Custer County Multi-Government

Hazard Mitigation Plan - 2023 Update

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SYNERGY DISASTER RECOVERY

EXECUTIVE SUMMARY

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

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

Custer County and a partnership of local governments and organizations within the county have developed and maintained a hazard mitigation plan (HMP) to reduce risks from natural disasters and to comply with the DMA. This 2023 plan update builds upon the community's previous efforts and identifies the mitigation strategy that Custer County and its local governments will follow over the next five years.

CHAPTER 1: MITIGATION STRATEGY

The updated mitigation strategy for this hazard mitigation plan (HMP) details how mitigation efforts will be directed over the next five years. This strategy was built upon the 2017 plan and has been updated based on community priorities, data from the risk assessment, and the results of the planning process.

HAZARDS

One of the largest inputs to a successful mitigation strategy is a thorough understanding of those hazards that impact communities and the ultimate risk they present. A large portion of this plan is devoted to a detailed review of these hazards and each community's vulnerabilities.

In this section, a brief overview of each hazard is provided. More specific details for each hazard's characteristics and impacts on the county are found in Chapter 4: Hazard Identification & Risk Assessment of this Plan.

An overall countywide hazard risk ranking, as well as individual rankings for the towns of Silver Cliff and Westcliffe, are provided in Table 1. Rankings for other adopting entities can be found in Appendix A: Local Government Annexes. The top hazards of concern among the jurisdictions include drought, geologic hazards, public health hazards, severe winter weather, thunderstorm, and wildfire.

This risk ranking considered the probability and impact of each hazard to the people, property / environment, and economy of Custer County and its local governments. 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, which correlates with the "high," "moderate," and "low" risk rankings.

Table 1. Custer County Hazard Risk Ratings

	Avalanche	Cyber Attack	Dam / Levee Incident	Drought	Earthquake	Extreme Heat	Flood	Geologic Hazards	Hazardous Materials Release	Landslide / Debris Flow / Rockfall	Public Health Hazards	Severe Winter Weather	Thunderstorm (hail, wind, lighting)	Tornado	Wildfire	Wildlife-Vehicle Collision
Custer County	L	M	M	H	M	M	M	M	M	M	H	H	H	M	H	M
Silver Cliff	M	H	M	H	H	H	H	H	H	M	H	H	H	H	H	H
Westcliffe	L	M	L	H	M	M	M	H	M	M	H	H	H	M	M	M

CUSTER COUNTY HAZARD OVERVIEW

AVALANCHE – Occur infrequently, in mountainous areas of the county. Risk to people is greatest for those recreating in these remote areas, minimal risk to property. One recent event caused serious injury during a "Considerable" danger advisory. No fatalities or property damage between 1950 – 2020.

CYBER ATTACK – Increasingly more common for local governments, private infrastructure organizations, hospitals, and other important operational entities to be targeted. Ransomware, overriding control of critical processes, and other evolving threats are impacting safety and security. No known cyber attacks in the county to date.

DAM / LEVEE INCIDENT – Multiple dams in the county (15), one High Hazard – DeWeese, and one recorded breach incident (Balman 1996). No Custer County municipalities downstream of DeWeese, Cañon City is 19 miles downstream. There are no properties or Lifelines infrastructure in the mapped inundation areas, but there are a handful of structures nearby. There is minimal risk to people.

DROUGHT– Drought is frequent and severity has varied greatly since 2000. Multiple extended periods, close to a year in some cases, recorded with extreme drought affecting 100% of the county. Exceptional drought instances recorded multiple times across the same period. Crop damage data is underreported; however, the county has had 11 Federal USDA Disaster Declarations since 2003, opening financial assistance for losses.

EARTHQUAKE – Low probability of a large magnitude earthquake occurring. If there is an event, would likely have a low magnitude. Buildings not constructed to current building codes are the most vulnerable to damages from an event. Westcliffe and Silver Cliff contain older building stock that would experience increased losses.

EXTREME HEAT – The county has seen a recent increase in temperatures and high heat days. The average high temperature in the summer, between June and September, is 73°F. In 2020, during that period, there were 33 days where the temperature was 85°F and above. Between 2000 until 2020, there were 364 days where the temperature was 85°F and above, an average of approximately 18 days each year.

FLOOD – A critical concern in Custer County, as there is a significant history of flooding and flash flooding events. There is the potential for extensive building damage and losses, as well as economic impacts to multiple areas in the county. Flooding has been worsