Relevant Goal(s)	Action Details / Benefits
							depressed community due to its below average household income and unemployment rate.
SCMWD - 2	Dam / Levee Risk Awareness Campaign	St. Charles Mesa Water District	District Manager	County	Dam / Levee Incident	2 & 7	Disseminate educational materials and content relating to the risk posed by these incidents and potential mitigation solutions. This yearly information campaign will be disseminated in the Spring to all residents deemed at risk.
n/a	n/a	Beulah Fire Protection District			Dam / Levee Incident		Per the risk assessment, this hazard does not present a known risk
Multi - 1	Pueblo Countywide Drought Mitigation Messaging	Pueblo County City of Pueblo Pueblo West Metro District Colorado City Metro District St. Charles Mesa Water District	PCSO OEM Pueblo Board of Water Works PWMD PIO CCMD District Manager SCMWD District Manager	Local governments	Drought	1, 2, 3, 7, &8	Use social and traditional media for educating the public on water conservation and other drought mitigation measures that can be implemented by residents and businesses. This annual campaign will be directed towards the entire city's population and will occur in the Spring.
Beulah - 3	Beulah Raw Water Storage	Beulah Fire Protection District	Fire Chief	Beulah Water Works District, Pine Drive Water District, County	Drought	7	Construct raw water storage facilities at both water treatment locations to increase the availability of water stored for when drought conditions are prevalent.

ID	Action Title	Local Government	Lead Organization	Partner Organization(s)	Primary Hazard Mitigated	Relevant Goal(s)	Action Details / Benefits
Multi - 2	Pueblo Countywide Earthquake Awareness	Pueblo County City of Pueblo Pueblo West Metro District Colorado City Metro District St. Charles Mesa Water District Beulah Fire Protection District	PCSO OEM City PIO Pueblo West PIO CCMD District Manager SCMWD District Manager Fire Chief	Pueblo County Risk Communications Network (RCN), CGS, local governments	Earthquake	1, 2, 5, & 7	Working with CGS, PIOs, & leaders of potentially vulnerable areas to develop materials and conduct annual awareness campaigns to the general public surrounding earthquakes and mitigation / preparation steps during annual preparedness month (September) of each year.
Multi - 3	Pueblo Countywide Backup Power Assessment	Pueblo County City of Pueblo Pueblo West Metro District Colorado City Metro District St. Charles Mesa Water District Beulah Fire Protection District	PCSO OEM City Public Works Pueblo West Fire Dept CCMD District Manager SCMWD District Manager Fire Chief	All local governments	Extreme Heat	1, 3, 5, 6, 7, & 8	Identify and evaluate all critical infrastructure assets that need and would support the permanent installation of backup power generation. Assets will be prioritized for future funding opportunities.

ID	Action Title	Local Government	Lead Organization	Partner Organization(s)	Primary Hazard Mitigated	Relevant Goal(s)	Action Details / Benefits
County - 6	Pueblo County Flood Planning	Pueblo County	PCSO OEM	PC Road & Bridge, City R&B, CDOT, local governments	Flood	1 & 7	Coordinate with local governments to identify possible flooding impacts due to drainage or other factors. Use this information to help inform their master plans and capital improvement plans to enhance stormwater retention and drainage to those affected areas.
Multi - 4	Floodplain Drainage Management	City of Pueblo Pueblo West Metro District Colorado City Metro District	City of Pueblo Stormwater Pueblo West Fire Dept CCMD District Manager		Flood	1, 5, 6, 7, & 8	Maintain and update drainage outfalls into flood plain to reduce potential flooding and damage to properties.
SCMWD - 1	Moffat Street Pump Station Replacement	St. Charles Mesa Water District	District Manager	County	Flood	1, 5, 6, 7, 8	The Moffat Street pumping station is 50 yards away from the Arkansas River and is the primary source of water for the district from Nov-April. Proposed project will be the replacement/rebuild of the current, agining, pump station structure and components, including elevating above the 100-year floodplain.
n/a	n/a	Beulah Fire Protection District			Flood		Per the risk assessment, this hazard does not present a known risk
Multi - 5	Pueblo Countywide Hail Education	Pueblo County City of Pueblo Pueblo West Metro District	PCSO OEM City PIO Pueblo West PIO	National Weather Service - Pueblo Office, local governments	Hail	1, 2, 5, & 7	Coordinate with the NWS-Pueblo on hail education materials that can be shared by local governments to the citizens of Pueblo County, annually during preparedness month (September) to better prepare for, and mitigate against the damages of a severe hail storm.

ID	Action Title	Local Government	Lead Organization	Partner Organization(s)	Primary Hazard Mitigated	Relevant Goal(s)	Action Details / Benefits
		Colorado City Metro District St. Charles Mesa Water District Beulah Fire Protection District	CCMD District Manager SCMWD District Manager Fire Chief				
Multi - 6	Pueblo County Landslide Education	Pueblo County Colorado City Metro District	PCSO OEM CCMD District Manager	PC R&B, City R&B, CDOT, local governments	Landslide / Debris Flow / Rockfall	1, 3, 4, 5, 6, & 7	Coordinate with CGS on landslide / debris flow / rockfall education materials that can be shared by local governments to the citizens of Pueblo County, annually during preparedness month (September) to better prepare for, and mitigate against the damages from these types of events.
n/a	n/a	City of Pueblo			Landslide / Debris Flow / Rockfall		Per the risk assessment, this hazard does not present a known risk
n/a	n/a	Pueblo West Metro District			Landslide / Debris Flow / Rockfall		Per the risk assessment, this hazard does not present a known risk
n/a	n/a	St. Charles Mesa Water District			Landslide / Debris Flow / Rockfall		Per the risk assessment, this hazard does not present a known risk
Beulah - 12	Oak Ridge Debris Flow Mitigation	Beulah Fire Protection District	Fire Chief	Beulah Fire	Landslide / Debris Flow / Rockfall	1, 5, 6, 7, & 8	Mitigate debris flow impacts from the recent Oak Ridge Fire by installing waddles and regrowth seeding to prevent future debris flow events.

ID	Action Title	Local Government	Lead Organization	Partner Organization(s)	Primary Hazard Mitigated	Relevant Goal(s)	Action Details / Benefits
County - 10	Pueblo County Building Code Updates	Pueblo County	PCSO OEM	National Weather Service - Pueblo Office, local governments	Severe Wind	1 & 5	Coordinate with local building officials and code officials to encourage continual adoption of the latest building and fire codes at the County level.
Pueblo City - 18	Severe Wind Assessments	City of Pueblo	Parks and Recreation		Severe Wind	2	Evaluate the health and safety of trees to mitigate by removal and replacement with native species.
Multi - 7	Building Code Compliance	Pueblo West Metro District Colorado City Metro District	Pueblo West Fire Dept. CCMD District Manager	County, Rye Fire Department	Severe Wind	2	Monitor district-wide compliance with established building codes.
SCMWD - 7	Facility Wind Retrofits	St. Charles Mesa Water District	District Manager		Severe Wind	1, 5, 6, & 7	Conduct structural wind retrofits to all district facilities.
Beulah - 13	Severe Wind Assessments	Beulah Fire Protection District	Fire Chief	Pueblo County	Severe Wind	2	Conduct property assessments to identify hazards to structures based on wind events and work with residents on means to mitigate such threats to their homes and properties.
Multi - 8	Pueblo Countywide Winter Weather Education	Pueblo County City of Pueblo Pueblo West Metro District Colorado City Metro District	PCSO OEM City PIO Pueblo West PIO CCMD District Manager	National Weather Service - Pueblo Office, all local governments	Severe Winter Weather	1, 3, 5, & 7	Coordinate with the NWS-Pueblo on severe winter weather education materials that can be shared by local governments to the citizens of Pueblo County, annually during preparedness month (September) to better prepare for, and mitigate against losses from a severe winter weather event.

ID	Action Title	Local Government	Lead Organization	Partner Organization(s)	Primary Hazard Mitigated	Relevant Goal(s)	Action Details / Benefits
		St. Charles Mesa Water District Beulah Fire Protection District	SCMWD District Manager Fire Chief				
Multi - 9	Pueblo Countywide Severe Weather Education	Pueblo County City of Pueblo Pueblo West Metro District Colorado City Metro District St. Charles Mesa Water District Beulah Fire Protection District	PCSO OEM City PIO Pueblo West PIO CCMD District Manager SCMWD District Manager Fire Chief	National Weather Service - Pueblo Office, all local governments	Thunderstorm / Lightning	1, 3, 5, & 7	Working with the NWS-Pueblo on thunderstorm watches / warnings educational materials that can be shared with local governments, and ultimately with the citizens of Pueblo County, annually during preparedness month (September) to better prepare for, and mitigate against, the damages of a severe thunderstorm / lightning.
Multi - 10	Pueblo Countywide Tornado Education	Pueblo County City of Pueblo Pueblo West Metro District	PCSO OEM City PIO Pueblo West PIO	National Weather Service - Pueblo Office, local governments	Tornado	1, 2, 5, & 7	Working with the NWS-Pueblo on tornado education materials that can be shared with local governments, and ultimately with the citizens of Pueblo County, annually during preparedness month (September) to better prepare for, and mitigate against the damages of a tornado

ID	Action Title	Local Government	Lead Organization	Partner Organization(s)	Primary Hazard Mitigated	Relevant Goal(s)	Action Details / Benefits
		St. Charles Mesa Water District	SCMWD District Manager				
n/a	n/a	Colorado City Metro District					Per the risk assessment, this hazard does not present a known risk
n/a	n/a	Beulah Fire Protection District					Per the risk assessment, this hazard does not present a known risk
County - 14	Pueblo County Tumbleweed Events	Pueblo County	PCSO OEM	Fire Chiefs Group	Tumbleweeds	1 & 7	Support communities affected by tumbleweed infestations through the use of the PCSO Wildland Fire Mitigation Team and other tools and mutual aid partners to reduce the threat posed by large amounts of accumulated tumbleweeds.
Multi - 11	Mitigation in the Interface with Prairie Lands	City of Pueblo Pueblo West Metro District Colorado City Metro District St. Charles Mesa Water District Beulah Fire Protection District	City Public Works Pueblo West Fire Dept CCMD District Manager SCMWD District Manager Fire Chief		Tumbleweeds	1 & 7	Control the growth and lessen the presence of weeds along the interface as practical. Mitigation tactics may include on site burning, tumbleweed removal, or tumbleweed onsite burial.

ID	Action Title	Local Government	Lead Organization	Partner Organization(s)	Primary Hazard Mitigated	Relevant Goal(s)	Action Details / Benefits
County - 15	Pueblo County Wildfire Codes	Pueblo County	PCSO OEM	Fire Chiefs Group	Wildfire	1, 3, 4, 5, 6, & 7	Work with local fire jurisdictions to ensure the latest fire codes - building and WUI are being enforced, and then work with partners in the identified WUI areas, to either complete mitigation efforts in ZONE 1 areas (for socially vulnerable residents) or encouraging others to do the same.
Pueblo City - 12	Fire Mitigation Along Waterways and Interfaces within the City Limits	City of Pueblo	Pueblo Fire Department/Parks and Recreation/Public Works		Wildfire	5	Reduce fuel loads and ladder fuels in the urban interface along the Fountain Creek, Arkansas River drainages and Lake Minnequa open space. Removal of non-native noxious plants and shrubs in these areas, treat and masticate to reduce re-growth.
PWMD - 11	Reduce WUI Fuel Loads	Pueblo West Metro District	Pueblo West Fire Dept		Wildfire		Reduce fuel loads and ladder fuels in the WUI. Removal of non-native noxious plants and shrubs in these areas, treat and masticate to reduce re-growth.
CCMD - 13	12 Mile Shaded Fuel Break	Colorado City Metro District	Rye Fire Department	Rye Fire Department	Wildfire	1	Create a 100' shaded fuel break along the private land owner portions of the Highway 78 section known as "12 mile" by contracting with companies to complete the mitigation thinning work needed.
SCMWD - 12	Reduce WUI Fuel Loads	St. Charles Mesa Water District	Rural Fire Department	Rural Fire Department	Wildfire		Reduce fuel loads and ladder fuels in the WUI areas surrounding district properties. Removal of non-native noxious plants and shrubs in these areas, treat and masticate to reduce re-growth.
Beulah - 19	12 Mile Shaded Fuel Break	Beulah Fire Protection District	Fire Chief	Pueblo County, CDOT, USFS	Wildfire	1	Create a 100' shaded fuel break along the private land owner portions of the Highway 78 section known as "12 mile" by contracting with companies to complete the mitigation thinning work needed.

ID	Action Title	Local Government	Lead Organization	Partner Organization(s)	Primary Hazard Mitigated	Relevant Goal(s)	Action Details / Benefits
County - 33	Foster working relationships with community organizations	Pueblo County	PCSO OEM	Non-governmental organizations, non-profits	Multiple	2, 3, & 7	Continue collaboration with a diverse list of organizations representing the county's underserved and socially vulnerable populations (see HMPC roster). OEM will continue to attend and contribute to a current list of 20 ongoing collaborative efforts and working groups. The hope is that by continuing to try and foster these relationships, improved engagement will occur during future HMP updates.

Table 3 New 2024 Mitigation Actions – Additional Details

ID	Priority	Estimated Timeframe for Completion	Potential Funding Source(s)	Reduces Risk to Existing Structures / Infrastructure?	Limits Risk to New Development / Redevelopment?	Benefits Underserved Communities / Socially Vulnerable Populations?	Mitigation Action Type
County - 2	Low	2028	County General Fund	Yes	Yes	Yes	Local Plans & Regulations
Pueblo City - 6	Medium	2028	City General Fund, CO Watershed Restoration Grants, FEMA BRIC / HMGP	Yes	No	Yes	Natural Systems Protection
CCMD - 14	High	2026	District General Fund, FEMA HHPD / HMGP	Yes	Yes	Yes	Structure & Infrastructure Projects
SCMWD - 2	Low	2028	District General Fund	No	Yes	Yes	Education & Awareness Programs
Multi - 1	Medium	2027	County / City / District General Funds	Yes	Yes	Yes	Education & Awareness Programs

ID	Priority	Estimated Timeframe for Completion	Potential Funding Source(s)	Reduces Risk to Existing Structures / Infrastructure?	Limits Risk to New Development / Redevelopment?	Benefits Underserved Communities / Socially Vulnerable Populations?	Mitigation Action Type
	High Medium Medium Low	2026 2028 2027 2028					
Beulah - 3	High	2026	District General Fund, Water Supply Reserve Fund (WSRF) Grant Program, FEMA BRIC / HMGP	Yes	Yes	Yes	Structure & Infrastructure Projects
Multi - 2	Low Low Low Low Low Low	2028 2028 2028 2028 2028 2028	County / City / District General Funds	Yes	Yes	Yes	Education & Awareness Programs
Multi - 3	Medium Medium Low Low Low Medium	2027 2027 2028 2028 2027 2027	County / City / District General Funds, FEMA BRIC / HMGP	No	No	Yes	Local Plans & Regulations

ID	Priority	Estimated Timeframe for Completion	Potential Funding Source(s)	Reduces Risk to Existing Structures / Infrastructure?	Limits Risk to New Development / Redevelopment?	Benefits Underserved Communities / Socially Vulnerable Populations?	Mitigation Action Type
County - 6	High	2026	County General Fund, FEMA BRIC / HMGP	Yes	Yes	Yes	Local Plans & Regulations
Multi - 4	Medium Medium Low	2028 2026 2028	City / District General Funds, FEMA BRIC / HMGP, CWCB Water Project Loan Program	Yes	Yes	Yes	Structure & Infrastructure Projects
SCMWD - 1	High	2027	District General Fund, FEMA BRIC / HMGP	Yes	Yes	Yes	Structure & Infrastructure Projects
–Multi - 5	Medium Low Low Low Low Low	2026 2028 2028 2027 2027 2028	County / City / District General Funds	Yes	Yes	Yes	Education & Awareness Programs
Multi - 6	Low Low	2027 2028	County / District General Funds	Yes	Yes	Yes	Education & Awareness Programs
Beulah - 12	High	2025	District General Fund, FEMA HMGP, USDA EWP	Yes	Yes	Yes	Structure & Infrastructure Projects
County - 10	High	2024	County General Fund	Yes	Yes	Yes	Local Plans & Regulations

ID	Priority	Estimated Timeframe for Completion	Potential Funding Source(s)	Reduces Risk to Existing Structures / Infrastructure?	Limits Risk to New Development / Redevelopment?	Benefits Underserved Communities / Socially Vulnerable Populations?	Mitigation Action Type
Pueblo City - 18	Medium	2028	City General Fund	Yes	Yes	Yes	Local Plans & Regulations
–Multi - 7	Medium Medium	2026 2027	District General Funds, FEMA BRIC	Yes	Yes	Yes	Local Plans & Regulations
SCMWD - 7	Medium	2027	District General Fund, FEMA BRIC / HMGP	Yes	No	Yes	Structure & Infrastructure Projects
Beulah - 13	Medium	2026	District General Fund	Yes	Yes	Yes	Local Plans & Regulations
Multi - 8	Medium Medium Medium Medium Low Medium	2026 2026 2027 2027 2028 2027	County / City / District General Funds	Yes	Yes	Yes	Education & Awareness Programs
Multi - 9	Medium Low Low Low Low	2026 2027 2028 2028 2027	County / City / District General Funds	No	No	Yes	Education & Awareness Programs

ID	Priority	Estimated Timeframe for Completion	Potential Funding Source(s)	Reduces Risk to Existing Structures / Infrastructure?	Limits Risk to New Development / Redevelopment?	Benefits Underserved Communities / Socially Vulnerable Populations?	Mitigation Action Type
	Medium	2026					
Multi - 10	Medium Low Low Low	2027 2028 2028 2028	County / City / District General Funds	No	No	Yes	Education & Awareness Programs
County - 14	Low	2028	County General Fund	Yes	Yes	Yes	Natural Systems Protection
Multi - 11	Low Low Low Low Low	2027 2028 2028 2027 2027	City / District General Funds	Yes	Yes	Yes	Natural Systems Protection
County - 15	High	2028	County General Fund, FEMA BRIC & HMPG, BLM CO Fuels Mgmt. and Comm. Fire Assistance, CSFSF Forest Restoration and Wildfire Risk Mitigation (FRWRM), CSFS Wildfire Mitigation Incentives for Local Governments, BLM Community Wildfire Assistance Program, NRCS Environmental Quality Incentives	Yes	Yes	Yes	Local Plans & Regulations

ID	Priority	Estimated Timeframe for Completion	Potential Funding Source(s)	Reduces Risk to Existing Structures / Infrastructure?	Limits Risk to New Development / Redevelopment?	Benefits Underserved Communities / Socially Vulnerable Populations?	Mitigation Action Type
			Program (EQIP), USFS Community Wildfire Defense Grants (CWDG)				
Pueblo City - 12	High	2026	City General Fund, FEMA BRIC & HMPG, BLM CO Fuels Mgmt. and Comm. Fire Assistance, CSFSF FRWRM, CSFS Wildfire Mitigation Incentives for Local Governments, BLM Community Wildfire Assistance Program, NRCS EQIP, USFS CWDG	Yes	Yes	Yes	Natural Systems Protection
PWMD - 11	High	2026	District General Fund, FEMA BRIC & HMPG, BLM CO Fuels Mgmt. and Comm. Fire Assistance, CSFSF FRWRM, CSFS Wildfire Mitigation Incentives for Local Governments, BLM Community Wildfire Assistance Program, NRCS EQIP, USFS CWDG	Yes	Yes	Yes	Natural Systems Protection
CCMD - 13	High	2026	District General Fund, FEMA BRIC & HMPG, BLM CO Fuels Mgmt. and Comm. Fire Assistance, CSFSF FRWRM, CSFS Wildfire Mitigation Incentives for Local Governments, BLM Community Wildfire Assistance Program, NRCS EQIP, USFS CWDG	Yes	Yes	Yes	Natural Systems Protection

ID	Priority	Estimated Timeframe for Completion	Potential Funding Source(s)	Reduces Risk to Existing Structures / Infrastructure?	Limits Risk to New Development / Redevelopment?	Benefits Underserved Communities / Socially Vulnerable Populations?	Mitigation Action Type
SCMWD - 12	High	2026	District General Fund, FEMA BRIC & HMPG, BLM CO Fuels Mgmt. and Comm. Fire Assistance, CSFSF FRWRM, CSFS Wildfire Mitigation Incentives for Local Governments, BLM Community Wildfire Assistance Program, NRCS EQIP, USFS CWDG	Yes	Yes	Yes	Natural Systems Protection
Beulah - 19	High	2026	District General Fund, FEMA BRIC & HMPG, BLM CO Fuels Mgmt. and Comm. Fire Assistance, CSFSF FRWRM, CSFS Wildfire Mitigation Incentives for Local Governments, BLM Community Wildfire Assistance Program, NRCS EQIP, USFS CWDG	Yes	Yes	Yes	Natural Systems Protection

Table 4 Auxiliary Mitigation Actions and Other Relevant Projects

ID	Action Title	Local Government	Lead Organization	Partner Organization(s)	Primary Hazard Mitigated	Relevant Goal(s)	Action Details / Benefits
Beulah - 1	Bear-Human Conflict	Beulah Fire Protection District	Fire Chief	Colorado Parks and Wildlife	Animal Disease Outbreak	5	Through funding by CPW, Beulah Fire will develop programs and projects to reduce the human-bear conflict and the introduction of bears into human waste. These actions will help reduce the possibility of wildlife contracting disease by human interaction.

ID	Action Title	Local Government	Lead Organization	Partner Organization(s)	Primary Hazard Mitigated	Relevant Goal(s)	Action Details / Benefits
Beulah - 4	Replace Aged Water System	Beulah Fire Protection District	Fire Chief	Pine Drive Water District	Drought	6	Replace the water distribution system of Pine Drive Water which currently has a 15% average daily loss in leaks.
County - 27	Mobile Water Filtration System	Pueblo County	PCSO OEM	Beulah Fire	Drought	7	Obtain a mobile water filtration system that could be deployed anywhere in Pueblo County when drought conditions limit Water Districts ability to produce potable water.
Beulah - 8	Watershed Protection	Beulah Fire Protection District	Fire Chief	Pueblo County, USFS	Flood	6	Partnering with the USFS, Beulah FPD, Beulah Water Dist., and Pine Drive Water Dist. to mitigate flood risks post wildfire to the Beulah Watershed.
County - 28	Drainage Upgrades	Pueblo County	PCSO OEM		Flood	1	Reduce potential of flooding and effects on existing and future structures and infrastructure by upgrading drainage structures in Beulah area.
Beulah - 14	Severe Winter Rescue	Beulah Fire Protection District	Fire Chief	Pueblo County	Severe Winter Weather	7	Obtain an all-terrain snow vehicle (Snow CAT) for large snow events making access to trapped and stranded citizens.
Beulah - 20	Beulah - Firewise Community	Beulah Fire Protection District	Fire Chief	Pueblo County, USFS	Wildfire	1	Complete mitigation efforts in Zone 1 on the 477 identified structures within the Beulah WUI.
Beulah - 21	Beulah - Overhead Electric Line Removal	Beulah Fire Protection District	Fire Chief	San Isabel Electric	Wildfire	1	Work with San Isabel Electric to remove the overhead power lines throughout the community and place the lines below ground reducing the threat of wildfire causes by power lines.

ID	Action Title	Local Government	Lead Organization	Partner Organization(s)	Primary Hazard Mitigated	Relevant Goal(s)	Action Details / Benefits
County - 29	Mobile Radio/Cell Tower	Pueblo County	PCSO OEM	Beulah Fire	Multiple	3	Purchase a mobile radio/cell tower that could be deployed anywhere in the County when such services are down due to a natural disaster.
County - 30	MCI Bus	Pueblo County	PCSO OEM	Beulah Fire	Multiple	7	Purchase a MCI Bus that would allow for field treatment following a Mass Casualty Incident from a natural disaster
County - 31	Evacuation Routes	Pueblo County	PCSO OEM	Beulah Fire	Multiple	2	Design and designate pre-determined evacuation routes and centers. Purchase street signs identifying these routes and centers. Educate the public on the routes and centers.
County - 32	County Wide Fire Department	Pueblo County	PCSO OEM		Multiple	1	Design and develop a County Wide Fire Protection District to add protection to the unincorporated areas of Pueblo County.
Beulah - 26	Beulah Water District Generator	Beulah Fire Protection District	Fire Chief		Multiple	3	Purchase an emergency power generator for the Beulah Water District operations facility.
Pueblo City - 1	Low Impact Development (LID) Techniques Implementation	City of Pueblo	Public Works/Stormwater		Flood	1, 5, 6	Lessen the need and expense for the upgrade of existing undersized storm sewer systems in older neighborhoods by implementation of Low Impact Development (LID) Techniques reduces potential of flooding due to source control of run-off. Work is continuous in this area as funding allows.
Pueblo City - 2	Property Removal from Floodplain	City of Pueblo	Public Works/Stormwater		Flood	1	Remove commercial and residential properties from the floodplain as a result of certification of the existing levees through attrition.

ID	Action Title	Local Government	Lead Organization	Partner Organization(s)	Primary Hazard Mitigated	Relevant Goal(s)	Action Details / Benefits
Pueblo City - 3	Peppersauce Bottoms Drainage Improvements	City of Pueblo	Public Works/Stormwater		Flood	1, 5	Reduce potential of flooding by the addition of detention ponds upstream of the impacted neighborhood of Peppersauce Bottoms Drainage Improvements.
Pueblo City - 4	Stormwater Detention- Lake Minnequa Park and Open Space	City of Pueblo	Parks and Recreation/Public Works/Stormwater		Flood	1	Reduce potential of flooding through stormwater detention; enhanced water quality at Lake Minnequa Park and Open Space. The lake needs to be dredged a min. of 3 feet to improve the water quality. Parks and Recreation is trying to find funding. This action will also help to control the phragamites in the lake.
Pueblo City - 7	Trail Maintenance in Floodplain	City of Pueblo	Parks and Recreation		Flood	1, 5	Remove debris, additional sediment and vegetation from Fountain Creek River bottom to reduce flooding potential. Parks has maintained trails in the drainage and continues to do so. Also, the removal of invasive plants is on going.
Pueblo City - 8	Wildhorse Dry Creek Channel Improvements	City of Pueblo	Public Works/Stormwater		Flood	1, 5	Reduce potential of flooding by increasing the capacity of the channel with Wildhorse Dry Creek Channel Improvements. Action is ongoing due to upstream sediment and debris.
Pueblo City - 9	Pueblo Mountain Park Fuel Maintenance	City of Pueblo	Parks and Recreation/Fire Department	Beulah Fire	Wildfire	1	Maintain 180 acres of shaded fuel breaks and other areas where hazardous fuels have been thinned in the Pueblo Mountain Park using federal grant funds since 2004 through continual mitigation efforts.
Pueblo City - 19	Tornado Warning	City of Pueblo	City of Pueblo	Pueblo County EM	Tornado	1	Purchase and place sirens in the county to warn of tornados or other hazardous weather.

ID	Action Title	Local Government	Lead Organization	Partner Organization(s)	Primary Hazard Mitigated	Relevant Goal(s)	Action Details / Benefits
County - 1	Pueblo County Animal Outbreaks	Pueblo County	PDPHE	CSU-Extension Office, Colo Dept. of Agriculture	Animal Disease Outbreak	1 & 7	Work with PDPHE, CSU-Extension Office, and the Colorado Department of Agriculture to monitor and plan for potential disease outbreaks among and related to Pueblo County's animal populations.
County - 9	Pueblo County Pandemic Event	Pueblo County	PCSO OEM	PDPHE, CDPHE	Pandemic	1 & 7	Working with local public health officials, ensure Pueblo County has a plan for public health, education, and access to PPE for first responders during a declared pandemic.
County - 16	Mobile Radio/Cell Tower	Pueblo County	PCSO OEM	City of Pueblo	Multiple	3	Purchase a Cell of Wheels (COW) or Cell on Light Truck (COLT) that could be deployed around the County in the event of incidents that affect regular cellular communications. This could include poor service areas, cyber attacks, or terrorist attacks
County - 18	Pueblo County Shelter Location	Pueblo County	PCSO OEM	Pueblo County P&R	Multiple	1 & 7	Working with Pueblo County Parks and Rec, create and establish a shelter location that can be used for both short- and long-term sheltering operations during disasters. While the County traditionally relies on 3rd party partners to provide this service, they are not always guaranteed to be available. This provides redundancy and supports the County's statutory responsibility to provide shelter.
County - 19	Pueblo County Sheriff's Office OEM ATVs	Pueblo County	PCSO OEM	Pueblo County Fleet	Multiple	1 & 7	Multiple events around the county - both summer and winter events - create the need to access remote areas of the County; the purchase of updated ATVs/Side-by-Sides with the track attachments would all them to operate in both dry and snow conditions and allow for the use of a single vehicle vs having ATVs and snowmobiles.
County - 20	Pueblo County Dive Team Enhancements	Pueblo County	PCSO OEM	Multiple	Multiple	1 & 7	Various scenarios lead to water rescues - swift water, flooding, drowning, winter weather ice rescues, etc. This requires specialty equipment and training. Working

ID	Action Title	Local Government	Lead Organization	Partner Organization(s)	Primary Hazard Mitigated	Relevant Goal(s)	Action Details / Benefits
							with the PCSO and other agencies to ensure that the County has properly trained and equipped personnel ready to respond to these type of emergencies.
County - 21	Mobile Water Filtration System	Pueblo County	PCSO OEM	Beulah Fire	Drought	7	Obtain a mobile water filtration system that could be deployed anywhere in Pueblo County when drought conditions limit Water Districts ability to produce potable water.
County - 22	Drainage Upgrades	Pueblo County	PCSO OEM		Flood	1	Reduce potential of flooding and effects on existing and future structures and infrastructure by upgrading drainage structures in Beulah area.
County - 23	Mobile Radio/Cell Tower	Pueblo County	PCSO OEM	Beulah Fire	Multiple	3	Purchase a mobile radio/cell tower that could be deployed anywhere in the County when such services are down due to a natural disaster.
County - 24	MCI Bus	Pueblo County	PCSO OEM	Beulah Fire	Multiple	7	Purchase a MCI Bus that would allow for field treatment following a Mass Casualty Incident from a natural disaster
County - 25	Evacuation Routes	Pueblo County	PCSO OEM	Beulah Fire	Multiple	2	Design and designate pre-determined evacuation routes and centers. Purchase street signs identifying these routes and centers. Educate the public on the routes and centers.
CCMD - 1	Dam / Levee Risk Awareness Campaign	Colorado City Metro District	CCMD District Manager	County	Dam / Levee Incident	2 & 7	Disseminate educational materials and content relating to the risk posed by these incidents and potential mitigation solutions. This yearly information campaign will be disseminated in the Spring to all residents deemed at risk.
SCMWD - 1	St. Charles River: Stabilize North Embankment	St. Charles Mesa Water District	District Manager	County	Multiple	1, 5, 6, & 7	In order to mitigate the potential of damage to their existing 1,800 acre-foot, raw water storage reservoir, the St. Charles Mesa Water District (SCMWD) wishes to implement stream bank stabilization along portions of the St. Charles River.

ID	Action Title	Local Government	Lead Organization	Partner Organization(s)	Primary Hazard Mitigated	Relevant Goal(s)	Action Details / Benefits
	Next to District Raw Water Storage Reservoir						This will help to mitigate future damages to the reservoir. The protection of the district's raw water supply is the goal of the project.
Beulah - 27	Prescribed Forest Treatments	Beulah Fire Protection District	Fire Chief		Wildfire	1, 5, 6, 7, & 8	Conducting prescribed fires in the district's watersheds to help protect from catastrophic fires

3.4 Mitigation Capabilities

The mitigation capability assessment examines the ability of Pueblo County to implement and manage the comprehensive mitigation strategy laid out in this HMP. The strengths, weaknesses, and resources of each local government are identified here as a means for evaluating and maintaining effective and appropriate management of the county's hazard mitigation program.

Local governments are encouraged to utilize this assessment to identify those capabilities that they want to expand and improve upon, to enhance implementation efforts towards the county's mitigation strategy. The ability to do so is dictated by each local government's elected leadership, management, and available funding and staffing. It is also noted that grant funding opportunities are available to improve these capabilities.

Included in the **2024 Mitigation Actions** section is a number of local government actions focused on enhancing these mitigation capabilities. One additional specific mitigation capability that each participating local government will improve over the next five years relates to the county's lack of an updated, countywide community wildfire protection plan (CWPP). Presently, Pueblo County has a CWPP for its Southwest portion that was written in 2006. Following the HMP planning process, the county and all local governments plan to develop a countywide CWPP to help further refine wildfire mitigation efforts.

Mitigation capabilities are classified into the following types:.

- Planning & Regulatory
  - Plans
  - Building Code, Permitting, & Inspection
  - Land Use Planning & Ordinances
- Administrative & Technical
  - Administration
  - Staff
  - Technical
- Financial
  - Funding Resources
- Education & Outreach
  - Programs & Organizations

Note that the capability assessment asked different questions, depending on the type of local government. Any grey cells in the following four tables are capabilities not applicable to special districts, and therefore not assessed.

Planning and regulatory capabilities are powerful tools for implementing hazard mitigation. The county and local governments currently utilize or have implemented many of these capabilities shown in **Table 5**. The county supports local government with some of these available capabilities. It is important for the county to regularly review each of these tools, to identify opportunities for further risk reduction efforts and to explore ways to increase capabilities of the municipalities.

Table 5 Planning & Regulatory Capabilities

Mitigation Capability	Pueblo County	City of Pueblo	Pueblo West	CO City	St. Charles	Beulah
Comprehensive, Master, or General Plan	Yes	Yes	Yes	No	Yes	Yes
Capital Improvement Program or Plan (CIP)	Yes	Yes	Yes	Yes	Yes	Yes
Floodplain Management Plan	Yes	Yes	No	Yes	No	Yes
Stormwater Program / Plan	Yes	Yes	Yes	No	No	No
Community Wildfire Protection Plan (CWPP)	Yes	No	No	Yes	No	Yes
Erosion / Sediment Control Program	Yes	Yes	No	No	No	Post fire
Economic Development Plan	Yes	Yes				
Other:	N/A	N/A	N/A	N/A	Dam moni-toring	N/A
Building Codes (Year)	2021	2021				
Building Code Effectiveness Grading Schedule (BCEGS) Rating	Unknown	Unknown				
Site Plan Review Requirements	Yes	Yes	Yes	Yes	N/A	Yes
Other:	Land Use Plan	Land Use Plan	Land Use Plan	Land Use Plan	Land Use Plan	Land Use Plan
Zoning Ordinance (Land Use)	Yes	Yes				
Subdivision Ordinance	Yes	Yes				
National Flood Insurance Program (NFIP) Participant	Yes	Yes				

Mitigation Capability	Pueblo County	City of Pueblo	Pueblo West	CO City	St. Charles	Beulah
Flood Insurance Study / Flood Insurance Rate Map / DFIRM	Yes	Yes				
Floodplain Ordinance	Yes	Yes				
Elevation Certificates for Floodplain Development	Yes	No				
Community Rating System (CRS) Participant	No	No				
Open Space / Conservation Program	Yes	No				
Growth Management Ordinance	Yes	No				
Stormwater Ordinance	Yes	Yes				
Other Hazard Ordinance (steep slope, wildfire, snow loads, etc.)	Yes	No	Yes – Comm-ittee of Archi-tecture	Yes - Coven-ant Commun-ity	N/A	N/A
Other:	N/A	N/A	N/A	N/A	N/A	N/A

Administrative and technical capabilities include staff, working groups, and technology which are vital for a community to be able to implement hazard mitigation. The county and local governments currently utilize or have implemented many of these capabilities shown in **Table 6**.

Table 6 Administrative & Technical Capabilities

Mitigation Capability	Pueblo County	City of Pueblo	Pueblo West	CO City	St. Charles	Beulah
Planning Commission	Yes	Yes				
Mitigation Planning Committee	No	No				
Maintenance Programs (tree trimming, clearing drainage, etc.)	Yes	Yes	No	Yes	Yes	Yes
Emergency Manager	Yes	No				

Mitigation Capability	Pueblo County	City of Pueblo	Pueblo West	CO City	St. Charles	Beulah
Building Official	Yes	Yes				
Floodplain Administrator	Yes	Yes				
Community Planner	Yes	Yes				
Transportation Planner	No	Yes				
Civil Engineer	Yes	Yes				
GIS Capability	Yes	Yes	No	Yes	Yes	Yes
Resiliency Planner	No	No				
Other:	N/A	N/A	N/A	N/A	N/A	N/A
Warning Systems / Services (flood)	Yes	No				
Warning Systems / Services (other / multi-hazard)	Yes	No				
Grant Writing / Management	No	Yes	No	Yes	No	Yes
Other:	Yes	N/A	N/A	N/A	On-call engineer consultant	N/A

The ability of a community to implement a comprehensive mitigation strategy is largely dependent on available funding. The county and local governments currently utilize or have implemented some of these capabilities shown in **Table 7**.

Table 7 Financial Capabilities

Mitigation Capability	Pueblo County	City of Pueblo	Pueblo West	CO City	St. Charles	Beulah
Levy for Specific Purposes with Voter Approval	No	No	Yes	Yes	No	No
Utilities Fees	No	No	Yes	Yes	Yes	Yes
System Development / Impact Development Fee	No	No	No	Yes	Yes	No

Mitigation Capability	Pueblo County	City of Pueblo	Pueblo West	CO City	St. Charles	Beulah
General Obligation Bonds to Incur Debt	Yes	No	No	Yes	Yes	Yes
Special Tax Bonds to Incur Debt	Yes	No	No	No	No	No
Withheld Spending in Hazard-Prone Areas	No	No	No	No	No	No
Open Space / Conservation Fund	No	No	No	No	No	No
Stormwater Utility Fees	No	Yes	No	No	No	No
Capital Improvement Project Funding	Yes	Yes	Yes	Yes	Yes	Yes
Community Development Block Grants (CDBG)	No	Yes	No	No	No	No
Other:	N/A	N/A	Mari-juana Tax, Special sales tax for public safety (Fire)	N/A	State SFR loans and grants	State Fire Grants and AFG grants

Education and outreach are important capabilities that allow a community to continue the conversation with their public regarding hazard risk and opportunities to mitigate. The county and local governments currently utilize or have implemented some of these capabilities shown in **Table 8**.

Table 8 Education & Outreach Capabilities

Mitigation Capability	Pueblo County	City of Pueblo	Pueblo West	CO City	St. Charles	Beulah
Public Hazard Education / Outreach Program	Yes	No	Yes	Yes	No	Yes
Local Citizen Groups that Communicate Hazard Risks	Yes	No	No	Yes	No	Yes

Mitigation Capability	Pueblo County	City of Pueblo	Pueblo West	CO City	St. Charles	Beulah
Firewise	No	No	No	No	No	In progress
StormReady	Yes	No	No	No	No	No
Other:	N/A	N/A	N/A	Pueblo Sheriff Dept. Board of County Commis-sioners.	Share resources on water quality and water waste	Property mitigation inspect-ions, Evac-uation and Mitigation Prepared-ness Day events

3.5 Compliance with Floodplain Requirements

The National Flood Insurance Program (NFIP) makes federally backed flood insurance available to homeowners, renters, and business owners in participating communities. Base flood elevations and the boundaries of the 100- and 500-year floodplains are shown on Flood Insurance Rate Maps (FIRM) which are the principal tool for identifying the extent and location of the flood hazard. FIRMs are the most detailed and consistent data source available, and for many communities they represent the minimum area of oversight under their floodplain management program.

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

- New buildings and those undergoing substantial improvements must, at a minimum, be elevated to protect against damage by the 100-year flood.
- New floodplain development must not aggravate existing flood problems or increase damage to other properties.

Pueblo County and all its incorporated communities have been mapped and participate in the NFIP, and have adopted NFIP minimum floodplain management criteria. Maintaining compliance under the NFIP is an important component of flood risk reduction. All will continue to comply with all NFIP requirements which is monitored by FEMA regional staff, including enforcing all locally adopted floodplain management regulations concerning existing structure improvements and new construction. The effective date for the current countywide FIRM, adopted by the county and city, is August 25, 2019. The county and participating communities are currently in good standing with the provisions of the NFIP.

Adopting floodplain management rules is only effective if the rules are followed and enforced. Implementation and enforcement of local floodplain regulations (i.e. – "compliance") is achieved through the following answers to questions posed by FEMA guidance:

- Pueblo County
  - Who is the floodplain manager? Is this their primary or a secondary role? Does this person have adequate training and capacity for their role?
    - The Zoning Administrator (Planning Director) or designee is the floodplain manager. This is a secondary role. Capacity is continually being enhanced as the county's Emergency Manager and Planning staff regularly participate in FEMA training opportunities.
  - Is the FIRM and FIS report in an accessible location? Does the community (or state) promote public access to floodplain information?
    - The information is readily available to the public on the county website. The county don't actively promote the information at this time, other than to offer access to it.
  - How does the community support map change requests? These could be requests during the Risk MAP process or through Letters of Map Amendment or Revision (LOMA/R).
    - The county does support the use of LOMAs and LOMRs for map updates but has not utilized these processes in the recent past. The county is currently coordinating updates on the ongoing Risk MAP project.
  - Does the community collect updated floodplain data or modeling? Is this shared with partners and with FEMA?
    - The county files all of the information received, and modeling performed, through our floodplain permitting process. This is available to be shared with internal and external partners as needed.
  - How does the community issue development permits in the special flood hazard area? Who is responsible for permitting?
    - Planning and Development issues floodplain permits utilizing an online application. The county has procured an engineering firm to perform technical reviews.
  - How are floodplains regulated in new subdivisions?
    - The county has not had any subdivisions in the floodplain, however, if this situation were to occur all proposed development would be reviewed accordingly.
  - Does the community maintain elevation records? Does it track the number of buildings in the special flood hazard area?

        - The county tracks elevation records within individual permit files. Future implementation of a centralized tracking system is being considered for evaluation.
    - How does the community enforce its floodplain rules? Does enforcement include monitoring compliance and acting to correct violations?
        - The county both enforces and monitors compliance with the NFIP through Planning and Development.
    - How does the community educate the public on floodplain management and the availability of flood insurance, in and out of the floodplain?
        - The county provides all related information on its website.
    - How the participating jurisdictions will comply with the Colorado Rules and Regulations for Regulatory Floodplains (2 CCR 408-1)?
        - The county will continue to comply with all state and federal requirements, through the floodplain permitting process.

- City of Pueblo
    - Who is the floodplain manager? Is this their primary or a secondary role? Does this person have adequate training and capacity for their role?
        - The Director of the Stormwater Department is the floodplain manager by ordinance. This is a secondary role. The floodplain manager has staff that are adequately trained to fulfill this role.
    - Is the FIRM and FIS report in an accessible location? Does the community (or state) promote public access to floodplain information?
        - The information is readily available to the public on the county website.
    - How does the community support map change requests? These could be requests during the Risk MAP process or through Letters of Map Amendment or Revision.
        - The community can support map changes through LOMAs and LOMRs. The Community typically supports map changes through based on Fill (LOMR-F). These requests can be submitted to FEMA online using the Online LOMC site. The LOMA process allows individuals to submit mapping and survey information to request that a property or structure be removed from the Special Flood Hazard Area (SFHA). The LOMR is an official revision, by letter, to an effective NFIP map. A LOMR may change

flood insurance risk zones, floodplain and/or floodway boundary delineations, planimetric features, and/or BFE.

- Does the community collect updated floodplain data or modeling? Is this shared with partners and with FEMA?
    - Yes. Updated models must be submitted by the engineer of record before a floodplain development permit is signed off. These updated models are shared with the Colorado Water Conservation Board (CWCB). The CWCB is the state agency responsible for administering and enforcing floodplain regulations. Models from the CWCB are also shared with local engineers so that the most current data is being utilized.
- How does the community issue development permits in the special flood hazard area? Who is responsible for permitting?
    - The city tries to discourage development within the Special Flood Hazard Area (SFHA). Most of the property that resides within the SFHA that is within city limits belongs to the City of Pueblo, who is responsible for issuing all floodplain development permits within the City.
- How are floodplains regulated in new subdivisions?
    - Floodplains are regulated via the zoning process that is required by all new development. Floodplains are also regulated via the City of Pueblo's Drainage Criteria Manual.
- Does the community maintain elevation records? Does it track the number of buildings in the special flood hazard area?
    - Yes. The city does the best job it can in tracking the number of buildings in the SFHA. This includes acquiring insurance records from the CWCB for property owners who are required to take a loan out on their investment. Notices are sent to property owners when FIRMs are updated by FEMA.
- How does the community enforce its floodplain rules? Does enforcement include monitoring compliance and acting to correct violations?
    - Typical enforcement mechanisms include: Written Warning, Notice of Violation, and Municipal Summons. A Certificate of Occupancy will not be issued until compliance violations have been corrected.

- How does the community educate the public on floodplain management and the availability of flood insurance, in and out of the floodplain?
  - Residents who are within the SFHA can come by the City's Stormwater Department to discuss options they have for flood insurance. An average insurance estimate is kept on file. The city's website shows a link to a FEMA website where further information can be found. Insurance agencies typically contact the city to get official information on a property that is located within the SFHA.
- How the participating jurisdictions will comply with the Colorado Rules and Regulations for Regulatory Floodplains (2 CCR 408-1)?
  - CWCB Rules and Regulations for Regulatory Floodplains in Colorado are adhered to by the City of Pueblo. A Community Assistance Visit (CAV) was conducted on April 26, 2019 with the City of Pueblo by the CWCB to discuss the city's participation in the NFIP. There were some deficiencies identified in the CAV that the city updated in its Code of Ordinances.

The NFIP looks to reduce flood risk after a flood event. It does this through substantial damage/substantial improvement rules. These rules apply when a structure is more than 50% damaged or improved (by cost). The owner must build in a way that complies with current building codes and ordinances. This applies even if the structure was exempt from those rules before the damage or improvement. It also applies to damage from non-flood events like fire or wind. Substantial damage/substantial improvement allows communities to require owners of structures built before they joined the NFIP to comply with current standards. Communities are responsible for making substantial damage/substantial improvement determinations and notifying property owners.

Substantial damage / improvement provisions of these regulations are implemented through the following answers to questions posed by FEMA guidance::

- Pueblo County
  - Which agency or person makes substantial damage / substantial improvement determinations?
    - Pueblo County Department of Planning and Community Development
  - Whether staff are trained to make substantial damage / substantial improvement determinations and if there are enough staff to complete them?
    - Yes, department staff are trained and can be supplemented by other staff to assist with damage assessments as necessary, to include subject matter experts and those from the Pueblo Regional Building or Fire Departments.

  - The process the community uses to make determinations?
    - Working with / through the Planning & Code Enforcement and Regional Building Process.
  - The community's methods for communicating substantial damage / substantial improvement requirements before and after an event?
    - The Planning / Zoning Department and Regional Building Department websites provide information on these requirements which are also documented in the building code requirements.
- City of Pueblo
  - Which agency or person makes substantial damage / substantial improvement determinations?
    - Insurance agencies typically make these determinations regarding the affairs of citizens. The city makes these determinations regarding the affairs of infrastructure that affects citizens.
  - Whether staff are trained to make substantial damage / substantial improvement determinations and if there are enough staff to complete them?
    - Staff are not trained to make substantial damage / improvement determinations as explained above. This duty falls on insurance agencies who issue individual policies. Staff are trained to design public improvements that remove floodplain risks. In May and June of 2015, a sequence of storm events destroyed a concrete pedestrian trail along Fountain Creek. A Presidential declaration was issued, and FEMA worked with city staff to remove the trail connection out of the floodplain to the top of the levee system.
  - The process the community uses to make determinations?
    - Not applicable
  - The community's methods for communicating substantial damage / substantial improvement requirements before and after an event?
    - The city's website shows a link to a FEMA website where further information can be found.

The Pueblo Regional Comprehensive Plan (2022) lists Policy-6.5.4 for floodplain regulation in the county. The policy states "continue implementation of floodplain regulations to protect against development in flood zones, mitigate identified risks, and maintain the community's rating in the National Flood Insurance Program."

There are a total of 129 policies currently in force in the county, with a total insured coverage of $40,529,600. A total of 46 claims have been paid since 1978 with a total of $263,997 in payments, which includes both building and content values.

Table 9 includes the details for the NFIP participants in the county, as well as the current policy coverage.

Table 9 NFIP Participation and Insurance Policy Details

Jurisdiction	Date of Entry	Initial FHBM ID	Initial FIRM ID	Policies in Force	Total Coverage
Pueblo County	9/29/1989	10/25/1974	9/29/1989	67	$20,348,200
City of Pueblo	8/24/1973	-	8/24/1973	44	$13,826,000
Town of Boone	7/15/1985	9/6/1974	8/15/2019	0	-
Town of Rye	8/15/2019	7/18/1975	8/15/2019	1	$53,400
Unknown	-	-	-	17	$6,302,000

3.6 Plan Monitoring and Maintenance

Pueblo County and the HMPC agreed upon these HMP maintenance procedures. It was determined that the emergency manager will serve as the primary point of contact for these tasks. This position will coordinate all local efforts to monitor, evaluate, and update the HMP. Each participating local government will be responsible for implementing their specific mitigation actions and reporting on the status of these actions to the emergency manager.

Throughout the year, the emergency manager will monitor for events that may require the HMPC to revisit sections of the HMP. Reasons for this may include but are not limited to: disaster events (affecting the county or other communities across the nation); changes in hazard risk or vulnerability due to population change, development, and/or climate change; changes in available funding resources, updated hazard studies or information, changes in governmental organizational structure, or public input / concerns.

Events that do not necessitate a HMP update at that time will be tracked by the emergency manager for integration into the five-year update.

Annually in November of each year, the emergency manager will solicit updates from all local governments on the status of their mitigation actions identified in this HMP. Responses will be compiled into a report which will be provided to the governing bodies of each local government. After considering the findings of the submitted progress report, the governing bodies and / or the HMPC may request a follow up with the organization responsible for implementing an action to discuss project conditions.

An evaluation of the HMP's effectiveness will be directly measured from these annual progress reports.

Beginning in year three of the five-year lifespan of the HMP, the emergency manager will begin efforts at securing funding and / or resources for the next update process. At this time it will be determined who will be leading this effort and if outside organizations or consultants will be utilized.

3.7 Planning Integration

Integration of the HMP into other planning mechanisms is vital for the overall implementation of the mitigation strategy. This also benefits a community by ensuring that there are no strategic conflicts across planning documents. **Table 10** documents how local governments were able to successfully integrate the 2017 HMP into other planning efforts.

Table 10 Integration of the 2017 HMP

Local Government	Plan Integration
Pueblo County	The current HMP was utilized during the Colorado Emergency Preparedness Assessment (CEPA). Portions of the current HMP were referenced during development of the Pueblo Regional Comprehensive Plan (2022) and 2045 Long Range Transportation Plan (2021**).**
City of Pueblo	Portions of the current HMP were referenced during development of the Pueblo Regional Comprehensive Plan (2022) and 2045 Long Range Transportation Plan (2021**).**
Pueblo West Metro District	Portions of the current HMP were referenced during development of the Pueblo Regional Comprehensive Plan (2022) and 2045 Long Range Transportation Plan (2021**).**
Colorado City Metro District	Colorado Metro District did not integrate the 2017 HMP into any planning efforts.
St. Charles Mesa Water District	The 2017 HMP was used as a reference for updating the districts Emergency Response Plan and Risk and Resilience Assessment that was completed in 2021.
Beulah Fire Protection District	The 2017 HMP has been incorporated in numerous planning efforts including wildfire evacuation information, wildfire mitigation, flood mitigation and all hazard mitigation efforts.

Table 11 details each local government's planned integration efforts for the 2024 HMP.

Table 11 Planned Integration of the 2024 HMP

Local Government	Plan Integration
Pueblo County	The county hopes to use this plan as a guide for future funding possibilities to increase whole community planning

Local Government	Plan Integration
	efforts and to decrease all-hazards impacts around Pueblo County. The information from the HMP will be utilized to help to further enhance policies / procedures and guidelines and to develop programmatic guidance for new initiatives within our organizations. Additionally, the risk assessment and mitigation strategy presented in this HMP will serve as the baseline for development of an updated, countywide CWPP.
City of Pueblo	The information from the HMP will be utilized to help to further enhance policies / procedures and guidelines and to develop programmatic guidance for new initiatives within our organizations. Additionally, the risk assessment and mitigation strategy presented in this HMP will serve as the baseline for development of an updated, countywide CWPP.
Pueblo West Metro District	We hope to use this plan as a guide for future funding possibilities to increase whole community planning efforts and to decrease all-hazards impacts around the Pueblo West area. The information from the HMP will be utilized to help to further enhance policies / procedures and guidelines and to develop programmatic guidance for new initiatives within our organizations. Additionally, the risk assessment and mitigation strategy presented in this HMP will serve as the baseline for development of an updated, countywide CWPP.
Colorado City Metro District	Colorado City Metro District will implement the HMP into the comprehensive plan. The information from the HMP will be utilized to assist in future grants to help develop the needs of the community water, sewer, and public safety. Additionally, the risk assessment and mitigation strategy presented in this HMP will serve as the baseline for development of an updated, countywide CWPP.

Local Government	Plan Integration
St. Charles Mesa Water District	The information from the HMP will be utilized to help to further enhance policies / procedures and guidelines and to develop programmatic guidance for new initiatives within our organizations. Additionally, the risk assessment and mitigation strategy presented in this HMP will serve as the baseline for development of an updated, countywide CWPP.
Beulah Fire Protection District	Beulah Fire Protection District will implement the HMP through annual budget projects to meet program needs along with assessment from HMP for grant applications. Additionally, the risk assessment and mitigation strategy presented in this HMP will serve as the baseline for development of an updated, countywide CWPP.

3.8 Continued Public Engagement

Continuing public engagement over the HMP's next five-year lifespan is paramount to retaining community momentum as it relates to implementing the mitigation strategy. It is also important to use this opportunity to identify additional ways that the county's underserved communities and populations can be best represented by the HMP (detailed in the **Underserved Communities** section later in this plan). **Table 12** identifies these planned public engagement efforts for each local government.

Table 12 Planned Continued Public Engagement Efforts

Local Government	Engagement Effort(s)
Pueblo County	Pueblo County Emergency Management personnel will disseminate information relating to hazards and hazard mitigation-related information through meeting attendance, holding town hall-style meetings, utilizing social media outreach / education programs, and posting on the website.
City of Pueblo	City personnel will disseminate information relating to hazards and hazard mitigation-related information through meeting attendance, holding town hall-style meetings, utilizing social media outreach / education programs, and posting on the website.
Pueblo West Metro District	Pueblo West will disseminate information relating to hazards and hazard mitigation-related information through

Local Government	Engagement Effort(s)
	meeting attendance, holding town hall-style meetings, utilizing social media outreach / education programs, and posting on the website.
Colorado City Metro District	Colorado City Metro District will continue public engagement relating to hazard mitigation through participation in planning meetings, public involvement, monthly newsletters, board meetings, surveys, and workshops meetings to meet the needs of the public.
St. Charles Mesa Water District	District personnel will disseminate information relating to hazards and hazard mitigation-related information through meeting attendance, holding town hall-style meetings, utilizing social media outreach / education programs, and posting on the website.
Beulah Fire Protection District	District personnel will disseminate information relating to hazards and hazard mitigation-related information through meeting attendance, holding town hall-style meetings, utilizing social media outreach / education programs, and posting on the website.

3.9 Changes in Community Priorities

Communities are continually evolving over the HMP's five-year lifespan. For some, this can lead to changes in local government priorities, as it relates to hazard mitigation. Factors potentially influencing these priorities can include but are not limited to: recent disaster events; changing local resources, needs, or capabilities; new state or federal policies and funding resources; new hazard impacts identified by the updated risk assessment; or changes in growth and development. At the same time, other communities may have experienced no major changes that would influence the updated HMP. **Table 13** presents how this HMP was revised due to these potential changes in each local government.

Table 13 Changes in Community Priorities

Local Government	Changes Since Last HMP
Pueblo County	There have been no major changes to community priorities relating to hazards and related mitigation since the previous plan.

Local Government	Changes Since Last HMP
City of Pueblo	There have been no major changes to community priorities relating to hazards and related mitigation since the previous plan.
Pueblo West Metro District	There have been no major changes to community priorities relating to hazards and related mitigation since the previous plan.
Colorado City Metro District	Dam inspections at the dam changed due to updated state and federal regulations. The importance of mitigation was proven by recent thunderstorm events that knocked out communications for SCADA and the internet. This impacted plants in communicating with each other and shutting them down. Increase of population over the last 5 years growth of 75 - 100 people a year stressing the infrastructure currently in place.
St. Charles Mesa Water District	There have been no major changes to community priorities relating to hazards and related mitigation since the previous plan.
Beulah Fire Protection District	There have been no major changes to community priorities relating to hazards and related mitigation since the previous plan.

4 Planning Process

4.1 Background

The 2024 Pueblo County HMP is an update to the 2017 Plan. HMPs are community-led efforts designed to identify, manage, and avoid risks through pre-disaster event planning. This plan is designed to reduce the risks posed by hazards that affect Pueblo County communities and must be updated and approved by FEMA every five years to keep it current and to maintain eligibility for FEMA Hazard Mitigation Assistance (HMA) Program Grants.

What is Hazard Mitigation?

The term "hazard mitigation" describes actions that can help reduce or eliminate long-term risks caused by hazards such as floods, wildfires, and severe weather. These actions include measures, projects, plans, or activities proposed to reduce current and future vulnerabilities. Hazard mitigation is best accomplished when based on a comprehensive, long-term plan developed before a disaster strikes. As the costs of disaster recovery continue to rise, local governments and citizens must find ways to reduce community hazard risks. Oftentimes after disasters, repairs and reconstruction are completed in such a way as to simply restore damaged property to pre-disaster conditions. These efforts may "get things back to normal," but the replication of pre-disaster conditions often results in a repetitive cycle of damage, reconstruction, and repeated damage. Hazard mitigation breaks this repetitive cycle by producing less vulnerable conditions through pre- and post-disaster repairs and reconstruction. The implementation of hazard mitigation actions by state and local governments helps to ensure that communities increase their collective resiliency to future disaster events and associated losses.

Purpose

Mitigation is an investment in a community's future safety and resiliency. Recent cost-benefit studies have proven mitigation to be cost effective for communities, with mitigation projects overall returning six dollars for every one dollar spent. Hazard mitigation planning helps residents, business owners, elected officials, and municipal departments think through how to plan, design, build, and establish partnerships for risk reduction. Consider the critical importance of mitigation to:

- Protect public safety and prevent loss of life and injury.
- Reduce property damage to existing and future development.
- Maintain community continuity and strengthen the social connections that are essential for recovery.
- Prevent harm to a community's unique economic, cultural, and environmental assets.
- Minimize operational downtime and accelerate recovery of government and business after disasters.
- Reduce the costs of disaster response and recovery and the exposure to risk for first responders.

- Help accomplish other community objectives such as capital improvements, infrastructure protection, open space preservation, and economic resiliency.

Additionally, Pueblo County and its local governments will benefit from this HMP by:

- Ensuring eligibility for all sources of hazard mitigation funds made available through FEMA.
- Increasing public awareness and understanding of vulnerabilities, as well as support for specific actions to reduce losses from future disasters.
- Ensuring community policies, programs, and goals are compatible with reducing vulnerability to all hazards and identifying those that are incompatible.
- Building partnerships with diverse stakeholders, increasing opportunities to leverage data and resources in reducing workloads, as well as achieving shared community objectives.
- Expanding the understanding of potential risk reduction measures to include: local plans and regulations; structure and infrastructure projects; natural systems protection; education and awareness programs; and other tools.
- Informing the development, prioritization, and implementation of mitigation projects. Benefits accrue over the life of these projects as losses are avoided from each subsequent hazard event.

Scope

This 2024 HMP has been prepared to meet requirements set forth by FEMA and the Colorado Division of Homeland Security and Emergency Management (DHSEM) in order for Pueblo County and its local governments to be eligible for funding and technical assistance from state and federal hazard mitigation programs. This HMP will be updated and FEMA-approved within its five-year expiration date.

Authority

This HMP has been adopted by Pueblo County and its participating local governments in accordance with the authority granted to counties and municipalities by the State of Colorado. This HMP was developed in accordance with current state and federal rules and regulations governing local HMPs and shall be monitored and updated on a routine basis to maintain compliance with the following legislation and guidance:

- Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C., Section 322, Mitigation Planning, as enacted by Section 104 of the Disaster Mitigation Act of 2000 (P.L. 106-390) and by FEMA's Interim Final Rule published in the Federal Register on February 26, 2002, at 44 CFR Part 201

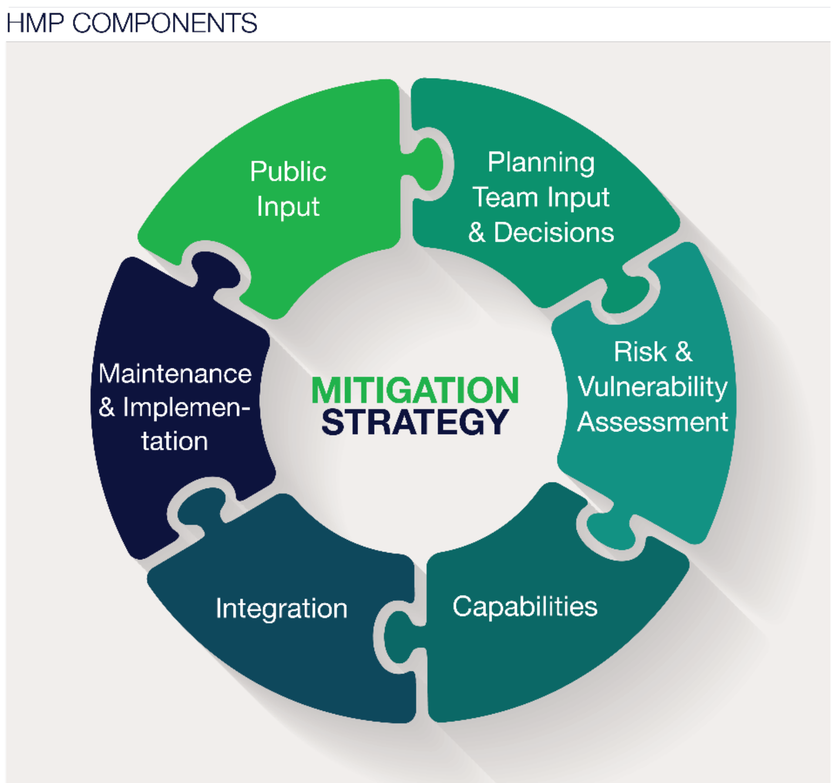
The following FEMA guides and reference documents were used to prepare this document:

- FEMA. Local Mitigation Planning Policy Guide. April 19, 2022.
- FEMA. Local Mitigation Planning Handbook. May 2023.

4.2 Update Process and Methodology

The planning process involved a series of meetings and workshops with the hazard mitigation planning committee (HMPC), coupled with public engagement efforts and development of an updated risk assessment. The culmination of this process was an updated mitigation strategy for Pueblo County and its local governments to work towards implementing over the next five years. A high-level summary of the components that contributed to the updated HMP is presented in **Figure 1**.

Figure 1 HMP Components

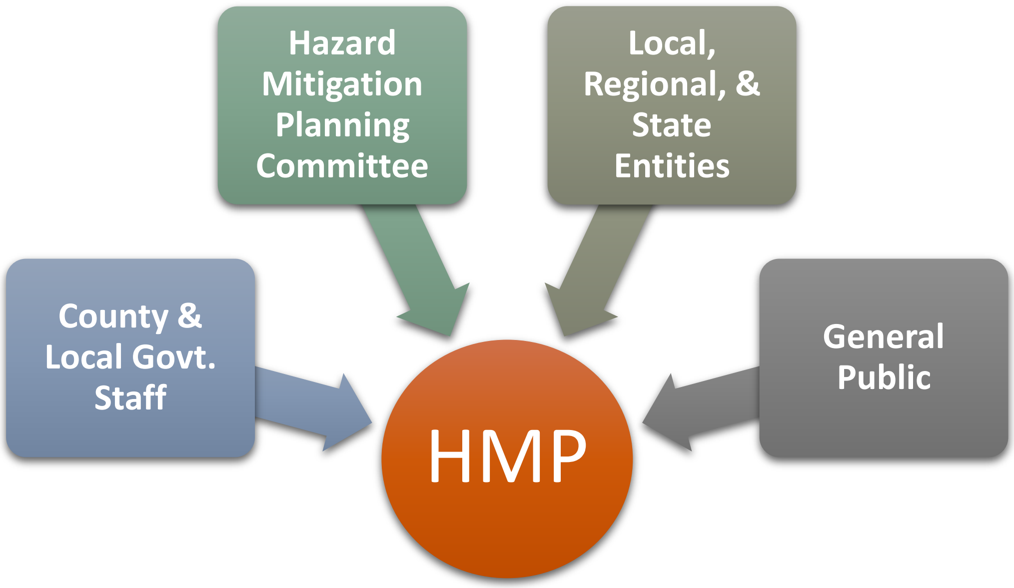


From a 'big picture' standpoint, the HMPC identified the following overarching project goals:

- Obtaining FEMA Approval
- Broadening jurisdictional collaboration and participation
- Improving public engagement
- Increasing mitigation grant funding pursuits

Input into the planning process came from a number of entities, shown in **Figure 2**.

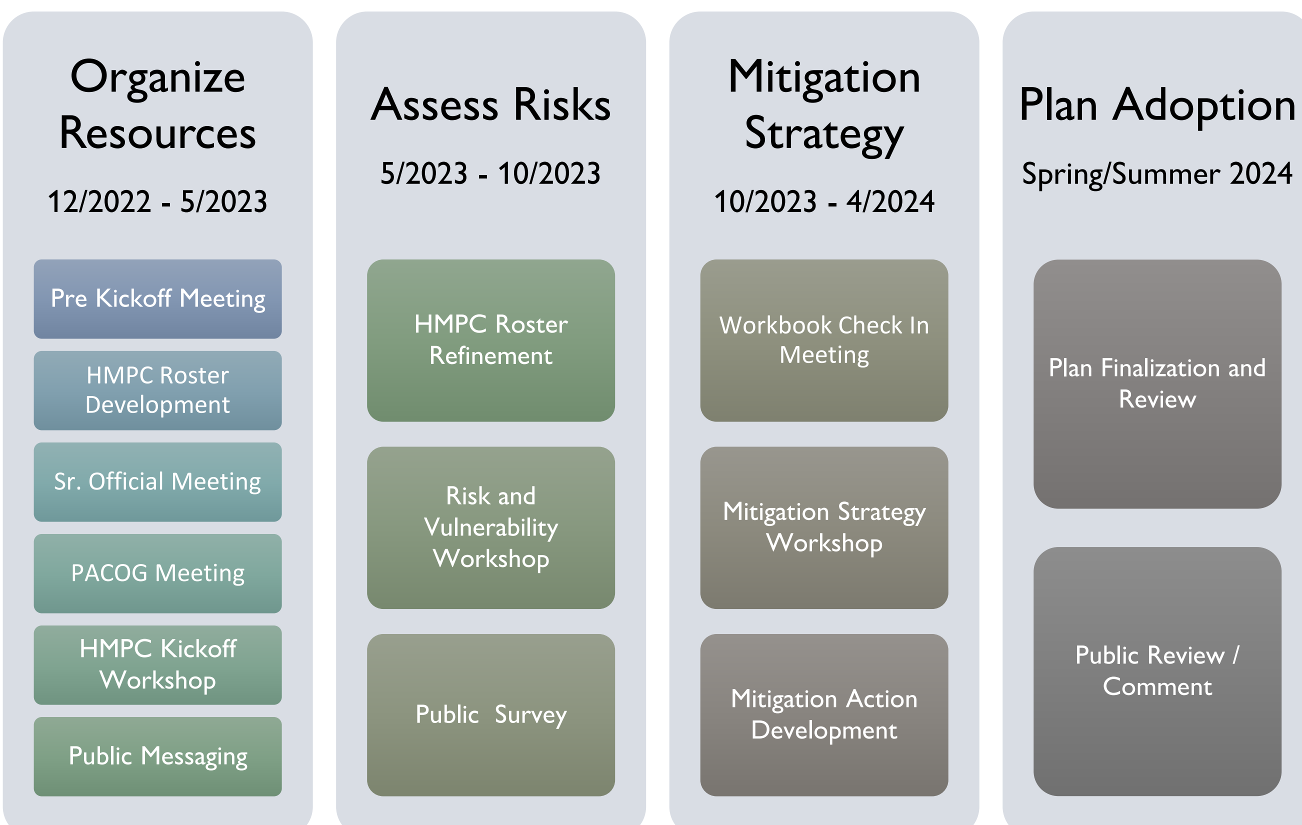
Figure 2 Planning Process Inputs



Timeline of Activities

Figure 3 summarizes the HMP's planning process schedule, including all HMPC and public touchpoints.

Figure 3 Project Milestones



Participating Local Governments

All local governments in Pueblo County were invited, via email, one-on-one conversations, and during other community meetings, by the Pueblo County Emergency Management Coordinator to participate in the planning process. They were informed of the participation requirements and the formation of the HMPC. The following organizations were formal participants in the planning process and have formally adopted this Plan:

- Pueblo County
- City of Pueblo
- Pueblo West Metro District
- Colorado City Metro District
- St. Charles Mesa Water District
- Beulah Fire Protection District

Local governments that decided to not be formal participants include:

- Town of Boone
- Town of Rye
- Board of Public Water Works
- Rye Fire Protection District

Participation in the planning process was closely tracked to ensure all entities remained engaged across the planning process. **Table 14** shows organizational participation at HMPC meetings, workshops, and webinars, in addition to non-HMP meetings where the HMP was discussed. Additional individual one-on-one discussions, emails, and meetings were also utilized as needed throughout the process. Event agendas can be found in **Annex F - Meeting Agendas and Participants**.

Table 14 Local Government Participation

Local Government	Pre Kickoff	Senior Officials	PACOG	Kickoff Workshop	Risk Assessment Workshop	Workbook Check In	Mitigation Strategy Workshop
Pueblo County	●	●	●	●	●	●	●
City of Pueblo		●	●	●		●	●
Pueblo West Metro District		●		●	●	●	

Local Government	Pre Kickoff	Senior Officials	PACOG	Kickoff Workshop	Risk Assessment Workshop	Workbook Check In	Mitigation Strategy Workshop
Colorado City Metro District		●	●	●	●	●	●
St. Charles Mesa Water District				●	●		
Buelah Fire Protection District				●	●		●

In addition to participating in planning events, formal participants were also required to complete a "Local Government HMP Workbook". This document, referenced at all planning events, requested those local inputs that are vital for a successful and ultimately, FEMA-Approvable HMP. Workbook responses were solicited over the course of the planning process.

Within three months of receiving FEMA-Approval, Pueblo County shall post the approved HMP, with all adoption resolutions and FEMA approval packet, to its website.

Hazard Mitigation Planning Committee

The full HMPC roster is included in **Annex B - Hazard Mitigation Planning Committee**. This list shows all of the invitees who were contacted via email to participate in, and contribute to, the planning process. The roster also highlights those who attended HMPC events and those community sectors that each individual represents. A summary of those sectors invited to the planning process includes:

- Emergency Management
- Economic Development
- Land Use & Development
- Housing
- Health & Social Services
- Infrastructure (Lifelines)
- Natural & Cultural Resources
- Underserved Communities & Socially Vulnerable Populations
- Management

- Elected Leadership
- Education
- Large Employers
- Neighboring Counties
- State Agencies
- Federal Agencies

Throughout the planning process, members of the HMPC representing the county's underserved and socially vulnerable communities were encouraged to participate in and contribute to the project. Unfortunately, many of these representatives were unable or chose not to participate, thus limiting the county's ability to engage many of these communities. Continued coordination with these organizations will continue beyond the HMP planning process through other ongoing efforts and working groups. The hope is that by continuing to try and foster these relationships, improved engagement will occur during future HMP updates. This effort is further reflected in a newly identified mitigation action for the county to work towards over the next five years.

STAKEHOLDERS

In addition to the HMPC, which included representatives from all local governments across the county, a number of other stakeholders were involved in the HMP update. Table 15 highlights these stakeholder's contributions to the HMP.

Table 15 Stakeholder Involvement

Organization	Involvement
Colorado Division of Homeland Security and Emergency Management (DHSEM)	Participated in HMPC workshops / Provided data utilized in the risk assessment / Provided guidance relating to the new FEMA planning policy / Reviewed the updated draft HMP
Colorado Geological Survey (CGS)	Provided data utilized in the risk assessment
Colorado Water Conservation Board (CWCB)	Provided data utilized in the risk assessment / Coordinated updates on the ongoing Risk MAP project
Colorado Department of Transportation (CDOT)	Invited to participate in HMPC workshops / Provided data utilized in the risk assessment / Provided opportunity to review the updated draft HMP
Colorado State Forest Service (CSFS)	Participated in HMPC workshops / Provided data utilized in the risk assessment / Provided opportunity to review the updated draft HMP

Organization	Involvement
Colorado Office of Dam Safety	Invited to participate in HMPC workshops / Provided data utilized in the risk assessment / Provided opportunity to review the updated draft HMP
Colorado Climate Center (CCC)	Provided data utilized in the risk assessment
Colorado Resiliency Office (CRO)	Provided grant-related resources utilized during the planning process
High & Significant Hazard Potential Dam Owners	Invited to participate in HMPC workshops / Provided opportunity to review the updated draft HMP
Federal Landowners	The US Bureau of Reclamation was invited to participate in HMPC workshops / Provided opportunity to review the updated draft HMP

Incorporation of Existing Plans & Information

In addition to the data provided by stakeholders mentioned previously, all HMP-relevant existing plans, studies, reports, and technical information were reviewed during the update process. Table 16 provides an overview of how each of these resources were incorporated into the HMP.

Table 16 Existing Resource Incorporation

Resource	How Incorporated
Colorado Enhanced State HMP (2023)	Informed the mitigation strategy and risk assessment
Colorado Emergency Preparedness Assessment (2023)	Integrated hazard risk rankings and vulnerability into the risk assessment
National Oceanic and Atmospheric Administration (NOAA) National Centers for Environmental Information (2023)	Informed the risk assessment
NOAA National Weather Service (NWS) Storm Prediction Center	Informed the risk assessment
Colorado Department of Public Health and Environment Reported Diseases (CDPHE) (2023)	Informed the risk assessment

Pueblo Regional Comprehensive Plan (2022)	Integrated community priorities, goals, and actions into the mitigation strategy
2045 Long Range Transportation Plan (2021)	Informed the mitigation strategy
Beckwith Dam – State Dam Safety Compliance Plan (2021)	Informed the risk assessment and mitigation strategy
St. Charles Mesa Risk and Resilience Assessment (2021)	Informed the risk assessment and mitigation strategy
Pueblo Mountain Park Prescribed Fire Plan (2020)	Informed the mitigation strategy
FEMA Flood Insurance Study (2019)	Utilized floodplains during the risk assessment
Pueblo County Community Wildfire Protection Plan (2016)	Integrated the community's understanding of their wildfire risk into the risk assessment
Blueprint for Mitigation (2016)	Informed the mitigation strategy

4.3 Planning Activities

The following section details activities, including meetings and workshops, that were utilized as part of the HMP update. Major points of discussion and decisions made are provided. Detailed agendas and participation tracking documentation is included in **Annex F - Meeting Agendas and Participants**.

Pre Kickoff Meeting

A pre kickoff meeting was held between the county's designated project managers and the planning consultant in October 2022. Important discussions are summarized in the following list:

- Schedule – A detailed schedule was coordinated, including regular monthly meetings between the county and consultant.
- Participating Local Governments – It was determined that all local governments within the county's boundary would be invited to participate in the HMP update
- HMPC Roster – The new FEMA planning policy was reviewed, specifically as it related to the roster. A detailed roster would be drafted following the meeting.
- In-Kind Tracking – The county confirmed their intent to submit in-kind donations as part of the local grant match. A tracking process and tool would be drafted following the meeting.
- Project Communication – It was determined that all project-related communications would come directly from the county.

- Hazards to Profile – An initial conversation about hazards to include or remove was had. This topic would be further discussed at the HMPC Kickoff Workshop.
- Past Events – Hazard events occurring since the last HMP was developed were reviewed.
- Public Engagement – An initial conversation about the project's public engagement plan was had. This topic would be further discussed at the HMPC Kickoff Workshop.
- High Hazard Potential Dams – It was determined that the updated HMP would aim to meet FEMA's HHPD planning policy requirements.
- An online instant poll was also made available for those attending virtually. Responses helped to guide future HMPC workshop discussions and updates to the HMP.
- Next Steps – It was agreed that the next steps in the planning process would involve meeting with senior leadership from all local governments.

Senior Officials Meeting

The HMP project was discussed at a regular senior official's meeting held in November of 2022. This agenda item was added by the county to ensure leadership were aware of the planning process and how their local governments could participate.

Pueblo Area Council of Governments (PACOG) Meeting

The HMP project was further discussed at a regular PACOG meeting held in December of 2022. This agenda item was added by the county to ensure all local governments were aware of the planning process, the benefits of participating, and participation requirements.

HMPC Kickoff Workshop

The HMPC kickoff workshop was held in May of 2023. The entire HMPC roster was invited to attend this hybrid-style workshop. Important discussions included:

- Participating Local Governments – All participants were informed of participation requirements necessary to receive FEMA-Approval of the updated HMP. At this point in time, all local governments were planning to fully participate in the process.
- HMPC Roster – The new FEMA planning policy was reviewed, specifically as it related to the roster. HMPC members were encouraged to help to further build out the roster, to ensure all community sectors were invited to the planning process.
- In-Kind Tracking – The county confirmed their intent to submit in-kind donations as part of the local grant match. A tracking process and tool would be drafted following the meeting.
- Hazards to Profile – Hazards from the previous HMP and the 2023 Colorado Enhanced State Hazard Mitigation Plan were reviewed for inclusion in the updated HMP. The final list is documented in the **Identified Hazards of Concern** section.

- Past Events – Hazard events occurring since the last HMP was developed were reviewed.
- Public Engagement – A conversation about the project's public engagement plan was had and the HMPC concurred with the county's proposed public engagement plan.
- Local Government HMP Workbook – This tool was presented to the HMPC, explaining how this would help to guide and capture those local inputs that are vital for a successful and ultimately, FEMA-Approvable, HMP.

HMPC Risk Assessment Workshop

The HMPC risk assessment workshop was held in October of 2023. The entire HMPC roster was invited to attend this in-person workshop. Important discussions included:

- Participating Local Governments – All participants were again informed of participation requirements necessary to receive FEMA-Approval of the updated HMP.
- Draft Risk Assessment Chapter – Comments were solicited on the draft plan chapter that was previously shared with the HMPC. Additional past hazard events were discussed to be added to the HMP.
- Public Engagement – A conversation about the project's public engagement plan was had and the HMPC concurred with the county's proposed public engagement plan.
- Local Government HMP Workbook – This tool and the next round of local government input requests was reviewed with the HMPC.
- Mitigation Strategy – Initial conversations relating to the updated mitigation strategy were had.

HMPC Workbook Check In Meeting

The HMPC workbook check in meeting was held in January of 2024. The entire HMPC roster was invited to attend this online meeting. This provided participating local governments with a chance to ask questions about and review the various inputs being requested.

HMPC Mitigation Strategy Workshop

The HMPC mitigation strategy workshop was held in March of 2024. The entire HMPC roster was invited to attend this in-person workshop. Important discussions included:

- Participating Local Governments – All participants were again informed of participation requirements necessary to receive FEMA-Approval of the updated HMP. At this point in time, six local governments were planning to fully participate in the process.
- Underserved Communities and Socially Vulnerable Populations – The HMPC discussed previous and potential future HMP outreach directed specifically towards these groups. Specific populations that the HMPC determined would be targeted for engagement include: those experiencing poverty, the elderly, those with disabilities, and the county's Hispanic community.

Planning Committee Draft Plan Review

Upon completion of the final draft plan, the HMPC was provided an opportunity to review and comment on the document in May of 2024. All comments received from the HMPC were incorporated.

4.4 Public and Stakeholder Participation

Public involvement is crucial to a representative hazard mitigation plan update. Pueblo County's Public Information Officer assisted in community messaging via social media and provided residents and businesses with multiple opportunities to contribute to informing the HMP update. Following are some examples of postings.

Underserved Communities

During the HMP update, the HMPC roster was carefully crafted to ensure extensive representation from organizations supporting underserved and vulnerable populations in the county. This roster includes the Pueblo County Sheriff's Office, the City of Pueblo Fire & Police Departments, the Mayor's Office, the Beulah Fire

Department, Health Solutions, CommonSpirit Health, the American Red Cross, and the Pueblo County Department of Public Health & Environment.

Those priority vulnerable populations that were identified to be specifically engaged during the planning process and through on-going public engagement include:

- Those experiencing poverty
    - Throughout the year, the City Police Department, City Fire Department, Health Department, and other partners proactively engage with communities experiencing homelessness to provide essential services. These include mental health support, hazardous waste removal during needle & campsite clean-ups, and preventive health screenings.
    - A variety of governmental, non-governmental organizations (NGO), and volunteer organizations active in disaster (VOAD) organizations collaborate with low-income groups regarding personal mitigation in areas susceptible to fires, diseases, and crimes, aiming to address problems before they escalate. This targeted messaging and area identification are executed pre-disaster to lessen the impact of hazards or disasters in flood-prone regions.
    - Community partners like the Beulah and Rye Fire Departments, along with the Pueblo County Sheriff's Office, provide free mitigation services in Zone 1 areas around structures to the elderly, disabled, or low-income families within identified Wildland/Urban Interface (WUI) areas.
- Elderly
    - The Pueblo County Senior Resource Development Agency (SRDA) and Americans with Disabilities Act (ADA) committee focus on spreading hazard-related information to organizations serving the elderly community.
    - Resources like the SRDA Senior Resource Center and ADA handicap transport vans are integral to pre-disaster mitigation planning, aiding evacuations for those with mobility challenges.
    - Like poverty initiatives, community partners offer no-charge mitigation in Zone 1 for elderly groups in designated WUI areas.
- Disabled populations
    - Various HMPC members are active with organizations advocating for the disabled or differently abled, ensuring their voices are heard in emergency management phases: mitigation, preparedness, response, and recovery.
    - Like poverty initiatives, community partners offer no-charge mitigation in Zone 1 for disabled groups in designated WUI areas.
- Hispanic
    - Given the substantial Hispanic and Spanish-speaking demographic in Pueblo County, public messages, including updates pertaining to the HMP planning process and emergency alerts, are translated into Spanish. This ensures broad reach and timely communication during emergencies.

Community Survey

The community survey was open to the public from June through July 2023 and received 120 responses. Responses from the public were reviewed during HMPC workshops and helped to inform the mitigation strategy, planning process, and risk assessment chapters of this HMP. A summary of the results can be found in **Annex C - Mitigation Strategy Action Ideas** and **Annex G - Public Survey Responses**.

Public Plan Review and Comment

Following development of the updated HMP a two-week public review and comment period was held. Announcements of the public review were posted widely to the county website and social media, through the county's Facebook, Nextdoor, and Twitter accounts. There were no public comments received through the online survey that was advertised along with a link to the updated document.

5 County Overview

The 2022 Pueblo Regional Comprehensive Plan provides a detailed overview of Pueblo County. Readers are encouraged to reference this document. The following section provides some additional overview information relating to Pueblo County and its communities. **Figure 4** presents those local participating governments and **Figure 5** provides an overview of the planning area.

Figure 4 Local Participating Governments

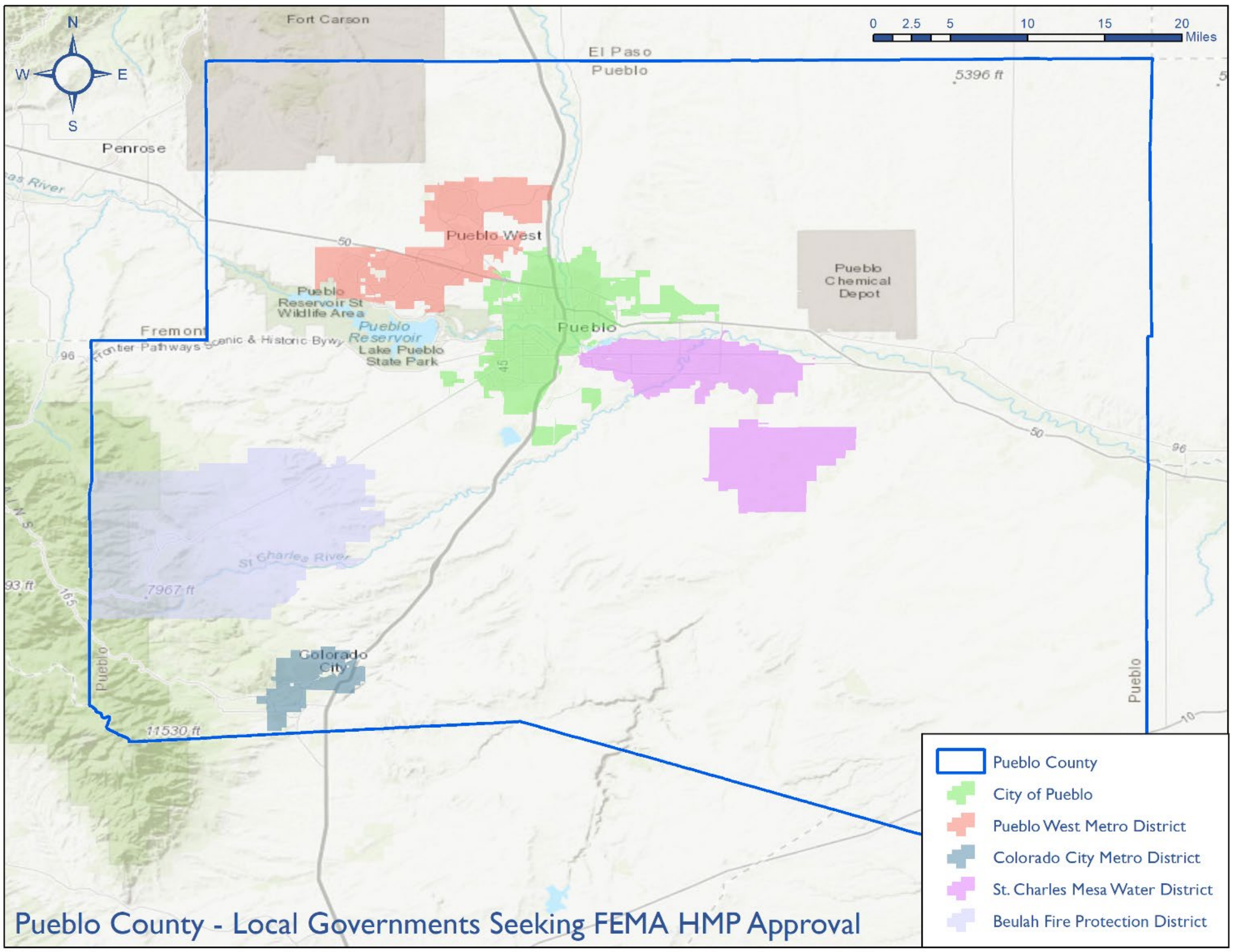
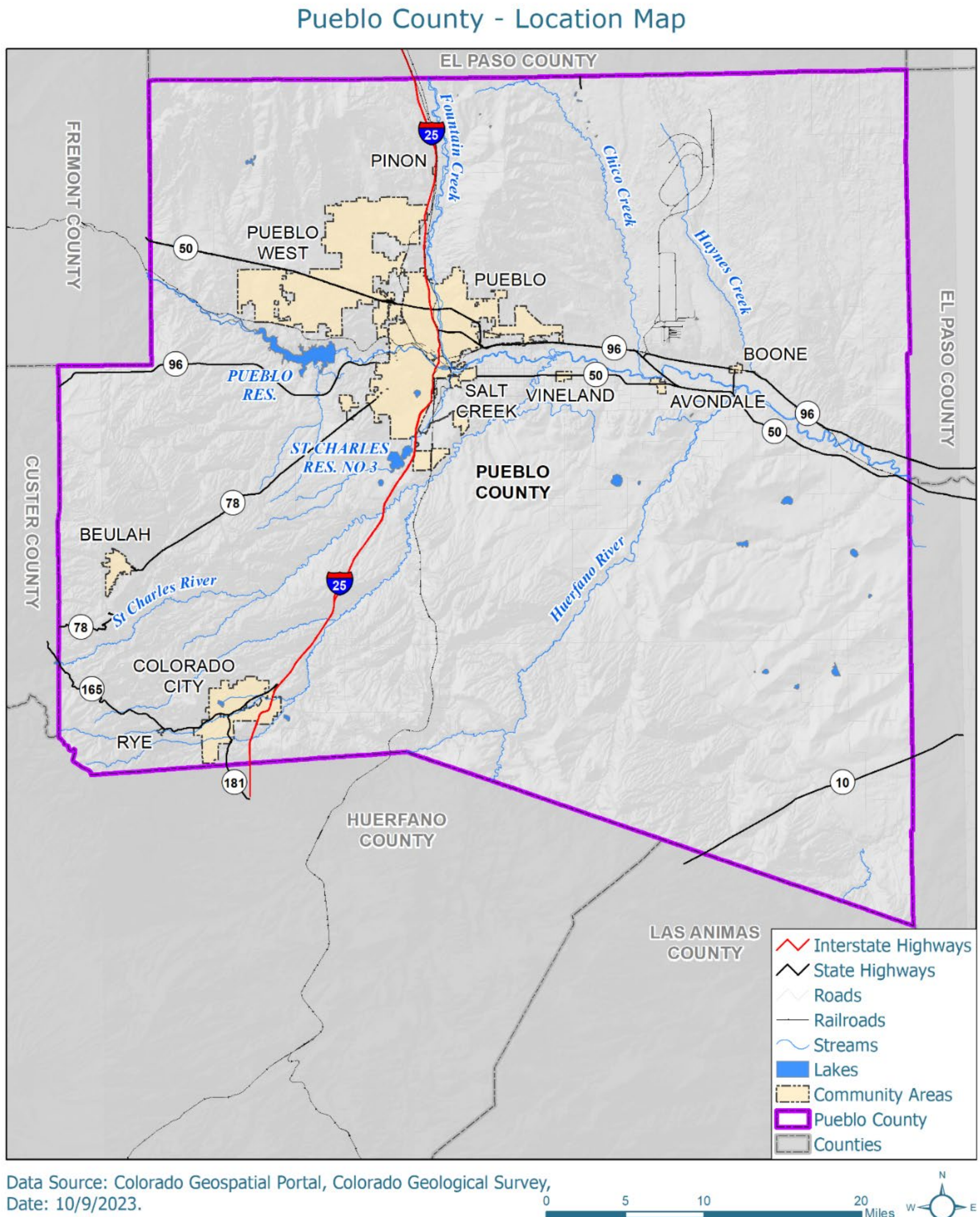


Figure 5 Location Map



5.1 Climate

Pueblo County is generally characterized by a continental, semi-arid climate, featuring hot, fairly moist summers and mild, fairly dry winters. Precipitation and temperatures vary across Pueblo County, with changing topography. Precipitation rates in the plains portion of the county are approximately half of what is experienced in the mountainous portions of southwest Pueblo County.

This is partially due to a phenomenon referred to as the Pueblo Precipitation Doughnut Hole which creates a drier climate in Pueblo County than the surrounding areas. It was explained by an NWS staffer at the Pueblo weather station that this is based on the topography in Pueblo County. Easterly winds are the only ones that bring precipitation in the winter and carry it over the mountains to the west of Pueblo County. As these winds meet the downslope terrain in the county they dry out and leave Pueblo without precipitation.

5.2 Demographics

The county's population, by Census Tract, is presented in **Figure 6**. Similarly, the county's population density is show in **Figure 7**. Future population growth projections, provided by Colorado's Department of Local Affairs, are shown in **Table 17** and show that the county expects continued growth through 2050. Data from the 2021 Census 2021 also reports that 43.7% of individuals identify as Hispanic in Pueblo County, as compared to 22.3% across the state.

Table 17 Projected Population Growth

	2025	2030	2035	2040	2045	2050
Pueblo County	171,462	177,759	183,253	187,534	190,577	192,621
Colorado	6,034,548	6,416,217	6,769,873	7,073,418	7,308,311	7,486,286

Figure 6 Population Estimates

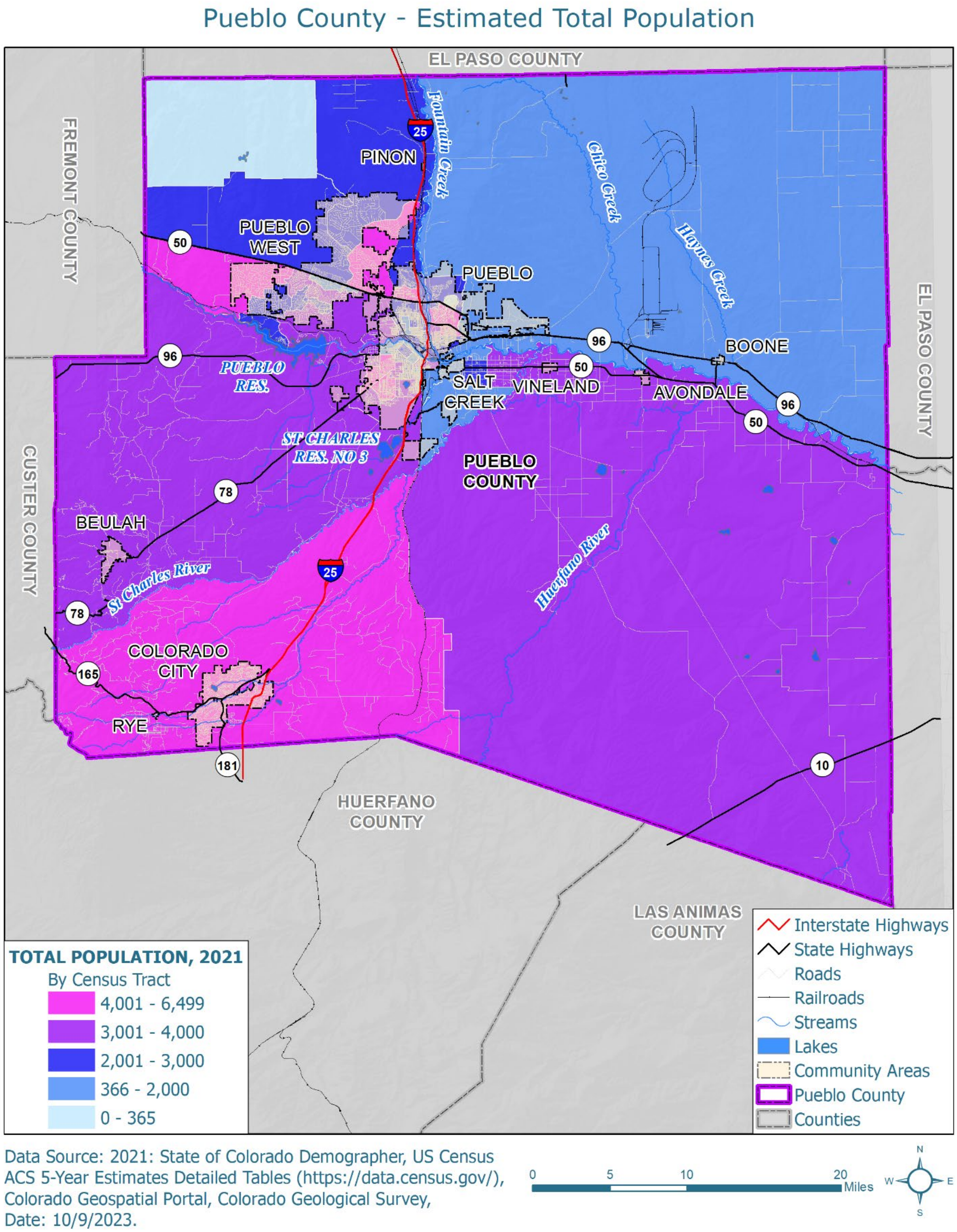
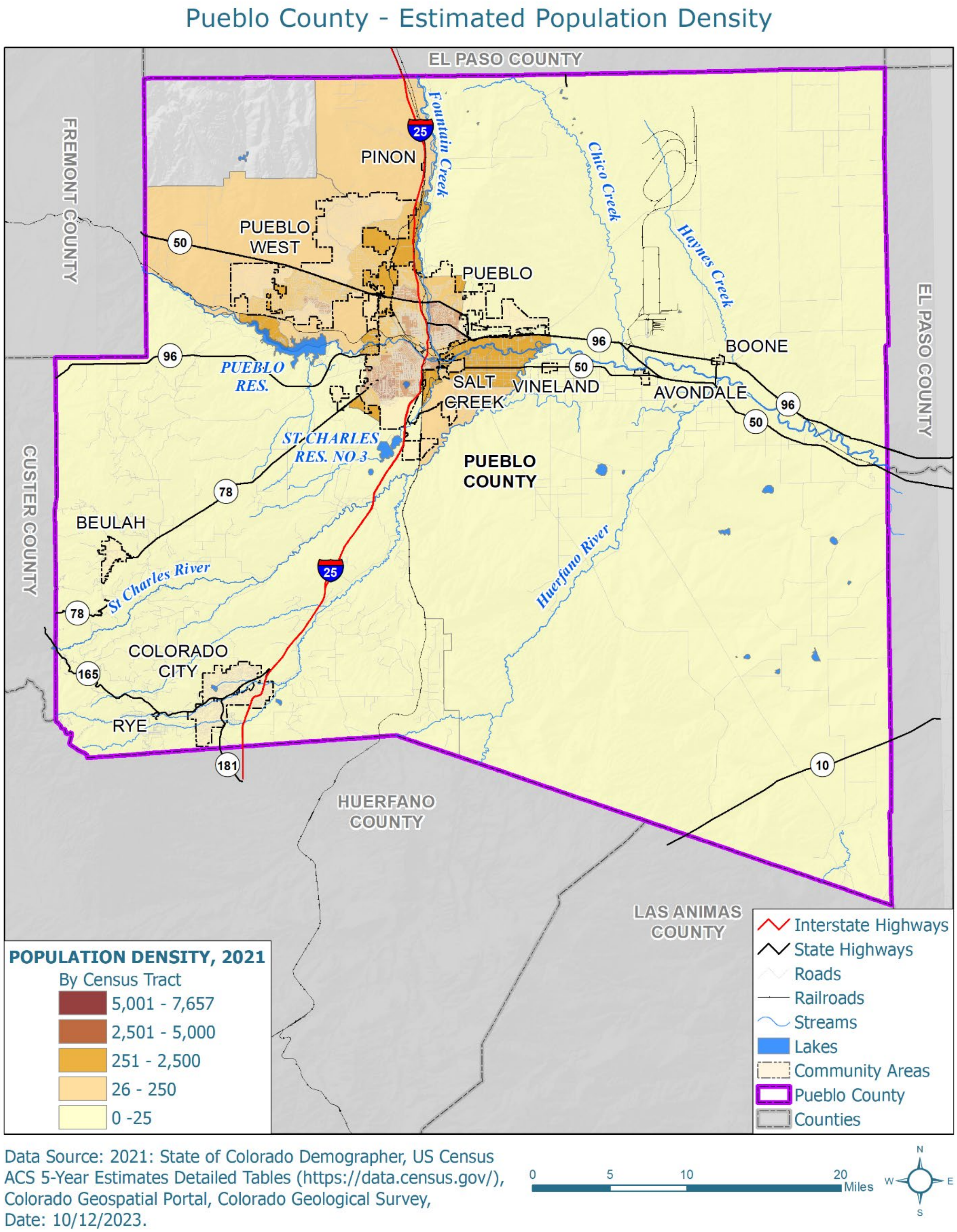


Figure 7 Population Density Estimates



5.3 Underserved Communities & Populations

Throughout the planning process, it was important for the county to be cognizant of those communities and populations who may have been historically underserved. Efforts were specifically focused on ensuring that these communities and populations were encouraged to be involved in the HMP planning process and to contribute their unique perspectives.

Table 18 provides a comparison of select community demographics as compared to the State of Colorado. Both from a hazard mitigation planning and emergency management perspective, it is important to note those populations that are potentially most vulnerable to, or disproportionally impacted by, the impacts of a disaster event. As compared to the state, Pueblo County has a larger percentage of individuals across all of these demographic groups.

Table 18 Community Demographics

Demographic	Pueblo County	Colorado
Population	169,622	5,811,297
Age: 4 and Under (%)	5.5	5.4
Age: Under 18 (%)	22.1	21.4
Age: 65 and Over (%)	19.1	15.1
Persons in Poverty (%)	16.2	9.7
Persons with a Disability (%)	18	11.2
Persons Age 65+ with a Disability (%)	37.4	29.7
Persons Under Age 65 with a Disability (%)	14.4	7.6
Adults who are Obese or Overweight (%)	69.1	60.6
Adults with Diabetes (%)	12.5	7
Adults with Asthma (%)	13.6	10.4
Adults with Coronary Heart Disease (%)	3.3	2.5

Additional data relating to the county's disabled populations is presented in **Table 19**. These populations are also some of those most vulnerable to, or disproportionally impacted by, the impacts of a disaster event. Similar to the selected demographic information previously presented, Pueblo County exceeds the state's average for each disability type. Following are definitions for these populations:

- Hearing difficulty: Deaf or having serious difficulty hearing (DEAR)
- Vision difficulty: Blind or having serious difficulty seeing, even when wearing glasses (DEYE)
- Cognitive difficulty: Because of a physical, mental, or emotional problem, having difficulty remembering, concentrating, or making decisions (DREM)
- Ambulatory difficulty: Having serious difficulty walking or climbing stairs (DPHY)
- Self-care difficulty: Having difficulty bathing or dressing (DDRS)
- Independent living difficulty: Because of a physical, mental, or emotional problem, having difficulty doing errands alone such as visiting a doctor's office or shopping (DOUT)

Table 19 Disabled Populations

Disability Type	Pueblo County	Colorado
Population with a Disability (%)	18	11.2
Hearing (%)	4.9	3.7
Vision (%)	3.2	2.1
Cognitive (%)	7.8	4.6
Ambulatory (%)	10	4.9
Self-care (%)	3.4	1.8
Independent Living Difficulty (%)	8.9	4.4

Throughout the HMP planning process, it was important for the HMPC to understand the locations of the county's socially vulnerable and underserved communities. There are a number of relevant data sets and indexes available as of this plan's writing. To ensure all communities were taken into account, the HMP references four separate indexes to present the broadest view of potential vulnerability across the county's population. **Figure 8** presents the national social vulnerability index (SVI) from the Center for Disease Control's (CDC) Agency for Toxic Substances and Disease Registry (ATSDR). **Figure 9** then displays the state's disproportionately impacted communities as presented in the Colorado EnviroScreen tool, developed by the State Department of Public Health and Environment. **Figure 10** maps disadvantaged communities, as defined by the United State Council on Environmental Quality's Climate and Economic Justice Screening Tool (CEJST). Lastly, **Figure 11** presents the results of Headwater Economics' analysis of rural capacity. Overall, areas of the county deemed most vulnerable tend to be in and around the City of Pueblo and the northeast portion of the unincorporated county.

Figure 8 Social Vulnerability Index

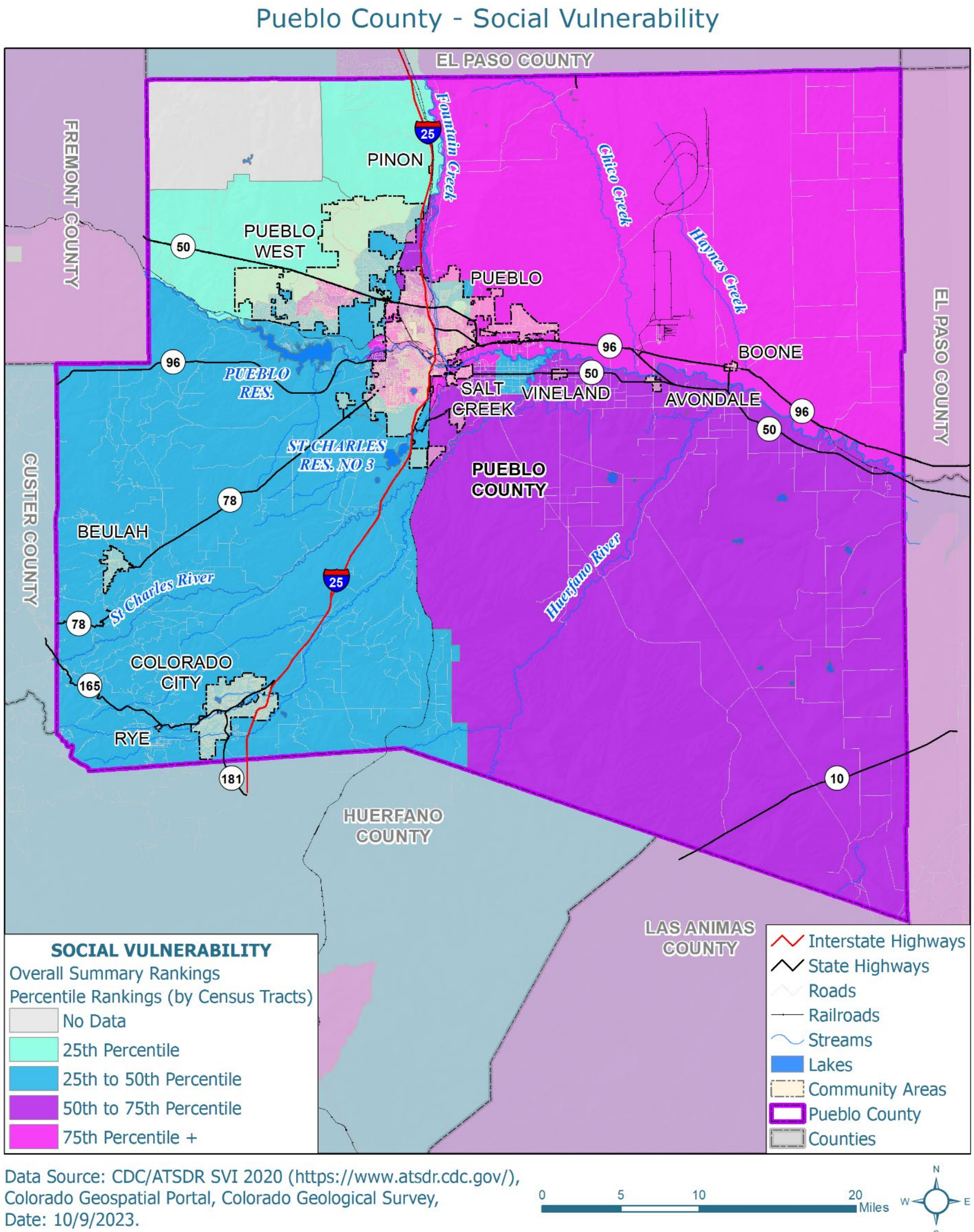


Figure 9 Disproportionately Impacted Communities

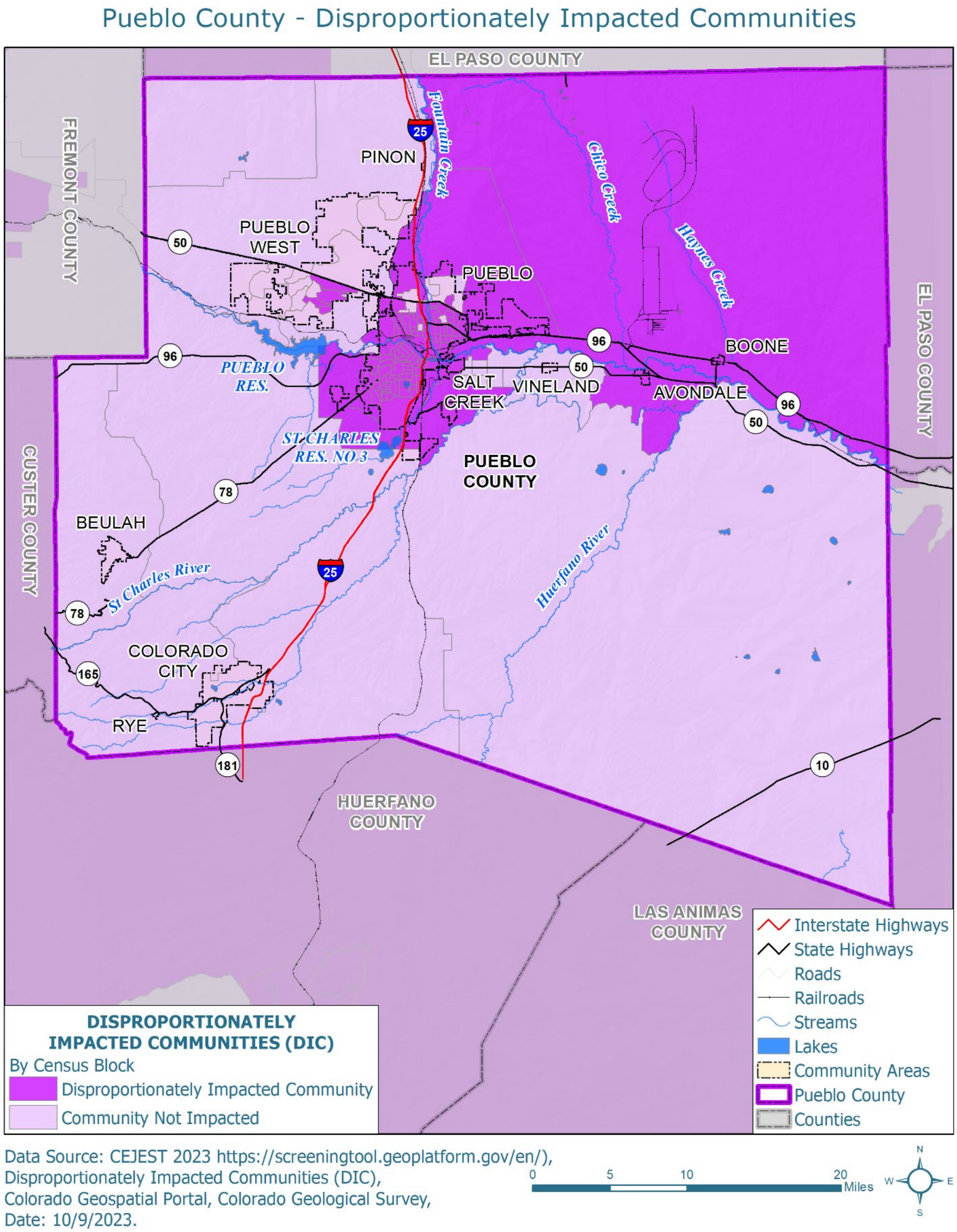


Figure 10 Disadvantaged Communities

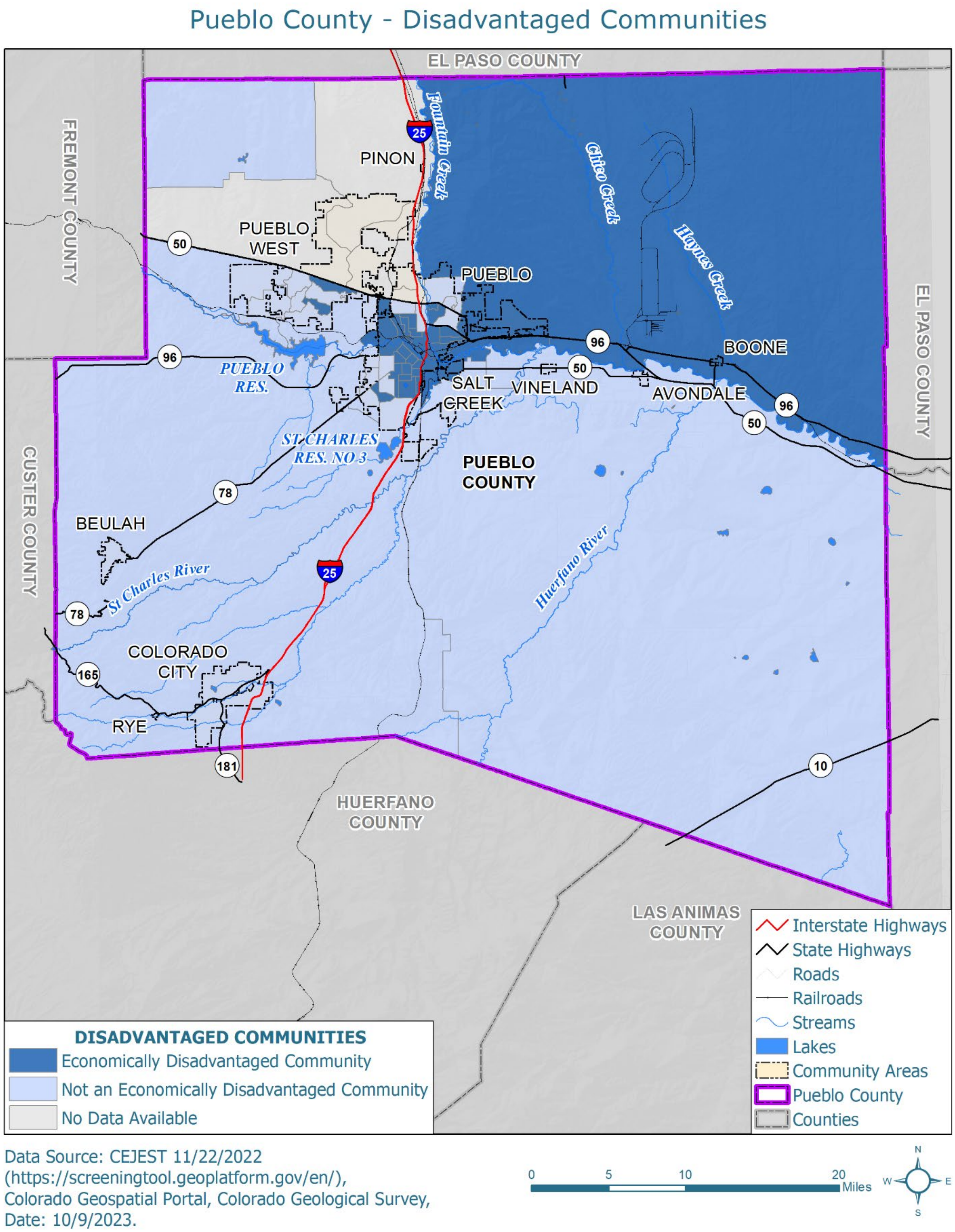
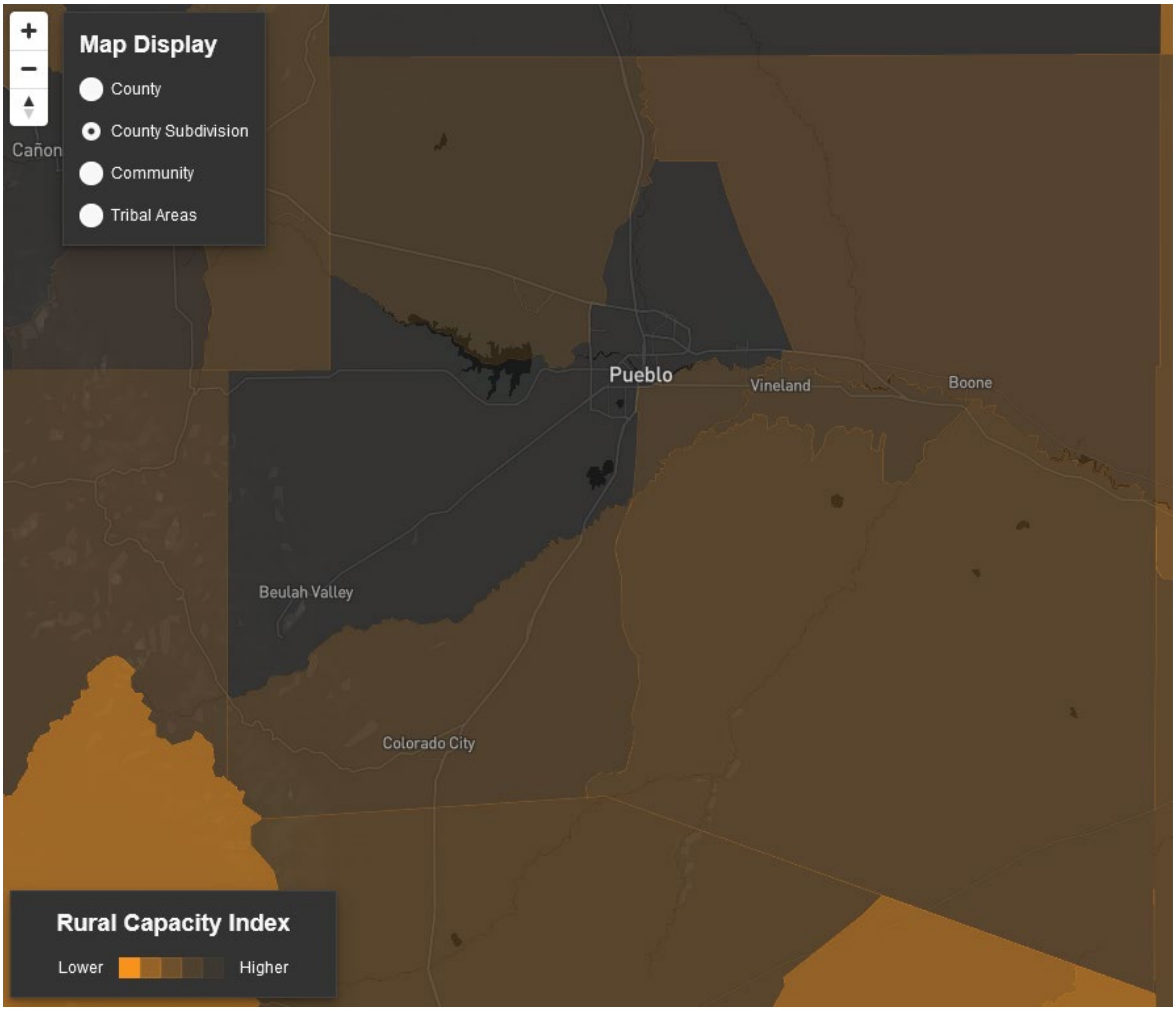
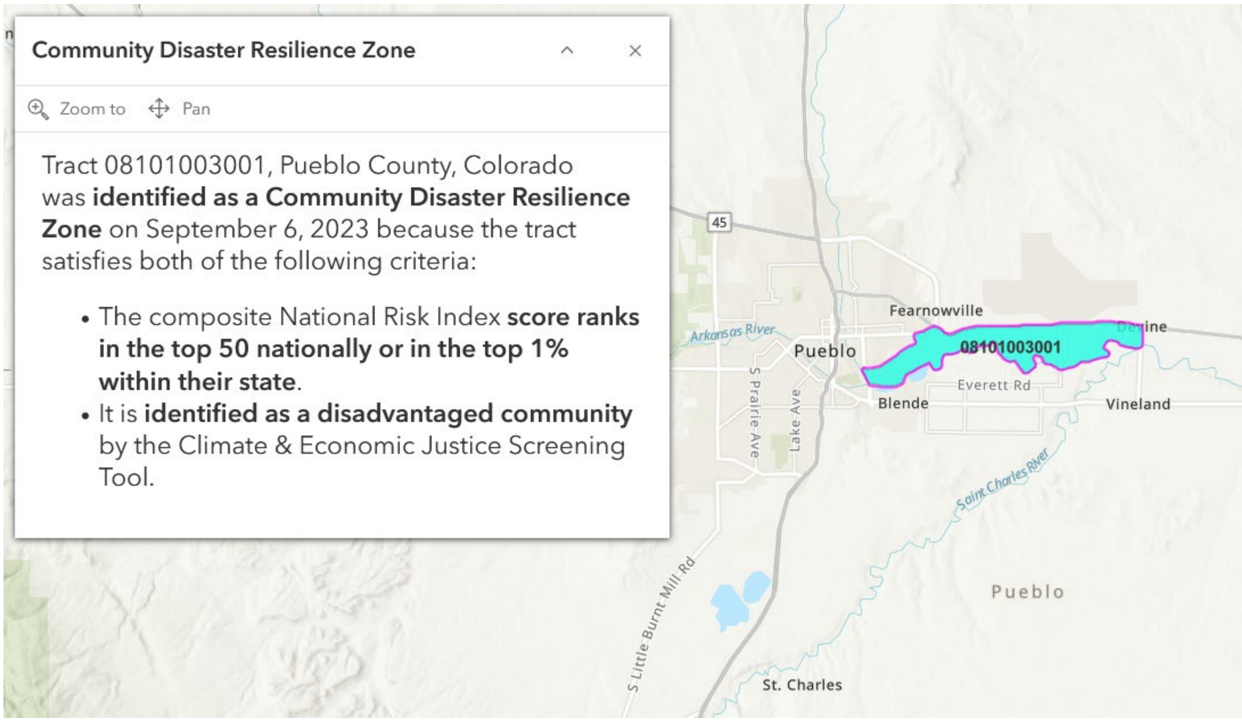


Figure 11 Rural Capacity Index



Additionally, FEMA recently identified what it terms Community Disaster Resilience Zones (CDRZ). These zones attempt to identify the most at-risk and in-need communities across the nation, which will be prioritized for targeted federal support. There is one CDRZ in Pueblo County as shown in **Figure 12**.

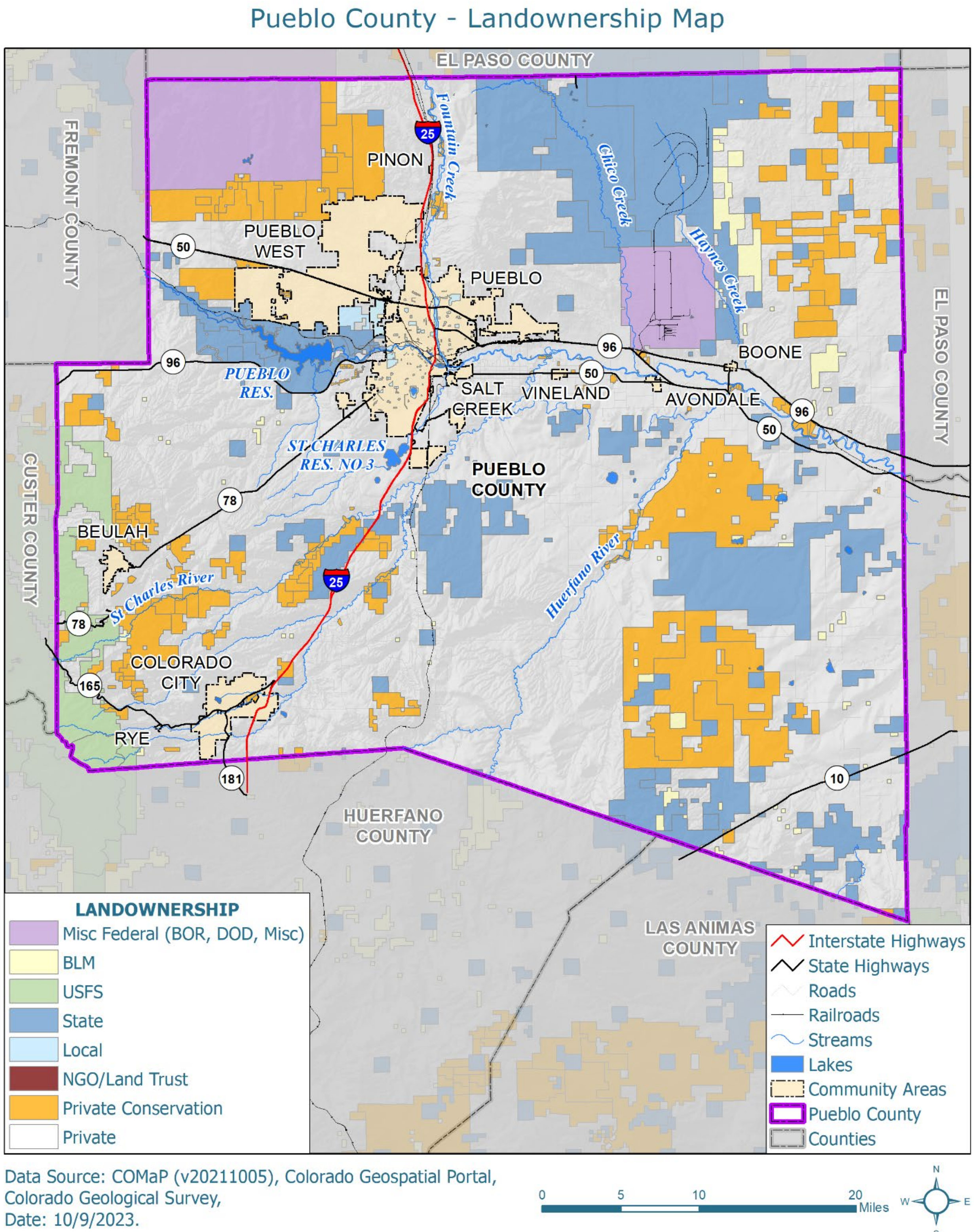
Figure 12 Community Disaster Resilience Zone



5.4 Land Ownership

There is a broad collection of local, state, and federal landowners across Pueblo County, as shown in **Figure 13**. This fact underscores the importance of close coordination when planning and implementing hazard mitigation activities.

Figure 13 Land Ownership



5.5 Future Development

The 2022 Pueblo Regional Comprehensive Plan (Comp Plan) lays out the vision for the region including policies, goals, and actions to successfully grow and thrive. It details the intersection of the Future Land Use Plan and the Pueblo Area Council of Governments' (PACOG) 2045 Long Range Transportation Plan (LRTP) which included modeling of the "anticipated location, type, and intensity of future land patterns in different parts of the region".

Per Goal 6.1 of the Comp Plan, the county is aiming to "promote a fiscally and environmentally responsible pattern of growth". Working towards this goal, the county has identified eight policy recommendations to implement, touching on topics such as:

- Coordinated planning
- Concentrated development
- New growth areas
- Annexation areas
- Compact development
- Prioritized investment
- Funding to support new development areas
- Environmentally sensitive areas

PREFERRED GROWTH SCENARIO

Community and stakeholder input on the future growth scenarios and associated policy considerations reflected strong support for both Scenario B and C. Common themes reflected in both Scenario B and C included a focus on:

- Infill and revitalization
- Compact development
- Expanding housing options
- Promoting efficient and fiscally-sound infrastructure investments
- Preserving prime agricultural lands
- Promoting sustainable development practices

With these priorities in mind, the Future Land Use Plan assumes that the majority of future growth and development in the region over the next ten to twenty years will be directed to areas within or immediately adjacent to the City of Pueblo, within the Pueblo West Metropolitan District, and within planned employment areas. While a limited amount of future development is expected to continue in Colorado City and in Rural Communities throughout Pueblo County, growth in these areas will be limited by access to infrastructure and services and market demand.

The various types of land use and neighborhoods are highlighted in the Comp Plan and illustrated in multiple maps. **Figure 14** presents the future land use for the county and **Figure 15** shows future land use around the City of Pueblo. Special Development Areas (SDA) have been identified within three miles of the City of Pueblo's boundary. These are potentially serviceable areas that may be suitable for future annexation.

The Comp Plan shares a population growth projection of 29,000 new residents by 2040, equating to 1,500 new residents each year. This growth is expected to create 14,700 new housing units. The county's preferred growth scenario from the Comp Plan is highlighted in the above side bar.

As mentioned in the Comp Plan, the county is also evaluating how best to implement a Transfer of Development Rights (TDR) Program. TDR programs shift development rights from areas unsuitable for development (e.g., natural hazard areas) or areas where lower density or land conservation are desired (e.g., sensitive lands such as wetlands or agricultural lands) to areas where more growth or higher densities are desired.

Figure 14 Future Land Use

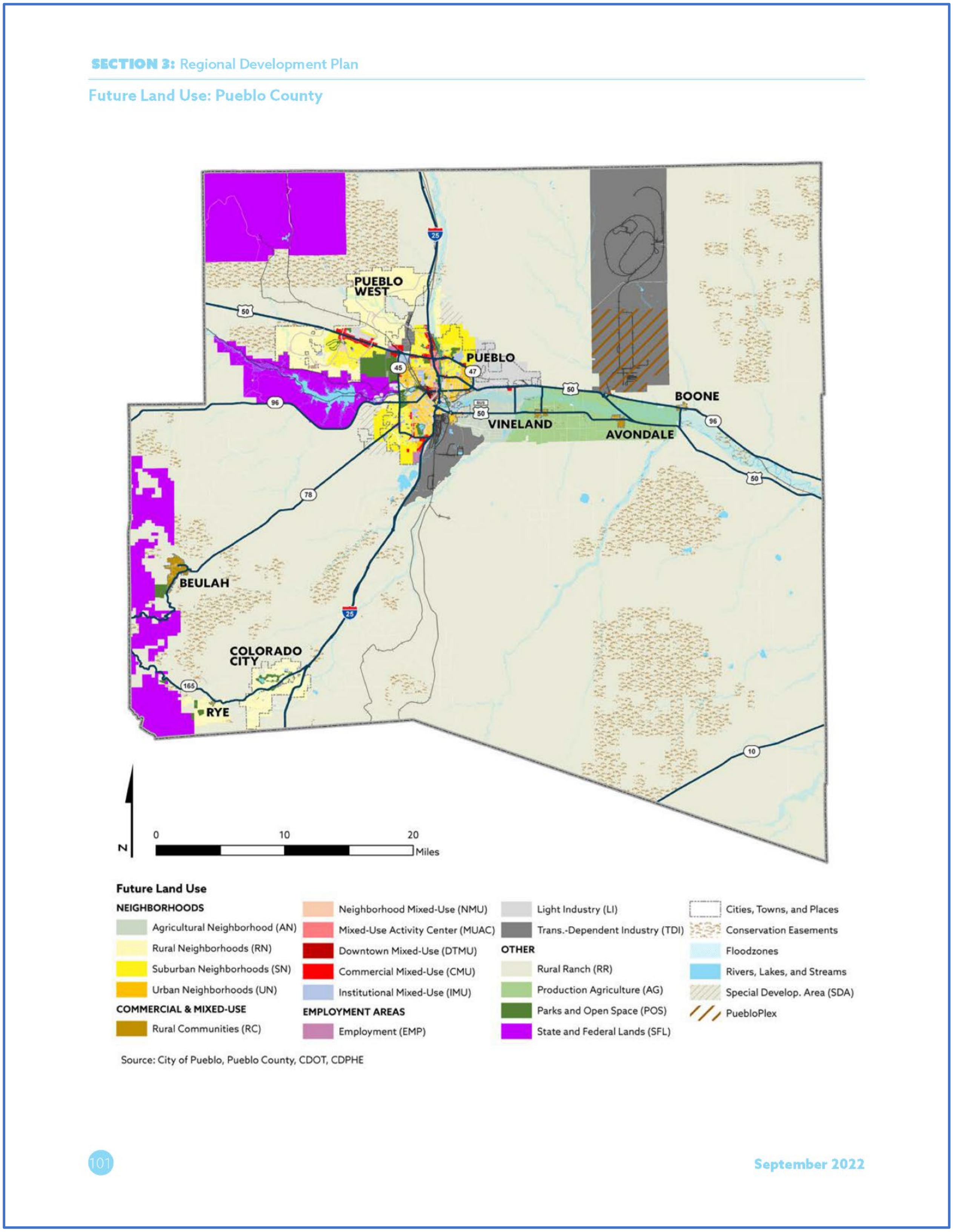
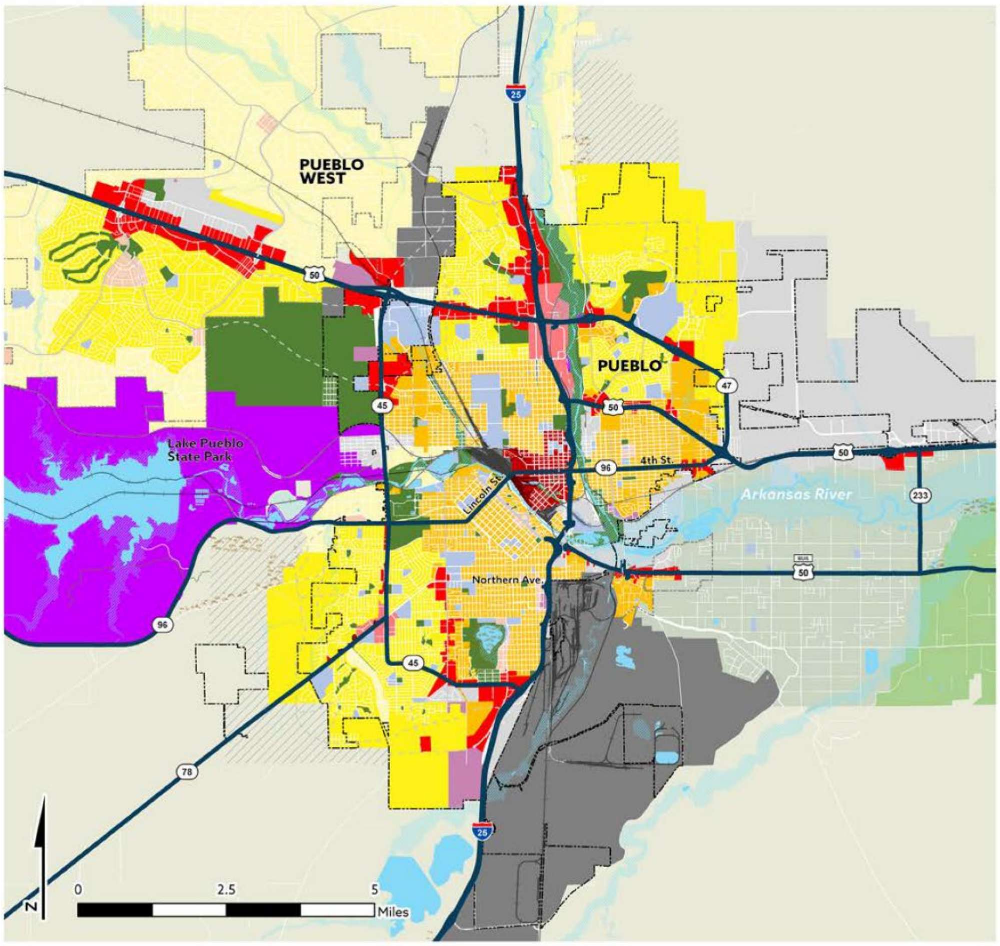


Figure 15 Future Land Use – City of Pueblo and Vicinity

Future Land Use: City of Pueblo and Vicinity



Future Land Use

NEIGHBORHOODS
- Agricultural Neighborhood (AN)
- Rural Neighborhoods (RN)
- Suburban Neighborhoods (SN)
- Urban Neighborhoods (UN)

COMMERCIAL & MIXED-USE
- Rural Communities (RC)
- Neighborhood Mixed-Use (NMU)
- Mixed-Use Activity Center (MUAC)
- Downtown Mixed-Use (DTMU)
- Commercial Mixed-Use (CMU)
- Institutional Mixed-Use (IMU)

EMPLOYMENT AREAS
- Employment (EMP)
- Light Industry (LI)
- Trans.-Dependent Industry (TDI)

OTHER
- Rural Ranch (RR)
- Production Agriculture (AG)
- Parks and Open Space (POS)
- State and Federal Lands (SFL)
- Future Roadways (LRTP)
- Conservation Easements
- Pueblo West Metropolitan District
- City of Pueblo
- Floodzones
- Rivers, Lakes, and Streams
- Special Develop. Area (SDA)

Source: City of Pueblo, Pueblo County, PACOG, CDOT, CDPHE

Zoning and Subdivision Codes

The recently updated Pueblo Regional Comprehensive Plan (2022) incorporated updated Land Use maps for the county to guide future development activities. Subdivision Codes are provided at the following location: https://county.pueblo.org/planning-and-development-department/title-16-subdivisions

It should be noted that one of the near-term initiatives included in the comprehensive plan for the city is to "consolidate and update land use and subdivision regulations as part of a Unified Development Code".

Building Codes

As documented in the **Mitigation Capabilities** section of this HMP, both the City of Pueblo and Pueblo County have adopted the latest 2021 building codes (International Residential Code [IRC] & International Building Code [IBC]. Additionally, local governments are in the process of adopting the 2021 fire codes (International Fire Code [IFC] & International Wildland Urban Interface Code [IWUIC]).

There have been no local modifications to the building codes. Proposed modifications to the fire codes are currently (as of May 2024) being drafted and include some removals and minor edits to the following sections, chapters, and appendixes:

- IFC
  - 111.1, 112.1, 112.3, 112.4, 113.4
  - C, D, N (with removal of E, G, J, L)
- IWUIC
  - 110.4
  - Removal of Chapter 5 and Appendix A-I

All codes adopted by the Pueblo Regional Building Department (PRBD) are provided on their website: https://www.prbd.com/bcodes.php

5.6 Evacuation / Access Challenges due to Natural Hazards

In Pueblo County, particularly within the mountainous communities, there are significant challenges related to evacuation and access during natural disasters. Many of these areas are served by limited ingress and egress routes, which can become severely compromised in the event of disasters such as wildfires, floods, or severe weather events. This limitation not only restricts the ability of emergency responders to reach affected areas promptly, but also hampers the safe and efficient evacuation of local populations. Addressing these vulnerabilities requires meticulous planning and enhanced coordination among local emergency services to ensure that alternative routes and strategies are clearly identified and communicated to residents well in advance of potential emergencies. This strategic approach is vital for minimizing risks and ensuring that all community members can access safety in times of need.

6 Hazard Identification and Risk Assessment

6.1 Risk Assessment Overview

A hazard risk assessment is the process of measuring the potential loss of life, personal injury, economic injury, and property damage that can result from natural and human-caused hazards. It allows a community to identify potential hazards and vulnerable assets. The process focuses on the following elements:

- Hazard identification – Use all available information to determine what types of disasters may affect a jurisdiction, how often they can occur, and their potential severity.
- Vulnerability identification – Use best available data to determine the impact of hazard events on the people, property, environment, economy, and lands of the region.
- Loss evaluation – Use best available data to estimate potential damages and losses, or costs that can be avoided through mitigation.

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

Identified Hazards of Concern

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

- Animal Disease Outbreak
- Dam / Levee Incident
- Drought
- Earthquake
- Extreme Heat
- Flood
- Hail
- Landslide / Debris Flow / Rockfall
- Pandemic
- Severe Wind
- Severe Winter Weather
- Thunderstorm / Lightning

- Tornado
- Tumbleweeds
- Wildfire

New hazards profiled in this 2024 plan update include dam / levee incident, extreme heat, and pandemic. All other natural hazards profiled in the 2023 Colorado Enhanced State Hazard Mitigation Plan were reviewed for inclusion in this update. Those hazards not profiled in this plan (avalanche, erosion / deposition, expansive soils / heaving bedrock, & sinkholes / subsidence / abandoned mines) do not currently present an immediate or impactful risk to Pueblo County and are therefore not a mitigation priority.

Hazard Profiles

The following pages provide detailed hazard profile chapters for each of the 15 hazards assessed in this plan. Each profile follows the same outline and addresses the following topics:

- General background
- Past events
- Location
- Severity
- Warning time
- Secondary hazards
- Exposure and vulnerability
- Future trends in development
- Probability of future occurrences
- Climate change impacts

Hazard Risk Summary

A qualitative risk ranking was performed by each participating local government for the hazards profiled in this plan. This risk ranking assessed the probability of each hazard's occurrence, as well as its likely impact on the people, property / environment, and economy of the planning area. The responses were collected utilizing a four-category qualitative scale. For probability of the hazard this included "unlikely (1)" "possible (2)", "probable (3)", and "likely (4)". For the impacts of the hazard to the three community sectors, the scale included "minor (1)", "limited (2), "critical (3)", and "catastrophic (4)". The responses were then calculated into a quantitative range by combining the impact scores and multiplying by the probability score, which correlates with the "high," "moderate," and "low" risk rankings. **Table 20** presents these results.

For some local governments, select hazards identified as affecting the county may not currently present an immediate or impactful risk. Those hazards are denoted as not applicable (NA).

Table 20 Pueblo County Hazard Risk Rankings

	Pueblo County	City of Pueblo	Pueblo West Metro District	Colorado City Metro District	St. Charles Mesa Water District	Beulah FPD
Animal Disease Outbreak	Low	Low	N/A	N/A	N/A	N/A
Dam / Levee Incident	Low	Moderate	N/A	High	Low	N/A
Drought	High	Moderate	High	High	High	High
Earthquake	Low	Low	Low	Low	Low	Low
Extreme Heat	High	Low	High	Moderate	High	Moderate
Flood	Moderate	Low	Moderate	High	Moderate	N/A
Hail	Low	Moderate	Low	Low	Low	Moderate

	Pueblo County	City of Pueblo	Pueblo West Metro District	Colorado City Metro District	St. Charles Mesa Water District	Beulah FPD
Landslide	Low	N/A	N/A	High	N/A	Moderate
Pandemic	Low	Low	Low	Low	Low	High
Severe Wind	High	High	High	Moderate	Moderate	Moderate
Severe Winter Weather	Low	Low	Low	Low	Low	Moderate
Thunderstorm / Lightning	Low	Moderate	Low	High	Low	Low
Tornado	Low	Moderate	Low	N/A	Low	N/A
Tumbleweeds	Moderate	Moderate	Moderate	Low	Low	Low
Wildfire	High	Moderate	High	Moderate	Moderate	High

Through surveys, the public was also asked to help rank each hazard based on their perceived level of risk. The data was collected using a simpler methodology, ranking the risk that each hazard posed from least to most. The public responses overall aligned to these hazard rankings.

Colorado Emergency Preparedness Assessment (2023)

The Colorado Emergency Preparedness Assessment (CEPA) presents a risk assessment for hazards in Pueblo County. The risk assessment measures the likelihood, consequence, relative risk, and the changes since 2020 for several possible hazards. The risks included in this assessment that are relevant to this plan are summarized in **Table 21**.

Table 21 CEPA Hazard Risk Assessment

Hazard	Likelihood	Consequence	Relative Risk	Changes since 2020
Animal Disease	Medium	Medium	9	3▲
Dam and Levee Failure	Low	Very High	10	-

Hazard	Likelihood	Consequence	Relative Risk	Changes since 2020
Drought	High	High	16	-
Earthquake	Low	Low	4	-
Extreme Temperature Hot / Cold	High	Medium	12	-
Flood	Medium	Medium	9	-
Hail	High	Medium	12	-
Landslides, Mud / Debris Flows and Rock Falls	Low	Medium	6	6 ▼
Pandemic / Epidemic	High	High	16	6 ▲
Severe Wind	High	Medium	12	-
Severe Winter Weather	Medium	Medium	9	-
Thunderstorms and Lightning	High	Medium	12	-
Tornadoes	Medium	Medium	9	1 ▲
Wildfire	Very High	High	20	-

Exposure Analysis

Structures

Throughout the risk and vulnerability assessment, exposure analysis was conducted for hazards as best available data permitted. Pueblo County provided both parcel and building footprint data which was utilized to assess structure valuations and building counts, respectively, at most risk to a hazard. A baseline of this data is presented in **Table 22**.

Table 22 Structures – Inventory

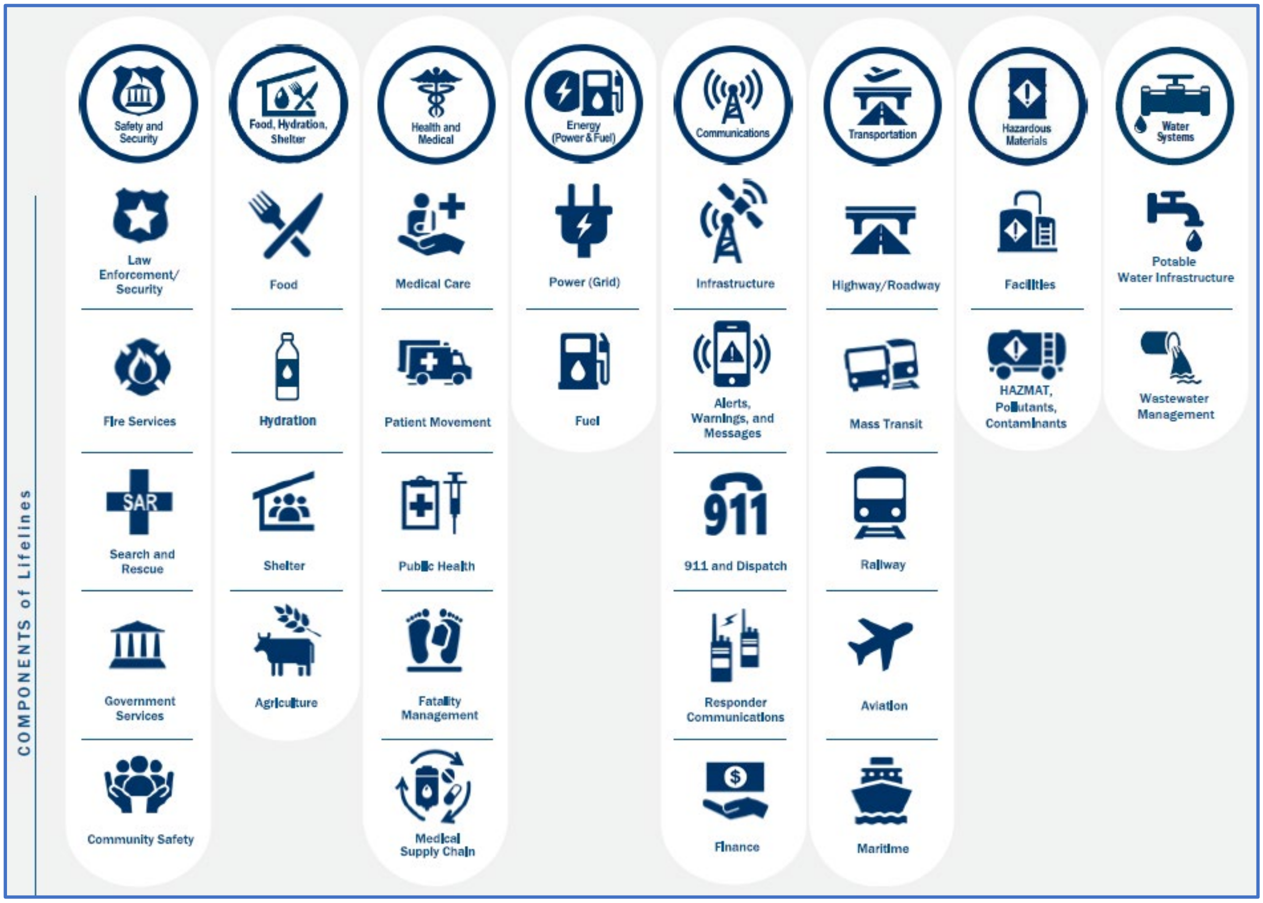
	City of Pueblo	Town of Boone	Town of Rye	Pueblo West Metro District	Colorado City Metro District	Unincor-porated	Total
Structures							
Building Count	58,314	356	153	13,680	1,285	19,356	**93,144**
Parcel Count	47,049	238	118	19,378	15,675	19,991	**102,449**
Valuation							
Total Land Value	$1,099,103,505	$849,699	$1,247,036	$620,029,541	$55,214,031	$846,854,532	**$2,623,298,344**
Total Structure Value	$7,682,603,559	$13,372,511	$15,248,291	$3,276,076,353	$207,444,838	$2,151,174,775	**$13,345,920,327**
Total Value	$8,781,707,064	$14,222,210	$16,495,327	$3,896,105,894	$262,658,869	$2,998,029,307	**$15,969,218,671**

Lifelines

The Community Lifelines framework was developed by FEMA to increase effectiveness in disaster operations and enable the continuous functioning of critical government, infrastructure, and business activities. In day-to-day community functions, lifelines support the recurring needs of the community. When these lifelines are stabilized, they safeguard the health, safety, and well-being of the public during a natural disaster occurrence.

The lifeline categories and subcomponents are crucial to understanding the interdependence of various organizations and systems to keep a community resilient in a disaster and effective in recovery. These categories and subcomponents can be found in **Figure 16**.

Figure 16 FEMA Lifelines

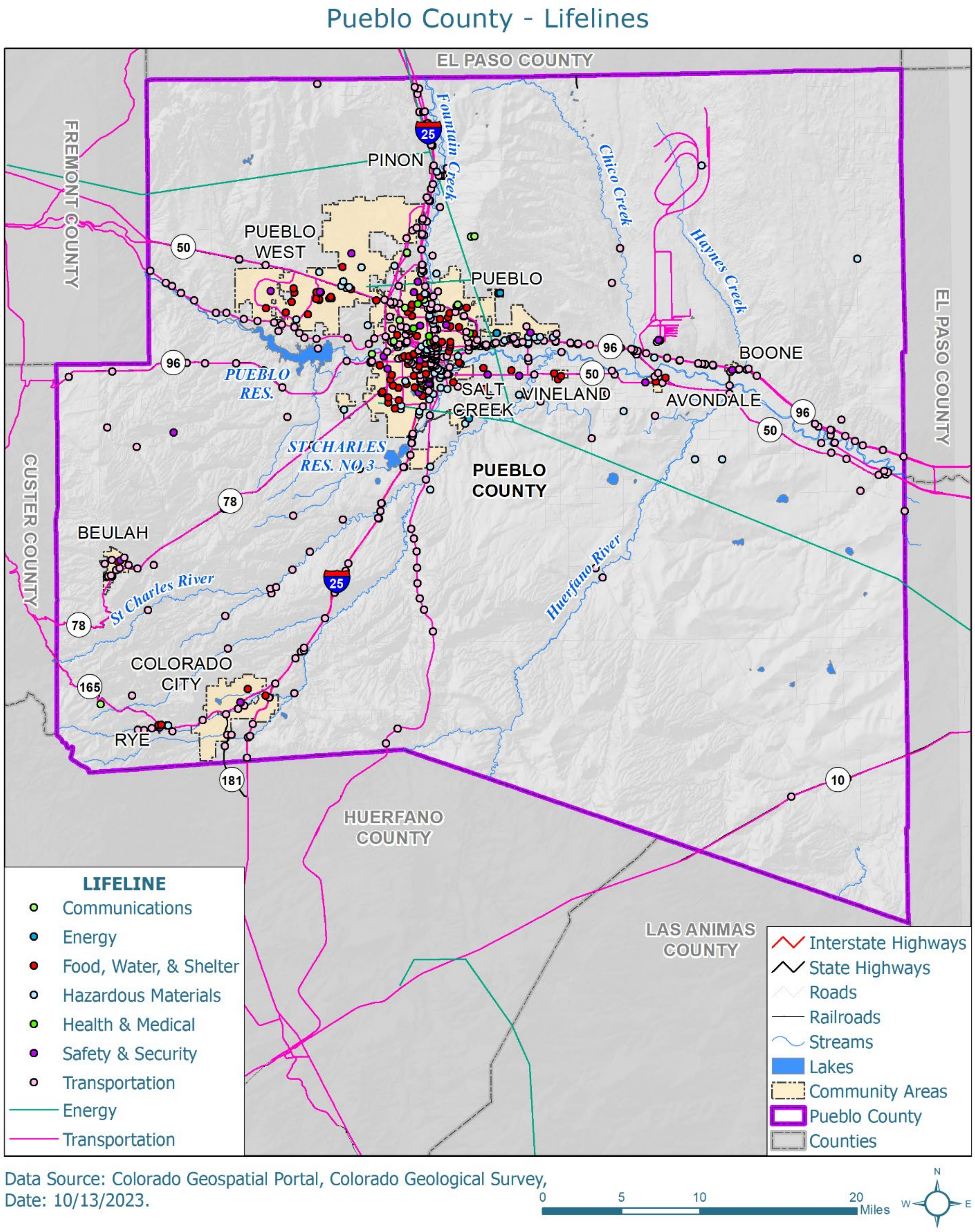


Lifelines were created to provide an outcome-based, survivor-centric framework to assist responders with determining the scale, complexity, and severity of a disaster. This information is used to establish operational priorities for the response and involves identifying the root causes and interdependencies of impacts to critical services, especially those that are life-sustaining or lifesaving.

An important component to the lifeline framework is the ability to communicate disaster-related information across all levels of public, private, and non-profit sectors using commonly understood, plain language. This is vital to preparedness education, community engagement, and public outreach.

The inclusion of the community lifelines construct in the risk assessment and mitigation strategy is important to address critical processes and infrastructure specific to Pueblo County. Identifying the lifelines across the county creates a better understanding of effects from hazards and risks to assets. Lifeline inputs for were derived from FEMA's National Inventory Database and are presented in **Figure 17**.

Figure 17 County Lifelines

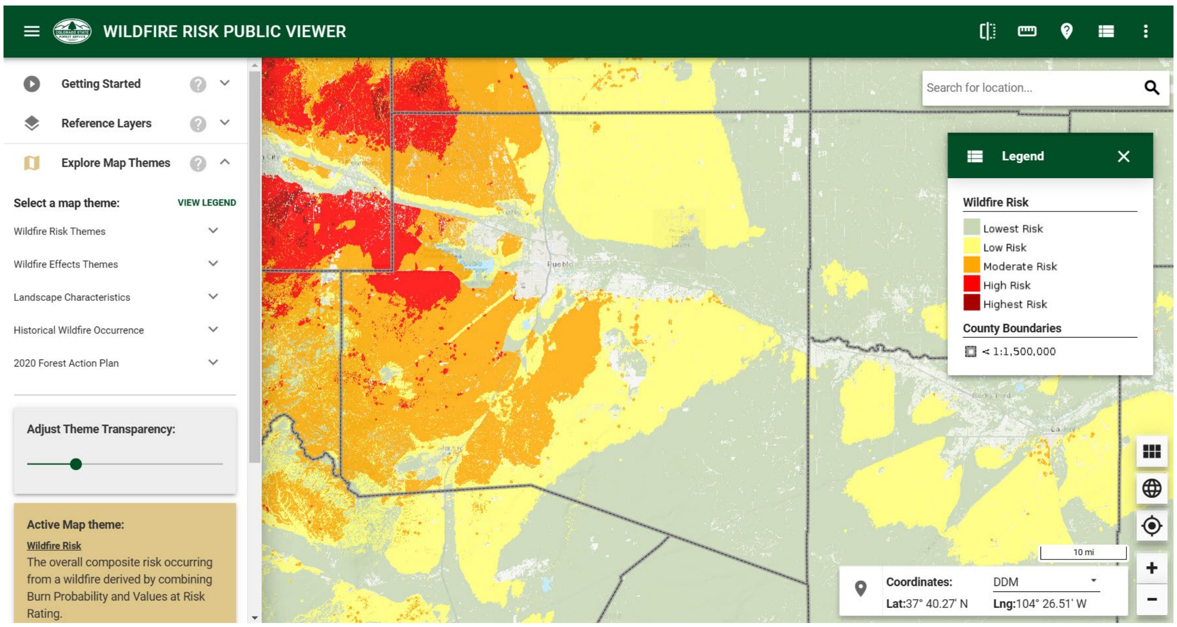


Hazard Data Viewers

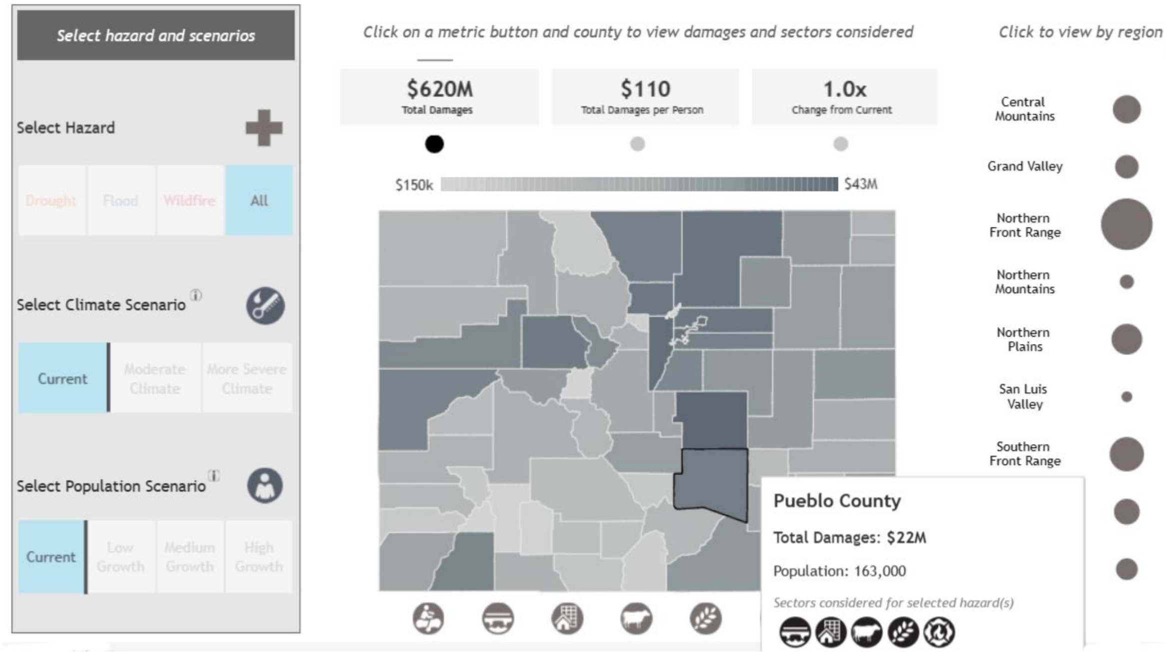
All of the information contained in the following risk and vulnerability assessments is considered a snapshot in time, based upon the best available data during this plan's development. It is expected that over the 5-year life of this updated plan many of these data sets will continue to be updated and enhanced, while new data sources will become available. In order for communities to ensure they are referencing the latest and greatest hazard data, it is important that they are aware of how to access this information.

Fortunately, communities are now able to leverage state and federal web map viewers to assess the most current hazard mapping available for many of the hazards profiled in this plan. Details on these currently available tools are shared below and you can access the platforms by clicking on the title of each viewer.

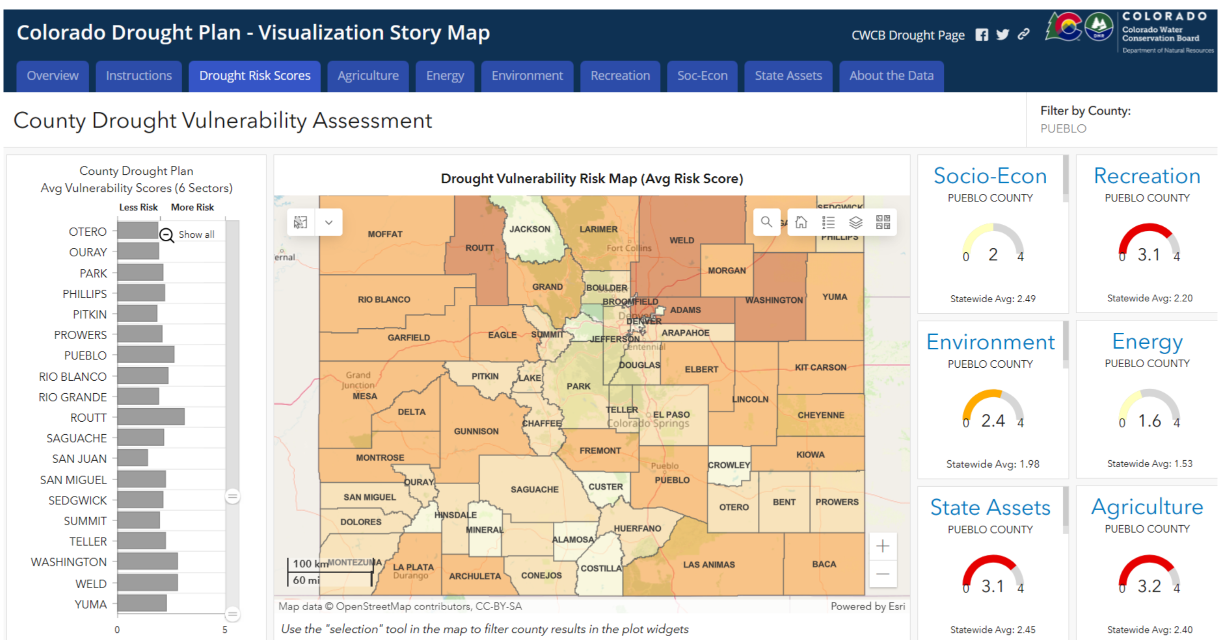
Colorado Forest Atlas – Wildfire Risk Viewer – is a web-mapping application that allows users to identify specific wildfire risk levels within ½-mile radius of a home, or any other point of interest on the map. A risk level description and link to additional resources is provided for users wanting to know how to reduce their risk.



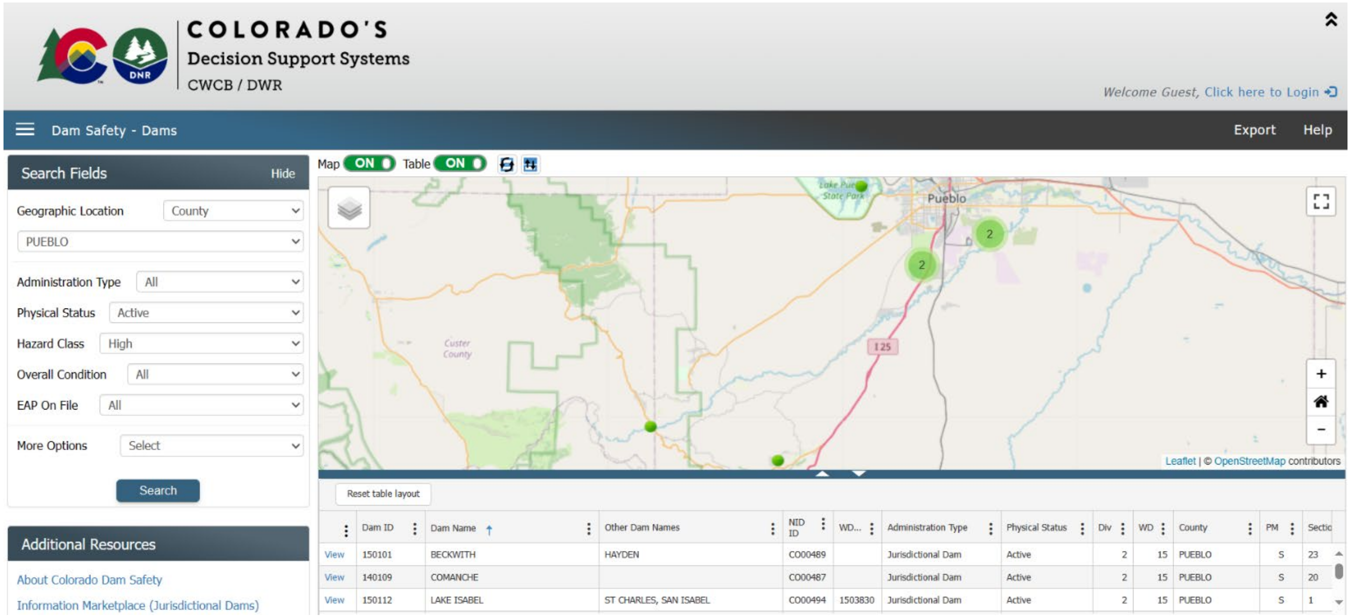
Colorado Water Conservation Board – Future Avoided Cost Explorer (FACE) – is an interactive viewer for impacts reported in terms of expected annual damages, the expense that would occur in any given year if monetary damages from all hazard probabilities and magnitudes were spread out over time. Utilizing models of fire, flood, and drought hazards, population growth, and climate change, data for each county and the sectors affected are illustrated.



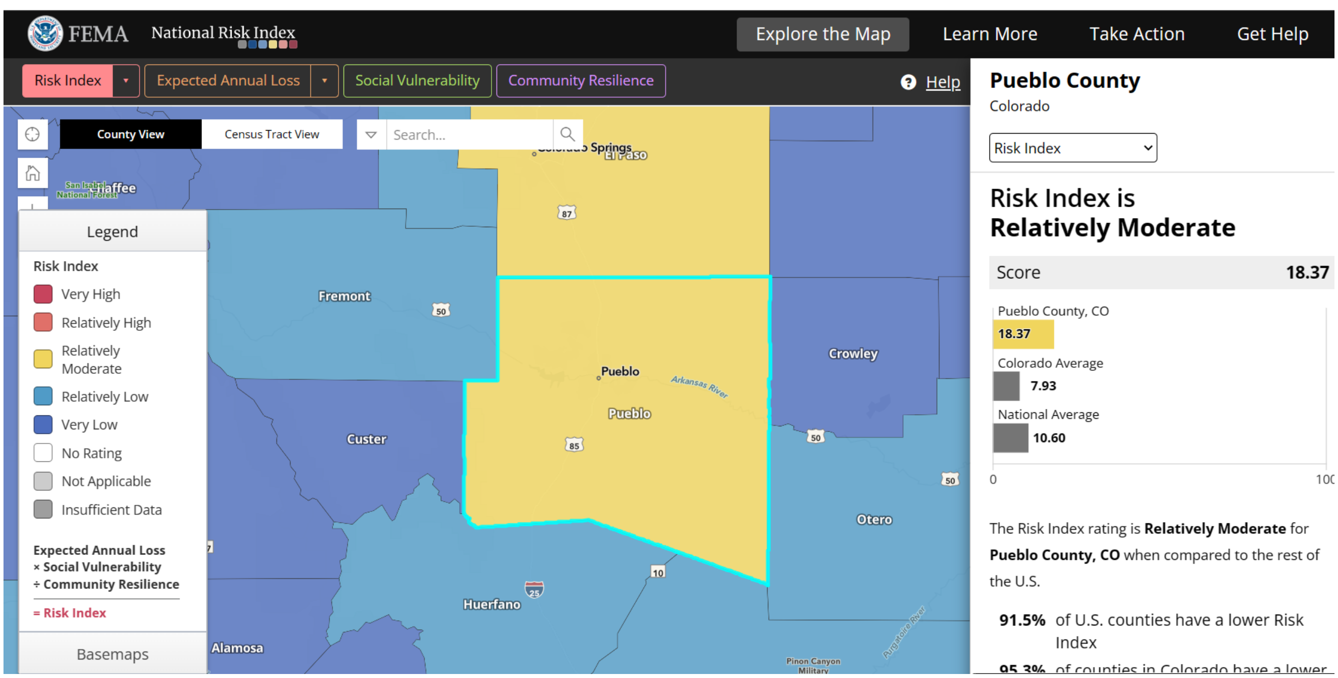
[Colorado Drought Plan - Visualization Story Map](#) – is an interactive viewer for sector vulnerability to drought in each county. This map shows the vulnerability assessment findings in the 2018 State of Colorado Drought Mitigation and Response Plan.



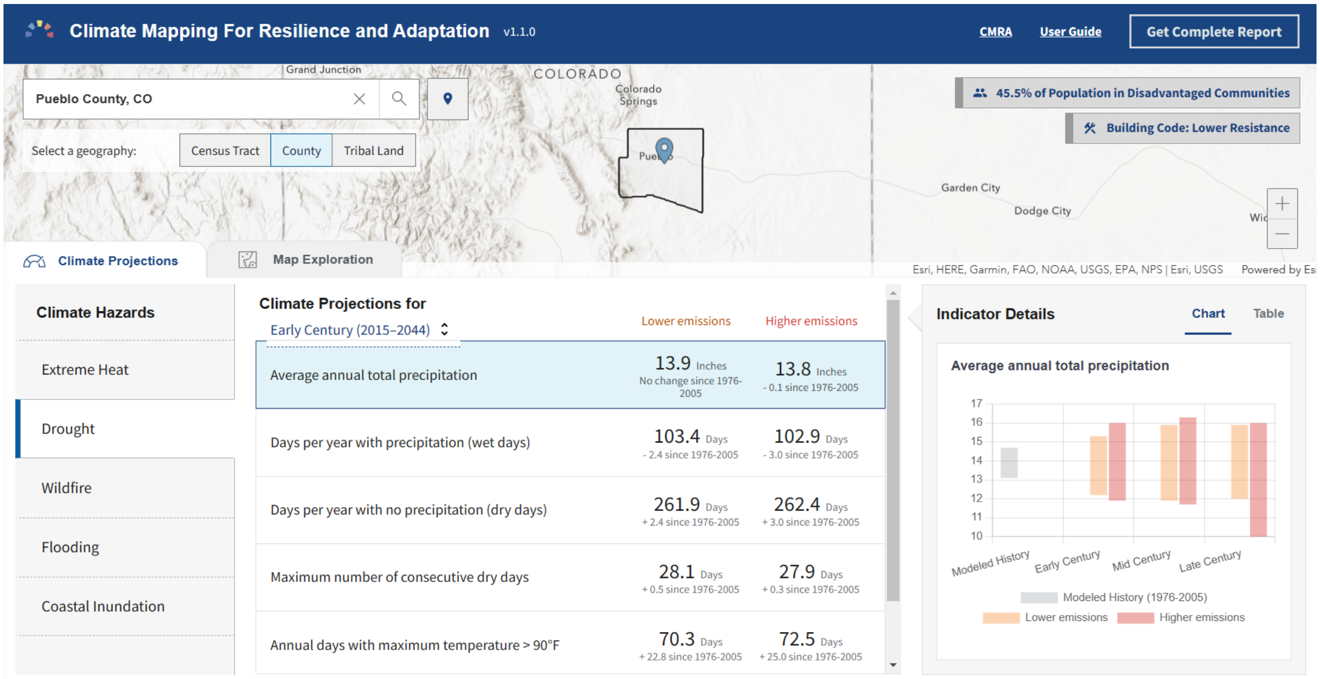
Colorado Dam Safety – Decision Support System – is an interactive viewer for dam information across Colorado.



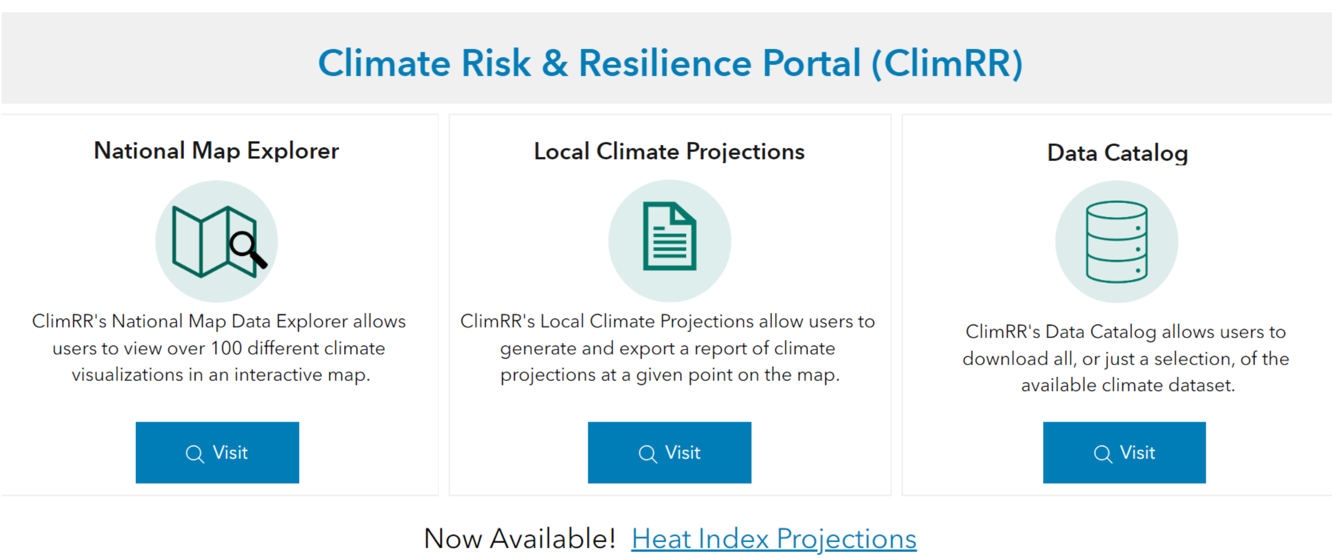
FEMA National Risk Index (NRI) – is a tool to help illustrate the communities most at risk for 18 natural hazards. The Risk Index leverages available source data for natural hazard and community risk factors. The risk equation behind the Risk Index includes three components: a natural hazards component (Expected Annual Loss), a consequence enhancing component (Social Vulnerability), and a consequence reduction component (Community Resilience).



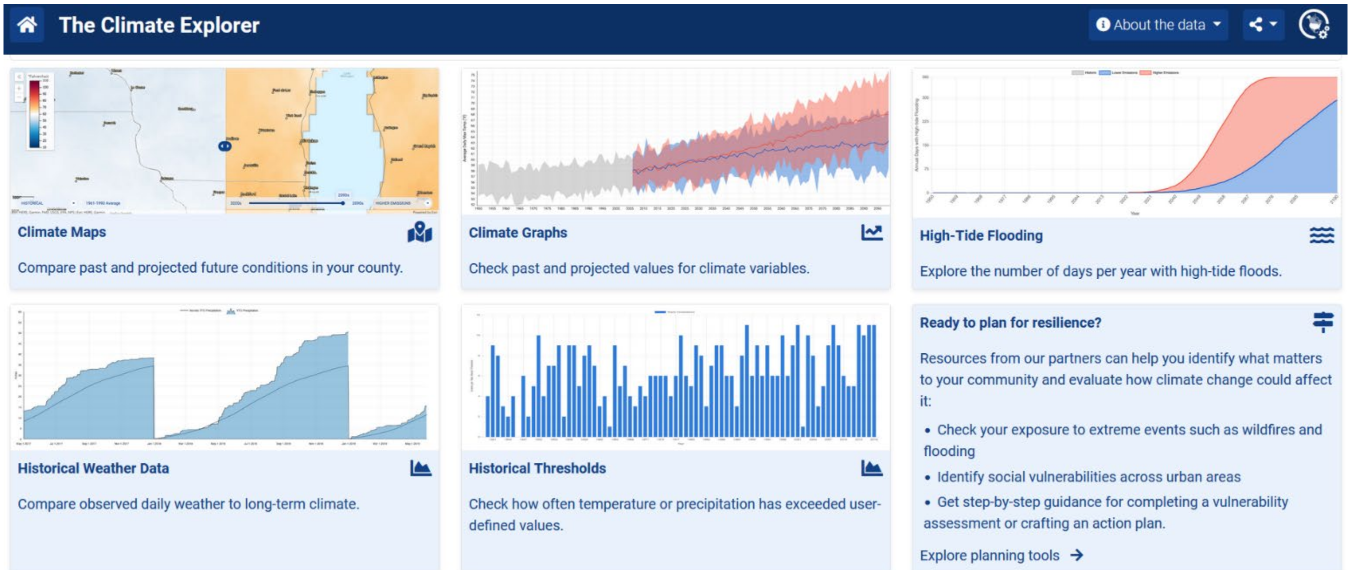
Climate Mapping for Resilience and Adaptation (CMRA) Assessment – is a tool that provides current and future climate hazard information to assist with prioritizing, identifying, and implementing climate-informed infrastructure investments. As a single source of historical and future climate data, the tool covers exposure of multiple hazards, status of disadvantaged communities, and building codes. The information can support the planning and implementation of climate resilient projects.



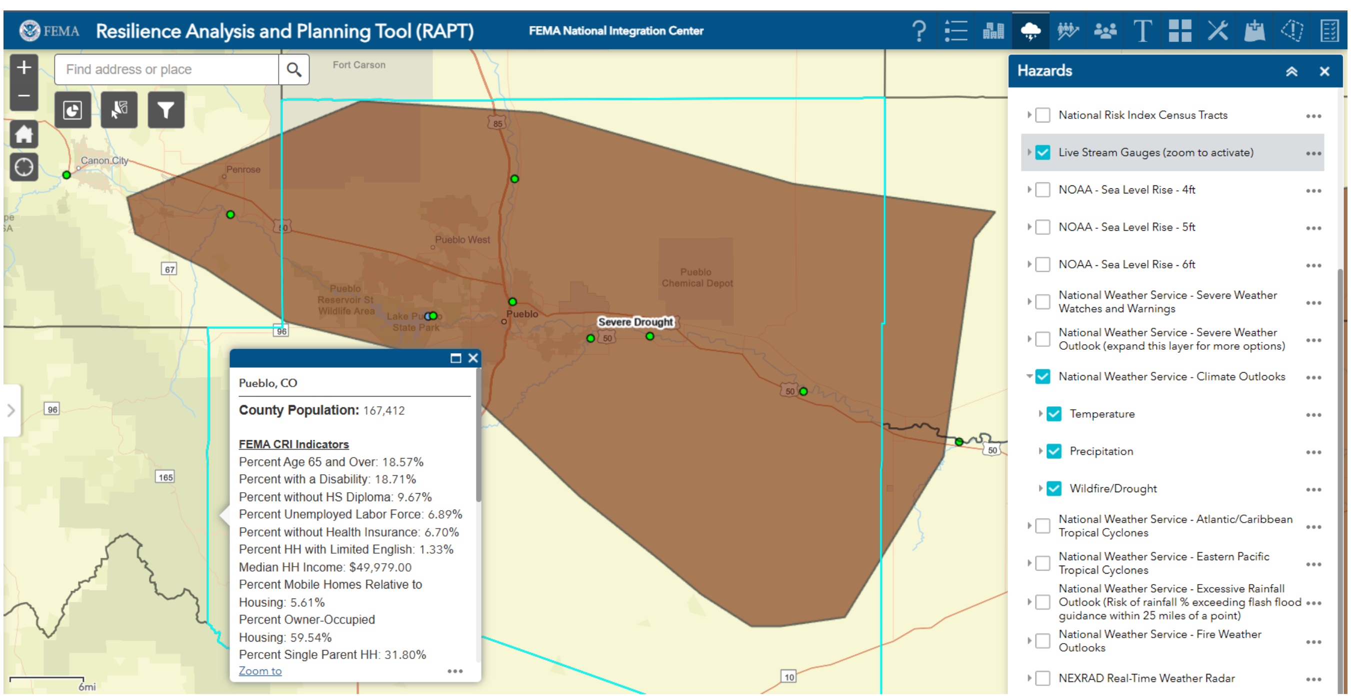
Climate Risk and Resilience Portal (ClimRR) – is a collection of tools and data related to estimated future climate-related variables: annual and seasonal averages of the maximum and minimum daily temperatures, annual total precipitation, drought (consecutive days with no precipitation) and annual average wind speed.



The Climate Explorer – is a collection of data and map viewers presenting how climate conditions in the United States are projected to change over the coming decades.



Resilience Analysis and Planning Tool (RAPT) – is a geographic information systems (GIS) tool to help emergency managers and community partners at all GIS skill levels visualize and assess potential challenges to community resilience. Hazard data include data layers of real-time radar and watch and warning notifications from the National Weather Service, live stream gauges, current wildfires, historical hazard data for tornadoes, flood, and seismic risk.



6.2 Previous Disaster Declarations

Pueblo County has been designated in numerous disaster declarations, at both the state and federal levels. Fires, severe storms, winter weather, and drought have impacted the county and its communities significantly, which is illustrated in the tables below.

STATE OF COLORADO DISASTER DECLARATIONS

Pueblo County has been a designated county in 19 state disaster declarations. Approximately one third of the declarations have been for winter weather and another third declared for wildfire. Drought, flood, severe weather, and biological hazards compose the rest of the declarations. **Table 23** shows these state declarations by date and areas designated. Due to the regional nature of most of these hazards many of the declarations were statewide.

Table 23 State of Colorado Disaster Declarations

Declaration Year	Year	Description
1994	Flood	Pueblo County, Town of Lyons, Boulder County
1994	Wildfires	Statewide
1999	Flooding, Landslides, Mudslides	Bent, Crowley, Custer, El Paso, Elbert, Fremont, Kiowa, Larimer, Otero, Las Animas, Pueblo, Weld Counties
2002	Wildfires	Statewide
2002	Drought	All Counties
2003	Snow Emergency	Statewide
2005	Wildfire	Pueblo, Custer Counties
2005	Hurricane Katrina	Statewide
2006	Flooding	Douglas, Teller, Fremont, Pueblo, Garfield Counties
2009	Severe Blizzard	Statewide
2009	Severe Spring Snowstorm	Statewide
2013	Winter Storm	Statewide

Declaration Year	Year	Description
2013	Flooding	Adams, Arapahoe, Broomfield, Boulder, Chaffee, Clear Creek, Crowley, Denver, El Paso, Gilpin, Fremont, Jefferson, Lake, Larimer, Lincoln, Logan, Morgan, Otero, Park, Pueblo, Prowers, Sedgwick, Washington, Weld Counties
2014	Extreme Weather	Statewide
2016	Wildfire	Custer, Pueblo Counties
2016	Wildfire	Pueblo County
2017	Wildfire	Statewide
2017	Extreme Weather and Flooding	Bent, Custer, Fremont, Huerfano, Otero, Pueblo Counties
2020	COVID-19	Statewide

FEDERAL DISASTER DECLARATIONS

Federal disaster declarations have occurred in Pueblo County 20 times since 1955, with 9 of those being Major disaster designations. These events are listed in **Table 24.**

Federal disaster declarations are typically issued for hazard events that cause more damage than state and local governments can respond to and recover from without assistance from the federal government. A Federal disaster declaration puts federal recovery programs into motion to help disaster victims, businesses, and public entities.

Table 24 Federal FEMA Disaster Declarations

Declaration Number	Year	Description	Declaration Type
DR-33-CO	1955	Flood	Major Disaster
DR-59-CO	1956	Flood	Major Disaster
DR-200-CO	1965	Tornadoes, Severe Storms, and Flooding	Major Disaster
DR-385-CO	1973	Heavy Rains, Snowmelt and Flooding	Major Disaster

Declaration Number	Year	Description	Declaration Type
DR-517-CO	1976	Severe Storms and Flash Flooding	Major Disaster
EM-3025-CO	1977	Drought	Emergency Declaration
DR-1276-CO	1999	Flood	Major Disaster
DR-1421-CO	2002	Wildfires	Major Disaster
EM-3185-CO	2003	Snow	Emergency Declaration
FM-2566-CO	2005	Mason Fire	Fire Management Assistance
EM-3224-CO	2005	Hurricane Katrina Evacuation	Emergency Declaration
EM-3270-CO	2007	Snow	Emergency Declaration
EM-3271-CO	2007	Snow	Emergency Declaration
FM-5022-CO	2013	Wetmore Fire	Fire Management Assistance
EM-3365-CO	2013	Severe Storms, Flooding, Landslides, and Mudslides	Emergency Declaration
DR-4229-CO	2015	Severe Storms, Tornadoes, Flooding, Landslides, and Mudslides	Major Disaster
FM-5155-CO	2017	Beulah Hill Fire	Fire Management Assistance
FM-5157-CO	2017	Junkins Fire	Fire Management Assistance
EM-3436-CO	2020	COVID-19	Emergency Declaration
DR-4498-CO	2020	COVID-19 Pandemic	Major Disaster

UNITED STATES DEPARTMENT OF AGRICULTURE (USDA) SECRETARIAL DISASTERS

Since 2003, the county has had 15 primary designations for USDA Secretarial disasters shown in **Table 25**.

Notably Pueblo County has been in drought declarations for the last five (5) years, 2018-2022. The last seven (7) declarations since 2013 are Fast Track declarations. A Fast Track designation process for severe drought was implemented in 2012. The process provides for a nearly automatic designation when, during the growing season, any portion of a county meets the D2 (Severe Drought) drought intensity value for eight consecutive weeks or a higher drought intensity value for any length of time as reported in the U.S. Drought Monitor.

Table 25 USDA Secretarial Disaster Declarations

Declaration Number	Year	Description
S1843	2003	Drought, Insects
S1947	2004	Drought, Freeze, Hail
S2188	2005	Drought, Wind, Heavy Rain, Hail
S2327	2005-2006	Drought, Fire, High Winds, Heat
S2750	2008	Drought
S3125	2011	Drought
S3133	2011	Drought
S3260	2012	Drought, Wind/High Winds, Heat, Excessive Heat
S3456	2013	Drought, Wind/High Winds, Fire, Excessive Heat, Insects
S3627	2014	Drought, Wind/High Winds, Fire, Excessive Heat, Insects
S4313	2018	Drought
S4468	2019	Drought
S4692	2020	Drought
S4917	2021	Drought
S5147	2022	Drought

6.3 Animal Disease Outbreak

General Background

A zoonotic disease is one that is passed to humans through a vector, which include mammals, birds, or insects. Once a human is infected through a vector zoonotic disease can be transmitted between humans as well. Insect, bird, and mammal vectors in Colorado carry numerous diseases. Some of the most common include:

- West Nile virus (and other encephalitis viruses which cause inflammation of brain tissue)
- Rabies
- Plague
- Tularemia
- Hantavirus
- Avian flu

The disease vectors have a presence often ebbing and flowing with the seasons and also may be more pronounced after a natural disaster such as flooding, drought, or wildland fire.

West Nile Virus (WNV)

According to the Centers for Disease Control and Prevention (CDC), West Nile Virus (WNV) is the leading cause of mosquito-borne disease in the continental United States. It is most commonly spread by the bite of an infected mosquito and cases of WNV occur during mosquito season, beginning in the summer through the fall. Mosquitos are infected with WNV when they feed on infected birds.

The majority of people infected with WNV do not feel sick but approximately 1 out of 150 infected people develop serious, sometimes fatal, illness. WNV human-to-human transmission is very rare and has occurred during blood transfusion and organ transplant, as well as mother to baby during pregnancy, delivery, or breast feeding.

WNV was first recognized in the United State in 1999 but was discovered in Uganda in 1937. An outbreak spread from New York, across the US, in 2002 and data for 2003 shows a large proportion of total infections that year were reported in Colorado.

Rabies

According to the CDC , rabies is a preventable viral disease of mammals most often transmitted through the bite of a rabid animal. The rabies virus infects the central nervous systems of mammals, ultimately causing disease in the brain and death. Death usually occurs within days of the onset of symptoms.

Rabies virus is transmitted through direct contact (such as through broken skin or mucous membranes in the eyes, nose, or mouth) with saliva or brain / nervous system tissue from an infected animal. People usually get rabies from the bite of a rabid animal, although in rare cases other types of non-bite exposure have resulted in infection.

Based on CDC data, rabies infection of humans is rare, only one (1) to three (3) cases a year in the US, but approximately 60,000 people get post exposure prophylaxis (PEP). PEP protects a person exposed to rabies from developing rabies and involves multiple days of medication administration.

Of reported animal rabies cases, 90% occur in wildlife, like raccoons, skunks, bats, and foxes. In the US, contact with bats infected with rabies is the leading cause of human rabies deaths. Domestic animals have very low rates of infection, especially due to mandatory rabies vaccinations, but cats, cattle, and dogs are reported each year.

Plague

According to the CDC, plague is an infectious disease that affects rodents, certain other animals, and humans. It is caused by the Yersinia pestis bacteria. There are three (3) different forms of plague, which affect the symptoms of each person differently and can make it difficult to diagnose.

- Bubonic plague – result of infected flea bite
- Septicemic plague - result of infected flea bite or handling infected animal
- Pneumonic plague – inhalation of infectious droplets, or untreated bubonic or septicemic plague (only plague form that can be transmitted human-to-human)

While millions of people died from plague in Europe in the Middle Ages, the evolution of medicine has created effective antibiotics. Although, if an infected person is not treated promptly, the disease may cause significant illness or death.

Tularemia

Tularemia is a potentially serious illness caused by the bacterium Francisella Tularensis. Tularemia is found in animals, especially rodents, rabbits, and hares. It is usually a rural disease and cases primarily occur in the south-central and western states. Tularemia is seen in people infected through insect bites, handling infected, sick, or dead animals and ingesting contaminated food or water. The bacteria causing tularemia can remain alive for weeks in water and soil.

Human-to-human transmission of the infection has not been reported.

Hantavirus

The CDC defines hantaviruses as a family of viruses spread mainly by rodents, which can cause varied disease syndromes in people worldwide. Infection with any hantavirus can produce hantavirus disease in people. Hantaviruses in the Americas are known as "New World" hantaviruses and may cause hantavirus pulmonary syndrome (HPS). HPS has a mortality rate of approximately 38%

Each hantavirus serotype has a specific rodent host species and is spread to people via aerosolized virus that is shed in urine, feces, and saliva, and less frequently by a bite from an infected host. The most important hantavirus in the United States that can cause HPS is the Sin Nombre virus, spread by the deer mouse. HPS has not been reported as spreading from human-to-human.

Avian Influenza (Bird Flu)

While large numbers of poultry are culled due to the virus, according to the CDC, it is rare that avian influenza, also known as bird flu, causes human infections.

> Although avian influenza viruses usually do not infect people, there have been some rare cases of human infection with these viruses. Illness in humans from bird flu virus infections have ranged in severity from no symptoms or mild illness to severe disease that resulted in death. Asian lineage H7N9 and highly pathogenic avian influenza Asian lineage H5N1 viruses have been responsible for most human illness from bird flu viruses worldwide to date, including the most serious illnesses and illness with the highest mortality.
>
> The spread of bird flu viruses from one infected person to a close contact is very rare, and when it has happened, it has only spread to a few people. However, because of the possibility that bird flu viruses could change and gain the ability to spread easily between people, monitoring for human infection and person-to-person spread is extremely important for public health.

The H5N1 virus was discovered in geese in China in 1996. The first H5N1 human infection in the United States was reported, in April 2022, in Colorado. The man worked as a culler at a commercial poultry operation in Montrose County and there was no transmission of the virus to other people. As of March 2022, the 51N1 HPAI (Highly Pathogenic Avian Influenza) virus has been found in 14 counties in Colorado, Pueblo County has confirmed 4 cases[1].

Past Events

West Nile Virus (WNV)

According to the CDC, in 2003, Colorado experienced a large West Nile virus (WNV) epidemic, which accounted for 29.9% of the nation's 9,862 reported WNV infections.

Pueblo County has had cases of West Nile Virus identified 253 times since 2003, and only four years with no cases reported. There have been 10 deaths attributed to WNV in the county in the same time period. The most recent death was reported in September 2015. Since 2015, a total of eight (8) cases have been reported.

The highest number of cases for Pueblo County was reported in 2003, with 183 cases resulting in six (6) of the 10 total deaths in the county. These figures accounted for 6% of all cases in the state and 9% of the total deaths in 2003. Over the last two (2) decades the number of cases has remained relatively

[1] https://www.9news.com/article/life/animals/avian-bird-flu-colorado-cases/73-8aa849cd-0e28-4f4f-a5ab-57f299f62567

steady with the exception of 2007 and the recent years with no cases. Pueblo County comprises 4% of the states total cases of WNV reported since 2003. **Table 26** illustrates WNV data for Pueblo County.

Table 26 West Nile Virus Cases – Pueblo County and the state of Colorado (2003-2022)

Year	Pueblo County Total Cases	Pueblo County Total Deaths	State Total Cases	State Total Deaths
2003	183	6	2,948	66
2004	4	0	291	4
2005	5	0	106	2
2006	7	0	345	8
2007	20	1	578	7
2008	5	0	96	1
2009	2	0	104	3
2010	2	0	79	4
2011	0	0	8	0
2012	1	0	131	6
2013	5	0	321	8
2014	7	2	118	6
2015	4	1	101	4
2016	1	0	150	8
2017	2	0	68	5
2018	0	0	96	5
2019	3	0	122	8
2020	0	0	35	1
2021	2	0	175	11
2022	0	0	206	19

Year	Pueblo County Total Cases	Pueblo County Total Deaths	State Total Cases	State Total Deaths
Grand Total	**253**	**10**	**5,872**	**176**

Rabies

The Colorado Department of Health and Environment (CDPHE) keeps detailed records of the types of animals that tested positive, as well as the animals and people that may have been exposed. **Table 27** shows the number of positive rabies results for animals from 2015 to 2022 for both the state and Pueblo County. The percentage of total positive rabies cases for the county in the overall state is listed along with the types of animals infected with rabies in Pueblo County.

Table 27 Animal Rabies Cases for Pueblo County and the state of Colorado (2015-2022)

Year	State Rabies Positive Animals	Pueblo County Rabies Positive Animals	Percent of Total Positive Cases	Bat	Domestic Animal	Skunk
2015	118	8	7%	8		
2016	88	13	15%	13		
2017	165	8	5%	8		
2018	325	16	5%	11	1 (dog)	4
2019	163	21	13%	4		17
2020	92	10	11%	1	1 (cattle)	8
2021	84	3	4%	2		1
2022	70	5	7%	5		

Plague

A person who spent time at Turkey Creek was infected with the plague and later died in 2015. This was the first plague death since 2004[2]. In 2004, a Pueblo County resident was infected in Park County while hunting rabbits.

In August 2000 there was a reported mass die-off of prairie dogs in a colony near Pueblo West.

Tularemia

There have been three (3) reported human tularemia cases in Pueblo County between 2012 and 2020 according to available data from CDPHE. One (1) of those was reported in 2018. More recently in June 2022, an infection of tularemia in a child was reported to the Pueblo Department of Public Health and Environment, which was followed by another reported infection in August 2022[3].

Hantavirus

Pueblo County has not had a case of hantavirus reported since records began in 1993. However, the state has had 119 cases between 1993 and 2021, which resulted in 41 deaths.

Avian Influenza (Bird Flu)

In May 2022, outbreaks of avian influenza have been reported in 35 states and the 51N1 HPAI virus has been found in wild birds in 38 states. Pueblo county has confirmed three cases in wild birds, one mammal (Red Fox), and detection in a backyard producer (non-poultry).[1] In early 2023, avian influenza had been confirmed in two additional species, the Canada Goose and the Great Horned Owl. This virus has caused animal mortalities in excess of 1,000 in Morgan and Logan CO with numerous large scale mortalities occurring across the southeastern region of the state.[4]

Location

West Nile Virus (WNV)

West Nile virus has been reported in all states in the continental United States. All counties in Colorado have reported at least one (1) case of WNV. Boulder, Larimer, and Weld have the highest number of cases in the state.

Rabies

Rabies infections occur across the state.

Plague

Plague occurs in rural and semi-rural areas of the western United States and is most common in the southwestern states, particularly New Mexico, Arizona, and Colorado. Although cases can occur any time of the year, most cases are acquired from late spring to early fall.

[2] https://kdvr.com/news/health/first-person-in-11-years-dies-of-plague-in-pueblo-county/
[3] Second Positive Human Case of Tularemia in Pueblo County | Pueblo County
[4] What to know about the avian flu with 2 cases confirmed in Pueblo (chieftain.com)

Tularemia

Based on data collected by CDPHE, three (3) of the four (4) types of ticks that can carry tularemia are found in Pueblo County.

Hantavirus

Hantavirus can occur anywhere there are deer mice, which are found across Colorado.

Avian Influenza (Bird Flu)

Avian influenza can occur in both domestic fowl and poultry, as well as at large commercial operations.

Severity

Severity of an infection is impacted by many aspects, such as the age and health of the person infected, the amount of time taken before seeking treatment, and the medical treatment available to them. Some of these diseases do not have data available to illustrate severity. Death is a possibility for many of these diseases and severity of illness varies greatly.

Public health education is key to recognizing these infections and getting assistance quickly. Programs to inform both citizens and the medical community can aid in infection outcomes or infection prevention.

Warning Time

There is not a warning time for these diseases but taking preventative and protective measures to minimize any situations of exposure helps to increase the periods between infections. Public health can monitor reported disease infections and assist the local government in determining if any vector management measures are necessary.

Secondary Hazards

These diseases do not create large scale impacts, but rather harm individuals and in some cases small groups. Overall, these diseases are more so the secondary hazards, impacted by larger hazards such as flood, drought, and wildfire.

West Nile Virus (WNV)

The impact of flood events on the number of mosquitos can be notable. As flood waters recede there can be many pools of standing water which are hospitable to mosquitoes increasing their numbers.

Rabies

Flood and wildfire can displace wildlife from their habitats and increase the possibility of people, domestic animals, and livestock coming into contact with rabies infected animals. Displace wildlife may behave erratically due to confusion and fear even without infection.

Plague

Plague could potentially spread if groundhog colonies and other rodents are displaced by fire or flood. Drought could cause animals to travel further for water sources and increase interactions with people.

Tularemia

Tularemia could potentially spread post flood events due to handling of any dead animals, increased insect activity, and potential contamination of food and water. Drought can potentially increase tularemia due to increased competition and interactions at water sources.

Hantavirus

Hantavirus infections could potentially occur after a flood if rodents are able to congregate in areas that are later cleared of debris by people without proper protective equipment.

Avian Influenza (Bird Flu)

Avian influenza is not likely to increase as a result of a disaster.

Exposure and Vulnerability

Lifelines

Lifelines overall are unlikely to be impacted by zoonotic diseases, but Health & Medical resources may be stressed if there are multiple concurrent infections. Food, Hydration, & Shelter could potentially be contaminated by the bacteria which causes tularemia.

People

People are impacted by zoonotic diseases, which can cause serious illness and death. The animal vectors are also at risk of illness and death. Infections occur to individuals in contact with infected animals or insects primarily and in rare cases can be passed human-to-human.

Structures

Structures and infrastructure are not impacted by zoonotic diseases, although the state of a property can be conducive to vectors such as rodent infestations. During a wildfire evacuation, food is often left behind and spoils, creating opportunities for rodents to feed and congregate. Similarly, other hazards may interrupt trash collection and leave refuse available for rodents.

Natural, Historic, and Cultural Resources

The environment that each disease and its vectors thrive in is different. Overall, these diseases do not have impacts on the environment, but changes in the environment such as disaster events can affect the vectors and disease exposure.

Other Community Assets and Activities

The economy could potentially be impacted by zoonotic diseases, primarily avian influenza which can result in the culling of thousands of poultry and fowl. HPAI poses threat to supply chains and the agricultural activities of the county, especially on the eastern side. The occurrence of HPAI is important to the Colorado State Fair hosted in Pueblo County annually, this event can spread the disease as well as introduce the disease to additional populations. Other government-specific vulnerabilities are shown in **Table 28**.

Table 28 Local Government Vulnerability – Other Community Assets and Activities

Local Government	Local Vulnerability
Pueblo County	Animal disease outbreak could impact the Colorado State Fair and / or our agricultural events / businesses in and around the county.
City of Pueblo	The unhoused populations in the city of Pueblo are vulnerable to animal disease outbreaks. Additionally, animal disease outbreaks can affect the Colorado State Fair.
Pueblo West Metro District	N/A
Colorado City Metro District	N/A
St. Charles Mesa Water District	N/A
Beulah Fire Protection District	N/A

Trends in Development

Consideration of the proximity of new development to wildlife and habitats during land use decisions is crucial to mitigating interactions with vectors and informing public awareness of the risk of zoonotic diseases.

Vector monitoring and intervention ensure public safety by minimizing opportunities for disease development and spread. Future public health and local government collaboration on an integrated pest control management plan including vectors such as mosquitos, rodents, and wildlife, can create cost effective processes. **Table 29** presents additional vulnerability information specific to each government.

Table 29 Local Government Vulnerability – Future Trends in Development

Local Government	Future Development
Pueblo County	Future development is not anticipated to impact vulnerability to this hazard.
City of Pueblo	Future development is not anticipated to impact vulnerability to this hazard.
Pueblo West Metro District	Future development is not anticipated to impact vulnerability to this hazard.

Local Government	Future Development
Colorado City Metro District	Future development is not anticipated to impact vulnerability to this hazard.
St. Charles Mesa Water District	Future development is not anticipated to impact vulnerability to this hazard.
Beulah Fire Protection District	The ranching population has not changed since the last HMP.

Probability of Future Occurrences

The frequency of infections varies greatly based on the vast variety of factors including vectors, incubation time, and location relative to people. The data presented in **Past Events** is the best illustration of how often then infections are occurring.

West Nile Virus (WNV)

Pueblo County will likely see WNV cases in the future, although it may be sporadic based on recent historical reporting. The 2003 data (183 cases) during the initial outbreak of WNV in the county heavily impacts the probability calculations, working out to be an average of 12 reported human infection in any given year. However, a better reflection of the probability is using the more consistent data beginning with 2004 results. These results include 70 cases over the 2004 to 2022 time period in the calculation and result in a 83% chance of an infection for WNV reported in a given year.

Rabies

Based on the data available, it is 100% likely in a given year that the county will have a reported case of rabies infecting a wild animal.

Plague

An infection from plague could potentially occur in the county, although the probability is low. There have been two infections, resulting in death, due to plague reported in the county since 2004, which calculates to a 10% chance of a person dying from plague in any given year.

Tularemia

Based on available data from CDPHE, it is likely there will be another case of tularemia in the county. The number of cases over the period of available data calculates to a 45% chance of a human case of tularemia being reported in any given year.

Hantavirus

The likelihood of a case of hantavirus reported in the county is exceedingly low, as there have been no reported cases in the 30 years since records began in 1993.

Avian Influenza (Bird Flu)

The likelihood of a human infection of avian flu being reported in the county is also exceedingly low, as only one (1) human case has been reported in the state, and country, since the initial outbreak concern in 2005. Potentially there could be infection of fowl and poultry in the county with the avian flu, however determining the probability is limited by available data.

Climate Change Impacts

The World Health Organization states:

> Climate change and rising temperatures lead to the spread of zoonotic hosts and vectors, increasing the human population that is exposed to vector-borne diseases. Rising temperatures further stimulate the rate of reproduction of both pathogens and vectors.

According to the best information available from the 2023 Colorado Enhanced State Hazard Mitigation Plan (CO E-SHMP), the future impacts of climate change are expected to influence future animal disease outbreaks. **Table 30** presents a breakdown of these projected changes in terms of hazard: location, extent/intensity, frequency, and duration.

Table 30 Climate Change Impacts

Impact	Projected Change
Location	The location of hazard impacts is not anticipated to change.
Extent/ Intensity	The extent is projected to increase with climate change. Climate change may increase the prevalence of parasites and diseases that affect livestock (i.e., the earlier onset of spring and warmer winters could allow some parasites and pathogens to survive more easily).
Frequency	Under warmer winter temperatures, new pests and diseases may become established.
Duration	Under warmer winter temperatures, some existing agricultural pests can persist year-round.

6.4 Dam / Levee Incident

General Background

Dam

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

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

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

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

Levee

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

Earthen levees can be damaged in several ways. For instance, strong river currents and waves can erode the surface. Debris and ice carried by floodwaters—and even large objects such as boats or barges—can collide with and gouge the levee. Trees growing on a levee can blow over, leaving a hole where the root wad and soil used to be. Burrowing animals can create holes that enable water to pass through a levee. If severe enough, any of these situations can lead to a zone of weakness that could cause a levee breach.

Earthquakes and ground shaking can cause a loss of soil strength, weakening a levee and possibly resulting in failure. Seismic activity can also cause levees to slide or slump, both of which can lead to failure. Unfortunately, in the rare occurrence when a levee system fails or is overtopped, severe flooding can occur due to increased elevation differences associated with levees and the increased water velocity that is created.

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

Regulatory Oversight

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

Colorado Rules and Regulations for Dam Safety and Dam Construction

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

U.S. Army Corps of Engineers Dam Safety Program

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

Federal Energy Regulatory Commission Dam Safety Program

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

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

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

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

Past Events

Based on best available data there have been no dam incidents and only two (2) levee incidents in the county in the past 100 years. In June 1921, the Arkansas River flooded with enough volume to break levees in several spots and cause the inundation of the Pueblo train depot. In May 2007, a levee on Fountain Creek broke north of Pueblo, flooding a shallow, 50-acre basin with 15 homes and businesses.

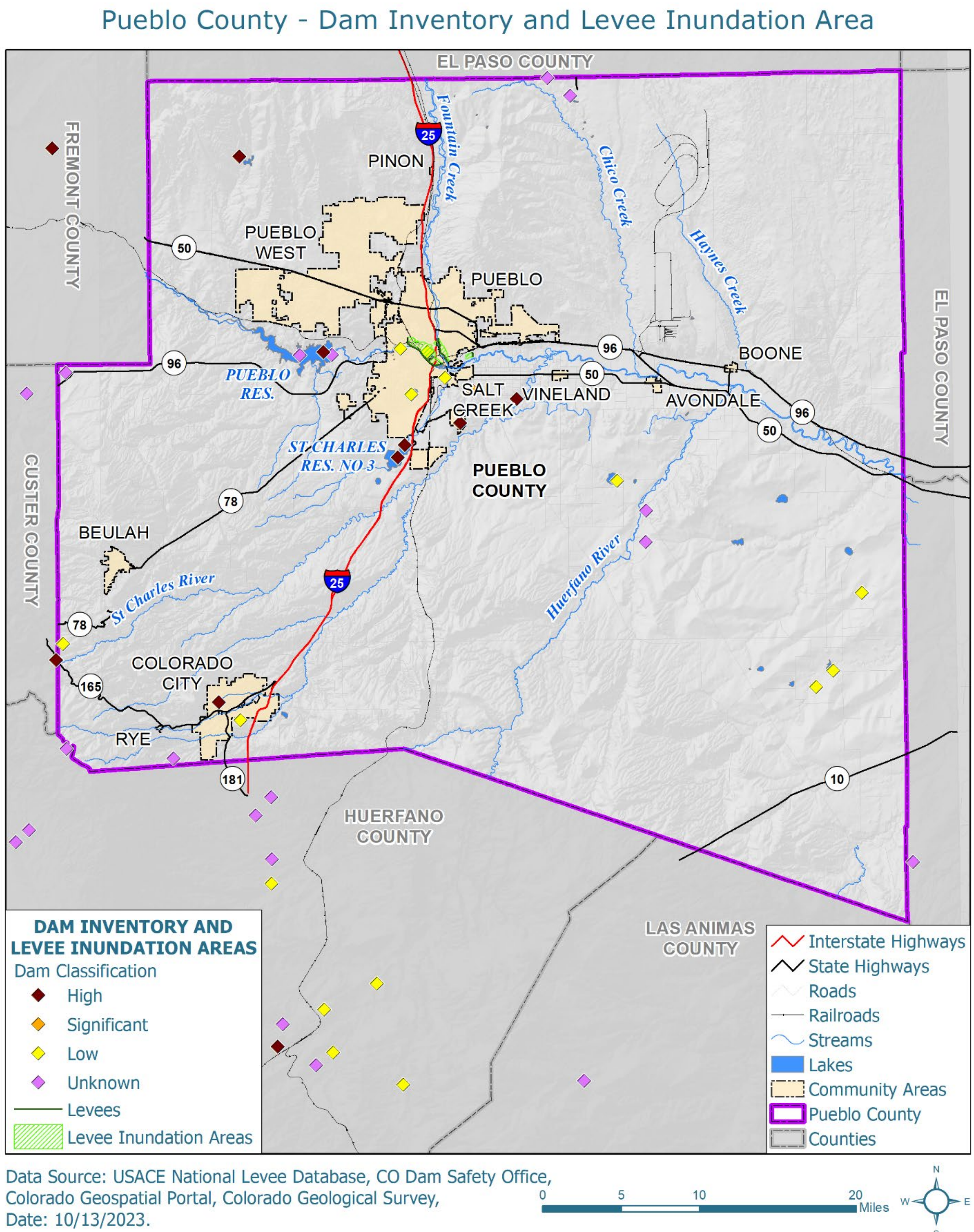
Location

Dam

According to the State of Colorado Division of Water Resources Dam Safety Branch, a total of 44 dams are located in the county. The dam with the oldest recorded date in Pueblo County was constructed in 1870 and the most recent was completed in 1998. A hydroelectric component was constructed for the Pueblo Dam in 2019 which supplies the City of Fountain and Fort Carson with 28 million kilowatt hours of electricity annually, enough to power approximately 2,500 homes.

Figure 18 shows the identified hazard potential for dams across the county.

Figure 18 Pueblo County – Dam Hazard Potential



Of the 44 dams, seven (7) have high hazard ratings and two (2) have significant hazard ratings. All of these dams have Emergency Action Plans (EAP) and inundation mapping. In addition to these dams there are 16 dams rated low hazard and 19 dams rated as no public hazard.

The details and overall condition of the high and significant hazard dams can be seen in **Table 31**. Notably, one (1) high hazard dam, the Beckwith Dam, currently has restrictions imposed by the state due to its unsatisfactory condition.

A classification of unsatisfactory condition indicates definite signs of structural distress (excessive seepage, cracks, slides, sinkholes, severe deterioration, etc.) which could lead to the failure of the dam if the reservoir is used to full capacity. The dam is judged unsafe for full storage of water.

Table 31 High and Significant Hazard Dams in Pueblo County

Dam Name	Hazard Class	EAP	Downstream Town	Town Distance	Year Completed	Overall Conditions
Beckwith	High	Yes	Colorado City	0	1911	Unsatisfactory
Comanche	High	Yes	Pueblo	2	1972	Satisfactory
Pueblo	High	Yes	Pueblo	3	1975	Satisfactory
St. Charles #2	High	Yes	Pueblo	2	1913	Satisfactory
St. Charles #3	High	Yes	Pueblo	2	1913	Conditionally Satisfactory
St. Charles Mesa #2	High	Yes	Pueblo	2	1980	Satisfactory
Teller	High	Yes	Pueblo	19	1910	Not Reported
St. Charles Mesa	Significant	Yes	Pueblo	3	1975	Conditionally Satisfactory

The Pueblo Dam was constructed between 1970 and 1975 as part of the Fryingpan–Arkansas Project. The project was authorized in 1962 for the purpose of supplying water for irrigation, municipal, domestic, and industrial uses and for generating and transmitting hydro-electric power.

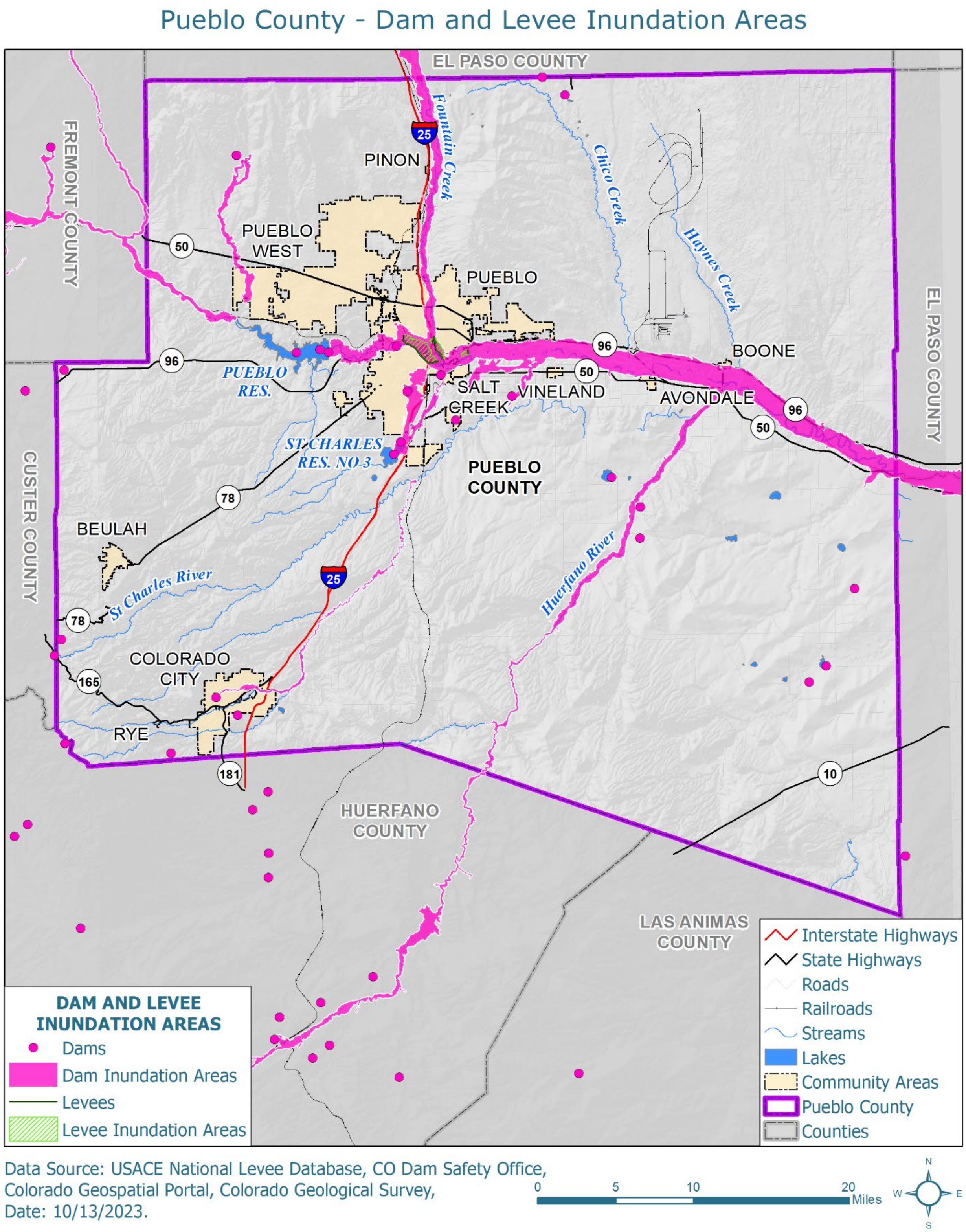
Pueblo Reservoir is one of the few Reclamation reservoirs in Colorado constructed for flood control purposes. That means Pueblo Reservoir fills to its full capacity only in a flood event. By keeping approximately 19 vertical feet, or 66,000 acre-feet, vacant, the dam helps prevent flood water from raging down the Arkansas River, into Pueblo, and east through the plains.

Levee

According to the USACE National Levee Database, there are four (4) levee systems in the county and all of these are accredited by FEMA, which certifies that the levee system reduces the base flood hazard. Three (3) of the levee systems are enrolled in USACE Rehabilitation and Inspection Program (RIP). The RIP program provides inspection and financial assistance for levee systems damaged by floods and storms.

Figure 19 shows dam and levee inundation areas in Pueblo County

Figure 19 Pueblo County – Dam and Levee Inundation Areas



Severity

Dams are classified based on hazard potential as high, significant, or low hazard. This classification is based on the consequences if a dam were to fail, not on the potential of failure or the existing condition of the dam. The hazard potential designation is based on such items as the acre-feet capacity of the dam, distance from the nearest community downstream, population density of the downstream community, and age of the dam. The potential consequences of a dam failure are:

- High Hazard – Probable loss of life
- Significant Hazard – No probable loss of human life but can cause economic loss, environment damage, disruption of lifeline facilities, or other major impacts; often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.
- Low Hazard – No probable loss of human life and low economic or environmental losses; losses are principally limited to the owner's property.

Impacts from a dam incident (controlled or uncontrolled release) will be downstream of the dam and similar to flood impacts, based on the depth, extent, and velocity of the inundation and proximity to people and property.

Pueblo Dam is an earthen embankment dam, with a center concrete section that supports a large spillway. The spillway is designed to *safely* pass floodwaters that would otherwise overflow the dam. If filled to the spillway crest, Pueblo Reservoir can hold 349,940 acre feet of water. One acre foot is approximately 271,000 gallons of water.

USACE requires that the level not exceed 265,000-acres feet by April 15th until the end of the flood season, to provide sufficient capacity for snowmelt and spring rain. Also, a part of the Pueblo Dam's role in flood control is an agreement that the flow at Pueblo Dam may be reduced so that by the time the water reaches the Avondale gauge (east of Pueblo), the flow will not exceed 6,000 cubic feet per second - which could potentially flood downstream towns and agricultural areas. At this gauge, the water is not just coming from the dam but from tributaries of the Arkansas River, therefore the dam can help reduce this cumulative flow.

Warning Time

Warning time for dam or levee incidents vary depending on the cause of the event. In circumstances of extreme precipitation or massive snowmelt, evacuations can typically be planned with sufficient time. In the event of a structural failure, there may be no warning time. A dam's structural type affects warning time, as well. Earthen dams do not tend to fail completely or instantaneously. Once a breach is initiated, discharging water erodes the breach until either the reservoir water is depleted, or the breach resists further erosion. The time of breach formation ranges from a few minutes to a few hours.

Secondary Hazards

Dam incidents can cause severe downstream flooding and debris flow, depending on the magnitude of the event. Spillway overtopping, as dams are designed to do, may also cause downstream flooding in areas not known to be at risk to riverine flooding. Additionally, reservoir releases necessary during times of flooding events may compound the severity of a flood event downstream of these structures.

Landslides around the reservoir perimeter, bank erosion on the rivers, and destruction of downstream habitat are other potential hazards secondary to a dam incident.

A dam incident may cause contamination of drinking water and potential releases of hazard materials. The flooded area can be dangerous even after the waters recede, as extended periods of moisture in buildings can lead to mold and health impacts.

Levee incidents can lead to flooding, potentially in areas that are unexpected or not prone to flooding due to the protection that the levee provides.

Exposure and Vulnerability

Through development of the dam inundation risk assessment, the county identified no data limitations relating to inundation mapping. All readily available data was incorporated into this plan. It was noted that one existing gap is the ability for individuals outside of the County Emergency Manger to freely access Emergency Action Plans (EAPs) and related inundation mapping.

Lifelines

Many Lifelines can be at risk from the effects of a dam or levee incident and resulting flooding; however, Food, Hydration, & Shelter will see the greatest immediate impact. A reservoir that serves as the primary source of drinking water can be disrupted or halted entirely, affecting the day-to-day lives of those who rely on the source, not only those who are in close proximity downstream of the dam. An incident may displace community members which may be for a short period or an extended duration if a home is destroyed.

Other Lifelines that can be affected are Energy, Communications, and Transportation. If a dam is used to generate power, the disruption of delivery to communities would impact daily operations and potentially Communications. If Communication infrastructure is damaged, the disruption or failure of communications can be dangerous for the community, as they may not receive alerts and dispatch can be interrupted. This would also greatly hinder response efforts.

Transportation system damage and interruptions can interfere with evacuations and incident response, including emergency services. If Transportation and Communications are affected, the impact on the Health and Medical Lifeline can be extensive. The Hazardous Material Lifeline can be affected also, as flood waters can lead to release of materials, from facilities downstream and private properties, especially unsecured propane tanks.

Table 32 details the Lifelines that are located in dam inundation areas. Similarly, **Table 33** details the Lifelines that are in levee protected areas. Energy and Transportation lines are measured in miles.

Table 32 Lifelines - Dam Inundation Areas

Lifeline	City of Pueblo	Town of Boone	Town of Rye	Pueblo West Metro District	Colorado City Metro District	Unin-corporated	Total
Energy (Miles)	5.2	0	0	0	0	8.7	**13.9**
Energy	1	0	0	0	0	0	**1**
Transportation (Miles)	59.9	1.6	0	0	0	80.8	**142.7**
Transportation	68	0	0	0	1	0	**69**
Communications	1	0	0	0	0	1	**2**
Food, Hydration, & Shelter	9	0	0	0	1	2	**12**
Health & Medical	27	0	0	0	0	0	**27**
Safety & Security	5	1	0	0	0	1	**7**
Hazardous Materials	0	0	0	0	0	5	**5**

Table 33 Lifelines - Levee Protected Areas

Lifeline	City of Pueblo	Town of Boone	Town of Rye	Pueblo West Metro District	Colorado City Metro District	Unin-corporated	Total
Energy	2.3	0	0	0	0	0	**2.3**

Lifeline	City of Pueblo	Town of Boone	Town of Rye	Pueblo West Metro District	Colorado City Metro District	Unin-corporated	Total
(Miles)							
Energy	1	0	0	0	0	0	**0**
Transportation (Miles)	26.9	0	0	0	0	0	**26.9**
Transportation	13	0	0	0	0	0	**13**
Communications	0	0	0	0	0	0	**0**
Food, Hydration, & Shelter	0	0	0	0	0	0	**0**
Health & Medical	0	0	0	0	0	0	**0**
Security & Safety	3	0	0	0	0	0	**3**
Hazardous Materials	12	0	0	0	0	0	**12**

People

Those in the community with access and functional needs (AFN), located downstream in dam inundation areas (or within levee protected areas), may be incapable of evacuating the area within the necessary time frame. This population includes elderly people, people with disabilities and mobility issues, those with independent living difficulty, those who are institutionalized and those without means of transportation. Non-English speaking populations are also included as communications and emergency messaging may not be available in languages other than English. In general, anyone who does not have adequate access to warnings from an emergency warning system may be disproportionately impacted by the hazard.

Table 34 presents analysis conducted by the Colorado Dam Safety Program. This shows 2020 Census population, by Census Block, that are located within a given dam's mapped dam breach inundation zone.

Table 34 Populations at Risk

Dam Name	Hazard Class	Census 2020 Population	2022 NID Condition Assessment
St. Charles #3	High	7,856	Fair
Pueblo	High	19,920	Satisfactory
St. Charles #2	High	7,841	Satisfactory
Beckwith	High	81	-
St. Charles Mesa #2	Low	483	-
St. Charles Mesa	Significant	1,541	Fair

Structures

All hazard potential classes of dams pose a risk to properties downstream. Vulnerable properties are those closest to, or within, the dam inundation or levee protected areas. Based on an evaluation of best available structure footprint data for the county, there are numerous properties within levee inundation areas. Currently, much of the downtown area is protected by levees from the 100-year flood.

Property damages range greatly after a dam or levee incident, based on the severity of the water release. Structures can be completely washed away or flooded by a relatively small level of water. Any flood has the potential to render buildings uninhabitable, either permanently or for a temporary period while clean up occurs.

Dam / levee incidents also cause damage to infrastructure. Roads or railroads that are blocked or damaged can isolate residents and can prevent access throughout the county. This is especially critical for those needing emergency service providers or for getting crews in to make repairs. Bridges washed out or blocked by floods or debris can also cause isolation. Utilities including power lines, cable, and phone lines may be knocked down or rendered unusable by the waters.

Water and sewer systems can be affected by flooding. Floodwater can back up drainage systems, causing localized flooding. Culverts can be blocked by debris from flood events, also causing localized flooding. Floodwater can get into drinking water supplies, causing contamination. Sewer systems can be backed up, causing wastewater to spill into homes, neighborhoods, rivers, and streams. Underground utilities can also be damaged.

To assess the exposure and vulnerability of structures in Pueblo County, **Table 36** records the building and parcel count as well as the valuation of these structures and land located in dam inundation areas. It should be noted that the inundation mapping that impacts Pueblo West Metro District is no longer accurate. No structures are at risk as the upstream dam (Teller) no longer stores water. This dam is also undergoing major mitigation by USACE, so no future risk is expected should the dam resume holding water (no expected timeline). **Table 35** records those in levee protected areas

Table 35 Structures – Dam Inundation Areas

	City of Pueblo	Town of Boone	Town of Rye	Pueblo West Metro District	Colorado City Metro District	Unincor-porated	Total
Structures							
Building Count	10,105	128	0	112	47	3,597	**13,989**
Parcel Count	7,992	85	0	283	266	2,045	**10,671**
Valuation							
Total Land Value	$147,182,597	$302,622	0	$6,075,556	$2,587,873	$47,502,828	**$203,651,476**
Total Structure Value	$912,954,284	$4,737,071	0	$35,846,268	$10,667,855	$270,002,387	**$1,234,207,865**
Total Value	$1,060,136,881	$5,039,693	0	$41,921,824	$13,255,728	$317,505,215	**$1,437,859,341**

Table 36 Structures – Levee Protected Areas

	City of Pueblo	Town of Boone	Town of Rye	Pueblo West Metro District	Colorado City Metro District	Unincor-porated	Total
Structures							
Building Count	1,927	0	0	0	0	30	**1,957**
Parcel Count	1,823	0	0	0	0	15	**1,838**
Valuation							
Total Land Value	$41,480,452	0	0	0	0	$197,497	**$41,677,949**
Total Structure Value	$216,513,278	0	0	0	0	$2,295,826	**$218,809,104**
Total Value	$257,993,730	0	0	0	0	$2,493,323	**$260,487,053**

Natural, Historic, and Cultural Resources

Dam incidents pose a great risk to the environment in the affected area. Flooding can change the local ecosystem, including permanent displacement of animals and extensive damage to vegetation. Damage to vegetation can contribute to erosion of riverbanks. Erosion can alter the waterway and push silt and debris downstream. The environment closest to the incident will likely be the most impacted; however, the repercussions of flooding can be felt much farther downstream.

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

Other Community Assets and Activities

Depending on the severity of a dam / levee incident there can be drastic effects on the county and regional economies, as well as financial issues for affected residents. Repairs to the dam itself can be considerable and many costs can fall to local agencies, businesses, and private owners. These costs could be considerable if the structures are not insured for floods. Any resulting damage downstream can affect daily operations for an extended period and has the potential to impact critical aspects of the economy such as recreation areas and tourist destinations.

Roads and infrastructure needed for day-to-day operations may be damaged. The transport of goods and travel across the county could be impacted, affecting the supply chain for local industry and the ability for residents to commute.

Agricultural lands can be greatly affected and depending on the time of year crop loss could be severe. Roads and bridges may become impassable and potentially need repairs.

Dam or levee failure aftermath could be detrimental to tourism and recreation in Pueblo County. The area around Pueblo Reservoir is managed by Colorado State Parks and is one of the most visited state parks. Pueblo State Park hosts over one million visitors each year. The fish hatchery and Rock Canyon Swim Beach area were built by Reclamation and are equally popular recreation areas. Other government-specific vulnerabilities are shown in **Table 37**.

Table 37 Local Government Vulnerability – Other Community Assets and Activities

Local Government	Local Vulnerability
Pueblo County	A dam incident could result in the loss of the largest man-made lake in Colorado and all of its accompanying benefits to the community. This would not directly impact county assets, except for the fleet department and offices within the City of Pueblo. An event of this magnitude would have numerous impacts on the county's residents, impacting local economies and major transportation routes (I-25).
City of Pueblo	The City of Pueblo is downstream from the Lake Pueblo State Park Dam. An incident would put much of the City at risk, including the historic downtown. Concerns include: residents within dam inundation areas, city wastewater and potable water treatment infrastructure, communication systems, the Union Ave

Local Government	Local Vulnerability
	Historic District/ Goodnight Barn, and various festivals within the city are all vulnerable to dam incidents.
Pueblo West Metro District	There are no dams upstream of the district that currently store any water. If the Teller Dam ever begins holding water again and would fail, the resulting flooding would be captured over a long distance by a number of control structures between the dam and district.
Colorado City Metro District	In the event if a dam incident 2,500 people could be affected from the loss of potable water. 15 homes, local golf courses, potable waterlines, and well service lines and sewer lines will be impacted.
St. Charles Mesa Water District	With several small(er) dams located around the community, the vulnerabilities faced by dam incidents around the St. Charles Mesa Water District are not as catastrophic as failure at the Pueblo Dam, but homes and agricultural impacts would be felt should dam failures occur at any of these locations.
Beulah Fire Protection District	There are no dams or levees that present any risk to the district.

Trends in Development

Any development downstream of dams in Pueblo County could increase risk and possibly elevate the hazard potential classifications. Pueblo County is expected to have an increase in growth and it is crucial to consider the hazards posed by dams and levees when making any future development and construction decisions. Projected growth between 2020 and 2035 is from 0.6% to 0.7% annually and it is important for municipalities to fully understand the risk presented by dam and levee failures to those vulnerable areas, to ensure new construction does not increase the county's risk to dam / levee failure.

Table 38 presents additional vulnerability information specific to each government.

Table 38 Local Government Vulnerability – Future Trends in Development

Local Government	Future Development
Pueblo County	Population has increased in the past five years resulting in a larger population that could be negatively impacted. Additional infrastructure and structures have

Local Government	Future Development
	been built resulting in a higher number of assets that could suffer damage.
City of Pueblo	Population has increased in the past five years resulting in a larger population that could be negatively impacted. Additional infrastructure and structures have been built resulting in a higher number of assets that could suffer damage.
Pueblo West Metro District	Future development is not anticipated to impact vulnerability to this hazard.
Colorado City Metro District	Growth of new house construction in inundation areas is expected to increase the district's vulnerability.
St. Charles Mesa Water District	Future development is not anticipated to impact vulnerability to this hazard.
Beulah Fire Protection District	Future development is not anticipated to impact vulnerability to this hazard.

Probability of Future Occurrences

Based on best available data, there have been no dam incidents in the county. There have been two (2) levee incidents in the county in the last 100 years, occurring in 1921 and 2007. That equates to a 2% chance of a levee event occurring each year.

The likelihood of future events increases based on multiple factors including structure age, correct operation and regular maintenance, and inspections of dam and levee infrastructure. With the added issue of severe weather events, all dams and levees, many of which may be well maintained and functional, can potentially have more incidents, especially overtopping, spillway discharges, or breaches.

Calculating probability based on past occurrences does not necessarily reflect the actual risk of future occurrence for dam and levee failure. Further information on this risk is unknown. According to the Division of Water Resources 2020 Rules and Regulations for dam safety, low hazard dams have no requirements of the frequency of regulatory inspections; however, there is a schedule for high and significant hazard dams. Low hazard dam condition status utilizes dam owners self-reporting once every three months which is submitted to the State Engineer. This is considered the standard regulatory inspection, unless the owner notifies the State Engineer of issues or proposes alterations to the dam.

Pueblo County has had 21 dams inspected since 2005, only one (1) of which was inspected outside of the last ten (10) years. Inspection results included nine (9) satisfactory and 11 conditionally satisfactory.

A conditionally satisfactory result indicates symptoms of structural distress (seepage, evidence of minor displacements, etc.) which if conditions worsen, could lead to failure of the dam. Essential monitoring, inspection, and maintenance must be performed as a requirement for continued full storage in the reservoir.

This means that at least one-quarter of the dams in the county have current symptoms of structural distress, which fortunately has been brought to the attention of operators, owners, and state officials. For the three (3) high hazard dams with unsatisfactory or conditionally satisfactory rankings, the High Hazard Potential Dam program may be leveraged to reduce the likelihood of a future occurrence.

Climate Change Impacts

Per information contained in the 2023 CO E-SHMP:

With a potential for increases in extreme precipitation events, climate change may result in large floods that could stress dams and levees, and thus potentially increase the risk of failure of these structures. Dams and other hydrologic containment structures are designed based on calculations of a river's flow behavior, and any changes in weather patterns can have significant effects on the hydrologic information used for the design of a dam or levee.

To address some of these impacts, the State Engineer Dam Safety Rules and Regulations for Dam Safety and Dam Construction was recently updated, adding content regarding the atmospheric moisture factor. This involves the calculation of runoff from precipitation to be calculated based on expected increases in temperature and increased atmospheric moisture availability over the 50-year period, 2020-2070.

Climate change may alter the dam/levee profile and affect the designed margin of safety. If freeboard is reduced, dam operators may be forced to release increased volumes of water to maintain the required safety parameters. Such early releases can increase flood potential downstream and possibly involve the spillway.

Additionally, the structural integrity of earthfill dams may be compromised by climate change impacts such as drought and severe storms. Changes in vegetation and prolonged drying due to drought, embankment erosion due to severe storms, and more extreme fluctuations in water levels due to severe storms and increased frequency of drought all make earthfill dams vulnerable to climate change. The structural integrity of non-erodible dams or levees, such as concrete, are less vulnerable to climate change, but extreme temperatures may lead to cracking or joint movement.

6.5 Drought

General Background

Drought is a prolonged period of abnormally low rainfall, leading to a shortage of water and can last for years. Drought is a normal part of the climate cycle, but the slow-moving nature of this hazard can create detrimental losses. While drought is typically thought of as impacting vegetation and crops, there are repercussions of drought across many aspects and sectors of communities. Public water supply, energy production, public health, and wildlife are all affected by drought, as well as the potential increase of wildfires due to the lack of moisture.

The National Oceanic and Atmospheric Administration (NOAA) Drought Task Force Report 2020-2021 explains drought[5]:

> Drought occurs when a water deficit at the land surface ensures that water demands cannot be met. Drought is typically defined based on where water supply and its demand are being considered. For example, most droughts begin due to a period of low precipitation, creating what is known as a meteorological drought. At some point, the low precipitation can dry soils, leading to an agricultural drought. Finally, if river and stream flow is impacted, the drought can become a hydrologic drought.

It is important to note three things: first, not all meteorological droughts become agricultural or hydrologic droughts. Second, agricultural or hydrologic droughts can occur without a meteorological drought, such as through poor water management. Finally, the major socioeconomic impacts of droughts tend to be associated with hydrologic and agricultural droughts, as they more directly affect human-managed systems, like hydropower and agriculture.

Comparison to the norm is used in climatologic observations of precipitation and agricultural measurement compares typical soil moisture and crop conditions to the current data. Hydrologic measures water in various locations, including what is contained in snowpack, reservoirs and ground water levels, and the flow rate of moving water.

The U.S. Drought Monitor releases data showing the areas in the country that are experiencing drought. The data classifies droughts in five categories: abnormally dry (D0), moderate (D1), severe (D2), extreme (D3) and exceptional (D4).

The data is comprised of inputs from the National Drought Mitigation Center (NDMC), US Department of Agriculture (USDA), NOAA, and the National integrated Drought Information System (NIDIS). The information provided by the U.S. Drought Monitor is used to determine disaster declarations across the nation and identify those areas that may be eligible for federal support for losses due to drought.

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[5] NOAA Drought Task Force Report on the 2020–2021 Southwestern U.S. Drought. NOAA Drought Task Force, MAPP, and NIDIS. Mankin JS, Simpson I, Hoell A, Fu R, Lisonbee J, Sheffield A, Barrie D. (2021)

There are multiple federal agencies responsible for mitigation of and response to periods of drought. NOAA and NIDIS lead the monitoring of the situation, with data inputs from the US Geological Survey (USGS) and National Aeronautics and Space Administration (NASA). The USDA leads response efforts, and the Environmental Protection Agency (EPA) regulates water quality impacts. While federal efforts are coordinated, the response efforts, planning, and water laws at the state level vary greatly.

Since drought is specific to local geography, weather patterns, and water usage, the NDMC recommends the definition of drought be decided for each particular area and community, using local data.

Past Events

The U.S. Drought Monitor displays drought data in multiple ways including a time series of drought occurrence in a particular area and percentage of the area affected. Drought data is published weekly which allows for detailed study of the duration and effects on communities of a drought occurrence.

The time series data for Pueblo County is shown in **Figure 20** from January 2000 through November 2022. The percent area of the county in drought is shown on the vertical axis. The drought categories and time period are shown along the horizontal axis.

Figure 20 Pueblo County Percent Area in U.S. Drought Monitor Categories (2000-2022)

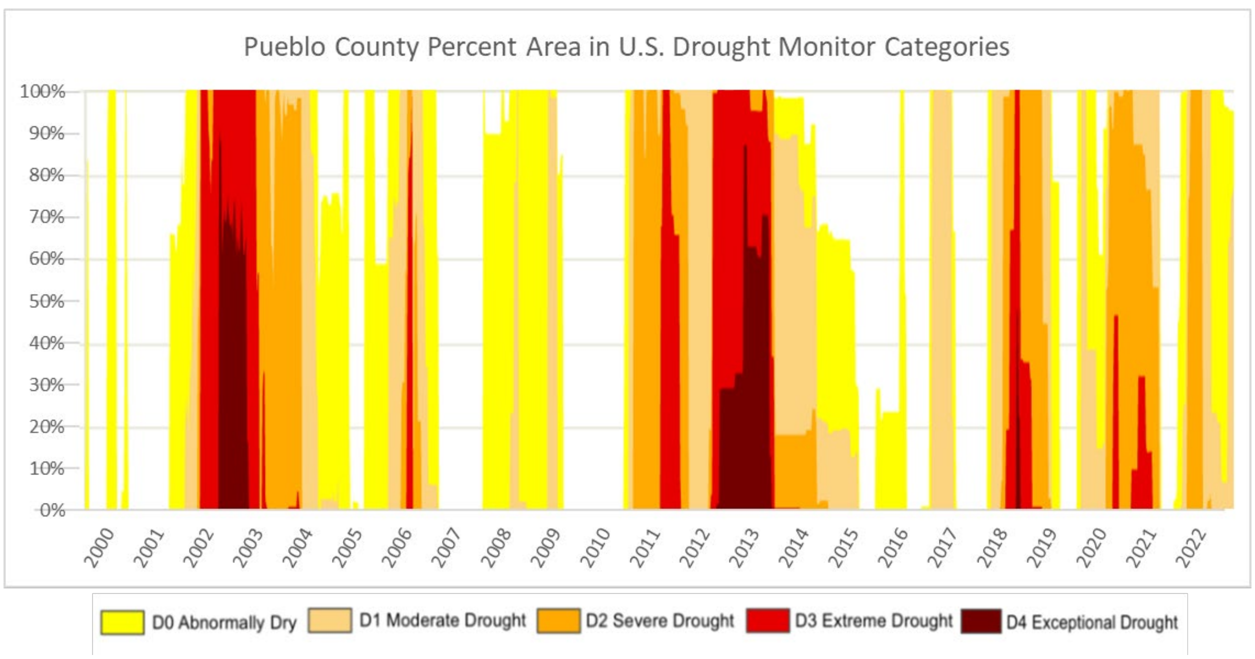


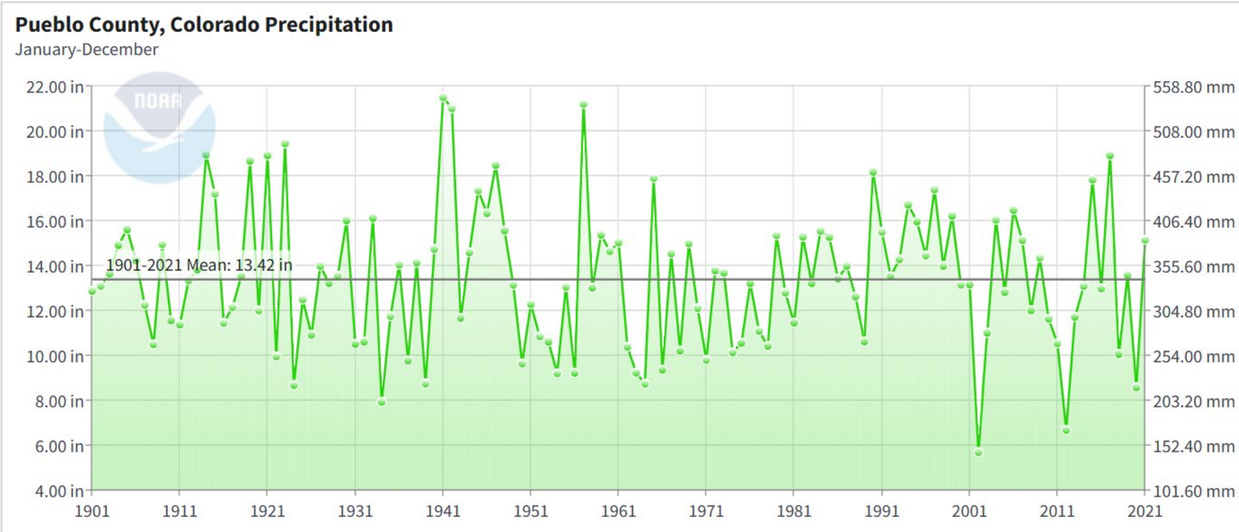
Table 39 highlights the periods of extreme and exceptional drought, based on NDMC data, including the duration of the occurrence and the lowest and highest percentage of the county affected. It is worth noting the common overlap of extreme and exceptional drought categories. For example, in the 2002 to 2003 event, both extreme and exceptional drought occurred. While the exceptional drought area fluctuated often, during that period 100% of the county was in either extreme or exceptional drought.

Table 39 Extreme and Exceptional Drought Events in Pueblo County (2000-2022)

Drought Severity	Period	Lowest Percentage of County Affected	Highest Percentage of County Affected
Extreme	2002 (May) – 2003 (May)	75%	100%
Exceptional	2002 (September) – 2003 (April)	16%	91%
Extreme	2006 (May – July)	43%	100%
Extreme	2011 (June – October)	8%	100%
Extreme	2012 (June) – 2013 (August)	4%	100%
Exceptional	2012 (June) – 2013 (August)	1%	87%
Extreme	2018 (April – December)	1%	100%
Exceptional	2018 – July	23%	46%
Extreme	2020 (June – July)	47%	47%
Extreme	2020 (October) – 2021 (March)	10%	32%

Figure 21 shows the historical precipitation for the county from 1901 to 2021. The average annual precipitation is 13.42 inches. The highest precipitation in a year was 21.52 inches in 1941 and the lowest average annual precipitation is 5.71 inches in 2002. The second lowest precipitation in a year, 6.71 inches, fell in in 2012. This correlates with the exceptional and extreme drought that occurred during those periods.

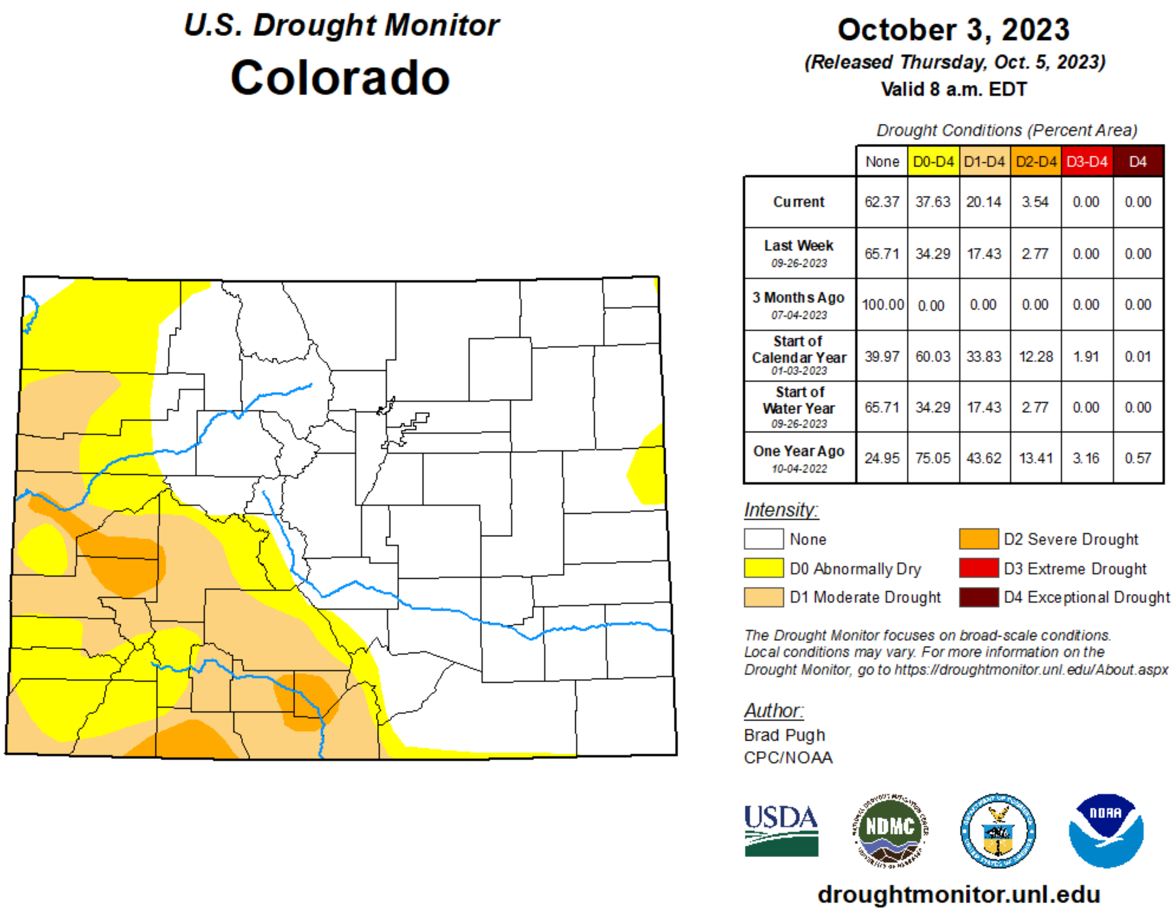
Figure 21 Pueblo County Annual Precipitation (1901 – 2021)



Location

Drought is a regional phenomenon that can affect all areas of the county and participating jurisdictions with similar frequency and severity; however, this can vary across the county. **Figure 22** from NDMC, shows the drought status of the State of Colorado for the week of October 3, 2023. This figure illustrates that at this time there were no drought conditions in all of Pueblo County . It does show drought conditions were being experienced in the Southwest portion of the state.

Figure 22 NDMC Colorado Drought Map



SEVERITY

The severity of drought depends on numerous factors including the degree of moisture deficiency, duration, and size of the affected area. Drought severity categories are based on the possible impacts from the event. **Figure 23**, from NDMC, details the specifics. Pueblo County has experienced all categories of drought, including events of extreme and exceptional drought lasting for extended periods.

Figure 23 Drought Category Possible Impacts

Category	Description	Possible Impacts
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
D1	Moderate Drought	• Some damage to crops, pastures • Streams, reservoirs, or wells low, some water shortages developing or imminent • Voluntary water-use restrictions requested
D2	Severe Drought	• Crop or pasture losses likely • Water shortages common • Water restrictions imposed
D3	Extreme Drought	• Major crop/pasture losses • Widespread water shortages or restrictions
D4	Exceptional Drought	• Exceptional and widespread crop/pasture losses • Shortages of water in reservoirs, streams, and wells creating water emergencies

Warning Time

Only generalized warning can take place due to numerous variables. Currently, scientists are unable to predict drought more than a month in advance for most locations. Predicting drought depends on the ability to forecast precipitation and temperature. Anomalies of precipitation and temperature may last from several months or potentially several decades, depending on interactions between the atmosphere and the oceans, soil moisture and land surface processes, topography, internal dynamics, and the accumulated influence of weather systems on the global scale.

Secondary Hazards

Wildfire is the secondary hazard most commonly associated with drought. A prolonged lack of precipitation dries out vegetation which becomes increasingly susceptible to ignition as the duration of the drought extends. A drought can increase the speed at which dead and fallen trees dry out and become more potent fuel sources for wildfires. Drought may also weaken trees in areas already affected by mountain pine beetle infestations, causing more extensive damage to trees and increasing wildfire risk, at least temporarily. An ongoing drought that severely inhibits natural plant growth cycles may impact critical wildlife habitats.

Drought conditions can cause soil to compact, decreasing its ability to absorb water, making an area more susceptible to flash flooding and erosion. Drought impacts increase with the length of a drought, as carry-over supplies in reservoirs are depleted and water levels in groundwater basins decline.

Water supplies, both for drinking water and agriculture, are at risk due to drought. Many residents in the county rely on private wells and during dry periods the aquifers that supply them are depleted. Water quality can be negatively impacted as well, according to the USGS 2021[6], research has shown that during drought periods levels of arsenic in well waters can increase.

Additionally, a reduction of electric power generation is a potential impact.

Exposure and Vulnerability

Lifelines

The Lifeline most impacted by a drought event is Food, Hydration, & Shelter which includes Agriculture. Droughts can affect people and their livelihoods in a multitude of ways. Most critically, a drought can be detrimental to the supply of drinking water and available water for agricultural use. If a drought affects agricultural yields, food scarcity can become an issue, but the bigger impact is financial, as a decimated harvest can harm the local farmers, regional economy, and influence the greater market for the crop.

The Health and Medical Lifeline can be impacted in the Public Health area, as drinking water quality and availability can quickly be affected in a drought. If availability is an issue, medical facilities may not be able to perform the necessary duties due to sanitary concerns.

People

The effects of water availability and quality on public health is the primary concern in a drought. The immediate concern of availability of safe drinking water during the drought affects everyone in the affected region. Extreme heat that may accompany a drought can be dangerous for community members, especially for the elderly, children, those with chronic health conditions, and those who do not have a way to cool their homes.

[6] Assessing the Impact of Drought on Arsenic Exposure from Private Domestic Wells in the Conterminous United States. Environmental Science & Technology 2021 55 (3), M. Lombard, J. Daniel, Z. Jeddy, L. Hay, and J. Ayotte

Those with breathing difficulties may be impacted if soil is dry and strong winds occur in the area, as air quality can worsen due to dust particles.

Structures

The majority of buildings and infrastructure are typically not affected by drought as they do not depend on water for functionality or stability. However, any power infrastructure that uses water to produce electricity for communities, such as the hydroelectric component of the Pueblo Dam, could be greatly impacted by an extended drought. If water levels are insufficient for generating the necessary power, operations may be halted.

Natural, Historic, and Cultural Resources

The geographic extent of drought can be far reaching and the effects can vary greatly across the impacted areas. In the region, abnormally low precipitation over an extended period puts stress on all ecosystems. As waterways decrease in flow, fish and aquatic plants can suffer and it may be difficult to recover the populations. Vegetation acting as food for animals and important binding for soils can dry out and struggle to grow back. Animals in search of water and food may have to travel farther, which can affect migration and breeding. Natural areas such as wetlands that play an important role in the overall health of the environment can be destroyed if water levels decrease. The risk of wildfires increases as fuel dries out and becomes easier to ignite. Soil erosion resulting from dying vegetation can impact air quality, as strong winds pick up the dry dust.

Other Community Assets and Activities

Pueblo is dependent on agricultural activity for a significant portion of its economic base. The lack of precipitation caused by drought can drastically impact the economy of the county. The loss of crops and livestock due to drought has compounding and long-term consequences for the local economy.

Lack of water, for irrigation and watering livestock, can affect the quality of water that is available as higher salinity concentrations result from water level drops. The lack of water availability will increase costs further limiting the value of the products.

Productivity of crop lands is reduced by drought which decreases yield, and results in crops of lower quality. The income loss for farmers due to a devastated harvest can be felt by the local and regional economies and can last an extended period depending on the length of the drought and possibility of recovery.

Manufacturing, tourism, recreation, and commercial and domestic use can also be impacted by drought. Depending on the needs of a sector, poor water quality could result in higher costs to obtain water from acceptable sources.

It is important to recognize the vast amount of investments in the agricultural industry. Between 1995 and 2020, the USDA has paid over $31 million in disaster payments within Pueblo County, including $8.2 million in livestock disaster assistance and $6.5 million in crop disaster assistance. Almost $4.4

million of the livestock assistance was paid out in 2014, while the crop payments between 2003 and 2005 totaled approximately one-third of the total crop assistance distributed during those years.

In 2019 Pueblo County received the second highest amount of disaster payment funds in Colorado, totaling $2.1 million dollars. These funds supported 20 different organizations across the county.

Other government-specific vulnerabilities are shown in **Table 40**.

Table 40 Local Government Vulnerability – Other Community Assets and Activities

Local Government	Local Vulnerability
Pueblo County	Drought will impact the drinking water supply as well as agriculture and related activities such as farm irrigation.
City of Pueblo	Recreational activities within the City of Pueblo are vulnerable to the impacts of drought events.
Pueblo West Metro District	The Pueblo Reservoir and the annual 4th of July Wet 'N Wild Parade are vulnerable to a drought event.
Colorado City Metro District	In a drought 2,500 people could be affected from the loss of potable water. Local golf courses, potable waterlines, and well service lines and sewer lines will be impacted.
St. Charles Mesa Water District	The SCMWD serves rural / agricultural communities and the impacts from a drought would be large on the community's economy and individual residents.
Beulah Fire Protection District	The elderly populations during water restrictions and ranchers and crops in the area can be impacted. Additional impacts to district wildfire response could be major if water is not available to fight fires.

Trends in Development

Water in the county is sourced from "surface waters", such as creeks, streams, lakes, and reservoirs and drought can drastically impact the population as these sources fluctuate. Leadership has an obligation to the county and communities to mitigate against drought and foster resilience in water management. Developing water management infrastructure, policies, codes, and public education can help to ensure that drought has a lessened effect as development continues. Addressing the pertinent issues during the development stage can help to avoid stressing the water supply unnecessarily, as Pueblo County expects considerable growth in the future.

Table 41 presents additional vulnerability information specific to each government.

Table 41 Local Government Vulnerability – Future Trends in Development

Local Government	Future Development
Pueblo County	Future development will increase water demand, thereby increasing potential vulnerability.
City of Pueblo	Future development will increase water demand, thereby increasing potential vulnerability.
Pueblo West Metro District	Future development will increase water demand, thereby increasing potential vulnerability.
Colorado City Metro District	There has been an increase of 20-25 new houses in the area. This increased population will put additional strain on the water system, thereby increasing potential vulnerability.
St. Charles Mesa Water District	Future development is not anticipated to impact vulnerability to this hazard.
Beulah Fire Protection District	Population has increased resulting in a higher use of the water system and more risk during times of drought.

Probability of Future Occurrences

As presented in **Table 25** earlier in this chapter, drought reported impacts in Pueblo County have resulted in USDA Secretarial Disaster Declarations during roughly 79% of the years since 2003.

Colorado is semiarid, thus, drought is a regular and natural occurrence in the state. The main source of water supply in the state is precipitation and much of this occurs in the winter as snowfall. Although drought conditions are difficult to predict, low levels of winter snowpack may act as an indicator that drought conditions are occurring.

The occurrences of drought in Pueblo County are an example of the hazard's cyclical nature. While drought duration and severity cannot be easily predicted, the pattern shows that since 2000 the county was in extreme drought 30% of the time. The greater concern is the potential pattern of exceptional drought lasting up to a year, which occurred twice in two (2) decades.

Drought will occur within the county in the future based on the data which shows in the last 22 years, there have been only 4 years without a drought event. Pueblo County experienced drought events during 82% of the past two-decade period.

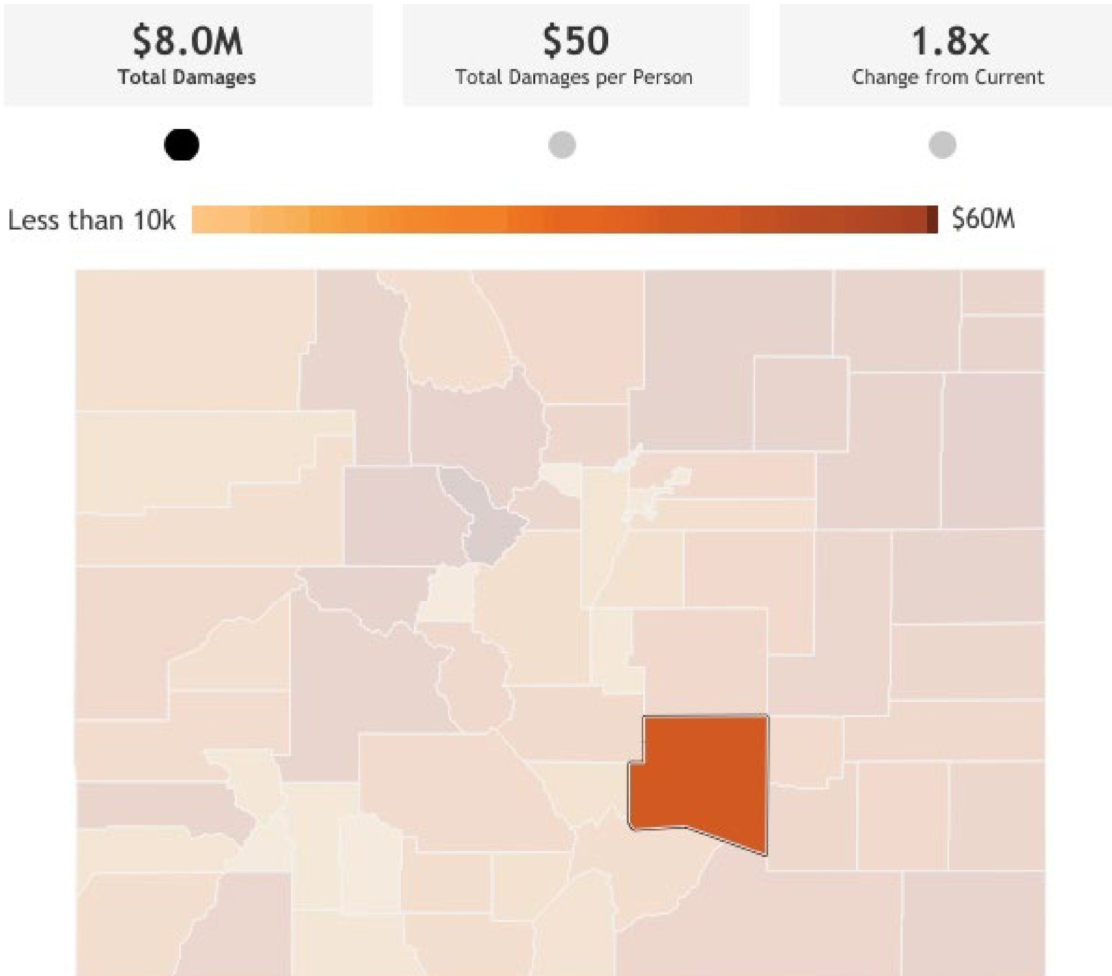
Climate Change Impacts

Per information contained in the CO E-SHMP, future climate scenarios suggest that several factors will lead to more frequent and more intense droughts in Colorado. These variables include a warmer and drier climate, less snowpack, lower streamflow amounts, and less surface water availability. These impacts will strain the water resource needs of Pueblo County and stress people, agriculture, and ecosystems. Increased drought will likely lead to increased risk from wildfire and insect outbreaks.

The 2023 CO E- SHMP further highlights the Future Avoided Cost Explorer (FACE) tool which was developed by the state to understand the economic impacts of flood, drought, and wildfire looking forward to 2050. It estimates the expected cost impacts of these three hazards on a selection of economic sectors, under future climate and population scenarios. These costs are expressed in expected annual damages, which are a function of the hazard magnitude, probability, and exposed assets.

For modeling drought scenarios two economic sectors were analyzed, cattle and crops. For the buildings sector, county-level changes in population were assessed to determine where increased development would occur. **Figure 24** from FACE estimates the potential future losses that drought will cause in the projected more severe climate. In Pueblo County, without any change to population growth, the county is expected to incur $8 million in damages from future flood events, a $3.6 million increase from current conditions.

Figure 24 Pueblo County Drought Damages - More Severe Climate



6.6 Earthquake

General Background

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

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

Geologists classify faults by their relative hazards. Active faults which represent the highest hazard, are those that have ruptured to the ground surface during the Holocene period (about the last 11,000 years). Potentially active faults are those that displaced layers of rock from the Quaternary period (the last 1,800,000 years). Determining if a fault is "active" or "potentially active" depends on geologic evidence which may not be available for every fault.

Faults are more likely to produce earthquakes if they have more rapid rates of movement, have had recent earthquakes along them, experience greater total displacements, and are aligned so that movement can relieve accumulating tectonic stresses. A direct relationship exists between a fault's length, location, and its ability to generate damaging ground motion at a given site.

Liquefaction

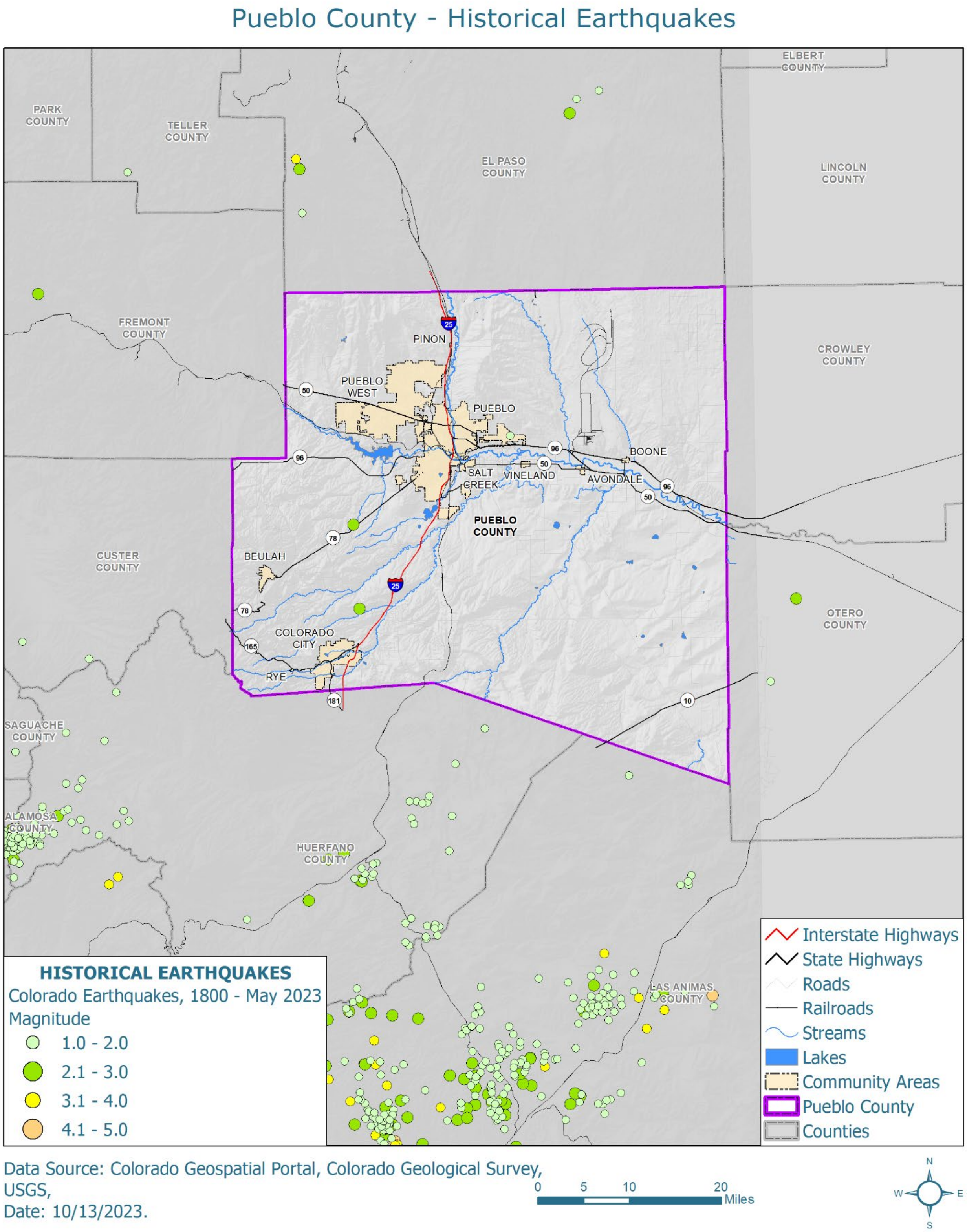
Liquefaction occurs when loose sediment that is saturated by water temporarily loses strength in response to ground shaking and acts as a fluid. When liquefaction occurs, buildings and cars can sink into the ground, slopes fail, buried tanks and pipes can rise to ground level, and lateral spreading can occur. Lateral spreading is when level ground shifts laterally, sometimes for tens of feet.

The liquified material can force open ground cracks to release to the surface and can cause debris flows or flooding. Factors for whether liquefaction will occur include the degree of saturation, the grain size distribution and consistency of the soil, as well as the duration and magnitude of the shaking.

Past Events

Figure 25 shows the location of historical earthquakes in Pueblo County and across the region.

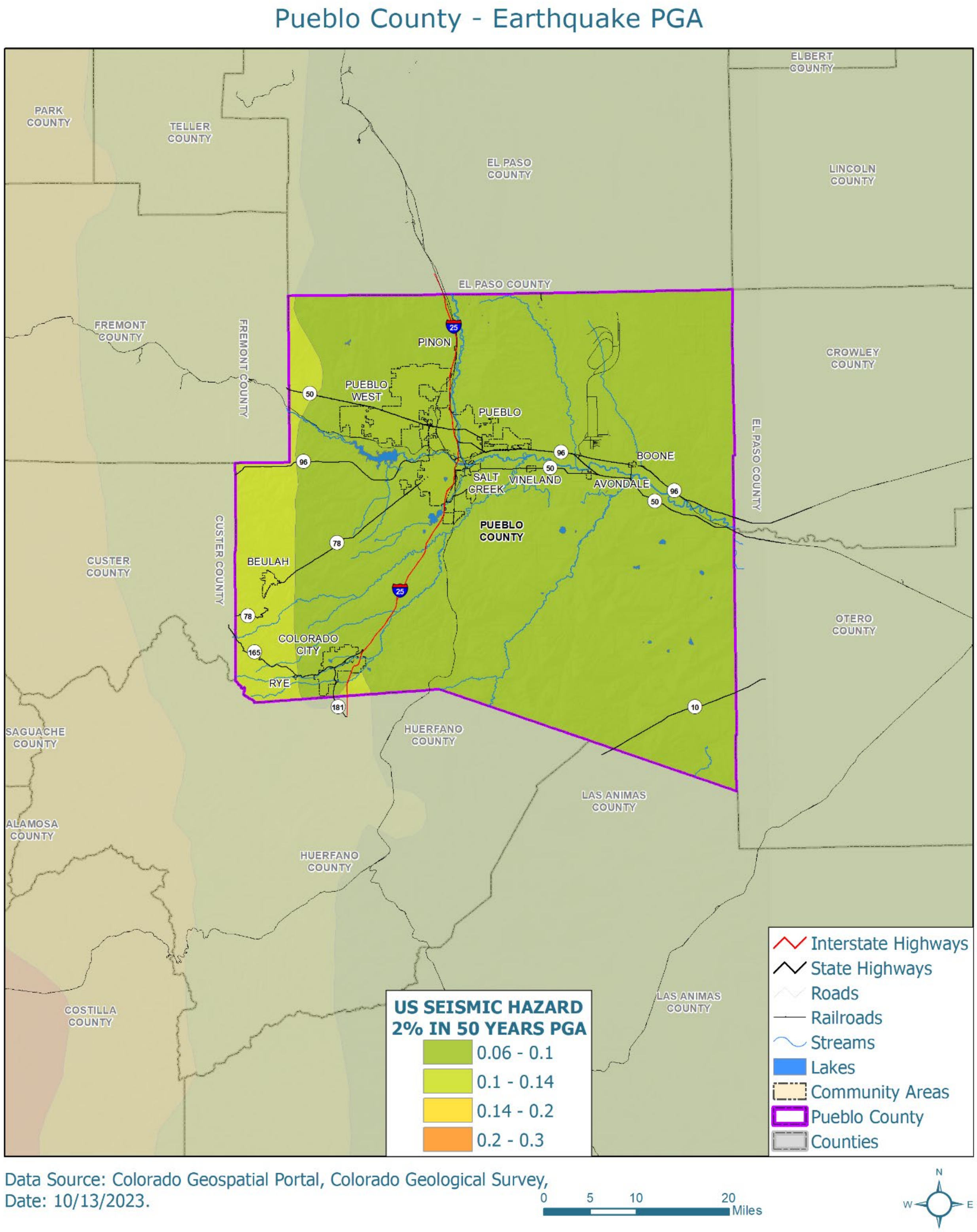
Figure 25 Pueblo County Historical Earthquakes (1800-2023)



Location

Earthquakes have the potential to impact all areas of the county. Peak ground acceleration (PGA) is a measure of the maximum force experienced by a small mass located at the surface of the ground during an earthquake. A higher PGA roughly equates to more intense shaking. **Figure 26** shows the USGS's modeled PGA based on velocity calculations for the top 30 meters of soil/bedrock. This data is being utilized because it takes into account the state's topographic variability. These VS30 (variable sub 30) values are estimated using topographic slope as a proxy .

Figure 26 Pueblo County Earthquake PGA



Severity

Earthquakes can last from a few seconds to over 5 minutes; they may also occur as a series of tremors over several days. The actual movement of the ground in an earthquake is seldom the direct cause of injury or death. Casualties generally result from falling objects and debris, because the shocks shake, damage, or demolish buildings and other structures. Disruption of communications, electrical power supplies and gas, sewer, and water lines should be expected. Earthquakes may trigger fires, dam failures, landslides, or releases of hazardous materials compounding their disastrous effects.

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

The impact of an earthquake is largely a function of the following components:

- Ground shaking (ground motion accelerations)
- Liquefaction (soil instability)
- Distance from the source (both horizontally and vertically)

Earthquakes can cause structural damage, injury, and loss of life, as well as damage to infrastructure networks, such as water, power, communication, and transportation lines. Damage and life loss can be particularly devastating in communities where buildings were not designed to withstand seismic forces (e.g., older or historic structures, buildings not constructed to code). Other damage-causing effects of earthquakes include surface rupture, fissuring, settlement, and permanent horizontal and vertical shifting of the ground.

Earthquakes are typically classified in one of two ways: by the impact on people and structures, measured as intensity; or by the amount of energy released, measured as magnitude. **Table 42** presents the Modified Mercalli Intensity Scale aligned with the Richter Scale Magnitude to show how these classifications approximately align.

Table 42 Modified Mercalli Intensity Scale

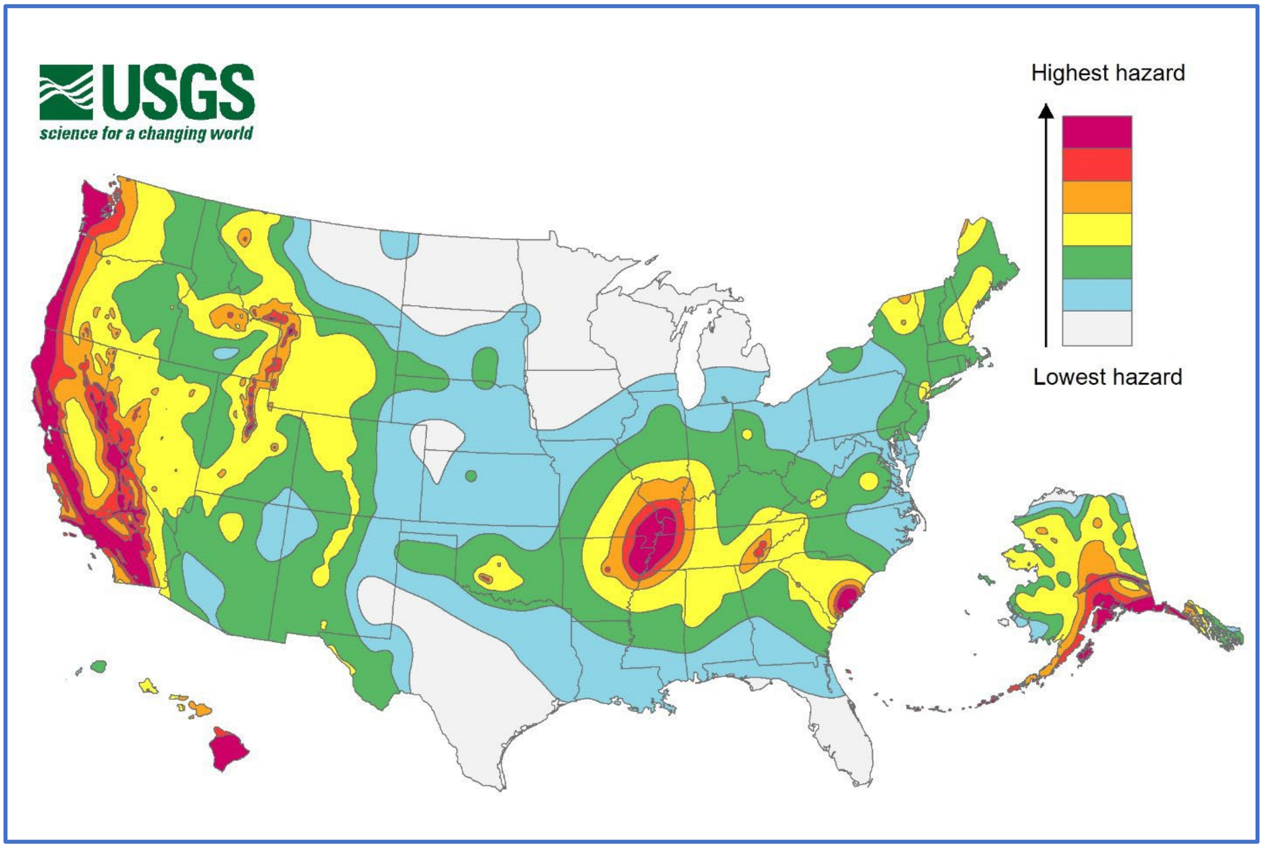
Scale	Intensity	Description of Effects	PGA (g)	Richter Scale Magnitude
I	Instrumental	Detected mostly by instruments.	<0.0017	<4.2
II	Feeble	Some people feel it		

Scale	Intensity	Description of Effects	PGA (g)	Richter Scale Magnitude
III	Slight	Felt by people indoors, like a truck rumbling by	0.0018-0.014	
IV	Moderate	Felt by people walking	0.015-0.039	<4.8
V	Slightly Strong	Sleepers are awakened, dishes and windows disturbed	0.040-0.092	<5.4
VI	Strong	Trees sway, suspended objects swing, objects fall off shelves	0.093-0.18	<6.1
VII	Very Strong	Mild alarm, walls crack, plaster falls	0.19-0.34	<6.9
VIII	Destructive	Moving cars are uncontrollable, poorly constructed buildings greatly damaged	0.35-0.65	
IX	Ruinous	Some houses collapse, ground cracks, pipes break open	0.66-1.24	<7.3
X	Disastrous	Significant ground cracks and many buildings destroyed. Liquefactions and landslides occur	>1.24	<8.0
XI	Very Disastrous	Buildings and bridges collapse, roads, railways, pipes, and cables destroyed, other hazards triggered	>1.24	<8.1
XII	Catastrophic	Total destruction. Waves are seen on the ground surface.	>1.24	>8.1

The USGS created a map to illustrate overall hazard potential across the country**. Figure 1.27** shows the long-term national seismic hazard. The figure, per the USGS description:

Earthquake hazard map showing peak ground accelerations having a 2 percent probability of being exceeded in 50 years, for a firm rock site. The map is based on the most recent USGS models for the conterminous UI (2018) .... The models are based on seismicity and fault-slip rates, and take into account the frequency of earthquakes of various magnitudes. Locally, the hazard may be greater than shown because site geology may amplify ground motions.

Figure 1.27 Long-term Seismic Hazard Map (2018)



Warning Time

There is currently no reliable way to predict the day or month that an earthquake will occur at any given location. Research is being done with warning systems that use the low energy waves that precede major earthquakes. These potential warning systems give approximately 40 seconds notice that a major earthquake is about to occur. The warning time is very short, but it could allow for someone to get under a desk, step away from a hazardous material they are working with, or shut down a computer system.

The main shock of an earthquake can usually be measured in seconds, and rarely lasts for more than a minute. Aftershocks can occur within the days, weeks, and even months following a major earthquake.

Secondary Hazards

Earthquakes have the potential to cause a variety of secondary hazards including avalanche, dam failure, landslide, and subsidence. An earthquake can also trigger a hazardous materials release, transportation impacts, ignite urban fires, and cause utility disruption, such as flooding from severed water pipelines.

Exposure and Vulnerability

When assessing the risk for seismic hazards the FEMA Hazus Loss estimation software (Hazus) which models the effects of various event scenarios, is the most appropriate tool. Using Hazus as a scenario modeling tool provides an acceptable means of forecasting earthquake damage, loss of infrastructure functionality, casualties, and numerous other factors.

Hazus 5.1 was used to conduct an earthquake analysis which was modeled using a 5.0 magnitude probabilistic event. This is the lowest magnitude that Hazus can assess, which exceeds known historical events in and around Pueblo County, but does equal historical events across the region. The model utilized a 2,500 year return period. This return period equates to a 2% probability of occurrence in 50 years and is the return period used by the International Building Code as the basis for seismic building design. This scenario was used because it represents a "worst case scenario" and included an analysis of approximately 70,000 buildings which have an aggregate total replacement value of $25 billion.

The Hazus software include a number of variables in order to arrive at the estimated values of loss and these loss estimates should not be taken as precise measures. This information should be viewed from the perspective of potential magnitude of expected losses. Details on the Hazus loss estimations are included in the applicable following sections. The full Hazus report can be found in **Annex E – FEMA Hazus Earthquake Risk Report**.

Lifelines

All Lifelines can be impacted significantly by an earthquake. Even with minimal damage Food, Hydration, & Shelter can be greatly affected due to need for sheltering displaced individuals, the likelihood of water pipelines leaking and breaking, and the possible contamination of the drinking water supply.

Infrastructure damage to Communications, Energy, and Transportation can range from minimal impacts on functionality to systems completely unable to provide information and power to the community. Transportation can be slowed by small upheavals in pavements or completely halted due to downed bridges or impassable roadways.

Health and Medical operations can be disrupted due to building damage or inability to transport patients. Fatality management may be needed on a large scale. Safety and Security may be unable to meet community needs if there is building or equipment damage. Hazardous Materials have the potential to be released from facilities or impacted in transit.

People

All people in the county are at risk to earthquakes. Depending on the location, magnitude, and other characteristics of the event, the effect on life safety can vary drastically. In a populated, developed area the risk of people being harmed is much higher than in an event that affects a rural area. Community members residing in multi-unit structures are vulnerable to the impacts of earthquakes, especially if their building is unstable or not built to current building codes.

Hazus analysis estimates:

- The most injuries are estimated for an event occurring mid-afternoon with 27 injuries requiring medical attention and 3 requiring hospitalization
- 43 households are expected to be displaces as a result of an earthquake
- 25 individuals will seek temporary public shelter in the event of an earthquake

Structures

There are many factors that affect the property damage an earthquake is capable of inflicting. Age and type of a building, as well as the materials used in construction all contribute to the likelihood of withstanding an earthquake with minimal damage. Historic buildings are especially at risk for these reasons.

Buildings constructed to meet updated codes or retrofitted to bring them up to code are at an advantage if an event were to happen. These codes are rated to a certain level of seismic activity; however, if an event of higher magnitude happens, serious damage is still possible.

Earthquakes can also rupture pipeline leading to sink holes causing damages to roads. Seismic waves can also cause damages to bridges, tunnels, sewer lines, and railways.

Damages from an earthquake can be broad, from minor cosmetic cracking to rendering a building uninhabitable. The variables of an event, as well as characteristics and the specifics of each building make estimation of damages difficult.

Hazus data estimates:

- 1,459 buildings will be moderately damaged, five will be damaged beyond repair
- Highway and railway infrastructure will not sustain moderate or complete damage
- The total building-related losses total $178 million

Natural, Historic and Cultural Resources

Earthquakes can change the very landscape of an environment, as ground openings, liquefaction, and landslides are possible. Wildlife may leave the area for an extended period, especially if an ecosystem is impacted. The secondary impacts of a dam failure or fire being ignited could have devastating effects in addition to the damage from the earthquake.

Other Community Assets and Activities

Earthquakes have the potential to impact the economy on a large scale. Depending on the magnitude and location of the earthquake there could be extensive damage to infrastructure, buildings, and roads. Major damage to any of these would disrupt daily operations and require considerable construction and repairs. The duration of recovery could have a significant effect on the ability of businesses to reopen.

Other government-specific vulnerabilities are shown in **Table 43**.

Table 43 Local Government Vulnerability – Other Community Assets and Activities

Local Government	Local Vulnerability
Pueblo County	An earthquake event would impact high-rise structures and buried critical infrastructure within the county.
City of Pueblo	Low-income housing, high-rise senior living centers, utility and communication infrastructure, and historic buildings within the City of Pueblo are vulnerable to an earthquake event.
Pueblo West Metro District	Critical infrastructure within Pueblo West is buried water lines, some of an aging and antiquated type, making it vulnerable to an earthquake event. Impacts could rupture these lines and cut off the water supply.
Colorado City Metro District	In the event of an earthquake 2,500 People could be affected from the loss of potable water. Potable waterlines, and well service lines and sewer lines will be impacted.
St. Charles Mesa Water District	In-ground water delivery systems and district buildings would be vulnerable during a large-scale earthquake event. Impacts could lead to a lack of potable water for the district and the destruction of structures.
Beulah Fire Protection District	District assets at risk include aging structures. Impacts to ingress/egress could be major. At-risk timber could be vulnerable during large-scale earthquake events in the Beulah Valley.

Trends in Development

The adoption of the most recent building codes is crucial to public safety, as growth continues and development increases. Adherence and enforcement of these codes, and ensuring the continued adoption of building code updates, will ensure construction is built to seismic standards, thereby mitigating future vulnerability increases due to growth.

Table 6.44 presents additional vulnerability information specific to each government.

Table 6.44 Local Government Vulnerability – Future Trends in Development

Local Government	Future Development
Pueblo County	Future development is not anticipated to impact vulnerability to this hazard.
City of Pueblo	Future development is not anticipated to impact vulnerability to this hazard.
Pueblo West Metro District	Future development is not anticipated to impact vulnerability to this hazard.
Colorado City Metro District	Future development is not anticipated to impact vulnerability to this hazard.
St. Charles Mesa Water District	Future development is not anticipated to impact vulnerability to this hazard.
Beulah Fire Protection District	Future development is not anticipated to impact vulnerability to this hazard.

Probability of Future Occurrences

By studying the geologic characteristics of faults, geoscientists can often estimate when the fault last moved and estimate the magnitude of the earthquake that produced the last movement. Because the occurrence of earthquakes is relatively infrequent in Colorado and the historical earthquake record is short, it is difficult to estimate magnitude, timing, or location of any future events.

Based on the historical record of three earthquake epicenters in the county since 1800, there is a roughly one-percent annual chance of an event occurring within Pueblo County.

Climate Change Impacts

Per the CO E-SHMP, the impacts of global climate change on earthquake probability are unknown.

Secondary impacts of earthquakes could be magnified by climate change. Soils saturated by repetitive storms could experience liquefaction during seismic activity due to the increased saturation. Dams storing increased volumes of water due to changes in the hydrograph could fail during seismic events. There are currently no models available to estimate these impacts.

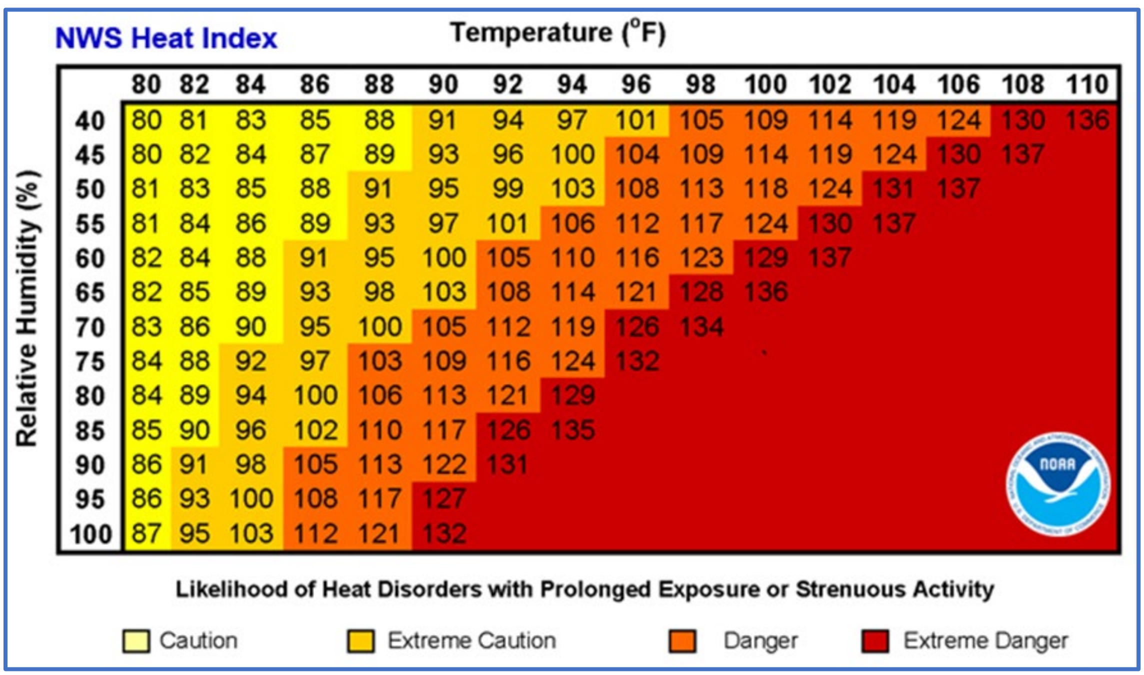
6.7 Extreme Heat

General Background

Excessive heat events are characterized by the U.S. Environmental Protection Agency (EPA) as "summertime weather that is substantially hotter or more humid than average for a location at that time of year". Criteria that define an excessive heat event may differ among jurisdictions and within the same jurisdiction depending on the time of year. Excessive heat events are often a result of more than just ambient air temperature. Heat index tables (**Figure 28**) are commonly used to provide information about how hot it feels which is based on the interactions between several meteorological conditions. Since heat index values were devised for shady, light wind conditions, exposure to full sunshine can increase heat index values by up to 15°F. Also, strong winds which can be produced by very hot, dry air, can be extremely hazardous.

According to the North America Land Data Assimilation System (NLDAS), extreme heat events are also characterized as periods with a duration of at least 2 or 3 consecutive days, in which an absolute threshold or threshold relative to the jurisdiction is surpassed.

Figure 28 NWS Heat Index

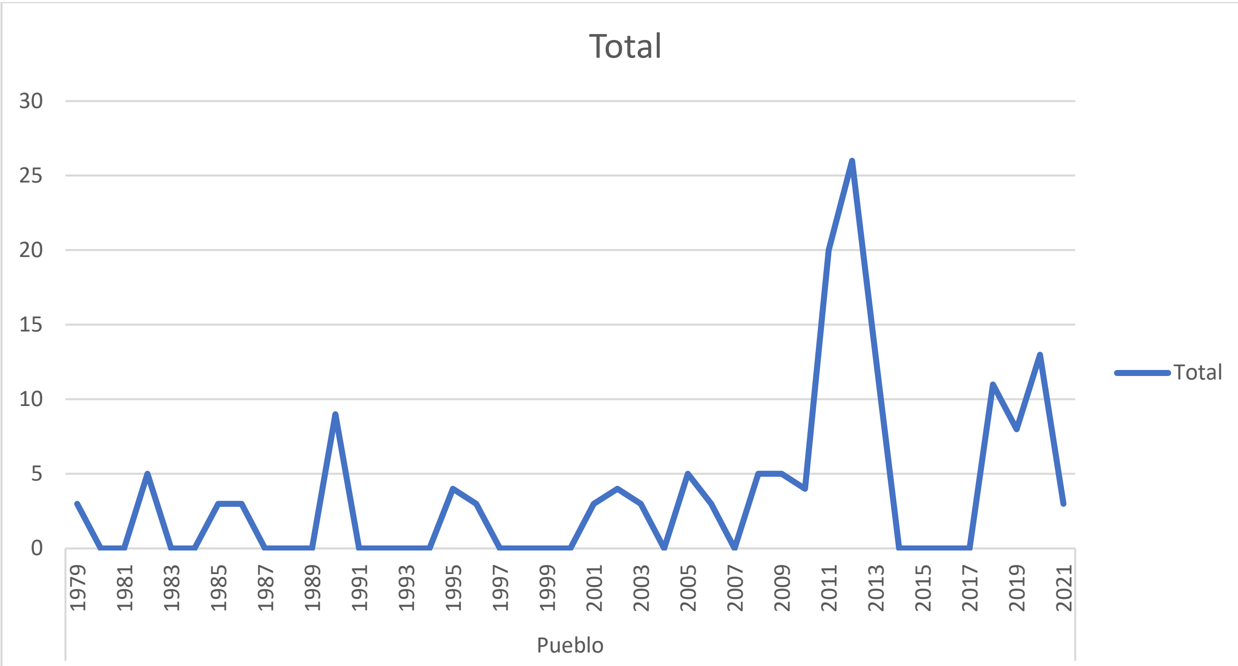

NWS Heat Index

Relative Humidity (%) \ Temperature (°F)	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										

Past Events

There have been numerous extreme heat events in Pueblo County since 1979. In 2010 63% of extreme heat events in Colorado occurred in Pueblo County, a higher rate than all other counties in the state. **Figure 29** shows the distribution of extreme heat events in Pueblo County.

Figure 29 Extreme Heat Events 1979-2021



Location

The entire county is at risk to extreme heat events; however, these events may be exacerbated in more urban areas. This is due to the reduced air flow, reduced vegetation, and increased generation of waste heat which can contribute to temperatures that are several degrees higher than in surrounding rural or less urbanized areas. This phenomenon is known as urban heat island effect.

Severity

Severity depends upon multiple factors, not just meteorological. While departure from typical temperatures are the basics of an event occurring, exposure and inability to find respite can drastically increase risk and prove deadly. The characteristics of the building people are housed in and whether there is air conditioning or other temperature control means also have considerable impacts. Populations susceptible to heat for health reasons or due to occupation, such as construction or agriculture, can be affected even if it is not considered an extreme heat event.

Temperatures abnormal to the area for extended periods contribute to sunstroke, heat cramps, and heat exhaustion. Pets and livestock are also vulnerable to heat-related injuries. Crops can be vulnerable as well.

Warning Time

NOAA issues outlooks for extreme heat 8-14 days, as well as 3-7 days in advance and provides hourly forecasts, advisories, watches, and warnings when dangerous heat becomes likely or imminent.

The NWS has implemented a new tool called HeatRisk, which rates heat risk (shown in **Figure 30**) based on variables like temperature, sun angle, and UV index. While tool does not factor in humidity as the classic heat index does, humidity is not an important variable when gauging heat risk in drier climates.[7] HeatRisk is expected to improve communication of dangerous extreme heat temperatures during peak afternoon hours.

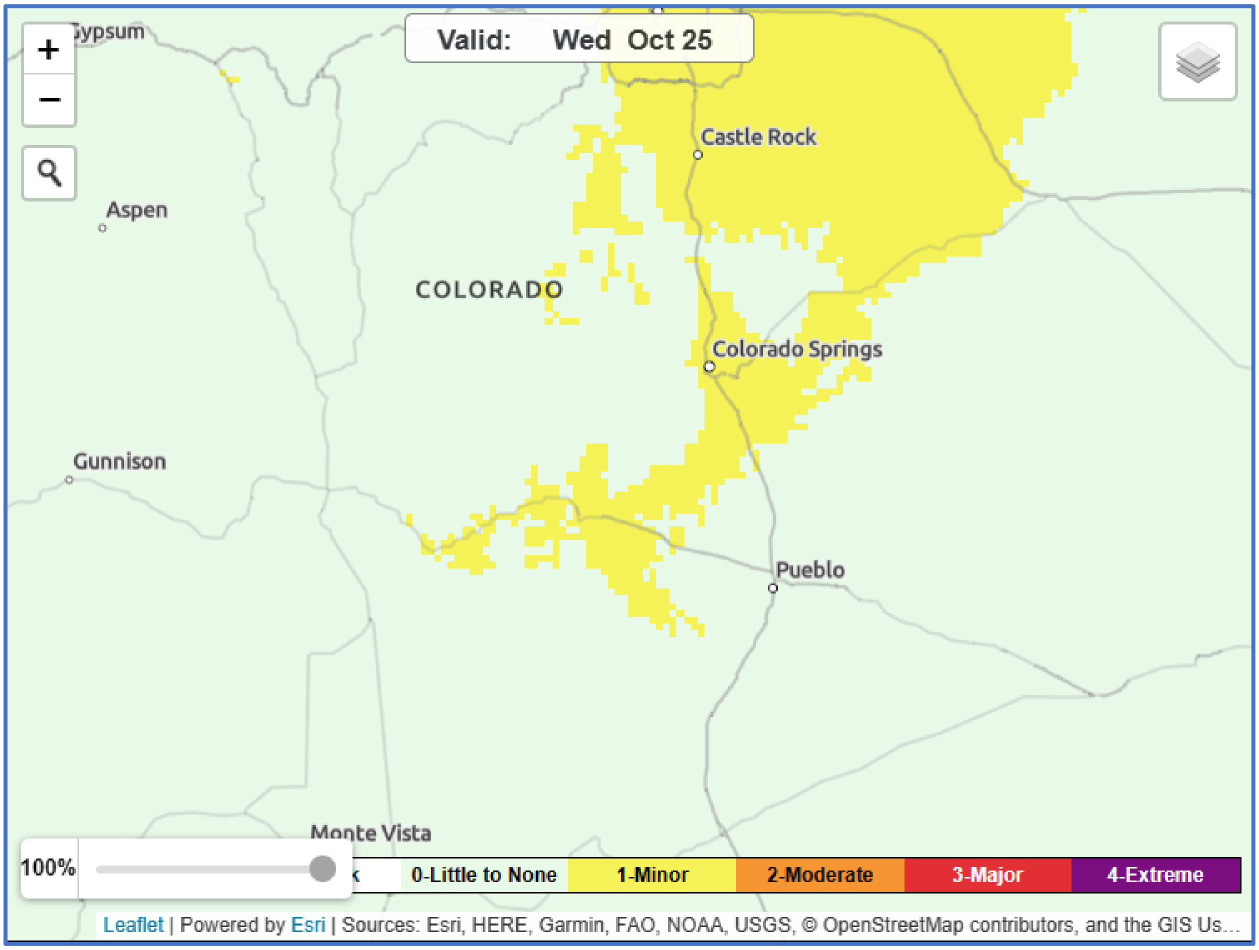
Figure 31 illustrates the heat risk ranking for Pueblo and surrounding areas on Wednesday October 25, 2023.

Figure 30 HeatRisk Heat Risk Rankings

Category	Risk of Heat-Related Impacts
Green 0	Little to no risk from expected heat.
Yellow 1	Minor - This level of heat affects primarily those individuals extremely sensitive to heat, especially when outdoors without effective cooling and/or adequate hydration.
Orange 2	Moderate - This level of heat affects most individuals sensitive to heat, especially those without effective cooling and/or adequate hydration. Impacts possible in some health systems and in heat-sensitive industries.
Red 3	Major - This level of heat affects anyone without effective cooling and/or adequate hydration. Impacts likely in some health systems, heat-sensitive industries and infrastructure.
Magenta 4	Extreme - This level of rare and/or long-duration extreme heat with little to no overnight relief affects anyone without effective cooling and/or adequate hydration. Impacts likely in most health systems, heat-sensitive industries and infrastructure.

[7] Colorado is likely to see more heat advisories this summer (koaa.com)

Figure 31 HeatRisk Map October 25, 2023



Secondary Hazards

Excessive heat events can cause failure of motorized systems such as ventilation systems used to control temperatures inside buildings. They can also further magnify drought conditions and effects, as well as increase wildfire risk.

Exposure and Vulnerability

Lifelines

The Energy Lifeline can be impacted by extreme heat events as power outages may occur. Additionally, the Transportation Lifeline may experience disruption in services due to infrastructure damage. According to the CO E-SHMP, concrete pavements have experienced "blowouts or heaves" both on local highway and the higher volume parkway and interstate systems. Blowouts occur when pavements expand and cannot function properly within their allotted spaces. Pavement sections may rise up several inches during such events. These conditions can cause motor vehicle accidents in their initial stages and can shut down traffic lanes or roadways entirely until such times as the conditions are mitigated.

People

All people are at risk of the effects of extreme heat; however, certain populations are less able to cope with the effects. Those who are 65 years and older, children, and those with access and functional needs are especially at risk of adverse impacts. People living in social isolation may be unable to get the assistance they need if the heat begins to affect them, such as losing consciousness. People who traditionally work outside such as agricultural workers, construction workers, utility workers, and others are at considerable risk due to extended time outside doing extensive manual work.

It is critical these populations be identified in Pueblo County, to ensure proper steps are taken to keep people safe and healthy. This may include cooling stations and community outreach to bring people to cooler areas.

Structures

The only impact extreme heat has on general building stock is increased demand on air conditioning equipment which in turn may cause strain on electrical systems. Roadways, bridges, rail lines, and power lines and substations have been identified as at high risk of damage. These assets may require more frequent repair or replacement with more heat resistant options.

Natural, Historic, and Cultural Resources

In arid regions such as Colorado, extreme heat will exacerbate drought conditions and increase water shortages. This can lead to negative impacts across all of the state's ecosystems.

These conditions will also negatively impact the agricultural sector. Heat stress can affect the liveweight gain, milk yield, and fertility of livestock, negatively impacting financial yields for farmers. Heat also threatens animal welfare as livestock is placed at risk of dehydration and other heat related illnesses without adequate cooling and potable water supply. Crops are also adversely affected by extreme heat. Crops in extreme heat experience higher stress, reducing plant growth and in turn crop yields.

Other Community Assets and Activities

Extreme heat events are not likely to have direct impacts on the overall economy. However, agricultural operations could be greatly affected, as crops and livestock may be unable to cope with extreme heat events.

According to a 2021 study by a team of researchers from around the world, the impacts on agriculture have been underestimated. Based on analysis of global datasets from 1979 to 2016, agricultural losses were larger than predicted, as much as 5-10 times[8]. This research is being used to develop climate change adaptation possibilities to reduce projected losses from extreme heat events.

Other government-specific vulnerabilities are shown in **Table 45**.

[8] https://www.colorado.edu/asmagazine/2021/03/16/heat-waves-could-cause-10-times-more-crop-damage-now-projected-research-finds

Table 45 Local Government Vulnerability – Other Community Assets and Activities

Local Government	Local Vulnerability
Pueblo County	The elderly and low-income populations who do not have access to air conditioning will be vulnerable to the impacts of an extreme heat event. Additionally, these events have the potential to over stretch water and power infrastructure in the county.
City of Pueblo	Senior citizens and those experiencing homelessness, as well as electrical and additional utility infrastructure, are vulnerable to extreme heat in the city.
Pueblo West Metro District	The Pueblo Reservoir is vulnerable to the impacts of an extreme heat event. An extreme heat event could also impact the annual 4th of July Parade and the lawns of residents.
Colorado City Metro District	Colorado City Metro District's supply of potable water and the local golf course are vulnerable the impacts of extreme heat.
St. Charles Mesa Water District	Due to the relatively small size of the SCMWD dams, and the importance of water to the community for agricultural purposes, the district is vulnerable to extreme heat. Potentially cascading impacts of extreme heat coupled with a drought event could reduce available water and lead to reductions in agricultural production.
Beulah Fire Protection District	The elderly and low-income populations, as well as electrical and additional utility infrastructure, are vulnerable to extreme heat in the district.

Trends in Development

All residents of future development can be affected by extreme heat events. The exposure to the population is increasing through time as more people enter the planning area. Public education is critical as new residents move to the area, as many may not have experienced the extent of extreme heat seen in the county. While property damage is not a concern, public safety can be improved with education.

Table 46 presents additional vulnerability information specific to each government.

Table 46 Local Government Vulnerability – Future Trends in Development

Local Government	Future Development
Pueblo County	Future development is not anticipated to directly impact vulnerability to this hazard. Any future development will increase collective exposure to this hazard.
City of Pueblo	Future development is not anticipated to directly impact vulnerability to this hazard. Any future development will increase collective exposure to this hazard.
Pueblo West Metro District	Future development is not anticipated to directly impact vulnerability to this hazard. Any future development will increase collective exposure to this hazard.
Colorado City Metro District	Future development is not anticipated to directly impact vulnerability to this hazard. Any future development will increase collective exposure to this hazard.
St. Charles Mesa Water District	Future development is not anticipated to directly impact vulnerability to this hazard. Any future development will increase collective exposure to this hazard.
Beulah Fire Protection District	Future development is not anticipated to directly impact vulnerability to this hazard. Any future development will increase collective exposure to this hazard.

Probability of Future Occurrences

Extreme heat events will continue to occur in Pueblo County in years to come (100% probability). It is difficult to predict these events as climate change continues to create sporadic weather patterns. The CDC recorded 531 extreme heat events occurring in the period between 1979 and 2021, an average of 12 events can be expected per year.

Climate Change Impacts

Temperatures are increasing due to climate change and this will likely result in more extreme heat days as the average temperature increases. Per the CO E-SHMP, extreme heat events are becoming more frequent, more severe, and longer lasting. More frequent extreme heat events could end up being more cause for concern than the long-term change in temperature and precipitation averages.

6.8 Flood

General Background

A flood is a general and temporary condition of partial or complete inundation of normally dry land areas from:

- the overflow of stream banks,
- the unusual and rapid accumulation of runoff of surface waters from any source

Flooding results when the flow of water is greater than the normal carrying capacity of the stream channel. Rate of rise, magnitude (or peak discharge), duration, and frequency of floods are a function of specific physiographic characteristics. Generally, the rise in water surface elevation is quite rapid on small (and steep gradient) streams and slow in large (and flat sloped) streams.

Floods caused by precipitation can result from: rain in a general storm system, rain in a localized intense thunderstorm, melting snow, rain on melting snow, and ice jams. Floods may also be caused by structural or hydrologic failures of dams or levees. A hydrologic failure occurs when the volume of water behind the dam or levee exceeds the structure's capacity resulting in overtopping. Structural failure arises when the physical stability of the dam or levee is compromised due to age, poor construction and maintenance, seismic activity, rodent tunneling, or a myriad of other causes. For more information on floods resulting from dam and levee failure refer to the **Dam / Levee Incident** section of this Plan.

The watersheds across the county are similar in that they are subject to the same types of storms and flooding, which is due to similar stream channel characteristics and climates. The stream channels in these watersheds are characterized by long, narrow stems and tributaries. Analysis of climatological data and inspection of the flood history for the Arkansas River sub basin above John Martin Reservoir (near Las Animas, CO) shows the most severe flood-producing storms occur during the late spring or summer months. Warm, moist air from the Gulf of Mexico mixes with cold, dry air from the Polar Regions to create increased thunderstorm activity in the area.

The runoff from these storms combine with snowmelt in the spring and can create high streamflows. These high flows are of small volumes and short durations. Valley storage, high infiltration rates, and irrigation diversions cause considerable attenuation of the flood flows moving downstream to the Arkansas River.

Flash floods are particularly dangerous and pose the greatest risk. These events are most often microbursts which produce a large amount of rainfall in a short amount of time. Flash floods, by their nature, occur suddenly but usually dissipate within hours. Despite their sudden nature, the National Weather Service (NWS) is usually able to issue advisories, watches, and warnings in advance of a flood.

The potential for flooding can change and increase through various land use changes and changes to land surface. A change in environment can create localized flooding problems inside and outside of natural floodplains by altering or confining watersheds or natural drainage channels. These changes are commonly created by human activities (e.g., development). These changes can also be created by other events such as wildfires. Wildfires create hydrophobic soils, a hardening or "glazing" of the earth's surface that prevents rainfall from being absorbed into the ground, thereby increasing runoff, erosion, and downstream sedimentation of channels.

Potential flood impacts include loss of life, injuries, and property damage. Floods can also affect infrastructure (water, gas, sewer, and power utilities), transportation, jobs, tourism, the environment, and ultimately local and regional economies.

The damaging floods in Pueblo on the Fountain Creek normally originate from storms in the Colorado Springs area on the main stem and tributaries. Floods that originate in this area may dissipate to negligible proportions prior to reaching Pueblo, depending upon precipitation events and soil moisture content in the area between Colorado Springs and Pueblo. The Fountain Creek Flood Control Project, designed to control up to a 200-year flood event in the City, helps mitigate against flooding.

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

The extent of flooding associated with a 1% annual probability of occurrence (the "base flood" or "100-year flood") is used as the regulatory boundary by FEMA and many other agencies. Also referred to as the special flood hazard area (SFHA), this boundary is a convenient tool for assessing vulnerability and risk in flood-prone communities.

Past Events

Pueblo has a history of damaging floods. Floods have been recorded in Pueblo in 28 of the years since 1864. These floods have resulted in over 200 reported deaths and countless injuries over the years. The largest reported numbers of deaths occurred in two floods, in 1904 and 1921. In the last three decades only one death and two injuries have been reported.

The Flood of 1921 is the flood of record for Pueblo County. The flood took over one hundred lives and destroyed infrastructure, businesses, and homes. The $19 million in property damages reported in 1921 is equivalent to more than $285 million in 2023 USD.

Table 47 shows the historical details of notable floods recorded in the county. Numerous data sources were used; however, damages and specific details for some of these events were not available.

Table 47 Pueblo County Notable Flood Events (1864-2021)

Date	Details
June 11, 1864	The first flood on the Arkansas River, for which detailed information has been found, was a result of a general storm over eastern Colorado. The early settlers agree that this flood reached a point near Third and Santa Fe Avenues in Pueblo, and if, as seems probable, the street has been graded down since 1864. The flood of that year may have been nearly as high as the flood of 1921.
June 26, 1884	Regarding this flood, the Pueblo Commercial Standard stated, "The Fountain at Pueblo was wide, swift, and deep and swept away both the wagon bridges on Fifth Street and the Denver and Rio Grande Railroad Bridge." No reference to the cause of this flood is made, but its occurrence coincides within a few days of the flood peak caused by the rain and melting snow in other basins. At Pueblo, east of the foothills, the precipitation from January 1 to April 30, 1884, was 62% above normal.
July 26, 1893	During one of the driest years of record in Pueblo, a flood occurred on which reached a stage 10 feet lower than that of the flood of 1921. The river rose 8 feet in 2 hours at Pueblo. No gauging record of the discharge is available, but it appears that the peak discharge was between 20,000 and 25,000 cubic feet per second.
June 1, 1894	Flooding was reported on Second Street between Santa Fe Avenue and Main Street, the water was 4 feet deep over the floors of the buildings. Five lives were lost in Pueblo, and damage amounting to nearly $2,000,000 was done to property.
May 20, 1901	The earliest recorded flood on the St. Charles River. The only information regarding it is contained in the press. The Pueblo Chieftain of May 23, 1901, included in a dispatch from Beulah, "On Monday evening [May 20] about 6, rain began to fall here with some hail. The storm increased until all the streams in the valley were out of their banks, and the oldest settlers declared they have never seen such a rainfall. All the bridges were washed out." The issue of the Pueblo Chieftain of the day prior, May 22, had contained the following, "Rio Grande train 115 lies in the bed of the St. Charles River at San Carlos [about 12 miles above the mouth] a snarl of wreckage. It was accomplished in less than 2 minutes when the train bore down upon the trestle. Coincident with the striking of the trestle by the

Date	Details
	train came a 10-foot wall of water, which swept everything before it. The bridge is 12 feet high, 15 "bents" long, each "bent" being 16 feet."
August 7, 1904	Approximately 8 miles north of Pueblo, a passenger train engine was crossing the bridge near Eden Station. A flash flood wave passed over the bridge and the train was dragged off the trestle. Around 100 people drowned when the train plunged into Fountain Creek. A cloudburst caused the waters of Fountain River and Dry Creek to move rapidly sweeping bridges and flooding mines.
June 3, 1921	The Great Flood of 1921 was caused by flooding of the Arkansas River. The number of known deaths was 120 and the number unaccounted for was over 140. The flood badly damaged the Rio Grande and Santa Fe railroad tracks and the town of Pueblo lost 1/3 of their businesses in the downtown area. The property damage was estimated to be $19 million (in 1921 dollars). A cloudburst dropping about 9 inches of rain caused the Arkansas River to swell in Pueblo. The torrent of the water that rose 15 feet swept away bridges, homes, and railroad tracks. The property loss was estimated at more than $10 million. The 4th Street Bridge collapsed with 100 people on it, all those lives were taken. Pueblo's gas, electricity, telephone lines, and water piping were out of service, and there was no drinking water present because of the debris pollution. Fires broke out and couldn't be extinguished because firemen didn't have water and in flooded businesses, looting occurred.
May 31, 1935	The flood overflowed the valley of Fountain Creek from Colorado Springs to the mouth, at Pueblo, destroying bridges and damaging agricultural land. At Pueblo, the flood eroded the banks in the vicinity of the State Hospital to such an extent that several small buildings were swept away. According to a witness of the floods of both 1921 and 1935, at a point 1½ miles above the mouth of Fountain Creek, the flood of 1935 was higher than that of 1921. During both floods, the channel was scoured to bedrock, which lies at a depth of 3 to 9 feet below the sand in the channel.

Date	Details
June 14, 1965	A heavy thunderstorm in El Paso County brought such a rise in Fountain Creek waters that it caused severe damages in Pueblo, including the Lower East Side and in the Lower Arkansas Valley. It resulted in no deaths, but 1,000 residents were evacuated. There was almost $4 million worth of damage (in 1965 dollars)
May 31, 1984	Flash flood on Fountain Creek sweeps away train, many drowned.
June 1994	Flash flooding damaged 160 homes and caused over $5 million dollars in property damage in Pueblo.
July 1994	Flash flooding damaged many basements and roadways in Pueblo.
June 1995	Torrential rains caused flash flooding causing over $17 million in damages in Pueblo.
July 1996	Flash flooding destroyed over 2,000 acres of crops and over $2 million in property damage in Pueblo. Heavy rains fell over Pueblo which caused widespread flooding. The rain caused the roof to collapse on three buildings and several roadways were covered with water. Several underpasses on I-25 were flooded and vehicles were carried away by water. Three lives were lost due to the flooding and the rain totaled to 1.22 inches in one hour.
August 1996	Flash flooding in Pueblo caused one death.
April 28 – May 1, 1999	Four days of heavy rainfall produced widespread flood on both the Arkansas River and Fountain Creek. Pueblo County was declared a disaster area with at least $3 million in property and public road bridges reported. Heavy rain and runoff in Fountain Creek results in the river running 6 feet above normal, and doing much damage along the river banks south of Colorado Springs and in Pueblo.
July 1999	Two people were injured in a flash flood East of Boone.
July 2004	Flash flooding East of Colorado City caused 5 to 6 feet of water standing on roadways.
July 2005	Heavy rains caused flash flooding on the Mason Gulch Burn scar. Mainly flooding roads north of Beulah.
July 2006	Heavy rains within a week of each other caused major damage to roads, homes, vehicles and drainage systems. Heavy rain flooded portions on I-25, forcing its closure for nearly two hours. There was concern for the Avondale flooding with the flux of rain combined with normal water release

Date	Details
	from Pueblo Dam. North Creek Road was closed twice in a week following rainstorms. Overton Road was closed after a culvert under the road failed.
July 2007	Heavy rains caused flooding in low-lying areas.
August 2007	Heavy rains caused flash flooding, washing out a section of Highway 78, making access to Beulah difficult. Other roads and bridges were damaged as well as basements being flooded. The heaviest rainfall appeared to be over and in the vicinity of the 2005 Mason Gulch Fire's burn scar, resulting in flash flooding along North Creek in Beulah.
September 13, 2013	Pueblo experienced some localized flooding which damaged some homes and roads, but did not have the devastating loss that the northern part of the state experienced. Lists of damages were made but Pueblo was not included in the FEMA or Department of Agriculture declarations.
July 15, 2014	Rain came down so fast that it washed out the Pine Drive Water District Dam in the St. Charles River by the water plant. There was minor damage on Rep Top Ranch Road and the lower crossing on Red Creek Springs Road where they had to close the roads until the water receded. Other localized flooding was also reported.
May 4 – June 16, 2015	Pueblo County was included in the disaster declaration DR-4229 for the State of Colorado issued by President Obama. The declaration triggered the release of Federal funds to help our community recover from the flooding.
May 10 – 11, 2017	Flooding led to the need for over $600,000 in funding and resources, in Beulah, including hiring private road contractors to assess roads and bridges. Several culverts washed out and roads were damaged, some closed to traffic for a week. Multiple people were evacuated by Colorado Air National Guard helicopter. Fortunately, no homes we severely damaged.
July 2, 2019	A storm brought waist high flood in some areas and strong winds, in excess of 60 mph, damaged roofs. The floodwaters caked the sidewalks with mud and deposited trash as they receded. Traffic came to a standstill and multiple cars were damaged.
July 24, 2021	Intense rainfall of 5.5 inches over two hours led to flooding in Pueblo West, north Platteville area. Basements flooded up to 8 ft in some cases. Multiple roads were closed. Damages were still being identified over a month later.

Location

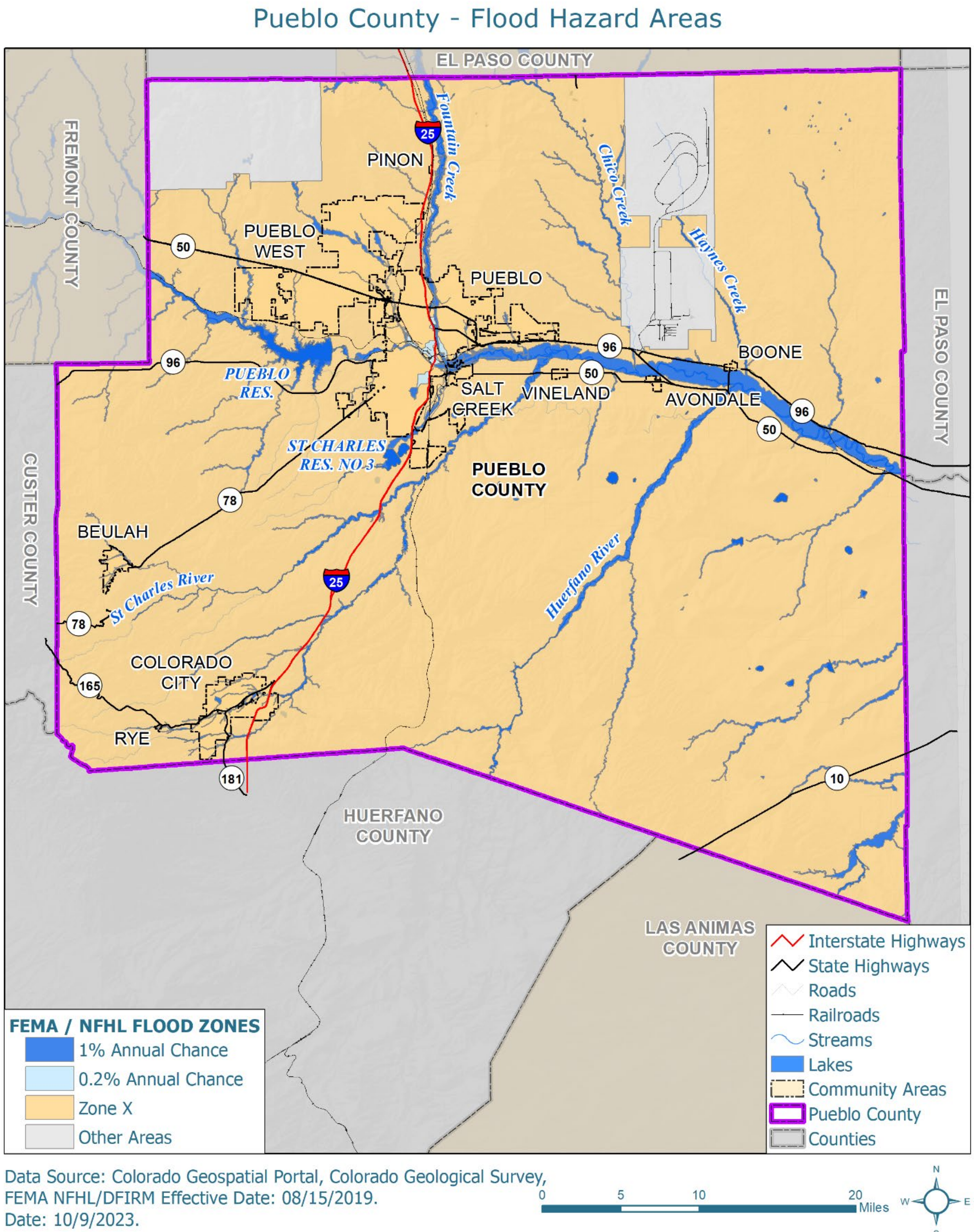
The streams discussed here are major drainages in Pueblo County which flow in or near the city. These waterways consist of the Arkansas River and its tributaries: Fountain Creek, St. Charles River, Wild Horse-Dry Creek, Dry Creek, Goodnight Arroyo, Huerfano River, and Salt Creek.

Additionally, localized urban flooding is often an issue as downtown Pueblo has a poor drainage system.

Figure 32 presents the FEMA regulatory special flood hazard areas (SFHA) identified across Pueblo County. This mapping was last updated in 2019.

As part of Pueblo County's on-going participation in FEMA's Risk MAP project, updated floodplains are being developed (as of June 2024). Base level engineering (BLE) is an engineering analysis technique used to determine the hydrologic and hydraulic conditions in the vicinity of streams and water courses during the 1% annual chance flood (i.e. – 100-year event). BLE uses high and low to moderate flood risk designations. High risk is equivalent to the 1% annual chance flood while low to moderate flood risk designates properties prone to flooding during a 0.2% annual chance flood (i.e. – 500-year event).

Figure 32 Pueblo County Flood Hazard Areas



SEVERITY

The depth and velocity of floodwaters, coupled with the length of time areas remain inundated with water, determine the severity of a flood event. Many SFHA's also provide water-surface elevations which describe the elevation of water that will result from a given discharge level. This is one of the most important factors used in estimating flood damage.

The Pueblo community is aware they must be as prepared as possible for the potential problem of flooding along the many streams in the area. At the present time, there are many different types of mitigation in place along these rivers.

- Following the 1921 flood, the Arkansas River underwent channel improvement and levee construction
- In 1975, the Pueblo Dam was completed, which helped flood control on the Arkansas River downstream, as well as upstream of the dam.
- In 1986, USACE authorized the Fountain Creek Flood Control Project
- By 1990, portions of Fountain Creek consisted of a levee system with a 200- year flood design composed of concrete, rip rap, and/or a soil cement mixture.
- Bessemer Ditch built concrete walls on portions of the ditch in 1980 and on other portions in 1990. The ditch runs from Pueblo Dam through the city and east to its owners, mostly farmers, on the St. Charles Mesa.
- Pueblo relies on the Satellite Stream Gauging Program under the administration of the Office of the State Engineer.

Recurrent intervals are used to measure the probability of flood events. **Table 48** presents these for six comment intervals. It should be noted that these intervals are based off best available historical data and may not adequately account for climate change.

Table 48 Flood Recurrence Intervals and Probability of Occurrences

Recurrence Interval (Years)	Probability of Occurrence in any Given Year	Percent Chance of Occurrence in any Given Year
100	1 in 100	1%
50	1 in 50	2%
25	1 in 25	4

Recurrence Interval (Years)	Probability of Occurrence in any Given Year	Percent Chance of Occurrence in any Given Year
10	1 in 10	10%
5	1 in 5	20%
2	1 in 2	50%

Warning Time

Due to the sequential pattern of meteorological conditions needed to cause serious flooding, it is unusual for a flood to occur without warning. Warning times for floods can be between 24 and 48 hours. Flash flooding can be less predictable, but potential hazard areas can oftentimes be warned in advance of potential flash flooding danger.

Secondary Hazards

There are numerous secondary hazards for flooding including debris flows and bank erosion which in some cases can be more harmful than actual flooding. Flooding is also responsible for hazards such as landslides when high flows over-saturate soils on steep slopes, causing them to fail. Hazardous materials spills are a secondary hazard of flooding, if storage tanks rupture and spill into streams, rivers, or storm sewers.

Exposure and Vulnerability

Lifelines

Floods impact Lifelines through closure of businesses and government facilities, disrupted communications, interruption in the delivery of utilities such as water and sewer, excess burden on emergency response resources, and generally hinder the normal functions of a community. Food, hydration, and shelter lifelines are impacted by floods as community residents can be displaced from their homes during a flooding event, agricultural activities can be disrupted, and potable water sources can be contaminated.

Additionally, Transportation can be disrupted by flooding events causing road damages and closures and increased traffic in the case of community evacuation.

Health and Medical lifelines can also be impacted by flood events. Transportation impacts can disrupt patient and medical supply transportation. Health and medical facilities management can also be impacted with physical damages and increases in in-coming patients.

Table 49 details the Lifelines that are located within 100- and 500-year floodplains. Energy and Transportation lines are measured in miles.

Table 49 Lifelines – Floodplain (100- and 500-Year)

Lifeline	City of Pueblo	Town of Boone	Town of Rye	Pueblo West Metro District	Colorado City Metro District	Unin-corporated	Total
100 – Year Floodplain							
Energy (Miles)	0.4	0	0	0	0	5.3	**5.7**
Energy	0	0	0	0	0	0	
Transportation (Miles)	4.4	0	0	0.1	0.6	27.2	**32.3**
Transportation	18	0	0	0	5	88	**111**
Comm-unications	0	0	0	0	0	1	**1**
Food, Hydration, & Shelter	1	0	0	0	0	0	**1**
Health & Medical	0	0	0	0	0	0	**0**
Safety & Security	0	0	0	0	0	0	**0**
Hazardous Materials	2	0	0	0	0	0	**2**
500 – Year Floodplain							
Energy (Miles)	2.6	0	0	0	0	5.6	**8.2**
Energy	1	0	0	0	0	0	
Transportation (Miles)	33.2	0	0	0	0	27.5	**60.7**

Lifeline	City of Pueblo	Town of Boone	Town of Rye	Pueblo West Metro District	Colorado City Metro District	Unin-corporated	Total
Transportation	47	0	0	0	0	0	**47**
Comm-unications	0	0	0	0	0	0	**0**
Food, Hydration, & Shelter	3	0	0	0	0	0	**3**
Health & Medical	1	0	0	0	0	0	**1**
Safety & Security	4	0	0	0	0	0	**4**
Hazardous Materials	16	0	0	0	0	1	**17**

People

People living in floodplains, known flooding areas, or near areas where flash floods can occur are at an increased risk from the hazard. Those in the community with access and functional needs (AFN) may have issues evacuating and are at increased further risk, including the elderly, children, those with mobility or communication issues, those with low incomes, institutionalized, and people who may be unfamiliar with the area. Floods can cause serious injury and death if people are unable to get to safe locations. Some of the population may be displaced from their homes, with varying durations which can strain community resources.

Non-English speaking populations are also included as having a higher vulnerability as communications and emergency messaging may not be available in languages other than English. In general, anyone who does not have adequate access to warnings from an emergency warning system may be disproportionately impacted by the hazard.

The dangers of flash flooding pose an even greater risk, as those in these populations may not be able to extricate themselves from an immediately threatening situation. The need for emergency responders to place these populations as a priority is crucial to the best possible outcomes.

STRUCTURES

It is important to identify who may be at risk if infrastructure is damaged by flooding. Roads or railroads that are blocked or damaged can isolate residents and can prevent access throughout the county. This is especially critical for those needing emergency service providers or for getting crews in to make repairs. Bridges washed out or blocked by floods or debris can also cause isolation. Utilities including power lines, cable, and phone lines may be knocked down or rendered unusable by the waters.

Water and sewer systems can be affected by flooding. Floodwater can back up drainage systems, causing localized flooding. Culverts can be blocked by debris from flood events, also causing localized flooding. Floodwater can get into drinking water supplies, causing contamination. Sewer systems can be backed up, causing wastewater to spill into homes, neighborhoods, rivers, and streams. Underground utilities can also be damaged.

Many properties in the county are vulnerable to flooding, including those that may not be within a mapped floodplain. While some properties make be flood proofed, the majority are likely to be significantly damaged if in the flooded area. Properties near waterways may have stability issues as the flood waters erode the banks and carry debris, while properties in low-lying areas are more vulnerable as these are where water would collect.

Table 50 details the number and valuation, respectively, of structures and parcels located in the 100- and 500- year floodplains.

Table 50 Structures – Floodplains (100- and 500-Year Zones)

	City of Pueblo	Town of Boone	Town of Rye	Pueblo West Metro District	Colorado City Metro District	Unincor-porated	Total
100- Year Floodplain							
Structures							
Building Count	173	0	28	14	24	787	**1,026**
Parcel Count	440	0	26	100	550	970	**2,086**
Valuation							

	City of Pueblo	Town of Boone	Town of Rye	Pueblo West Metro District	Colorado City Metro District	Unincor-porated	**Total**
Total Land Value	$9,793,518	0	$384,298	$2,613,941	$2,018,062	$14,368,766	**$29,178,585**
Total Structure Value	$5,915,698	0	$3,606,402	$8,668,287	$5,798,564	$57,975,203	**$81,964,154**
Total Value	$15,709,216	0	$3,990,700	$11,282,228	$7,816,626	$72,343,969	**$111,142,739**
500- Year Floodplain							
Structures							
Building Count	4,465	0	28	29	24	835	**5,329**
Parcel Count	3,888	0	28	116	550	990	**4,994**
Valuation							
Total Land Value	$71,380,653	0	$384,298	$3,131,641	$2,018,062	$14,607,091	**$89,119,385**
Total Structure Value	$417,639,412	0	$3,606,402	$11,973,769	$5,798,564	$59,801,585	**$489,414,766**

	City of Pueblo	Town of Boone	Town of Rye	Pueblo West Metro District	Colorado City Metro District	Unincor-porated	Total
Total Value	$489,020,065	0	$3,990,700	$15,105,410	$7,816,626	$74,408,676	**$578,534,151**

Repetitive Loss Properties

There are three (3) total Repetitive Loss Properties in the county, including one (1) in the City of Pueblo and two (2) in unincorporated Pueblo County. Each property has had two (2) losses. Details for these properties are shown in **Table 51**. There are no Severe Repetitive Loss properties in the county.

Table 51 Repetitive / Severe Repetitive Loss Properties in Pueblo County

Jurisdiction	Building Type	Building Value	Total Losses	Date of Loss	Payment
Pueblo	Residential	$106,195	2	5/10/2015	$18,864
				5/31/2016	$4,958
				Total Paid	$23,823
Pueblo	Residential	$158,400	2	4/30/1999	$2,147
				7/10/2006	$2,521
				Total Paid	$4,668
City of Pueblo	NonResidential	$65,000	2	6/3/1995	$3,889
				7/9/1996	$5,786
				Total Paid	$9,675

Natural, Historic, and Cultural Resources

Flooding is a natural event, and floodplains provide many natural and beneficial functions. However, with human development factored in, flooding can impact the environment in negative ways. Wildlife habitats can be impacted, due to altered food availability and interrupted breeding patterns. The effects on water quality due to silt and debris can impact wildlife downstream of the flooding. Erosion of riverbanks can permanently alter a waterway and vegetation on the banks may not recover from the damage. Aquatic life can wash onto roads or over dikes into flooded fields. Pollution from roads such as oil and hazardous materials can wash into rivers and streams. During floods, these can settle onto normally dry soils, polluting them for agricultural uses.

Other Community Assets and Activities

Flooding can have a long-term economic impact on individuals and the county. Homes that are damaged may require extensive repairs which can take place over a long duration, especially if mold develops. The cost of infrastructure repair for utilities, roads, and bridges, as well as the components of Lifelines may extend over multiple years as projects are prioritized and funds are acquired. Costs for debris clean-up can be considerable and can be a burden to property owners.

Returning to normal operations and daily life can take time which affects the day-to-day economy of the flooded area. Some businesses may struggle with repair costs and whether they can reopen at all.

Destruction of crops, erosion of topsoil, and deposition of debris and sediment on croplands due to flood would be expensive to remediate, as well as recover from lack of yield. Direct costs for the value lost and indirect costs for the loss of work that comes from harvest and livestock transport can impact the agricultural community for an extended period.

Other government-specific vulnerabilities are shown in **Table 52**.

Table 52 Local Government Vulnerability – Other Community Assets and Activities

Local Government	Local Vulnerability
Pueblo County	Pueblo County has a large population experiencing homelessness that lives / camps along the Fountain Creek & Arkansas River; flooding rises water levels which displaces those persons and also creates a public health issue with trash, hazardous materials, and waste floating away. Additionally, flooding can cause damage to roadways, undersized drainage culverts, intersections, and wastewater lift stations.
City of Pueblo	The unhoused populations and those with mobility limitations, structures located within floodplains, communication and water infrastructure, historical districts, the Goodbye Barn, and many of the festivals and events within the city are vulnerable to flood events.
Pueblo West Metro District	Food shortages as a result of a flood event can impact PWMD's ability to provide holiday food baskets to those in need within the community.

Local Government	Local Vulnerability
Colorado City Metro District	If a flood event occurs 2,500 people could be affected from the loss of potable water. Homes, local golf courses, potable waterlines, and well service lines and sewer lines can be impacted.
St. Charles Mesa Water District	Flooding can have impacts all around the district. From lack of access to district facilities, loss of power at sites, to creating cascading failures at dam locations. Water lines, homes, and pumping sites can also be impacted. Vulnerability of the district's raw water supplies is caused both by flooding and the cascading impacts of erosion events.
Beulah Fire Protection District	Flooding is not a hazard that impacts the district. There is no immediate or impactful risk to district assets.

Trends in Development

Growth in Pueblo County has increased potential vulnerability to flooding in populated areas. This is especially true in Pueblo where the Arkansas River flows through the city and receives flow from many tributaries in the Pueblo area. The city and county have taken and continue to take many steps to ensure the safety of Pueblo from damaging floods. These structural (e.g. levees, dam) and nonstructural (e.g. zoning) mitigation steps, to lessen vulnerability, often resulted from planning after a devastating flood in Pueblo.

It is important for municipalities to fully understand the risk presented by flood to vulnerable areas, to ensure new construction does not increase the county's collective risk. **Table 53** presents additional vulnerability information specific to each government.

Table 53 Local Government Vulnerability – Future Trends in Development

Local Government	Future Development
Pueblo County	Future development is not anticipated to directly impact vulnerability to this hazard.
City of Pueblo	Future development is not anticipated to directly impact vulnerability to this hazard.
Pueblo West Metro District	Future development is not anticipated to directly impact vulnerability to this hazard.

Local Government	Future Development
Colorado City Metro District	Future development is not anticipated to directly impact vulnerability to this hazard.
St. Charles Mesa Water District	Future development is not anticipated to directly impact vulnerability to this hazard.
Beulah Fire Protection District	More homes have recently been built across creeks that have a tendency to flood, this has increased the need for alternative means of access by first responders. This growth has increased the district's vulnerability.

Probability of Future Occurrences

There have been 28 reported damaging floods since 1864, suggesting a probability of approximately 18%, for future damaging flooding in a given year. Damages can be under-reported for various reasons, including insurance payouts not being recorded or no claims made in the first place, making it difficult to determine the extent to which the county has seen flood damages. Therefore, this probability for damaging floods has the potential to be higher.

Climate Change Impacts

Use of historical hydrologic data has long been the standard of practice for designing and operating water supply and flood protection projects. For example, historical data are used for flood forecasting models and to forecast snowmelt runoff for water supply. This method of forecasting assumes that the climate of the future will be similar to that of the period of historical record. However, the hydrologic record cannot be used to predict changes in frequency and severity of extreme climate events such as floods. Going forward, model calibration or statistical relation development must happen more frequently, new forecast-based tools must be developed, and a standard of practice that explicitly considers climate change must be adopted. Climate change is already impacting water resources, and resource managers have observed the following:

- Historical hydrologic patterns can no longer be solely relied upon to forecast the water future.
- Precipitation and runoff patterns are changing, increasing the uncertainty for water supply and quality, flood management, and ecosystem functions.
- Extreme climatic events have become more frequent, necessitating improvement in flood protection, drought preparedness, and emergency response.

The amount of snow is critical for water supply and environmental needs, but so is the timing of snowmelt runoff into rivers and streams. High frequency flood events (e.g., 10-year floods) in particular, will likely increase with a changing climate. Along with reductions in the amount of the snowpack and accelerated snowmelt, scientists project greater storm intensity, resulting in more direct runoff and flooding. Changes in watershed vegetation and soil moisture conditions will likewise change runoff and recharge patterns. As stream flows and velocities change, erosion patterns will also change, altering channel shapes and depths, possibly increasing sedimentation behind dams, and affecting habitat and water quality. With potential increases in the frequency and intensity of wildfires due to climate change, there is potential for more floods following fire which increase sediment loads and water quality impacts.

As hydrology changes, what is currently considered a 100-year flood may strike more often, leaving many communities at greater risk. Planners will need to factor a new level of safety into the design, operation, and regulation of flood protection facilities such as dams, floodways, bypass channels, and levees, as well as the design of local sewers and storm drains.

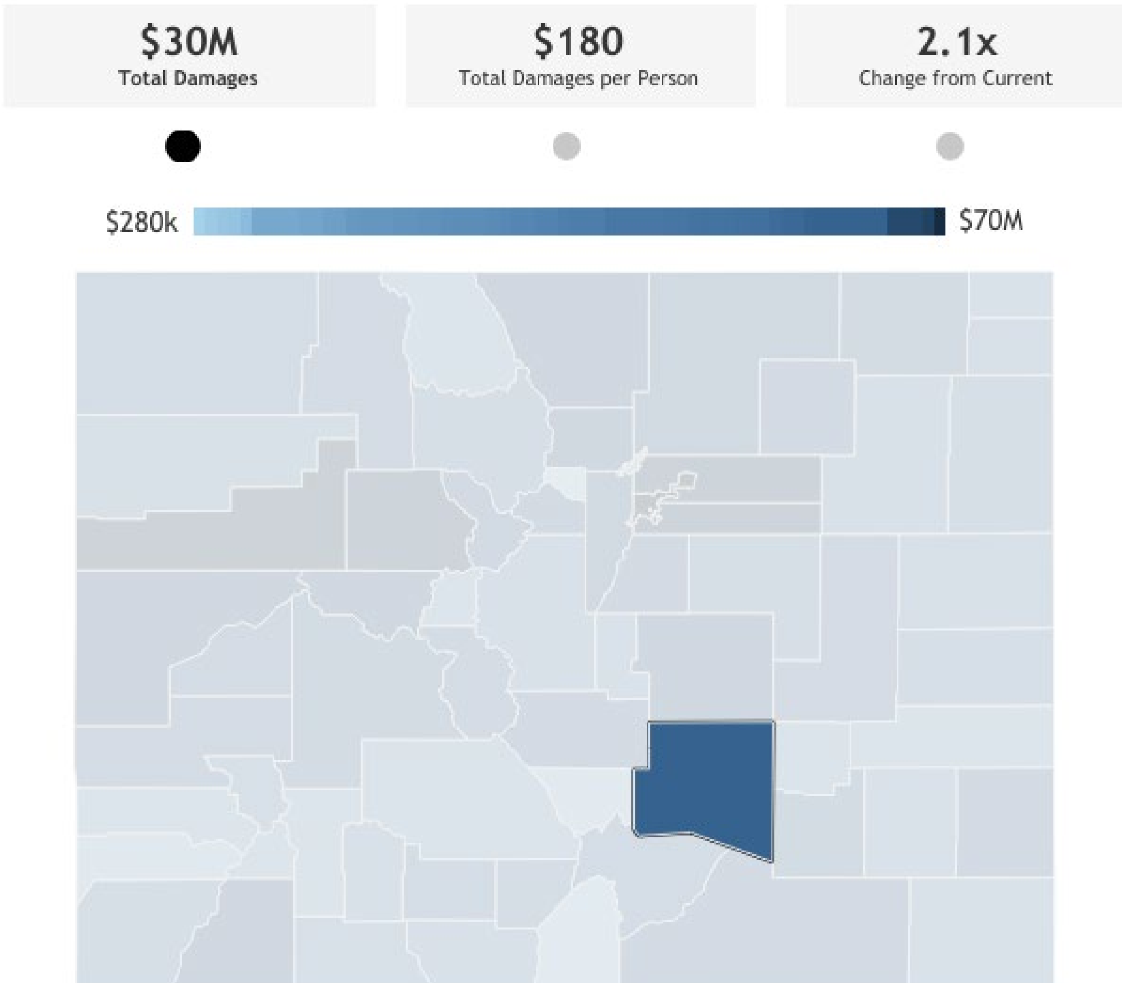
Additionally, per the 2023 CO E-SHMP, the extent and intensity of flash flooding may expand with larger wildfire burn scars creating new areas that are vulnerable to flash flooding during intense summer rainfall events. The extent and intensity of flash floods in urban areas may also increase, owing to expansion of areas covered by impervious surfaces (e.g., roads, parking lots) that can contribute to flooding.

The 2023 CO E- SHMP further highlights the Future Avoided Cost Explorer (FACE) tool which was developed by the state to understand the economic impacts of flood, drought, and wildfire looking forward to 2050. It estimates the expected cost impacts of these three hazards on a selection of economic sectors, under future climate and population scenarios. These costs are expressed in expected annual damages, which are a function of the hazard magnitude, probability, and exposed assets.

For modeling flood scenarios two economic sectors were analyzed, buildings and bridges. For the buildings sector, county-level changes in population were assessed to determine where increased development would occur. Across all counties, it was assumed that local regulations will prevent development within mapped 100-year floodplains, but that future development will be unrestricted in the zone between the 100-year and 500-year floodplains. The change in building replacement cost between the 100 and 500-year floodplains was calculated for each population growth scenario. There was insufficient information on how bridge size and location would be affected by growth, so population scenarios were not applied to these estimates.

Figure 33 from FACE estimates the potential future losses that floods will cause in the projected more severe climate. In Pueblo County, without any change to population growth, the county is expected to incur $30 million in damages from future flood events, a $16 million increase from current conditions.

Figure 33 Pueblo County Flood Damages - More Severe Climate



6.9 Hail

General Background

Hail occurs when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere where they freeze into ice. Eventually, the hailstones encounter downdraft air and fall to the ground. Colorado's damaging hail season runs from April through September. Hailstones can result in extreme damages, injuries, and sometimes death. In 2023, the largest recorded hailstone in state history fell in Yuma County and measured 5.25". The largest recorded hailstone in Pueblo County fell in Beulah, on June 20, 2001, and was 3 inches in diameter.

Past Events

According to National Centers for Environmental Information (NCEI) Storm Events Database, there have been 517 hail events reported during 244 days between 1958 and 2022. Some of these events resulted in multiple injuries: nine (9) in August 1984, one (1) in August 1994, and seven (7) in July 2009. No deaths have been reported as a result of a hail event in Pueblo County. **Table 54** details some of the significant hail events which caused damages in the county.

The NCEI report "U.S. Billion-Dollar Weather & Climate Disasters 1980-2022"[9] additionally details a storm in June 2018 that impacted Colorado Springs and Pueblo. This hailstorm caused severe damage to many homes, businesses, and vehicles. The result was $1 billion in damages across the region and fortunately no reported deaths.

Table 54 Significant Hail Events in Pueblo County (1958-2022)

Date	Location	Hail Size (inches)	Property Damage	Crop Damage	Description
August 4, 1993	Pueblo	2	$ 50,000,000	-	Hail up to hen egg-size pelted Pueblo, causing an estimated $20 million in damage to autos, residences, and businesses.

[9] https://www.ncei.noaa.gov/access/billions/events.pdf

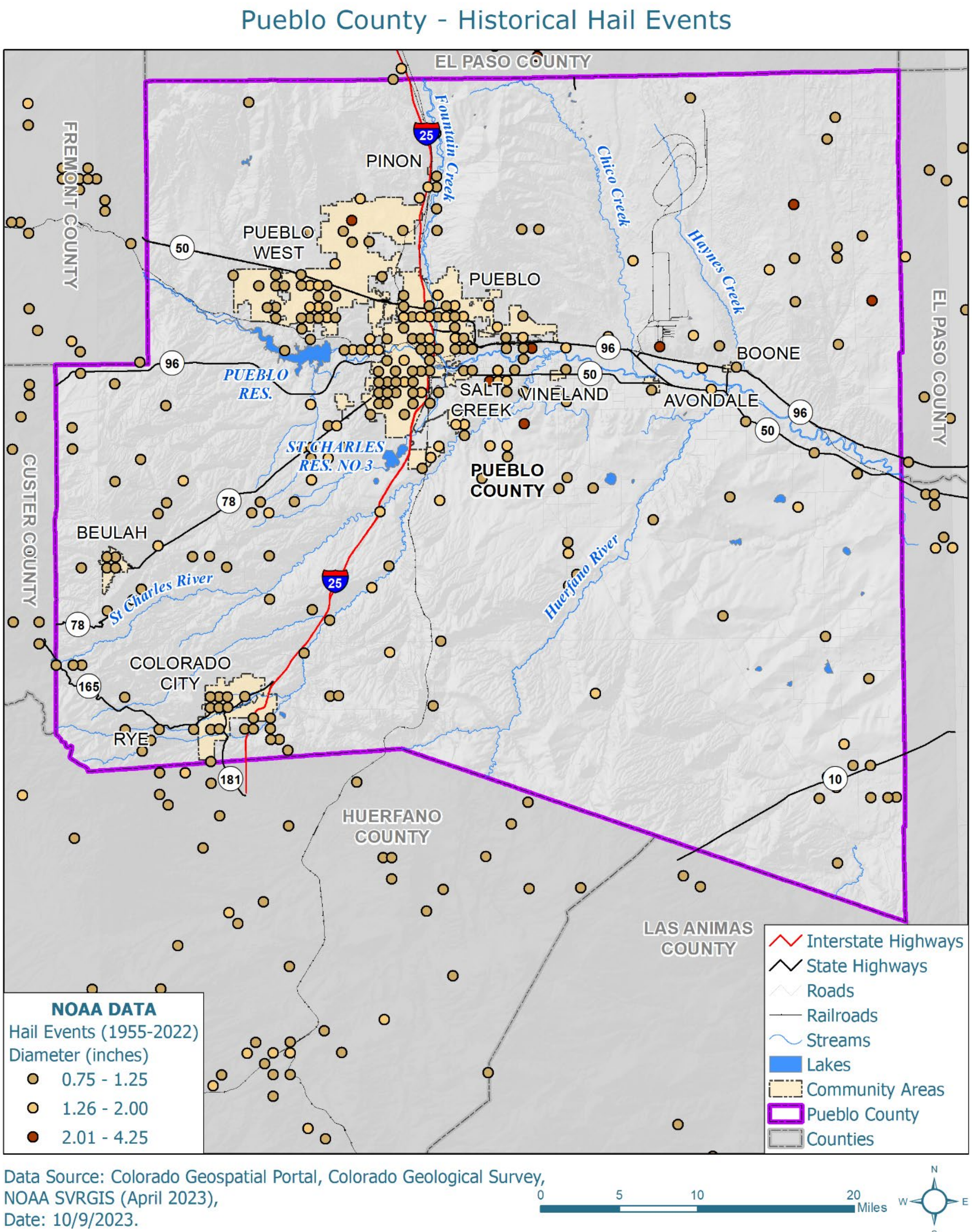
Date	Location	Hail Size (inches)	Property Damage	Crop Damage	Description
August 13, 1994	Pueblo	0.75	$ 1,000,000	-	As much as 4.50 inches of rain and 3/4 inch hail. Streets, highways, and underpasses flooded and closed for a time. Several large trees were downed by thunderstorm winds. A section of the Pueblo Mall collapsed injuring one person. Damage at the mall was estimated at $350,000. Damage to the windows at the library, was estimated at $30,000 to $50,000. Total property damage in Pueblo was estimated to be near $1 million.
August 18, 1995	Avondale	-	$ 250,000	-	Slow moving thunderstorms with rain estimates of 4-5 inches and a lot of small hail resulted in extensive crop damage. Several roads were also washed out. No crop damage figures available.
July 22, 1996	Pueblo	1	$ 300,000	-	Pueblo's south side was pounded by strong winds, torrential rainfall, and large hail, producing damage to nearly 200 homes.
July 20, 2000	Pueblo Municipal Airport	2	$ 5,000,000	$ 15,000,000	An estimated 15,000 acres in crop were lost as a result of the storm.
June 20, 2001	Beulah	2.5	$ 1,000,000	-	-

Date	Location	Hail Size (inches)	Property Damage	Crop Damage	Description
June 20, 2001	Colorado City	1.5	$ 2,000,000	-	A severe storm produced very large hail from Beulah to Colorado City. Vehicles and buildings were damaged, including a bank in Colorado City. The roof of the bank collapsed from the weight of hail and rain collected.
June 20, 2003	Pueblo	1.75	$ 4,000,000	-	Some slow moving thunderstorms dropped large hail on parts of Pueblo from the southwest to northeast. There was damage primarily to the roofs of structures and vehicles.
July 29, 2009	Cedarwood	1.75	$ 90,000,000	$ 20,000,000	Numerous severe thunderstorms occurred over the southeast plains. Hail was up to the size of baseballs and wind gusts at 60 mph were noted. The city of Pueblo was particularly hard hit with golf ball to tennis ball size hail. Damage estimates were around $110 million to vehicles, structures, and crops.
August 10, 2009	Pueblo Municipal Airport	1.75	$ 2,000	-	Severe storms produced hail up to the size of golf balls.

Date	Location	Hail Size (inches)	Property Damage	Crop Damage	Description
May 26, 2010	Pueblo	1.5	$ 2,000,000	-	A long-lasting hailstorm struck the Pueblo area. In areas to the east of Pueblo, hail reached the size of baseballs and persisted for 30 minutes.

Figure 34 shows the location of previous recorded hail events in Pueblo County. It should be noted that a majority of these historical events occur in populated areas. This is referred to as 'urban observation bias', where more events are reported in areas with a larger number of people to witness, in addition to a higher potential of damages to get reported.

Figure 34 Pueblo County Historical Hail Events (1955-2022)



Location

Hail events can occur anywhere in Pueblo County and pose a similar risk to all local governments.

Severity

The National Weather Service (NWS) classifies hail by diameter size, and corresponding everyday objects to help relay scope and severity to the population. **Table 55** presents those measurements utilized by the NWS.

Table 55 Hail Size Description Chart

Hail Stone Size	Measurement (Inches)
Pea	0.25
Peanut	0.50
Penny	0.75
Nickle	0.88
Quarter	1
Half Dollar	1.25
Golf ball	1.75
Lime	2
Tennis Ball	2.5
Baseball	2.75
Large Apple	3
Softball	4
Grapefruit	4.50

Hail can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from resulting damages. Hail has been known to cause injury to humans and occasionally has been fatal. Research has shown that damage occurs after hail reaches around 1" in diameter and larger. Hail of this size will trigger a severe thunderstorm warning from NWS. Hail in Pueblo County is prolific but is typically smaller in size.

Warning Time

Meteorologists have the capability of predicting the likelihood of a severe storm and give several days of warning time. However, distinction between storms that do and do not produce hail is unclear. Using radar, the National Severe Storms Laboratory[10] can detect the difference between heavy rain and hail as well as hail size:

> NSSL's Multi-Radar, Multi-Sensor (MRMS) system produces a Maximum Estimated Hail Size product, or MESH. This product is accumulated over several time periods (e.g., 1-hr, 1-day) and can help in both issuing warnings and verification of incidences of hail after the fact.

Secondary Hazards

Hail has the potential to cause or worsen dam / levee incidents, flooding, and thunderstorm events. Hail can be the result of, or be exacerbated by, severe wind, thunderstorms, and tornadoes.

Exposure and Vulnerability

Lifelines

All infrastructure Lifelines are exposed to risks associated with hail. Energy and Communications infrastructure could be damaged. Transportation could be impacted if hail causes accidents, and injuries or deaths. Hail can also have significant impacts on Communication and Energy, as hailstorms can cut power and damage lines of communication to communities, by causing damage to power grids, power lines, and cell towers.

People

The entire planning area is exposed to hail events. Areas of greater exposure are where higher population densities exist.

Populations with access and functional needs (AFN), including the elderly, those with low income, linguistically isolated populations, people with mobility issues, and residents living in areas that are isolated from major roads may see more impacts from severe weather events. Power outages can be life threatening to those dependent on electricity for medical support. Isolation of these populations is a significant concern. Those working outdoors or recreating in the area are more vulnerable to severe weather events.

Structures

All buildings are considered exposed to hail. Depending on size, hail can damage roofs, break windows, and tear up siding, all of which can lead to significant water damage. Hail also damages HVAC systems that are installed on the exterior of buildings and solar panels installed on roofs. Additionally, hail has the ability to cause damage to concrete, resulting in dents, cracks, and surface spalling that can occur on

[10] Severe Weather 101: Hail Detection (noaa.gov)

sidewalks and roads. Over time the damage caused by hail can wear down concrete, compromising its strength.

Natural, Historic, and Cultural Resources

Natural habitats risk major damage and destruction from hail. Large hail has the potential to damage vegetation, tree canopy, and harm animals. Crop yields can be significantly reduced in the event of a hailstorm, and farmers will also experience damage to their physical equipment. Large hail has the possibility to cause significant bruising, injury, and even death to livestock and wild animals, disrupting agricultural yields and natural ecosystems.

Hail also can cause major damage to, and destruction of, historical buildings. Large hail can break slate and tile roofing, shatter windows, and dent copper flashings causing irreparable damage to historical buildings. Additionally, this damage can allow water to enter the building and its foundations causing water damage, but also under freezing temperatures will expand once frozen causing further fissures to the structure of a building.

Other Community Assets and Activities

Economic impact from hail events is possible, as damage to property, crops, and livestock may result in losses. Events with large hail have been known to cause the death of livestock and devastate crops, which can bring considerable losses to the local and regional economy.

In addition, disruption of Lifelines and daily operations due to damaged infrastructure and facilities can cause losses. Repairing, rebuilding, or replacing critical equipment may be a slow process which could have cascading effects on businesses and the local economy. Any extended delay of returning to normal functioning has the potential to close businesses and impact industry.

Other government-specific vulnerabilities are shown in **Table 56**.

Table 56 Local Government Vulnerability – Other Community Assets and Activities

Local Government	Local Vulnerability
Pueblo County	The unhoused populations in the county are particularly vulnerable to the impacts of hail. Hail can also impact structures in the county, damaging roofs, solar, windows, etc.
City of Pueblo	The unhoused populations in the city are vulnerable to the impacts of a hail event. Additionally, communications towers, cable dishes, communication and utilities systems, as well as historical structures and outdoor festivals in the city are vulnerable to hail events.

Local Government	Local Vulnerability
Pueblo West Metro District	Hail can impact structures in Pueblo West, damaging roofs, solar, windows, etc.
Colorado City Metro District	Hail can impact structures around the district, damaging roofs, solar, windows, etc. for both locals and tourists alike.
St. Charles Mesa Water District	Hail can impact structures, crops, and animals around the district causing large financial and economic impacts to the community.
Beulah Fire Protection District	Visitors to the San Isabel National Forest are vulnerable to hail if a storm would come in while they are outdoors.

Trends in Development

All future development can be affected by hail. The vulnerability of community assets is increasing through time as more people enter the planning area. Public education is critical as new residents move to the area, as many may not have experienced the extent of hail seen in the county. While property damage is often unavoidable, public safety can be improved with education.

Table 57 presents additional vulnerability information specific to each government.

Table 57 Local Government Vulnerability – Future Trends in Development

Local Government	Future Development
Pueblo County	Any future development will increase exposure to this hazard.
City of Pueblo	Any future development will increase exposure to this hazard.
Pueblo West Metro District	Any future development will increase exposure to this hazard.
Colorado City Metro District	Any future development will increase exposure to this hazard.
St. Charles Mesa Water District	Any future development will increase exposure to this hazard.
Beulah Fire Protection District	Any future development will increase exposure to this hazard.

Probability of Future Occurrences

Based on NCEI data, there were 343 reported hail events in Pueblo County between 1958 and 2022. This equates to an average of 5 events in a given year. that a hail event will occur annually in the county. In addition, the number of hail events is likely higher, due to the under reporting of hail which reinforces this probability.

Climate Change Impacts

Climate change presents a significant challenge for risk management associated with severe weather. The frequency of severe weather events has increased steadily over the last century and historical data shows that the probability for severe weather events increases in a warmer climate. The changing hydrograph, caused by climate change, could have a significant impact on the intensity, duration, and frequency of storm events. According to the 2023 CO E-SHMP, small hail may become less frequent, owing to increasing temperature causing this hail to melt and fall as rain. However, large hail may increase in frequency in eastern Colorado, owing to an increase in conditions supporting intense thunderstorms. All of these impacts could have significant economic consequences. Duration is the only impact of hailstorms that is not expected to be affected by future climate change.

6.10 Landslide / Debris Flow / Rockfall

General Background

A landslide is a general term for a variety of mass-movement processes (i.e. - mass wasting events) that generate a downslope movement of soil, rock, and vegetation under gravitational influence. Some of the natural causes of ground instability are stream and lakeshore erosion, heavy rainfall, a decrease in the shear strength of the slope material, and an increase in the shear stress borne by slope materials. In addition, many human activities can make earth materials less stable and increase the chance of ground failure. Human activities contribute to soil instability through improper grading of slopes, removal of vegetation, excessive irrigation, or overloading slopes with fill, structures, or pavements.

The USGS estimates that an average of 25-50 people in the United States die from landslides each year, with the global yearly death toll in the thousands. The deadliest of landslides are rockfalls, debris flows, or volcanic debris flows (lahars)[11].

Landslide

Landslides are caused by one or a combination of the following factors: change in slope of the terrain, increased load on the land, shocks and vibrations, change in water content, groundwater movement, frost action, weathering of rocks, and removing or changing the type of vegetation covering slopes. In general, landslide hazard areas are where the land has characteristics that contribute to the risk of the downhill movement of material, which includes evaluating the slope, history of prior failure, and the strength of the soil or rock. Cuts to the toe of a slope by natural erosion or human activity can also cause landslide events.

Deep-seated landslide failures typically have a slow onset and can be monitored through soil moisture levels and inspecting for ground cracking or slumping in areas of previous landslide activity.

Debris Flow

Debris flows are fast-moving landslides that are particularly dangerous to life and property because they move quickly, destroy objects in their paths, and often strike without warning. Debris flows generally occur during periods of intense rainfall or rapid snowmelt and usually start on hillsides or mountains. Debris flows can travel at fast speeds and can carry large boulders, trees, and cars. If a debris flow enters a steep stream channel, they can travel for several miles, impacting areas unaware of the hazard. Areas recently burned by a forest fire are especially susceptible to debris flows, including the areas downslope and outside of the burned area. Debris flows are sometimes referred to as mudslides, mudflows, or debris avalanche.

Rockfall

Rockfall is a type of fast-moving landslide that happens when rock bounces or rolls from a cliff or down a very steep slope. Weathering and decomposition of geological materials produce conditions favorable

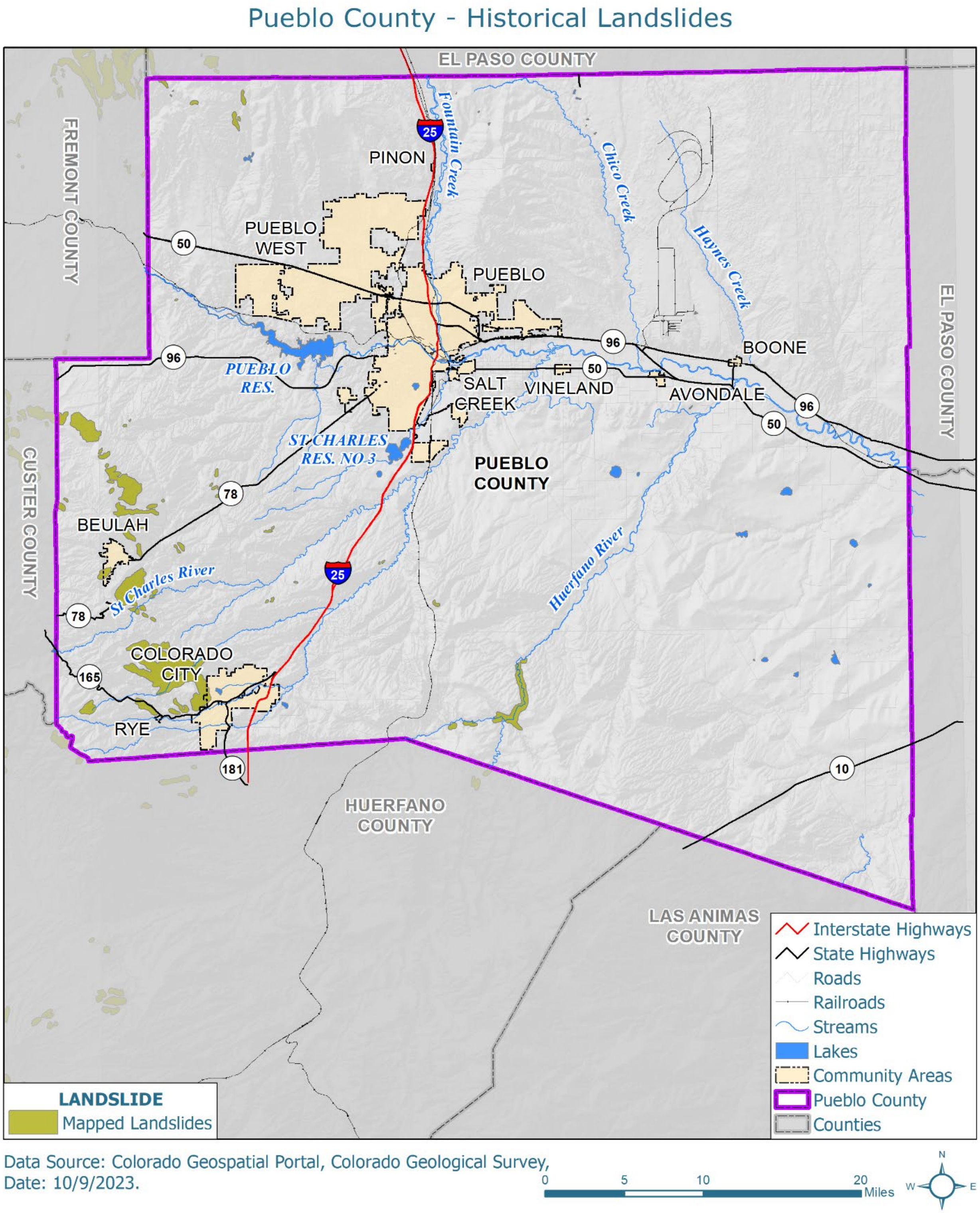
[11] How many deaths result from landslides each year? | U.S. Geological Survey (usgs.gov)

to rockfalls. Rockfalls are caused by the loss of support from underneath through erosion, or triggered by ice wedging, root growth, or ground shaking. Changes to an area or slope, such as cutting and filling activities, can also increase the risk of a rockfall. Rocks in a rockfall can be of any dimension, from the size of baseballs to houses. Spring is typically the landslide / rockfall season in Colorado as snow melts saturates the ground and temperatures enter into freeze / thaw cycles.

Past Events

Mainly located in the Western and Southern areas of the county, **Figure 35** shows the location of historical landsides in Pueblo County.

Figure 35 Pueblo County Historical Landslides



Location

As shown in the previous Figure, landslides are most likely to occur in the more mountainous and hilly areas of the county and can be expected to occur near historical events.

Severity

Landslides destroy property and infrastructure and can take the lives of people. It is likely that past events have resulted in isolated deaths or multiple injuries, as well as major or long-term property damage.

A 2015 paper published by CDOT presents a detailed quantitative assessment of how rockfalls, rockslides, landslides, debris flows, and sinkholes affect the state's transportation infrastructure. The statewide impacts from geologic hazards along CDOT highways can be grouped into two categories: (1) direct costs incurred by CDOT for maintenance, labor and equipment, engineering, and construction activities, and (2) indirect costs including but not limited to property damage, injury or fatalities, traveler delay, lost productivity, loss of revenue to businesses and communities, and environmental impacts.[12]

Warning Time

Mass movements can occur suddenly or slowly. The velocity of movement may range from a slow creep of inches per year to many feet per second, depending on slope angle, material, and water content. Some methods used to monitor mass movements can provide an idea of the type of movement and the amount of time prior to failure. It is also possible to identify what areas are at risk during general time periods. Assessing the geology, vegetation, and amount of predicted precipitation for an area can help in these predictions. However, there is no practical warning system for individual landslides. The current standard operating procedure is to monitor situations on a case-by-case basis and respond after the event has occurred.

Secondary Hazards

Landslides can cause several types of secondary effects, such as blocking access to roads, which can isolate residents and businesses and delay commercial, public, and private transportation. This could result in economic losses for businesses. More significantly, landslides can limit the ability of emergency response services to access and serve portions of the county and Highway 96. Additionally, rockfalls to the river can create blockages causing flooding and damage to rivers or streams. Other potential problems resulting from landslides are power and communication failures, which can also occur when vegetation or poles on slopes are knocked over. Landslides have the potential of destabilizing the foundation of structures, which may result in monetary loss for residents.

Debris flow poses a secondary hazard of flooding due to the blockages that debris may create and trap water. The debris flow and flooding can also contribute to bank erosion. Debris flows may cause

[12] The Economic Impacts of Geologic Hazard Events on Colorado Transportation Facilities

hazardous material releases if the debris were to damage storage tanks or infrastructure. Public health issues are a hazard as well, the impact to the drinking water supply from the debris flow and flooding could be dangerous, as well as any damage to sewer systems or wastewater spillage.

Exposure and Vulnerability

Lifelines

All community Lifelines across the county are vulnerable to the impacts from a mass wasting event. The Transportation Lifeline could be the most impacted. While no analysis is possible without mapped hazard areas, the likelihood of road closures and bridge damage in a debris flow event is high. Most debris flows will have little to no impact to Lifelines. In some cases, single events may have significant impact, resulting in deaths or causing extensive damage to public infrastructure.

Table 58 details the Lifelines that are located within Moderate hazard landslide areas. **Table 59** provides a similar assessment for those Lifelines in the High or Highest debris flow probability areas. Energy and Transportation lines are measured in miles.

Table 58 Lifelines – Landslide Susceptibility (Moderate Hazard)

Lifeline	City of Pueblo	Town of Boone	Town of Rye	Pueblo West Metro District	Colorado City Metro District	Unincorporated	Total
Energy (Miles)	0	0	0	0	0	0	**0**
Energy	0	0	0	0	0	0	**0**
Transportation (Miles)	0	0	0	0	0	1.6	**1.6**
Transportation	0	0	0	0	0	2	**2**
Comm-unications	0	0	0	0	0	0	**0**
Food, Hydration, & Shelter	0	0	0	0	0	0	**0**
Health & Medical	0	0	0	0	0	0	**0**

Lifeline	City of Pueblo	Town of Boone	Town of Rye	Pueblo West Metro District	Colorado City Metro District	Unincorporated	Total
Safety & Security	0	0	0	0	0	0	**0**
Hazardous Materials	0	0	0	0	0	0	**0**

Table 59 Lifelines - Debris Flow Probability

Lifeline	City of Pueblo	Town of Boone	Town of Rye	Pueblo West Metro District	Colorado City Metro District	Unin-corporated	Total
High							
Energy (Miles)	0	0	0	0	0	0	**0**
Energy	0	0	0	0	0	0	**0**
Transportation (Miles)	0	0	0	0	0.1	2.2	**2.3**
Transportation	0	0	0	0	2	5	**7**
Comm-unications	0	0	0	0	0	0	**0**
Food, Hydration, & Shelter	0	0	0	0	0	0	**0**
Health & Medical	0	0	0	0	0	0	**0**
Safety & Security	0	0	0	0	0	0	**0**

Lifeline	City of Pueblo	Town of Boone	Town of Rye	Pueblo West Metro District	Colorado City Metro District	Unin-corporated	Total
Hazardous Materials	0	0	0	0	0	0	**0**
Highest							
Energy (Miles)	0	0	0	0	0	0	**0**
Energy	0	0	0	0	0	0	**0**
Transportation (Miles)	0	0	0	0	0	13.1	**13.1**
Transportation	0	0	0	0	0	1	**1**
Comm-unications	0	0	0	0	0	0	**0**
Food, Hydration, & Shelter	0	0	0	0	0	0	**0**
Health & Medical	0	0	0	0	0	0	**0**
Safety & Security	0	0	0	0	0	0	**0**
Hazardous Materials	0	0	0	0	0	0	**0**

People

Exposure to landslide hazard areas is likely limited for a majority of the population. Individuals in recreation areas or driving on roadways may be exposed to landslide hazards. In general, all persons exposed to landslide hazard areas are considered to be vulnerable.

In most debris flow events, there are limited or no deaths and injuries.

STRUCTURES

Several types of infrastructure are exposed to mass movements, including transportation, water and sewer, and power. Highly susceptible areas of the county include mountain roads and transportation infrastructure. At this time, all infrastructure and transportation corridors identified as exposed to the landslide hazard are considered vulnerable until more information becomes available.

Table 60 details the number and valuation, respectively, of structures and parcels located in the Moderate hazard landslide areas. **Table 61** provides a similar assessment for the High and Highest probability debris flow areas.

Table 60 Structures – Landslide Susceptibility (Moderate Hazard)

	City of Pueblo	Town of Boone	Town of Rye	Pueblo West Metro District	Colorado City Metro District	Unincor-porated	Total
Structures							
Building Count	0	0	0	0	69	87	**156**
Parcel Count	0	0	0	0	204	191	**395**
Valuation							
Total Land Value	0	0	0	0	$2,222,136	$3,681,673	**$5,903,809**
Total Structure Value	0	0	0	0	$11,002,052	$32,078,201	**$43,080,253**
Total Value	0	0	0	0	$13,224,188	$35,759,874	**$48,984,062**

Table 61 Structures - Debris Flow Probability

	City of Pueblo	Town of Boone	Town of Rye	Pueblo West Metro District	Colorado City Metro District	Unincor-porated	Total
High							
Structures							
Building Count	0	0	0	0	0	496	**496**
Parcel Count	0	0	0	0	0	1,749	**1,749**
Valuation							
Total Land Value	0	0	0	0	0	$13,436,802	**$13,436,802**
Total Structure Value	0	0	0	0	0	$100,726,594	**$100,726,594**
Total Value	0	0	0	0	0	$114,163,396	**$114,163,396**
Highest							
Structures							
Building Count	0	0	0	0	0	910	**910**

	City of Pueblo	Town of Boone	Town of Rye	Pueblo West Metro District	Colorado City Metro District	Unincor-porated	Total
Parcel Count	0	0	0	0	0	1,075	**1,075**
Valuation							
Total Land Value	0	0	0	0	0	$103,435,038	**$103,435,038**
Total Structure Value	0	0	0	0	0	$136,886,580	**$136,886,580**
Total Value	0	0	0	0	0	$240,321,618	**$240,321,618**

Natural, Historic, and Cultural resources

Landslides, debris flows, and rockfalls have the ability to cause damages to the various natural, historic, and cultural resources of the community. Additionally, these events can damage agricultural systems, destroying crops and harming livestock, and disrupt natural ecosystems.

Other Community Assets and Activities

Road closures caused by landslides, debris flows, and rockfalls have economic impacts on impacted communities. Not only may businesses along closed road experience decreased customer traffic, reduced sales, and potential financial losses, road closures can impact supply chains, transportation logistics, and productivity.[13] Also per CDOT's 2021 Climate Resilience Study, "estimated annual direct departmental costs from geohazard events averages about $17 million to $20 million…each year. Over one-half of the direct costs is the result of landslide. CDOT maintenance work orders suggest routine maintenance response for rockfall creates an annual direct cost of over $5 million. In terms of larger

[13] How does a road closure affect traffic flow? – National Traffic Designs

rockfall events, the economic impact for two rockfall events that closed I-70 for several days in 2004 and 2010 was estimated to be more than $40 million each."

Other government-specific vulnerabilities are shown in **Table 62**.

Table 62 Local Government Vulnerability – Other Community Assets and Activities

Local Government	Local Vulnerability
Pueblo County	Some communities/roadways could be impacted and cause extended travel delays as people have to find alternate routes.
City of Pueblo	Landslide is not a hazard of concern due to the geography within and neighboring the city.
Pueblo West Metro District	Landslide is not a hazard of concern due to the geography within and neighboring the district.
Colorado City Metro District	Landslide events can result in roads being blocked, limiting the ability for populations to get out of the area for resources. This would additionally limit emergency access for first responders to citizens in need.
St. Charles Mesa Water District	Landslide is not a hazard of concern due to the geography within and neighboring the district.
Beulah Fire Protection District	Landslide events can result in roads being blocked, limiting the ability for populations to get out of the area for resources. This would additionally limit emergency access for first responder to citizens in need.

Trends in Development

Any development in known landslide area could increase risk to this hazard. Development in and around previous wildfire burn scars will also experience increased risk to debris flows. **Table 63** presents additional vulnerability information specific to each government.

Table 63 Local Government Vulnerability – Future Trends in Development

Local Government	Future Development
Pueblo County	Future development is not anticipated to directly impact vulnerability to this hazard.
City of Pueblo	Future development is not anticipated to directly impact vulnerability to this hazard.
Pueblo West Metro District	Future development is not anticipated to directly impact vulnerability to this hazard.
Colorado City Metro District	There has been an increase in new home construction in hazard areas or in areas that could be greatly impacted by an event. Growth of new house construction in these hazard areas has increased the district's vulnerability.
St. Charles Mesa Water District	Future development is not anticipated to directly impact vulnerability to this hazard.
Beulah Fire Protection District	Future development is not anticipated to directly impact vulnerability to this hazard.

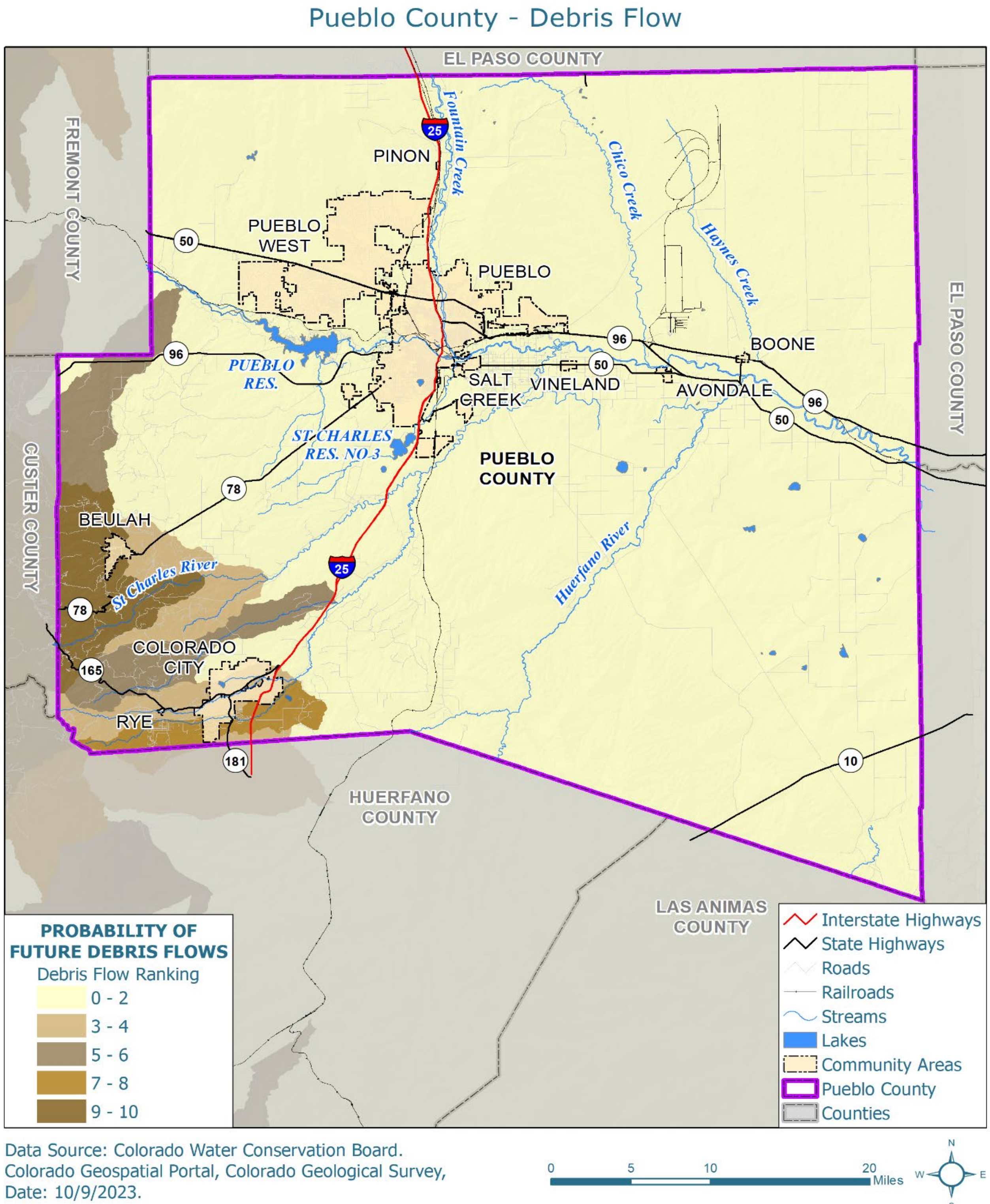
Probability of Future Occurrences

The frequency of landslide events within the county are difficult to ascertain due to a lack of information regarding past events. For the purposes of this plan, it will be assumed that landslide / rockfall events are likely to occur in any given year (100% chance).

Debris flows can occur rapidly with little warning during torrential rains. Debris flows generally occur with floods and downpours associated with the late summer monsoon season. Quantitative data availability is limited but, future debris flow events are likely to occur across the county regularly. Multiple factors may increase the frequency, including the effects of wildfire on the landscape and its ability to retain water.

Based on the recent Wildfire Ready Watersheds assessment by the Colorado Water Conservation Board (CWCB), **Figure 36** details the probability that a debris flow will occur within a two-year period across HUC 12 watersheds, given assumed burn severity (FlamMap). Higher probability areas are naturally located in the mountainous Western portions of the county.

Figure 36 Pueblo County – Probability of Future Debris Flows



Climate Change Impacts

The 2023 CO E-SHMP highlights climate change projections for more intense precipitation coupled with cycles of drought and/or wildfire events have the potential to increase mass wasting incidence. **Table 64** presents a breakdown of these projected changes in the hazard's location, extent/intensity, frequency, and duration.

Table 64 Climate Change Impacts

Impact	Projected Change
Location	Landslides, mud-debris flows, and rockfalls are only a hazard in mountainous regions of the state. Larger wildfire burn scars may create new areas that are vulnerable to landslides and debris flows during intense summer rainfall events.
Extent/ Intensity	The extent and intensity of flash flooding and debris flows may expand with larger wildfire burn scars creating new areas that are vulnerable to flash flooding during intense summer rainfall events.
Frequency	There are no clear trends in heavy precipitation events for Colorado, and like annual precipitation, there is considerable variability at annual and decadal time scales. If intense wildfires increase, then landslides and debris flows will become more frequent in burn-scar areas.
Duration	N/A

Per CDOT's 2021 Climate Resilience Study[14], climate change will affect mass wasting hazards in different ways. Both rockfalls and debris flows are expected to increase their frequency and magnitude (FM) due to increases in the number of extreme freeze/thaw days and increases in winter precipitation. Winter precipitation is also expected to increase FM for shallow and deep landslides. The increase in the number of extreme heat days and decrease in summer precipitation will also increase debris flow FM, due to expected increased wildfire events.

A decrease in summer precipitation is expected to decrease the FM for both debris flow and shallow landslides. Note that the study also points out that changes in FM will have a significant economic impact.

[14] 3538.00.20200129 (codot.gov)

6.11 Pandemic

General Background

A pandemic is an outbreak of an infectious disease over a widespread geographical area with significant prevalence affecting a large proportion of individuals in afflicted areas. Pandemics begin as an epidemic, which occur when a population experiences the occurrence of cases of an illness that are clearly in excess of expectancy and begin to spread to other areas and populations. The epidemiologic triangle used to understand the spread of infectious diseases consists of three main components; the first is the agent or the microorganism capable of producing an infectious disease. Infectivity, pathogenicity, and virulence are the characteristics of an infectious agent that dictate the severity of a disease. The second is the host, the person or animal that is susceptible to disease. The severity of an infection depends on the host's ability to fight off the infectious agent. The third is the environment, the domain in which disease-causing agents may exist, survive, or originate. An important component to the environment is the reservoir in which the infectious agent lives, grows, and multiplies. Additionally, time is an important aspect of the epidemiological triangle as it dictates the course of infectious diseases.

Disease transmission can either be vertical or horizontal. Vertical transmission passes the disease from mother to child through the mammary glands, placenta, or vagina. Horizontal transmission passes the disease from an infected individual to another susceptible individual, directly or indirectly. Direct transmission is person to person, through either direct contact (skin-to-skin, exchange of bodily fluids) or through droplets (sneezing, coughing, talking). Indirect transmission goes through an intermediary source. Airborne transmission carries infectious agents through dust or droplet nuclei suspended in the air, vector borne transmission involves an insect or animal in the transmission of the disease agent, and vehicle borne transmission requires an inanimate object (water, food, soil, fomites) to transmit the disease agent. After exposure to an infectious agent the chain of events is as follows, the agent infects the host, subclinical disease stage where the individual has not presented symptoms of the disease, clinical disease stage where symptoms of the disease ae evident, and then the stage of recovery, disability, or death.

To understand pandemic and the spread of infectious diseases, it is important to acknowledge the role of carriers. Infection can often be descried in comparison to an iceberg, the active clinical cases are just the tip, a relatively small proportion of the host's infections and exposures to disease agents, meaning that often individuals are carriers of infectious agents without their knowledge. Carriers fall under four categories; firstly, those who are asymptomatic (healthy) are individuals with inapparent infections, they never develop illness but can transmit infection. Secondly, those who are incubatory are individuals who will eventually become ill but begin transmission of infection before the onset of symptoms. Thirdly, those who are convalescent are individuals who continue to be infectious after their recovery. Finally, those who are chronic are individuals who will continue to harbor infections for a year or longer after being infected.

Past Events

Over the past 100 years there have been five pandemics (four as the result of influenza viruses and one of a coronavirus); the 1918 Spanish Flu, the 1957 Asian Flu, 1968 Flu, 2008 Swine Flu, and the 2019 Coronavirus.

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

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

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

2009 Swine Flu: In the spring of 2009, a new version of the H1N1 virus emerged. This version, due to its genetic lineage, became known as Swine Flu. By June, the Centers for Disease Control and Prevention (CDC) had stopped counting cases and declared it a pandemic. The CDC estimated that there were 60.8 million cases, 274,304 hospitalizations, and 12,469 deaths throughout the United States. A vaccine was distributed in the U.S. in October 2009 and the pandemic was declared over on August 11, 2010.

In Colorado, there had been 2,041 hospitalizations across 54 counties by May of 2010. A total of 69 people died. Unlike most other pandemics, deaths were fairly spread out amongst all age groups, with younger generations taking more of the brunt. Approximately 17% of the total deaths were under 18 years of age. This is likely because older generations had been exposed to another version of H1N1 at some point in their lives, giving them some immunity, while those who were younger had no existing immunity. Of those who were hospitalized, the CDC estimated that about 70 percent of them belonged to a high-risk group, meaning they likely had existing complications that only compounded the illness.

2019 Novel Coronavirus (COVID-19): In December 2019, COVID-19 emerged in China and the first confirmed COVID-19 case in Colorado presented on March 5, 2020. As of writing this plan, WHO data counts fatalities in the US as over 1.1 million deaths and globally over 6.9 million. The COVID-19 pandemic has affected approximately 1.7 million people in Colorado, with over 14,000 deaths.[15] Vaccines became available in December 2020 and 71.8% of Coloradoans, roughly 4.1 million, have completed the primary series of vaccine doses based on Colorado Department of Public Health and Environment (CDPHE) data. On May 11, 2023, the COVID-19 public health emergency was declared over in US.

Location

Pandemics occur across vast geographical regions, without regard to state or country boundaries, or continental distance. With the ease of international travel, a virus can spread across the globe within a day. As an example, a flight from Sydney, Australia to Denver, Colorado is less than 19 hours of travel time.

Severity

By its definition, a pandemic is a severe event. The characteristics of the virus are crucial, as how fast it spreads and incubates, along with how deadly it is can inform scientists and medical professionals of the best way to treat and eliminate it.

The more infectious it is, the larger the strain on healthcare and resources, as well as risk to the population which may rapidly become infected in large numbers. Other factors include the availability of a vaccine, personal protective equipment, and education about the virus, as well as the duration of the event.

Warning Time

To anticipate pandemic outbreaks, epidemiologists study the transmission of many infectious diseases. Additionally, epidemic curves outlining common (point, continuous, and intermittent) sources and propagated sources, measures of disease such as attack rates, secondary attack rates, case fatality rates, and basic reproductive rates, as well as screening measures allow epidemiologists to anticipate the source, severity, and vehicle of infections while rapidly assessing the trajectory of an pandemic outbreak.

Secondary Hazards

Severe weather events, especially prolonged storms requiring people to shelter closely can exacerbate the spread of the disease. Flooding can impact water safety and potentially introduce an illness that spreads among the population.

[15] Colorado - COVID-19 Overview - Johns Hopkins (jhu.edu)

Exposure and Vulnerability

Lifelines

Health & Medical is initially the most impacted Lifeline, as people who become ill from a public health hazard will seek medical attention. If there are a large number of people seeking medical attention, compared to the ability of a facility to treat them, strain on the healthcare system can occur which can affect treatment. In rural areas this may require transferring patients to other facilities, but if this option is not a feasible the person's care will be negatively impacted.

Other Lifelines that can be impacted by public health hazards are Food, Hydration, & Shelter, as any issues with the quality of the water and possible outbreaks on certain crops can cause large groups to need medical attention. Foodborne disease outbreaks can also rapidly affect the health of a community.

People

Depending on the disease, portions of the population will be at increased risk of negative impacts. Those with chronic conditions such as diabetes, asthma, heart disease, and obesity can have difficulties with their body's response to an infectious disease. It may be challenging for those with a low income, living in poverty, those with a disability, and the elderly to get the care and resources they need in a timely manner.

Structures

Structures and infrastructure are not impacted by pandemic events.

Natural, Historic, and Cultural Resources

Environmental impacts of a pandemic may long standing, if the disease is able to affect the animal population.

Other Community Assets and Activities

The economy, regional and local, can be affected in a variety of ways due to a pandemic, as was experienced during COVID-19. In extreme cases such as that event, the shutting down of businesses can be used to regulate the transmission of a disease outbreak and can be in effect for extended periods. This results in impacts throughout the region, as inter-county commerce is an important part of the local economies. The drop in tourism due to a pandemic event would also greatly affect the regional and local economies.

An indirect economic impact can be seen in loss of people in the workforce, as parents may need to stay home due to childcare and school closures. If people are leaving their houses less, shopping less locally and struggling with low income, the impact on the local economy may be seen in commodity and retail sales.

Other government-specific vulnerabilities are shown in **Table 65**.

Table 65 Local Government Vulnerability – Other Community Assets and Activities

Local Government	Local Vulnerability
Pueblo County	Elderly populations with limited mobility to access vaccines and all public events within the area are vulnerable to a pandemic event.
City of Pueblo	The citizens, hospitals, and festival events within the City of Pueblo are vulnerable to a pandemic event.
Pueblo West Metro District	Local populations can be affected by pandemic depending on severity. Similarly, the hospitals in the area could be overwhelmed by a pandemic event.
Colorado City Metro District	Elderly populations with limited mobility to access vaccines and all public events within the area are vulnerable to a pandemic event.
St. Charles Mesa Water District	Elderly populations with limited mobility to access vaccines and all public events within the area are vulnerable to a pandemic event.
Beulah Fire Protection District	Elderly populations with limited mobility to access vaccines and all public events within the area are vulnerable to a pandemic event.

Trends in Development

All residents of future development can be affected by pandemic events. The vulnerability of the population is increasing through time as more people enter the planning area. While property damage is not a concern, public safety can be improved with education.

Table 66 presents additional vulnerability information specific to each government.

Table 66 Local Government Vulnerability – Future Trends in Development

Local Government	Future Development
Pueblo County	Any future development will increase exposure to this hazard.
City of Pueblo	Any future development will increase exposure to this hazard.

Local Government	Future Development
Pueblo West Metro District	Any future development will increase exposure to this hazard.
Colorado City Metro District	Any future development will increase exposure to this hazard.
St. Charles Mesa Water District	Any future development will increase exposure to this hazard.
Beulah Fire Protection District	As the community population continues to age the increased risk of health issues increase especially in the face of a pandemic.

Probability of Future Occurrences

Pandemics are expected to continue to occur. Based on historical pandemic events there is annually a 4.7% chance of a pandemic event . However, it is not practical or feasible to predict future occurrences.

Climate Change Impacts

According to the CO E-SHMP, the future impacts of climate change are expected to influence future pandemic events. The following **Table 67** presents a breakdown of these projected changes in terms of hazard: location, extent/intensity, frequency, and duration.

Table 67 Climate Change Impacts

Impact	Projected Change
Location	Climate change will influence vector-borne disease prevalence, but the direction of the effects (increased or decreased incidence) will be location- and disease specific.
Extent/ Intensity	Intensity is projected to increase. Disadvantaged populations are expected to bear a greater burden from climate change as a result of their current reduced access to medical care and limited resources for adaptation strategies. Extent of certain diseases is expected to increase.
Frequency	Additional research is needed to determine the effects of climate change on the frequency of epidemics and pandemics.
Duration	Additional research is needed to determine the effects of climate change on the duration of epidemics and pandemics.

6.12 Severe Wind

General Background

Damaging winds are classified as those exceeding 60 mph. Damage from such winds accounts for half of all severe weather reports in the lower 48 states and is more common than damage from tornadoes. Wind speeds can reach up to 100 mph and can produce a damage path extending for hundreds of miles. There are seven types of damaging winds:

- Straight-line winds - Any thunderstorm wind that is not associated with rotation; this term is used mainly to differentiate from tornado winds. Most thunderstorms produce some straight-line winds because of outflow generated by the thunderstorm downdraft.
- Downdrafts - A small-scale column of air that rapidly sinks toward the ground.
- Downbursts - A strong downdraft with horizontal dimensions larger than 2.5 miles resulting in an outward burst or damaging winds on or near the ground. Downburst winds may begin as a microburst and spread out over a wider area, sometimes producing damage similar to a strong tornado. Although usually associated with thunderstorms, downbursts can occur with showers too weak to produce thunder.
- Microbursts - A small, concentrated downburst that produces an outward burst of damaging winds at the surface. Microbursts are generally less than 2.5 miles across and short-lived, lasting only 5 to 10 minutes, with maximum wind speeds up to 168 mph. There are two kinds of microbursts: wet and dry. A wet microburst is accompanied by heavy precipitation at the surface. Dry microbursts, common in places like the high plains and the intermountain west, occur with little or no precipitation reaching the ground.
- Gust front - A gust front is the leading edge of rain-cooled air that clashes with warmer thunderstorm inflow. Gust fronts are characterized by a wind shift, temperature drop, and gusty winds out ahead of a thunderstorm. Sometimes the winds push up air above them, forming a shelf cloud or detached roll cloud.
- Derecho - A derecho is a widespread thunderstorm wind caused when new thunderstorms form along the leading edge of an outflow boundary (the boundary formed by horizontal spreading of thunderstorm-cooled air). The word “derecho” is of Spanish origin and means “straight ahead.” Thunderstorms feed on the boundary and continue to reproduce. Derechos typically occur in summer when complexes of thunderstorms form over plains, producing heavy rain and severe wind. The damaging winds can last a long time and cover a large area.

- Bow Echo - A bow echo is a linear wind front bent outward in a bow shape. Damaging straight- line winds often occur near the center of a bow echo. Bow echoes can be 200 miles long, last for several hours, and produce extensive wind damage at the ground.

Past Events

The NCEI Storm Database has a record of 222 days with reported high wind and thunderstorm wind events between 1955 and 2022. The highest recorded windspeed was 84 mph and while higher windspeeds may have occurred the Storm Database relies on best available data submitted. During the period of record there have been no reported deaths, seven (7) reported injuries, and no damages to crops reported.

According to Colorado Public Radio[16], in May of 2022, high winds caused a boat on Lake Pueblo to capsize. The accident tragically resulted in 2 fatalities.

Table 68 shows the details of some of the significant wind events which caused damages or injuries per the NCEI database. In some cases, wind events are not reported with damages, but did impact the community. A wind event in July 2019, ripped off a large part of the roofing from a church in Pueblo, which later flooded due to severe hail and rain.

Another notable wind event in Pueblo County occurred on December 15, 2021, when winds from 70 to 81 miles per hour wreaked havoc across the county[17], from Blende to Colorado City to Pueblo West. Reports of downed power lines left an estimated 15,000 residents without power across Pueblo and the strong winds took down trees, blew off roofs, and flipped over cars. The winds caused heavy dust storms and tumbleweeds raced across communities in large numbers[18].

Table 68 Significant Wind Events in Pueblo County (1955-2022)

Date	Location	Magnitude (mph)	Injuries	Property Damage	Description
July 8, 1995	Pueblo Lake	-	4	-	Strong thunderstorm winds capsized a boat and injured four occupants on Pueblo Lake.
May 20, 2001	Pueblo West	75	0	$ 2,500,000	

[16] Authorities recover two bodies, rescue 11 after boat capsizes on Lake Pueblo Sunday | Colorado Public Radio (cpr.org)
[17] Extreme Wind Event (weather.gov)
[18] Downed trees, thousands without power in Pueblo following wind storm | KRDO

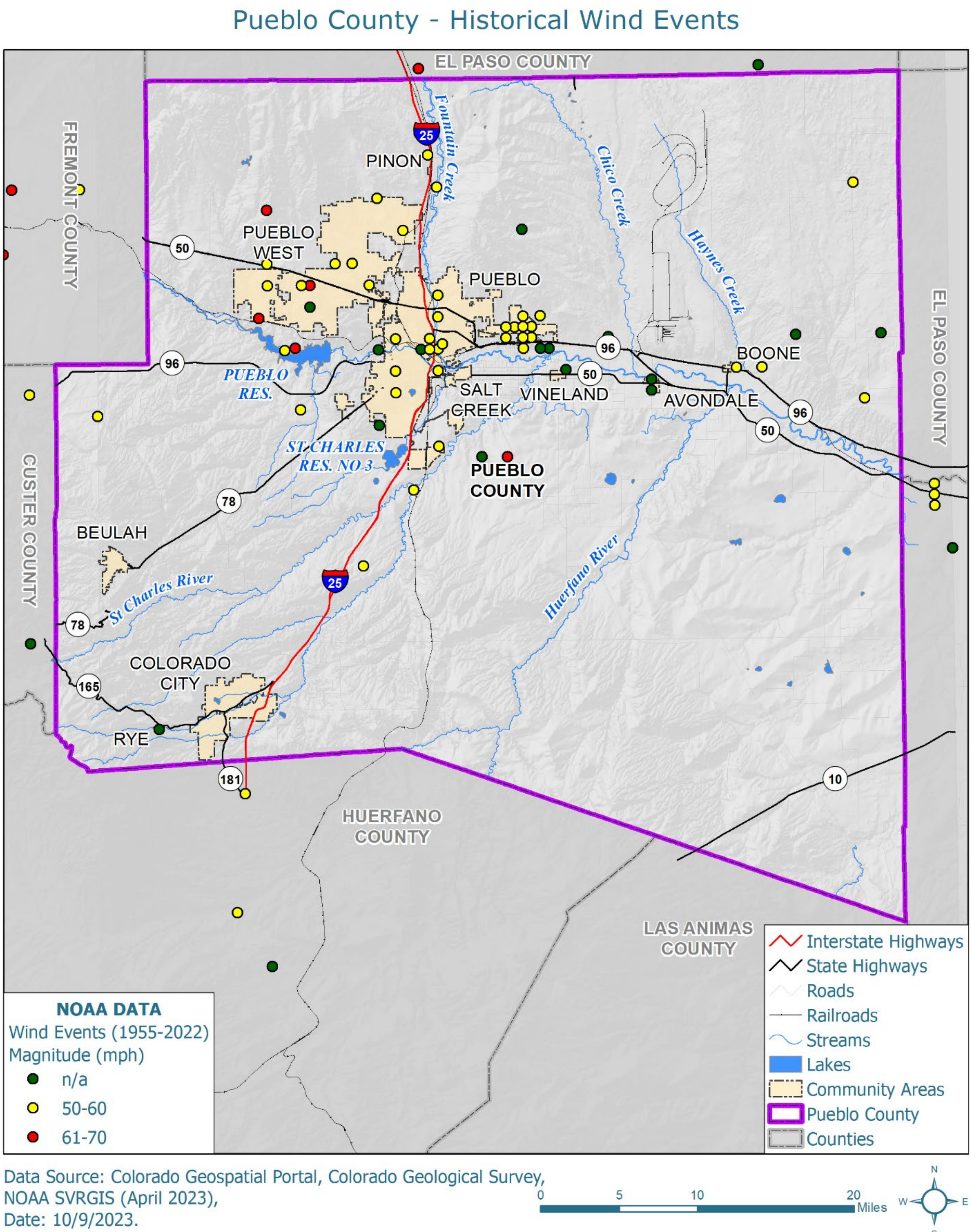
Date	Location	Magnitude (mph)	Injuries	Property Damage	Description
June 17, 2002	Pueblo West	71	0	$ 30,000	An 82 mph microburst wind gust caused many fences to be blown down, some trees were uprooted and about 200 homes were without electricity for a short time.
August 26, 2006	Pueblo	60	3	$ 1,000,000	Severe winds ripped through Pueblo West and mainly the north half of Pueblo causing minor but widespread damages. Three people suffered minor injuries at the Colorado State Fair when a large tent was upset. Power outages affected around 10,000 Pueblo West and Pueblo residents and visitors, some lasting up to two days.
August 26, 2006	Pueblo	60	0	$ 40,000	Severe winds caused one aircraft to be tipped on its nose and another aircraft to be overturned at Pueblo Memorial Airport. Both planes were tethered.
July 12, 2009	Pueblo West	45	0	$ 20,000	Two boats sank as a result of six (6) foot waves due to outflow winds from thunderstorms in El Paso County.

Date	Location	Magnitude (mph)	Injuries	Property Damage	Description
May 24, 2010	Pueblo West	52	0	$ 20,000	Gradient winds gusting up to 75 mph caused damage over portions of El Paso and Pueblo Counties. A modular building was flipped on its top by the wind in Pueblo West. A few trees were uprooted in the City of Pueblo.
July 8, 2011	Pueblo Municipal Airport	70	0	$ 20,000	Severe storms generated damaging wind gusts up to 80 mph, as well as hail up to the size of quarters. A metal ramp was moved approximately 100 yards from an NWS outbuilding. In addition, evaporation pans were blown across the street. Also, a semi was flipped over on Eaton Way and portions of the Goodrich plant roof were peeled away.
June 8, 2014	Pueblo Municipal Airport	53	0	$ 3,000	Storms produced severe gusts and hail in the I-25 corridor. Multiple vehicles had windows blown out.
July 15, 2014	Boone	83	0	$ 3,000	A powerful microburst occurred just west and south of Fowler in extreme eastern Pueblo County. A chimney was toppled and large trees were uprooted.
July 25, 2014	Pueblo	52	0	$ 2,000	A dead tree was struck by lightning then blow down by severe winds.

Date	Location	Magnitude (mph)	Injuries	Property Damage	Description
July 4, 2017	Pueblo West	61	0	$ 30,000	A shower that fell into relatively dry air, created a damaging microburst that struck the North Shore Marina on the Pueblo Reservoir. Damage was done to several docks and minor damage occurred to boats.
August 9, 2017	Pueblo West	60	0	$ 4,000	Two modular homes were damaged, one being flipped on its side. They were unoccupied and no one was injured.

Figure 37 shows the location of historical wind events in Pueblo County

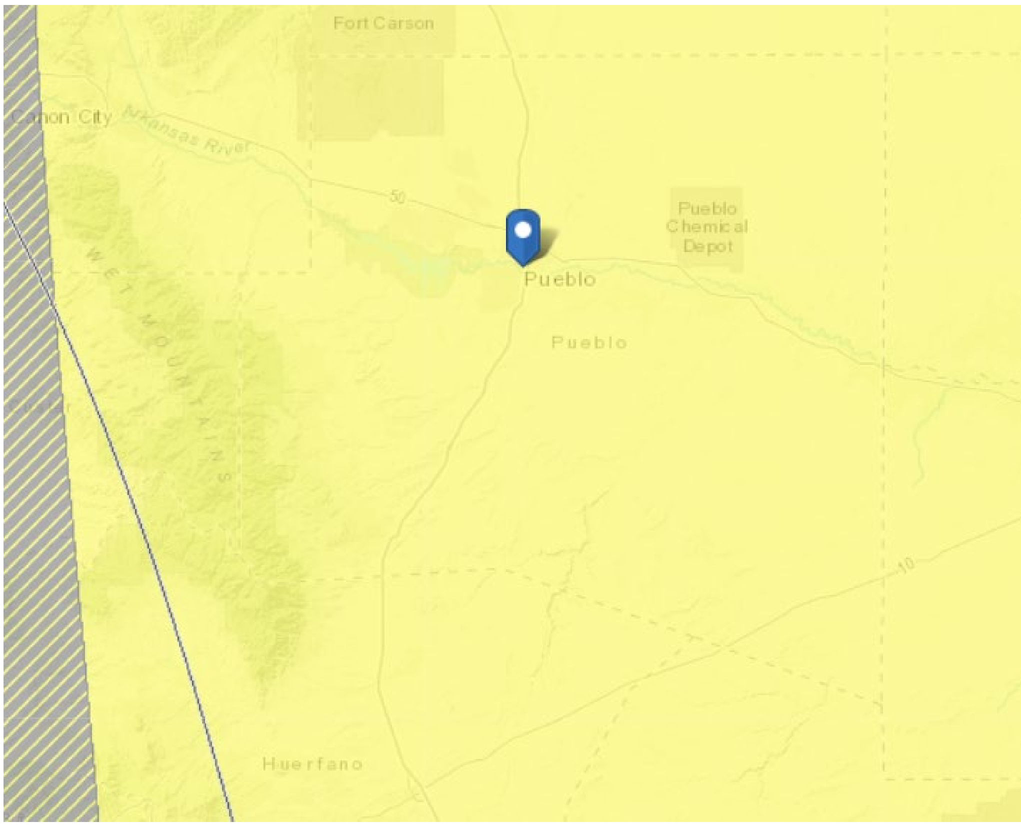
Figure 37 Pueblo County Historical Wind Events (1955-2022)



Location

Wind events can occur anywhere in Pueblo County and pose a similar risk to all local governments. The American Society of Civil Engineers' [Wind Zones in the United States Map](), shown in **Figure 38,** states that Pueblo County can expect wind events between 106 - 114 mph.

Figure 38 Pueblo County Wind Zones



Severity

The Beaufort Wind Scale, summarized in **Table 69**, is used to measure the severity of high winds. Hurricane force winds are defined as a speed equal to or greater than 64 knots (74 mph) or Beaufort Number 12 (Force 12). Hurricane-force winds are not exclusive to hurricanes; they can occur during severe thunderstorms.

Table 69 Beaufort Wind Scale

Force	Wind Speed (KTS)	WMO Classification	Appearance of Wind Effects (on Land)
0	< 1	Calm	Calm, smoke rises vertically
1	1-3	Light Air	Smoke drift indicated wind direction, still wind vanes
2	4-6	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	7-10	Gentle Breeze	Leaves and small twigs constantly moving, light flags extended
4	11-16	Moderate Breeze	Dust, leaves, and loose paper lifted, small tree branches move
5	17-21	Fresh Breeze	Small trees in leaf begin to sway
6	22-27	Strong Breeze	Larger tree branches moving, whistling in wires
7	28-33	Near Gale	Whole trees moving, resistance felt walking against wind
8	34-40	Gale	Twigs breaking off trees, generally impedes progress
9	41-47	Strong Gale	Slight structural damage occurs, slate blows off roofs
10	48-55	Storm	Seldom experienced on land, trees broken or uprooted, "considerable structural damage"
11	56-63	Violent Storm	
12	64+	Hurricane	

High winds, often accompanying severe thunderstorms, can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. Strong wind events due to topography gap flow winds are frequent in Pueblo County especially in shoulder seasons. The county can also experience cold front gusts up to 90 mph. Wind events in Pueblo

County are rarely life threatening but do disrupt daily activities and cause damage to buildings and structures. Winds can also cause trees to fall creating a hazard to property and individuals.

Warning Time

Meteorologists can often predict the likelihood of a severe thunderstorm. This can give several days of warning time. However, meteorologists cannot predict the exact time of onset or severity of the storm. Some storms may come on more quickly and have only a few hours of warning time.

Secondary Hazards

The most significant secondary hazards associated with severe wind are downed trees and downed power lines. Many locations in the county have minimal vegetative ground cover and the high winds can create a large dust storm which becomes a hazard for travelers and a disruption for local services. Debris carried by high winds can also result in injury or damage to property. A wildland fire can be accelerated and rendered unpredictable by high winds.

Exposure and Vulnerability

Lifelines

All community Lifelines across Pueblo County are vulnerable to the impacts from a severe wind event. Expected impacts to the Energy Lifeline are anticipated to pose the most risk to the county.

People

It can be assumed that the entire planning area is exposed high wind events. Areas of greater exposure are where higher population densities exist. Certain areas experience more severe events due to geographic location and local weather patterns. Populations living at higher elevations, with large stands of trees or power lines may be more susceptible to wind damage and blackouts.

Populations with access and functional needs (AFN), including the elderly, those with low income, linguistically isolated populations, people with mobility issues, and residents living in areas that are isolated from major roads may see more impacts from severe wind events. Power outages can be life threatening to those dependent on electricity for medical support. Isolation of these populations is a significant concern. Those working outdoors or recreating in the area are more vulnerable to severe weather events.

Those who reside in manufactured (mobile) homes can be vulnerable to the impacts of extreme winds if their residences are not properly anchored to a secure foundation.

Structures

All infrastructure Lifelines are exposed to risks associated with severe winds. Those on higher ground may have increased exposure to wind damage and all are at risk of damage from falling trees. The most common problems associated with these events are loss of utilities. Downed power lines can cause blackouts, leaving large areas isolated and without communications. Failure of these systems would have cascading effects throughout the county.

All buildings are considered exposed to the high wind. Vulnerable structures such as those in poor condition or mobiles, or in often affected locations (located on hilltops or exposed open areas) may risk the most damage. The frequency and degree of damage will depend on specific locations and behavior of the winds.

Wind pressure can create a direct and frontal assault on a structure, pushing walls, doors, and windows inward. Conversely, passing currents can create lift and suction forces that act to pull building components and surfaces outward. The effects of winds are magnified in the upper levels of multi-story structures. As positive and negative forces impact the building's protective envelope (doors, windows, and walls), the result can be roof or building component failures and considerable structural damage.

Natural, Historic, and Cultural Resources

Severe winds can have tremendous impacts on the natural, historic, and cultural resources of a community. Strong winds can damage buildings, especially older historic buildings, and public community spaces, such as parks and public art. The environment is highly exposed to high wind. Natural habitats risk major damage and destruction. Severe winds can strip and uproot vegetation, affecting natural ecosystems and agricultural crop yields.

Other Community Assets and Activities

Economic impact from severe wind is possible, as damage to property, crops and livestock may result in losses. High wind events are also extremely damaging to crops. The losses suffered from a harvest ruined by severe wind, or the death of livestock, can affect the local economy.

In addition, disruption of Lifelines and daily operations due to damaged infrastructure and facilities can cause losses. Repairing, rebuilding, or replacing critical equipment may be a slow process which could have cascading effects on businesses and the local economy. Any extended delay of returning to normal functioning has the potential to close businesses and impact industry.

Other government-specific vulnerabilities are shown in **Table 70**.

Table 70 Local Government Vulnerability – Other Community Assets and Activities

Local Government	Local Vulnerability
Pueblo County	Severe wind events can impact structures in the county damaging roofs, siding, etc. Roughly 33% of powerlines and 50-60% of phone and fiber internet lines are above ground in the county and are vulnerable to the impacts of a severe wind event.

Local Government	Local Vulnerability
City of Pueblo	In the city of Pueblo the unhoused populations, various buildings (specifically older construction), communication and power systems, and festival events are vulnerable to the impacts of severe wind.
Pueblo West Metro District	Severe winds can damage the roofs, siding, etc. of structures in Pueblo West. There are roughly 50-60 above ground phone and fiber internet lines and 20% above ground power lines in PWMD that are vulnerable to severe winds. Additionally severe wind can impact the annual 4th of July Parade.
Colorado City Metro District	In the event of severe wind 2,500 people could be affected from a loss of potable water. The loss of power will shut down the potable water plant and water pumps will be unable to distribute water.
St. Charles Mesa Water District	Severe winds can damage the roofs, siding, etc. of structures for the district. A loss of power the to the area could limit water production and distribution to customers.
Beulah Fire Protection District	Structure damage to residences and commercial properties have occurred in the past due to high wind events. Additionally, the San Isable Power Lines are vulnerable to severe wind events.

Future Trends in Development

All future development can be affected by severe wind. The exposure across the county is increasing through time as more people move into the county. The ability to mitigate impacts lies in consistent enforcement of codes and regulations for new construction. Adherence to these building codes will ensure construction is more likely to withstand a severe weather event.

Public education is critical as new residents move to the area. Many may not have experienced the types of severe wind events seen in the county and will not know how to be prepared. Educating the population on these hazards and how to minimize risk from events will prove beneficial for the county.

Table 71 presents additional vulnerability information specific to each government.

Table 71 Local Government Vulnerability – Future Trends in Development

Local Government	Future Development
Pueblo County	Future development is not anticipated to directly impact vulnerability to this hazard. Any future development will increase exposure to this hazard.
City of Pueblo	Any future development will increase exposure to this hazard, mostly impacting private buildings.
Pueblo West Metro District	Future development is not anticipated to directly impact vulnerability to this hazard. Any future development will increase exposure to this hazard.
Colorado City Metro District	Any future development will increase exposure to this hazard. This would create more overhead power lines to be blown down.
St. Charles Mesa Water District	Future development is not anticipated to directly impact vulnerability to this hazard. Any future development will increase exposure to this hazard.
Beulah Fire Protection District	Future development is not anticipated to directly impact vulnerability to this hazard. Any future development will increase exposure to this hazard.

Probability of Future Occurrences

Best available data for reported windstorm events suggests an event will occur in any given year, while reported damaging windstorm events have an approximate 19% chance of occurring annually.

Climate Change Impacts

Climate change presents a significant challenge for risk management associated with severe weather. The frequency of severe weather events has increased steadily over the last century and historical data shows that the probability for severe weather events increases in a warmer climate. The changing hydrograph, caused by climate change, could have a significant impact on the intensity, duration, and frequency of storm events. All of these impacts could have significant economic consequences.

The 2023 CO E-SHMP details that the location, extent/intensity, and frequency of severe wind events is not projected to change, however it is unknown if the duration of these events will change.

6.13 Severe Winter Weather

General Background

Winter storms can include heavy snow, ice, and blizzard conditions. Heavy snow can immobilize a region, stranding commuters, stopping the flow of supplies, and disrupting emergency and medical services. Pueblo County receives varying amounts of snow throughout the area. Average annual snowfall in Pueblo County ranges from around 28 inches in eastern and central sections to over 120 inches on the slopes of the Wet Mountains. Blizzards are infrequent in Pueblo County. A blizzard is defined as visibilities frequently reduced to lower than ¼ mile in falling or blowing snow, with sustained winds or frequent gusts above 35 mph.

Accumulations of snow can collapse roofs and knock down trees and power lines. In rural areas, homes and farms may be isolated for days, and unprotected livestock may be lost. The cost of snow removal, damage repair, and business losses can have a tremendous impact on municipalities.

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, as well as close highways. Serious vehicle accidents can result in injuries and deaths. Winter winds can also induce avalanches.

Extreme cold often accompanies a winter storm, or is left in its wake, and is most likely to occur in the winter months of December, January, and February. Prolonged exposure to the cold can cause frostbite and hypothermia, as well as become life-threatening. Wind chill is the dangerous combination of wind and cold temperatures and is based on the rate of heat loss from exposed skin. A wind chill watch is issued by the NWS when wind chill warning criteria are possible in the next 12 to 36 hours. A wind chill warning is issued for wind chills of at least -25°F on the plains.

Past Events

Southeastern Colorado, including Pueblo, received three (3) FEMA Emergency Snow Declarations, one for a storm in March 2003 and another two (2) for the heavy snow accumulation during the last couple of weeks in December 2006.

Cold, moist northeast air flow with storm systems can typically yield 10 to 20 inches of snowfall in extreme western and southwestern parts of the county, while the rest of the county sees only minor accumulations with hazardous travel conditions.

The "Blizzard of 1997" during the last week of October, immobilized Pueblo County; stranding motorists, stopping the flow of supplies, and disrupting emergency and medical services. This event caused a reported $300,000 in damages and one death in Pueblo County.

From March 17 to 20, 2003, higher terrain in Colorado's southeastern mountains experienced extreme accumulations of snow. In the Wet Mountains, snow accumulations ranged from 35 to 75 inches over a two-day period. Southern Colorado came to a halt as all major highways were closed.

On March 13, 2019, Colorado was hit with a historic bomb cyclone. A bomb cyclone is simply the rapid deepening of a low-pressure system by 24 millibars in 24 hours. Strong winds blew down trees and powerlines and grounded planes in airports across the state, leaving 445,000 people across the state without power and thousands stranded. Blizard conditions closed major highways and cause numerous vehicle collisions.[19]

A rare extreme cold event occurred in Pueblo, on December 22, 2022, when a strong cold front moved across the area in the evening, bringing a brief period of snowfall, gusty northerly winds, and frigid temperatures. Snowfall amounts generally stayed light, two to four inches. Extreme cold was reported over the plains, observing wind chill values of 25 to 35 degrees below zero.

Based on NCEI data, during the period of 1996 to 2022, there have been 351 severe winter weather events over 182 days in Pueblo County which includes blizzard (8), winter storm (243), winter weather (34), and heavy snow (66) events. The NCEI Storm Database primarily lists snow totals for regions that experienced the event, **Table 72** highlights notable, recorded snow totals, over 1 foot, between 1996 and 2021.

Table 72 Notable Snow Totals (1996-2022)

Date	Location	Description
December 9, 1997	Beulah, Rye	One foot at Beulah and 20 to 25 inches around Rye
March 17, 2003	Pueblo County	Most of the accumulating snow fell above 6000 feet, including the central and southeast mountains, high valleys and the adjacent plains. Areas hardest hit by snow on the plains were the northern half of El Paso county and southern Pueblo county to the New Mexico state line. Snow totals varied greatly.
April 22, 2004	Beulah, Rye	Two feet around Beulah and Rye

[19] Looking Back: Analyzing the March 13th, 2019 Bomb Cyclone (koaa.com)

Date	Location	Description
January 28, 2005	Colorado City	25 inches around Colorado City
December 20, 2006	Colorado City, Rye	22 inches at Rye and Colorado City
December 28, 2006	Colorado City, Rye	17 to 20 inches in and around Rye and 22 inches east of Colorado City
December 8, 2008	Beulah, Colorado City, Rye	12 to 15 inches in and near Colorado City and Beulah, 18 to 19 inches in Rye
March 26, 2009	Pueblo	A blizzard impacted the I-25 corridor and southeast plains with snow amounts up to 20 inches. wind gusts in excess of 50 mph and near zero visibilities. Several roads including US Highway 50 between Pueblo and Penrose and a section of I-25 around Walsenburg were closed for several hours.
October 28, 2009	Beulah, Rye	14 to 16 inches around Rye and Beulah
March 19, 2010	Beulah, Colorado City, Rye	Around a foot of snow fell near Colorado City. 16 to 18 inches of snow fell near the communities of Beulah and Rye
March 23, 2010	Beulah, Colorado City, Rye	11 to 14 inches of snow was noted in and near the communities Beulah. Rye was covered by 15 inches of snow while Colorado City measured 17 inches of snow.
February 5, 2011	Beulah, Rye	14 to 22 inches of snow covered Rye and Beulah
April 2, 2012	Beulah, Rye	17 to 20 inches was measured in and near the communities Rye and Beulah
March 9, 2013	Beulah, Rye	13 to 18 inches around Beulah and Rye
February 21, 2015	Beulah, Colorado City	16 to 20 inches of snow was measured near Beulah and Colorado City
February 25, 2015	Pueblo, Pueblo West, Beulah, Colorado City, Rye	Snow totals include 6 to 10 inches around Pueblo and Pueblo West. Around 15 inches graced Rye, Colorado City, and Beulah

Date	Location	Description
February 1, 2016	Blended, Pueblo, Beulah, Colorado City, Rye	6 to 9 inches near Blende and Pueblo, 10 to 13 inches Colorado City. 14 to 17 inches in Beulah and 22 inches at Rye
April 3, 2017	Beulah, Rye	21 to 22 inches of snow enveloped the communities of Beulah and Rye respectively
April 28, 2017	Beulah, Colorado City, Rye	23 inches of snow was measured near Beulah. An impressive 25 to 30 inches of snow covered the communities of Rye and Colorado City
October 15, 2020	Colorado City	16 inches of snow fell in Colorado City.

Location

Severe winter weather events can occur over large geographical areas. All of Pueblo County may be affected by winter weather of various durations and extent of area. With multiple crucial transportation routes traversing the county, including Interstate 25, the impacts of winter weather can have far reaching effects. Whether it is travelers, commuters, or transportation of goods, potentially including hazardous materials, winter weather events can jeopardize public safety.

Severity

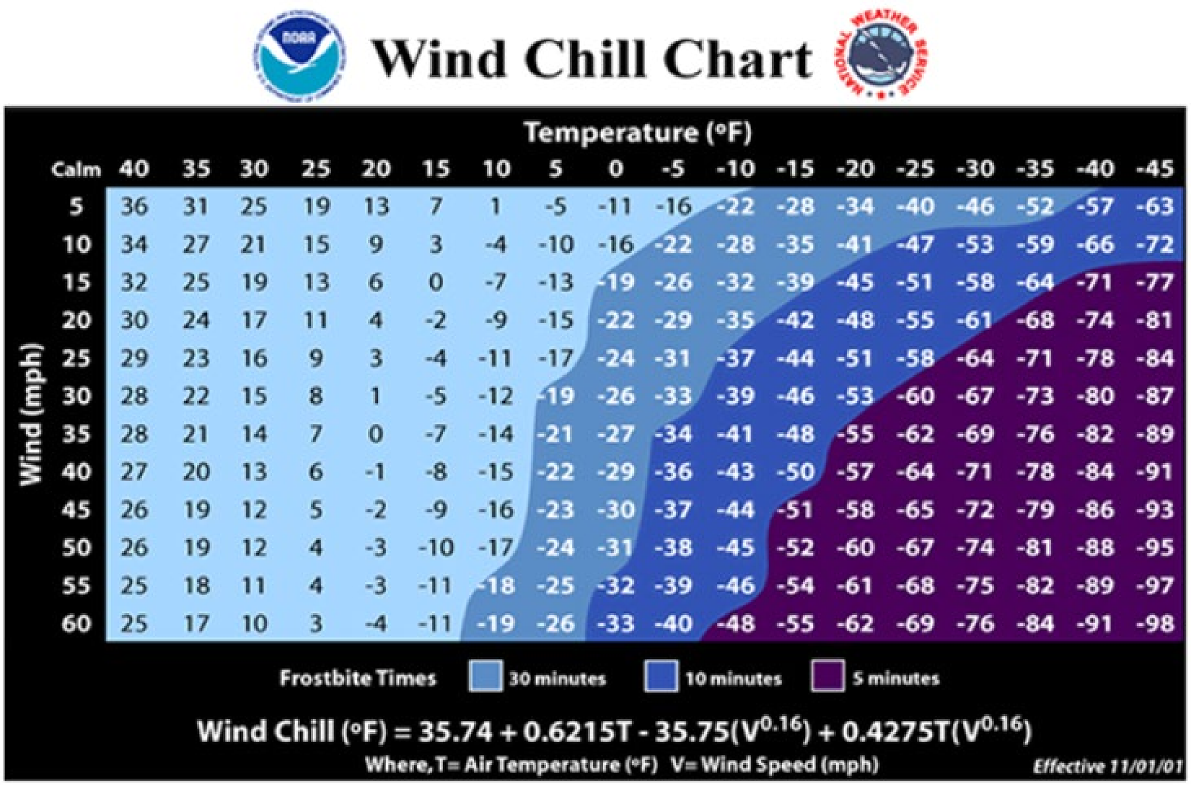
Winter storms occur in many forms and can vary significantly in size, strength, intensity, duration, and impact. High winds create snowdrifts, blocking roads and creating dangerous wind chill conditions. Storms or freezing temperatures are not needed for wind chill conditions to become hazardous. NCEI data shows the overall average minimum temperature in the county, between November and February, from 1901 to 2021 is 19.9°F. The lowest recorded temperature in the county was -30°F on February 1, 1951. NOAA reports that the average annual snowfall in Pueblo is 28.3 inches. Larger snowfall amounts are common in the higher altitude areas of the county.

According to NWS, one notable phenomenon in Pueblo County, related to winter weather and snowfall, is the "Pueblo Precipitation Doughnut Hole" which is an area where no snow is present when other surrounding areas are impacted by snowfall. This area in the county is warmer and drier due to wind directions and is referred to as the one true banana belt in Colorado.

NWS Pueblo explains that stormy winds in Colorado usually come from the west, the north, and sometimes the south. Pueblo is sheltered from the winds by higher terrain, forcing the air to sink into Pueblo instead of rising. Rising air is needed to create snow clouds. Snowfall in Pueblo results from winds out of the east, which is the least common wind direction in Colorado.

In 2001, the National Weather Service (NWS) implemented an updated Wind-Chill Temperature index (**Figure 39**). Wind chill is not a direct measurement of temperature; 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, increasing the likelihood of severe injury or death to exposed persons and animals.

Figure 39 NWS Wind-Chill Temperature Index


Wind Chill Chart

Temperature (°F)

Wind (mph) \ 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)

Effective 11/01/01

The NWS issues a wind chill advisory when wind and temperature combine to produce wind chill values of at least 25° below zero in the mountains/foothills, and at least 18° below zero on the plains. 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 more significant. Primary concerns for winter storms are the ability to knock out heat, power, and communications services to homes and offices, sometimes for days at a time.

Heavy snowfall and extreme cold can immobilize an entire region. The NWS refers to winter storms as the "Deceptive Killers" because most deaths are indirectly related to the storm. Instead, people die in traffic accidents on icy roads and of hypothermia from prolonged exposure to cold. It is essential to be prepared for winter weather before it strikes. Heavy snow loads have caused roofs to collapse. Such storms can bring down powerlines if combined with near-freezing temperatures and early spring rain..

Warning Time

Meteorologists can often predict the likelihood of severe winter storms. When forecasts are available, they can give several days of warning time. However, meteorologists cannot predict the exact time of onset or severity of the storm. Some storms may come on more quickly and have only a few hours of warning time.

Secondary Hazards

The most significant secondary hazards associated with severe winter storms are falling and downed trees, landslides, and downed power lines. Rapidly melting snow combined with heavy rain can overwhelm both natural and manmade drainage systems, causing overflow and property destruction. Landslides occur when the soil on slopes becomes oversaturated and fails. Additionally, the storms may result in closed highways and blocked roads. It is not unusual for motorists and residents to become stranded. Annually, heavy snow loads and frozen pipes cause damage to residences and businesses. Late season heavy snows will typically cause some plant and crop damage.

Exposure and Vulnerability

Lifelines

Severe winds, downed trees, and ice accumulation can create serious impacts on Energy and Communications infrastructure, including power lines and above-ground communication lines. Transportation Lifeline failures, due to loss and interruption of roadway capacity, are a secondary hazard often most associated with severe winter weather.

People

The populations most likely to suffer the negative effects of severe winter weather events are motorists who may be stranded, those participating in outdoor recreation activities, and those with AFN.

AFN populations face isolation and exposure during severe winter weather events and could suffer more secondary effects of the hazard. Power outages can be life threatening to those dependent on electricity for medical equipment and those sensitive to temperature extremes.

The use of fuel-burning heaters indoors and the potential of poisoning and asphyxiation also poses a significant risk to the population of the county.

Low income and residents living below the poverty line are susceptible to the impacts of severe winter weather. For these community members, heating in the case of extreme cold temperatures can be financially inaccessible. Additionally, residents may not have the option to remain at home during an extreme winter weather event and can place themselves in danger traveling on dangers road conditions.

Furthermore, those in the community who do not have access to a vehicle and rely on public transportation can be vulnerable to health impacts of extreme cold temperatures as well as the possibility of hazardous road conditions while using public transportation.

Structures

The freezing of structure water lines, and resulting breaks and flooding, is one of the most damaging impacts from severe cold spells. Freezing of power and communication lines can cause them to break, disrupting electricity and communication. Loss of electricity and phone connection would leave certain populations isolated, as residents would be unable to call for assistance. Extreme cold can disrupt or impair communications facilities.

Primary transportation failures, due to loss and interruption of roadway capacity, are a secondary hazard often most associated with severe winter weather. Roads may become impassable due to ice or snow accumulation which create dangerous driving conditions. Availability of county roads to move people and supplies throughout the region is also a concern.

These types of events can significantly impact the transportation system and the availability of public safety services. Of particular concern are roads providing access to isolated areas and to those with access and functional needs (AFN). Prolonged obstruction of major routes can disrupt the shipment of goods and other commerce.

All buildings in the county are exposed to severe winter weather, but structures in poor condition or in particularly vulnerable locations (located on hilltops or exposed open areas) may risk the most damage. Those that are located under or near overhead lines, or near large trees may be vulnerable to falling ice or may be damaged in the event of a tree or limb collapse. The frequency and degree of damage will depend on specific locations.

Natural, Historic, and Cultural Resources

Natural habitats risk major damage and destruction from severe winter weather. Heavy snowfall and high winds can collapse trees. Freezing temperatures can kill crops, vegetation, and animals. Mass die offs of wildlife are possible as snow covers vegetation and freezes as temperatures drop. These events alter the ecosystem and hunting quotas in the following season. Livestock are also vulnerable to severe winter weather without proper shelter.

Other Community Assets and Activities

Negative economic impact from severe winter weather is possible. Damage to property, crops, and livestock can result in costs, both direct and indirect. Direct costs for the value lost and indirect costs for the loss of work that comes from harvest and livestock transport, as well as the overhead that may result during repair or reconstruction of properties.

Short term impacts may occur if roads and businesses must close, affecting transport and commerce which can have a negative effect for an entire region. Other government-specific vulnerabilities are shown in **Table 73**.

Table 73 Local Government Vulnerability – Other Community Assets and Activities

Local Government	Local Vulnerability
Pueblo County	Closed roads caused by severe winter weather can delay the response of healthcare workers to the homebound.
City of Pueblo	Low-income and unhoused populations, older buildings, communications and power systems, and city events are vulnerable to the impacts of severe winter weather.
Pueblo West Metro District	Closed roads caused by severe winter weather can delay the response of healthcare workers to the homebound.
Colorado City Metro District	In a severe winter weather event 2,500 people could be affected from the loss of potable water. Loss of power will shut down the potable water plant, and water pumps will be unable to distribute water.
St. Charles Mesa Water District	Severe winter weather could negatively impact water delivery through above-ground or near-surface infrastructure through freezing and breaking of pipes and subsequent loss of water. This would lead to delays in service to customers and potential impacts on the elderly and other vulnerable populations.
Beulah Fire Protection District	Severe winter weather can limit road access, the elderly or others who need emergency access are vulnerable. Additionally, the San Isabel Power Lines are vulnerable to the impacts of severe winter weather.

Trends in Development

All future development can be affected by severe winter weather events. The county's exposure is increasing through time as the population increases. The ability to mitigate impacts lies in consistent enforcement of codes and regulations for new construction.

Public education is critical as new residents move to the area. Many may not have experienced the severity of winter weather events seen in the county and will not know how to be prepared. Educating the population on these hazards and how to minimize risk from events will prove beneficial for the county.

Table 74 presents additional vulnerability information specific to each government.

Table 74 Local Government Vulnerability – Future Trends in Development

Local Government	Future Development
Pueblo County	Future development is not anticipated to directly impact vulnerability to this hazard. Any future development will increase exposure to this hazard.
City of Pueblo	Any future development will increase exposure to this hazard. Increases in road miles to clear.
Pueblo West Metro District	Future development is not anticipated to directly impact vulnerability to this hazard. Any future development will increase exposure to this hazard.
Colorado City Metro District	Any future development will increase exposure to this hazard. More areas to plow with the size of community growing.
St. Charles Mesa Water District	Future development is not anticipated to directly impact vulnerability to this hazard. Any future development will increase exposure to this hazard.
Beulah Fire Protection District	Future development is not anticipated to directly impact vulnerability to this hazard. Any future development will increase exposure to this hazard.

Probability of Future Occurrences

Severe winter weather will continue to occur in the county and based on historical data will happen at least annually (100% chance). The severity of these events is difficult to specify, as each storm has unique characteristics and numerous factors will dictate the ultimate impacts.

Winter weather will occur each year across the county; however, the severity is determined by a variety of conditions and is therefore difficult to predict. Severe winter weather events have occurred as early as October and as late as May in the county.

Climate Change Impacts

Climate change presents a significant challenge for risk management associated with severe weather. The frequency of severe weather events has increased steadily over the last century and historical data shows that the probability for severe weather events increases in a warmer climate. The changing hydrograph, caused by climate change, could have a significant impact on the intensity, duration, and frequency of storm events. All of these impacts could have significant economic consequences

The 2023 CO E-SHMP denotes that according to the best data available, the future impacts of climate change are expected to influence future severe winter weather events.

Table 75 presents a breakdown of these projected changes in terms of hazard: location, extent/intensity, frequency, and duration.

Table 75 Climate Change Impacts

Impact	Projected Change
Location	The area at risk to winter storms is not projected to change.
Extent/ Intensity	It is unknown if or how the intensity of winter storm events will change. Extent is projected to increase. Winter precipitation events are projected to increase in magnitude.
Frequency	The seasonality of winter storms may change as a result of increasing temperatures and changing weather patterns, but the direct influences on winter storm frequency are unclear.
Duration	It is unknown if or how the duration of severe winter weather events will change.

6.14 Thunderstorm / Lightning

General Background

Thunderstorm

A thunderstorm is a rain event that includes thunder and lightning. A thunderstorm is classified as "severe" when it contains one or more of the following: hail with a diameter of three-quarter inch or greater, winds gusting in excess of 50 knots (57.5 mph), or tornado.

Lightning

Cloud-to-ground lightning is the most damaging and dangerous form of lightning. This type of lightning is particularly dangerous for several reasons. It is unpredictable and frequently strikes away from the rain core, either ahead or behind the thunderstorm. It can strike as far as 5 or 10 miles from the storm in areas that most people do not consider to be a threat.

U.S. lightning statistics compiled by the NOAA indicate that most lightning incidents occur during the summer months of June, July, and August and during the afternoon hours from between 2 and 6 p.m.

Microbursts

A microburst is a small, concentrated downburst that produces an outward burst of strong winds at or near the surface. Microbursts are small — less than 2.5 miles across — and short-lived, lasting only five to 10 minutes, with maximum windspeeds sometimes exceeding 100 mph. There are two kinds of microbursts: wet and dry. A wet microburst is accompanied by heavy precipitation at the surface. Dry microbursts, common in places like the high plains and the intermountain west, occur with little or no precipitation reaching the ground (NOAA, 2023).

Past Events

According to NCEI data, between 1950 and 2022, there have been 116 days reported with thunderstorm events. Twelve of these events caused approximately $3.7 million in property damages and 7 injuries. A storm in 2001, caused the majority of damage costs with $2.5 million. In 2006, another storm caused $1 million in damages and three of the injuries. A storm in 1995 was responsible for the other four injuries.

Three (3) lightning injury events have been reported since 1997 and no deaths due to lightning have been reported in the county. The have been no reported crop damages from lightning. **Table 76** shows the lightning events which reportedly caused injuries or property damages.

Severe thunderstorms have also occurred in the county. A severe storm on July 2, 2019, caused significant road flooding and strong winds which damaged buildings and roofs. Similarly, a severe storm on July 24, 2021 poured 5.5 inches of rain over the course of two hours causing severe flooding in Pueblo West. Reports highlight cases of basements flooding up to 8 ft, over a month after the event, damages were still being identified and reported.

Table 76 Significant Lightning Events in Pueblo County (1997-2022)

Date	Location	Injuries	Property Damage	Description
August 10, 1997	Pueblo	0	$ 160,000	A Pueblo home was a total loss when lightning struck its wood-shingled roof.
July 26, 1999	Colorado City	1	-	A 25-year-old golfer was struck and nearly killed by a lightning flash while golfing during a thunderstorm, when the golfer was struck.
August 18, 2003	Pueblo	0	$ 25,000	Lightning hit a house and started a fire which caused extensive damage.
June 23, 2005	Pueblo	1	-	A 13-year old girl was struck by lightning during a softball scrimmage. The victim was transported to a Denver hospital in critical condition. Another girl was temporarily stunned by the strike, but required no medical care.
July 5, 2005	Pueblo	0	$ 50,000	Lightning struck a house on Galbraith Road causing the house to be nearly destroyed.

Date	Location	Injuries	Property Damage	Description
September 8, 2005	Pueblo	1	-	A 24-year old man was struck by lightning while riding an ATV at the Pueblo Motorsports Park. He was awake and breathing when transported to the hospital.
May 19, 2006	Beulah	0	$ 70,000	A triple-wide mobile home was struck by lightning and burned to the ground.
May 16, 2007	Beulah	0	$ 70,000	A house was struck by lightning and burned to the ground in Beulah.
August 6, 2008	Pueblo	0	$ 30,000	A 135-foot tall church steeple was struck by lightning. The top 40-feet of the steeple was burned.
July 29, 2011	Pueblo West	0	$ 50,000	Lightning caused a house fire which destroyed the garage and two vehicles.

Location

Thunderstorms and lightning events can occur anywhere in Pueblo County. These types of storms can cover large areas and can affect multiple towns, cities, and counties. Larger systems and lines of storms can impact the entire state.

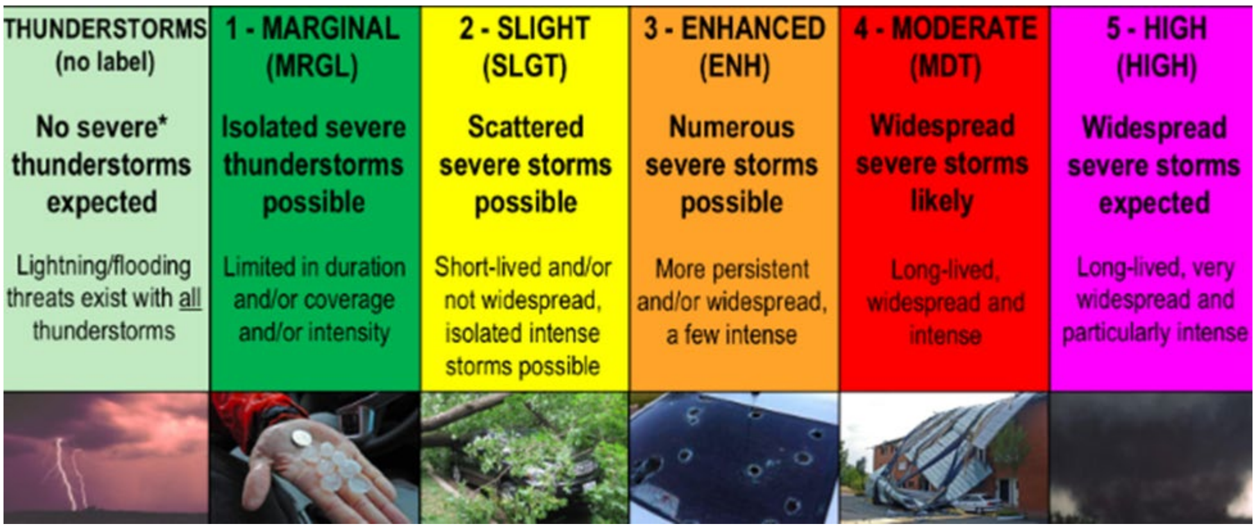
Lightning occurrence is increased in some areas due to a combination of topography, low-level wind flow regime, and low-level atmospheric moisture.

According to Vaisala (née Global Atmospherics, Inc.), common locations of lightning strikes include open fields, ball fields, under trees, water-related/boats, golf courses, and near heavy equipment such as tractors.

SEVERITY

The NWS's Storm Prediction Center (SPC) uses a scale from 1 to 5 to measure the severity of thunderstorms shown in **Figure 40**.

Figure 40 Severe Thunderstorm Risk Categories



Lightning is one of the more dangerous weather hazards in the United States and in Colorado. Each year, lightning is responsible for deaths, injuries, and millions of dollars in property damage, including damage to buildings, communications systems, power lines, and electrical systems. Lightning can cause forest and brush fires, as well as deaths and injuries to livestock and other animals. According to the National Lightning Safety Institute, lightning causes more than 26,000 fires in the United States each year. The institute estimates property damage, increased operating costs, production delays, and lost revenue from lightning and secondary effects to be in excess of $6 billion per year. Impacts can be direct or indirect. People or objects can be directly struck, or damage can occur indirectly when the current passes through or nearby.

Lightning is measured by the Lightning Activity Level (LAL) scale, created by the National Weather Service to define lightning activity into a specific categorical scale. The LAL is a standard parameter used in fire weather forecasts nationwide. It is reproduced in **Table 77**.

Table 77 Lightning Activity Levels (LAL) Scale

Activity Level	Description
LAL 1	No thunderstorms

Activity Level	Description
LAL 2	Isolated thunderstorms. Light rain will occasionally reach the ground. Lightning is very infrequent, 1 to 5 cloud-to-ground strikes in five minutes
LAL 3	Widely scattered thunderstorms. Light to moderate rain will reach the ground. Lightning is infrequent, with 6 to 10 cloud-to-ground strikes in five minutes.
LAL 4	Scattered thunderstorms. Moderate rain is commonly produced. Lightning is frequent, with 11 to 15 cloud-to-ground strikes in five minutes.
LAL 5	Numerous thunderstorms. Rainfall is moderate to heavy. Lightning is frequent and intense, greater than 15 cloud-to-ground strikes in five minutes.
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.

Warning Time

Meteorologists can often predict the likelihood of a severe thunderstorm. This can give several days of warning time. However, meteorologists cannot predict the exact time of onset or severity of the storm. Some storms may come on more quickly and have only a few hours of warning time.

Secondary Hazards

The most significant secondary hazards associated with thunderstorms and lightning are floods, debris flow, and wildfire. Heavy rain can overwhelm both natural and manmade drainage systems, causing overflow and property destruction. Debris flows occur when the soil on slopes becomes oversaturated and fails. Wildfires can occur because of lightning strikes.

Exposure and Vulnerability

Lifelines

Communication, Energy, Food, Hydration, and Shelter, and Transportation are the community lifelines most vulnerable to the impacts from a thunderstorm and lightning event. A large-scale power outage resulting from a storm could stress some systems.

People

It can be assumed that the entire planning area is exposed to thunderstorm and lightning events. Areas of greater exposure are where higher population densities exist. Certain areas are more exposed due to geographic location and local weather patterns.

Populations with access and functional needs (AFN), including the elderly, those with low income, linguistically isolated populations, people with mobility issues, and residents living in areas that are isolated from major roads may see more impacts from severe weather events. Power outages can be life threatening to those dependent on electricity for medical support. The isolation of these populations is a significant concern. Those working outdoors or recreating in the area are more vulnerable to severe weather events.

Structures

All buildings are considered to be exposed to the thunderstorm and lightning hazards, but structures in poor condition or in particularly vulnerable locations (located on hilltops or exposed open areas) may risk the most damage. The frequency and degree of damage will depend on specific locations and the condition of the building.

Lightning strikes can also damage county infrastructure such as power lines and cellphone towers.

Natural, Historic, and Cultural Resources

Lightning strikes can be destructive to the natural resources of a community. Strikes can hit trees with the potential to cause wildfires. Lightning strikes can also damage historical buildings that may not be able to be repaired.

Other Community Assets and Activities

Economic impact from thunderstorm and lightning hazards is possible, as damage to property, crops and livestock may result in losses.

In addition, disruption of Lifelines and daily operations due to damaged infrastructure and facilities can cause losses. Repairing, rebuilding, or replacing critical equipment may be a slow process which could have cascading effects on businesses and the local economy. Any extended delay of returning to normal functioning has the potential to close businesses and impact industry.

Other government-specific vulnerabilities are shown in **Table 78**.

Table 78 Local Government Vulnerability – Other Community Assets and Activities

Local Government	Local Vulnerability
Pueblo County	Lightning strikes can cause damages to buildings in the county.

Local Government	Local Vulnerability
City of Pueblo	Unhoused populations, communication and electrical power infrastructure, communication and data systems, and all outdoor festivals and events are vulnerable to thunderstorm and lightning events.
Pueblo West Metro District	Lightning strikes can cause damages to buildings in Pueblo West.
Colorado City Metro District	In a thunderstorm / lightning event 2,500 people could be affected from the loss of potable water. Loss of power will shut down the potable water plant and water pumps will be unable to distribute water.
St. Charles Mesa Water District	Lightning strikes can cause damages to buildings in the SCMWD.
Beulah Fire Protection District	Lightning strikes can not only cause damage to buildings within the Beulah Valley, but also have a very high potential of causing forest fires within the community.

Trends in Development

All future development can be affected by thunderstorm and lightning. The exposure of community assets is increasing through time as more people enter the planning area. The ability to mitigate impacts lies in consistent enforcement of codes and regulations for new construction.

Public education is critical as new residents move to the area. Many may not have experienced the types of weather events seen in the county and will not know how to be prepared. Educating the population on these hazards and how to minimize risk from events will prove beneficial for the county.

Table 79 presents additional vulnerability information specific to each government.

Table 79 Local Government Vulnerability – Future Trends in Development

Local Government	Future Development
Pueblo County	Future development is not anticipated to directly impact vulnerability to this hazard. Any future development will increase exposure to this hazard.
City of Pueblo	Any future development will increase exposure to this hazard, mainly impacting private structures.

Local Government	Future Development
Pueblo West Metro District	Future development is not anticipated to directly impact vulnerability to this hazard. Any future development will increase exposure to this hazard.
Colorado City Metro District	Any future development will increase exposure to this hazard. Concerns of increased stress on old infrastructure (water, power, sewer).
St. Charles Mesa Water District	Future development is not anticipated to directly impact vulnerability to this hazard.
Beulah Fire Protection District	Future development is not anticipated to directly impact vulnerability to this hazard.

Probability of Future Occurrences

Thunderstorms and lightning events will annually occur in the county (100% chance). Based on past events, NCEI data suggests that the probability of a damaging lightning event is approximately 40% annual chance.

Climate Change Impacts

Climate change presents a significant challenge for risk management associated with severe weather. The frequency of severe weather events has increased steadily over the last century and historical data shows that the probability for severe weather events increases in a warmer climate. The changing hydrograph, caused by climate change, could have a significant impact on the intensity, duration, and frequency of storm events. All of these impacts could have significant economic consequences.

Table 80, based on the CO E-SHMP, shows the future impacts of climate change on thunderstorms and lightning are still unclear.

Table 80 Climate Change Impacts

Impact	Projected Change
Location	Thunderstorm and lightning events occur across all of the state. The area at risk to lightning events is not projected to change.
Extent/ Intensity	No clear projected trend in the frequency or intensity of warm-season convective storms has been identified for Colorado. Therefore, the intensity and extent of thunderstorm and lightning events is not projected to change.
Frequency	The frequency of thunderstorm and lightning events is not projected to change.

Impact	Projected Change
Duration	It is unknown if or how the duration of thunderstorms and lightning will change.

6.15 Tornado

General Background

A tornado is a narrow, violently rotating column of air that extends from the base of a cumulonimbus cloud to the ground. The visible sign of a tornado is the dust and debris that is caught in the rotating column made up of water droplets. Tornadoes are the most violent of all atmospheric storms. The following are common ingredients for tornado formation:

- Very strong winds in the mid and upper levels of the atmosphere
- Clockwise turning of the wind with height (i.e., from southeast at the surface to west aloft)
- Increasing wind speed in the lowest 10,000 feet of the atmosphere (i.e., 20 mph at the surface and 50 mph at 7,000 feet.)
- Very warm, moist air near the ground with unusually cooler air aloft
- A forcing mechanism such as a cold front or leftover weather boundary from previous shower or thunderstorm activity.

Tornadoes can form from individual cells within severe thunderstorm squall lines. They also can form from an isolated super-cell thunderstorm. Weak tornadoes can sometimes occur from air that is converging and spinning upward, with little more than a rain shower occurring in the vicinity. Variations of tornados that are important to reference as defined by NOAA are:

- **Gustnado:** a small, whirlwind which forms as an eddy in thunderstorm outflows. They do not connect with any cloud-base rotation and are not tornadoes. Since their origin is associated with cumuliform clouds, gustnadoes will be classified as Thunderstorm Wind events. Like dust devils, some stronger gustnadoes can cause damage.
- **Landspouts:** a tornado that does not arise from organized storm-scale rotation and therefore is not associated with a wall cloud (visually) or a mesocyclone (on radar). Landspouts typically are observed beneath Cbs or towering cumulus clouds (often as no more than a dust whirl), and essentially are the land-based equivalents of waterspouts.

Past Events

There have been 19 tornadoes reported since 1974, the highest rated of which was an F2 (see **Severity** for details on ratings) on August 21, 1984. This event resulted in $2,500 in damages and brought down power lines, snapping some of the poles in half. The ratings and number of tornadoes with each rating from 1974 to 2022 are shown in **Table 6.81**. The most recent tornadoes, occurring after 2007, have EF ratings, reflecting the change to the Enhanced Fujita Scale.

In Pueblo County both landspouts and gustnados have occurred. In 2019 a gustnado swept across Pueblo West High School's campus with gusts measured at 107 mph. This event caused minor structural damage on the campus.[20]

Table 6.81 Historical Tornado Ratings in Pueblo County (1974-2022)

EF0	F0	F1	F2
4	7	7	1

Table 6.82 details the tornadoes with reported damages between 1974 and 2022. All reported damages from tornadoes in the county have been property damages. No deaths or injuries have been reported as a result of a tornado. **Figure 41** shows the location of historic tornado events in Pueblo County.

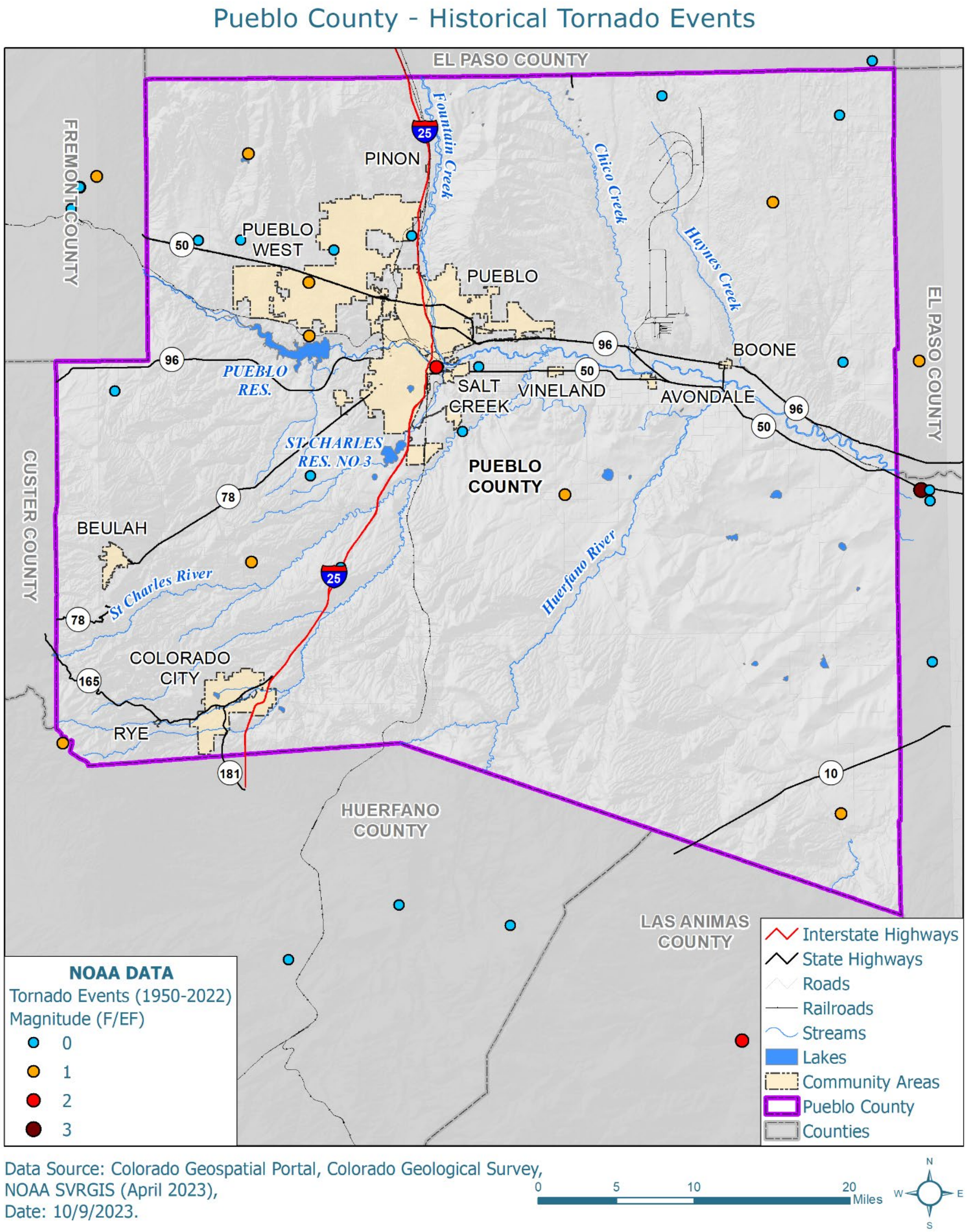
Table 6.82 Significant Tornado Events in Pueblo County (1974-2022)

Date	Location	Magnitude	Property Damage	Description
August 6, 1981	Pueblo County	F1	$ 2,500	A tornado in Pueblo West leveled a barn.
August 21, 1984	Pueblo County	F2	$ 2,500	The thunderstorm that spawned the large hail that hit Pueblo also produced a tornado just of town that destroyed power lines and poles. Some of the poles were snapped in two.
July 1, 1998	Pueblo West	F0	$ 7,000	A tornado touched down 5 miles west-northwest of Pueblo West and tracked east-southeast, finally dissipating 2 miles east-southeast of Pueblo West. The tornado tossed two overhead campers at a dealership into the air but produced little damage elsewhere.

[20] Shocking Video of Gustnado Spinning Through High School Campus - WeatherNation (weathernationtv.com)

Date	Location	Magnitude	Property Damage	Description
July 9, 2006	Pueblo West	F1	$ 100,000	A short-lived tornado formed and the track extended from The National Horseman's Arena near McCulloch Blvd. to Purcell Blvd. The tornado path ranged from 50-200 ft wide. It knocked down a section of fence, shattered windows in a structure at an arena, flipped over a trailer, and ripped the sheet metal roofing off a building. It moved across several businesses between Industrial Blvd. and U.S. Hwy 50. One business had a large section of wall destroyed. Several trailers, boats, and vehicles were moved by the high winds. It struck an anchored chain link fence, damaging an 85 ft section.
July 10, 2011	Cedarwood	EF0	$ 20,000	A short-lived land spout tornado destroyed a carport, damaged a vehicle, and lifted the roof of a recreation room causing some minor damage.

Figure 41 Pueblo County – Historical Tornado Events (1950-2022)



Location

Tornadoes may occur anywhere in the county. Historical data shows that damaging tornadoes have not occurred in the mountainous southwestern portion of the county, with only a few minor events on record.

Severity

If a major tornado were to strike within the populated areas of Pueblo County, damage could be widespread. Businesses could be forced to close for an extended period or permanently, fatalities could be high, many people could be homeless for an extended period, and routine services such as telephone or power could be disrupted. Buildings may be damaged or destroyed.

Historically, tornadoes have not typically been severe or caused damage in the planning area. Tornadoes are classified based on the damage inflicted once it has passed over a manmade structure which allows experts to assess and estimate wind intensity. The Fujita Scale was used until 2007, classifying the intensity from the least to most intense, in seven categories (F0-F6). This scale was replaced by the Enhanced Fujita Scale which uses six intensity categories (EF0-EF5) to measure tornado strength and associated damages. The scale was revised to reflect better examinations of tornado damage surveys, to align wind speeds more closely with associated storm damage. The new scale takes into account how most structures are designed and is considered a more accurate representation of the surface wind speeds in the most violent tornadoes.

Table 83 provides details on how the Enhanced Fujita Scale intensities were derived from the previous Fujita Scale.

Table 83 Derived Enhanced Fujita Scale

Fujita Scale		**Derived EF Scale**	
F Number	3 Second Gust (mph)	EF Number	3 Second Gust (mph)
0	45-78	0	65-85
1	79-117	1	86-109
2	118-161	2	110-137
3	162-209	3	138-167
4	210-261	4	168-199
5	262-317	5	200-234

Warning Time

NOAA's storm prediction center issues tornado watches and warnings for Pueblo County:

- Tornado Watch - Tornadoes are possible. Remain alert for approaching storms. Watch the sky and stay tuned to NOAA Weather Radio, commercial radio, or television for information–
- Tornado Warning - A tornado has been sighted or indicated by weather radar. Take shelter immediately.

Once a warning has been issued, residents may have only a matter of seconds or minutes to seek shelter.

Secondary Hazards

Tornadoes may cause loss of power if utility service is disrupted. Additionally, damages to natural gas infrastructure may cause fires and interrupt distribution. Hazardous materials may be released if a structure housing such materials is damaged or if such a material is in transport. Public health may be impacted if water and wastewater facilities are affected.

Exposure and Vulnerability

Lifelines

All Lifelines are exposed to tornadoes. The most common problems associated with this hazard are utility losses, which falls under the Energy and Communications Lifeline. Downed power lines can cause blackouts, leaving large areas isolated. Phone, water, and sewer systems may not function. Communication infrastructure may be affected by an event, creating issues with dispatching first responders, keeping the public informed, and requesting aid and supplies.

Tornadoes can cause significant damage to trees and power lines. The Transportation Lifeline can be impacted if debris caused by tornadoes blocks roads, incapacitates transportation corridors, isolates populations, and disrupts ingress and egress. Of particular concern are roads providing access to isolated areas and to those with access and functional needs (AFN).

Any facility that is in the path of a tornado is likely to sustain damage and medical or sheltering facilities sustaining damages could have cascading impacts for the community.

People

It can be assumed that the entire planning area is exposed to tornadoes. Populations requiring extra assistance during an event and those with AFN have specific needs to maintain safety and security.

Power outages can be life threatening to those dependent on electricity for medical equipment and support. These populations face isolation and exposure after tornado events and could suffer more secondary effects of the hazard.

Individuals caught in the path of a tornado who are unable to seek appropriate shelter are especially at risk. This may include individuals who are out in the open, in cars, or those who do not have access to basements, cellars, or safe rooms. Non-English speaking populations may experience a lack of warning communications.

Structures

Any structure that is in the path of a tornado is likely to sustain damage and medical or sheltering facilities sustaining damages could have cascading impacts for the community. All property is vulnerable during tornado events, but properties in poor condition or manufactured housing are at the highest risk.

Natural, Historic, and Cultural Resources

Habitats may be exposed to tornado risk and an event could destroy critical components of these areas. If tornadoes impact facilities that store hazardous materials, the surrounding areas may be especially vulnerable to contamination from a hazardous materials release.

Other Community Assets and Activities

Tornadoes may have a devastating impact on the economy. The factors of what sustains damages such as property, crops, or livestock and the extent of the damage dictates the level of impact. In the case of less intense tornadoes which may touch down only briefly, damage might be minimal and limited in losses. However, even a lower intensity tornado that touches down and travels can leave a path of destruction and extensive damages in its wake.

High intensity tornadoes which can destroy structures in a matter of seconds, can leave a community with significant rebuilding which may take an extended duration. These periods of rebuilding are likely to have a negative impact on the strength of the economy, as businesses remain closed and Lifelines services may be disrupted.

Other government-specific vulnerabilities are shown in **Table 84**.

Table 84 Local Government Vulnerability – Other Community Assets and Activities

Local Government	Local Vulnerability
Pueblo County	Residents and structures in communities across Pueblo County are vulnerable to tornado events.
City of Pueblo	Unhoused populations and those that have limited mobility are vulnerable to tornado events. Additionally, water and wastewater treatment structures, communication towers and systems, data systems, historic districts, and outdoor festivals in the city are vulnerable to tornado events.

Local Government	Local Vulnerability
Pueblo West Metro District	While generally considered a low probability event, residents and structures in Pueblo West are vulnerable to tornado events.
Colorado City Metro District	Tornadoes are not a hazard of concern due to the geography and elevation of the district, which has also historically never been impacted by an event.
St. Charles Mesa Water District	While generally considered a low probability event, residents and structures in the SCMWD are vulnerable to tornado events.
Beulah Fire Protection District	Tornadoes are not a hazard of concern due to the geography and elevation of the district, which has also historically never been impacted by an event.

Trends in Development

All future development will increase the county's exposure to tornadoes. The ability to mitigate these impacts lies in consistent enforcement of codes and regulations for new construction. **Table 85** presents additional vulnerability information specific to each government.

Table 85 Local Government Vulnerability – Future Trends in Development

Local Government	Future Development
Pueblo County	Future development is not anticipated to directly impact vulnerability to this hazard. Any future development will increase exposure to this hazard.
City of Pueblo	Any future development will increase exposure to this hazard, mainly impacting private structures.
Pueblo West Metro District	Future development is not anticipated to directly impact vulnerability to this hazard. Any future development will increase exposure to this hazard.
Colorado City Metro District	Future development is not anticipated to directly impact vulnerability to this hazard. Any future development will increase exposure to this hazard.

Local Government	Future Development
St. Charles Mesa Water District	Future development is not anticipated to directly impact vulnerability to this hazard. Any future development will increase exposure to this hazard.
Beulah Fire Protection District	Future development is not anticipated to directly impact vulnerability to this hazard. Any future development will increase exposure to this hazard.

Probability of Future Occurrences

Tornadoes have been reported nine months of the year in Colorado, with peak occurrences between mid-May through mid-August. State-wide, June is the month with the most recorded tornadoes. Tornadoes occur at all times of the day, with more than half occurring between 3 p.m. and 6 p.m., and about 88 percent occurring between 1 p.m. and 9 p.m.

Probability of future occurrences for tornado events is reliant on the reported data, but it should be taken into consideration there may be a number of tornadoes that are not spotted and therefore not reported. Based on the best available data, it is likely that Pueblo County will see further tornado events. The probability of a damaging tornado event is 10% chance in a given year. The 48 year period of records, between 1974 and 2022, showed a total of 5 tornadoes with damages reported. Tornadoes with impacts on people and / or property are of the most concern and assessing probability with consideration of the factors of risk and historical impact data is important.

Climate Change Impacts

Climate change impacts on the frequency and severity of tornadoes are unclear. According to the Center for Climate Change and Energy Solutions, "Researchers are working to better understand how the building blocks for tornadoes – atmospheric instability and wind shear – will respond to global warming. It is likely that a warmer, moister world would allow for more frequent instability. However, it is also likely that a warmer world would lessen chances for wind shear. Recent trends for these quantities in the Midwest during the spring are inconclusive. It is also possible that these changes could shift the timing of tornadoes or regions that are most likely to be hit".

The 2023 CO E-SHMP states "according to the best data available at the time of this plan update, the future impacts of climate change on tornado events in Colorado remain highly uncertain. The areas currently vulnerable to tornadoes, especially eastern Colorado, will remain vulnerable to tornadoes in the future".

6.16 Tumbleweeds

General Background

The Colorado State University Extension labels both Kochia and Russian thistle as troublesome summer annual weeds of rangelands, pastures, fields, disturbed areas, gardens, roadsides, ditch banks, and small acreages. If uncontrolled, they become tumbleweeds that can disperse seeds over a large area.

Both species are non-native to the United States. Russian thistle originated in Russia and was brought to the U.S. in the late 1800's. Kochia, a native of Asia, was introduced from Europe and is found in all western states except Alaska. Russian thistle is found in every state in the U.S., except Alaska and Florida.

Both plants may provide good forage quality when the plant is young. However, the forage quality declines as the plant matures. The value to wildlife is shared by many species. Deer and pronghorn eat the foliage, while seeds are consumed by songbirds and upland game birds. Both plants also provide loafing and nesting cover for upland game birds.

Nitrate, oxalate, sulfates, saponins, and alkaloids are found in kochia at levels that can cause poisoning in cattle and sheep. The likelihood of poisoning increases as the plant matures or when drought stressed. While it can be used as forage in some areas, other forage species should be available to avoid the possibility of livestock poisoning.

Both plants reproduce only from seed; therefore, preventing seed-set is important for successful management. Competition from desirable plant species will limit Russian thistle and Kochia establishment and site dominance. Due to the thorny nature and numbers, tumbleweeds are difficult, expensive, and time consuming to remove.

Tumbleweeds are a threat to life safety, as they can cause or exacerbate fire, flooding, road closures, and entrapment in buildings. Colorado's droughts are advantageous for the growth and spread of tumbleweeds which will continue to be a hazard for the county.

Downslope wind days, westerly winds, and days with high wind warnings above 60 mph present conditions that can exacerbate the impact of tumbleweeds.

Past Events

Table 86 shows details of some of the recent large-scale tumbleweed events. Costs for the recovery and clean-up for these events are not currently available. One detail worth noting is the clean-up for the December 15, 2021 event did not finish until January 7, 2022, illustrating the extent of the tumbleweed inundation.

In November of 2014 a state of emergency was declared as tumbleweeds flooded communities in Pueblo County trapping residents and vehicles. In 2021 two invasions of tumbleweeds occurred within two months of each other. The first event occurred on the 27th of October and the second on the 15th of December. Tumbleweeds filled up neighborhoods and took weeks to fully clear.

Table 86 Notable Recent Tumbleweed Events

Date	Location	Description
November 14, 2014	Pueblo County, El Paso County	State of emergency was declared by multiple counties, and El Paso County used snowplows to clear the roads because the weed piles had gotten too large.
October 27, 2021	Pueblo – El Camino Neighborhood	Tumbleweeds covered houses and blocked doors. Pueblo Public Works came out to assist the residents, bringing street sweepers, tractors, dump trucks, and loaders to try and haul the debris away. One resident had mobility issues and was assisted.
December 15, 2021	Pueblo	Severe winds brought an avalanche of tumbleweeds and the city's Public Works Department helped Pueblo residents and neighborhoods to get rid of the tumbleweeds. Roads had to be cleared across the city. Cleanup of the city took three (3) weeks.

Location

Tumbleweeds grow well in areas with minimal competition from other plants and loose soil. Empty agricultural land and vacant lots are common places of growth. For Pueblo County, the majority of tumbleweeds impacting communities grow on the Great Plains and grazing land, which due to smaller herds may not be grazed often.

Severity

Tumbleweeds have become a recurring flood risk as they tend to accumulate in ditches, stream channels, culverts, and bridge crossings. Tumbleweeds are also a significant contributor to wildfire risk, helping to spread fire rapidly.

Depending on the amount of tumbleweeds that have grown within a travelable distance the effects can be dangerous if high wind or a thunderstorm event occurs. Tumbleweeds can travel quickly and in large numbers.

Tumbleweeds can create hazardous driving conditions crossing roads or can block roads completely. If a car drives over a tumbleweed there is a potential of igniting the brush and creating a quickly traveling fire. Homes can become blocked with residents unable to leave, which can be especially dangerous for those with access and functional needs who may require care.

Warning Time

There is little warning time for a tumbleweed incident, as high winds can be forecast but may not trigger tumbleweed movement.

Secondary Hazards

Wildfire is the secondary hazard of most concern related to tumbleweeds. The nature of a tumbleweed, dry and airy, is conducive to rapid ignition and intense heat. If a tumbleweed is ignited, it can be swiftly carried to other materials and spread the fire. Tumbleweeds that have accumulated along other flammable vegetation, wood fences, and homes pose considerable risk.

Flood is a hazard related to tumbleweeds. Blockages of various water channels and infrastructure caused by a build-up of tumbleweeds can lead to rising waters and dangerous potential for a blockage releasing and causing a downstream rush of water.

Exposure and Vulnerability

Lifelines

Tumbleweeds are capable of impacting the Transportation Lifeline, as large accumulations can shut down roadways, impacting responders and residents.

People

Tumbleweeds present safety issues for residents in multiple ways. Driving interference, becoming stuck in a home or building, contribution to rapid wildfire growth, and physical reactions from exposure with the plant. Allergic reactions can occur if one is scratched by a tumbleweed and the pollen produced by the plants can impact breathing in some cases.

Structures

Property is not likely to have long term impacts from a tumbleweed event. The most immediate impact is the need to clear debris from the area for safety.

It is important for property owners to understand the responsibility of mitigating and clearing tumbleweed plants. While it is ideal to remove young plants, removal of any tumbleweeds that have collected along fence lines and rows of trees is critical.

It can be very expensive to remove these plants and efforts should be made to support community efforts, especially those with access and functional needs who are unable to complete work themselves.

Natural, Historic, and Cultural Resources

Russian thistle can threaten native plant ecosystems, as they become dominant due to rapid seeding and minimal need for resources. Kochia can be poisonous to animals if eaten when they are too mature.

Other Community Assets and Activities

Tumbleweeds are difficult to manage for multiple reasons including ecological, financial, and availability of labor for removal. Prior to a large event the amount of time, manpower, and capital it can take to remove the plants for mitigation can be prohibitive. After an event occurs the costs of a large-scale clean-up can impact a municipality's budget and ability to support residents' debris clearing efforts. Large-scale tumbleweed inundation events can take weeks to clean-up.

A tumbleweed event is not likely to have a long-term effect on the local and regional economy, but individual homeowners and business may see impacts. For homeowners the costs of removal can be significant. Businesses, in addition to removal costs, may incur business losses for any closure time.

In agricultural areas, Russian thistle can reduce yield and quality of numerous crops, particularly alfalfa and small grains. It depletes soil moisture, interferes with tillage operations, and serves as a shelter or food source to many insects, vertebrate pests, and crop diseases.

Other government-specific vulnerabilities are shown in **Table 87**.

Table 87 Local Government Vulnerability – Other Community Assets and Activities

Local Government	Local Vulnerability
Pueblo County	Tumbleweeds can trap residents in or out of their homes. Additionally, tumbleweeds can cause delayed access into / out of buildings in the county.
City of Pueblo	Persons residing in the prairie interface are vulnerable to tumbleweed events. Additionally, structures are at increased risk of wildfire impacts. Communication systems, such as overhead fiber lines, as well as outdoor activities and festivals in the county are vulnerable to the impacts of tumbleweeds.
Pueblo West Metro District	Tumbleweeds can trap residents in or out of their homes. Additionally, tumble weeds can cause delayed access into / out of buildings in Pueblo West.
Colorado City Metro District	Rural residents and structures may have access blocked and fire danger increases with tumbleweeds.
St. Charles Mesa Water District	Rural residents and structures may have access blocked and fire danger increases with tumbleweeds.
Beulah Fire Protection District	Rural residents and structures may have access blocked and fire danger increases with tumbleweeds.

Trends in Development

Management is the key to tumbleweed mitigation, and this begins with the education of property owners. Education and the subsequent responsibility regarding tumbleweed mitigation will improve safety on properties, as well as minimize the overall impacts of tumbleweed events or potential secondary hazards.

While developing areas, awareness and planting of competitive, more desirable species of plants can be effective mitigation. Mowing or destroying young plants can prevent seed production. Monitoring and clearing abandoned properties minimize growth.

Clearance requirements for property owners are an option to ensure public safety and minimize risk of secondary hazards. **Table 88** presents additional vulnerability information specific to each government.

Table 88 Local Government Vulnerability – Future Trends in Development

Local Government	Future Development
Pueblo County	Future development is not anticipated to directly impact vulnerability to this hazard. Any future development will increase exposure to this hazard.
City of Pueblo	Increase in houses along the interface would increase risk.
Pueblo West Metro District	Future development is not anticipated to directly impact vulnerability to this hazard. Any future development will increase exposure to this hazard.
Colorado City Metro District	Future development is not anticipated to directly impact vulnerability to this hazard. Any future development will increase exposure to this hazard.
St. Charles Mesa Water District	Future development is not anticipated to directly impact vulnerability to this hazard. Any future development will increase exposure to this hazard.
Beulah Fire Protection District	Future development is not anticipated to directly impact vulnerability to this hazard. Any future development will increase exposure to this hazard.

Probability of Future Occurrences

Tumbleweeds are a fixture in the county and are constantly growing. The frequency of impactful events when tumble weeds inundate an area are difficult to determine. This is based on multiple factors including tumbleweed management, precipitation, and weather events.

Probability of future occurrences is 100%, as tumbleweeds are notoriously invasive and difficult to manage, drought is common, and high winds happen each year. These factors do not mean each year will see a large-scale event, but there will always be a concern for the impact of tumbleweeds on public safety.

Climate Change Impacts

Tumbleweeds thrive on low soil moisture and the impacts of climate change, particularly drought are conducive to the growth and perpetuation of the plants. The continued impacts of climate change are beneficial for the proliferation of tumbleweeds, leading to more large-scale events of tumbleweed inundation in the future.

6.17 Wildfire

General Background

A wildfire is any uncontrolled fire occurring on undeveloped land that requires fire suppression. Wildfires can be ignited by lightning or by human activity such as smoking, campfires, equipment use, and arson.

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

Wildfires do not affect communities equally. Populations with health and mobility issues, those who lack resources whether financial or transportation, and those with communication barriers, are disproportionately impacted at all stages: preparedness, response, and recovery. Recognition of the diverse needs of a community is critical to life safety and begins with planning and education. Identifying and giving a voice to these populations will create more inclusive and relevant plans.

Wildfires are of significant concern throughout Colorado. According to the Colorado State Forest Service (CSFS), 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. Per the CO E-SHMP, a century of aggressive fire suppression combined with cycles of drought and changing land management practices has left many of Colorado's forests, including those in Pueblo County, unnaturally dense and ready to burn. Further, the threat of wildfire and potential losses is constantly increasing as population and development grow and the WUI expands. Another contributing factor to fuel loads in the forest are standing trees killed by several species of beetles which have been affecting the forests of Colorado since 2002, becoming more widespread and a serious concern.

The Colorado State Forest Service provides a Wildfire Risk Assessment Summary Report, that offers additional detailed information pertaining to wildfire risk across Pueblo County. See **Annex D – CSFS Wildfire Risk Assessment Report**.

Past Events

There are multiple sources for wildfire event data including the NCEI and the National Interagency Fire Center Wildland Fire database. To ensure a well-rounded understanding of the prior incidents in the county both sources were used to illustrate the most comprehensive history from best data available.

The NCEI data reports that the largest fires recorded for Pueblo County have been shared with other counties including Custer and El Paso Counties. Calculating the split of acreage and damages between the different jurisdictions is difficult, so overall figures for each incident are shown in the tables below. NCEI records show no deaths, injuries, or crop damages due to wildfire in the county. **Table 89** details the reported fire events in the county including available property damage figures.

One of the most notable wildfires, the 117 Fire started around 11 AM on April 18, 2018 engulfing a total of 43,000 acres in El Paso and Pueblo County. Strong winds fueled the flames and prevented air efforts to fight and map the fire. Both counties evacuated numerous communities as the fire spread. The fire burned 23 homes and caused $1.3 million in damages and suppression efforts.

Table 89 Pueblo County Wildfire Incidents and Reported Damages (NCEI: 2005-2022)

Location	Incident Period	Acres	Property Damages	Description
Mason Gulch – eastern Custer County and western Pueblo County between Wetmore and Beulah	7/6 – 7/16, 2005	11,375	$ 5,300,000	The fire was started by lightning on the evening of July 6th approximately 2 miles south of Wetmore and made a run towards Beulah on July 10th. The community of Beulah was evacuated while the towns of San Isabel, Colorado City, and Rye were put on standby evacuation orders.
Rye	10/11/2007 – Ended the same day	20	$ 10,000	A human-caused fire started near Rye, consuming around 20 acres, and forced the closing of Highway 165 west of Rye. Around a dozen houses were evacuated.
Pueblo West	12/1/2007 – Ended the same day	164	$ 30,000	Winds up to 50 mph fanned a fire which destroyed three empty mobile homes and a semi-trailer. In addition, a controlled burn in Pueblo West became a wildfire, consuming 164 acres. Wildfires broke out in Pueblo County, Crowley County, and Bent County.
Pueblo	3/4/2008 – Ended the same day	-	$ 30,000	Strong winds and low relative humidity sparked a grassfire on the west edge of Pueblo. Two mobile homes were destroyed.
Vineland	12/10/2010 – Ended the same day	40	$ 40,000	A fire was started near Vineland by a passing motorist which consumed 40 acres, a modular home and two vehicles.

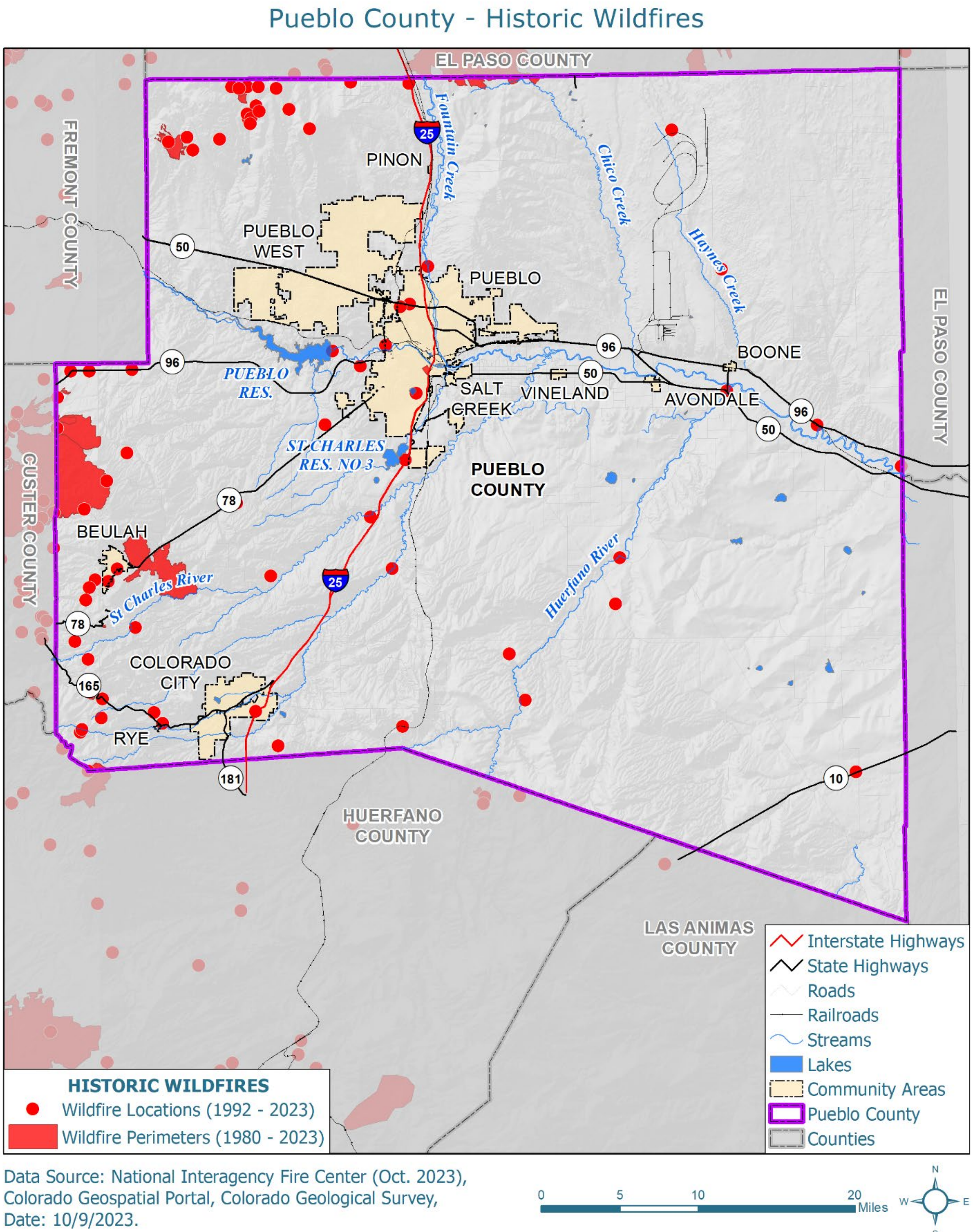
Location	Incident Period	Acres	Property Damages	Description
Pueblo Chemical Depot Lands	3/24/2011 – Ended the same day	1,600	-	Strong winds knocked down a power pole, which sparked a fast moving wildfire on the Pueblo Chemical Depot lands in northeast Pueblo County. No structures were threatened during the fire, which consumed approximately 1,600 acres of short grass and weeds.
Wetmore Fire – Custer and Pueblo Counties	10/23-10/26 2012	1,998	Reported Estimate: $2 to 5 million	A wildfire of unknown cause spread rapidly eastward. It consumed 15 houses and additional out-buildings in the Greenwood Village subdivision. Hundreds of residences were evacuated in Pueblo County. Twenty organizations responded to the wildfire, which scorched 1,998 acres in Custer and Pueblo Counties.
Beulah Hill – Pueblo Counties	10/3 – 10/15 2016	5,300	-	A human caused wildfire was sparked during red flag conditions and spread rapidly into the hills both north and south of Highway 78, just east of the Beulah Valley. Hundreds of residents were evacuated around Beulah and 8 structures were destroyed. The wildfire consumed just over 5,300 acres of grassland and mixed conifer. No firefighters or residents were injured.
Junkins Fire – Custer and Pueblo Counties	10/17 – 10/30 2016	18,000	-	The human caused fire burned on the Pike/San Isabel National Forest (PSI), Bureau of Land Management (BLM), Colorado State Land Board, and Private lands. Initially, it rapidly burned through mixed fuels, scorching over 15,000 acres within the first 24 hours, affecting Custer and Pueblo Counties. Nine houses were destroyed, along with 17 outbuildings. Multiple communities were threatened and around 600 people were evacuated from their properties for a time. There were numerous road closures. The wildfire impacted the popular hunting and recreational area. The fire burned just over 18,000 acres as the month closed out.

Location	Incident Period	Acres	Property Damages	Description
117 Fire – El Paso and Pueblo Counties	4/17 – 4/19 2018	42,795*	$ 1,300,000	

* Acreage for 117 Fire reported by Colorado Division of Fire Prevention and Control

Figure 42 shows the location of historical wildfire events in Pueblo County.

Figure 42 Pueblo County – Historic Wildfire (1980-2023)



The National Interagency Fire Center keep a history of wildland fire locations throughout the country since 2014 when the database was created. **Table 90** gives details of the fires reported in Pueblo County, over 100 acres and on non-federal land since 2014. This data includes the incident management team type if a team was required. The lower the team type number, from one (1) to five (5), the more skill, experience, and certifications are present on the team. Pueblo County has been supported by a type three (3) team on multiple fires, which is a state level team sent to support extended operations.

Table 90 Pueblo County Wildfire Incidents and Reported Damages (NIFC: 2014-2022)

Name	Incident Period	Acres	Reported Damages	Cause	Incident Mgmt. Team Type	Total Incident Personnel
Huerfano	3/2 – 3/4 2016	300	$13,000	Human	Type 3	50
Mustang	6/24/2016	120	-	Natural	-	-
Beulah Hill	10/3 – 10/14 2016	5,232	$1,785,142	Human	Type 4	14
Apache Complex	2/24/2018	2,885	-	Undetermined	Type 4	2
Pony	2/24 – 3/9 2018	857	-	Human	-	-
Dog	2/25 – 3/9 2018	198	-	Human	-	-
Chick	2/26 – 3/9 2018	1,384	-	Human	-	-
Orchard	3/9 – 3/14 2018	1,537	-	Human	Type 3	5
Airburst	3/14 – 3/16 2018	310	-	Human	-	-
Double Fork	4/12/2018	825	-	Human	-	-
Test Center	5/27 – 5/28 2018	2,171	-	Natural	Type 5	45

Name	Incident Period	Acres	Reported Damages	Cause	Incident Mgmt. Team Type	Total Incident Personnel
Stonemore	6/29 – 7/2 2018	137	-	Human	-	-
Bar Nothing	6/25 – 7/3 2020	127	-	Natural - Lightning	-	-
Huerfano Road	3/2 – 3/8 2022	231	$13,000	Human	Type 3	50

Location

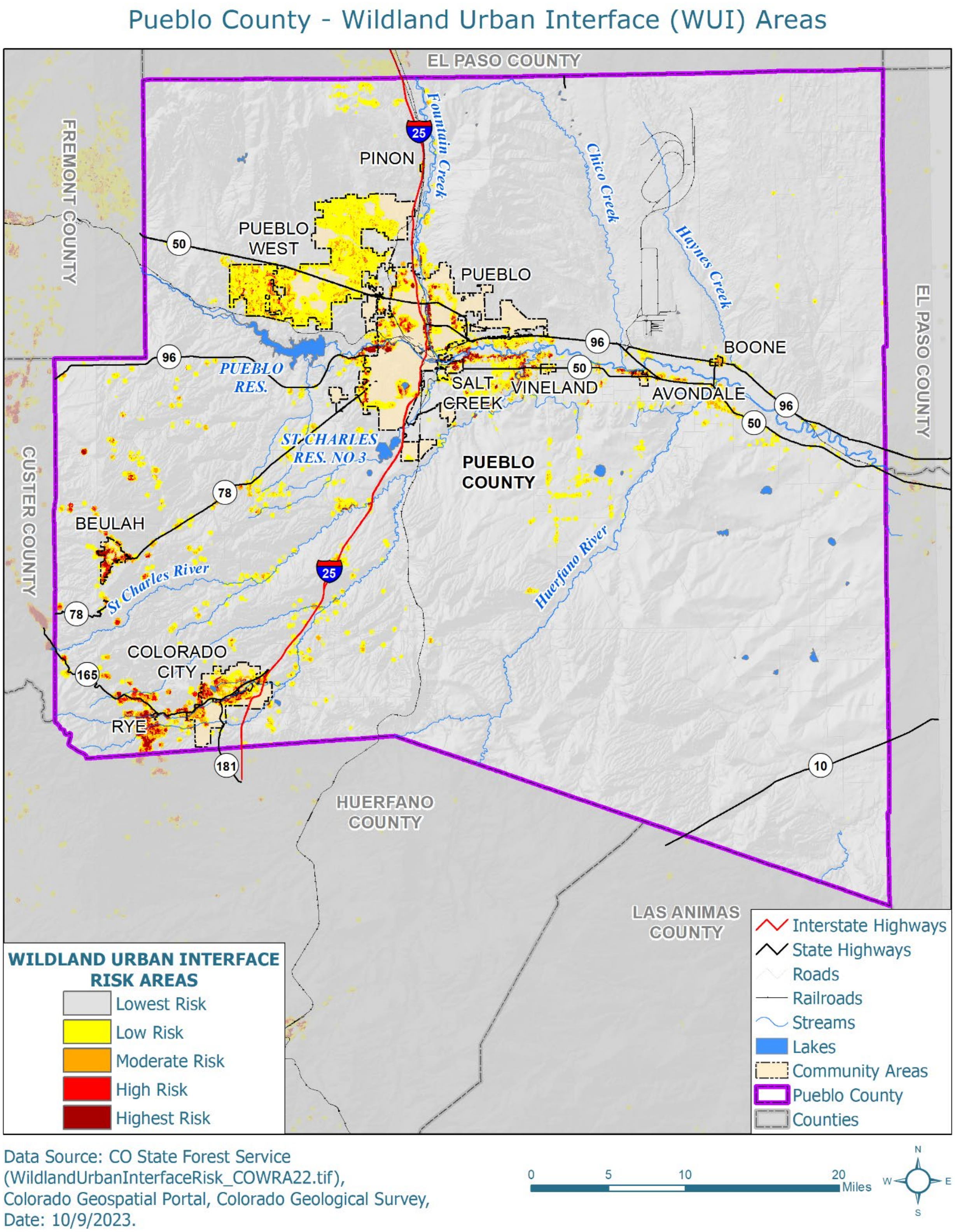
Wildfires can affect communities across the county; however, the risk of wildfire is significantly higher for those who reside in the Wildland Urban Interface (WUI). See **Figure 43** or the highest risk WUI areas across the county.

The wildland-urban interface (WUI) is an area where residential, public, and commercial structures are constructed in close proximity to or within areas of extensive natural vegetation, most notably in southwest Pueblo County.

The Pueblo County Community Wildfire Protection Plan details some contributing factors to the level of risk of fire occurrence. The Plan states:

> The probability of fire is highest in lower elevation forests and decreases with elevation because the amount of precipitation received tends to increase as the elevation increases. The increased precipitation contributes to higher fuel moisture and humidity that reduce the probability of ignition and impede fire spread. Nonetheless, even in mid- to upper-elevation forests, drought and low fuel moistures can make most forests vulnerable to fire.

Figure 43 Pueblo County – Wildland Urban Interface (WUI) Areas

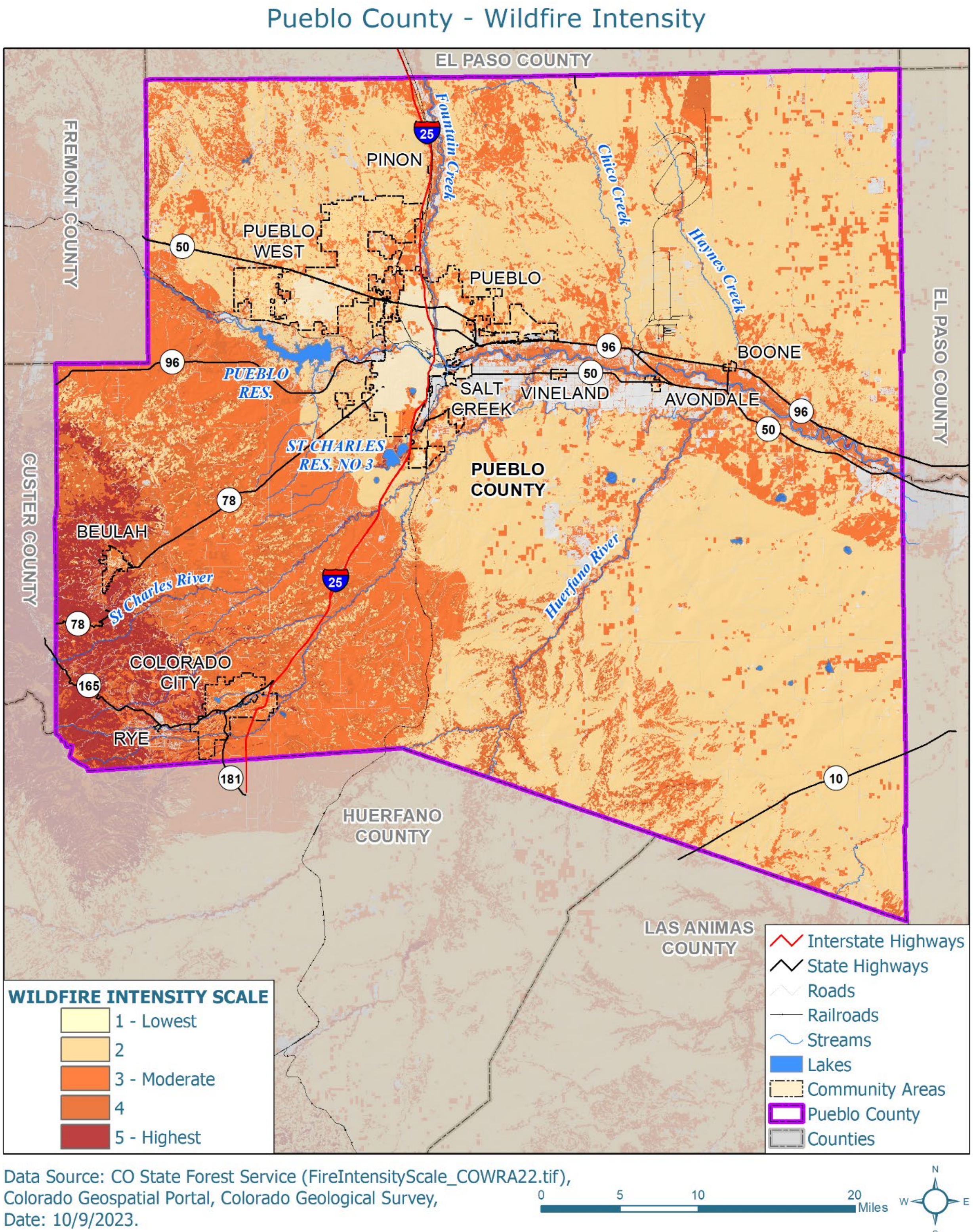


SEVERITY

Wildfire is indiscriminate in the areas it can spread and therefore almost all areas in the county are at risk of the hazard. **Figure 44** shows the modeled wildfire intensity across the county. Readers are directed to the Colorado Forest Atlas Wildfire Risk Viewer to learn more and access a web viewer of these various risk maps.

Fuels, weather, and topography all contribute to fire spread rate. When considering fuels, there are multiple factors including type, especially dry and small vegetation, the quantity, and spacing of fuels (both horizontal and vertical). Weather influences spread based on wind, temperature, and moisture. Topography includes slope, aspect, and terrain that each impact rate of spread in a variety of ways. Topography can increase the rate of spread up steep slopes, the amount of sunlight a fire gains heat from, and influence the behavior of winds. Topography can also affect responder's ability to access certain areas and suppress fire activity.

Figure 44 Pueblo County – Wildfire Intensity



Warning Time

There is no way to predict when a wildfire might ignite or how quickly it will spread which makes warning times difficult to quantify. Wildfires are often caused by humans, either intentionally or accidentally, and outdoor recreation increases risk. Severe weather can be predicted allowing special attention during weather events that may include lightning, which can ignite fires. National Weather Service lightning warnings are available on average 24 to 48 hours before a significant electrical storm.

If a fire does break out and spreads rapidly, residents may need to evacuate within hours or minutes. Improvements to communication technologies have contributed to progress in timely warning delivery and successful delivery of evacuation orders.

Secondary Hazards

Wildfires can generate a range of secondary effects which in some cases may cause more widespread and prolonged damage than the fire itself. Fires can cause direct economic losses in the reduction of harvestable timber and indirect economic losses in reduced tourism. Wildfires cause the contamination of reservoirs, destroy transmission lines, and contribute to flooding.

Most damaging, wildfires strip slopes of vegetation, exposing them to greater amounts of runoff. This in turn can weaken soils and cause failures on slopes. Major debris flows and landslides can occur several years after a wildfire. Most wildfires burn hot and for long durations which can bake soils, especially those high in clay content. This increases the imperviousness of the ground which increases the runoff generated by storm events, thus increasing the chance of flooding and debris flow events.

Exposure and Vulnerability

Lifelines

All community Lifelines across Pueblo County are vulnerable to the impacts from wildfire events. Multiple Lifelines are at risk due to wildfire, from a structural standpoint as well as resource management. While large-scale fires are rare for the county each fire can tax countywide resources, impacting public safety and government services. Fires can create conditions that block or prevent ingress / egress and can isolate residents and emergency service providers.

Energy infrastructure can be impacted as power line poles are made of wood and susceptible to burning. Pipelines carrying fuel can be damaged, potentially leading to a catastrophic explosion and interruption of resource delivery. Any Lifeline infrastructure with wood frame construction is especially vulnerable during wildfire events. Most roads and railroads would be without damage except in the worst scenarios.

Health & Medical services as well as Food, Water, & Shelter may be impacted if there is a need to evacuate the public and citizens or first responders need medical care.

Table 91 details the Lifelines that have Moderately High and the Highest potential for wildfire intensity and **Table 92** does the same for the Lifelines located in the High and Highest areas of WUI risk. Energy and Transportation lines are measured in miles.

Table 91 Lifelines – Wildfire Intensity

Lifeline	City of Pueblo	Town of Boone	Town of Rye	Pueblo West Metro District	Colorado City Metro District	Unin-corporated	Total
Moderately High							
Energy (Miles)	0.2	0	0	0	0	2.5	**2.7**
Energy	0	0	0	0	0	0	**0**
Transportation (Miles)	2	0	0	0	0.4	28.2	**30.6**
Transportation	0	0	0	0	0	0	**0**
Comm-unications	0	0	0	0	0	17	**17**
Food, Hydration, & Shelter	0	0	0	0	0	0	**0**
Health & Medical	0	0	0	0	0	0	**0**
Safety & Security	0	0	0	0	0	1	**1**
Hazardous Materials	0	0	0	0	0	0	**0**
Highest							
Energy (Miles)	0	0	0	0	0	0.1	**0.1**
Energy	0	0	0	0	0	0	**0**

Lifeline	City of Pueblo	Town of Boone	Town of Rye	Pueblo West Metro District	Colorado City Metro District	Unin-corporated	Total
Transportation (Miles)	0.1	0	0	0.1	0	4.1	**4.3**
Transportation	0	0	0	0	0	3	**3**
Comm-unications	0	0	0	0	0	1	**1**
Food, Hydration, & Shelter	0	0	0	0	1	1	**2**
Health & Medical	0	0	0	0	0	0	**0**
Safety & Security	0	0	0	0	0	0	**0**
Hazardous Materials	0	0	0	0	0	0	**0**

Table 92 Lifelines – Wildland Urban Interface (WUI)

Lifeline	City of Pueblo	Town of Boone	Town of Rye	Pueblo West Metro District	Colorado City Metro District	Unin-corporated	Total
High							
Energy (Miles)	0.4	0	0	0	0	0.1	**0.5**
Energy	0	0	0	0	0	0	**0**
Transportation (Miles)	3.1	0	0	0	0.4	5.8	**9.3**

Lifeline	City of Pueblo	Town of Boone	Town of Rye	Pueblo West Metro District	Colorado City Metro District	Unin-corporated	Total
Transportation	0	0	0	0	3	8	**11**
Comm-unications	0	0	0	0	0	0	**0**
Food, Hydration, & Shelter	1	0	0	0	0	1	**2**
Health & Medical	0	0	0	0	0	0	**0**
Safety & Security	1	0	0	0	1	0	**2**
Hazardous Materials	0	0	0	0	0	0	**0**
Highest							
Energy (Miles)	0	0	0	0	0	0.4	**0.4**
Energy	0	0	0	0	0	0	**0**
Transportation (Miles)	3.5	0	0	0.2	0.2	2.5	**6.4**
Transportation	2	0	0	0	2	12	**16**
Comm-unications	0	0	0	0	0	1	**1**
Food, Hydration, & Shelter	2	0	0	0	0	0	**2**
Health & Medical	0	0	0	0	0	0	**0**

Lifeline	City of Pueblo	Town of Boone	Town of Rye	Pueblo West Metro District	Colorado City Metro District	Unin-corporated	Total
Safety & Security	0	0	0	0	1	0	**1**
Hazardous Materials	1	0	0	0	0	0	**1**

People

Smoke and air pollution from wildfires can be a severe health hazard, especially for sensitive populations, including children, the elderly, and those with respiratory and cardiovascular diseases. Smoke generated by wildfire consists of visible and invisible emissions that contain particulate matter (soot, tar, water vapor, and minerals), gases (carbon monoxide, carbon dioxide, nitrogen oxides), and toxics (formaldehyde, benzene). Emissions from wildfires depend on the type of fuel, the moisture content of the fuel, the efficiency (or temperature) of combustion, and the weather. Public health impacts associated with wildfire include difficulty in breathing, odor, and reduction in visibility.

Wildfire may also threaten the health and safety of those fighting the fires. First responders are exposed to the dangers from the initial incident and the after-effects from smoke inhalation and heat stroke.

A report titled: '*Ahead of the Fire: Where will the West's next deadly wildfire strike? The risks are everywhere.*" was published in The Arizona Republic in the summer of 2019. The study, spurred by the devastating Paradise Fire in California, looked across 5,000 small communities throughout 11 states to determine wildfire risk.

The analysis began with the U.S. Forest Service's Wildfire Hazard Potential (WHP) which assigns a score to every 18-acre parcel of land in the country. The higher the score, the higher the probability the place will experience a catastrophic wildfire.

Pueblo, Pueblo West, Rye, Beulah, Beulah Valley, and Colorado City each have results from the analysis which are shown in **Figure 45, Figure 46, Figure 47, Figure 48, Figure 49**, and **Figure 50**. Inputs into this analysis included a wildfire hazard potential dataset, in addition to the following inputs: evacuation routes, resident age, disabilities, and language spoken, emergency alerts, and mobile home inventories. Note that the demographic data utilized aligns with access and functional needs (AFN) categories.

Pueblo and Pueblo West have a lower hazard potential than Rye, Beulah, Beulah Valley, and Colorado City. However, both Pueblo and Pueblo West have the highest evacuation constraint scores with both over 1,500 which is an unusually high figure. Evacuation constraint refers to how "limited routes out of a community can lead to mass congestion during evacuation. Evacuation constraint is measured as the ratio of total households (including seasonal residences) to major roads that exit a community."

Each of these communities have similar demographics, however Pueblo, Rye, and Colorado City have a higher percentage of residents with a disability.

Figure 45 Pueblo Wildfire Hazard Potential

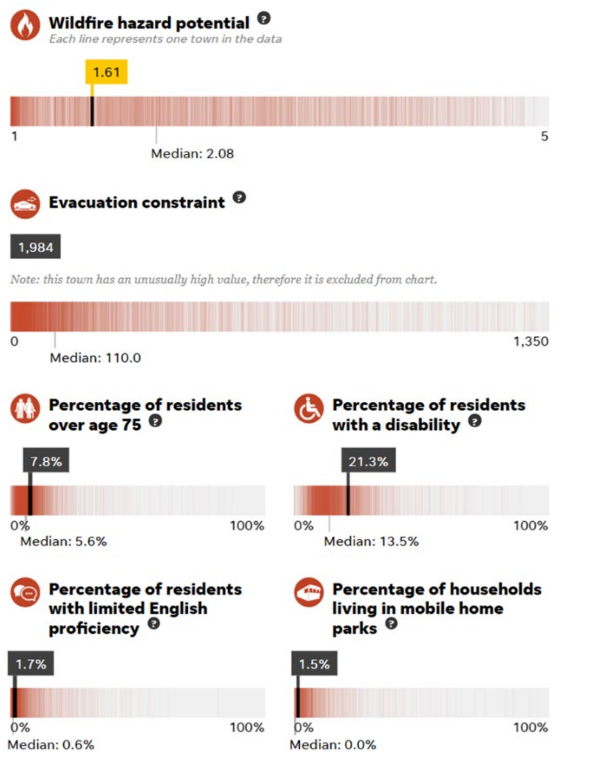


Figure 46 Pueblo West Wildfire Hazard Potential

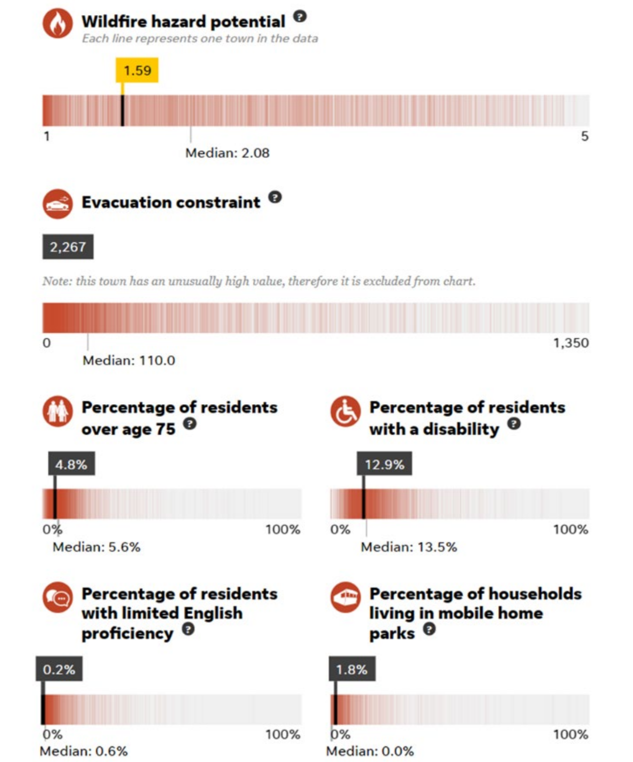


Figure 47 Rye Wildfire Hazard Potential

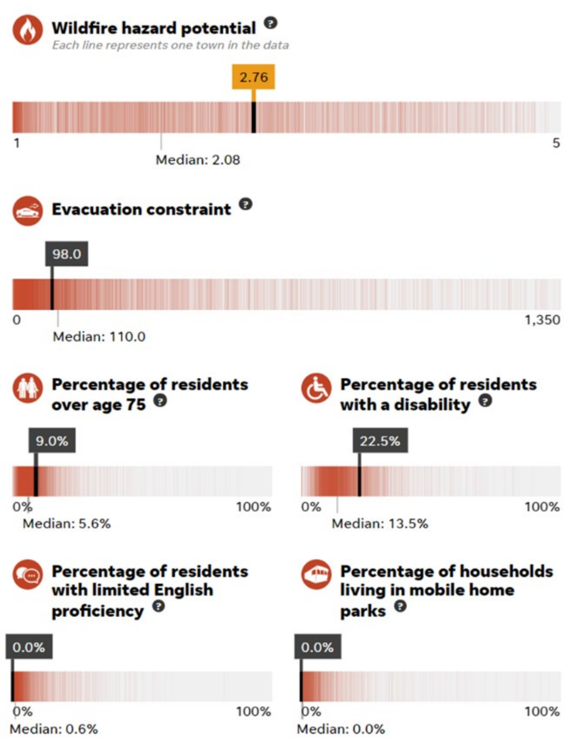


Figure 48 Beulah Wildfire Hazard Potential

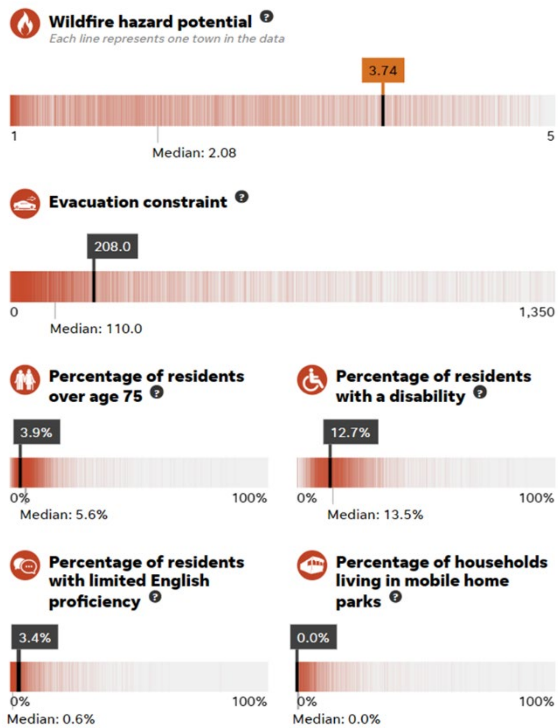


Figure 49 Beulah Valley Wildfire Hazard Potential

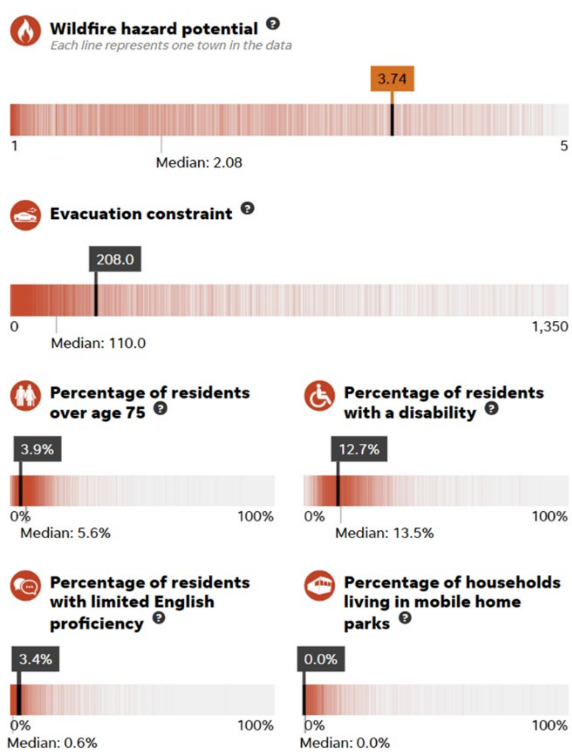
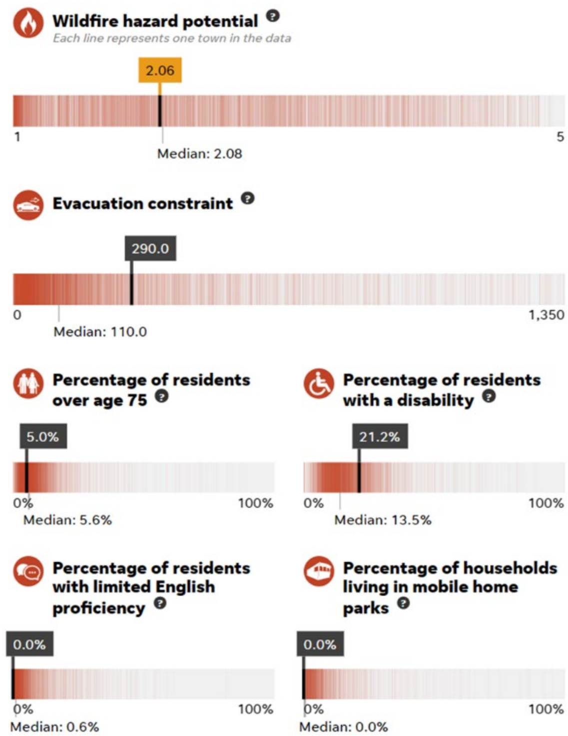


Figure 50 Colorado City Wildfire Hazard Potential



STRUCTURES

Property damage from wildfires can be severe and can significantly alter entire communities. **Table 93** and **Table 94** presents the counts and valuations, respectively, of structures and parcels at most risk to wildfire. The first table utilizes CSFS's wildfire intensity data, while the second table utilizes CSFS's WUI risk data. While this analysis attempts to quantify those structures at most risk across the county, it should be noted that all property is potentially vulnerable to wildfire.

Table 93 Structures – Wildfire Intensity

	City of Pueblo	Town of Boone	Town of Rye	Pueblo West Metro District	Colorado City Metro District	Unincor-porated	Total
Moderately High							
Structures							
Building Count	27	4	27	26	111	1,022	**1,217**
Parcel Count	152	5	24	107	4,995	2,263	**7,546**
Valuation							
Total Land Value	$3,595,721	$34,870	$336,220	$2,578,656	$13,474,963	$73,551,145	**$93,571,575**
Total Structure Value	$7,489,770	$312,045	$3,118,430	$10,774,720	$34,200,705	$229,281,520	**$285,177,190**
Total Value	$11,085,491	$346,915	$3,454,650	$13,353,376	$47,675,668	$302,832,665	**$378,748,765**
Highest							
Structures							
Building Count	10	0	5	0	41	326	**382**

	City of Pueblo	Town of Boone	Town of Rye	Pueblo West Metro District	Colorado City Metro District	Unincor-porated	Total
Parcel Count	12	0	1	2	768	997	**1,780**
Valuation							
Total Land Value	$353,895	0	$18,000	$71,400	$2,830,590	$189,779,461	**$193,053,346**
Total Structure Value	$2,809,253	0	$162,239	$243,611	$9,829,249	$115,112,780	**$128,157,132**
Total Value	$3,163,148	0	$180,239	$315,011	$12,659,839	$304,892,241	**$321,210,478**

Table 94 Structures – Wildland Urban Interface (WUI) Risk

	City of Pueblo	Town of Boone	Town of Rye	Pueblo West Metro District	Colorado City Metro District	Unincor-porated	Total
High							
Structures							
Building Count	879	28	58	195	265	1,070	**2,495**
Parcel Count	948	12	39	353	757	39	**2,148**
Valuation							
Total Land Value	$23,537,126	$31,704	$402,312	$13,167,693	$6,969,404	$402,312	**$44,510,551**
Total Structure Value	$145,130,084	$866,575	$4,796,299	$73,922,578	$36,720,906	$4,796,299	**$266,232,741**
Total Value	$168,667,210	$898,279	$5,198,611	$87,090,271	$43,690,310	$5,198,611	**$310,743,292**
Highest							
Structures							
Building Count	1,137	6	31	2	154	1,696	**3,026**

	City of Pueblo	Town of Boone	Town of Rye	Pueblo West Metro District	Colorado City Metro District	Unincor-porated	Total
Parcel Count	1,038	5	20	7	463	1,153	**2,731**
Valuation							
Total Land Value	$28,119,916	$24,156	$293,776	$245,300	$5,171,713	$23,487,853	**$57,342,714**
Total Structure Value	$207,091,493	$280,144	$2,292,765	$2,135,807	$28,409,818	$176,158,598	**$416,368,625**
Total Value	$235,211,409	$304,300	$2,586,541	$2,381,107	$33,581,531	$199,646,451	**$473,711,339**

Natural, Historic, and Cultural Resources

In addition to stripping the land of vegetation and destroying forest resources, large, intense fires can harm the soil, waterways, and the land itself. Soil exposed to intense heat may lose its capability to absorb moisture and support life. Exposed soils erode quickly and enhance siltation of waterways; thereby enhancing flood potential, harming aquatic life, and degrading water quality. Lands stripped of vegetation are also subject to increased debris flow.

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

- Damaged Fisheries – Critical fisheries can suffer from increased water temperatures, sedimentation, and changes in water quality.
- Soil Erosion – The protective covering provided by foliage and dead organic matter is removed, leaving the soil fully exposed to wind and water erosion. Accelerated soil erosion can occur, causing landslides and threatening aquatic habitats.

- Spread of Invasive Plant Species – Non-native woody plant species frequently invade burned areas. When weeds become established, they can dominate the plant cover over broad landscapes, and become difficult and costly to control.
- Disease and Insect Infestations – Unless diseased or insect-infested trees are swiftly removed, infestations and disease can spread to healthy forests and private lands. Timely active management actions are needed to remove diseased or infested trees.
- Destroyed Endangered Species Habitat – Catastrophic fires can have devastating consequences for endangered species.
- Soil Sterilization – Topsoil exposed to extreme heat can become water repellant, and soil nutrients may be lost. It can take decades or even centuries for ecosystems to recover from a fire. Some fires burn so hot they can sterilize the soil.

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

Other Community Assets and Activities

Wildfire can impact the economy due to potential damage to property, crops, and livestock. There may be direct costs due to losses and indirect costs for the loss of work that comes from harvest and livestock transport. Overhead that may result during repair or reconstruction of properties may also be an indirect cost.

If roads are closed or areas are evacuated due to a fire, transport may be limited, and businesses may have to close. While this can typically be a short-term impact, prolonged wildfires can have a large impact on the operations of a community and its economy.

Other government-specific vulnerabilities are shown in **Table 95**.

Table 95 Local Government Vulnerability – Other Community Assets and Activities

Local Government	Local Vulnerability
Pueblo County	All structures and residents located in wildfire affected areas within the county are vulnerable to the impacts of a wildfire event. Impacts affecting the community could negatively affect the economy, transportation lifelines, the tourism & agriculture sectors, and air quality/public health.
City of Pueblo	Persons and structures in interface areas including unhoused populations, communications and utility systems, the Goodnight Barn, and outdoor activities

Local Government	Local Vulnerability
	and festivals in the city are vulnerable to wildfire events.
Pueblo West Metro District	District assets at risk include all district-owned facilities, including sewer pumps, water treatment facilities, vehicles, and fire stations. Impacts could include complete destruction of all assets.
Colorado City Metro District	In a wildfire event 2,500 residents and raw water intake and water supply will be impacted. Stream contamination will affect the potable water plant and the reservoir.
St. Charles Mesa Water District	Fire events require more water to be pulled from streams. Additionally, if a wildfire is at higher elevation it can contaminate a potable water lake.
Beulah Fire Protection District	Those who are unable to self-evacuate, the 4,777 homes in the WUI, San Isabel power, Dotson Cabin and Pueblo Mountain Park are vulnerable to wildfires.

Trends in Development

As some of these areas are at a higher risk to wildfire and located in the WUI, future development has the potential to greatly increase the risk to this hazard.

While the risk of wildfire on public land is generally understood, much of the adjacent private land is equally at risk. Private lands adjoining public lands are becoming increasingly valued for their scenic beauty, solitude, and access to recreation opportunities. As development in these areas continue to increase, the risk to lives, property, and resources correspondingly increases.

The expansion of the WUI can be managed with strong land use and building codes. In May 1972, a revision to the Colorado Revised Statutes exempted properties divided into parcels of 35 acres or more from the statutory definition of a subdivision. Tracts of 35-acre lots developed since that time have not been subject to state or local subdivision regulations.

Table 96 presents additional vulnerability information specific to each government.

Table 96 Local Government Vulnerability – Future Trends in Development

Local Government	Future Development
Pueblo County	Future development is not anticipated to directly impact vulnerability to this hazard. Any future development will increase exposure to this hazard.
City of Pueblo	Increase in houses along the interface will increase vulnerability.
Pueblo West Metro District	Future development is not anticipated to directly impact vulnerability to this hazard. Any future development will increase exposure to this hazard.
Colorado City Metro District	Future development is not anticipated to directly impact vulnerability to this hazard. Any future development will increase exposure to this hazard.
St. Charles Mesa Water District	Future development is not anticipated to directly impact vulnerability to this hazard. Any future development will increase exposure to this hazard.
Beulah Fire Protection District	More homes are being built in WUI areas increasing vulnerability to this hazard.

Probability of Future Occurrences

Considering the minimal history of fire in the county, it would seem probability is low. However, as was seen by the recent 2021 Marshall Wildfire in Boulder County, wildland fires are capable of catastrophic damage in areas historically considered low risk.

The wildfire and WUI risk areas are expected to see more construction and structures. More development in these areas poses new considerations for probability, as humans are the most significant cause of wildfire.

The frequency of fire in the county based on the recent data for fires over 100 acres since 2014 suggests larger fires occur approximately every year and a half. On average these fires have an average of over 1,000 burned acres.

Climate Change Impacts

Climate change impacts will likely have an unpredictable impact on wildfire occurrences in the county.

Fire in western ecosystems is affected by climate variability, local topography, and human intervention. Climate change has the potential to affect multiple elements of the wildfire system: fire behavior, ignitions, fire management, and vegetation fuels. Hot, dry spells create the highest fire risk. Increased temperatures may intensify wildfire danger by warming and drying out vegetation. When climate alters fuel loads and fuel moisture, forest susceptibility to wildfires changes. Faster fires are harder to contain, and thus are more likely to expand into residential neighborhoods.

According to the 2023 CO E-SHMP, "statewide annual average temperatures have increased by 2.0°F over the past 30 years and 2.5°F over the past 50 years. Warming trends have been observed over these periods in most parts of the state."

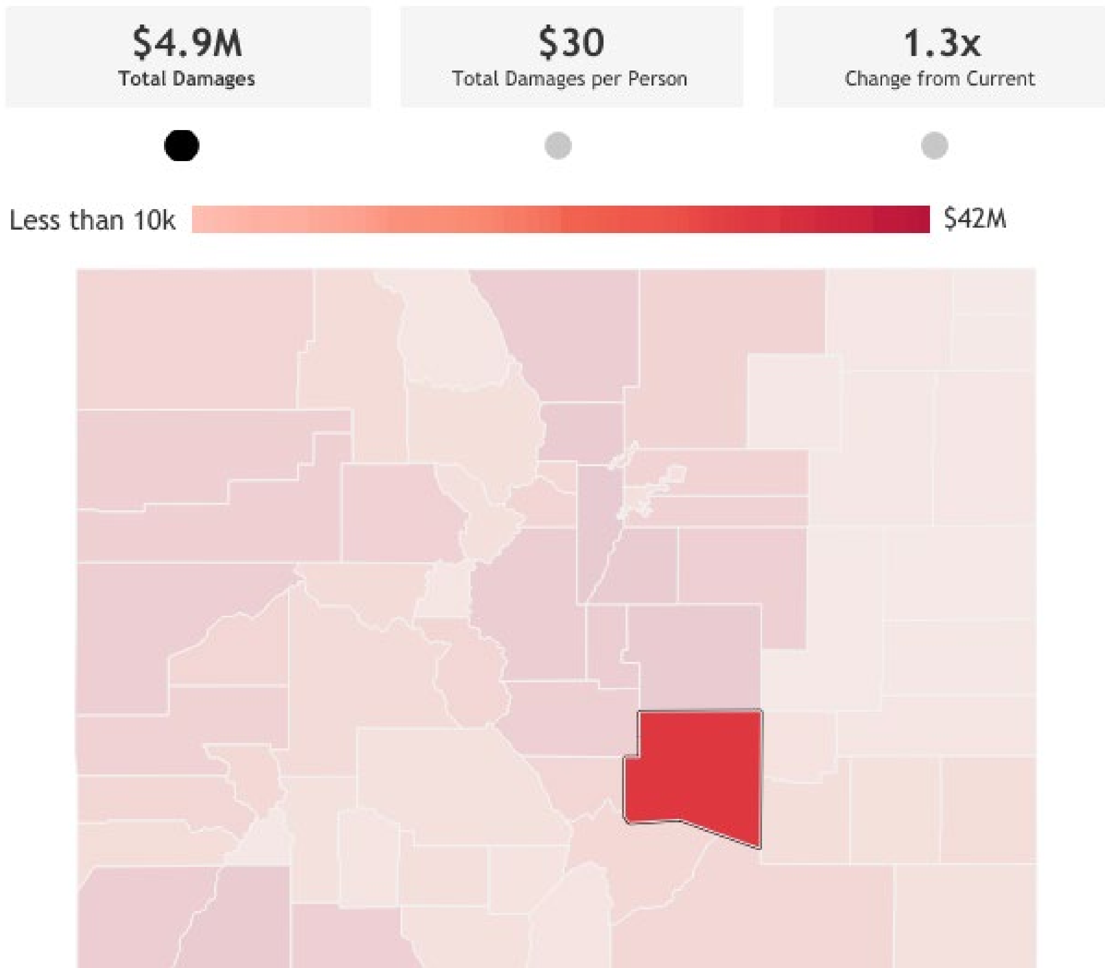
Such conditions can exacerbate drought, further promoting wildfires which then release stores of carbon and further contribute to the buildup of greenhouse gases. The E-SHMP also projects that the risk area, total area burned, duration of wildfires will increase with time.

The E- SHMP further highlights the Future Avoided Cost Explorer (FACE) tool which was developed by the state to understand the economic impacts of flood, drought, and wildfire looking forward to 2050. It estimates the expected cost impacts of these three hazards on a selection of economic sectors, under future climate and population scenarios. These costs are expressed in expected annual damages, which are a function of the hazard magnitude, probability, and exposed assets.

For modeling wildfire scenarios two economic sectors were analyzed, buildings and suppression. Damages are conceptually represented as the intersection of wildfire hazard (burn probability and intensity) and asset vulnerability (building replacement costs). The cost of suppression, which is the amount the state spends to fight and extinguish ongoing fires, was also modeled.

Figure 51 presents the Pueblo County's estimated expected annual damages from wildfire, based on a more severe climate and consistent population. The county is expected to incur $4 million in damages from future flood events, a $1 million increase from current conditions.

Figure 51 Pueblo County Wildfire Damages - More Severe Climate



7 Annex A - FEMA Approval and Local Government Adoption

8 Annex B - Hazard Mitigation Planning Committee

This HMPC Roster includes all invitees. Participants in the planning process are identified using (*).

Table 97 Hazard Mitigation Planning Committee Roster

Name	Title	Organization	Sector
Alexander Stejskal*	Water Resources Analyst	Xcel Enegy	Community Sectors: Infrastructure (Lifelines)
Allison Waldvogel	Animal Logistics Manager	HSPPR-Pueblo	Other: Regional Stakeholders
Amanda Cesar	Deputy Director	Pueblo County Parks and Recreation	Community Sectors: Natural & Cultural Resources
Andrew Hayes	Director	Pueblo Department of Public Works	Community Sectors: Infrastructure (Lifelines)
Andrew Notbohm	Director	Pikes Peak Reg. Emergency Management	Neighboring Counties
Barb Huber*	Fire Chief / Deputy Mayor	Pueblo City Fire	Community Sectors: Emergency Management
Bob Tracy	Assistant Fire Chief	Pueblo Rural Fire Department	Community Sectors: Emergency Management
Brian Caserta*	Fire Chief	Pueblo West Fire Department	Community Sectors: Emergency Management
Brian Cotter	Pueblo County Coroner	Pueblo County Coroner's Ofc.	Community Sectors: Health & Social Services
Brian Lyons*	Major	Colorado State Patrol	Community Sectors: Emergency Management
Britney Duston*	Representative	Evraz Inc.	Other: Large Employers
Britteny Ciarlo	Emergency Manager	Huerfano County	Neighboring Counties

Name	Title	Organization	Sector
Bryan Ware*	Fire Chief	Beulah Fire Protection District	Community Sectors: Emergency Management
Carmen Howard*	Director	Pueblo County Planning & Development	Community Sectors: Land Use & Development
Catalina Santos	St. Charles Dams #2 & #3	Evraz Inc.	Other: Large Employers
Chad Ones	St. Charles Dams #2 & #3	Evraz Inc.	Other: Large Employers
Chris Harner*	Deputy Fire Chief	Pueblo City Fire	Community Sectors: Emergency Management
Chris Noeller	Police Chief	Pueblo Police Department	Community Sectors: Emergency Management
Christe Coleman*	Regional Field Manager	Colorado DHSEM	State Entities: Division of Homeland Security and Emergency Management (DHSEM)
Christopher Kilpatrick*	Lieutenant	Pueblo County Sheriff's Office	Community Sectors: Emergency Management
Clifford Kindred	Captain	Pueblo County Sheriff's Office	Community Sectors: Emergency Management
Cori Tanner	Regional Disaster Services Manager	American Red Cross	Other: Regional Stakeholders
Crystal Breckenridge*	Mayor Pro Tem	Town of Boone	Community Sectors: Elected Leadership
Dan Kogovsek*	City Attorney	City of Pueblo	Community Sectors: Management
Danny Chavez	Emergency Manager	Otero County	Neighboring Counties
Darren Kochis*	Building Safety & Security Manager	Pueblo County Government	Community Sectors: Infrastructure (Lifelines)
Dave Lucero*	Pueblo County Sheriff	Pueblo County Sheriff's Office	Community Sectors: Elected Leadership

Name	Title	Organization	Sector
Emily Drosselmeyer*	Deputy SHMO	DHSEM	State Entities: Division of Homeland Security and Emergency Management (DHSEM)
Eppie Griego*	Commissioner	Pueblo County	Community Sectors: Elected Leadership
Fiona Norby	Manager	CART	Other: Regional Stakeholders
Frank Ortega	Sergeant	Pueblo Police Department	Community Sectors: Emergency Management
Garrison Ortiz*	Commissioner	Pueblo County	Community Sectors: Elected Leadership
Gavin Wolny	County Attorney	Pueblo County	Community Sectors: Management
Gayle Perez*	Public Information Officer	Pueblo County Sheriff's Office	Community Sectors: Emergency Management
Grant Genova	Captain	Pueblo Rural Fire Department	Community Sectors: Emergency Management
Harry Hochsteller*	Treasurer	Colorado City Metro District	Community Sectors: Economic Development
Heather Graham	Pueblo Mayor	City of Pueblo	Community Sectors: Elected Leadership
Ian Fitzlgh*	CO State Mitigation Specialist	DHSEM	State Entities: Division of Homeland Security and Emergency Management (DHSEM)
Irene Merrifield*	Mitigation Planning Lead	DHSEM	State Entities: Division of Homeland Security and Emergency Management (DHSEM)
Isaiah Goodreau	Plains Division Manager	San Isabel Gas	Community Sectors: Infrastructure (Lifelines)
James Buford	40TH St. Detention Basin	CDOT Region 2	Other: "High" & "Significant" Risk Dam Owners
Jim Eccher*	District Manager, Beckwith Dam	Colorado City Metro District	Other: "High" & "Significant" Risk Dam Owners

Name	Title	Organization	Sector
Jimmy Jenkins*	Disaster Specialist	American Red Cross	Other: Regional Stakeholders
JJ King*	Division Fire Chief	Pueblo West Fire Department	Community Sectors: Emergency Management
Joe Cervi	Public Relations Specialist	Board of Public Water Works	Community Sectors: Infrastructure (Lifelines)
Joe Richards	Emergency Manager	Las Animas County	Neighboring Counties
John Grieve	Supervisory Forester	CSFS	State Entities: State Forest Service (CSFS)
John Reitan	Emergency Manager	Crowley County	Neighboring Counties
Josh Johnson*	Emergency Management Coordinator	Pueblo County Sheriff's Office	Community Sectors: Emergency Management
Justin Carbee*	Safety Manager	Health Solutions	Community Sectors: Health & Social Services
Justin Yougren*	Fire Chief	Red Creek Fire Department	Community Sectors: Emergency Management
Katie LaConte*	Corporal	Pueblo Police Department	Community Sectors: Emergency Management
Ken Espinoza	Deputy Pueblo County Coroner	Pueblo County Coroner's Office	Community Sectors: Health & Social Services
Ken Stroud	Emergency Manager	Lincoln County	Neighboring Counties
Kenny Rider	Captain	Pueblo Police Department	Community Sectors: Emergency Management
Kevin Schaefer*	CES Manager	American Medical Response	Community Sectors: Health & Social Services
Kim Jeffries	Communications Center Manager	Pueblo Police Department	Community Sectors: Emergency Management

Name	Title	Organization	Sector
Klint Skelly*	Warning Meteorologist	National Weather Service Pueblo	Other: Regional Stakeholders
Larry Atencio	City Council Representative	City of Pueblo	Community Sectors: Elected Leadership
Lee Hodge*	Assistant DHS Director	Pueblo County DHS	Community Sectors: Housing
Lindsey Vigna	Animal Control Supervisor	HSPPR-Pueblo	Other: Regional Stakeholders
Lucas Snedeker*	CO State Mitigation Specialist	DHSEM	State Entities: Division of Homeland Security and Emergency Management (DHSEM)
Margaret Gaillard*	Vice President of Operations	PEDCO	Community Sectors: Economic Development
Mark Mears*	Bureau Chief	Pueblo County Sheriff's Office	Community Sectors: Emergency Management
Mark Perry	Regional Dam Safety Eng.	CO Dam Safety	State Entities: Office of Dam Safety
Marty Rahl	Mayor	Town of Rye	Community Sectors: Elected Leadership
Melanie Moss*	Emergency Management Specialist	CommonSpirit Health	Community Sectors: Health & Social Services
Michael Bayer	Safety Manager	School District 60	Community Sectors: Education
Michael R Tafoya	Captain	Colorado State Patrol	Community Sectors: Emergency Management
Mike Cafasso*	President/CEO	CommonSpirit Health	Community Sectors: Health & Social Services
Mike Furney	Fire Chief	Pueblo Rural Fire Department	Community Sectors: Emergency Management
Mike Hill		Bessemer Irrigating Ditch Co.	Community Sectors: Infrastructure (Lifelines)

Name	Title	Organization	Sector
Mike Lening	Operations Manager	American Medical Response	Community Sectors: Health & Social Services
Monroe Robinson	Safety Officer	Pueblo School District 70	Community Sectors: Education
Mykel Kroll	Emergency Manager	Fremont County	Neighboring Counties
Nick Laydon*	Facilities Manager - Safety Officer	CommonSpirit Health	Community Sectors: Health & Social Services
Patrick Farrell*	District Manager, St. Charles Mesa Dams #1 & #2	St. Charles Mesa Water District	Other: "High" & "Significant" Risk Dam Owners
Randy Evetts*	Director	Pueblo Dept of Public Health & Environ.	Community Sectors: Health & Social Services
Rich Belt	Director, Chemistry and Water Resources - Comanche	Xcel Energy	Other: "High" & "Significant" Risk Dam Owners
Richard Garcia	Disaster Specialist	American Red Cross	Other: Regional Stakeholders
Robyn Knappe*	Emergency Manager	Custer County	Neighboring Counties
Ronald Sasaoka*	Emergency Preparedness & Response Coord.	Pueblo Dept of Public Health & Environ.	Community Sectors: Health & Social Services
Sabina Genesio*	County Manager	Pueblo County	Community Sectors: Management
Sadie Martinez*	AFN Coordinator	DHSEM	Community Sectors: Underserved Communities & Socially Vulnerable Populations
Shannon Monahan	Lake Isabel Dam	Dam Program Mgt - Rocky Mt. Region	Other: "High" & "Significant" Risk Dam Owners
Shawnna Clementi*	Communications Center Manager	Pueblo County Coroner's Office	Community Sectors: Emergency Management

Name	Title	Organization	Sector
Stephanie Garcia	Animal Control Supervisor	HSPPR-Pueblo	Other: Regional Stakeholders
Steve Bennett	Fire Chief	Rye Fire Protection District	Community Sectors: Emergency Management
Steve Bryant*	Pueblo County Undersheriff	Pueblo County Sheriff's Office	Community Sectors: Emergency Management
Steven Meier	Director	Pueblo Parks & Rection	Community Sectors: Natural & Cultural Resources
Steven Noeller*	Chief	City of Pueblo Police Department	Community Sectors: Emergency Management
Travis Bauer*	Pueblo	U.S. Bureau of Reclamation	Other: "High" & "Significant" Risk Dam Owners

9 Annex C - Mitigation Strategy Action Ideas

Mitigation Strategy Action Ideas

The following ideas for mitigation actions / projects were identified over the course of the hazard mitigation planning process.

Hazard Mitigation Planning Committee:

- Development and maintenance of a lifeline GIS layer
- Support the region's water districts in efforts to secure adequate or expanded water supply resources to meet current and projected water demands, maintain and expand delivery infrastructure as needed, and implement water conservation measures. [Comprehensive Plan]
- Support the expansion of water conservation efforts through programs and regulations that reduce domestic water use, including reduced use of irrigation water by expanding drought-tolerant landscaping, grey water recycling programs, and installation of water-efficient landscape irrigation systems, among other initiatives. [Comprehensive Plan]
- Collaborate on efforts to improve and maintain water quality in the Arkansas River, Fountain Creek, and other rivers, creeks, and streams in the region, so they support various uses, including fishing, swimming, and provision of drinking water. [Comprehensive Plan]
- Prioritize intra-county use of surplus water, ahead of non-Pueblo County needs, to ensure surplus water serves Pueblo County needs whenever possible for industrial and agricultural uses, along with municipal uses that will not encourage development that is unsupported by permanent sources of water to meet current and future demand. [Comprehensive Plan]
- Assess the resilience of existing infrastructure, such as roads, water and sewer systems, and the energy grid, in withstanding existing climate threats such as extreme heat, drought, flooding and fires, and identify any improvements or alterations that could increase resilience. When siting new infrastructure, incorporate resilience considerations in advance of determining locations for new facilities and structures. [Comprehensive Plan]
- Reduce the danger of losses from wildfire by actively managing wildland urban interface areas in the County, limiting the encroachment of development in these sensitive areas. Collaborate with rural and volunteer fire departments on the development of Community Wildfire Protection Plans for areas with the greatest risk. [Comprehensive Plan]
- Reduce the heat island effect in urbanized areas of the region through the incorporation of site and building features that reduce heat generation and concentration, including measures such as shade trees and reflective materials, green roofs, and cool pavements materials. [Comprehensive Plan]
- Emphasize inclusion of green infrastructure into proposed development, scaling from individual sites to neighborhood wide initiatives, possibly including district energy, permeable pavers, bioswales, rainwater harvesting, and greywater recycling, among other related features. [Comprehensive Plan]
- Encourage the widespread use of landscaping materials that are suited to the local climate, including native plants and those that require low water usage, and are drought- and heat-tolerant. [Comprehensive Plan]
- Continue to administer, and expand where necessary, programs that protect critical habitat, prime irrigated farmland, floodplain, forest, and other environmentally sensitive areas from encroachment by development or other incompatible land use. [Comprehensive Plan]

- Pursue land use and vegetation management practices that protect from aquifer contamination, while supporting initiatives that divert potentially overtaxing, harmful, or inappropriate development away from areas reaching water availability limits or with high groundwater recharge potential. [Comprehensive Plan]
- Pueblo Union Avenue Bridge Repair
- Pueblo Water – Southside diversion dam modifications and river improvements
- Finding an effective way to manage stormwater discharges, attenuate flooding, and reduce the dynamic changes of the Fountain Creek and other water features.
- Back up power for specific agencies
- Public cooling centers
- Community outreach and education events – to be held across the county in specific high-risk hazard areas
- Develop unified community outreach messaging between all jurisdictions (city, county, etc.). The county would like to determine the need to increase community outreach in schools (e.g., knowledge of risks from identified threats and hazards). [CEPA]
- Review agencies that have successful long-term vulnerability reduction programs and expand those programs to the whole community. The county identified challenges with expanding this capability due to limited time and personnel. [CEPA]

Community Survey Responses:

- *Multiple Hazards*
    - Better sewage run-off and storm drainage during severe storms and floods to control storm water. Additional flood mitigation focused in North and Eastern Pueblo.
    - Introduce drought resistant plants to mitigate the impact of drought and wildfire.
    - Increased opportunities for community involvement and education- partnership with county response force to mitigate risk and train community members on response, community center to gather at during a disaster event to receive current and important information, education on preparedness.
    - Increased community evacuation shelters (including those for animals and homeless) adequately prepared for disaster event – food and clean water stock, power generators, adequate emergency medical care (especially for vulnerable populations who may have special medical equipment, medication, and care needs). Special attention to Pueblo West, which is not prepared for a large scale evacuation.
    - Funding and resources to Pueblo Rescue Mission and other non-profits to help most at-risk populations shelter from hazards before they occur.
    - Better evacuation resources - better roads, clear evacuation routes and signage (particularly in the mountains), emergency/evacuation alert systems (Reverse 911 and multi-purpose tornado sirens), resources (i.e. Transportation) for evacuation for vulnerable populations (elderly, nursing homes, those with disabilities, homeless).

Mitigation Strategy Action Ideas

  - Road improvements in urban and rural areas, including repairs, and better snow and ice removal to mitigate flooding, aid evacuation, and prevent accidents. Additionally construction of new road or repairs to help with emergency department access in WUI areas.
  - Increase/better city sanitation (specifically in Fountain Creek).
- *Drought*
  - Distribute information on water conservation methods to use during drought events.
- *Flood*
  - Implement awareness program for flood insurance and discounts.
  - Enhance stream maintenance projects.
- *Wildfire*
  - Wildfire mitigation in unincorporated parts of the county, Fountain Creek, and the El Camino areas in addition to San Isabel, Beulah, and South East Rye. Mitigation actions including fire barriers, rainwater collection and utilization in areas of fire risk, and better resources for fire protection.
  - Weed, brush, and forest measures for wildfire mitigation: trimming and removal of weeds and brush in residential and mountain areas, removal of dead foliage, tumbleweed mitigation, residential and urban maintenance ordinances, and promotion of fire-resistant landscaping. Availability of resources (such as chippers) to residents as well as provide help for those who are unable to perform mitigation actions for themselves.

General Ideas to Consider:

  - Disclose natural hazard risks during real estate transactions
  - Buyout flood prone properties and maintain as open space
  - Provide accessible resources for individuals with communication disabilities and/or through
  - Prevent / restrict development in hazard-prone areas
  - Protect and strengthen critical facilities (e.g. transportation, hospitals, fire stations, schools)
  - Protect historical and cultural landmarks
  - Strengthen building codes and laws to improve standards for development in high hazard areas
  - Construct, maintain, or retrofit infrastructure to reduce hazard impact (e.g. elevating roadways, improving drainage systems, dams, detention basins, storm sewers, etc.)
  - Create a stream gage and weather monitoring program for more accurate data and warnings
  - Install indoor / outdoor warning systems throughout county
  - Inform property owners how to minimize damage to their properties
  - Assist vulnerable property owners with securing funding to protect their property
  - Protect and improve reliability of utilities
  - Preserve or restore natural systems to reduce hazard impacts (e.g. floodplain protection, habitat preservation, slope stabilization and forest management)
  - Protect and improve reliability of utilities

SYNERGY DISASTER RECOVERY

10 Annex D – CSFS Wildfire Risk Assessment Report

2023 Colorado Wildfire Risk Assessment Summary Report

COLORADO STATE FOREST SERVICE
COLORADO STATE UNIVERSITY

Pueblo

Report was generated using www.ColoradoForestAtlas.org

Report version: 3.0.0
Report generated: 10-13-2023

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Disclamer

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User should also note that property boundaries included in any product do not represent an on-the-ground survey suitable for legal, engineering, or surveying purposes. They represent only the approximate relative locations.

Introduction

Colorado Wildfire Risk Assessment Report

Welcome to the Colorado Wildfire Risk Assessment Summary Reporting Tool.

This tool allows users of the Risk Reduction Planner application of the Colorado Forest Atlas web portal to define a specific project area and generate information for this area. A detailed risk summary report can be generated using a set of predefined map products developed by the Colorado Wildfire Risk Assessment project which have been summarized explicitly for the user defined project area. The report is generated in PDF format.

The report has been designed so that information from the report can be copied and pasted into other specific plans, reports, or documents depending on user needs. Examples include, but are not limited to, Community Wildfire Protection Plans, Local Fire Plans, Fuels Mitigation Plans, Hazard Mitigation Plans, Homeowner Risk Assessments, and Forest Management or Stewardship Plans. Example templates for some of these reports are available for download on the
Colorado Forest Atlas web portal.

The Colorado WRA provides a consistent, comparable set of scientific results to be used as a foundation for wildfire mitigation and prevention planning in Colorado.

Results of the assessment can be used to help prioritize areas in the state where mitigation treatments, community interaction and education, or tactical analyses might be necessary to reduce risk from wildfires.

The Colorado WRA products included in this report are designed to provide the information needed to support the following key priorities:

- Identify areas that are most prone to wildfire
- Plan and prioritize hazardous fuel treatment programs
- Allow agencies to work together to better define priorities and improve emergency response, particularly across jurisdictional boundaries
- Increase communication with local residents and the public to address community priorities and needs

Products

Each product in this report is accompanied by a general description, table, chart and/or map. A list of available Colorado WRA products in this report is provided in the following table.

COWRA Product	Description
Wildland Urban Interface	Housing density depicting where humans and their structures meet or intermix with wildland fuel
Wildland Urban Interface Risk	A measure of the potential impact on people and their homes from wildfire
Wildfire Risk to Assets	The overall composite risk occurring from a wildfire derived by combining Burn Probability and Values at Risk Rating
Burn Probability	Annual probability of any location burning due to wildfire
Terrain Difficulty Index	Reflects the difficulty to suppress a fire given the terrain and vegetation conditions that may impact ground resource access and capabilities
Characteristic Flame Length	A measure of the expected flame length of a potential fire
Fire Intensity Scale	Quantifies the potential fire intensity by orders of magnitude
Fire Type	Potential for canopy fire type for extreme weather conditions (canopy fire potential)
Rate of Spread	The speed with which a fire moves in a horizontal direction across the landscape
Surface Fuels	Characterization of surface fuel models that contain the parameters for calculating fire behavior outputs
Vegetation	General vegetation and landcover types
Watershed Protection Risk	A measure of risk to watershed protection areas based on the potential negative impacts from wildfire.
Riparian Assets Risk	A measure of the risk to riparian areas based on the potential negative impacts from wildfire
Forest Assets Risk	A measure of the risk to forested areas based on the potential negative impacts from wildfire

COWRA Product	Description
Building Damage Potential	Estimates the potential for building loss
Defensible Space Index	The arithmetic mean of the three defensible space components: canopy, fuels, and slope. The colors shown represent the relative range and are the average for all of the buildings in the hexagon.

Wildland Urban Interface

Reflects housing density depicting where humans and their structures meet or intermix with wildland fuels

Colorado is one of the fastest growing states in the Nation, with much of this growth occurring outside urban boundaries. This increase in population across the state will impact counties and communities that are located within the Wildland Urban Interface (WUI). The WUI is described as the area where structures and other human improvements meet and intermingle with undeveloped wildland or vegetative fuels. Population growth within the WUI substantially increases the risk from wildfire.

The Wildland Urban Interface (WUI) layer reflects housing density depicting where humans and their structures meet or intermix with wildland fuels. In the past, conventional wildland-urban interface data sets, such as USFS SILVIS, have been used to reflect these concerns. However, USFS SILVIS and other existing data sources did not provide the level of detail needed by the Colorado State Forest Service and local fire protection agencies, particularly reflecting encroachment into urban core areas.

For the **Pueblo** project area, it is estimated that **78,537** people or **46%** percent of the total project area population (169,621) live within the WUI.

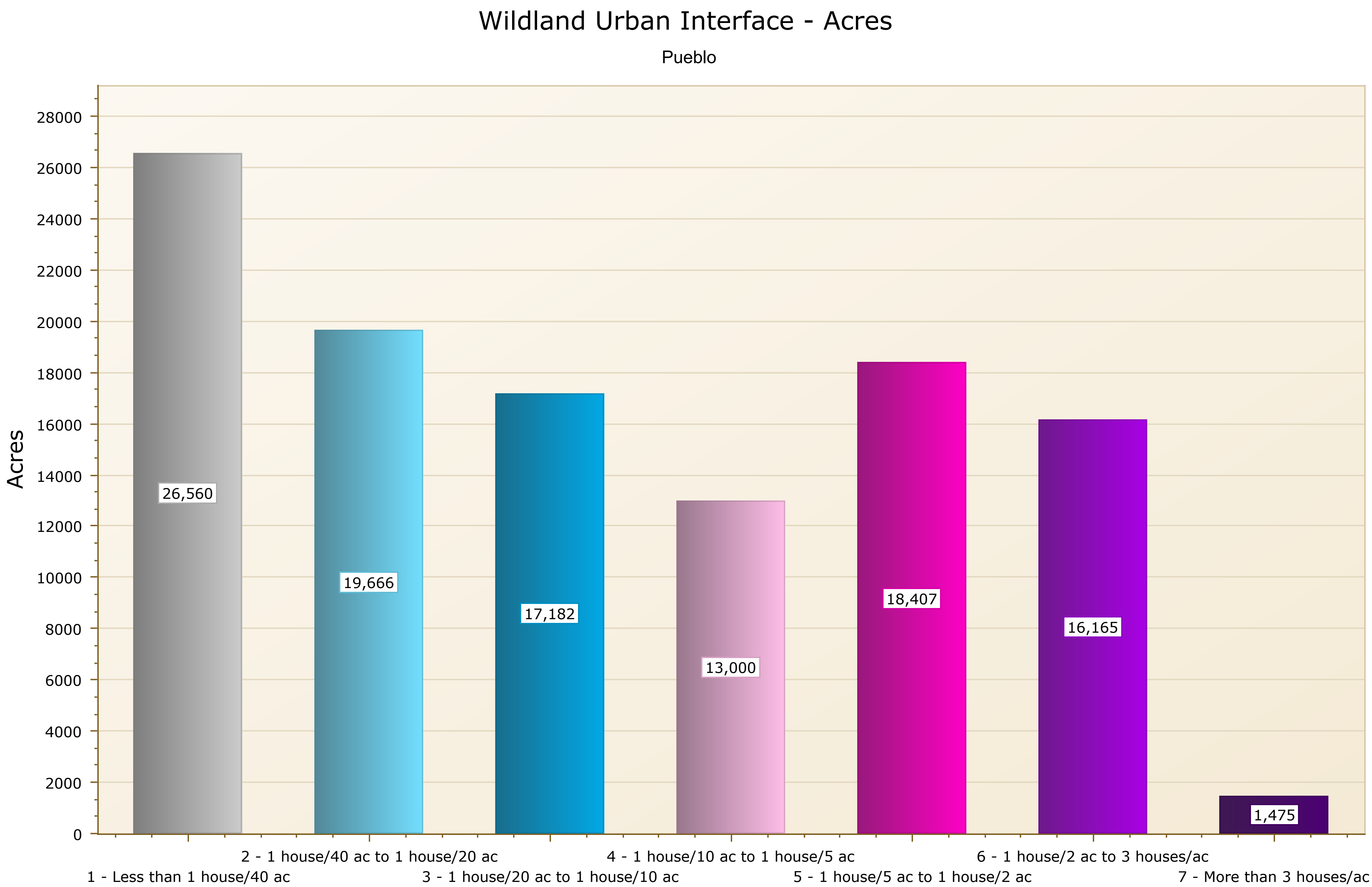
The new WUI data set is derived using advanced modeling techniques based on the Where People Live (housing density) data set and 2021 LandScan USA population count data available from the Department of Homeland Security, HSIP data. WUI is simply a subset of the Where People Live data set. The primary difference is populated areas surrounded by sufficient non-burnable areas (i.e. interior urban areas) are removed from the Where People Live data set, as these areas are not expected to be directly impacted by a wildfire. Fringe urban areas, i.e. those on the edge of urban areas directly adjacent to burnable fuels are included in the WUI. Advanced encroachment algorithms were used to define these fringe areas.

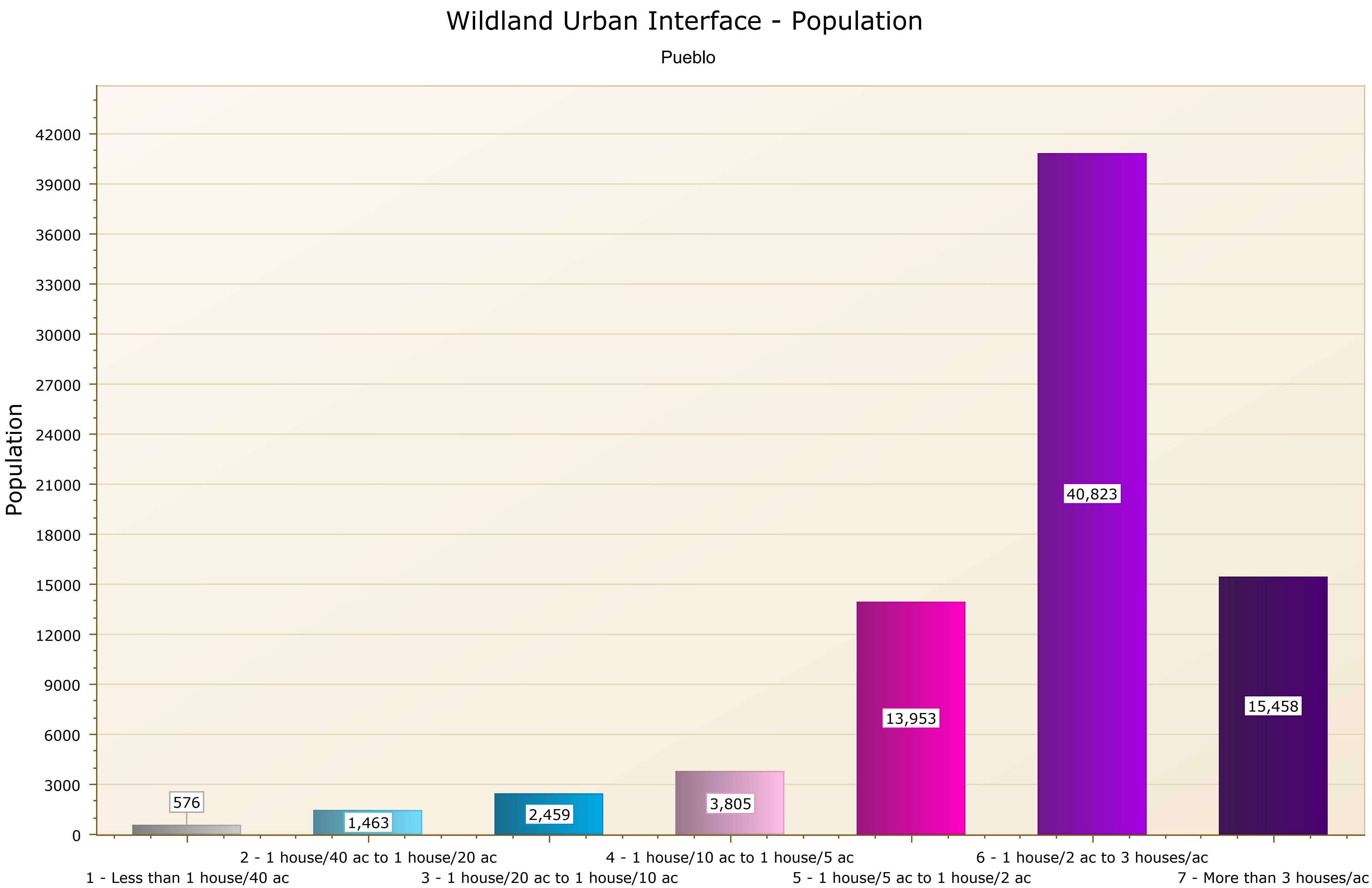
Data is modeled at a 20-meter grid cell resolution, which is consistent with other CO-WRA layers. The WUI classes are based on the number of houses per acre. Class breaks are based on densities well understood and commonly used for fire protection planning.

A more detailed description of the risk assessment algorithms is provided in the Colorado Wildfire Risk Assessment (Colorado WRA) Final Report, which can be downloaded from www.ColoradoForestAtlas.com

	Housing Density	WUI Population	Percent of WUI Population
	1 - Less than 1 house/40 ac	576	0.7%
	2 - 1 house/40 ac to 1 house/20 ac	1,463	1.9%
	3 - 1 house/20 ac to 1 house/10 ac	2,459	3.1%
	4 - 1 house/10 ac to 1 house/5 ac	3,805	4.8%
	5 - 1 house/5 ac to 1 house/2 ac	13,953	17.8%
	6 - 1 house/2 ac to 3 houses/ac	40,823	52%
	7 - More than 3 houses/ac	15,458	19.7%
	Total	**78,537**	**100%**

	Housing Density	WUI Acres	Percent of WUI Acres
	1 - Less than 1 house/40 ac	26,560	23.6%
	2 - 1 house/40 ac to 1 house/20 ac	19,666	17.5%
	3 - 1 house/20 ac to 1 house/10 ac	17,182	15.3%
	4 - 1 house/10 ac to 1 house/5 ac	13,000	11.6%
	5 - 1 house/5 ac to 1 house/2 ac	18,407	16.4%
	6 - 1 house/2 ac to 3 houses/ac	16,165	14.4%
	7 - More than 3 houses/ac	1,475	1.3%
	None	**112,454**	**100%**

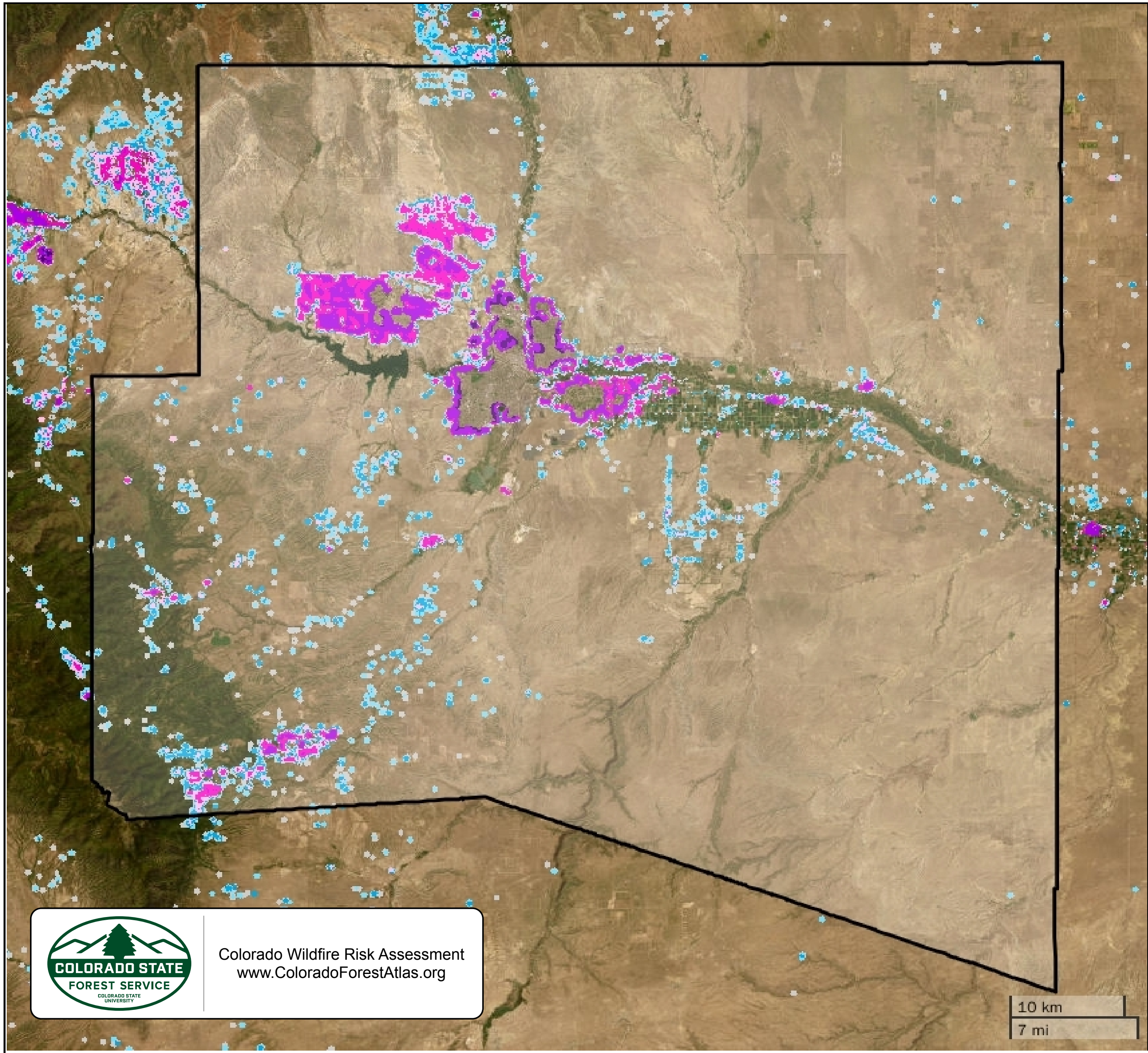

Wildland Urban Interface - Acres
Pueblo
Acres
28000
26000
24000
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
26,560
19,666
17,182
13,000
18,407
16,165
1,475
1 - Less than 1 house/40 ac
2 - 1 house/40 ac to 1 house/20 ac
3 - 1 house/20 ac to 1 house/10 ac
4 - 1 house/10 ac to 1 house/5 ac
5 - 1 house/5 ac to 1 house/2 ac
6 - 1 house/2 ac to 3 houses/ac
7 - More than 3 houses/ac


Wildland Urban Interface - Population
Pueblo
Population
42000
39000
36000
33000
30000
27000
24000
21000
18000
15000
12000
9000
6000
3000
0
576
1,463
2,459
3,805
13,953
40,823
15,458
1 - Less than 1 house/40 ac
2 - 1 house/40 ac to 1 house/20 ac
3 - 1 house/20 ac to 1 house/10 ac
4 - 1 house/10 ac to 1 house/5 ac
5 - 1 house/5 ac to 1 house/2 ac
6 - 1 house/2 ac to 3 houses/ac
7 - More than 3 houses/ac

Pueblo

Wildland Urban Interface

- 1 - Less than 1 house/40 ac
- 2 - 1 house/40 ac to 1 house/20 ac
- 3 - 1 house/20 ac to 1 house/10 ac
- 4 - 1 house/10 ac to 1 house/5 ac
- 5 - 1 house/5 ac to 1 house/2 ac
- 6 - 1 house/2 ac to 3 houses/ac
- 7 - More than 3 houses/ac



Wildland Urban Interface (WUI) Risk

The Wildland-Urban Interface (WUI) Risk Index layer is a rating of the potential impact of a wildfire on people and their homes.
The key input, WUI, reflects housing density (houses per acre) consistent with Federal Register National standards. The location of people living in the wildland-urban interface and rural areas is essential for defining potential wildfire impacts to people and homes.

The WUI Risk Index is derived using a response function modeling approach. Response functions are a method of assigning a net change in the value to a resource or asset based on susceptibility to fire at different intensity levels, such as flame length.

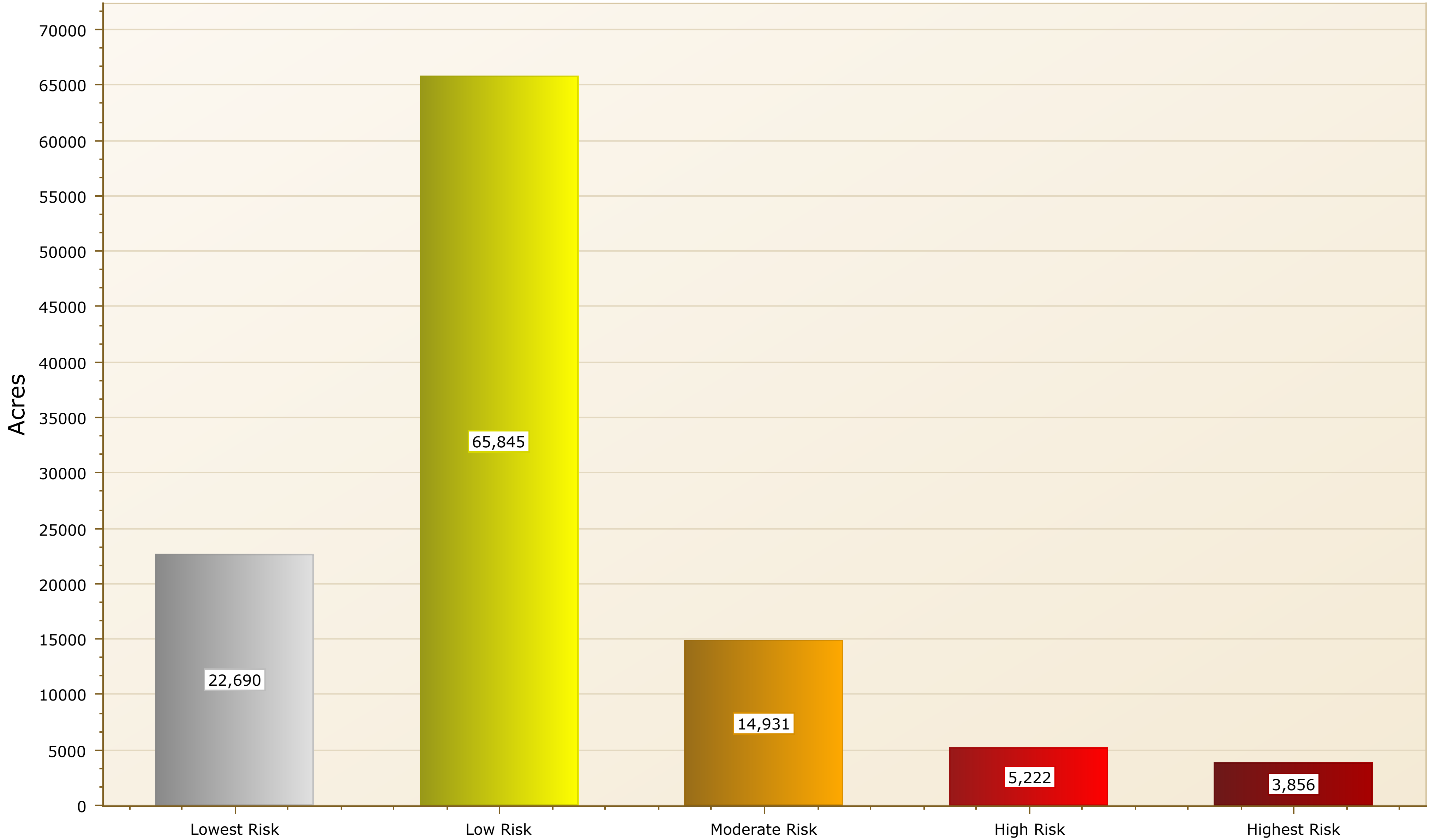
To calculate the WUI Risk Index, the WUI housing density data were combined with flame length data and response functions were defined to represent potential impacts. The response functions were defined by a team of experts led by Colorado State Forest Service mitigation planning staff. By combining flame length with the WUI housing density data, it is possible to determine where the greatest potential impact to homes and people is likely to occur. Customized urban encroachment algorithms were used to ensure those fringe urban areas were included in the WUI Risk outputs. Encroachment distances into urban areas were based on the underlying fuel models and their fuel types and propensity for spotting and spreading.

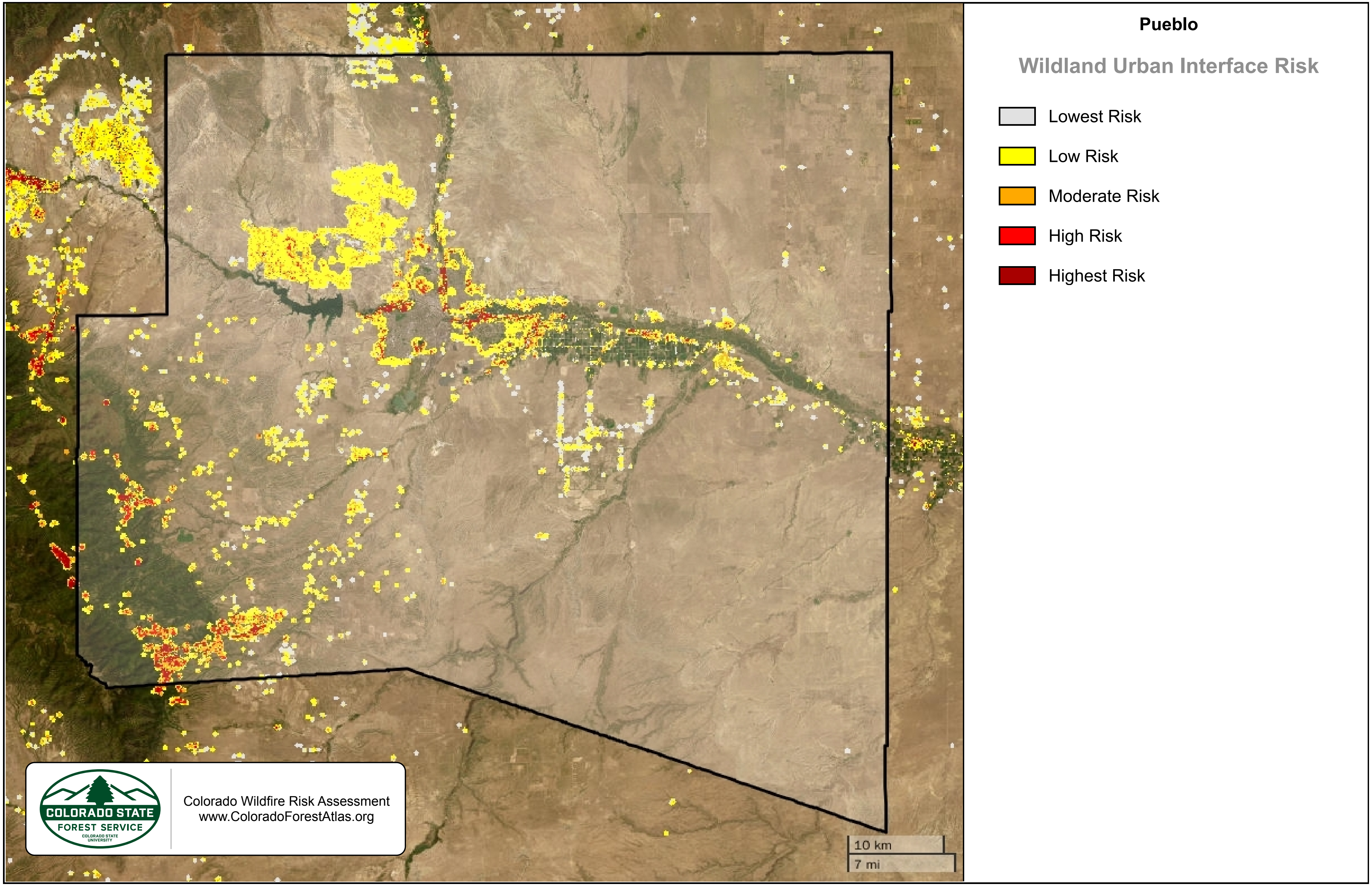
The WUI Risk Index has been calculated consistently for all areas in Colorado, which allows for comparison and ordination of areas across the entire state. Data is modeled at a 20-meter cell resolution, which is consistent with other CO-WRA layers.

WUI Risk Class	Acres	Percent
Lowest Risk	22,690	20.2%
Low Risk	65,845	58.5%
Moderate Risk	14,931	13.3%
High Risk	5,222	4.6%
Highest Risk	3,856	3.4%
Total	**112,544**	**100%**

Wildland Urban Interface Risk

Pueblo




Pueblo
Wildland Urban Interface Risk
Lowest Risk
Low Risk
Moderate Risk
High Risk
Highest Risk
Colorado Wildfire Risk Assessment
www.ColoradoForestAtlas.org
10 km
7 mi

Firewise USA Recognized Sites

Description

Firewise USA® is a national recognition program that provides resources to inform communities how to adapt to living with wildfire and encourages neighbors to take action together to reduce their wildfire risk. Colorado communities that take the following five steps can be recognized as Firewise:

1. Form a Firewise board or committe
2. Obtain a wildfire risk assessment from the CSFS or local fire department, and create an action plan
3. Hold a Firewise event once per year
4. Invest a minimum of $24.14 per dwelling unit in local Firewise actions annually
5. Create a National Fire Prevention Association (NFPA) profile and follow the application directions located at https://portal.firewise.org/user/login

The Firewise USA® dataset defines the boundaries of the recognized communities. Mapping Firewise USA® boundaries will generally be completed by CSFS staff.

NFPA

FIREWISE USA®

Residents reducing wildfire risks

Note: These are estimated boundaries using a variety of methods with varying degrees of accuracy. These are not legal boundaries and should not be construed as such. The boundaries may overlap with CWPP areas and are subject to change over time as the communities develop, change, and continue to implement wildfire mitigation efforts.
To learn more about the Firewise USA® recognition program or to fill out an application, visit https://www.nfpa.org/Public-Education/By-topic/Wildfire/Firewise-USA - OR https://csfs.colostate.edu/wildfire-mitigation/colorado-firewise-communities/

The designated area does not contain data for this section.

Community Wildfire Protection Plans (CWPPs)

Description

A Community Wildfire Protection Plan (CWPP) is a document developed and agreed upon by a community to identify how the community will reduce its wildfire risk. CWPPs identify areas where fuels reduction is needed to reduce wildfire threats to communities and critical infrastructure, address protection of homes and other structures, and plan for wildfire response capability. The Colorado State Forest Service (CSFS) supports the development and implementation of CWPPs and provides resources, educational materials and information to those interested in developing CWPPs.

The CWPP dataset represents the boundaries of those areas that have developed a CWPP. Note that CWPPs can be developed by different groups at varying scales, such as county, Fire Protection District (FPD), community/subdivision, HOA, etc., and as such, can overlap. In addition, the CWPPs can be from different dates. Often a county CWPP is completed first with subsequently more detailed CWPPs done for local communities within that county or FPD. CO-WRAP provides a tool that allows the user to select the CWPP area and retrieve the CWPP document for review (PDF).

At a minimum, a CWPP should include:

- The wildland-urban interface (WUI) boundary, defined on a map, where people, structures and other community values are most likely to be negatively impacted by wildfire
- The CSFS, local fire authority and local government involvement and any additional stakeholders
- A narrative that identifies the community's values and fuel hazards
- The community's plan for when a wildfire occurs
- An implementation plan that identifies areas of high priority for fuels treatments

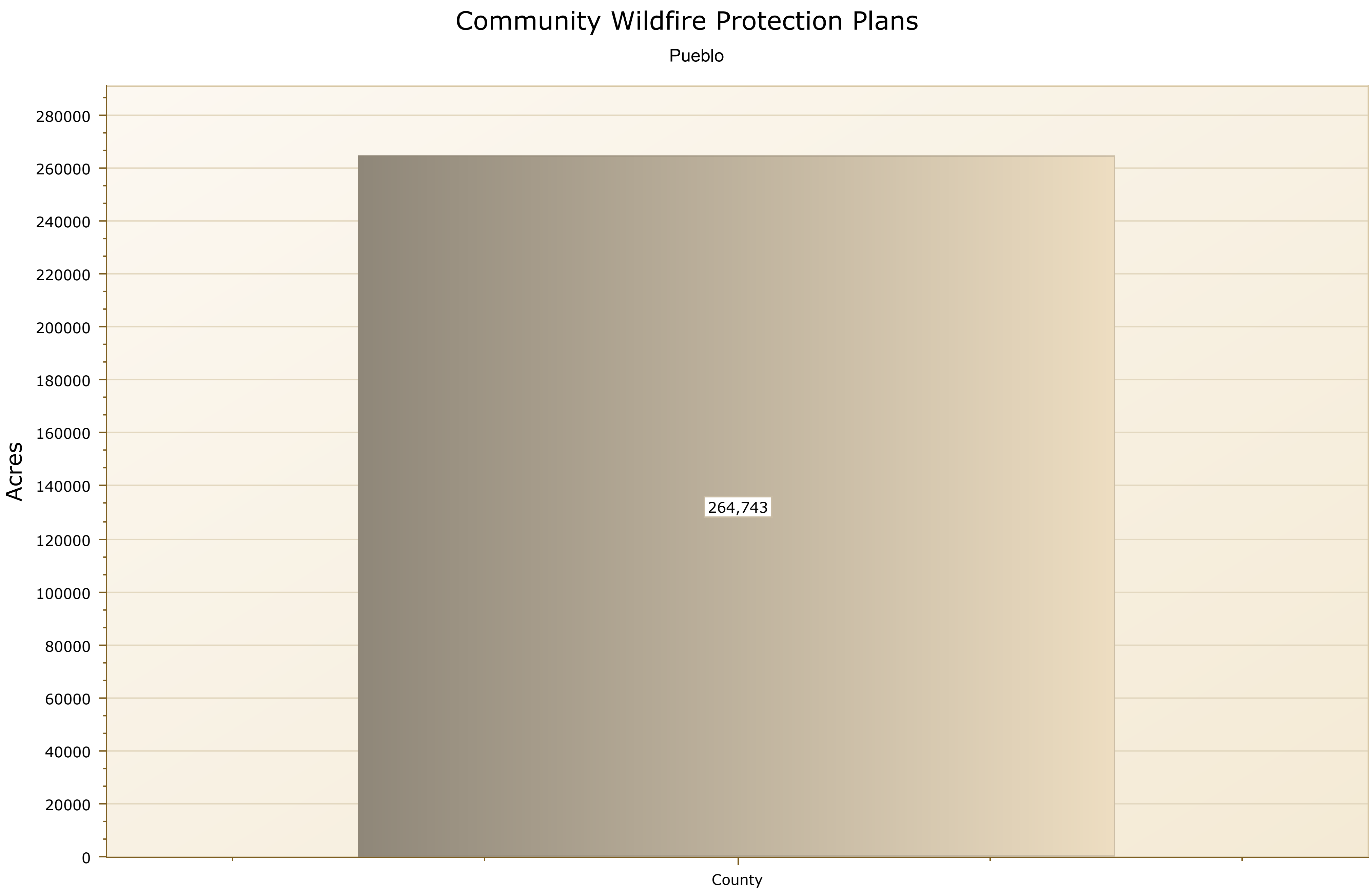
Community input is the foundation of a Community Wildfire Protection Plan that identfies community needs and garners community support.

CWPPs are not shelf documents and should be reviewed, tracked and updated. A plan stays alive when it is periodically updated to address the accomplishments of the community. Community review of progress in meeting plan objectives and determining areas of new concern where actions must be taken to reduce wildfire risk helps the community stay current with changing environment and wildfire mitigation priorities.

If your community is in an area at risk from wildfire, now is a good time to start working with neighbors on a CWPP and preparing forfuture wildfires. Contact your local CSFS district to learn how to start this process and create a CWPP for your community: http://csfs.colostate.edu/pages/your-local-forester.html

For the **Pueblo** test project area, there are 5 CWPPs areas that are totally or partially in the defined project area.

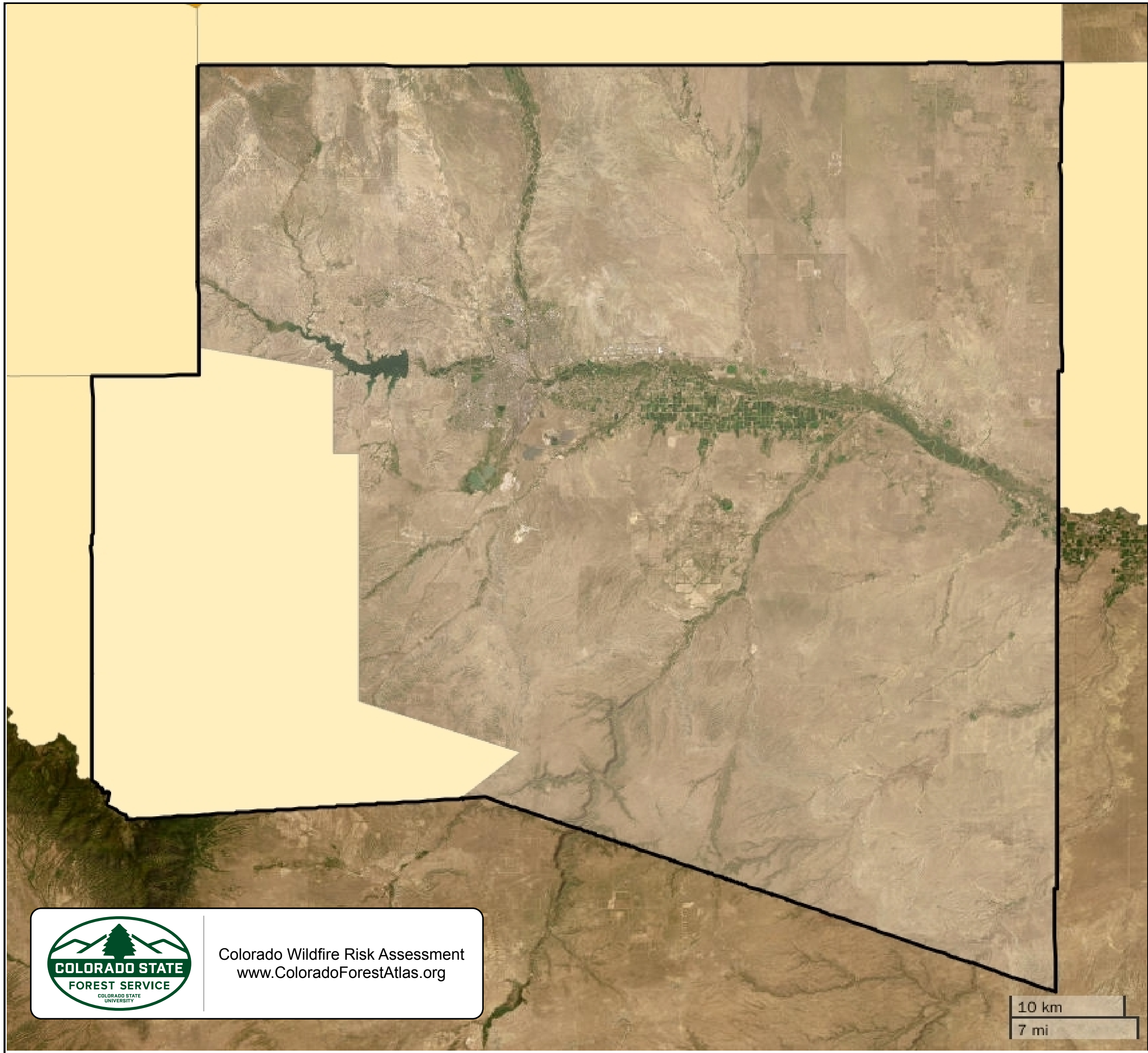
CWPP Name	CWPP Type	CSFS District	Acres inside project area	Total Acres
Crowley County	County	La Junta	52	512,080
Southwest Pueblo County	County	Canon City	264,655	264,926
El Paso County	County	Woodland Park	32	1,361,917
Fremont County	County	Canon City	3	980,972
Custer County	County	Canon City		473,188
Total Acres			**264,743**	**3,593,082**


Community Wildfire Protection Plans
Pueblo
Acres
280000
260000
240000
220000
200000
180000
160000
140000
120000
100000
80000
60000
40000
20000
0
264,743
County

Pueblo

CWPP

	Local
	FPD
	County



Colorado Wildfire Risk Assessment
www.ColoradoForestAtlas.org

Wildfire Risk to Assets

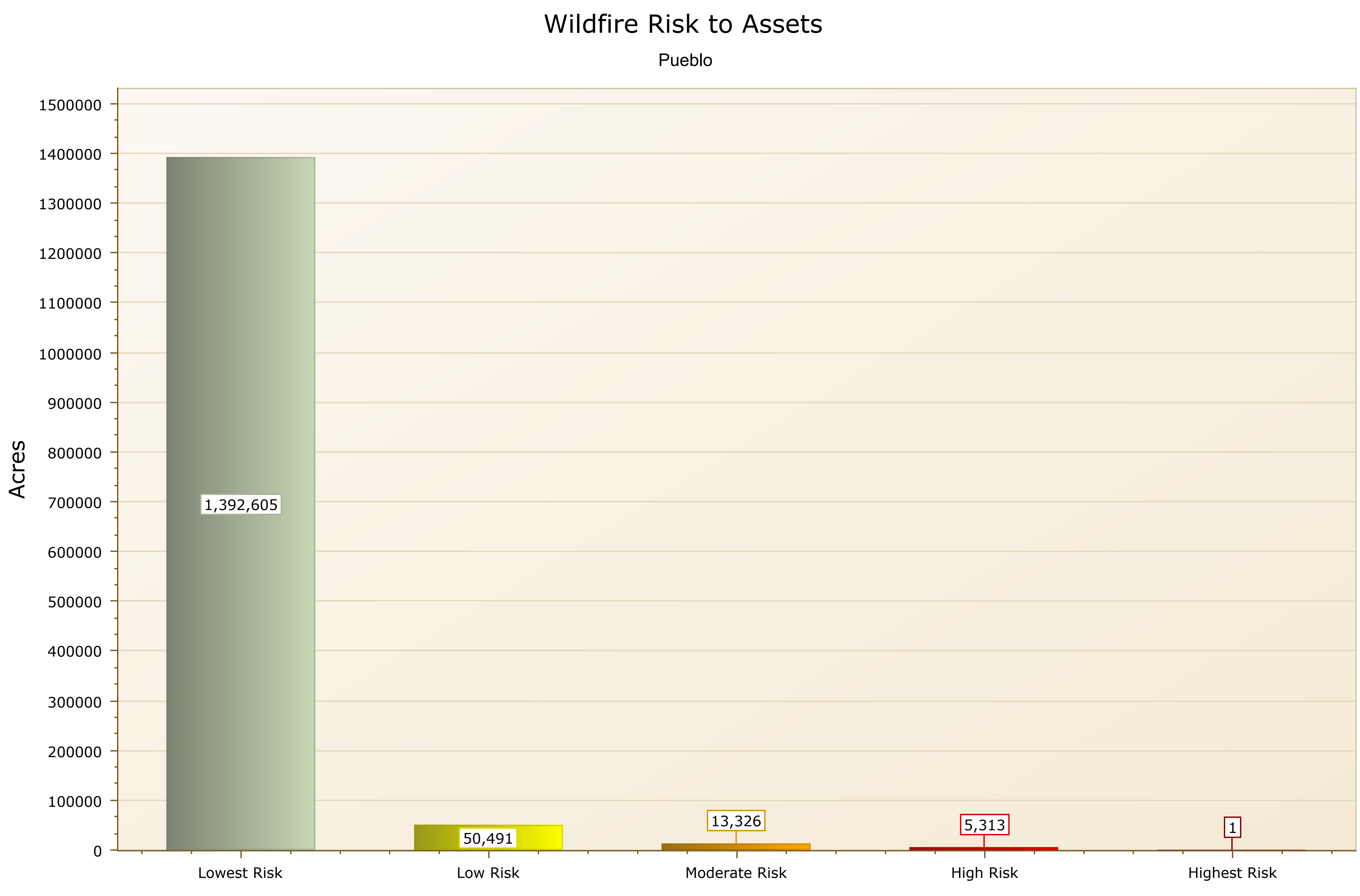
Description

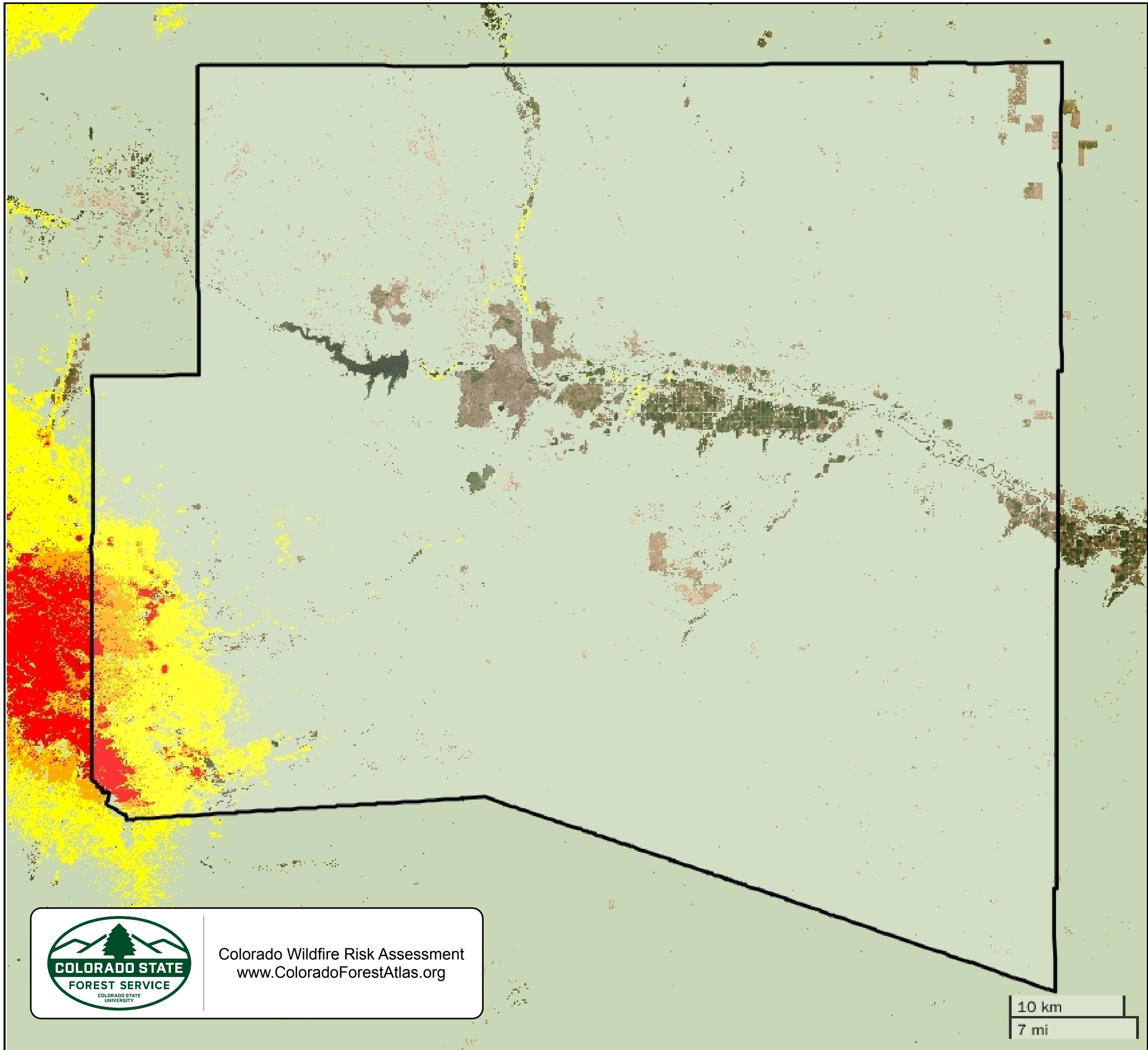
Wildfire Risk is a composite risk map created by combining the Values at Risk Rating and the Burn Probability layers.
It identifies areas with the greatest potential impacts from a wildfire – i.e., those areas most at risk when considering the four values layers.

The Values at Risk Rating is a key component of Wildfire Risk. It is comprised of several individual risk layers including Wildland Urban Interface (housing density), Forest Assets, Riparian Assets and Watershed Protection risk outputs. The WUI component is a key element of the composite risk since it represents where people live in the wildland and urban fringe areas that are susceptible to wildfires and damages. The found individual risk layers are weighted to derive the Values at Risk Rating layer.

The risk map is derived at a 20-meter resolution. This scale of data was chosen to be consistent with the accuracy of the primary surface fuels dataset used in the assessment. While not appropriate for site specific analysis, it is appropriate for regional, county, or local planning efforts.

Wildfire Risk		Acres	Percent
	Lowest Risk	1,392,605	95.3%
	Low Risk	50,491	3.4%
	Moderate Risk	13,326	0.9%
	High Risk	5,313	0.4%
	Highest Risk	1	9.5%
Total		**1,461,737**	**109%**


Wildfire Risk to Assets
Pueblo
Acres
1500000
1400000
1300000
1200000
1100000
1000000
900000
800000
700000
600000
500000
400000
300000
200000
100000
0
1,392,605
50,491
13,326
5,313
1
Lowest Risk
Low Risk
Moderate Risk
High Risk
Highest Risk



Pueblo

Wildfire Risk

- Lowest Risk
- Low Risk
- Moderate Risk
- High Risk
- Highest Risk

Burn Probability

Description

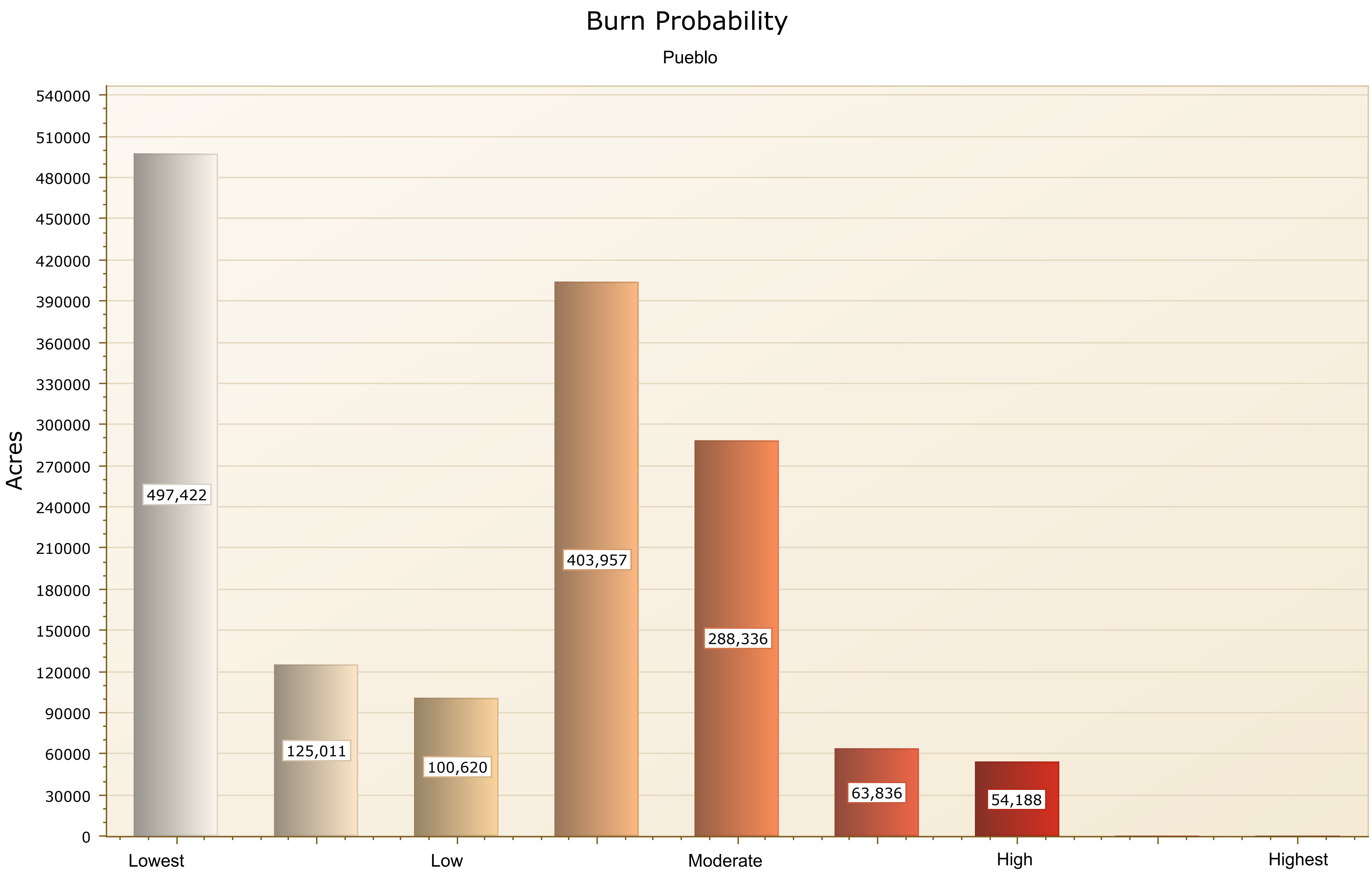
Burn Probability (BP) is the annual probability of any location burning due to a wildfire.

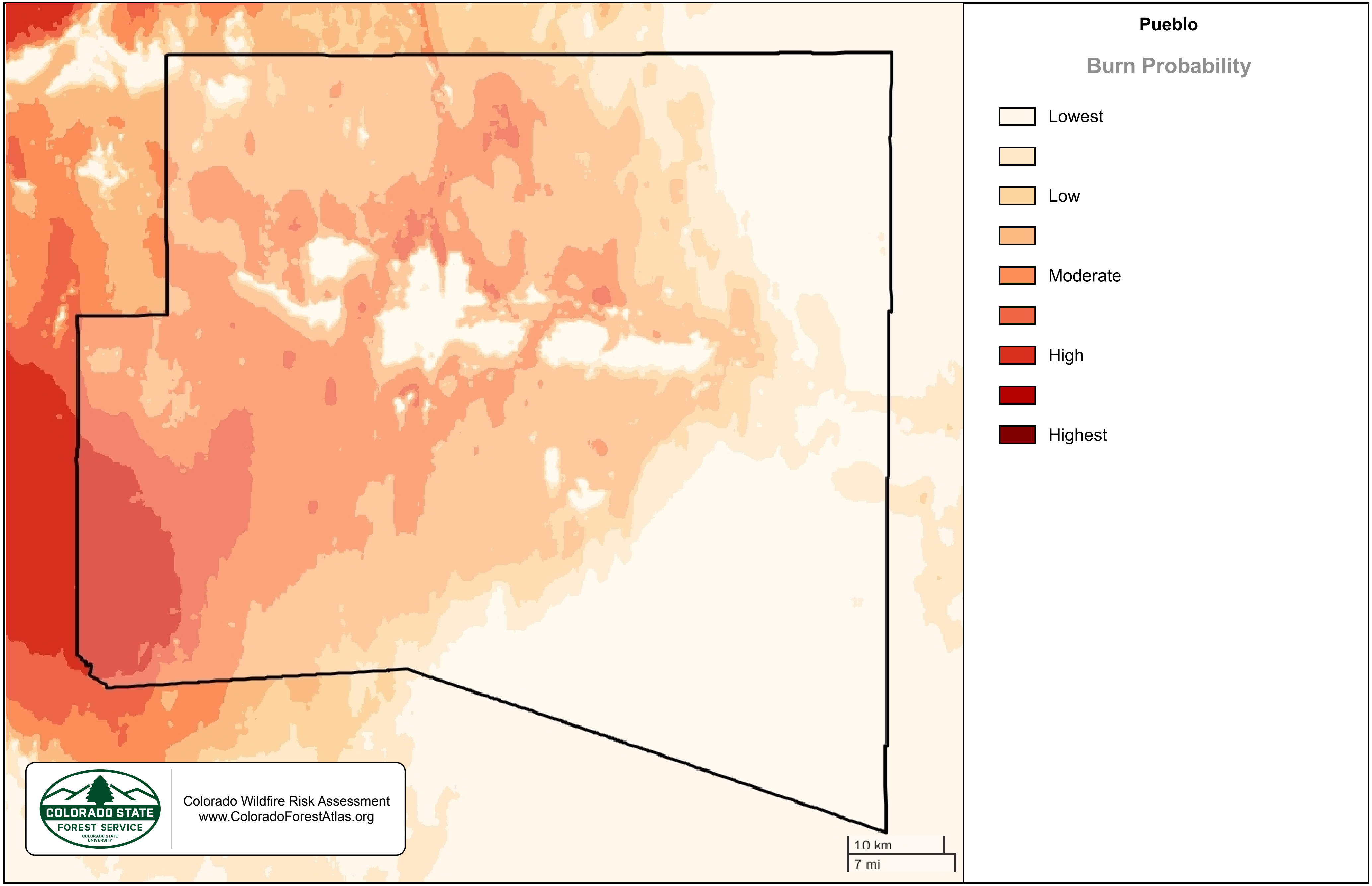
The annual BP was calculated as the number of times that a cell was burned and the number of iterations used to run the models. The annual BP was estimated for Colorado by using a wildfire simulation approach with Technosylva's Wildfire Analyst software (Homepage). A total number of 2,342,334 fires were simulated (3,200,000 if we consider those fires outside the Colorado border which were used in a buffer area around the study area to compute BP) with a mean ignition density of 8.68 fires/km2. The ignition points were spatially distributed evenly every 500 meters across the state. Only high and extreme weather conditions were used to run the single fires because they usually burn most of the annual burned area. All fires simulations had a duration of 8 h. After simulating all the fires, some cells were not burned by any simulated fire, resulting in a BP value of zero. Some cells were non-burnable due to the associated fuel type (i.e. water, roads, urban, agricultural areas, barren areas). However, the lowest BP value found in "burnable" cells was assigned to cells where the simulated fires did not reach.

The Wildfire Analyst fire simulator considered the number of times that the simulated fires burned each cell. After that, results were weighted by considering the historical fire occurrence. The weighting was done by assessing the relation between the annual historical fire ignition density in Colorado and the total number of simulated fires with varying input data in high and moderate weather scenarios and the historical spatial distribution of the ignition points.

The probability map is derived at a 20-meter resolution. This scale of data was chosen to be consistent with the accuracy of the primary surface fuels dataset used in the assessment. While not appropriate for site specific analysis, it is appropriate for regional, county or local protection mitigation or prevention.

Burn Probability	Acres	Percent
Lowest	497,422	32.4%
	125,011	8.2%
Low	100,620	6.6%
	403,957	26.3%
Moderate	288,336	18.8%
	63,836	4.2%
High	54,188	3.5%
		0%
Highest		0%
Total	**1,533,370**	**100%**


Burn Probability
Pueblo
Acres
540000
510000
480000
450000
420000
390000
360000
330000
300000
270000
240000
210000
180000
150000
120000
90000
60000
30000
0
497,422
125,011
100,620
403,957
288,336
63,836
54,188
Lowest
Low
Moderate
High
Highest


Pueblo
Burn Probability
Lowest
Low
Moderate
High
Highest
COLORADO STATE
FOREST SERVICE
Colorado Wildfire Risk Assessment
www.ColoradoForestAtlas.org
10 km
7 mi

Terrain Difficulty Index

Description

The 2012 and 2017 CO-WRA included a simple metric that described suppression difficulty based on fireline dozer rates. For 2022 CO-WRA, this standalone metric has been updated to reflect a more enhanced definition of areas where access to fires and suppression from ground resources is difficult. Although not a component of the standard risk assessment outputs, this metric is provided as it helps inform which areas may have limited suppression capabilities, especially for initial attack, across the State.

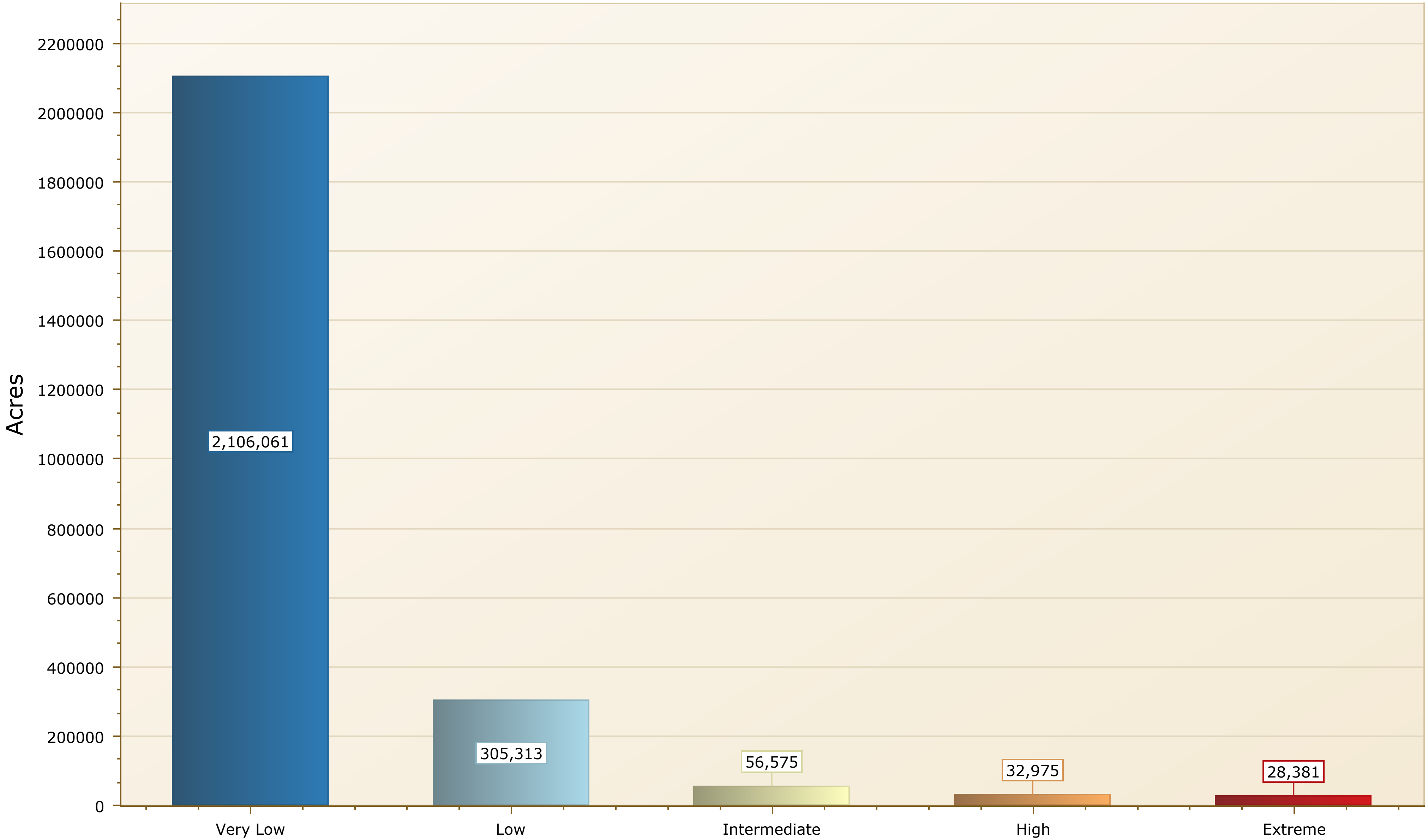
The Terrain Difficulty Index (TDI) is a metric that describes the characteristics of the landscape which evaluates the difficulty of extinction, especially in initial attack, although it can also be extrapolated to extended attacks. This static index quantifies the availability of access for the arrival of terrestrial means, the ability to penetrate the area where the fire originates, and the difficulty of extinguishing fuels.

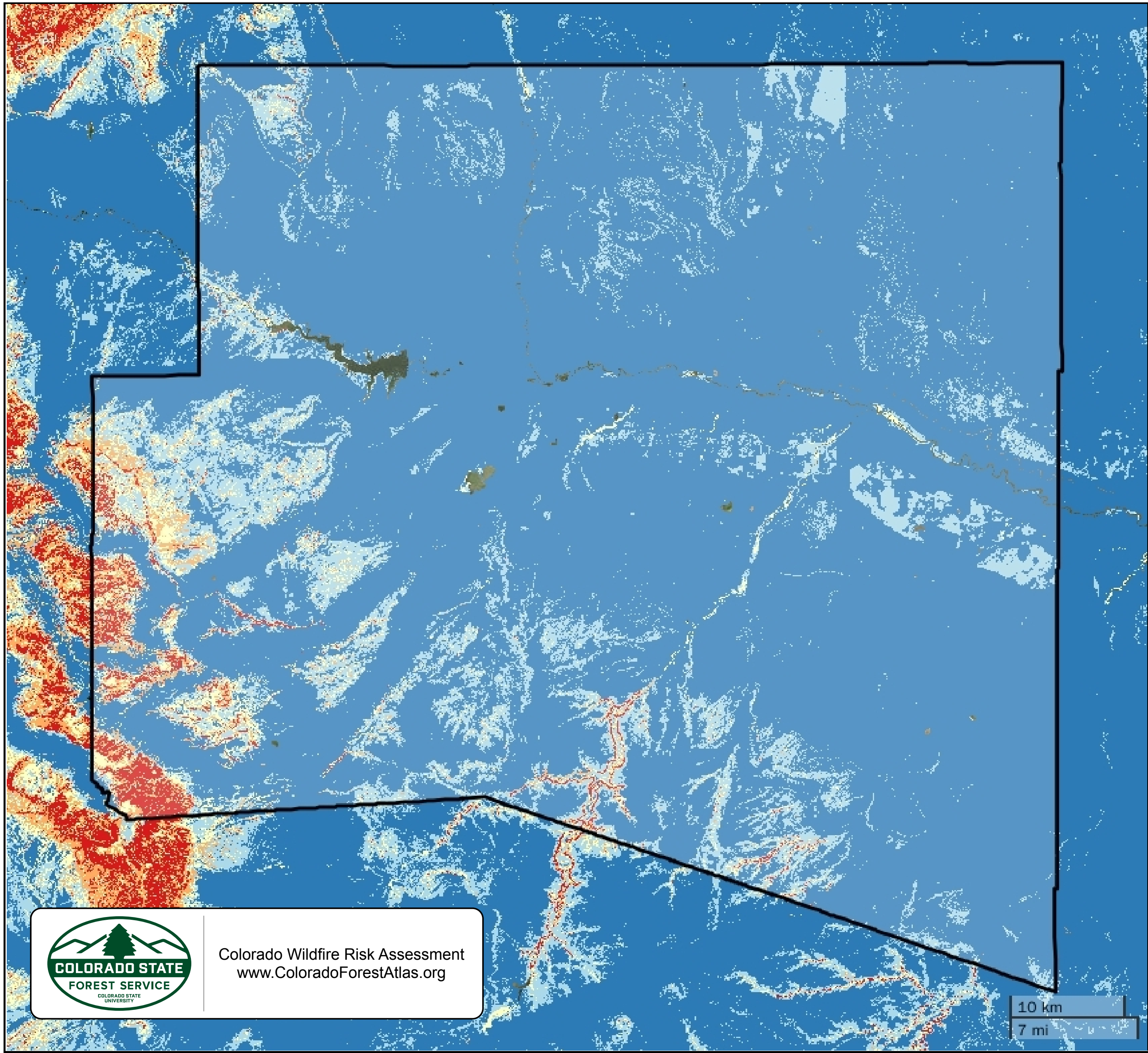
Indicators such as the Accessibility Index, Penetrability Index and Fireline Opening Index (construction) have been used for the formulation of TDI. This index is based on other indices such as the Wildfire Suppression Difficulty Index (terrestrial) (SDIt) (Matthew P Thompson et al, 2018. Francisco Rodriguez and Silva et al, 2020.) which is a quantitative rating of the relative difficulty to perform fire control work. However, TDI is dynamic as it incorporates changes in surface fuels over time providing a less static perspective for a planning point of view.

Terrain Difficulty Index	Acres	Percent
Very Low	2,106,061	83.3%
Low	305,313	12.1%
Intermediate	56,575	2.2%
High	32,975	1.3%
Extreme	28,381	1.1%
Total	**2,529,305**	**100%**

Terrain Difficulty Index

Pueblo





Pueblo

Terrain Difficulty

- Very Low
- Low
- Intermediate
- High
- Extreme

Wildfire Behavior Outputs

Description

Fire behavior is the way a fire reacts to the following environmental influences:

1. Fuels
2. Weather
3. Topography

Fire behavior characteristics are attributes of wildland fire that pertain to its spread, intensity, and growth. Fire behavior characteristics utilized in the Colorado WRA include fire type, rate of spread, flame length and fireline intensity (fire intensity scale). These metrics are used to determine the potential fire behavior under different weather scenarios. Areas that exhibit moderate to high fire behavior potential can be identified for mitigation treatments, especially if these areas are in close proximity to homes, business, or other assets.

Fuels

The Colorado WRA includes composition and characteristics for both surface fuels and canopy fuels. Assessing canopy fire potential and surface fire potential allows identification of areas where significant increases in fire behavior affects the potential of a fire to transition from a surface fire to a canopy fire.

Fuel datasets required to compute both surface and canopy fire potential include:

1.Surface Fuels are typically categorized into one of four primary fuel types based on the primary carrier of the surface fire: 1) grass, 2) shrub/brush, 3) timber litter, and 4) slash. They are generally referred to as fire behavior fuel models and provide the input parameters needed to compute surface fire behavior. The 2022 assessment uses the latest 2022 calibrated fuels for Colorado. The following custom fuels were included to improve the fire modeling in timber, WUI and agricultural areas:

- Timber: 2 new categories (171 and 191)

- Urban: 7 new categories (911,912,913,914,915,916 and 919)

- Roads: 5 new categories (941,942,943,944 and 949)

- Agriculture: 4 new categories (931,932,938 and 939)

- Water: 3 new categories (981,982 and 989)

2. Canopy Cover is the horizontal percentage of the ground surface that is covered by tree crowns. It is used to compute wind-reduction factors and shading.

3.Canopy Ceiling Height/Stand Height is the height above the ground of the highest canopy layer where the density of the crown mass within the layer is high enough to support vertical movement of a fire. A good estimate of canopy ceiling height is the average height of the dominant and co-dominant trees in a stand. It is used to compute wind reduction to mid-flame height, and spotting distances from torching trees.

4.Canopy Base Height is the lowest height above the ground above which sufficient canopy fuel exists to vertically propagate fire (Scott & Reinhardt, 2001). Canopy base height is a property of a plot, stand or group of trees, not an individual tree. For fire modeling, canopy base height is an effective value that incorporates ladder fuels, such as tall shrubs and small trees. Canopy base height is used to determine whether a surface fire will transition to a canopy fire.

5. Canopy Bulk Density is the mass of available canopy fuel per unit canopy volume (Scott & Reinhardt, 2001). Canopy bulk density is a bulk property of a stand, plot, or group of trees, not an individual tree. Canopy bulk density is used to predict whether an active crown fire is possible.

Weather

Weather data (1979-2022) from gridMET was used to analyze potential weather scenarios in which assessing fire behavior and spread. gridMET is a dataset of daily high-spatial resolution (~4-km, 1/24th degree) surface meteorological data covering the contiguous US. Air temperature data at 2m, relative humidity at 2m, and wind speed and direction at 10 m were all downloaded and used.

After computing the weather percentiles of the gridMET variables, data was interpolated using IDW algorithms (Inverse Distance Weighting) at 20-meter pixel resolution.

Dead fuel moisture content was estimated using the model of Rothermel and Rinehart (1983). Both temperature and air relative humidity at 2m from gridMET was used to define the fuel moisture model. The model also considered elevation and aspect to take into account the accumulated solar radiation at 14h (local time). 1% and 2% were added to the 1h-dead fuel moisture content to estimate 10h and 100h dead fuel moisture content, respectively.

For the first time in CO-WRA risk assessments, both herbaceous and woody live fuel moisture content was modelled using Technosylva's proprietary models based on optical imagery, drought indices and phenology. The models were trained with the WFAS National live fuel moisture content. Foliar moisture content in the canopies was considered as a constant value (80%) across the entire state.

Wind speed at 10 m was estimated at 20 ft applying a wind adjustment factor to use 20-ft wind speed in the fire spread and behavior equations. Afterward, wind speed percentiles were computed to use these data in the FB analysis at 20-meter pixel resolution. Wind direction for Colorado was analyzed for a 40-year period (1979-2022) considering the calculated wind speed percentiles from gridMET data. Predominant wind direction is from SW to NE, especially when wind speed is high or very high.

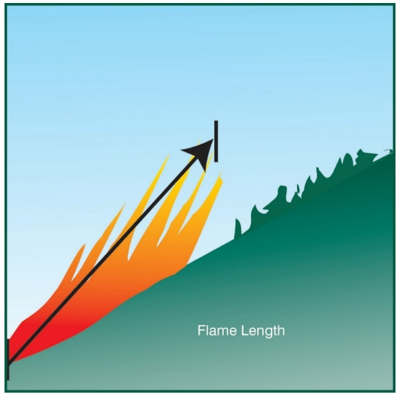
Characteristic Flame Length

The typical or representative flame length of a potential fire based on a weighted average of four percentile weather categories.

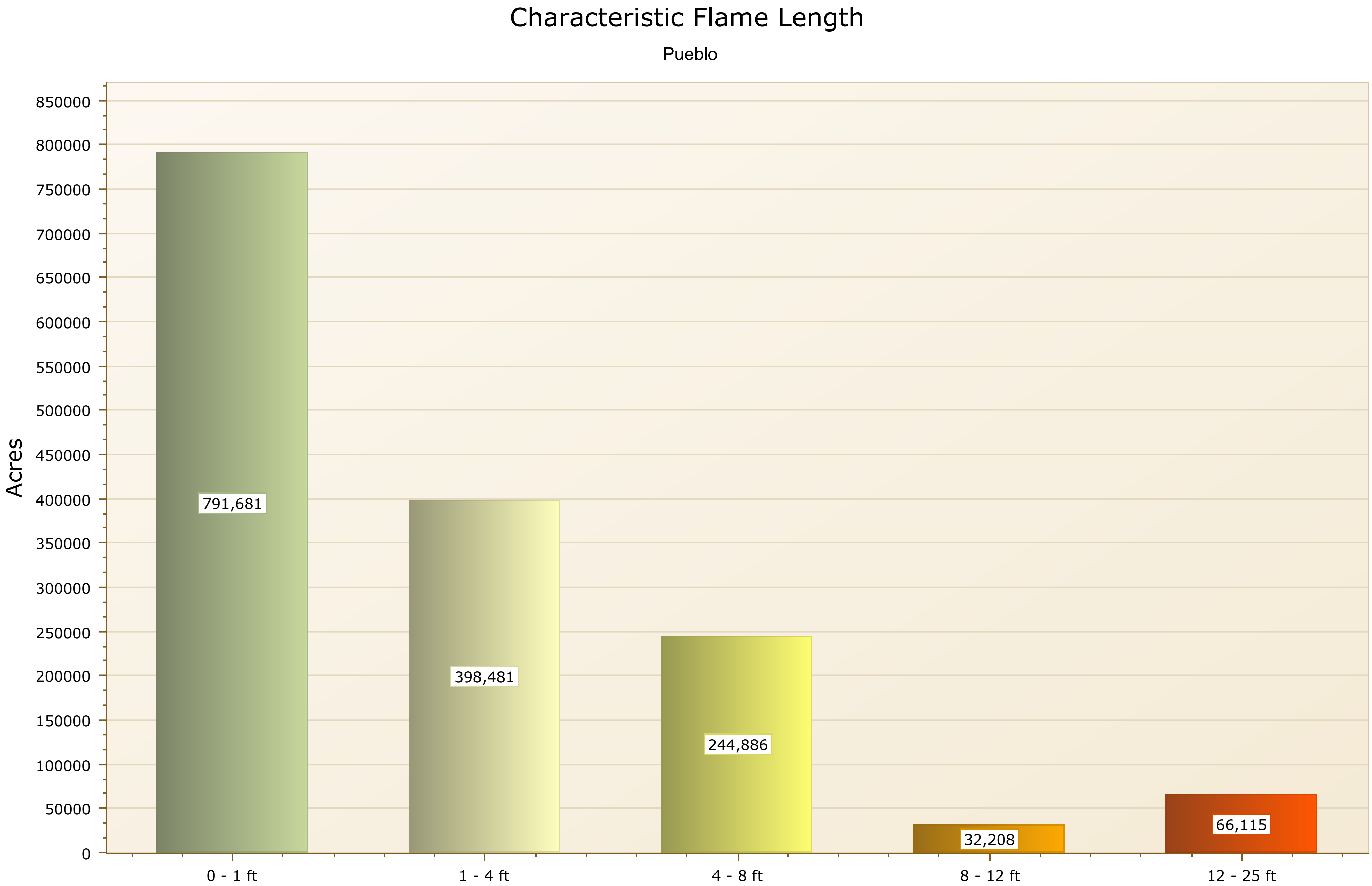
Flame Length is defined as the distance between the flame tip and the midpoint of the flame depth at the base of the flame, which is generally the ground surface. It is an indicator of fire intensity and is often used to estimate how much heat the fire is generating.

Flame length is typically measured in feet. Flame length is the measure of fire intensity used to generate the Fire Effects outputs for the CO-WRA and it is influenced by three environmental factors - fuels, weather, and topography. Weather is by far the most dynamic variable as it changes frequently. To account for this variability, four percentile weather categories were created from historical weather observations to represent low, moderate, high, and extreme weather days for each 20-meter grid cell in Colorado.

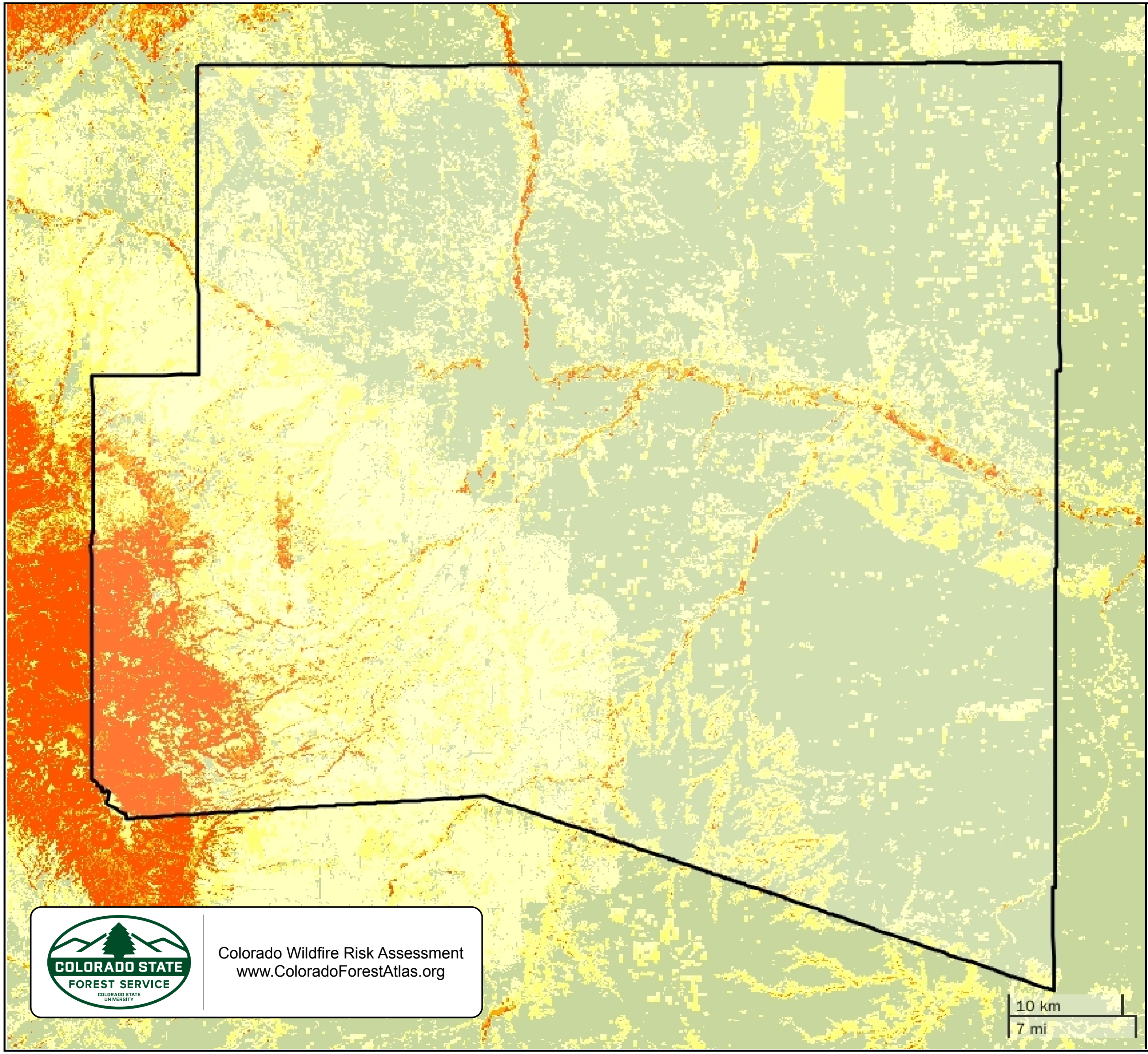
The Characteristic Flame Length represents the weighted average for all four weather percentiles. While not discussed in this report, the individual percentile weather Flame Length outputs are available in the CO-WRA data.



Characteristic Flame Length	Acres	Percent
0 - 1 ft	791,681	51.6%
1 - 4 ft	398,481	26%
4 - 8 ft	244,886	16%
8 - 12 ft	32,208	2.1%
12 - 25 ft	66,115	4.3%
Total	**1,533,370**	**100%**



Characteristic Flame Length
Pueblo
Acres
850000
800000
750000
700000
650000
600000
550000
500000
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
791,681
398,481
244,886
32,208
66,115
0 - 1 ft
1 - 4 ft
4 - 8 ft
8 - 12 ft
12 - 25 ft



Pueblo

Characteristic Flame Length

- 0 - 1 ft
- 1 - 4 ft
- 4 - 8 ft
- 8 - 12 ft
- 12 - 25 ft

Fire Intensity Scale

Description

Quantifies the potential fire intensity by orders of magnitude.
Fire Intensity Scale (FIS) specifically identifies areas where significant fuel hazards and associated dangerous fire behavior potential exist. Similar to the Richter scale for earthquakes, FIS provides a standard scale to measure potential wildfire intensity. FIS consist of five (5) 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.

1. 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.

2. 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.

3. Class 3, Moderate:
Flames up to 8 feet in length; short-range spotting is possible. Trained firefighters will 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.

4. 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.

5. 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.

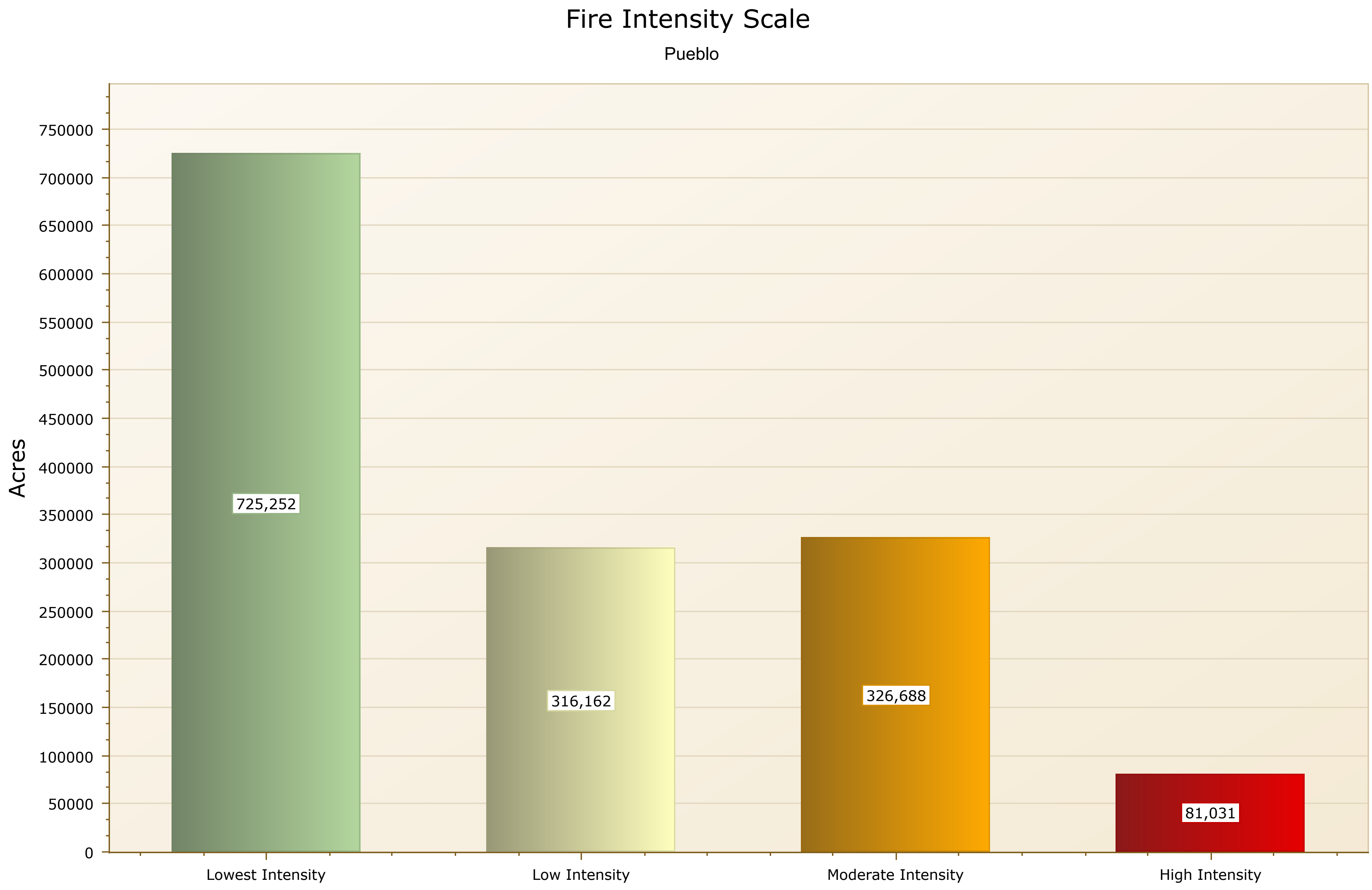
Burn Probability and Fire Intensity Scale are designed to complement each other. Unlike Wildfire Threat, the Fire Intensity Scale does not incorporate historical occurrence information. It only evaluates the potential fire behavior for an area, regardless if any fires have occurred there in the past. This additional information allows mitigation planners to quickly identify areas where dangerous fire behavior potential exists in relationship to nearby homes or other valued assets.

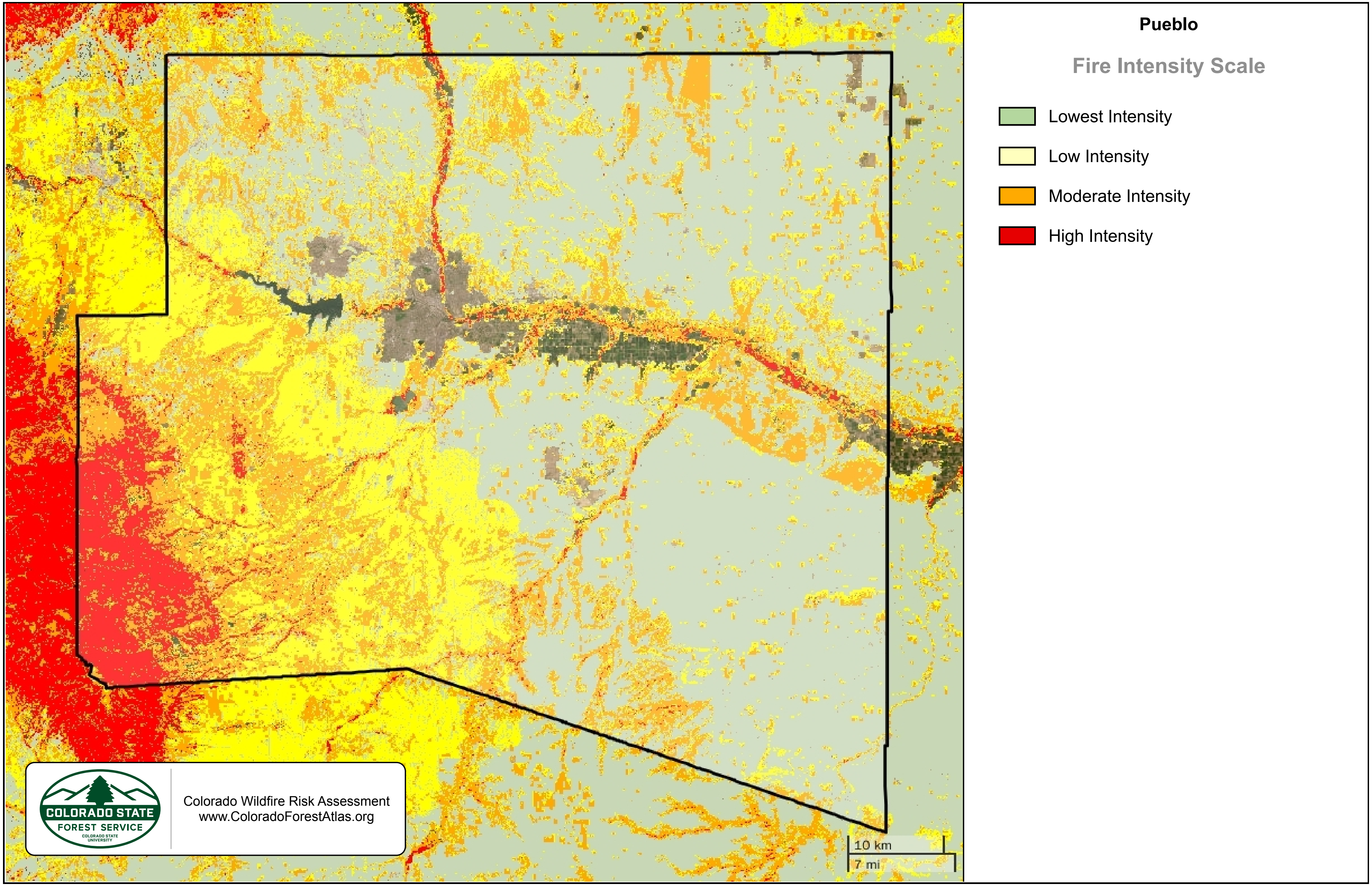
Since all areas in Colorado have fire intensity scale calculated consistently, it allows for comparison and ordination of areas across the entire state. For example, a high fire intensity area in Eastern Colorado is equivalent to a high fire intensity area in Western Colorado.

Fire intensity scale is a fire behavior output, which is influenced by three environmental factors - fuels, weather, and topography – and the spread itself (back, flank or head fire influences fire behavior for a given pixel for a specific fire simulation). Weather is by far the most dynamic variable as it changes frequently. Thus, each pixel may burn many times with different fire spread patterns based on the aforementioned factors. The fire intensity scale maps represent an average fire intensity map.

The fire intensity scale map is derived at a 20-meter resolution. This scale of data was chosen to be consistent with the accuracy of the primary surface fuels dataset used in the assessment. While not appropriate for site specific analysis, it is appropriate for regional, county, or local planning efforts.

	FIS Class	Acres	Percent
	Lowest Intensity	725,252	50%
	Low Intensity	316,162	21.8%
	Moderate Intensity	326,688	22.5%
	High Intensity	81,031	5.6%
	Total	**1,449,133**	**100%**


Fire Intensity Scale
Pueblo
Acres
750000
700000
650000
600000
550000
500000
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
725,252
316,162
326,688
81,031
Lowest Intensity
Low Intensity
Moderate Intensity
High Intensity


Colorado State Forest Service
Colorado State University
Colorado Wildfire Risk Assessment
www.ColoradoForestAtlas.org
10 km
7 mi
Pueblo
Fire Intensity Scale
Lowest Intensity
Low Intensity
Moderate Intensity
High Intensity

Fire Type

Represents the potential fire type under the extreme percentile weather category.




Canopy fires are very dangerous, destructive and difficult to control due to their increased fire intensity. From a planning perspective, it is important to identify where these conditions are likely to occur on the landscape so that special preparedness measure can be taken if necessary. The Fire Type layer shows the footprint of where these areas are most likely to occur. However, it is important to note that canopy fires are not restricted to these areas. Under the right conditions, it can occur in other canopied areas.

There are two primary fire types – surface fire and canopy fire. Canopy fire can be further subdivided into passive canopy fire and active canopy fire. A short description of each of these is provided below.

• Surface Fire - A fire that spreads through surface fuel without consuming any overlying canopy fuel. Surface fuels include grass, timber litter, shrub/brush, slash and other dead or live vegetation within about 6 feet of the ground.

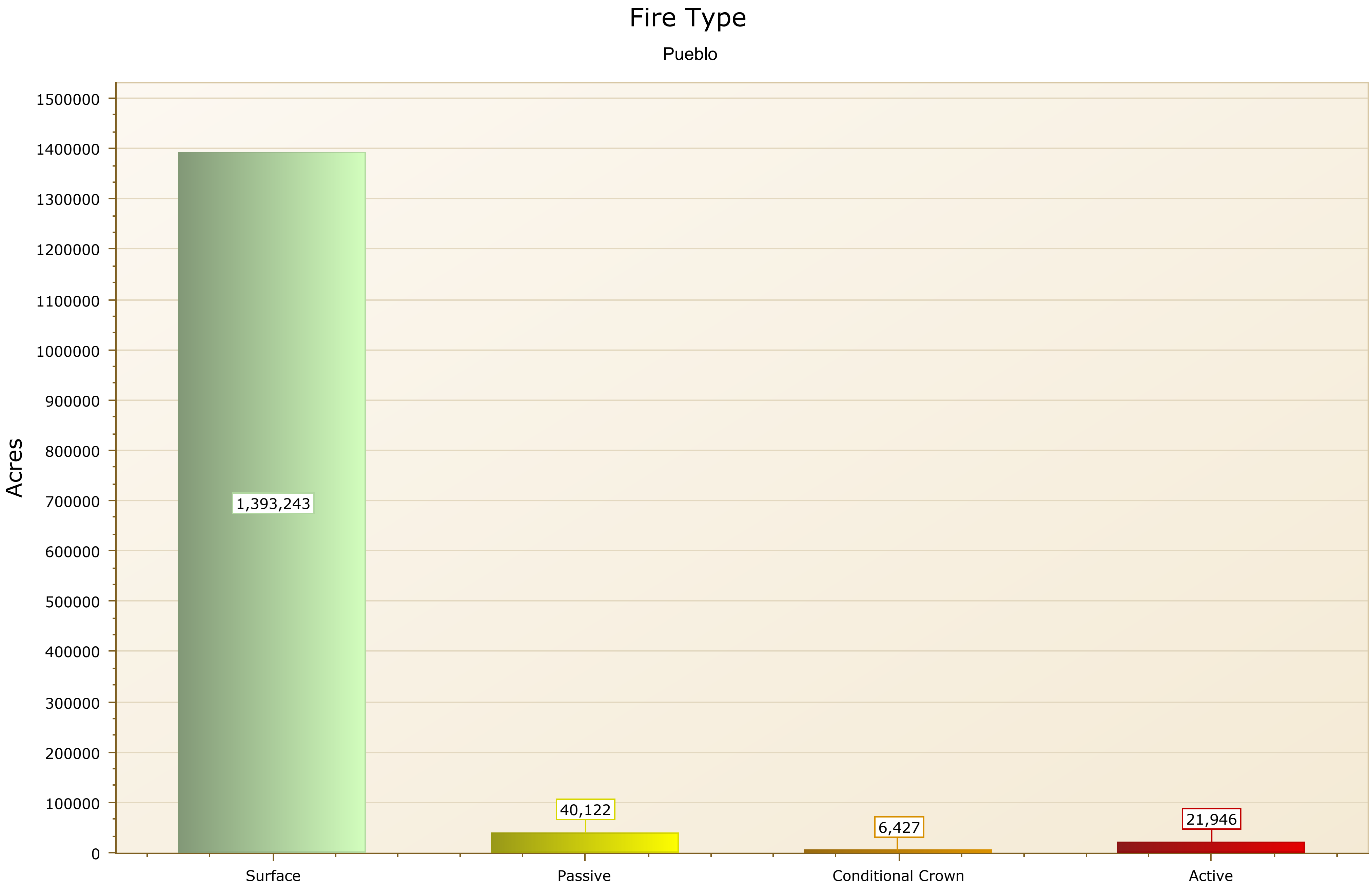
• Passive Canopy Fire – A type of crown fire in which the crowns of individual trees or small groups of trees burn, but solid flaming in the canopy cannot be maintained except for short periods (Scott & Reinhardt, 2001).

• Conditional Crown Fire – A type of crown fire in which an active crown fire is possible but one would not be predicted to initiate. Two outcomes are possible in that situation: surface fire if the fire starts in the stand as a surface fire, or active crown fire if fire enters the stand as an active crown fire.

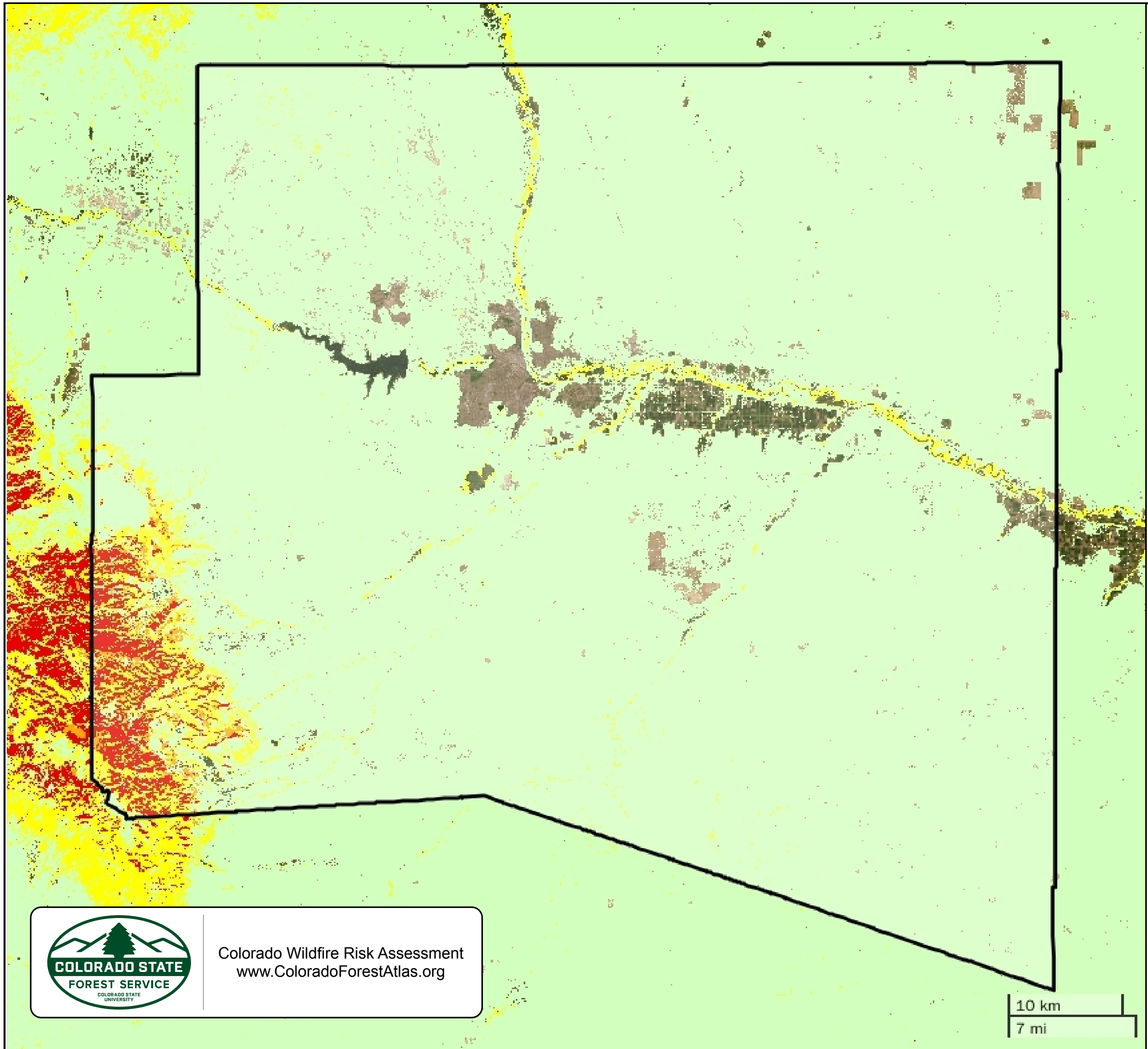
• Active Canopy Fire - A crown fire in which the entire fuel complex (canopy) is involved in flame, but the crowning phase remains dependent on heat released from surface fuel for continued spread (Scott & Reinhardt, 2001).

The fire type map is derived at a 20-meter resolution and was estimated based on the extreme weather scenario (percentile 97th). This scale of data was chosen to be consistent with the accuracy of the primary surface fuels dataset used in the assessment. While not appropriate for site specific analysis, it is appropriate for regional, county or local planning efforts.

Fire Type		Acres	Percent
	Surface	1,393,243	95.3%
	Passive	40,122	2.7%
	Conditional Crown	6,427	0.4%
	Active	21,946	1.5%
Total		**1,461,737**	**100%**



Fire Type
Pueblo
Acres
1500000
1400000
1300000
1200000
1100000
1000000
900000
800000
700000
600000
500000
400000
300000
200000
100000
0
1,393,243
40,122
6,427
21,946
Surface
Passive
Conditional Crown
Active



Pueblo

Fire Type

- Surface
- Passive
- Conditional Crown
- Active

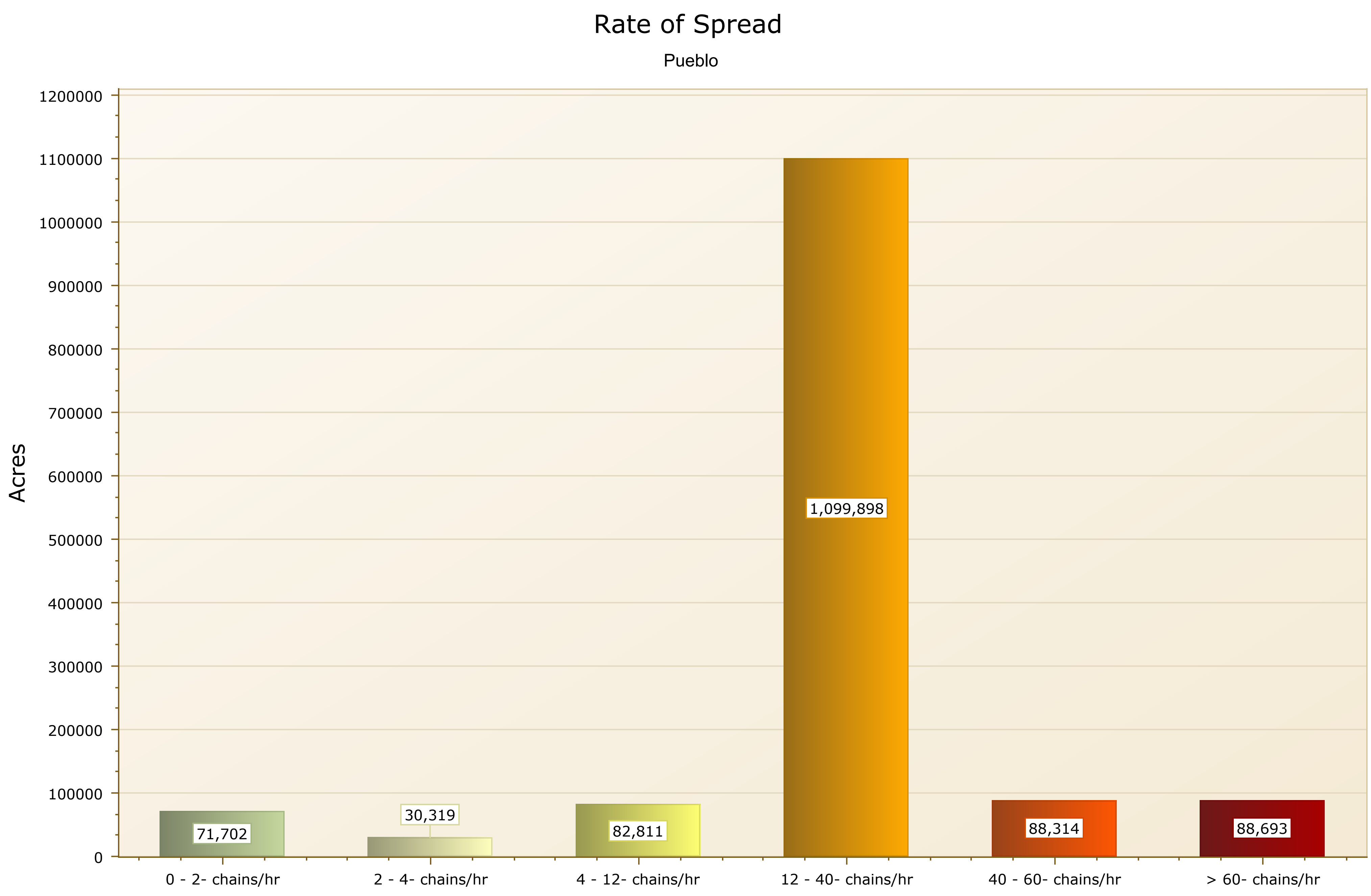
Rate of Spread

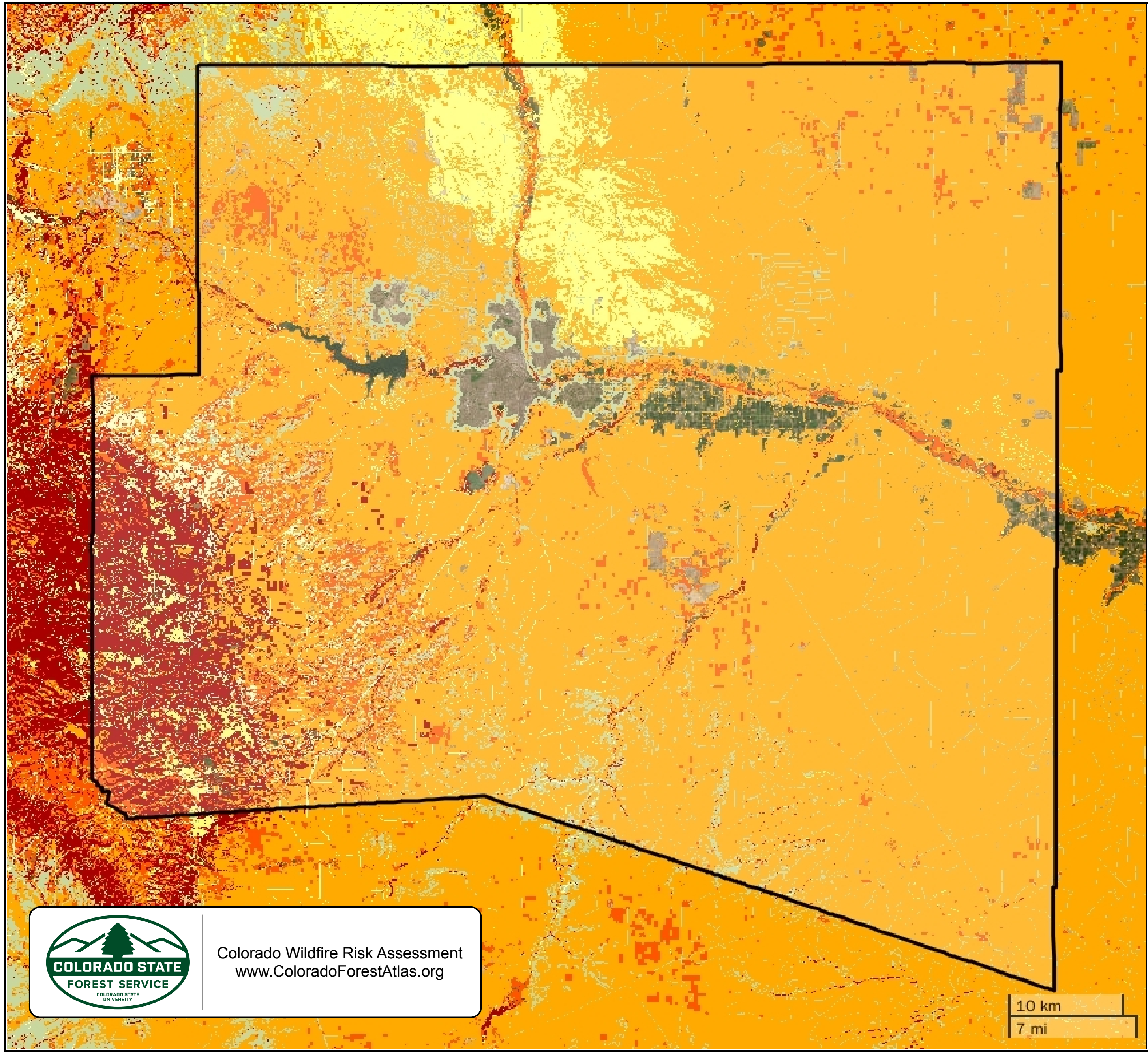
The typical or representative rate of spread of a potential fire based on a weighted average of four percentile weather categories.

Rate of spread is the speed with which a fire moves in a horizontal direction across the landscape, usually expressed in chains per hour (ch/hr) or feet per minute (ft/min). For purposes of the CO-WRA, this measurement represents the maximum rate of spread of the fire front.

Rate of spread is a fire behavior output, which is influenced by three environmental factors - fuels, weather, and topography. Weather is by far the most dynamic variable as it changes frequently. To account for this variability, four percentile weather categories were created from historical weather observations to represent low, moderate, high, and extreme weather days for a 20-meter grid cell in Colorado.

Rate of Spread	Acres	Percent
0 - 2- chains/hr	71,702	4.9%
2 - 4- chains/hr	30,319	2.1%
4 - 12- chains/hr	82,811	5.7%
12 - 40- chains/hr	1,099,898	75.2%
40 - 60- chains/hr	88,314	6%
> 60- chains/hr	88,693	6.1%
Total	**1,461,737**	**100%**


Rate of Spread
Pueblo
Acres
1200000
1100000
1000000
900000
800000
700000
600000
500000
400000
300000
200000
100000
0
71,702
30,319
82,811
1,099,898
88,314
88,693
0 - 2- chains/hr
2 - 4- chains/hr
4 - 12- chains/hr
12 - 40- chains/hr
40 - 60- chains/hr
> 60- chains/hr



Pueblo

Rate of Spread

- 0 - 2- chains/hr
- 2 - 4- chains/hr
- 4 - 12- chains/hr
- 12 - 40- chains/hr
- 40 - 60- chains/hr
- > 60- chains/hr

Surface Fuels

Fire behavior fuel models that contain the parameters required to calculate fire behavior outputs.

Surface fuels, or fire behavior fuel models as they are technically referred to, contain the parameters needed by the Rothermel (1972) surface fire spread model to compute surface fire behavior characteristics, e.g. rate of spread, flame length, fireline intensity, and other fire behavior metrics. As the name might suggest, surface fuels account only for surface fire potential. Canopy fire potential is computed through a separate but linked process. The CO-WRA accounts for both surface and canopy fire potential in the fire behavior outputs.

An up-to-date surface fuel dataset at 20-meter (m) resolution was developed for this project, based on Scott and Burgan (2005) fuel models, enhanced with custom fuels created by Technosylva. The custom fuels distinguish this assessment from previous ones performed in Colorado as they allow a better characterization of fire behavior across the landscape. Additionally, the urban and road custom fuel models included in the assessment are key for better characterizing the exposure, vulnerability and risk of both buildings and population in the Wildland Urban Interface (WUI). This also allows for better modeling of fire encroachment in urban areas considering the building density, community structure and fuels surrounding the buildings and urban areas.

The following custom fuels were included in order to improve the fire modeling in timber, WUI and agricultural areas:

• Timber: 2 new categories (171 and 191)
• Urban: 7 new categories (911,912,913,914,915,916 and 919)
• Roads: 5 new categories (941,942,943,944 and 949)
• Agriculture: 4 new categories (931,932,938a and 939)
• Water: 3 new categories (981,982 and 989)
Additionally, we also considered canopy fuel data to better simulate crown fire behavior. This includes:
• canopy bulk density (CBD),
• canopy base height (CBH),
• canopy cover (CC) and
• canopy height (CH).

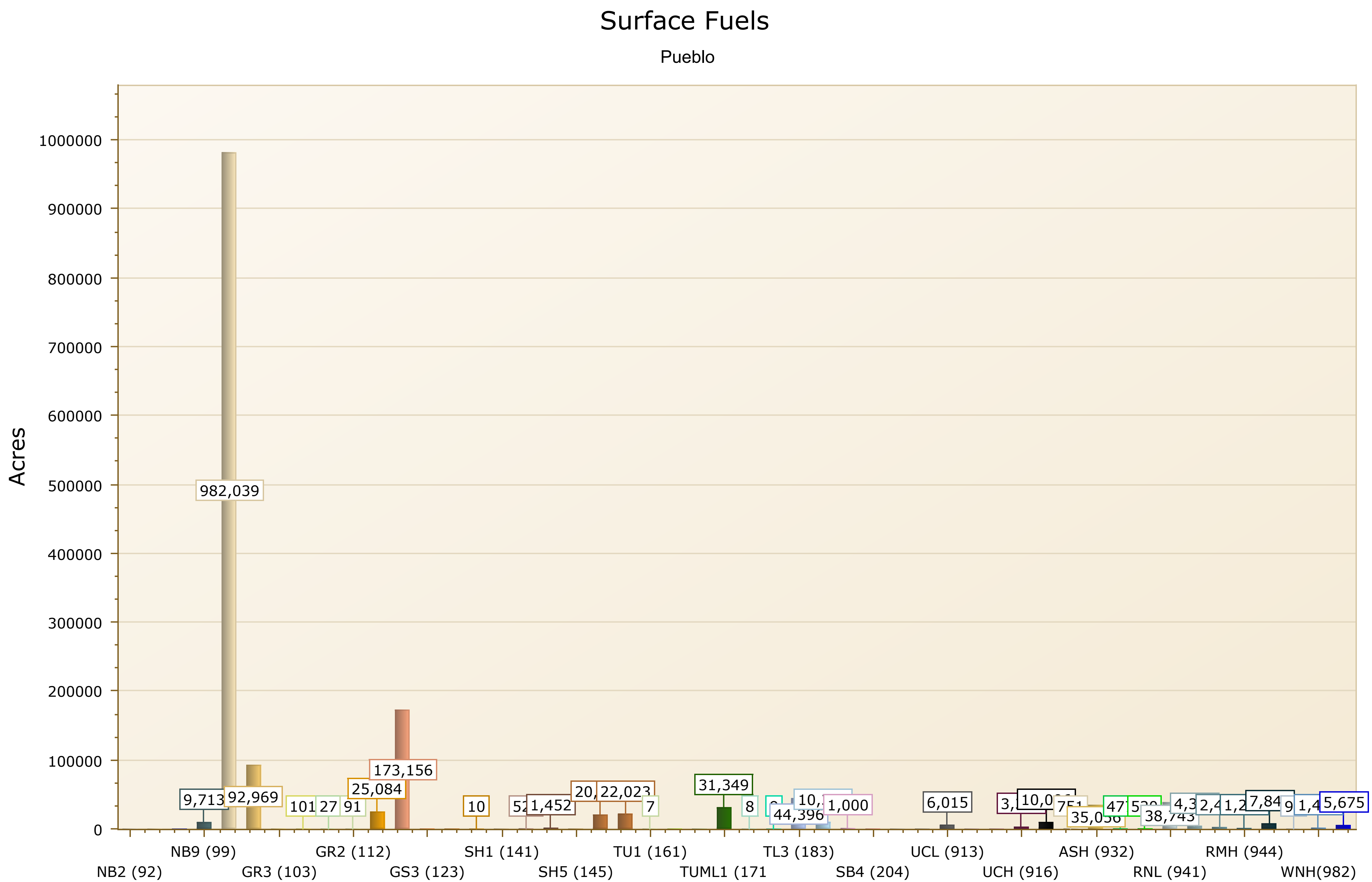
Unmanaged forest with dead amd dowmed trees and branches

Slash on the ground indicates that forest management treatments have occurred in this area

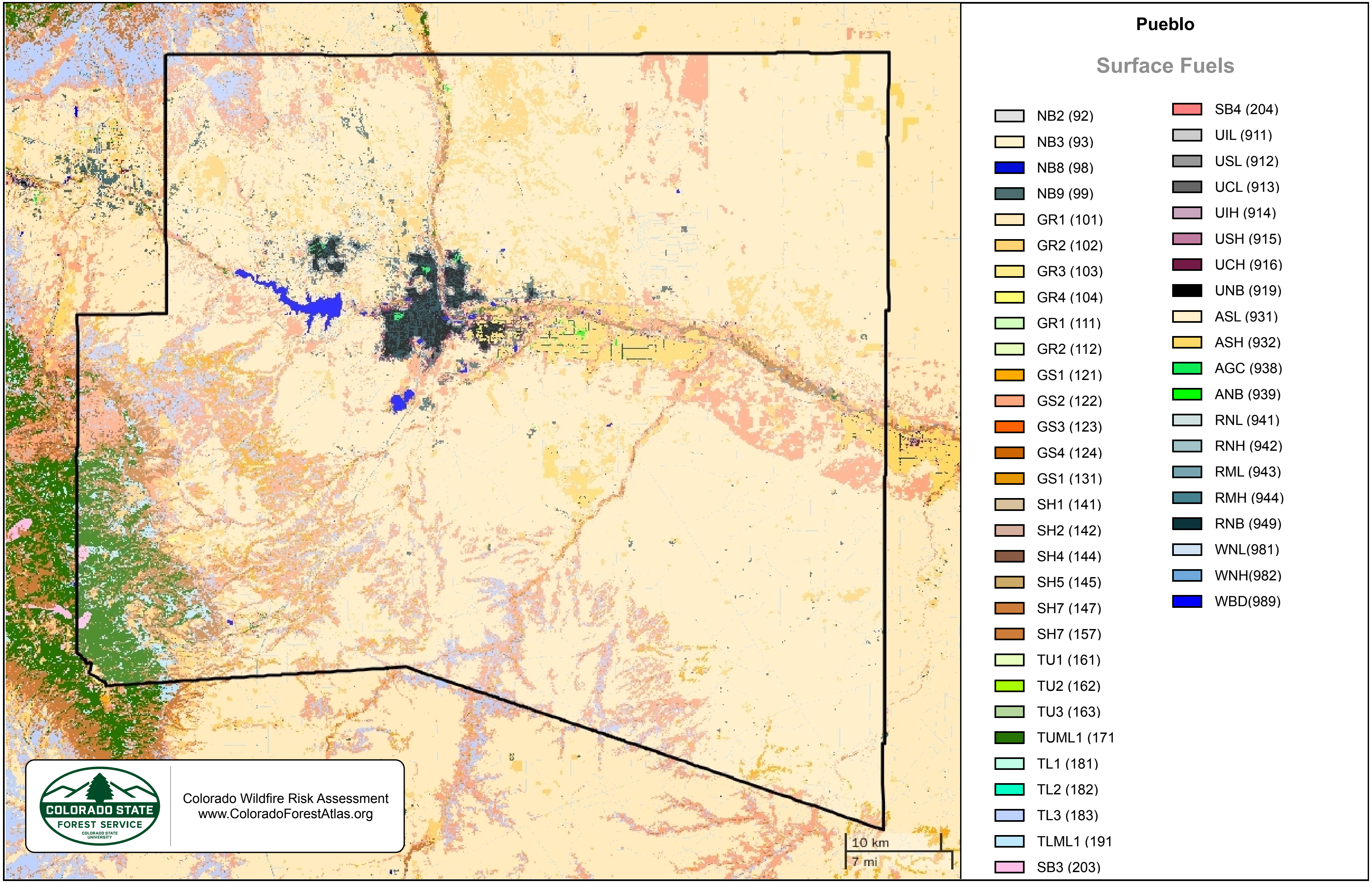
The updated fuel dataset also considered the effects of natural disturbances on vegetation (fires, insect and disease, and harvesting/fuel treatments) that occurred in Colorado from 2013 to 2022. More information about the methods used can be found in the Colorado 2022 Fuels Mapping Final Report.

Surface Fuels	Description	Acres	Percent
NB2 (92)	Snow/Ice		0%
NB3 (93)	Agricultural		0%
NB8 (98)	Open Water		0%
NB9 (99)	Bare Ground	9,713	0.6%
GR1 (101)	Short, Sparse Dry Climate Grass	982,039	64%
GR2 (102)	Low Load, Dry Climate Grass	92,969	6.1%
GR3 (103)	Low Load, Very Coarse, Humid Climate Grass		0%
GR4 (104)	Moderate Load, Dry Climate Grass	101	0%
GR1 (111)	Short, Sparse Dry Climate Grass - ALPINE	27	0%
GR2 (112)	Low Load, Dry Climate Grass - ALPINE	91	0%
GS1 (121)	Low Load, Dry Climate Grass-Shrub	25,084	1.6%
GS2 (122)	Moderate Load, Dry Climate Grass-Shrub	173,156	11.3%
GS3 (123)	Moderate Load, Humid Climate Grass-Shrub		0%
GS4 (124)	High Load, Humid Climate Grass-Shrub		0%
GS1 (131)	Low Load, Dry Climate Grass-Shrub - ALPINE	10	0%
SH1 (141)	Low Load Dry Climate Shrub		0%
SH2 (142)	Moderate Load Dry Climate Shrub	523	0%
SH4 (144)	Low Load, Humid Climate Timber-Shrub	1,452	0.1%
SH5 (145)	High Load, Dry Climate Shrub		0%
SH7 (147)	Very High Load, Dry Climate Shrub	20,927	1.4%
SH7 (157)	Very High Load, Dry Climate Shrub	22,023	1.4%
TU1 (161)	Low Load Dry Climate Timber-Grass-Shrub	7	0%
TU2 (162)	Moderate Load, Humid Climate Timber-Shrub		0%
TU3 (163)	Moderate Load, Humid Climate Timber-Grass-Shrub		0%
TUML1 (171	Timber Understory Dynamic ML (TSYL 2022)	31,349	2%
TL1 (181)	Low Load Compact Conifer Litter	8	0%
TL2 (182)	Low Load Broadleaf Litter	9	0%
TL3 (183)	Moderate Load Conifer Litter	44,396	2.9%
TLML1 (191	Timber Litter ML (TSYL 2022)	10,398	0.7%

Surface Fuels	Description	Acres	Percent
SB3 (203)	High Load Activity Fuel or Moderate Load Blowdown	1,000	0.1%
SB4 (204)	High Load Blowdown		0%
UIL (911)	Isolated urban surrounded by Low FB fuel		0%
USL (912)	Scattered urban surrounded by Low FB fuel		0%
UCL (913)	Urban core surrounded by Low FB fuel	6,015	0.4%
UIH (914)	Isolated urban surrounded by High FB fuel		0%
USH (915)	Scattered urban surrounded by High FB fuel		0%
UCH (916)	Urban core surrounded by High FB fuel	3,358	0.2%
UNB (919)	Unburnable urban areas	10,006	0.6%
ASL (931)	Agricultural Low Load Fuels, with seasonal changes of its Burnable condition	751	0%
ASH (932)	Agricultural High Load Fuels, with seasonal changes of its Burnable condition	35,056	2.3%
AGC (938)	Golf courses - Non-Burnable (no encroachment)	477	0%
ANB (939)	Agricultural Fields, maintained in a Non-Burnable condition	520	0%
RNL (941)	Minor roads Low FB	38,743	2.5%
RNH (942)	Minor roads High FB	4,349	0.3%
RML (943)	Major roads Low FB	2,438	0.2%
RMH (944)	Major roads High FB	1,265	0.1%
RNB (949)	Roads surrounded by non-burnable fuels	7,841	0.5%
WNL(981)	Minor Water streams surrounded by Low Load Fuel (moderate encroachment)	96	0%
WNH(982)	Minor Water streams surrounded by High Load Fuel (high encroachment)	1,498	0.1%
WBD(989)	Water Bodies	5,675	0.4%
Total		**1,533,370**	**100%**



Surface Fuels
Pueblo
Acres
1000000
900000
800000
700000
600000
500000
400000
300000
200000
100000
0
982,039
173,156
92,969
31,349
25,084
22,023
44,396
38,743
35,056
9,713
6,015
5,675
1,452
1,000
10
7
8
NB2 (92)
NB9 (99)
GR3 (103)
GR2 (112)
GS3 (123)
SH1 (141)
SH5 (145)
TU1 (161)
TUML1 (171
TL3 (183)
SB4 (204)
UCL (913)
UCH (916)
ASH (932)
RNL (941)
RMH (944)
WNH(982)


Pueblo
Surface Fuels
NB2 (92)
NB3 (93)
NB8 (98)
NB9 (99)
GR1 (101)
GR2 (102)
GR3 (103)
GR4 (104)
GR1 (111)
GR2 (112)
GS1 (121)
GS2 (122)
GS3 (123)
GS4 (124)
GS1 (131)
SH1 (141)
SH2 (142)
SH4 (144)
SH5 (145)
SH7 (147)
SH7 (157)
TU1 (161)
TU2 (162)
TU3 (163)
TUML1 (171
TL1 (181)
TL2 (182)
TL3 (183)
TLML1 (191
SB3 (203)
SB4 (204)
UIL (911)
USL (912)
UCL (913)
UIH (914)
USH (915)
UCH (916)
UNB (919)
ASL (931)
ASH (932)
AGC (938)
ANB (939)
RNL (941)
RNH (942)
RML (943)
RMH (944)
RNB (949)
WNL(981)
WNH(982)
WBD(989)
10 km
7 mi
COLORADO STATE FOREST SERVICE
Colorado Wildfire Risk Assessment
www.ColoradoForestAtlas.org

Vegetation

The Vegetation map describes the general vegetation and landcover types across the state of Colorado.

In the CO-WRA, the Vegetation dataset is used to support the development of the Surface Fuels, Canopy Cover, Canopy Stand Height, Canopy Base Height, and Canopy Bulk Density datasets.
The 2020 LANDFIRE program data product (Existing Vegetation Type) was used to compile the Vegetation data for the CO-WRA. This reflects data current to 2020. The LANDFIRE EVT data were classified to reflect general vegetation cover types for representation with CFA.

Oak shrublands are commonly found añlong dry foothills and lower mountain slopes, and are often situates above Piñyon-juniper.

Piñyon-juniper woodlands are common in southern and southwestern Colorado

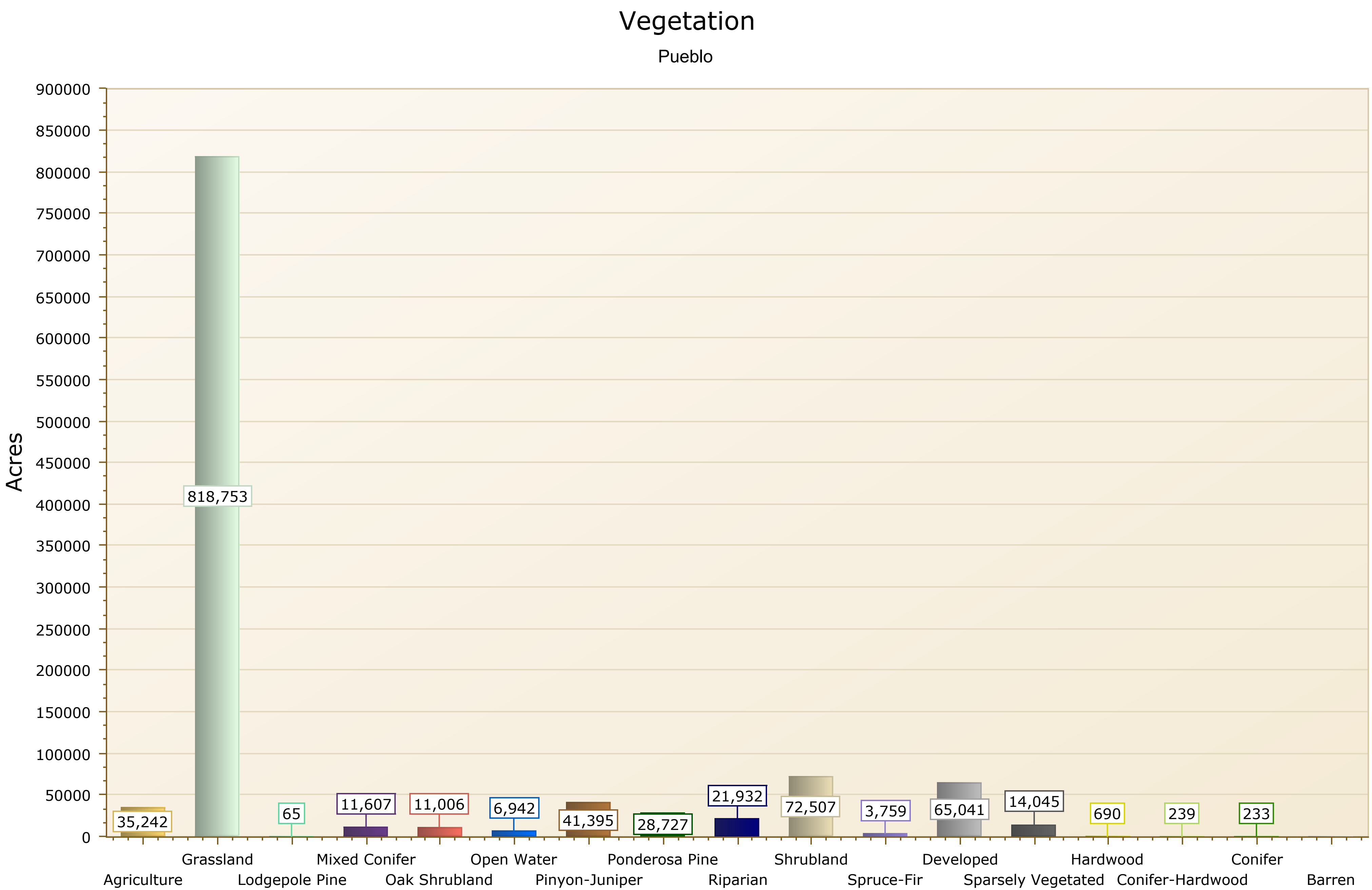
Douglas-fir understory in a ponderosa pine forest

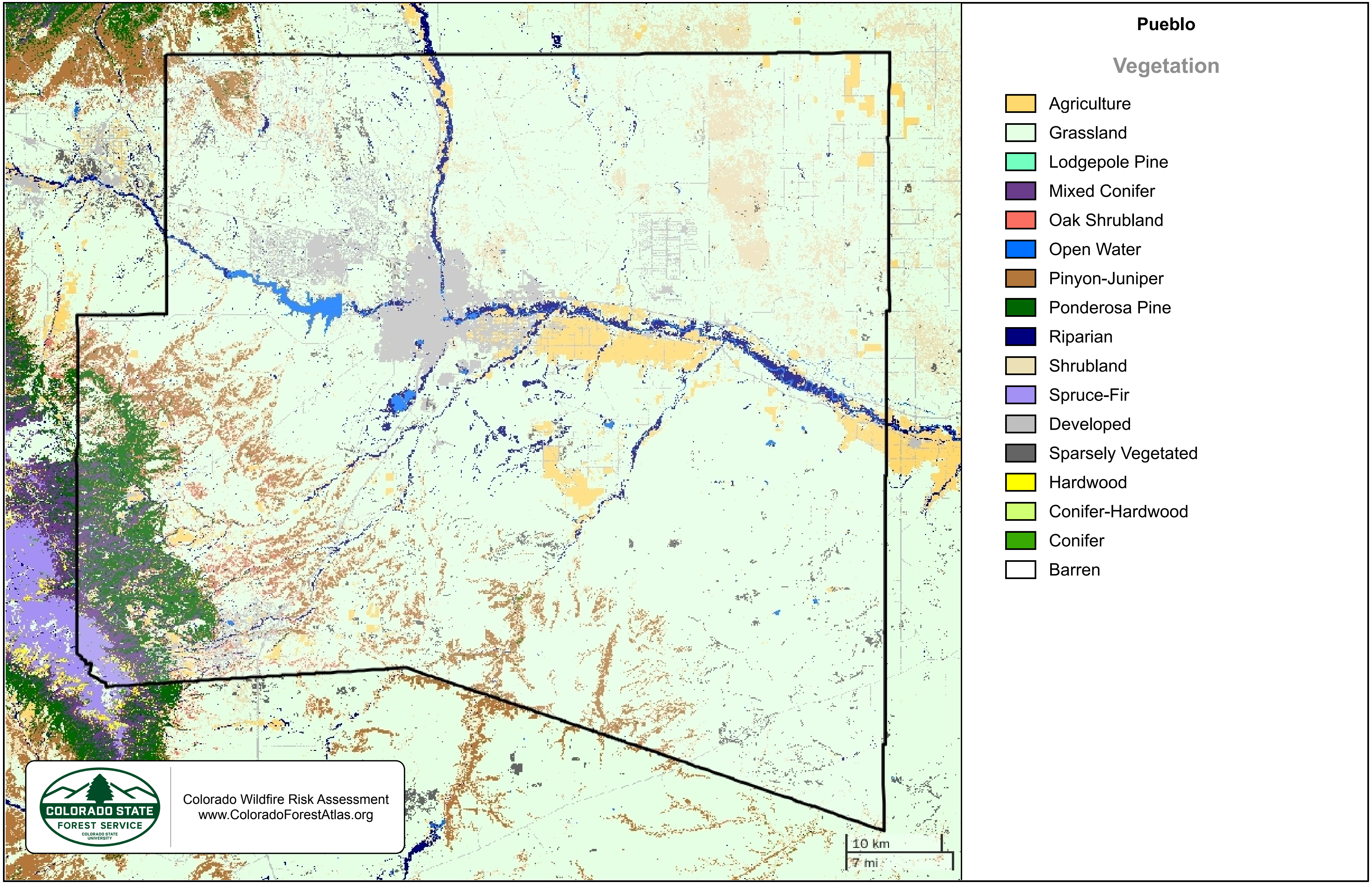
Grasslands occur both on Colorado's Eastern Plains and on the Western Slope.

Wildland fire threat increases in lodgepole pine as the dense forest grow old

Overly dense ponderosa pine, a dominant species of the montane zone

Vegetation Class		Acres	Percent
	Agriculture	35,242	3.1%
	Grassland	818,753	72.3%
	Lodgepole Pine	65	0%
	Mixed Conifer	11,607	1%
	Oak Shrubland	11,006	1%
	Open Water	6,942	0.6%
	Pinyon-Juniper	41,395	3.6%
	Ponderosa Pine	28,727	2.5%
	Riparian	21,932	1.9%
	Shrubland	72,507	6.4%
	Spruce-Fir	3,759	0.3%
	Developed	65,041	5.7%
	Sparsely Vegetated	14,045	1.2%
	Hardwood	690	0.1%
	Conifer-Hardwood	239	0%
	Conifer	233	0%
	Barren		0%
Total		**1,132,183**	**100%**


Vegetation
Pueblo
Acres
900000
850000
800000
750000
700000
650000
600000
550000
500000
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
35,242
818,753
65
11,607
11,006
6,942
41,395
28,727
21,932
72,507
3,759
65,041
14,045
690
239
233
Agriculture
Grassland
Lodgepole Pine
Mixed Conifer
Oak Shrubland
Open Water
Pinyon-Juniper
Ponderosa Pine
Riparian
Shrubland
Spruce-Fir
Developed
Sparsely Vegetated
Hardwood
Conifer-Hardwood
Conifer
Barren

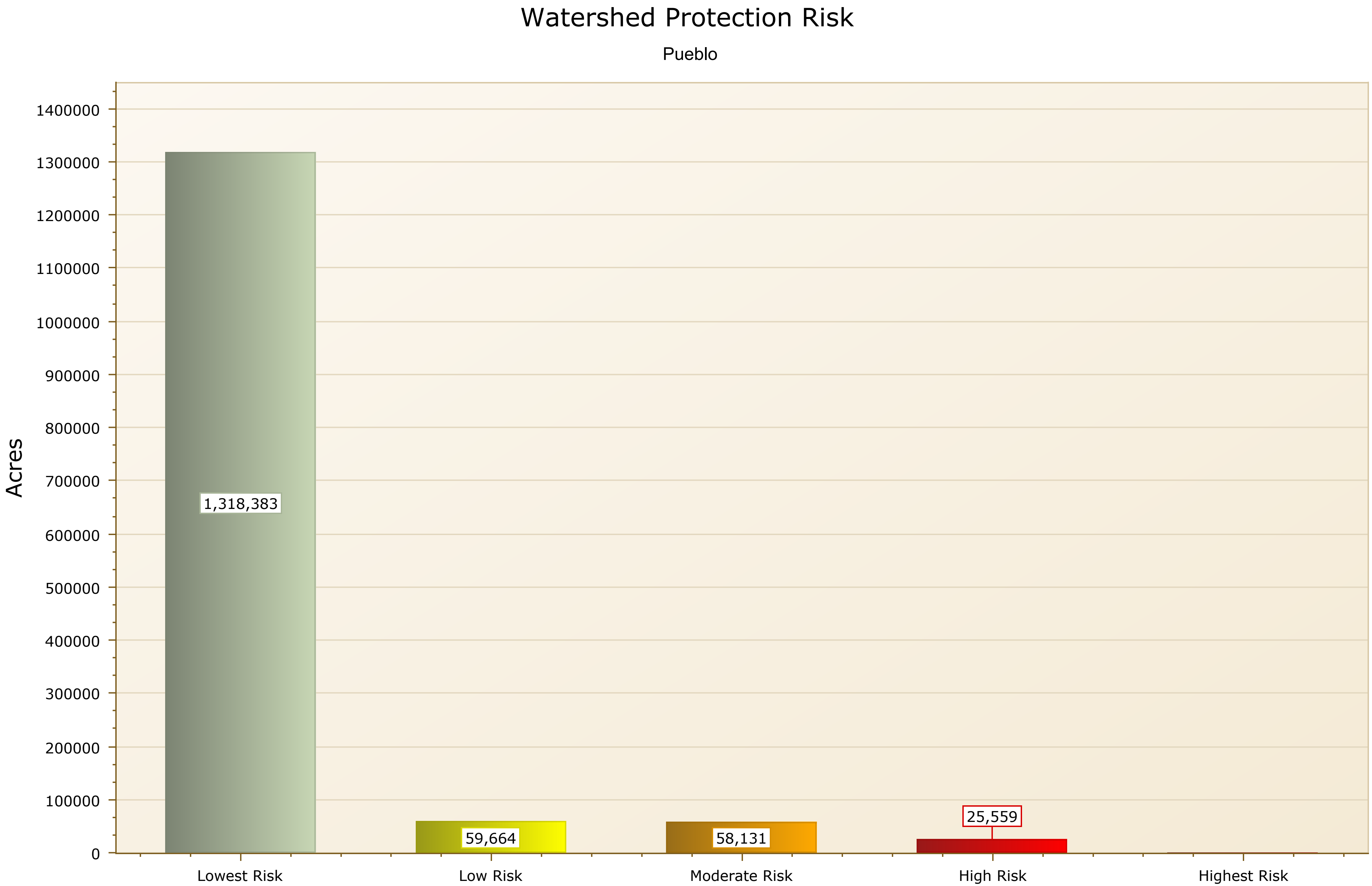

Pueblo
Vegetation
Agriculture
Grassland
Lodgepole Pine
Mixed Conifer
Oak Shrubland
Open Water
Pinyon-Juniper
Ponderosa Pine
Riparian
Shrubland
Spruce-Fir
Developed
Sparsely Vegetated
Hardwood
Conifer-Hardwood
Conifer
Barren
COLORADO STATE
FOREST SERVICE
Colorado Wildfire Risk Assessment
www.ColoradoForestAtlas.org
10 km
7 mi

Watershed Protection Risk

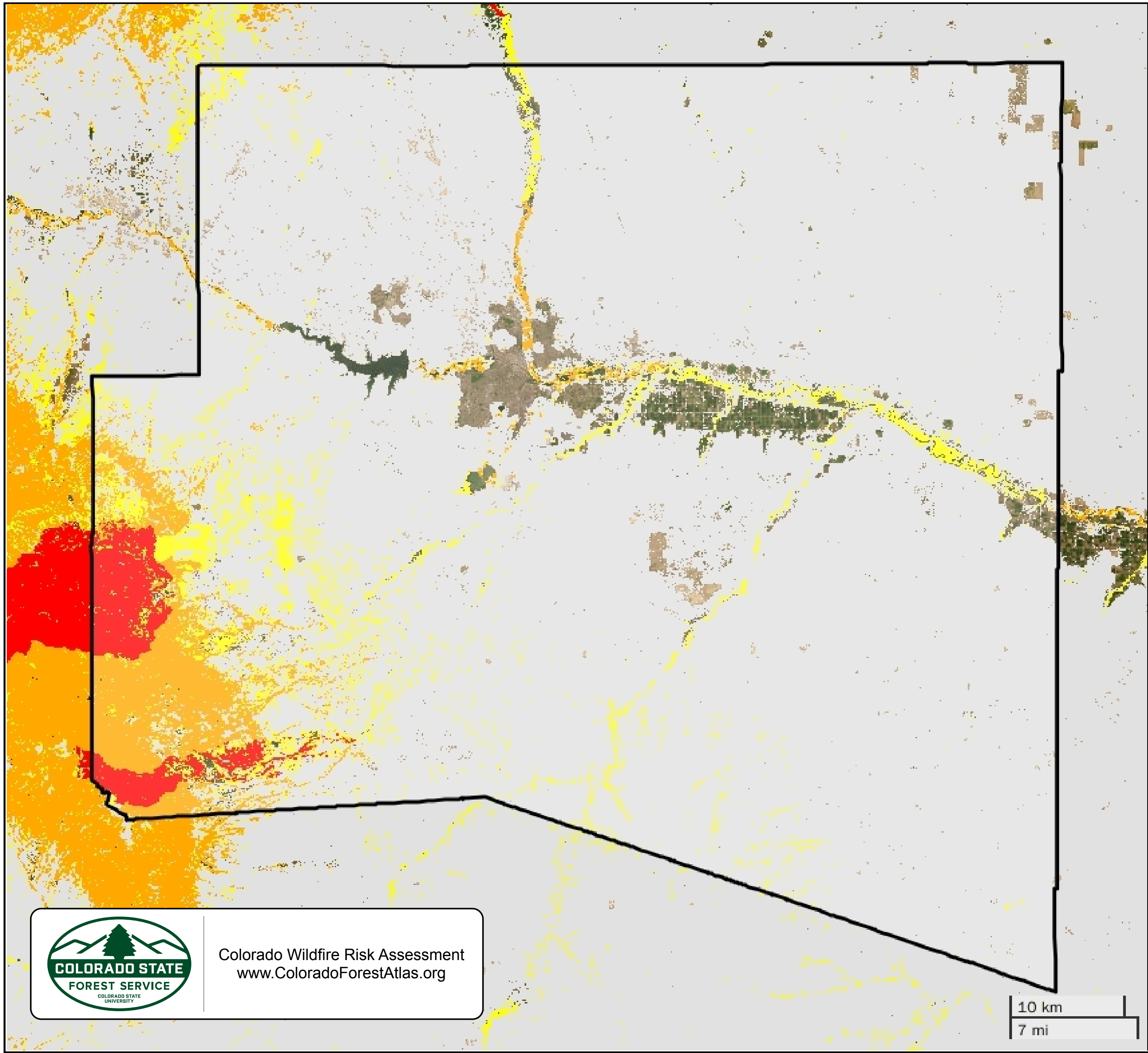
A measure of the risk to Watershed Protection Areas based on the potential negative impacts from wildfire.

In areas that experience low-severity burns, fire events can serve to eliminate competition, rejuvenate growth and improve watershed conditions. But in landscapes subjected to high, or even moderate-burn severity, the post-fire threats to public safety and natural resources can be extreme.
High-severity wildfires remove virtually all forest vegetation – from trees, shrubs and grasses down to discarded needles, decomposed roots and other elements of ground cover or duff that protect forest soils. A severe wildfire also can cause certain types of soil to become hydrophobic by forming a waxy, water-repellent layer that keeps water from penetrating the soil, dramatically amplifying the rate of runoff.
The loss of critical surface vegetation leaves forested slopes extremely vulnerable to large-scale soil erosion and flooding during subsequent storm events. In turn, these threats can impact the health, safety and integrity of communities and natural resources downstream. The likelihood that such a post-fire event will occur in Colorado is increased by the prevalence of highly erodible soils in several parts of the state, and weather patterns that frequently bring heavy rains on the heels of fire season.
In the aftermath of the 2002 fire season, the Colorado Department of Health estimated that 26 municipal water storage facilities were shut down due to fire and post-fire impacts. The potential for severe soil erosion is a consequence of wildfire because as a fire burns, it destroys plant material and the litter layer. Shrubs, forbs, grasses, trees and the litter layer disperse water during severe rainstorms. Plant roots stabilize the soil, and stems and leaves slow the water to give it time to percolate into the soil profile. Fire can destroy this soil protection.
The risk index has been calculated by combining the Watershed Protection data with a measure of fire intensity using a Response Function approach. Those areas with the highest negative impact (-9) represent areas with high potential fire intensity and high importance for ecosystem services. Those areas with the lowest negative impact (-1) represent those areas with low potential fire intensity and a low importance for ecosystem services. The response function outputs were combined into 5 qualitative classes.

Watershed Protection Risk	Acres	Percent
Lowest Risk	1,318,383	90.2%
Low Risk	59,664	4.1%
Moderate Risk	58,131	4%
High Risk	25,559	1.7%
Highest Risk		0%
Total	**1,461,737**	**100%**



Watershed Protection Risk
Pueblo
Acres
1400000
1300000
1200000
1100000
1000000
900000
800000
700000
600000
500000
400000
300000
200000
100000
0
1,318,383
59,664
58,131
25,559
Lowest Risk
Low Risk
Moderate Risk
High Risk
Highest Risk



Pueblo

Watershed Protection Risk

- Lowest Risk
- Low Risk
- Moderate Risk
- High Risk
- Highest Risk

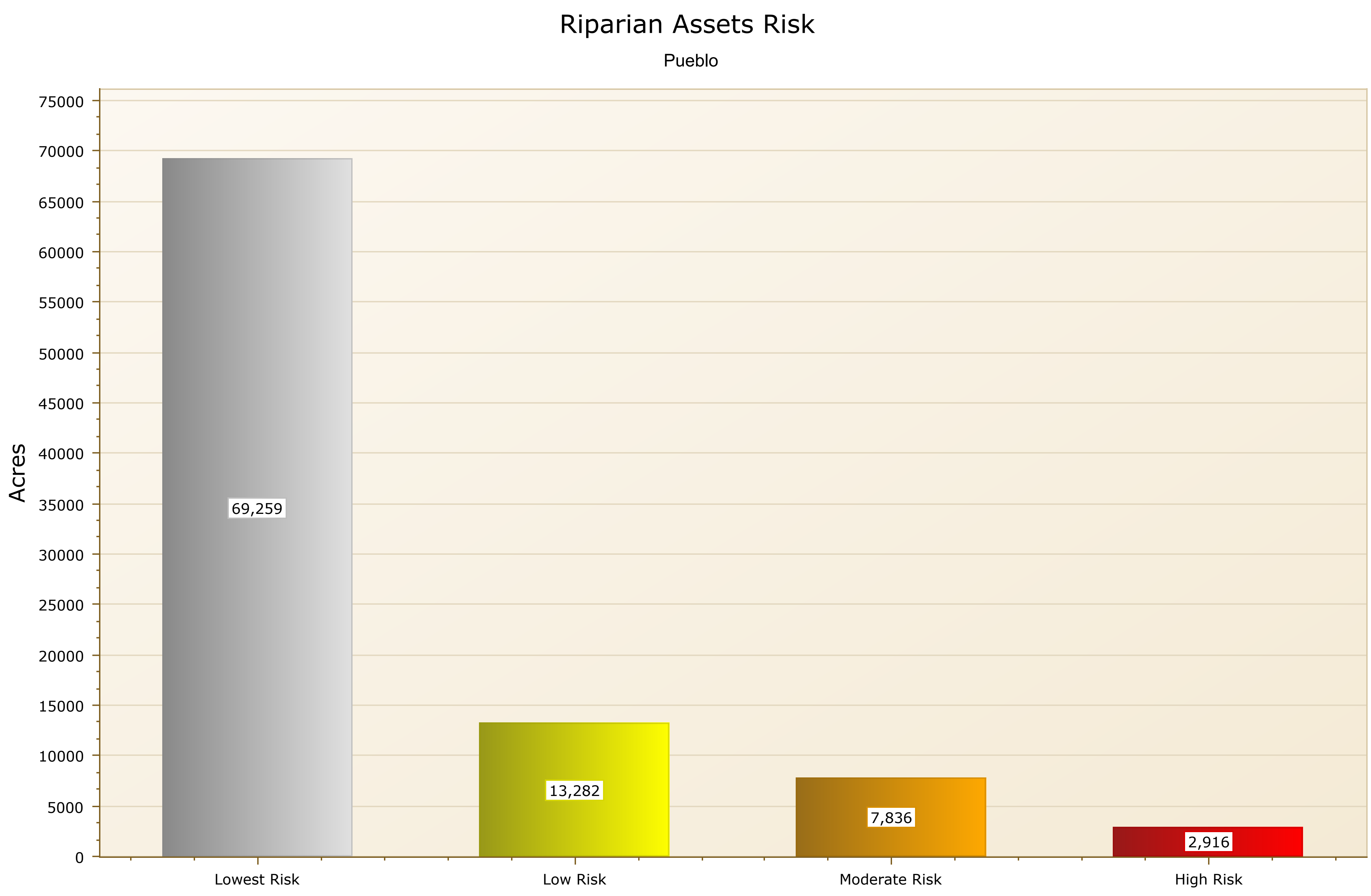
Riparian Assets Risk

A measure of the risk to riparian areas based on the potential negative impacts from wildfire.

The risk index has been calculated by combining the Riparian Assets data with a measure of fire intensity using a Response Function approach. Those areas with the highest negative impact (-9) represent areas with high potential fire intensity and high importance for ecosystem services. Those areas with the lowest negative impact (-1) represent those areas with low potential fire intensity and a low importance for ecosystem services. The response function outputs were combined into 5 qualitative classes.

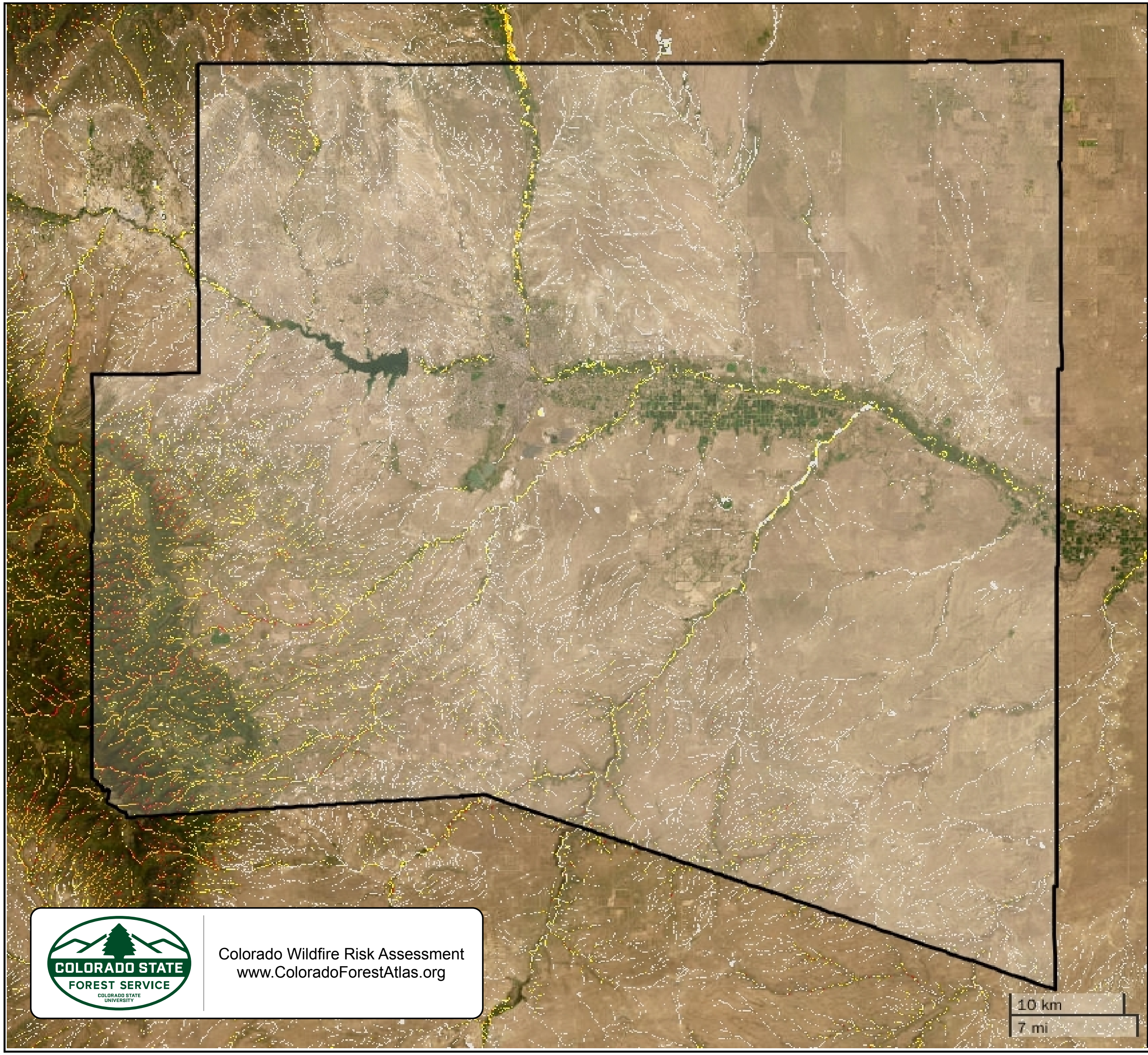
This risk output is intended to supplement the Watershed Protection Risk Index by identifying wildfire risk within the more detailed riparian areas.

Riparian Assets Risk	Acres	Percent
Lowest Risk	69,259	74.2%
Low Risk	13,282	14.2%
Moderate Risk	7,836	8.4%
High Risk	2,916	3.1%
Total	**93,294**	**100%**


Riparian Assets Risk
Pueblo
Acres
75000
70000
65000
60000
55000
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
69,259
13,282
7,836
2,916
Lowest Risk
Low Risk
Moderate Risk
High Risk

Pueblo

Riparian Assets Risk



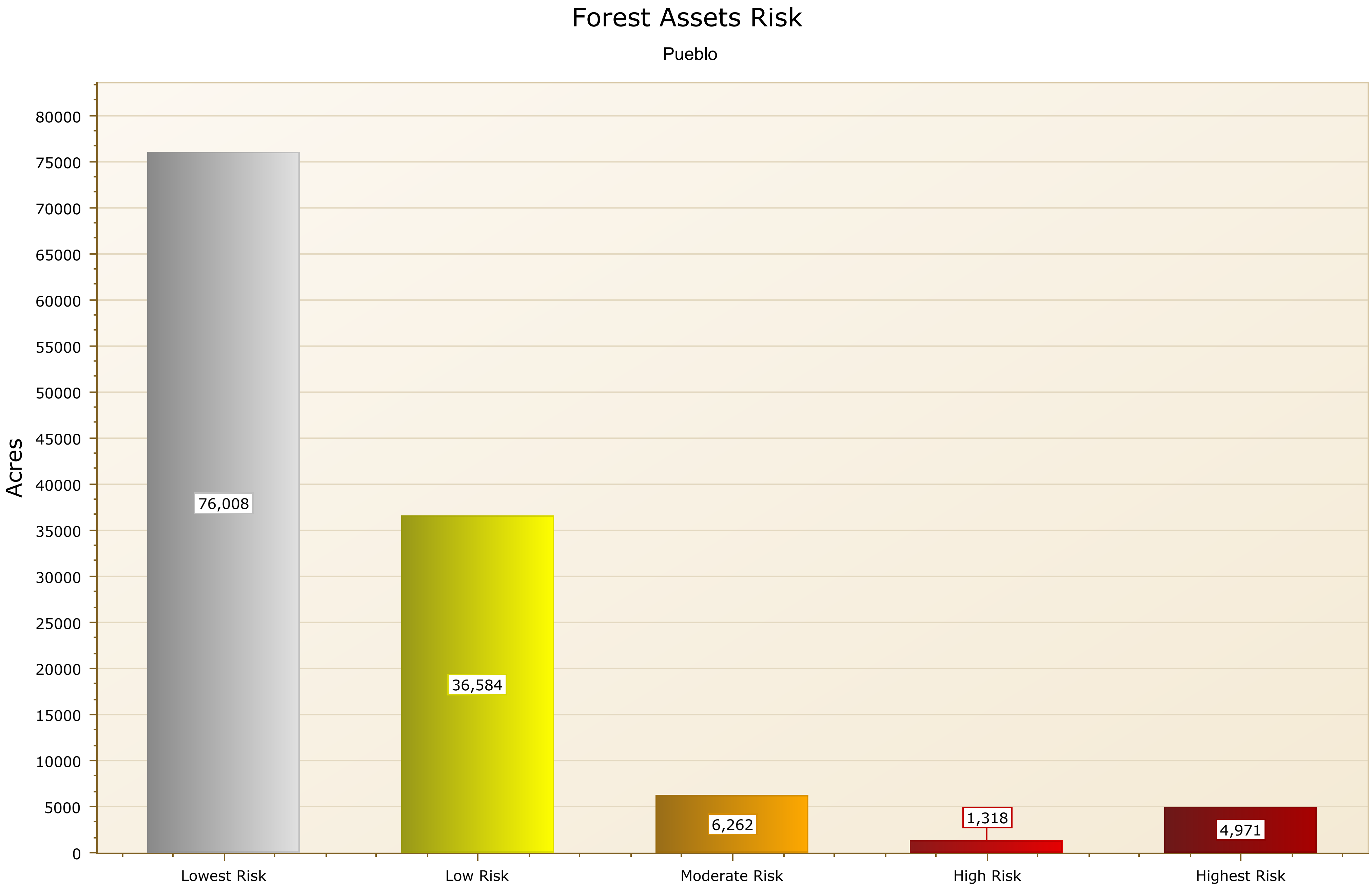
Forest Assets Risk

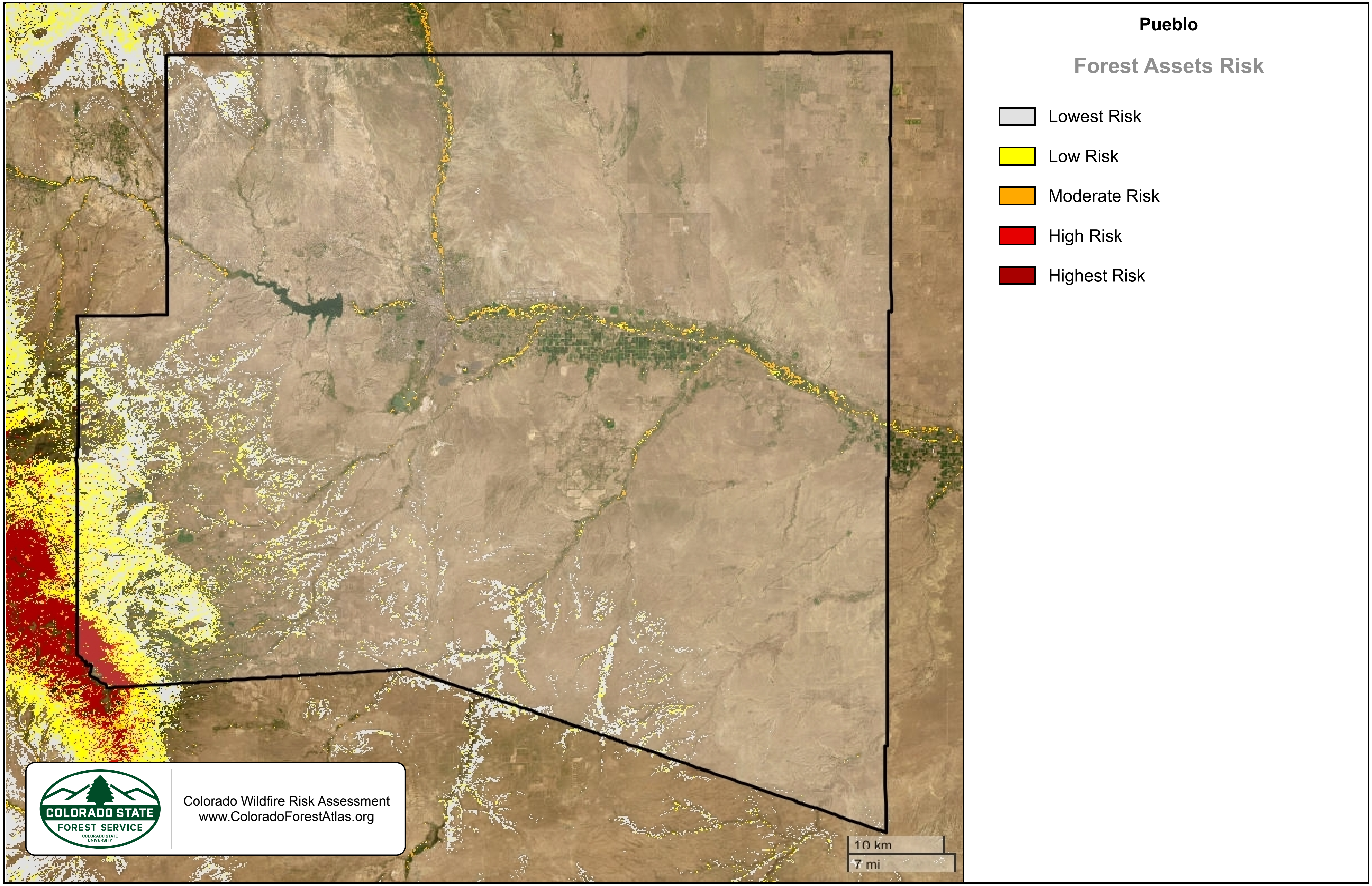
A measure of the risk to forested areas based on the potential negative impacts from wildfire.
This layer identifies those forested areas with the greatest potential for adverse effects from wildfire.This layer identifies those forested areas with the greatest potential for adverse effects from wildfire.

The risk index has been calculated by combining the Forest Assets data with a measure of fire intensity using a Response Function approach. Those areas with the highest negative impact (-9) represent areas with high potential fire intensity and low resilience or adaptability to fire. Those areas with the lowest negative impact (-1) represent those areas with low potential fire intensity and high resilience or adaptability to fire. The response function outputs were combined into 5 qualitative classes.

This risk output is intended to provide an overall forest index for potential impact from wildfire. This can be applied to consider aesthetic values, ecosystem services, or economic values of forested lands.

Forest Assets Risk		Acres	Percent
	Lowest Risk	76,008	60.7%
	Low Risk	36,584	29.2%
	Moderate Risk	6,262	5%
	High Risk	1,318	1%
	Highest Risk	4,971	4%
Total		**125,143**	**100%**


Forest Assets Risk
Pueblo
Acres
80000
75000
70000
65000
60000
55000
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
76,008
36,584
6,262
1,318
4,971
Lowest Risk
Low Risk
Moderate Risk
High Risk
Highest Risk


Pueblo
Forest Assets Risk
Lowest Risk
Low Risk
Moderate Risk
High Risk
Highest Risk
COLORADO STATE
FOREST SERVICE
Colorado Wildfire Risk Assessment
www.ColoradoForestAtlas.org
10 km
7 mi

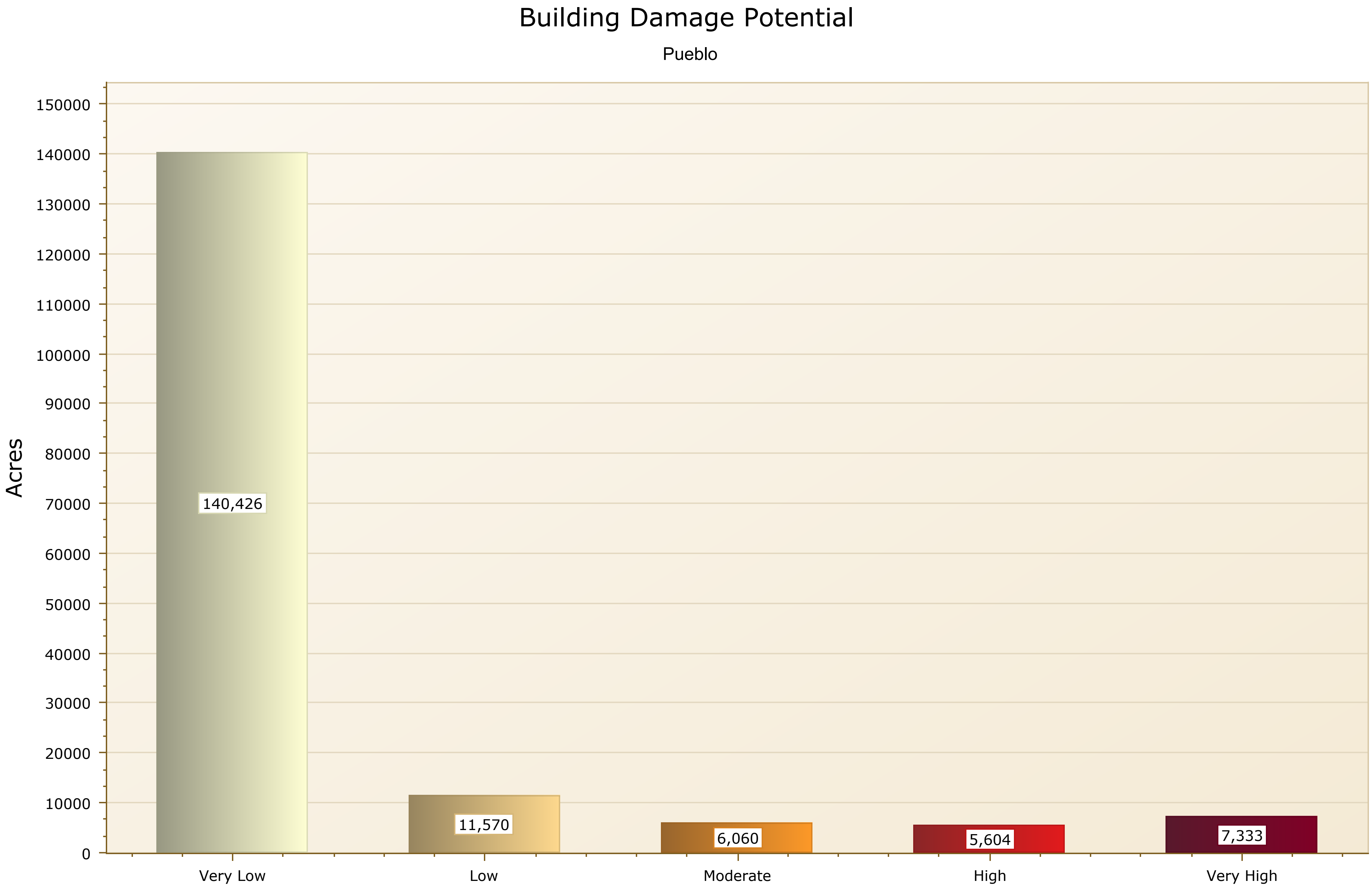
Building Damage Potential

This metric estimates the potential for building loss and was derived using proprietary data from Technosylva Inc. on building damages that was created by analyzing 13 years of building damage data from state agency inspections after large fires.

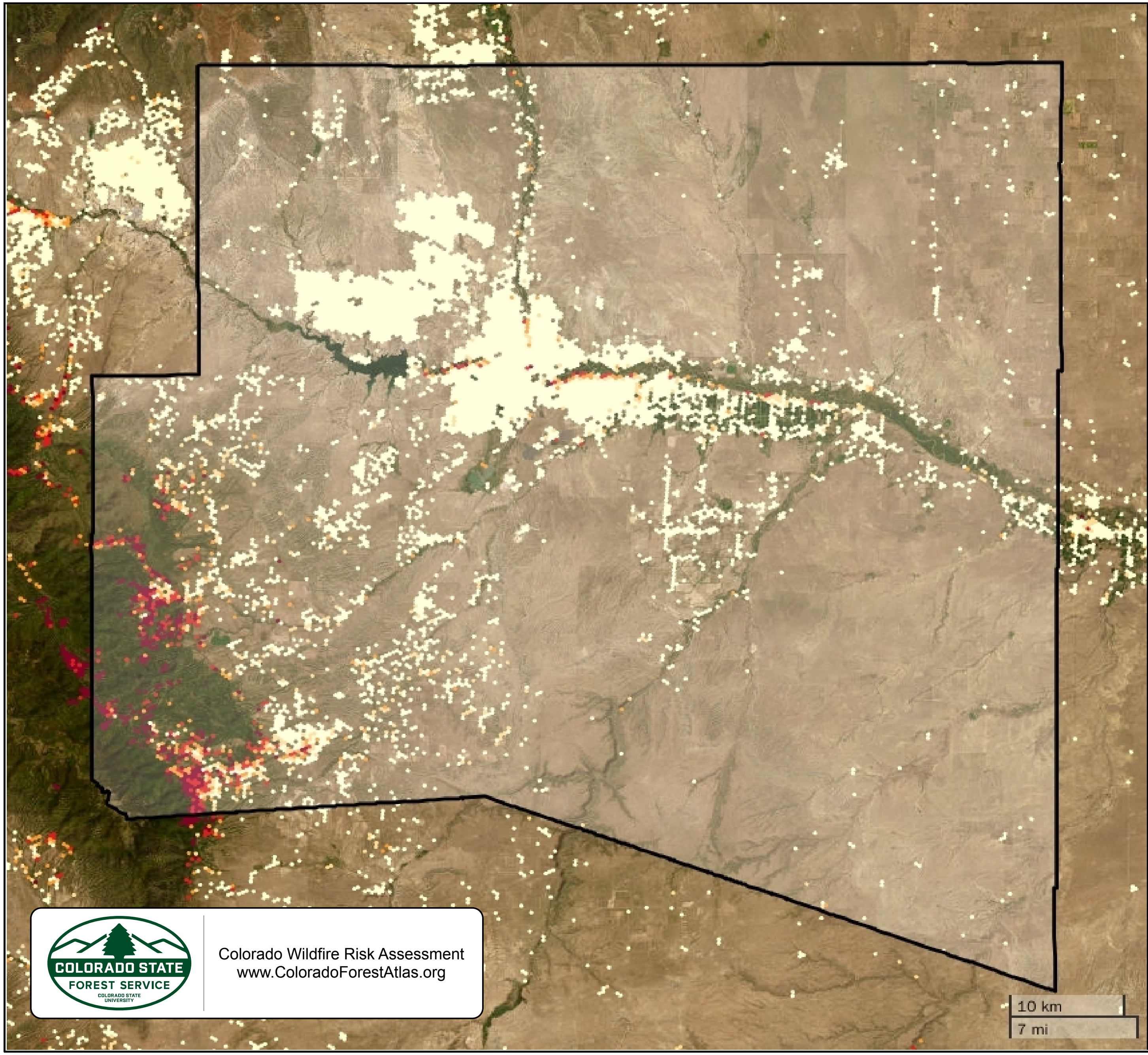
BDP is a spatially variable metric that is calculated on a building-by-building basis and aggregated to Uber H3 hexagons, providing a measure of the number of potential buildings lost based on the number of buildings threatened by fires in the specific area. BDP was calibrated using Machine Learning algorithms that identified the key factors that influenced building loss from historical damage inspection databases. The model has been calibrated using 13 years of damage inspection data and validated across multiple Western States with current wildfire data.

BDP is available as a static risk layer, although a key factor involved in the metric is conditional fire behavior. Conditional Flame Length derived in the fire behavior analysis conducted for the 2022 CO-WRA was used. However, the metric can also be used as a dynamic layer when modulated by the fire intensity of an active wildfire through conventional fire behavior analysis. Although applied as a static layer for the 2022 CO-WRA, the metric is used operationally in California by state agencies and private industry for risk forecasting

Building Damage Potential	Acres	Percent
Very Low	140,426	82.1%
Low	11,570	6.8%
Moderate	6,060	3.5%
High	5,604	3.3%
Very High	7,333	4.3%
Total	**170,992**	**100%**



Building Damage Potential
Pueblo
Acres
150000
140000
130000
120000
110000
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
140,426
11,570
6,060
5,604
7,333
Very Low
Low
Moderate
High
Very High



Pueblo

Building Damage Potential

- Very Low
- Low
- Moderate
- High
- Very High

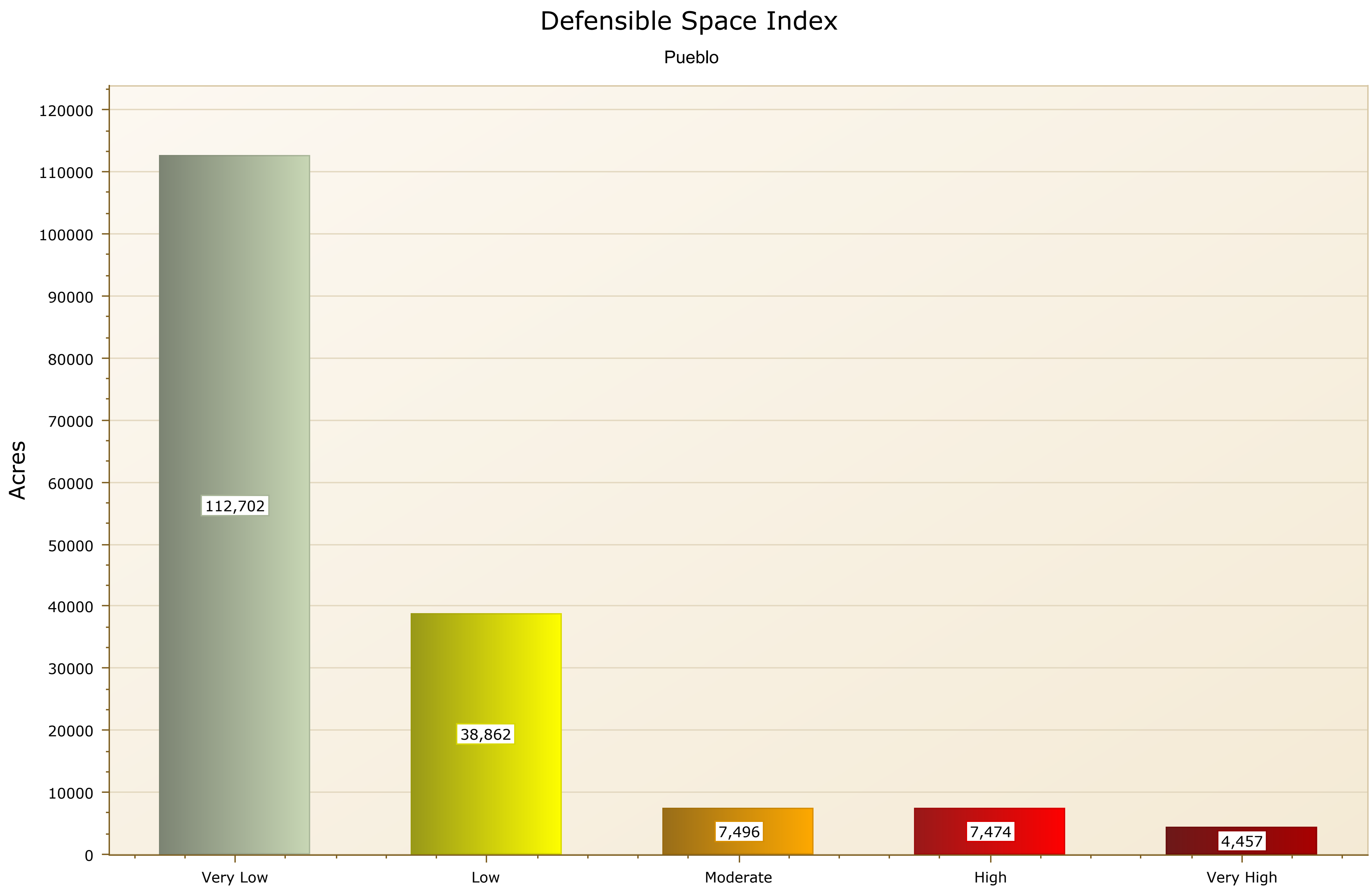
Defensible Space Index

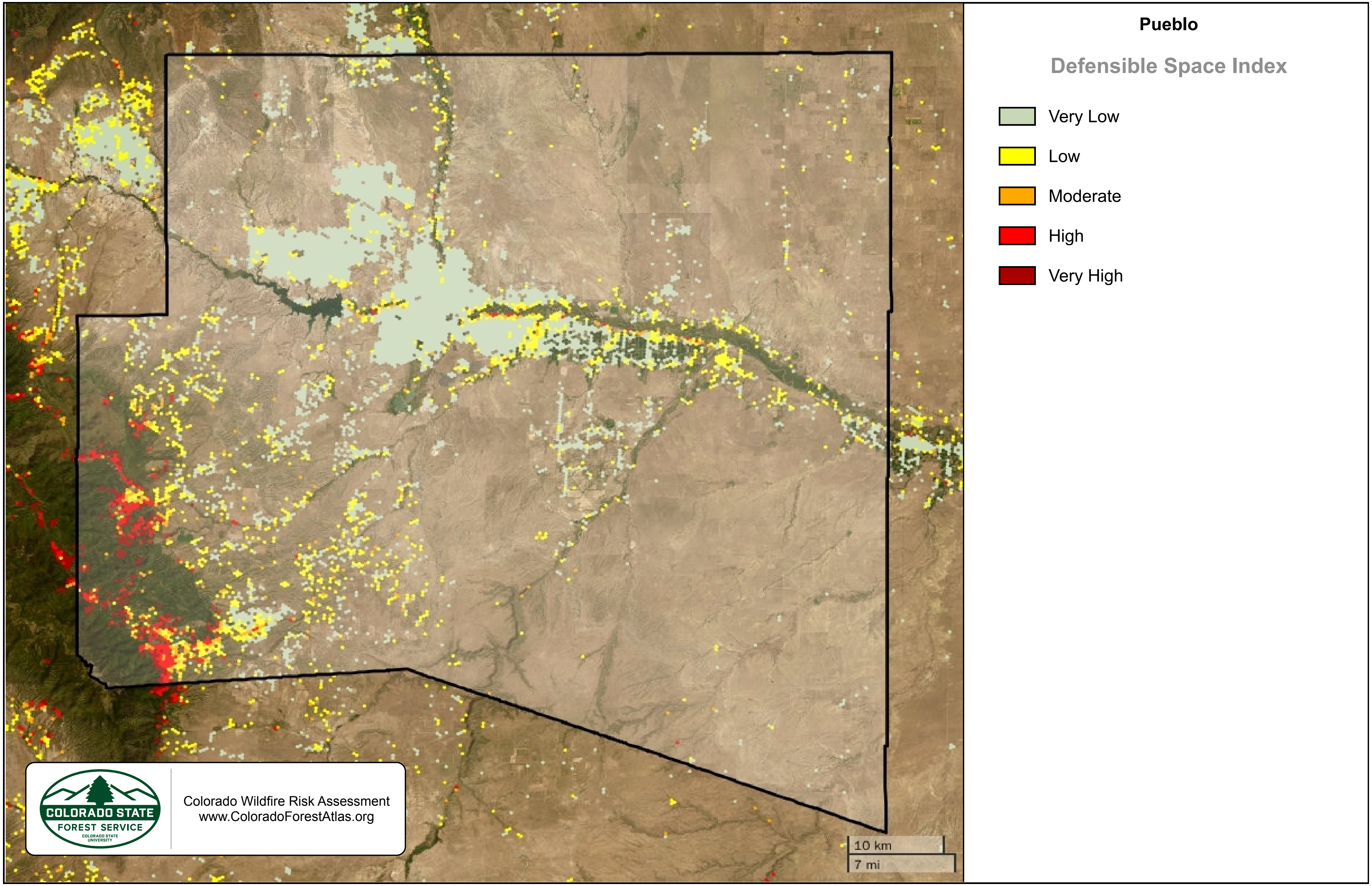
The defensible space in a Wildfire Urban Interface (WUI) analysis context refers to the space that surrounds a specific building and can be used to define the hazard, or the exposure, to a wildfire occurrence. In this area, natural and manmade fuels are treated, cleared or reduced to slow the spread of wildfire near structures.

Individual building footprints were used to identify structure locations. Buildings were then grouped using Uber's hexagonal hierarchical spatial index. Within each hexagon, the building values were averaged and applied to the hexagon to remove building specific metrics. This provides a detailed measure of defensible space characteristics for small areas consistent with the accuracy of the structure locations and wildfire fuels and risk analysis data.

Each hexagon in the defensible space risk has a relative value from 0 to 1 that represents the average building hazard in that hexagon. This defensible space value is based on three spatial components/variables: 1) canopy cover, 2) slope, and 3) fuel models present within the buffer around the buildings analyzed.

Defensible Space Index	Acres	Percent
Very Low	112,702	65.9%
Low	38,862	22.7%
Moderate	7,496	4.4%
High	7,474	4.4%
Very High	4,457	2.6%
Total	**170,992**	**100%**


Defensible Space Index
Pueblo
Acres
120000
110000
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
112,702
38,862
7,496
7,474
4,457
Very Low
Low
Moderate
High
Very High


Pueblo
Defensible Space Index
Very Low
Low
Moderate
High
Very High
COLORADO STATE
FOREST SERVICE
Colorado Wildfire Risk Assessment
www.ColoradoForestAtlas.org
10 km
7 mi

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COLORADO STATE FOREST SERVICE
COLORADO STATE UNIVERSITY

11 Annex E – FEMA Hazus Earthquake Risk Report

Hazus: Earthquake Global Risk Report

Region Name: PuebloCounty_CO

Earthquake Scenario: PC_PROBABILISTIC_M5_2500YR_CT

Print Date: October 16, 2023

Table of Contents

General Description of the Region

Hazus-MH is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 1 county(ies) from the following state(s):

Colorado

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 2,395.36 square miles and contains 58 census tracts. There are over 67 thousand households in the region which has a total population of 168,162 peopleF. The distribution of population by Total Region and County is provided in Appendix B.

There are an estimated 70 thousand buildings in the region with a total building replacement value (excluding contents) of 24,995 (millions of dollars). Approximately 89.00 % of the buildings (and 56.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 5,032 and 13,003 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 70 thousand buildings in the region which have an aggregate total replacement value of 24,995 (millions of dollars) . Appendix B provides a general distribution of the building value by Total Region and County.

In terms of building construction types found in the region, wood frame construction makes up 65% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 6 hospitals in the region with a total bed capacity of 1,700 beds. There are 72 schools, 24 fire stations, 7 police stations and 1 emergency operation facilities. With respect to high potential loss facilities (HPL), there are no dams identified within the inventory. The inventory also includes no hazardous material sites, no military installations and no nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 18,035.00 (millions of dollars). This inventory includes over 281.48 miles of highways, 262 bridges, 6,597.10 miles of pipes.

Table 1: Transportation System Lifeline Inventory

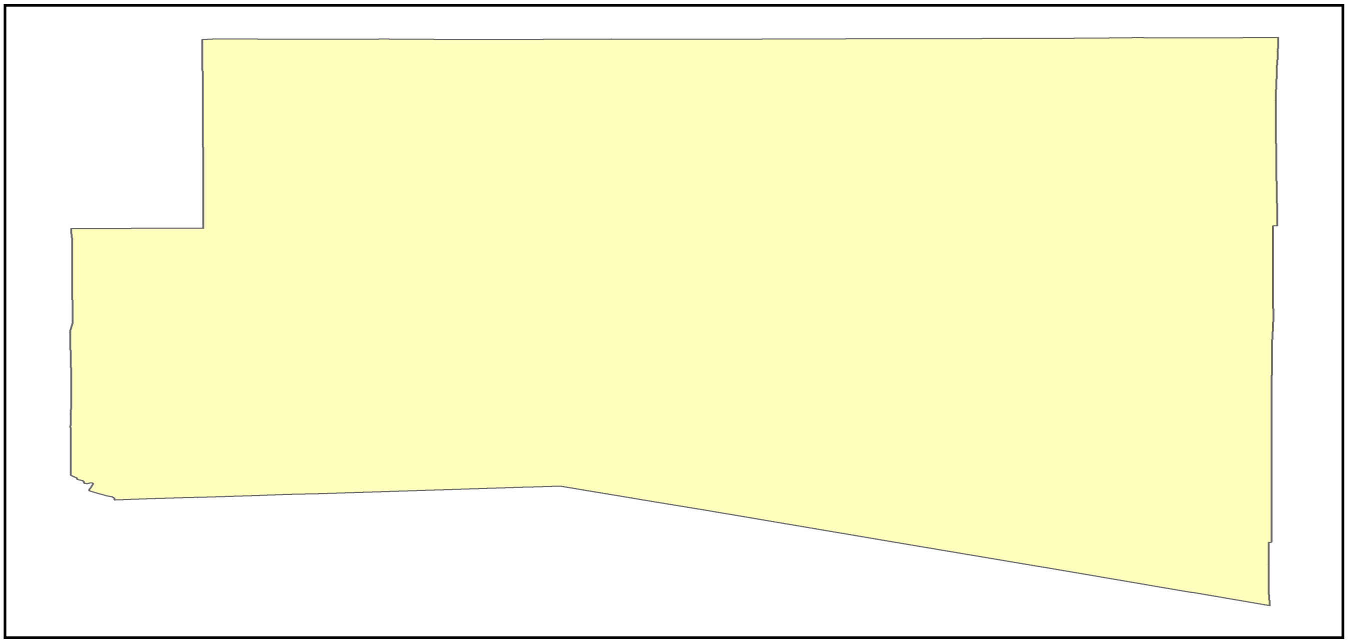
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	262	673.3875
	Segments	104	2508.3600
	Tunnels	1	1.4797
		Subtotal	**3183.2272**
Railways	Bridges	114	502.7400
	Facilities	0	0.0000
	Segments	183	1305.6311
	Tunnels	0	0.0000
		Subtotal	**1808.3711**
Light Rail	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	0	0.0000
	Tunnels	0	0.0000
		Subtotal	**0.0000**
Bus	Facilities	1	1.7349
		Subtotal	**1.7349**
Ferry	Facilities	0	0.0000
		Subtotal	**0.0000**
Port	Facilities	0	0.0000
		Subtotal	**0.0000**
Airport	Facilities	1	1.0360
	Runways	3	38.5596
		Subtotal	**39.5956**
		Total	**5,032.90**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	130.9519
	Facilities	1	32.3010
	Pipelines	0	0.0000
		Subtotal	**163.2529**
Waste Water	Distribution Lines	NA	78.5711
	Facilities	8	1066.1616
	Pipelines	0	0.0000
		Subtotal	**1144.7327**
Natural Gas	Distribution Lines	NA	52.3808
	Facilities	0	0.0000
	Pipelines	10	343.9935
		Subtotal	**396.3743**
Oil Systems	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**0.0000**
Electrical Power	Facilities	5	11298.5147
		Subtotal	**11298.5147**
Communication	Facilities	11	1.0670
		Subtotal	**1.0670**
		Total	**13,003.90**

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	PC_PROBABILISTIC_M5_2500YR_CT
Type of Earthquake	Probabilistic
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	2,500.00
Longitude of Epicenter	NA
Latitude of Epicenter	NA
Earthquake Magnitude	5.00
Depth (km)	NA
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	NA

Building Damage

Hazus estimates that about 1,459 buildings will be at least moderately damaged. This is over 2.00 % of the buildings in the region. There are an estimated 5 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage Categories by General Occupancy Type

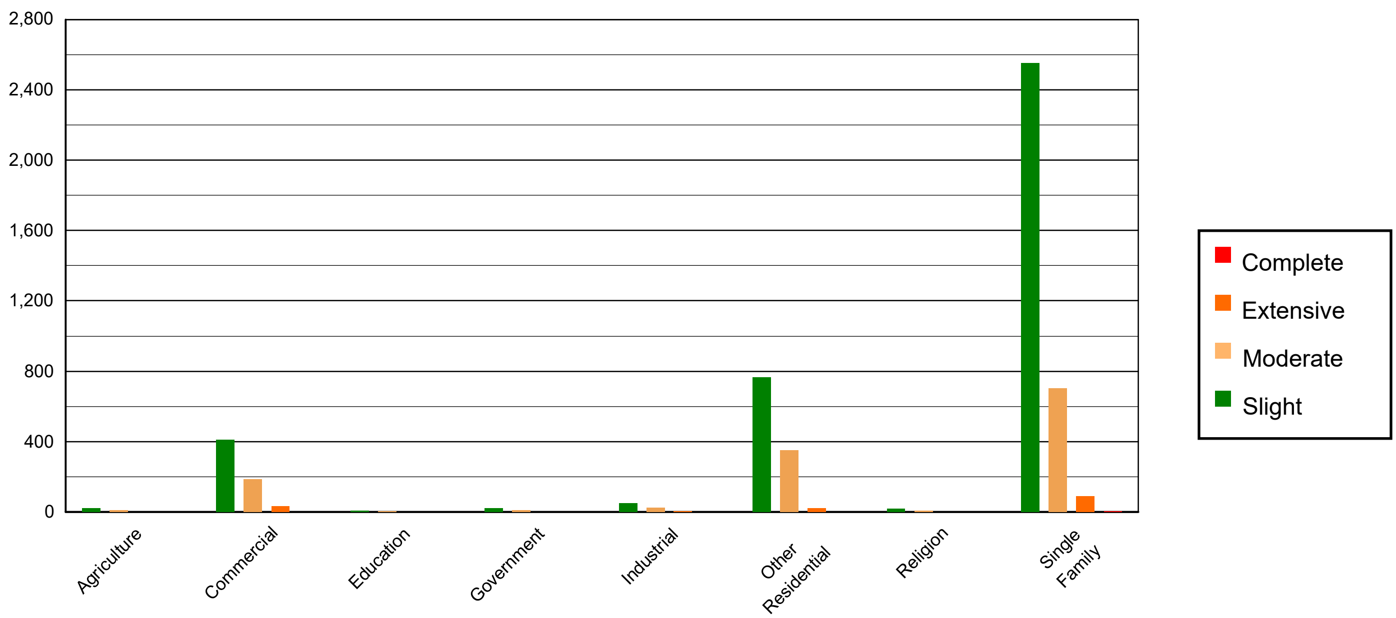


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	313.01	0.48	21.12	0.55	10.16	0.78	1.67	1.09	0.04	0.77
Commercial	5218.94	7.97	409.56	10.65	187.15	14.38	31.25	20.41	1.11	20.97
Education	93.44	0.14	6.29	0.16	2.85	0.22	0.41	0.26	0.01	0.26
Government	347.88	0.53	23.16	0.60	9.73	0.75	1.19	0.78	0.04	0.73
Industrial	602.15	0.92	50.85	1.32	25.51	1.96	4.40	2.87	0.09	1.68
Other Residential	7862.60	12.01	766.54	19.93	352.33	27.08	21.18	13.83	0.35	6.64
Religion	263.87	0.40	16.95	0.44	7.20	0.55	0.94	0.61	0.03	0.66
Single Family	50743.90	77.54	2552.32	66.35	706.09	54.27	92.08	60.14	3.61	68.30
Total	**65,446**		**3,847**		**1,301**		**153**		**5**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	44019.11	67.26	2021.86	52.56	253.97	19.52	9.71	6.34	0.00	0.00
Steel	1325.89	2.03	95.70	2.49	51.33	3.95	7.11	4.64	0.14	2.62
Concrete	1445.27	2.21	113.29	2.94	42.55	3.27	3.58	2.34	0.03	0.49
Precast	1100.33	1.68	93.70	2.44	71.73	5.51	16.37	10.69	0.14	2.56
RM	11889.23	18.17	656.52	17.07	419.27	32.23	65.91	43.04	0.00	0.00
URM	1827.11	2.79	292.76	7.61	160.02	12.30	35.68	23.30	4.85	91.70
MH	3838.85	5.87	572.96	14.89	302.16	23.22	14.75	9.63	0.14	2.62
Total	**65,446**		**3,847**		**1,301**		**153**		**5**	

*Note:

RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 1,700 hospital beds available for use. On the day of the earthquake, the model estimates that only 1,405 hospital beds (83.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 93.00% of the beds will be back in service. By 30 days, 99.00% will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	6	0	0	6
Schools	72	0	0	72
EOCs	1	0	0	1
PoliceStations	7	0	0	7
FireStations	24	0	0	24

Transportation Lifeline Damage

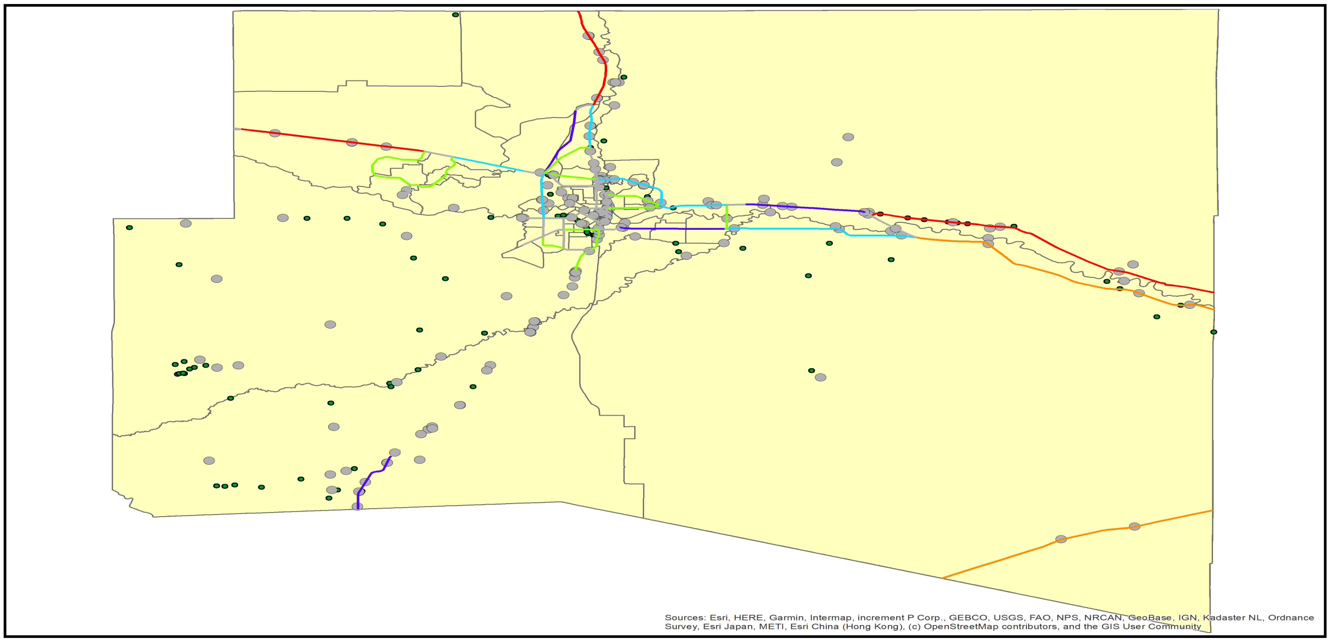


Table 6: Expected Damage to the Transportation Systems

System	Component	Number of Locations_				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	104	0	0	104	104
	Bridges	262	0	0	262	262
	Tunnels	1	0	0	1	1
Railways	Segments	183	0	0	183	183
	Bridges	114	0	0	114	114
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	1	0	0	1	1
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	1	0	0	1	1
	Runways	3	0	0	3	3

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	1	0	0	1	1
Waste Water	8	0	0	8	8
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	5	0	0	5	5
Communication	11	0	0	11	11

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	4,068	31	8
Waste Water	2,441	16	4
Natural Gas	88	0	0
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	67,095	0	0	0	0	0
Electric Power		0	0	0	0	0

Induced Earthquake Damage

Fire Following Earthquake

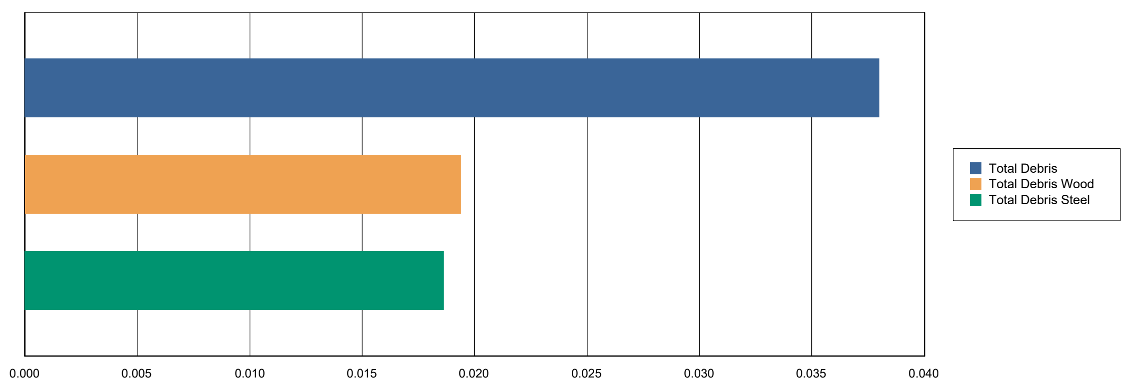
Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 0 ignitions that will burn about 0.00 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 0 people and burn about 0 (millions of dollars) of building value.

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 38,000 tons of debris will be generated. Of the total amount, Brick/Wood comprises 51.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 1,520 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)



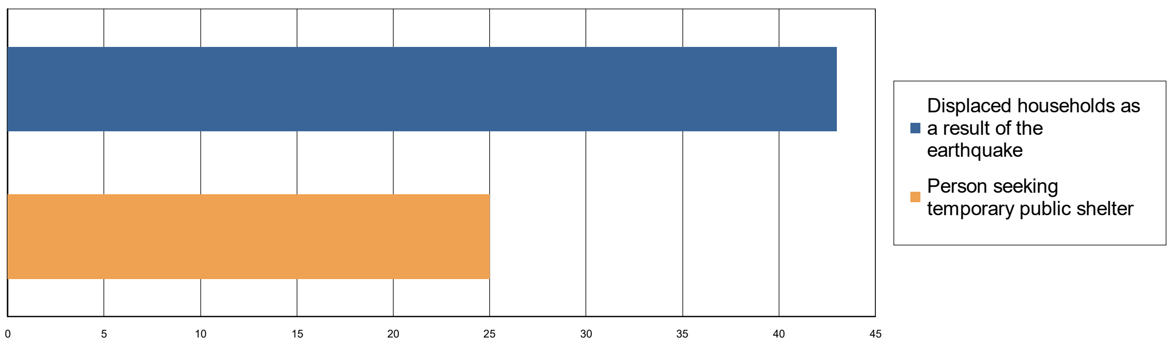
Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
0.02	0.02	0.04	1,520 (@25 tons/truck)

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 43 households to be displaced due to the earthquake. Of these, 25 people (out of a total population of 168,162) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter



Displaced households as a result of the earthquake	Persons seeking temporary public shelter
43	25

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described 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 provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	0.23	0.03	0.00	0.00
	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	0.15	0.02	0.00	0.00
	Other-Residential	5.24	0.50	0.01	0.03
	Single Family	10.74	1.13	0.07	0.13
	Total	**16**	**2**	**0**	**0**
2 PM	Commercial	15.22	1.79	0.11	0.20
	Commuting	0.00	0.00	0.00	0.00
	Educational	5.52	0.64	0.04	0.07
	Hotels	0.00	0.00	0.00	0.00
	Industrial	1.09	0.12	0.00	0.01
	Other-Residential	1.61	0.15	0.00	0.01
	Single Family	3.46	0.38	0.02	0.04
	Total	**27**	**3**	**0**	**0**
5 PM	Commercial	10.31	1.22	0.08	0.14
	Commuting	0.00	0.00	0.00	0.00
	Educational	1.01	0.12	0.01	0.01
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.68	0.07	0.00	0.01
	Other-Residential	1.92	0.19	0.01	0.01
	Single Family	4.13	0.45	0.03	0.05
	Total	**18**	**2**	**0**	**0**

Economic Loss

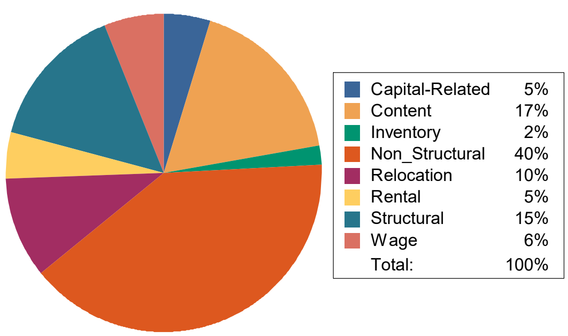
The total economic loss estimated for the earthquake is 455.57 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

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

The total building-related losses were 178.87 (millions of dollars); 26 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 38 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

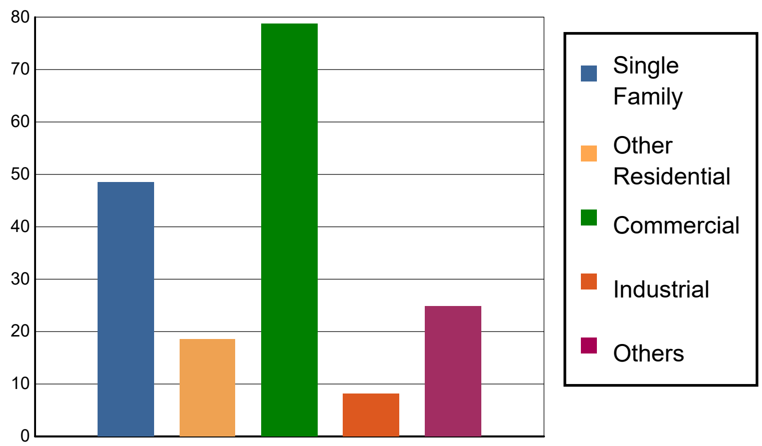


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	0.8893	8.6112	0.2125	1.3316	11.0446
	Capital-Related	0.0000	0.3784	7.8944	0.1271	0.2769	8.6768
	Rental	1.4221	1.3113	5.2620	0.0691	0.5077	8.5722
	Relocation	5.1131	1.3927	7.5278	0.4222	3.7884	18.2442
	Subtotal	**6.5352**	**3.9717**	**29.2954**	**0.8309**	**5.9046**	**46.5378**
Capital Stock Losses							
	Structural	8.1766	2.6027	10.7763	1.1757	3.2989	26.0302
	Non_Structural	25.6304	9.7892	23.4519	3.4644	9.6016	71.9375
	Content	8.1644	2.2229	12.8557	2.2028	5.7685	31.2143
	Inventory	0.0000	0.0000	2.3736	0.4584	0.3196	3.1516
	Subtotal	**41.9714**	**14.6148**	**49.4575**	**7.3013**	**18.9886**	**132.3336**
	Total	**48.51**	**18.59**	**78.75**	**8.13**	**24.89**	**178.87**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	2508.3600	0.0000	0.00
	Bridges	673.3875	0.0504	0.01
	Tunnels	1.4797	0.0001	0.01
	Subtotal	**3183.2272**	**0.0505**	
Railways	Segments	1305.6311	0.0000	0.00
	Bridges	502.7400	0.0003	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**1808.3711**	**0.0003**	
Light Rail	Segments	0.0000	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Bus	Facilities	1.7349	0.0727	4.19
	Subtotal	**1.7349**	**0.0727**	
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	1.0360	0.0434	4.19
	Runways	38.5596	0.0000	0.00
	Subtotal	**39.5956**	**0.0434**	
	Total	**5,032.93**	**0.17**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	32.3010	0.3476	1.08
	Distribution Lines	130.9519	0.1393	0.11
	Subtotal	**163.2529**	**0.4869**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	1066.1616	11.9617	1.12
	Distribution Lines	78.5711	0.0700	0.09
	Subtotal	**1144.7327**	**12.0317**	
Natural Gas	Pipelines	343.9935	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	52.3808	0.0240	0.05
	Subtotal	**396.3743**	**0.0240**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Electrical Power	Facilities	11298.5147	263.9680	2.34
	Subtotal	**11298.5147**	**263.9680**	
Communication	Facilities	1.0670	0.0236	2.21
	Subtotal	**1.0670**	**0.0236**	
	Total	**13,003.94**	**276.53**	

Appendix A: County Listing for the Region

Pueblo,CO

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Colorado					
	Pueblo	168,162	14,111	10,884	24,995
Total Region		**168,162**	**14,111**	**10,884**	**24,995**

12 Annex F - Meeting Agendas and Participants

Pueblo County Hazard Mitigation Plan
2023 Update

HMP Pre Kickoff Meeting

Friday October 28, 2022 / 2:00 -3:30 PM
Virtual (via Teams): Click here to join the meeting
Meeting ID: 244 845 674 288 / Passcode: WrxWgU / Dial-In: 872.242.8065

Agenda

1. Schedule
2. Adoptees (**previous adoptee**)
    a. **Pueblo County, City of Pueblo**, Towns of Boone and Rye
    b. **Pueblo West** and Colorado City Metropolitan Districts; the Board of Public Water Works and **St. Charles Mesa Water District**
    c. Beulah Fire Protection and Ambulance District and **Rye Fire Protection District**
3. Roster - new FEMA requirements
4. Comments on existing plan
5. In kind tracking
6. Ongoing planning / recent hazard data-studies?
7. Communication preferences
8. Working .doc / FEMA past comments?
9. Hazards to profile
10. Past hazard events
11. Public engagement
12. Current FEMA/CSFS grants in progress?
13. HHPD interest?
14. CWPP

Post-Meeting Requests

- Schedule 'executive' and 'planning team' kickoff meetings
- County to compile initial roster / Synergy to share spreadsheet

QUESTIONS, COMMENTS, CONCERNS? –

CONTACT SYNERGY DISASTER RECOVERY'S PROJECT MANAGER

MICHAEL GARNER: 303.710.9498 | MGARNER@SYNERGY-DR.COM

Pueblo County Sheriff
David J. Lucero

November 3rd, 2022

Senior Government Officials,

As the Pueblo County Sheriff and Emergency Manager, I invite you to attend our annual stakeholder and kickoff meeting for the update to our county's multi-jurisdictional hazard mitigation plan (HMP). The meeting will take place on Monday, November 21st, 2022, at the Pueblo County Sheriff's Office - Emergency Services Center, 101 W. 10th Street Pueblo, CO 81003. The meeting/lunch will begin at 11:30 am and will conclude by 1:00 pm.

Agenda:

Lunch
Introductions
Emergency Management update
Chemical Stockpile Emergency Preparedness Program update
Pueblo County HMP**

**The Pueblo County HMP is an informational meeting designed to educate local governments on the planning project, highlighting the resulting benefits of this community planning process. As senior community officials you all play a significant role in implementing hazard mitigation, as we work together to build a stronger and more resilient whole-community.

We look forward to seeing you on November 21st, 2022, as we host our annual stakeholder meeting and kickoff our HMP process.

Yours in Service,

David J. Lucero

David J. Lucero
Sheriff

DJL/cb

CC: File

909 Court Street • Pueblo, CO 81003 • E-mail sheriff@pueblocounty.us
Law Enforcement 719.583.6125 • Detention 719.583.6135 • Emergency Services 719.583.6200

People Activity Report Summary

Assignment	Time In	Time Out	Assigned Time	Total Time
Colorado (Colorado)				
Baca, Sam (221121200959804)				
Checked In	11/21/2022 1:10:20 PM	11/21/2022 4:55:30 PM	3:45:09	3:45:09
Checked Out	11/21/2022 4:55:30 PM	11/21/2022 4:55:34 PM	0:00:05	3:45:14
Bennett, Annmarie (221121213346226)				
Checked In	11/21/2022 2:33:59 PM	11/21/2022 4:53:19 PM	2:19:21	2:19:21
Checked Out	11/21/2022 4:53:19 PM	11/21/2022 4:55:34 PM	0:02:15	2:21:36
Bradley, Chuck (221121200647640)				
Checked In	11/21/2022 1:07:47 PM	11/21/2022 2:53:46 PM	1:45:59	1:45:59
Checked Out	11/21/2022 2:53:46 PM	11/21/2022 4:55:34 PM	2:01:49	3:47:48
Breckenridge, Crystal (221121182339601)				
Checked In	11/21/2022 11:23:51 AM	11/21/2022 2:35:55 PM	3:12:03	3:12:03
Checked Out	11/21/2022 2:35:55 PM	11/21/2022 4:55:34 PM	2:19:40	5:31:43
Bryant, Steve (221121182155650)				
Checked In	11/21/2022 11:22:02 AM	11/21/2022 2:36:23 PM	3:14:22	3:14:22
Checked Out	11/21/2022 2:36:23 PM	11/21/2022 4:55:34 PM	2:19:11	5:33:33
Carillo, Jody (221121200839410)				
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Checked Out	11/21/2022 4:55:05 PM	11/21/2022 4:55:34 PM	0:00:29	3:46:44
Caserta, Brian (221121201042346)				
Checked In	11/21/2022 1:10:58 PM	11/21/2022 2:54:16 PM	1:43:17	1:43:17
Checked Out	11/21/2022 2:54:16 PM	11/21/2022 4:55:34 PM	2:01:19	3:44:36
Casias, Kayana (221121213155259)				
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Checked Out	11/21/2022 4:53:50 PM	11/21/2022 4:55:34 PM	0:01:45	2:23:25
Denardo, Denise (221121212613459)				
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Draper, Katherine (221121181837716)				
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Eccher, Jim (221121181825566)				
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Checked Out	11/21/2022 2:36:03 PM	11/21/2022 4:55:34 PM	2:19:32	5:36:58
Elliott, Neil (221121200946359)				
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Everate, Randy (221121182203917)				
Checked In	11/21/2022 11:22:20 AM	11/21/2022 2:35:39 PM	3:13:18	3:13:18
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Farrell, Patrick (221121200827173)				
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Flores`, Pam (221121212714217)				
Checked In	11/21/2022 2:27:24 PM	11/21/2022 4:54:29 PM	2:27:05	2:27:05

People Activity Report Summary

Checked Out	11/21/2022 4:54:29 PM	11/21/2022 4:55:34 PM	0:01:05	2:28:10
Gage, Justin (221121201020857)				
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Gonzales, Fudge (221121212700156)				
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Gradisar, Nicholas (221121183505185)				
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Hernandez, Helen (221121212746682)				
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Huber, Barbara (221121181857616)				
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Johnson, Josh (221121200810447)				
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Checked Out	11/21/2022 2:53:58 PM	11/21/2022 4:55:34 PM	2:01:37	3:47:09
Kochen, Hanah (221121213210035)				
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Checked Out	11/21/2022 2:53:06 PM	11/21/2022 4:55:34 PM	2:02:29	3:32:43
Lowe, Austin (221121200923085)				
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Checked Out	11/21/2022 2:53:24 PM	11/21/2022 4:55:34 PM	2:02:11	3:46:00
Lucero, Dave (221121183141635)				
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Mcgarth, Martin (221121182405334)				
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Mears, Mark (221121200747987)				
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Meastas, Miranda (221121200900029)				

People Activity Report Summary

Checked In	11/21/2022 1:09:22 PM	11/21/2022 2:53:32 PM	1:44:10	1:44:10
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Noeller, Steven (221121183323098)				
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Checked Out	11/21/2022 2:37:27 PM	11/21/2022 4:55:34 PM	2:18:07	5:21:20
Penndleton, Crystal (221121213359120)				
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Checked Out	11/21/2022 4:53:26 PM	11/21/2022 4:55:34 PM	0:02:08	2:21:23
Perez, Claudia (221121212821159)				
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Checked Out	11/21/2022 4:54:13 PM	11/21/2022 4:55:34 PM	0:01:22	2:27:02
Perez, Gayle (221121200935549)				
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Checked Out	11/21/2022 2:53:40 PM	11/21/2022 4:55:34 PM	2:01:55	3:45:50
Rodriguez, Stephen (221121182935318)				
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Checked Out	11/21/2022 2:36:10 PM	11/21/2022 4:55:34 PM	2:19:24	5:25:47
Solano, Laura (221121182250866)				
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Soles, Allyssa (221121213001980)				
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Checked Out	11/21/2022 4:53:56 PM	11/21/2022 4:55:34 PM	0:01:39	2:25:21
speier, Dee (221121212849471)				
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Checked Out	11/21/2022 4:54:19 PM	11/21/2022 4:55:34 PM	0:01:16	2:26:34
Telfer, Maria (221121212948125)				
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Tracy, Brenda (221121213323606)				
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Checked Out	11/21/2022 4:53:35 PM	11/21/2022 4:55:34 PM	0:02:00	2:21:49
Vasquez, Fernando (221121150316148)				
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Velasquez, Patricia (221121212901345)				
Checked In	11/21/2022 2:29:12 PM	11/21/2022 4:54:07 PM	2:24:55	2:24:55
Checked Out	11/21/2022 4:54:07 PM	11/21/2022 4:55:34 PM	0:01:27	2:26:22
Welcow, Corrie (221121212803503)				
Checked In	11/21/2022 2:28:19 PM	11/21/2022 4:54:24 PM	2:26:05	2:26:05
Checked Out	11/21/2022 4:54:24 PM	11/21/2022 4:55:34 PM	0:01:10	2:27:15
Yougren, Justin (221121181526977)				
Checked In	11/21/2022 11:16:10 AM	11/21/2022 2:34:53 PM	3:18:42	3:18:42
Checked Out	11/21/2022 2:34:53 PM	11/21/2022 4:55:34 PM	2:20:42	5:39:24
		Colorado	**Total Time**	**169:29:00**

AGENDA

PUEBLO AREA COUNCIL OF GOVERNMENTS

THURSDAY, DECEMBER 8, 2022

12:15 P.M. TO 1:30 P.M.

PUEBLO COUNTY DEPARTMENT OF EMERGENCY MANAGEMENT
101 WEST 10TH STREET, FIRST FLOOR CONFERENCE ROOM

THE PUEBLO AREA COUNCIL OF GOVERNMENTS' (PACOG) MEETING WILL BE HELD IN PERSON AND VIRTUALLY VIA ZOOM (SEE LINK BELOW).

Join Zoom Meeting
https://zoom.us/j/98163938159

Meeting ID: **981 6393 8159**

Dial by your location
+1 253 215 8782 US (Tacoma)
+1 346 248 7799 US (Houston)
+1 669 900 6833 US (San Jose)

ROLL CALL

PUBLIC COMMENTS (Citizen Comments)

CONSENT ITEMS (Carmen Howard, Manager):

1 Minutes of October 27, 2022 Meeting
Action Required: Approve/Amend as Mailed

2 Treasurer's Report
Action Required: Receive and File October 2022 Financial Report
(If you have any questions, please contact Todd Mihelich, MGPM, PC, at 543-0516 prior to the meeting.)

3 A Resolution Retaining the Services of McPherson, Goodrich, Paolucci, and Mihelich, PC to Perform Bookkeeping Services for the Pueblo Area Council of Governments for FY 2023
Action Required: Approve/Disapprove

4 A Resolution Adopting the State Fiscal Year 2023-2027 Pueblo Area Council of Governments' Regional Transportation Improvement Program (TIP) for the Pueblo Metropolitan Planning Organization (MPO) and the Pueblo Transportation Planning Region (TPR); Colorado Department of Transportation (CDOT)
Action Required: Approve/Disapprove

***REGULAR ITEMS*:**

PACOG BUDGET HEARING

The Pueblo Area Council of Governments will hold a public hearing regarding its proposed 2023 budget. The budget proposal is set forth in the resolutions listed in Regular Items 1-3. A notice of the public hearing and the availability of the proposed budget was published in the Pueblo Chieftain on November 23, 2022.

1 A Resolution Approving a Budget for the Pueblo Area Council of Governments (PACOG) for Fiscal Year 2023 (Garrison Ortiz, PACOG Budget Committee)
Action Required: Approve/Disapprove

2 A Resolution Directing the Pueblo County Planning and Development Department to Implement the FY 2023 Work Program and Appropriating Funds for Said Work Program (Garrison Ortiz, PACOG Budget Committee)
Action Required: Approve/Disapprove

3 A Resolution Approving the Pueblo Area Council of Governments' (PACOG) FY 2023 Membership Contribution Schedule for Administration and Insurance Activities (Garrison Ortiz, PACOG Budget Committee)
Action Required: Approve/Disapprove

4 Chairperson's Report:

A) Lunch Appreciation
Action Required: Thank You to the Pueblo City Council for Providing Lunch
B) Presentation of Plaque to Outgoing Member (Chris Wiseman)
Action Required: Plaque Presentation
C) Selection of PACOG Nominating Committee for 2023 Officers
Action Required: Appoint Members

5 Manager's Report: (Carmen Howard)

A) ADA Advisory Committee Minutes
Action Required: Information Only
B) 2023 PACOG Meeting Date Schedule
Action Required: Information Only

6 A Resolution Approving a Site Application for Upgrade of an Existing Wastewater Treatment Facility to Replace Aeration Equipment and Decrease Capacity at the Arkansas Point Wastewater Treatment Facility at Lake Pueblo, Pueblo County, Colorado (Carmen Howard, PACOG Manager)
Action Required: Approve/Disapprove

7 Hazard Mitigation Plan Update (Josh Johnson, Pueblo County Emergency Management Coordinator)
Action Required: Presentation

REGULAR ITEMS (CONT.):

8 Review of Draft Grant Navigator Contract (Sabina Genesio, County Manager and PACOG Co-Executive Director)
Action Required: Discussion/Authorization of Chair to sign contract when vendor is selected

9 Possible Renaming of Pueblo Boulevard to Martin Luther King, Jr. Boulevard (Garrison Ortiz, County Commissioner)
Action Required: Discussion

10 Transportation Commissioner or CDOT Region 2 Director's Report (Terry Hart or Ajin Hu)

11 State Transportation Advisory Committee (STAC) Update (Chris Wiseman, PACOG STAC Representative)

12 Status on Front Range Passenger Rail District (Dennis Flores, PACOG Front Range Passenger Rail District Representative)

13 MPO Staff Report (Eva Cosyleon, MPO Manager):

A) Greenhouse Gas 101 (Libba Rollins or Theresa Takushi, GHG Specialists, CDOT)
Action Required: Presentation

B) FY 2022-2025 Transportation Improvement Program
CDOT Region 2 Request(s) for PACOG MPO/TPR TIP Amendment(s)
Administrative Notification of Roll Forward Project Funding or TIP/STIP Policy Amendment(s) in the MPO and TPR Area(s)
Action Required: Informational

Project Name: **U.S. 50 West Construction at Purcell**
STIP Number: SPB7004.999
Project Location and Description: **Drainage Pond G**
Fund Source(s): **FY 2023 Permanent Water Quality Funds**

Federal Program Funds:	$592,000
State Matching Funds:	$ 0
Local Matching Funds:	$ 0
Other Project Funds:	$...........0
TOTAL PROJECT FUND AMENDMENT:	**$592,000**

Advancing Funds: CDOT Region 2 is asking to add permanent water quality funds into Pond G construction on the U.S. 50 West project. The pond was constructed per the original design, but the elevation of the groundwater was higher than expected so a portion of the pond is currently below the groundwater level. The redesign has been completed so the contractor will be raising the pond about two feet. The area must be continuously dewatered in order for construction to continue. Unfortunately, the groundwater is contaminated and must be treated offsite. The PWQ funding is needed for the dewatering and offsite treatment of the groundwater.

C) Other Transportation Matters
Action Required: Discussion, if necessary

<u>REGULAR ITEMS (CONT.)</u>:

14 New Business

15 Future Agenda Items

ADJOURNMENT

LRS

(The next meeting of the Pueblo Area Council of Governments is to be held on Thursday, February 23, 2023, due to the cancellation of the January 26, 2023 meeting. It will be held at the County's Emergency Operations Center, 101 West 10th Street, 1st Floor Conference Room. The meeting will be held in-person and virtually via Zoom.)

<u>NOTE</u>: Following the regular PACOG meeting, there will be a joint meeting held between the Pueblo City Council and Board of County Commissioners to make one appointment to the Pueblo Regional Building Department's Building Board of Appeals (General Contractor).

INDIVIDUALS REQUIRING SPECIAL ACCOMMODATIONS ARE REQUESTED TO NOTIFY PACOG AT (719) 553-2259 AT LEAST TWO (2) WORKING DAYS IN ADVANCE OF THE MEETING.

People Activity Report Summary

Assignment	Time In	Time Out	Assigned Time	Total Time
American Medical Response (081016200AMR)				
Lening, Michael (CO 92-132-7727)				
Checked In	12/8/2022 10:24:45 AM	12/8/2022 11:09:54 AM	0:45:09	0:45:09
Checked Out	12/8/2022 11:09:54 AM	12/9/2022 7:59:15 AM	20:49:21	21:34:30
		American Medical Response	**Total Time**	**21:34:30**
Colorado (Colorado)				
Bruestle, Donaldo (221208190834058)				
Checked In	12/8/2022 12:08:53 PM	12/8/2022 1:25:49 PM	1:16:57	1:16:57
Checked Out	12/8/2022 1:25:49 PM	12/9/2022 7:59:15 AM	18:33:25	19:50:22
Genesio, Sabina (221208190344657)				
Checked In	12/8/2022 12:03:53 PM	12/8/2022 1:26:16 PM	1:22:23	1:22:23
Checked Out	12/8/2022 1:26:16 PM	12/9/2022 7:59:15 AM	18:32:59	19:55:22
Griego, Eppie (221208190315711)				
Checked In	12/8/2022 12:03:42 PM	12/8/2022 1:26:36 PM	1:22:55	1:22:55
Checked Out	12/8/2022 1:26:36 PM	12/9/2022 7:59:15 AM	18:32:38	19:55:33
Hobson, Scott (221208191715726)				
Checked In	12/8/2022 12:17:28 PM	12/8/2022 1:26:42 PM	1:09:14	1:09:14
Checked Out	12/8/2022 1:26:42 PM	12/9/2022 7:59:15 AM	18:32:32	19:41:46
Howard, Carmen (221208190255607)				
Checked In	12/8/2022 12:03:13 PM	12/8/2022 1:27:05 PM	1:23:51	1:23:51
Checked Out	12/8/2022 1:27:05 PM	12/9/2022 7:59:15 AM	18:32:10	19:56:01
Martinez-Ortega, Victia (221208190522067)				
Checked In	12/8/2022 12:05:45 PM	12/8/2022 1:27:28 PM	1:21:43	1:21:43
Checked Out	12/8/2022 1:27:28 PM	12/9/2022 7:59:15 AM	18:31:46	19:53:29
Ortiz, Garison (221208190804156)				
Checked In	12/8/2022 12:08:23 PM	12/8/2022 1:27:33 PM	1:19:10	1:19:10
Checked Out	12/8/2022 1:27:33 PM	12/9/2022 7:59:15 AM	18:31:41	19:50:51
		Colorado	**Total Time**	**139:03:24**
Pueblo Rural Fire Protection Dist. (081010000010150)				
Atencio, Larry (221208185748878)				
Checked In	12/8/2022 11:57:57 AM	12/8/2022 1:25:43 PM	1:27:46	1:27:46
Checked Out	12/8/2022 1:25:43 PM	12/9/2022 7:59:15 AM	18:33:31	20:01:17
Caffosso, Mike (221208185532085)				
Checked In	12/8/2022 11:55:49 AM	12/8/2022 1:25:56 PM	1:30:06	1:30:06
Checked Out	12/8/2022 1:25:56 PM	12/9/2022 7:59:15 AM	18:33:19	20:03:25
Cosylen, Eva (221208185725764)				
Checked In	12/8/2022 11:57:48 AM	12/8/2022 1:26:02 PM	1:28:15	1:28:15
Checked Out	12/8/2022 1:26:02 PM	12/9/2022 7:59:15 AM	18:33:12	20:01:27
Gradashar, Nic (221208190052461)				
Checked In	12/8/2022 12:01:04 PM	12/8/2022 1:26:26 PM	1:25:22	1:25:22

People Activity Report Summary

Checked Out	12/8/2022 1:26:26 PM	12/9/2022 7:59:15 AM	18:32:48	19:58:10
Hochsteller, Harry (221208185506587)				
Checked In	12/8/2022 11:55:23 AM	12/8/2022 1:26:58 PM	1:31:34	1:31:34
Checked Out	12/8/2022 1:26:58 PM	12/9/2022 7:59:15 AM	18:32:17	20:03:51
Kelly, Jason (221208180027610)				
Checked In	12/8/2022 11:02:07 AM	12/8/2022 3:54:43 PM	4:52:36	4:52:36
Checked Out	12/8/2022 3:54:43 PM	12/9/2022 7:59:15 AM	16:04:31	20:57:07
Koaches, Darren (221208190005641)				
Checked In	12/8/2022 12:00:33 PM	12/8/2022 1:27:12 PM	1:26:39	1:26:39
Checked Out	12/8/2022 1:27:12 PM	12/9/2022 7:59:15 AM	18:32:03	19:58:42
Kovovesk, Dan (221208185828598)				
Checked In	12/8/2022 11:59:02 AM	12/8/2022 1:27:17 PM	1:28:14	1:28:14
Checked Out	12/8/2022 1:27:17 PM	12/9/2022 7:59:15 AM	18:31:58	20:00:12
Marquez, Lauie (221208172813488)				
Checked In	12/8/2022 10:28:37 AM	12/8/2022 1:27:23 PM	2:58:46	2:58:46
Checked Out	12/8/2022 1:27:23 PM	12/9/2022 7:59:15 AM	18:31:52	21:30:38
Mueller, Stephanie (221208185903985)				
Checked In	12/8/2022 11:59:17 AM	12/8/2022 3:10:19 PM	3:11:03	3:11:03
Checked Out	12/8/2022 3:10:19 PM	12/9/2022 7:59:15 AM	16:48:55	19:59:58
Phillips, Tracy (221208184531915)				
Checked In	12/8/2022 11:45:51 AM	12/8/2022 3:10:27 PM	3:24:37	3:24:37
Checked Out	12/8/2022 3:10:27 PM	12/9/2022 7:59:15 AM	16:48:47	20:13:24
Salazar, Louella (221208184554633)				
Checked In	12/8/2022 11:46:21 AM	12/8/2022 3:10:34 PM	3:24:13	3:24:13
Checked Out	12/8/2022 3:10:34 PM	12/9/2022 7:59:15 AM	16:48:41	20:12:54
Santos, Daniel (221208225417406)				
Checked In	12/8/2022 3:54:27 PM	12/8/2022 3:56:23 PM	0:01:56	0:01:56
Checked Out	12/8/2022 3:56:23 PM	12/9/2022 7:59:15 AM	16:02:52	16:04:48
Sanville, Andrew (221208184419552)				
Checked In	12/8/2022 11:44:43 AM	12/8/2022 3:10:40 PM	3:25:56	3:25:56
Checked Out	12/8/2022 3:10:40 PM	12/9/2022 7:59:15 AM	16:48:35	20:14:31
Tracy, Robert (98-131-0439)				
Checked In	12/8/2022 10:27:56 AM	12/8/2022 11:10:15 AM	0:42:18	0:42:18
Checked Out	12/8/2022 11:10:15 AM	12/9/2022 7:59:15 AM	20:49:00	21:31:18
Uhernik, Hannah (221208184017729)				
Checked In	12/8/2022 11:40:32 AM	12/8/2022 1:27:43 PM	1:47:11	1:47:11
Checked Out	12/8/2022 1:27:43 PM	12/9/2022 7:59:15 AM	18:31:32	20:18:43
		Pueblo Rural Fire Protection Dist.	**Total Time**	**321:10:25**

Rye Fire Protection District (081016689510160)				
Bennett, Steven (92-018-1752)				
Checked In	12/8/2022 10:20:11 AM	12/8/2022 3:10:06 PM	4:49:56	4:49:56
Checked Out	12/8/2022 3:10:06 PM	12/9/2022 7:59:15 AM	16:49:08	21:39:04
Martinez`, Ed (221208172059851)				
Checked In	12/8/2022 10:21:07 AM	12/8/2022 11:09:59 AM	0:48:51	0:48:51
Checked Out	12/8/2022 11:09:59 AM	12/9/2022 7:59:15 AM	20:49:16	21:38:07
Scarlett, Meg (221208172422558)				
Checked In	12/8/2022 10:24:31 AM	12/8/2022 11:10:08 AM	0:45:37	0:45:37
Checked Out	12/8/2022 11:10:08 AM	12/9/2022 7:59:15 AM	20:49:07	21:34:44
		Rye Fire Protection District	**Total Time**	**64:51:55**

Pueblo County Hazard Mitigation Plan
2024 Update

HMP Kickoff Webinar
Tuesday, May 9, 2023 / 1:00-3:00 PM
In-person (encouraged):
Pueblo County Sheriff's Office - EOC
101 W. 10th Street, Pueblo, CO 81003

Virtual (via GoToMeeting):
https://meet.goto.com/PCSOCSEPP/hmp-update
Call in: 872.240.3212 / Code: 467-194-069

Agenda:

1. Hazard Mitigation Overview
2. Project Scope & Schedule
3. Roles & Responsibilities
4. Public Involvement Strategy
5. 2017 HMP Input
6. Recent Community Planning
7. Hazards to Profile
8. Recent Hazard Events
9. Lifelines
10. Mitigation Strategy
11. Mitigation Grant Funding
12. Next Steps
13. Mitigation Resources

Hazard Mitigation Planning Committee (HMPC) Post-Meeting Requests:

- Best Available Hazard Data & Reports
- Recent Community Plans
- HMPC Roster Additions
- Disseminate Public Engagement Content
- 2017 Mitigation Action Reporting
- Local Government Plan Update Guide

QUESTIONS, COMMENTS, CONCERNS? –

CONTACT PROJECT MANAGER MICHAEL GARNER AT ANY POINT THROUGHOUT THE PLANNING PROCESS:
303.710.9498 | MGARNER@SYNERGY-DR.COM

SYNERGY DISASTER RECOVERY

Kickoff Workshop - 5/9/2023

Name	Title	Organization	Email	Present
Adam Uhernik	Public Information Officer	Pueblo County Government	uhernik@pueblocounty.us	
Allison Waldvogel	Animal Logistics Manager	HSPPR-Pueblo	awaldvogel@hsppr.org	
Barb Huber	Fire Chief / Deputy Mayor	Pueblo City Fire	bhuber@pueblo.us	
Bob Tracy	Assistant Fire Chief	Pueblo Rural Fire Department	tracyprfd@gmail.com	
Brad Zerfas	St. Charles Dams #2 & #3	Evraz Inc.	Brad.Zerfas@evrazna.com	
Brian Caserta	Fire Chief	Pueblo West Fire Department	bcaserta@pwmd-co.us	
Brian Cotter	Pueblo County Coroner	Pueblo County Coroner's Ofc.	cotterb@pueblocounty.us	
Brian Lyons	Major	Colorado State Patrol	brian.lyons@state.co.us	
Britteny Ciarlo	Emergency Manager	Huerfano County	bciarlo@huerfano.us	
Bryan Ware	Fire Chief	Beulah Fire Protection District	Chief@socolo.net	
~~Bryce Boyer~~	~~Captain~~	~~Pueblo City Fire~~	~~bboyer@pueblo.us~~	
Carmen Howard	Director	Pueblo County Planning & Development	howardca@pueblocounty.us	
Chris Harner	Deputy Fire Chief	Pueblo City Fire	gharner@pueblo.us	
Chris Noeller	Police Chief	Pueblo Police Department	snoeller@pueblo.us	
Christe Coleman	Regional Field Manager	Colorado DHSEM	christe.coleman@state.co.us	✓
Christopher Kilpatrick	Lieutenant	Pueblo County Sheriff's Office	kilpatrick@pueblocounty.us	
Clifford Kindred	Captain	Pueblo County Sheriff's Office	kindred@pueblocounty.us	

Kickoff Workshop - 5/9/2023

Name	Title	Organization	Email	Present
Cori Tanner	Regional Disaster Services Manager	American Red Cross	cori.tanner@redcross.org	
Crystal Breckenridge	Mayor Pro Tem	Town of Boone	townofboone@yahoo.com	
Dan Kogovsek	City Attorney	City of Pueblo	dkogovsek@pueblo.us	
Danny Chavez	Emergency Manager	Otero County	em@oterogov.org	
Darren Koaches	Building Safety & Security Manager	Pueblo County Government	kochisdp@pueblocounty.us	
Dave Lucero	Pueblo County Sheriff	Pueblo County Sheriff's Office	Lucerod@pueblocounty.us	
Emily Palmer	Hazard Mitigation Planning Specialist	DHSEM	emily.palmer@state.co.us	
Eppie Griego	Commissioner	Pueblo County	griegoep@pueblocounty.us	
Felix Gallardo	Bureau Captain	Pueblo County Sheriff's Office	gallardf@pueblocounty.us	
Fiona Norby	Manager	CART	cart@hsppr.org	
Frank Ortega	Sergeant	Pueblo Police Department	fortega@pueblo.us	
Garrison Ortiz	Commissioner	Pueblo County	ortizga@pueblocounty.us	
Gavin Wolny	County Attorney	Pueblo County	wolnyg@pueblocounty.us	
Gayle Perez	Public Information Officer	Pueblo County Sheriff's Office	perezg@pueblocounty.us	OTP
Grant Genova	Captain	Pueblo Rural Fire Department	ggenova@puebloruralfire.com	
Harry Hochsteller	Treasurer	Colorado City Metro District		
Irene Merrifield	Mitigation Planning Lead	DHSEM	irene.merrifield@state.co.us	✓
Isaiah Goodreau	Plains Division Manager	San Isabel Gas	igoodreau@coloradonaturalgas.com	

Kickoff Workshop - 5/9/2023

Name	Title	Organization	Email	Present
James Buford	40TH St. Detention Basin	CDOT Region 2	JAMES.BUFORD@STATE.CO.US	
Jason Abney	Safety Officer	Parkview Medical Center	Jason_Abney@parkviewmc.com	
Jim Eccher	District Manager, Beckwith Dam	Colorado City Metro District	colocitymanager@ghvalley.net	
Jimmy Jenkins	Disaster Specialist	American Red Cross	jimmy.jenkins@redcross.org	
JJ King	Division Fire Chief	Pueblo West Fire Department	JKing@pwmd-co.us	
Joe Cervi	Public Relations Specialist	Board of Public Water Works	jcervi@pueblowater.org	
Joe Richards	Emergency Manager	Las Animas County	joe.richards@lasanimascounty.org	
John Grieve	Supervisory Forester	CSFS	john.grieve@colostate.edu	
John Reitan	Emergency Manager	Crowley County	john.reitan@crowleycounty.net	
Josh Johnson	Emergency Management Coordinator	Pueblo County Sheriff's Office	johnsonj@pueblocounty.us	
Justin Carbee	Safety Manager	Health Solutions	justinc@health.solutions	JC
Justin Yougren	Fire Chief	Red Creek Fire Department	my1chiropractor@yahoo.com	
Ken Espinoza	Deputy Pueblo County Coroner	Pueblo County Coroner's Office	espinoza@pueblocounty.us	
Ken Stroud	Emergency Manager	Lincoln County		
Kenny Rider	Captain	Pueblo Police Department	krider@pueblo.us	
Kevin Schaefer	CES Manager	American Medical Response	kevin.schaefer@gmr.net	KWS
Kim Jeffries	Communications Center Manager	Pueblo Police Department	kjeffries@pueblo.us	
Klint Skelly	Warning Meteorologist	National Weather Service Pueblo	klint.skelly@noaa.gov	KTS

Pueblo County Hazard Mitigation Plan Update

Kickoff Workshop - 5/9/2023

Name	Title	Organization	Email	Present
Larry Atencio	City Council Representative	City of Pueblo	latencio@pueblo.us	
Laura Solano	Pueblo Mayor Chief of Staff	City of Pueblo	Lsolano@pueblo.us	
Lee Hodge	Assistant DHS Director	Pueblo County DHS	lee.hodge@pueblocounty.us	
Lindsey Vigna	Animal Control Supervisor	HSPPR-Pueblo	lvigna@hsppr.org	
Lonnie Inzer	Emergency Manager	El Paso County	lonnieinzer@elpasoco.com	
Loraine Greenwood	CSEPP Program Manager - Medical	Pueblo Dept of Pub Health& Environ.	loraine.greenwood@pueblocounty.us	LG
Margaret Gaillard	Vice President of Operations	PEDCO	mgaillard@pedco.org	
Mark Mears	Bureau Chief	Pueblo County Sheriff's Office	mears@pueblocounty.us	
Marty Rahl	Mayor	Town of Rye	rye.town.clerk@gmail.com	
Michael Bayer	Safety Manager	School District 60	michael.bayer@pueblocityschools.us	
Michael R Tafoya	Captain	Colorado State Patrol	michaelr.tafoya@state.co.us	
Mike Cafasso	President/CEO	Centura St Mary-Corwin Hospital	michaelcafasso@centura.org	Nick Laydon
Mike Furney	Fire Chief	Pueblo Rural Fire Department	mfurney@puebloruralfire.com	
Mike Lening	Operations Manager	American Medical Response	mike_lening@gmr.net	
Monroe Robinson	Safety Officer	Pueblo School District 70	mrobinson@district70.org	
Mykel Kroll	Emergency Manager	Fremont County	mykel.kroll@fremontco.com	
Nick Gradisar	Pueblo Mayor	City of Pueblo	Ngradisar@pueblo.us	
Nick Laydon	Safety Officer	Centura Health - St. Mary Corwin	OrlandoLaydon@centura.org	NL

Pueblo County Hazard Mitigation Plan Update

Kickoff Workshop - 5/9/2023

Name	Title	Organization	Email	Present
Patrick Farrell	District Manager, St. Charles Mesa Dams #1 & #2	St. Charles Mesa Water Distrit	patrick.farrell@scmwd-pueblo.org	YES
Randy ~~Everett~~ Evetts	Director	Pueblo Dept of Pub Health& Environ.	evettsr@pueblocounty.us	RE
Ray Walsh	Deputy Emergency Manager	Huerfano County	rwalsh@huerfano.us	
Rich Belt	Comanche	Xcel Enegy	richard.L.Belt@xcelenergy.com	
Richard Garcia	Disaster Specialist	American Red Cross	richard.garcia@redcross.org	
Robyn Knappe	Emergency Manager	Custer County	Robyn@custercounty-co.gov	
Russ Drury	Business Development Manager	Black Hills Electric	russ.drury@blackhillscorp.com	
Sabina Genesio	County Manager	Pueblo County	genesios@pueblocounty.us	
Sadie Martinez	AFN Coordinator	DHSEM	sadie.martinez@state.co.us	
Shannon Monahan	Lake Isabel Dam	Dam Program Mgt - Rocky Mt. Region	Shannon.Monahan@usda.gov	
Shawnna Clementi	Communications Center Manager	Pueblo County Coroner's Office	clementi@pueblocounty.us	yes
Stephanie Garcia	Animal Control Supervisor	HSPPR-Pueblo	sgarcia@hsppr.org	
Steve Bennett	Fire Chief	Rye Fire Protection District	sbennett.ryefire@gmail.com	
Steve Bryant	Pueblo County Undersheriff	Pueblo County Sheriff's Office	Bryant@pueblocounty.us	
Steven Noeller	Chief	City of Pueblo Police Department	snoeller@pueblo.us	
Travis Bauer	Pueblo	U.S. Bureau of Reclamation	tbauer@usbr.gov	
Troy Puga	Deputy Coroner	Pueblo County Coroner's Ofc.	pugat@pueblocounty.us	

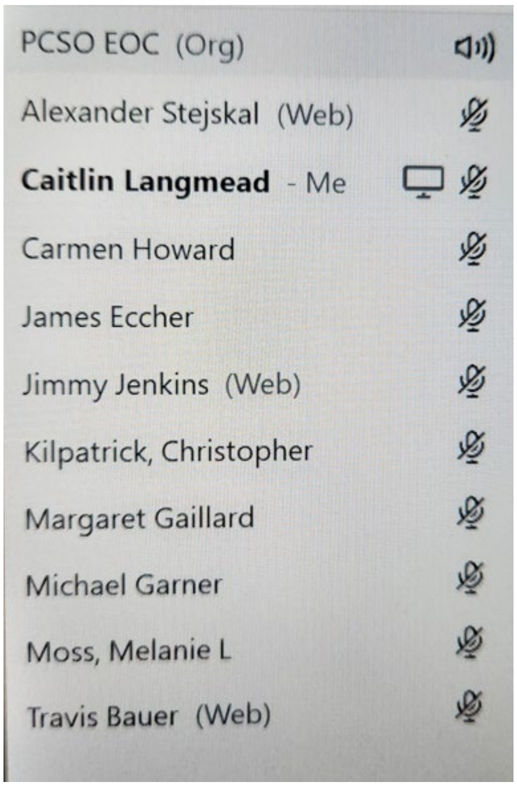
Kickoff Workshop - 5/9/2023

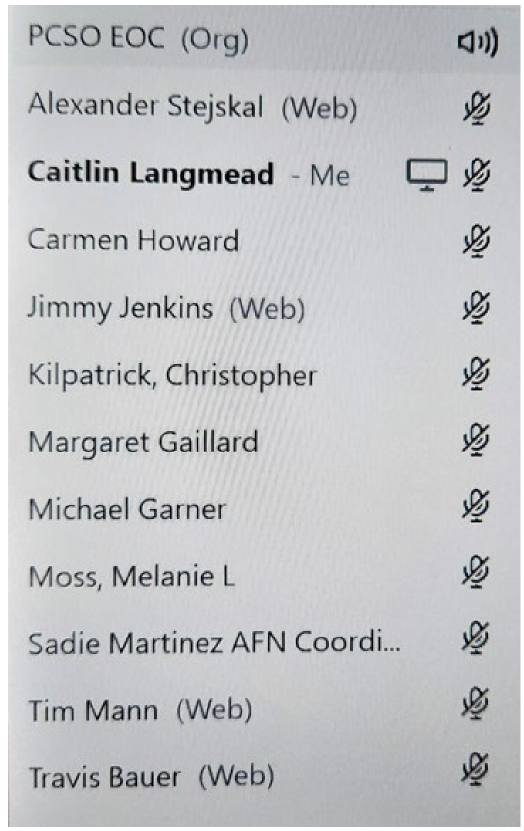
Name	Title	Organization	Email	Present
Darrel Kochis	Safety Mgr Pueblo County	Pueblo County	kochisdp@pueblocounty.us	✓
Irene Merrifield	Mitigation Planning	DHSEM		
Ronald Sasaoka	EPR Generalist	PDPHE	Ronald.Sasaoka@pueblocounty.us	
Felix Gallard	SR PCSO	PCSO	gallardf@pueblocounty.us	
Katie LaConte	Corporal	Pueblo Police Department	Klaconte@pueblo.us	✓

PUEBLO COUNTY HAZARD MITIGATION PLANNING

KICKOFF MEETING ONLINE ATTENDANCE

MAY 9th, 2023





Pueblo County Hazard Mitigation Plan 2024 Update

HMP Risk Assessment Workshop #2
Monday October 23, 2023 / 10:00-12:00 PM
Pueblo County Sheriff's Office - EOC
101 W. 10th Street, Pueblo, CO 81003

Agenda:

1. Project Overview & Updates
2. Public Involvement Strategy
3. Risk Assessment Summary
4. Local Government Workbook
5. Mitigation Strategy
6. Community Wildfire Protection Plan
7. Next Steps
8. Mitigation Resources

Hazard Mitigation Planning Committee (HMPC) Post-Meeting Requests:

- Workbook Tasks 5, 6, 7, & 8
- Any Outstanding Workbook Tasks 2, 3, or 4
- Review Draft Risk Assessment Chapter
- Mitigation Action Ideas
- In-Kind Tracking

Questions, Comments, Concerns? –

Contact project manager Michael Garner at any point throughout the planning process:
303.710.9498 | MGarner@Synergy-DR.com

SYNERGY DISASTER RECOVERY

Workshop #2 - 10/23/2023

Name	Title	Organization	Email	Present
Adam Uhernik	Public Information Officer	Pueblo County Government	uhernik@pueblocounty.us	
Alexander Stejskal	Water Resources Analyst	Xcel Enegy		
Allison Waldvogel	Animal Logistics Manager	HSPPR-Pueblo	awaldvogel@hsppr.org	
Amanda Cesar	Deputy Director	Pueblo County Parks and Recreation	cesara@pueblocounty.us	
Andrew Hayes			hayesa@pueblo.us	
Andrew Notbohm	Director	Pikes Peak Reg. Emergency Management	OfficeofEmergency.Management@coloradosprings.g	
Barb Huber	Fire Chief / Deputy Mayor	Pueblo City Fire	bhuber@pueblo.us	
Bob Tracy	Assistant Fire Chief	Pueblo Rural Fire Department	tracyprfd@gmail.com	
Brian Caserta	Fire Chief	Pueblo West Fire Department	bcaserta@pwmd-co.us	
Brian Cotter	Pueblo County Coroner	Pueblo County Coroner's Ofc.	cotterb@pueblocounty.us	
Brian Lyons	Major	Colorado State Patrol	brian.lyons@state.co.us	BCL
Britteny Ciarlo	Emergency Manager	Huerfano County	bciarlo@huerfano.us	
Bryan Ware	Fire Chief	Beulah Fire Protection District	Chief@socolo.net	
Carmen Howard	Director	Pueblo County Planning & Development	howardca@pueblocounty.us	
Catalina Santos	St. Charles Dams #2 & #3	Evraz Inc.	catalina.santos@evrazna.com	
Chad Ones	St. Charles Dams #2 & #3	Evraz Inc.	chad.ones@evrazna.com	
Chris Harner	Deputy Fire Chief	Pueblo City Fire	gharner@pueblo.us	

Workshop #2 - 10/23/2023

Name	Title	Organization	Email	Present
Chris Noeller	Police Chief	Pueblo Police Department	snoeller@pueblo.us	
Christe Coleman	Regional Field Manager	Colorado DHSEM	christe.coleman@state.co.us	
Christopher Kilpatrick	Lieutenant	Pueblo County Sheriff's Office	kilpatrick@pueblocounty.us	
Clifford Kindred	Captain	Pueblo County Sheriff's Office	kindred@pueblocounty.us	
Cori Tanner	Regional Disaster Services Manager	American Red Cross	cori.tanner@redcross.org	
Crystal Breckenridge	Mayor Pro Tem	Town of Boone	townofboone@yahoo.com	
Dan Kogovsek	City Attorney	City of Pueblo		
Danny Chavez	Emergency Manager	Otero County	em@oterogov.org	
Darren Kochis	Building Safety & Security Manager	Pueblo County Government	kochisdp@pueblocounty.us	
Dave Lucero	Pueblo County Sheriff	Pueblo County Sheriff's Office	Lucerod@pueblocounty.us	
Emily Palmer	Hazard Mitigation Planning Specialist	DHSEM	emily.palmer@state.co.us	
Eppie Griego	Commissioner	Pueblo County	griegoep@pueblocounty.us	
Felix Gallardo	Bureau Captain	Pueblo County Sheriff's Office	gallardf@pueblocounty.us	
Fiona Norby	Manager	CART	cart@hsppr.org	
Frank Ortega	Sergeant	Pueblo Police Department	fortega@pueblo.us	
Garrison Ortiz	Commissioner	Pueblo County	ortizga@pueblocounty.us	
Gavin Wolny	County Attorney	Pueblo County	wolnyg@pueblocounty.us	

Workshop #2 - 10/23/2023

Name	Title	Organization	Email	Present
Gayle Perez	Public Information Officer	Pueblo County Sheriff's Office	perezg@pueblocounty.us	GP
Grant Genova	Captain	Pueblo Rural Fire Department	ggenova@puebloruralfire.com	
Harry Hochsteller	Treasurer	Colorado City Metro District		
Irene Merrifield	Mitigation Planning Lead	DHSEM	irene.merrifield@state.co.us	
Isaiah Goodreau	Plains Division Manager	San Isabel Gas	igoodreau@coloradonaturalgas.com	
James Buford	40TH St. Detention Basin	CDOT Region 2	JAMES.BUFORD@STATE.CO.US	
Jason Abney	Safety Officer	Parkview Medical Center	Jason_Abney@parkviewmc.com	
Jim Eccher	District Manager, Beckwith Dam	Colorado City Metro District	colocitymanager@ghvalley.net	
Jimmy Jenkins	Disaster Specialist	American Red Cross	jimmy.jenkins@redcross.org	
JJ King	Division Fire Chief	Pueblo West Fire Department	JKing@pwmd-co.us	
Joe Cervi	Public Relations Specialist	Board of Public Water Works	jcervi@pueblowater.org	
Joe Richards	Emergency Manager	Las Animas County	joe.richards@lasanimascounty.org	
John Grieve	Supervisory Forester	CSFS	john.grieve@colostate.edu	
John Reitan	Emergency Manager	Crowley County	john.reitan@crowleycounty.net	
Josh Johnson	Emergency Management Coordinator	Pueblo County Sheriff's Office	johnsonj@pueblocounty.us	
Justin Carbee	Safety Manager	Health Solutions	justinc@health.solutions	JC
Justin Yougren	Fire Chief	Red Creek Fire Department	my1chiropractor@yahoo.com	

Workshop #2 - 10/23/2023

Name	Title	Organization	Email	Present
Katie LaConte	Corporal	Pueblo Police Department	klaconte@pueblo.us	
Ken Espinoza	Deputy Pueblo County Coroner	Pueblo County Coroner's Office	espinoza@pueblocounty.us	
Ken Stroud	Emergency Manager	Lincoln County		
Kenny Rider	Captain	Pueblo Police Department	krider@pueblo.us	
Kevin Schaefer	CES Manager	American Medical Response	kevin.schaefer@gmr.net	Kms
Kim Jeffries	Communications Center Manager	Pueblo Police Department	kjeffries@pueblo.us	
Klint Skelly	Warning Meteorologist	National Weather Service Pueblo	klint.skelly@noaa.gov	
Larry Atencio	City Council Representative	City of Pueblo	latencio@pueblo.us	
Laura Solano	Pueblo Mayor Chief of Staff	City of Pueblo	Lsolano@pueblo.us	
Lee Hodge	Assistant DHS Director	Pueblo County DHS	lee.hodge@pueblocounty.us	
Lindsey Vigna	Animal Control Supervisor	HSPPR-Pueblo	lvigna@hsppr.org	
Loraine Greenwood	CSEPP Program Manager - Medical	Pueblo Dept of Public Health & Environ.	loraine.greenwood@pueblocounty.us	
Margaret Gaillard	Vice President of Operations	PEDCO	mgaillard@pedco.org	
Mark Mears	Bureau Chief	Pueblo County Sheriff's Office	mears@pueblocounty.us	[illegible]
Mark Perry	Regional Dam Safety Eng.	CO Dam Safety		
Marty Rahl	Mayor	Town of Rye	rye.town.clerk@gmail.com	
Melanie Moss	Emergency Management Specialist	Centura Health		

Workshop #2 - 10/23/2023

Name	Title	Organization	Email	Present
Michael Bayer	Safety Manager	School District 60	michael.bayer@pueblocityschools.us	
Michael R Tafoya	Captain	Colorado State Patrol	michaelr.tafoya@state.co.us	
Mike Cafasso	President/CEO	Centura St Mary-Corwin Hospital	michaelcafasso@centura.org	
Mike Furney	Fire Chief	Pueblo Rural Fire Department	mfurney@puebloruralfire.com	
Mike Hill		Bessemer Irrigating Ditch Co.	mikehill97@yahoo.com	
Mike Lening	Operations Manager	American Medical Response	mike.lening@gmr.net	
Monroe Robinson	Safety Officer	Pueblo School District 70	mrobinson@district70.org	
Mykel Kroll	Emergency Manager	Fremont County	mykel.kroll@fremontco.com	
Nick Gradisar	Pueblo Mayor	City of Pueblo	Ngradisar@pueblo.us	
Nick Laydon	Facilities Manager - Safety Officer	Centura Health - St. Mary Corwin	OrlandoLaydon@centura.org	
Patrick Farrell	District Manager, St. Charles Mesa Dams #1 & #2	St. Charles Mesa Water Distrit	patrick.farrell@scmwd-pueblo.org	YES PF
Randy Evetts	Director	Pueblo Dept of Public Health & Environ.	evettsr@pueblocounty.us	
Ray Walsh	Deputy Emergency Manager	Huerfano County	rwalsh@huerfano.us	
Rich Belt	Director, Chemistry and Water Resources - Comanche	Xcel Enegy	richard.L.Belt@xcelenergy.com	
Richard Garcia	Disaster Specialist	American Red Cross	richard.garcia@redcross.org	
Robyn Knappe	Emergency Manager	Custer County	Robyn@custercounty-co.gov	
Ronald Sasaoka	Emergency Preparedness & Response Coord.	Pueblo Dept of Public Health & Environ.	ronald.sasaoka@pueblocounty.us	

Workshop #2 - 10/23/2023

Name	Title	Organization	Email	Present
Russ Drury	Business Development Manager	Black Hills Electric	russ.drury@blackhillscorp.com	
Sabina Genesio	County Manager	Pueblo County	genesios@pueblocounty.us	
Sadie Martinez	AFN Coordinator	DHSEM	sadie.martinez@state.co.us	
Shannon Monahan	Lake Isabel Dam	Dam Program Mgt - Rocky Mt. Region	Shannon.Monahan@usda.gov	
Shawnna Clementi	Communications Center Manager	Pueblo County Coroner's Office	clementi@pueblocounty.us	
Stephanie Garcia	Animal Control Supervisor	HSPPR-Pueblo	sgarcia@hsppr.org	
Steve Bennett	Fire Chief	Rye Fire Protection District	sbennett.ryefire@gmail.com	
Steve Bryant	Pueblo County Undersheriff	Pueblo County Sheriff's Office	Bryant@pueblocounty.us	
Steven Meier			meiers@pueblo.us	
Steven Noeller	Chief	City of Pueblo Police Department	snoeller@pueblo.us	
Tim Mann				
Travis Bauer	Pueblo	U.S. Bureau of Reclamation	tbauer@usbr.gov	

Pueblo County Hazard Mitigation Plan 2024 Update

HMP Mitigation Strategy Workshop #3
Tuesday, March 5th, 2024 / 1:00-3:00 PM
Pueblo County Sheriff's Office - EOC
101 W. 10th Street, Pueblo, CO 81003

Agenda:

1. Project Updates
2. Local Government Participation
3. Risk Assessment Chapter Comments
4. Underserved Community Engagement
5. Local Government Workbooks
6. Updated Mitigation Strategy
7. Mitigation Grant Funding
8. New Mitigation Actions / Projects
9. Action / Project Prioritization
10. HMP Maintenance
11. Next Steps
12. Mitigation Resources

Hazard Mitigation Planning Committee (HMPC) Post-Meeting Requests:

- All Required Workbook Tasks
- In-Kind Tracking

Questions, Comments, Concerns? –

Contact project manager Michael Garner at any point throughout the planning process:
303.710.9498 | MGarner@Synergy-DR.com

SYNERGY DISASTER RECOVERY

Workshop #3 - 3/5/2024

Name	Title	Organization	Email	Present
Adam Uhernik	Public Information Officer	Pueblo County Government	uhernik@pueblocounty.us	
Alexander Stejskal	Water Resources Analyst	Xcel Enegy		
Allison Waldvogel	Animal Logistics Manager	HSPPR-Pueblo	awaldvogel@hsppr.org	
Amanda Cesar	Deputy Director	Pueblo County Parks and Recreation	cesara@pueblocounty.us	
Andrew Hayes			hayesa@pueblo.us	
Andrew Notbohm	Director	Pikes Peak Reg. Emergency Management	OfficeofEmergency.Management@coloradosprings.g	
Barb Huber	Fire Chief / Deputy Mayor	Pueblo City Fire	bhuber@pueblo.us	BH
Bob Tracy	Assistant Fire Chief	Pueblo Rural Fire Department	tracyprfd@gmail.com	
Brian Caserta	Fire Chief	Pueblo West Fire Department	bcaserta@pwmd-co.us	
Brian Cotter	Pueblo County Coroner	Pueblo County Coroner's Ofc.	cotterb@pueblocounty.us	
Brian Lyons	Major	Colorado State Patrol	brian.lyons@state.co.us	
Britney Duston		Evraz Inc.		
Britteny Ciarlo	Emergency Manager	Huerfano County	bciarlo@huerfano.us	
Bryan Ware	Fire Chief	Beulah Fire Protection District	Chief@socolo.net	C✓
Carmen Howard	Director	Pueblo County Planning & Development	howardca@pueblocounty.us	CH
Catalina Santos	St. Charles Dams #2 & #3	Evraz Inc.	catalina.santos@evrazna.com	
Chad Ones	St. Charles Dams #2 & #3	Evraz Inc.	chad.ones@evrazna.com	

Pueblo County Hazard Mitigation Plan Update

Workshop #3 - 3/5/2024

Name	Title	Organization	Email	Present
Chris Harner	Deputy Fire Chief	Pueblo City Fire	gharner@pueblo.us	
Chris Noeller	Police Chief	Pueblo Police Department	snoeller@pueblo.us	
Christe Coleman	Regional Field Manager	Colorado DHSEM	christe.coleman@state.co.us	
Christopher Kilpatrick	Lieutenant	Pueblo County Sheriff's Office	kilpatrick@pueblocounty.us	
Clifford Kindred	Captain	Pueblo County Sheriff's Office	kindred@pueblocounty.us	
Cori Tanner	Regional Disaster Services Manager	American Red Cross	cori.tanner@redcross.org	
Crystal Breckenridge	Mayor Pro Tem	Town of Boone	townofboone@yahoo.com	
Dan Kogovsek	City Attorney	City of Pueblo		
Danny Chavez	Emergency Manager	Otero County	em@oterogov.org	
Darren Kochis	Building Safety & Security Manager	Pueblo County Government	kochisdp@pueblocounty.us	DK
Dave Lucero	Pueblo County Sheriff	Pueblo County Sheriff's Office	Lucerod@pueblocounty.us	
Emily Palmer	DS4MO ~~Hazard Mitigation Planning Specialist~~	DHSEM	emily.palmer@state.co.us emily.drosselmeyer@state.co.us	EP
Eppie Griego	Commissioner	Pueblo County	griegoep@pueblocounty.us	
Felix Gallardo	Bureau Captain	Pueblo County Sheriff's Office	gallardf@pueblocounty.us	
Fiona Norby	Manager	CART	cart@hsppr.org	
Frank Ortega	Sergeant	Pueblo Police Department	fortega@pueblo.us	
Garrison Ortiz	Commissioner	Pueblo County	ortizga@pueblocounty.us	

Pueblo County Hazard Mitigation Plan Update

Workshop #3 - 3/5/2024

Name	Title	Organization	Email	Present
Gavin Wolny	County Attorney	Pueblo County	wolnyg@pueblocounty.us	
Gayle Perez	Public Information Officer	Pueblo County Sheriff's Office	perezg@pueblocounty.us	GP
Grant Genova	Captain	Pueblo Rural Fire Department	ggenova@puebloruralfire.com	
Harry Hochsteller	Treasurer	Colorado City Metro District		
Irene Merrifield	Mitigation Planning Lead	DHSEM	irene.merrifield@state.co.us	
Isaiah Goodreau	Plains Division Manager	San Isabel Gas	igoodreau@coloradonaturalgas.com	
James Buford	40TH St. Detention Basin	CDOT Region 2	JAMES.BUFORD@STATE.CO.US	
Jason Abney	Safety Officer	Parkview Medical Center	Jason_Abney@parkviewmc.com	
Jim Eccher	District Manager, Beckwith Dam	Colorado City Metro District	colocitymanager@ghvalley.net	[illegible]
Jimmy Jenkins	Disaster Specialist	American Red Cross	jimmy.jenkins@redcross.org	
JJ King	Division Fire Chief	Pueblo West Fire Department	JKing@pwmd-co.us	
Joe Cervi	Public Relations Specialist	Board of Public Water Works	jcervi@pueblowater.org	
Joe Richards	Emergency Manager	Las Animas County	joe.richards@lasanimascounty.org	
John Grieve	Supervisory Forester	CSFS	john.grieve@colostate.edu	
John Reitan	Emergency Manager	Crowley County	john.reitan@crowleycounty.net	
Josh Johnson	Emergency Management Coordinator	Pueblo County Sheriff's Office	johnsonj@pueblocounty.us	
Justin Carbee	Safety Manager	Health Solutions	justinc@health.solutions	JC

Workshop #3 - 3/5/2024

Name	Title	Organization	Email	Present
Justin Yougren	Fire Chief	Red Creek Fire Department	my1chiropractor@yahoo.com	
Katie LaConte	Corporal	Pueblo Police Department	klaconte@pueblo.us	
Ken Espinoza	Deputy Pueblo County Coroner	Pueblo County Coroner's Office	espinoza@pueblocounty.us	
Ken Stroud	Emergency Manager	Lincoln County		
Kenny Rider	Captain	Pueblo Police Department	krider@pueblo.us	
Kevin Schaefer	CES Manager	American Medical Response	kevin.schaefer@gmr.net	KMS
Kim Jeffries	Communications Center Manager	Pueblo Police Department	kjeffries@pueblo.us	
Klint Skelly	Warning Meteorologist	National Weather Service Pueblo	klint.skelly@noaa.gov	
Larry Atencio	City Council Representative	City of Pueblo	latencio@pueblo.us	
Laura Solano	Pueblo Mayor Chief of Staff	City of Pueblo	Lsolano@pueblo.us	
Lee Hodge	Assistant DHS Director	Pueblo County DHS	lee.hodge@pueblocounty.us	
Lindsey Vigna	Animal Control Supervisor	HSPPR-Pueblo	lvigna@hsppr.org	
Loraine Greenwood	CSEPP Program Manager - Medical	Pueblo Dept of Public Health & Environ.	loraine.greenwood@pueblocounty.us	
Margaret Gaillard	Vice President of Operations	PEDCO	mgaillard@pedco.org	
Mark Mears	Bureau Chief	Pueblo County Sheriff's Office	mears@pueblocounty.us	MM
Mark Perry	Regional Dam Safety Eng.	CO Dam Safety		
Marty Rahl	Mayor	Town of Rye	rye.town.clerk@gmail.com	

Workshop #3 - 3/5/2024

Name	Title	Organization	Email	Present
Melanie Moss	Emergency Management Specialist	Centura Health		
Michael Bayer	Safety Manager	School District 60	michael.bayer@pueblocityschools.us	
Michael R Tafoya	Captain	Colorado State Patrol	michaelr.tafoya@state.co.us	
Mike Cafasso	President/CEO	Centura St Mary-Corwin Hospital	michaelcafasso@centura.org	
Mike Furney	Fire Chief	Pueblo Rural Fire Department	mfurney@puebloruralfire.com	
Mike Hill		Bessemer Irrigating Ditch Co.	mikehill97@yahoo.com	
Mike Lening	Operations Manager	American Medical Response	mike.lening@gmr.net	
Monroe Robinson	Safety Officer	Pueblo School District 70	mrobinson@district70.org	
Mykel Kroll	Emergency Manager	Fremont County	mykel.kroll@fremontco.com	
Nick Gradisar	Pueblo Mayor	City of Pueblo	Ngradisar@pueblo.us	
Nick Laydon	Facilities Manager - Safety Officer	Centura Health - St. Mary Corwin	OrlandoLaydon@centura.org	
Patrick Farrell	District Manager, St. Charles Mesa Dams #1 & #2	St. Charles Mesa Water Distrit	patrick.farrell@scmwd-pueblo.org	
Randy Evetts	Director	Pueblo Dept of Public Health & Environ.	evettsr@pueblocounty.us	RE
Ray Walsh	Deputy Emergency Manager	Huerfano County	rwalsh@huerfano.us	
Rich Belt	Director, Chemistry and Water Resources - Comanche	Xcel Enegy	richard.L.Belt@xcelenergy.com	
Richard Garcia	Disaster Specialist	American Red Cross	richard.garcia@redcross.org	
Robyn Knappe	Emergency Manager	Custer County	Robyn@custercounty-co.gov	RK

Pueblo County Hazard Mitigation Plan Update

Workshop #3 - 3/5/2024

Name	Title	Organization	Email	Present
Ronald Sasaoka	Emergency Preparedness & Response Coord.	Pueblo Dept of Public Health & Environ.	ronald.sasaoka@pueblocounty.us	[illegible]
Russ Drury	Business Development Manager	Black Hills Electric	russ.drury@blackhillscorp.com	
Sabina Genesio	County Manager	Pueblo County	genesios@pueblocounty.us	
Sadie Martinez	AFN Coordinator	DHSEM	sadie.martinez@state.co.us	
Shannon Monahan	Lake Isabel Dam	Dam Program Mgt - Rocky Mt. Region	Shannon.Monahan@usda.gov	
Shawnna Clementi	Communications Center Manager	Pueblo County Coroner's Office	clementi@pueblocounty.us	
Stephanie Garcia	Animal Control Supervisor	HSPPR-Pueblo	sgarcia@hsppr.org	
Steve Bennett	Fire Chief	Rye Fire Protection District	sbennett.ryefire@gmail.com	
Steve Bryant	Pueblo County Undersheriff	Pueblo County Sheriff's Office	Bryant@pueblocounty.us	
Steven Meier			meiers@pueblo.us	
Steven Noeller	Chief	City of Pueblo Police Department	snoeller@pueblo.us	
Tim Mann				
Travis Bauer	Pueblo	U.S. Bureau of Reclamation	tbauer@usbr.gov	
Ian Fitzhugh	State of CO Mitigation Specialist	DHSEM	ian.fitzhugh@state.co.us	[illegible]
Lucas Snedeker	State mitigation specialist	DHSEM	lucas.snedeker@state.co.us	LS

Pueblo County Hazard Mitigation Plan Update

13 Annex G - Public Survey Responses

Public Hazard Risk Perception Survey

This survey is being conducted as part of the ongoing Pueblo County hazard mitigation planning process. This plan covers the entire county, including local municipalities, special districts, and other community organizations. Your response is appreciated and will remain anonymous.

This survey should take only five minutes and the results will help to inform and educate the hazard mitigation planning committee.

If you have any questions about this project, please contact Michael Garner (mgarner@synergy-dr.com), the project manager from Synergy Disaster Recovery, whom was hired by Pueblo County to lead this plan's development.

Mentimeter

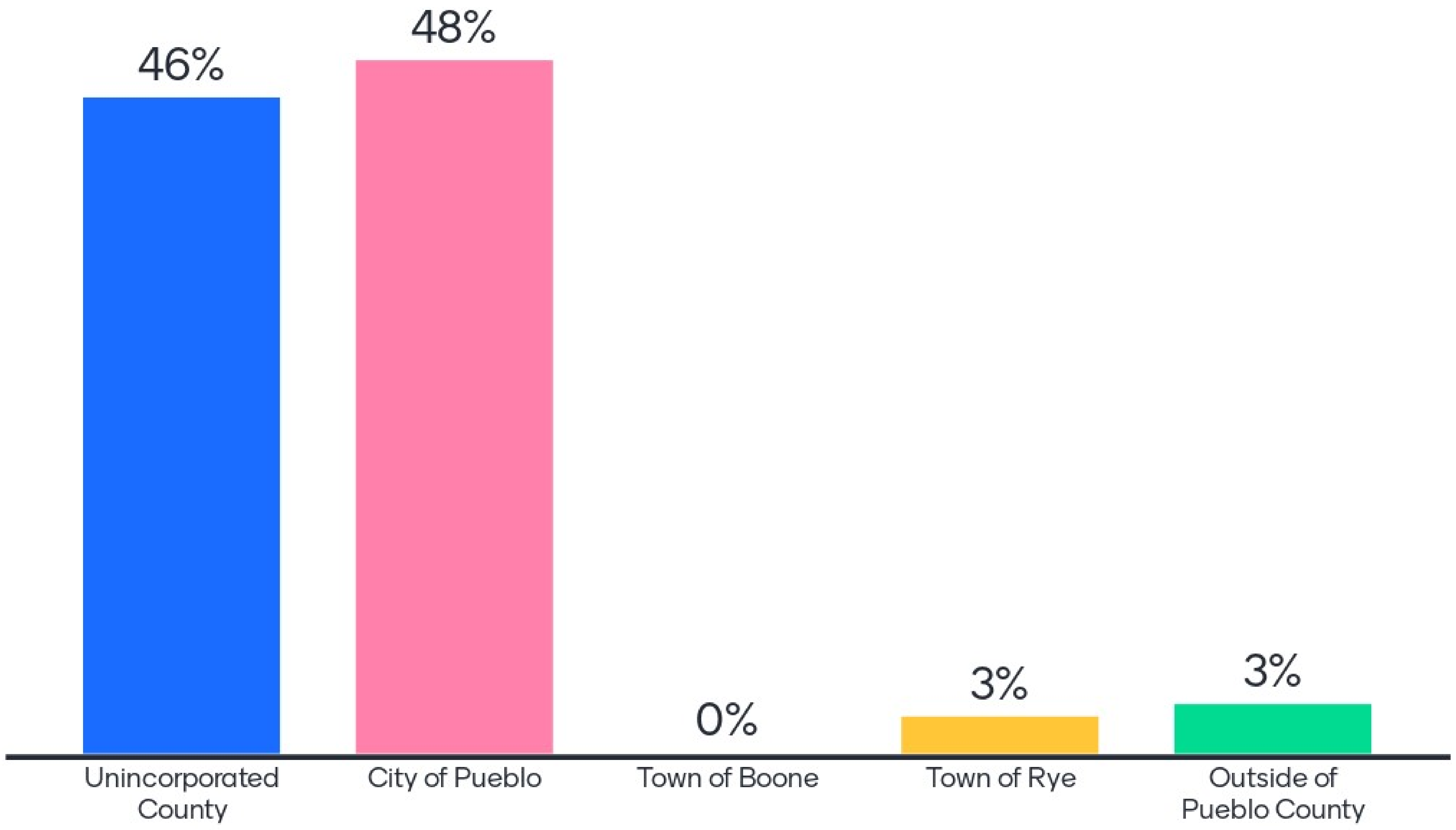
HMP COMPONENTS

What is Hazard Mitigation?

Hazard mitigation is a: "Sustained action taken to reduce or eliminate long-term risk to people and property from hazards and their effects."

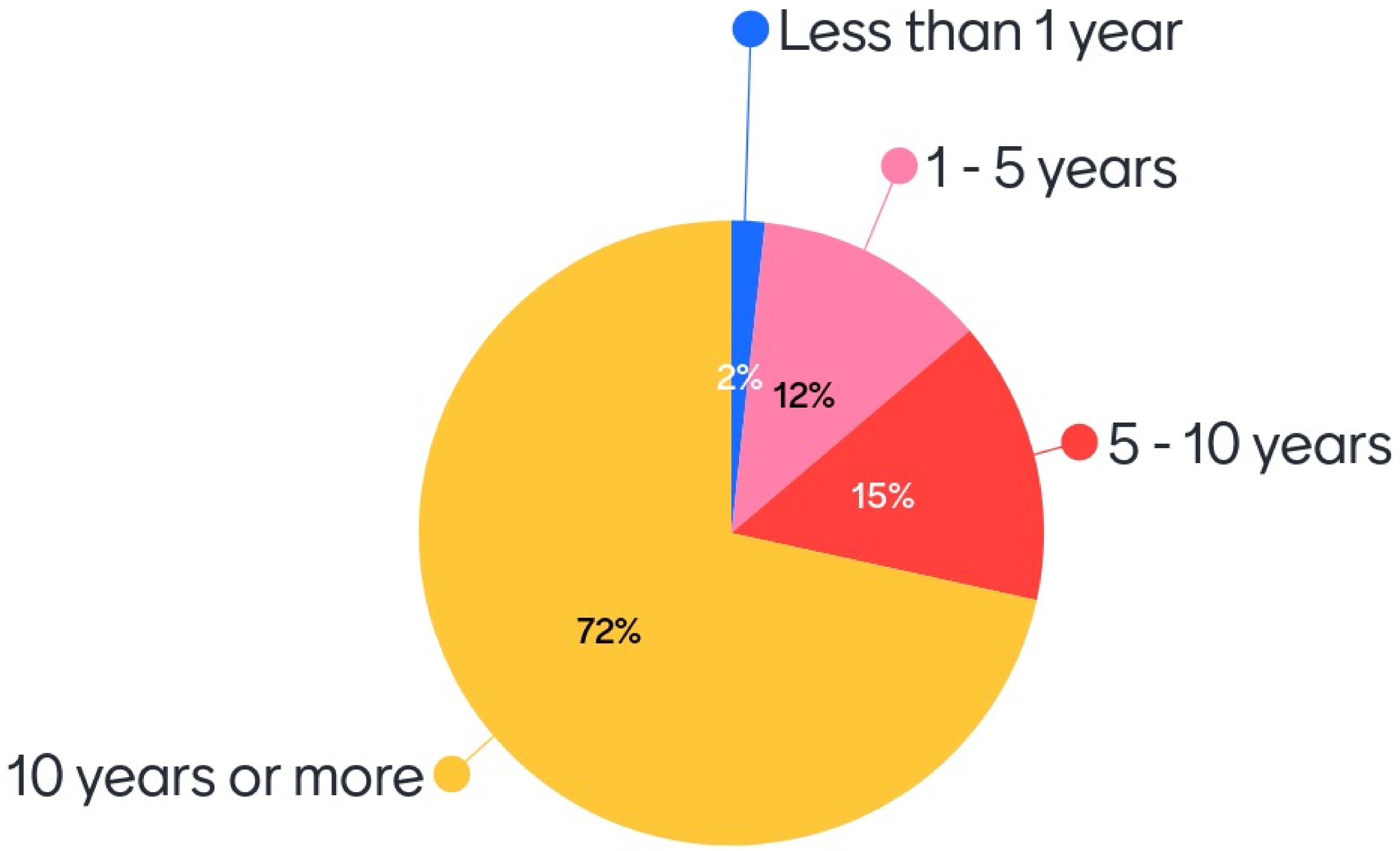
A hazard mitigation plan (HMP) is required for communities to become eligible for certain mitigation grant funding programs. This community plan documents the overall mitigation strategy and specific mitigation actions and projects that your communities would like to implement to increase resiliency to future disaster events.

In what community do you reside?



116

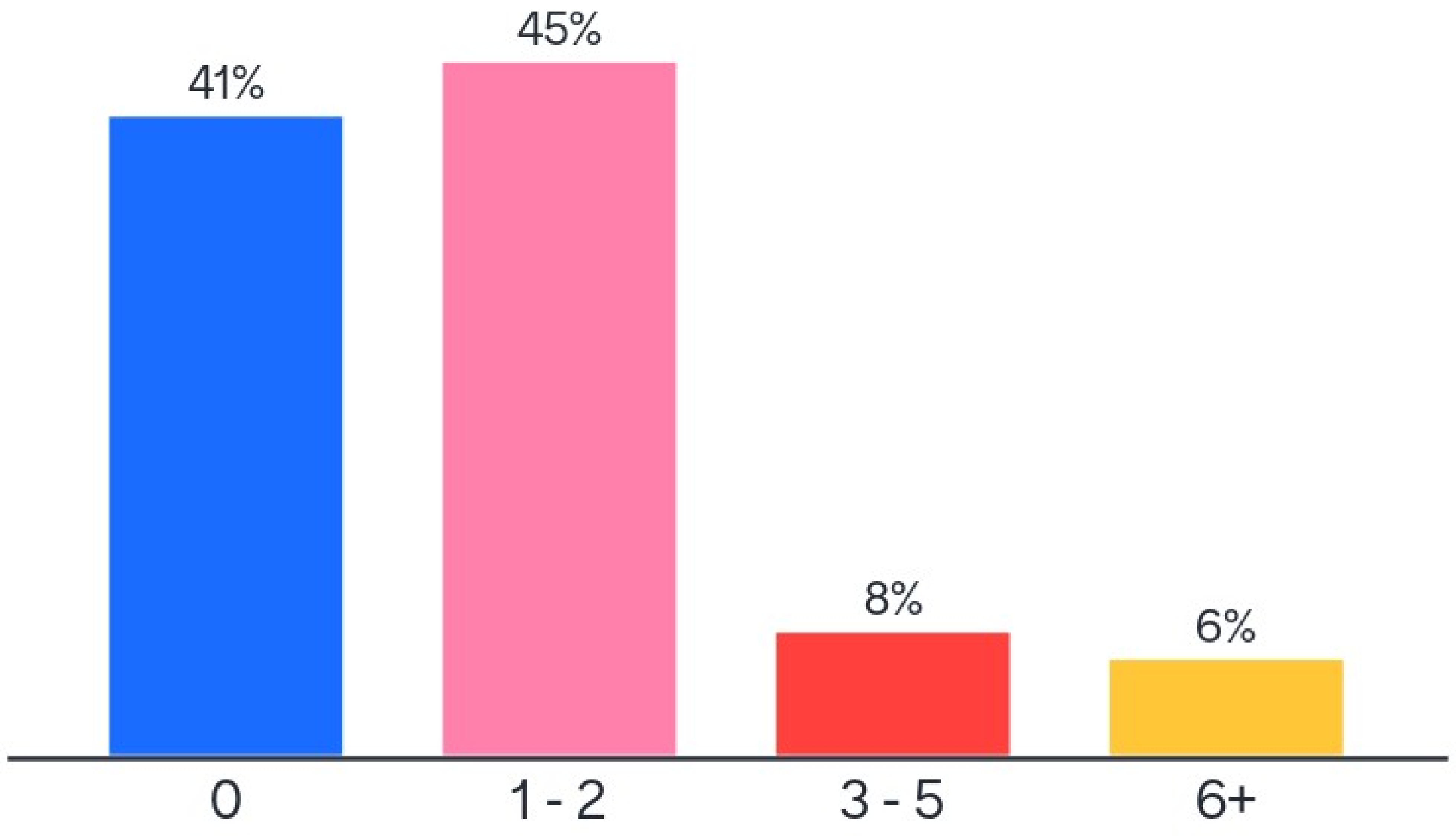
How long have you lived here?



116

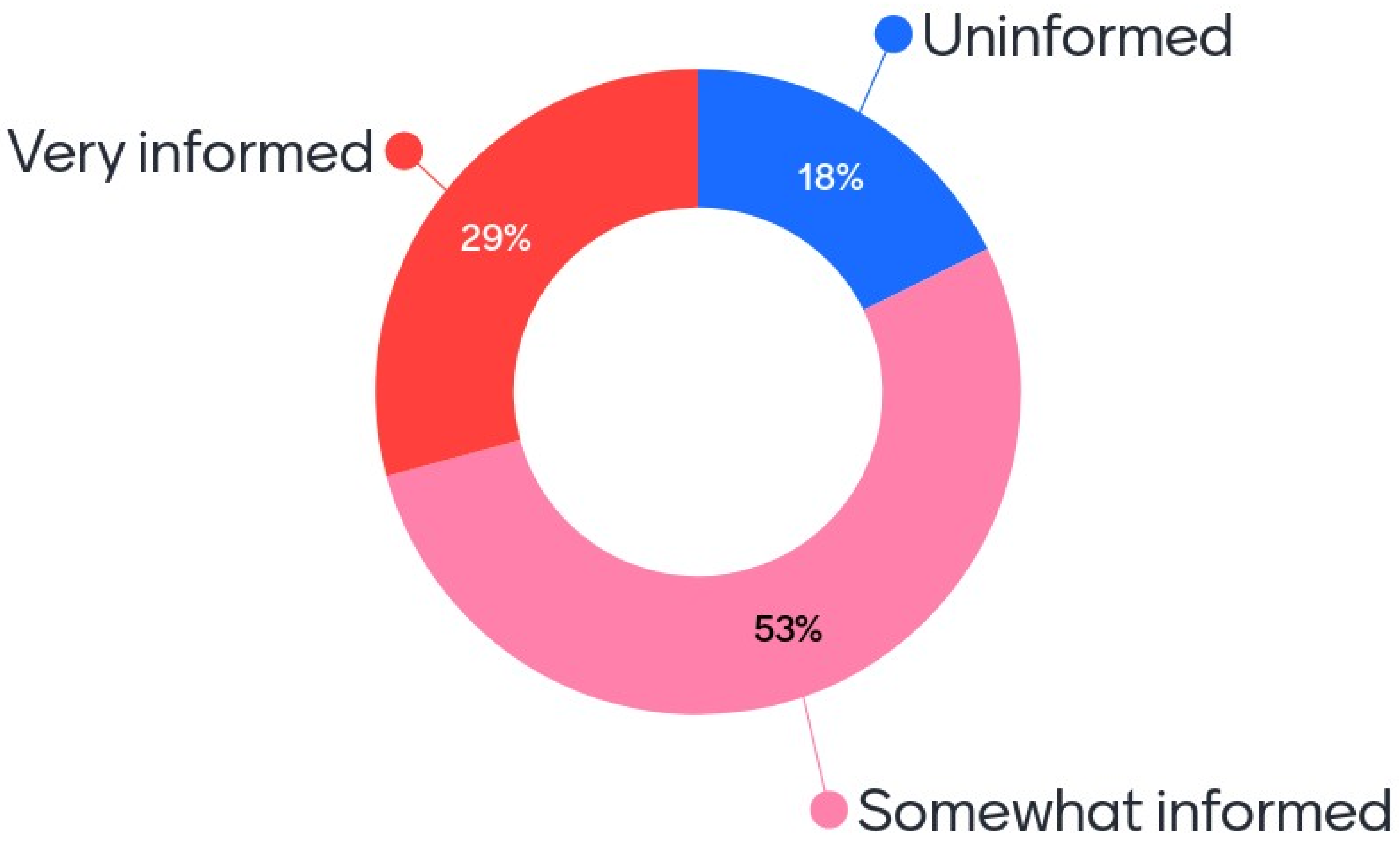
Mentimeter

How many times has a hazard event significantly impacted your daily life (in last 5 years)?



114

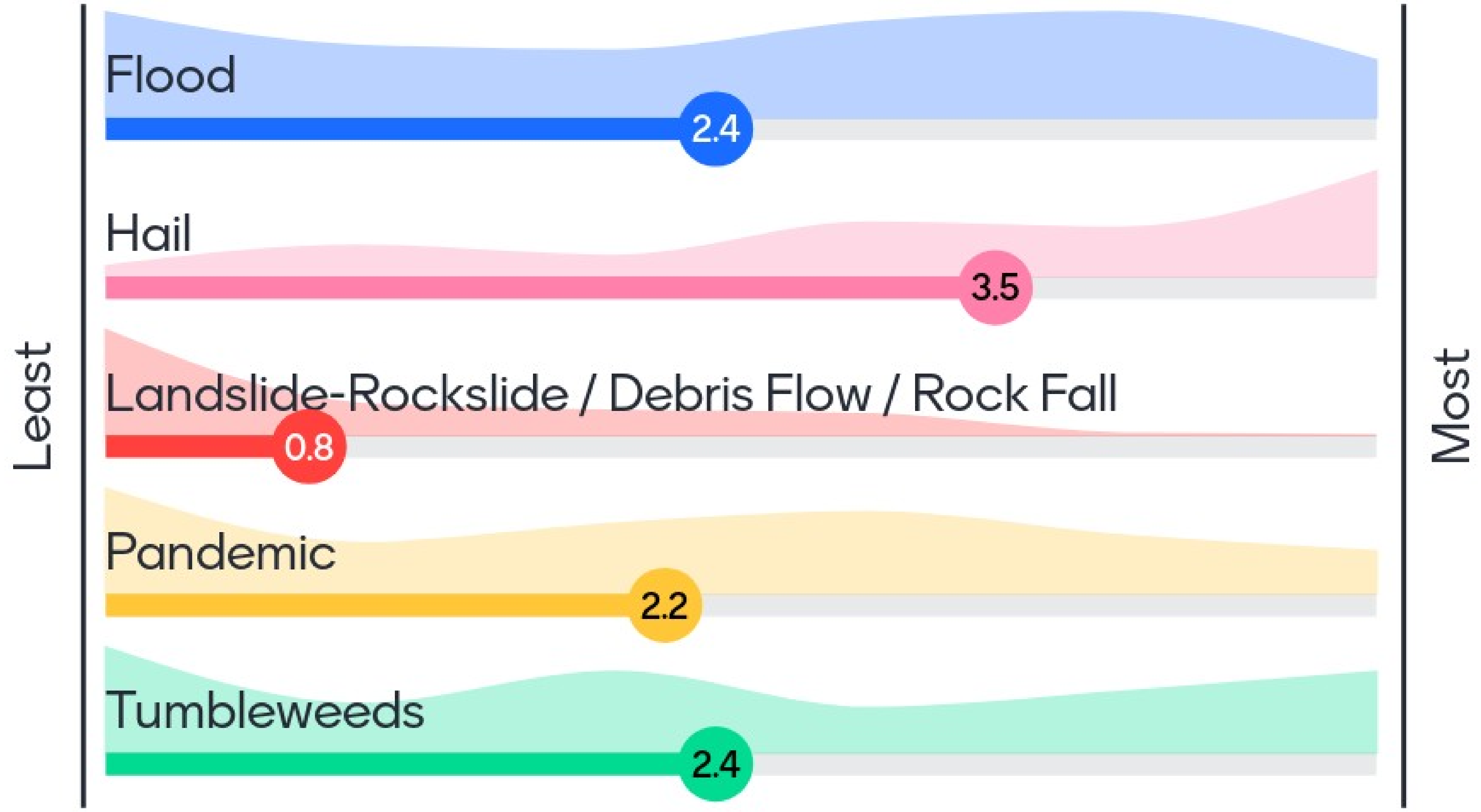
How well do you understand the risks posed by hazards that can impact Pueblo County?



113

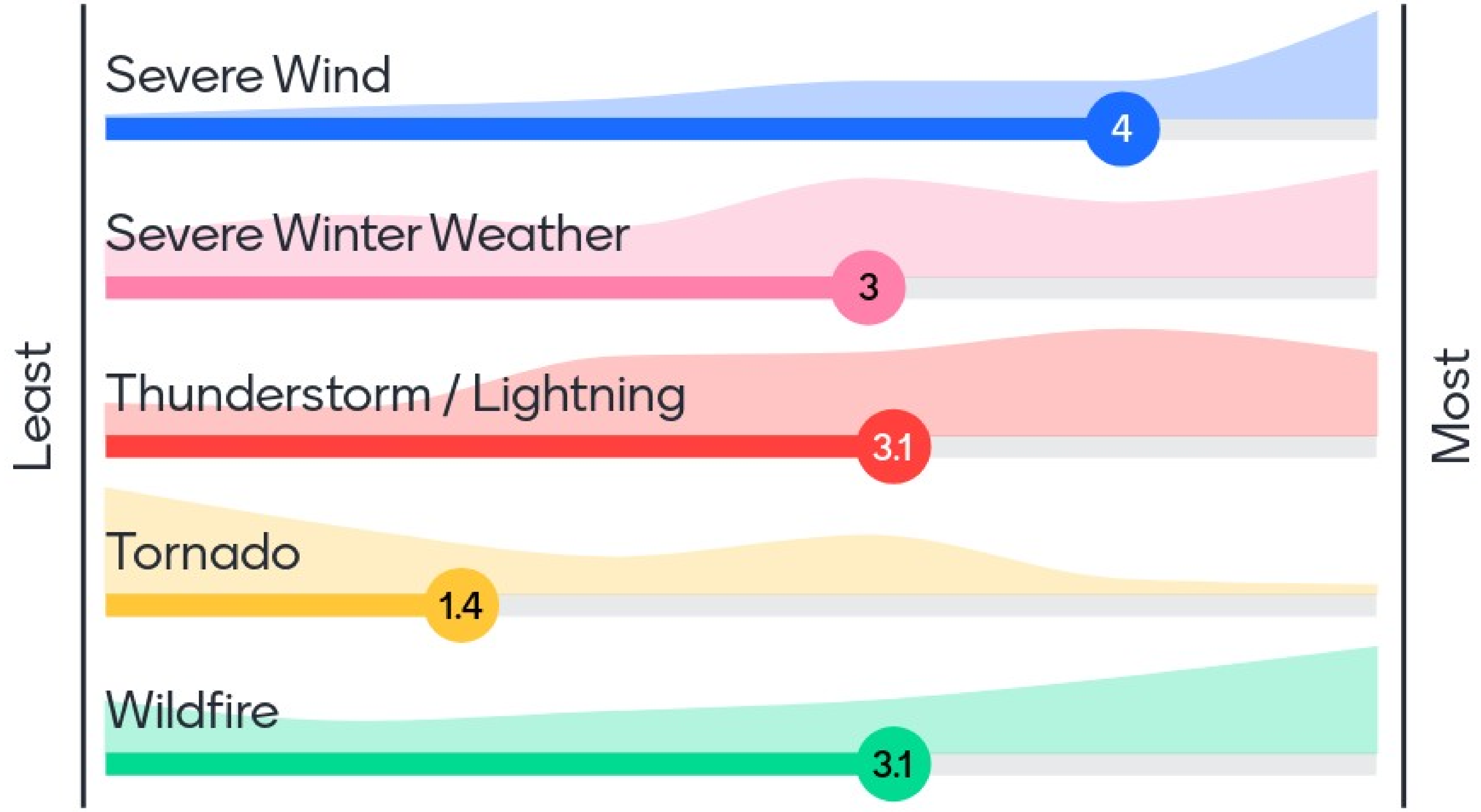
Please rank the following hazards based on the risk they present to you and your community:

Please rank the following hazards based on the risk they present to you and your community (continued 2):



105

Please rank the following hazards based on the risk they present to you and your community (continued 2):



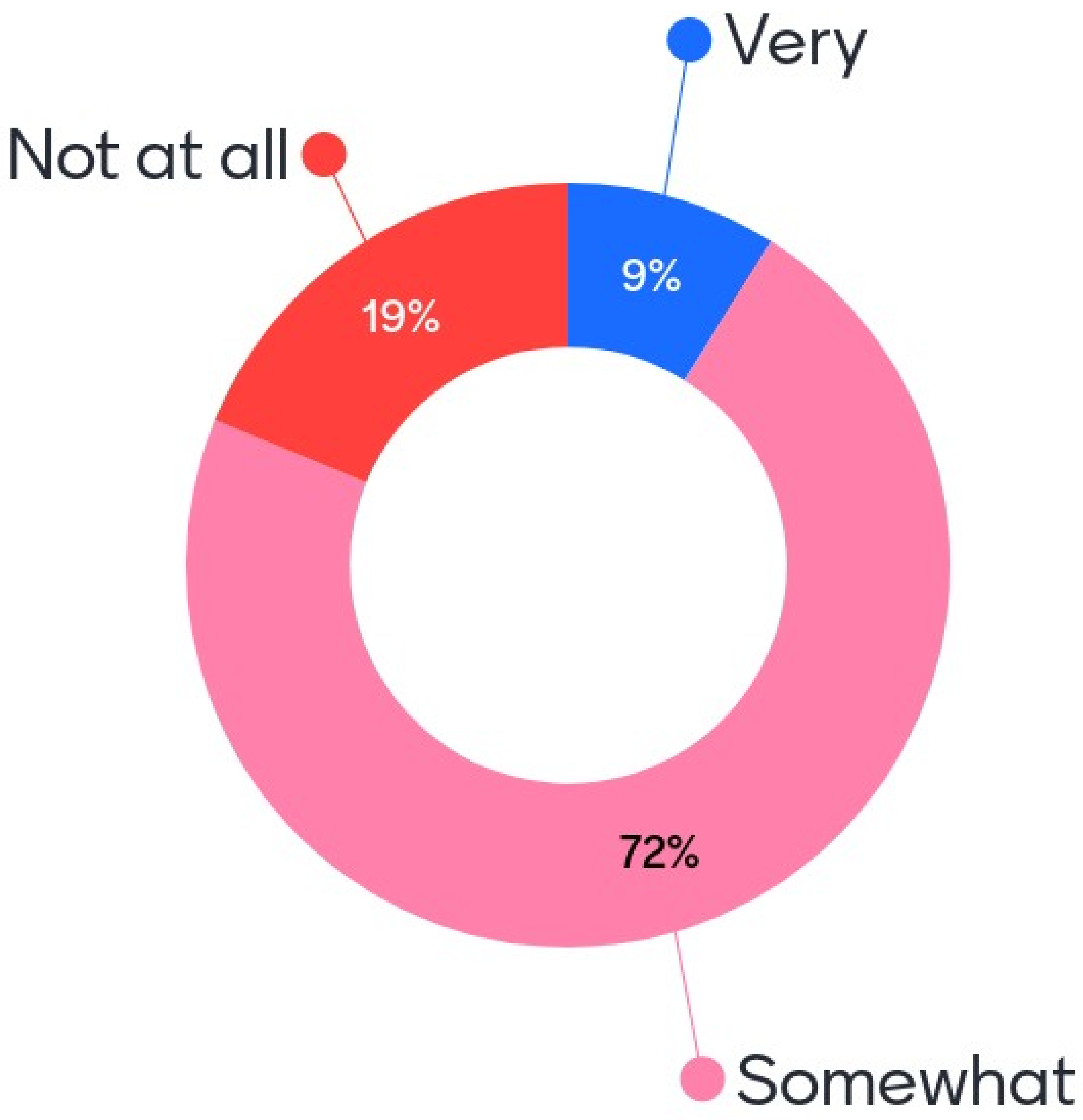
104

Mentimeter

How concerned are you about the following scenarios during and following a disaster?

102

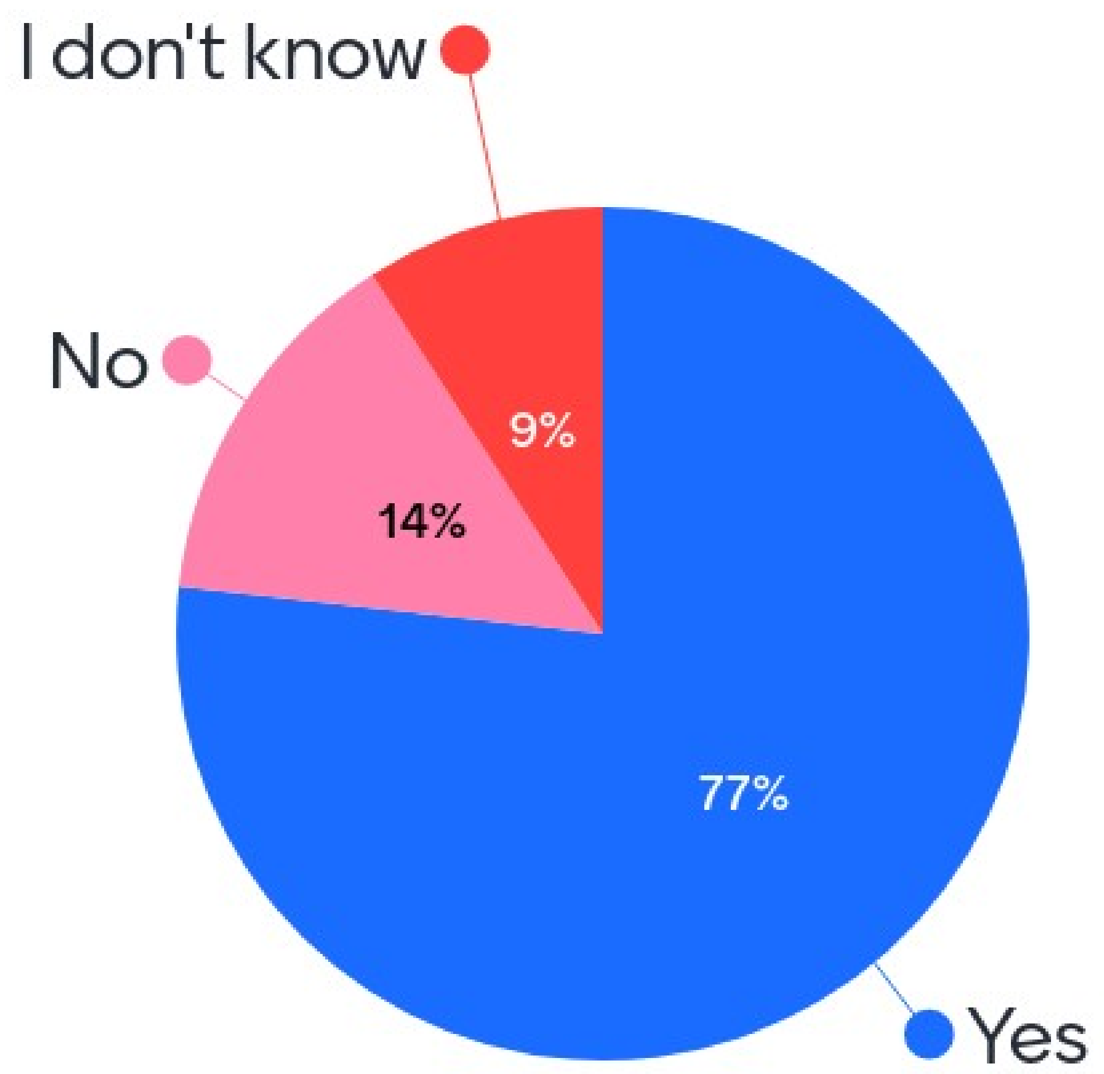
How vulnerable are you and / or the people living in your household to the impacts of hazard events?



101

Mentimeter

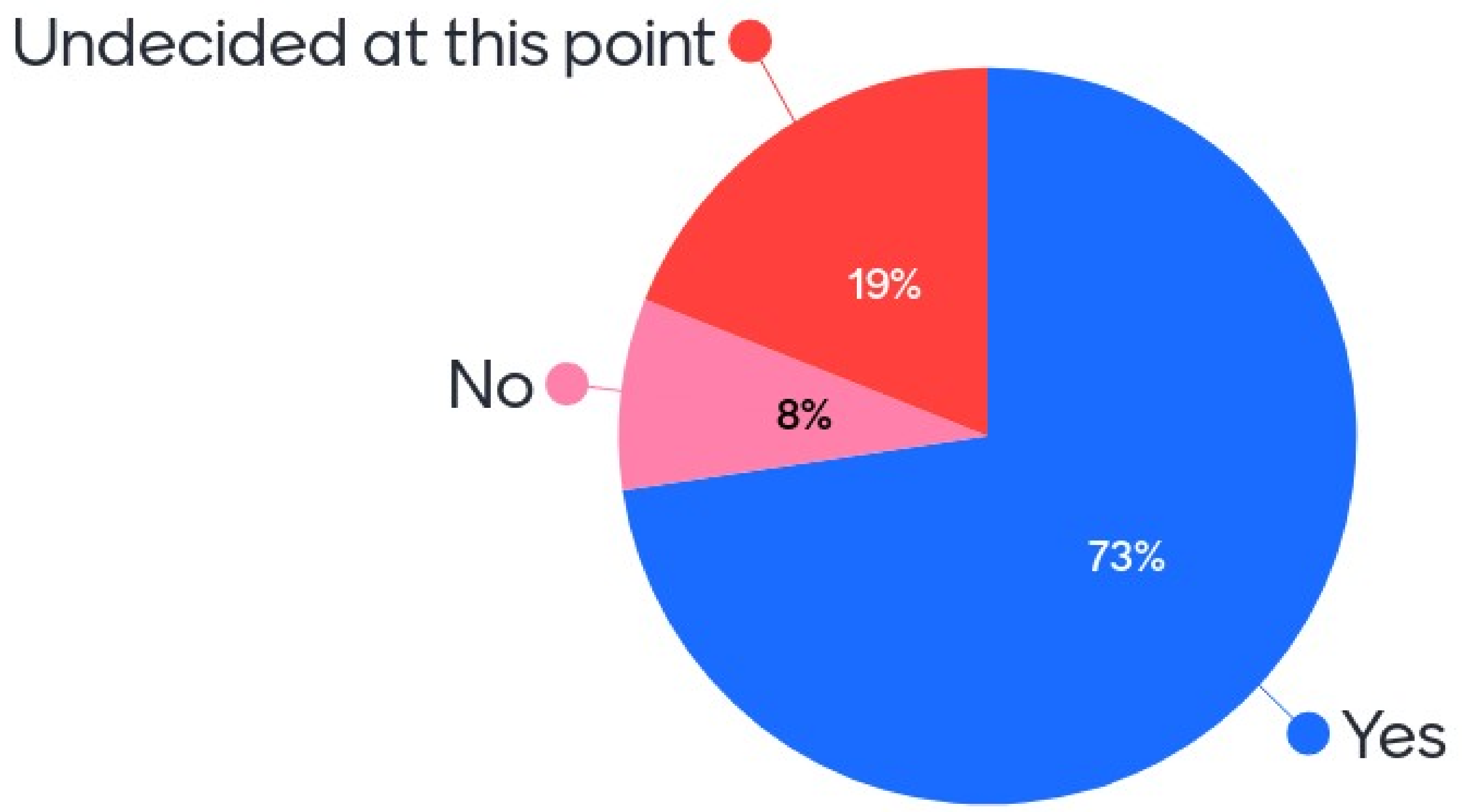
Have you personally taken mitigation actions to make your home or business more resilient to hazards?



99

Mentimeter

Do you support your community's pursuit of hazard mitigation grant funding opportunities (knowing that the federal share can be 75% of project costs)?



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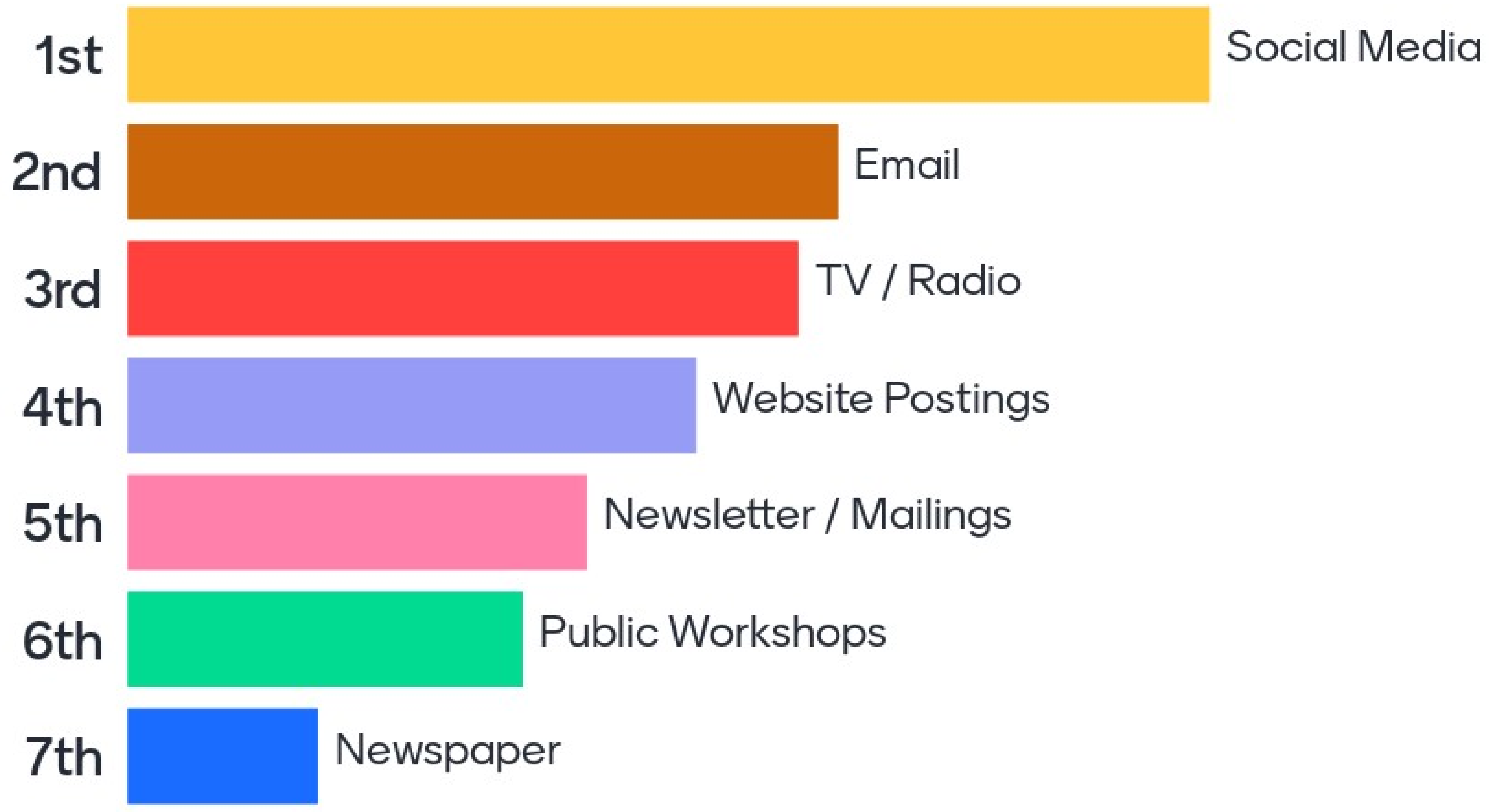
What is the most effective way for you to receive information about making your home and business more resilient to hazards?



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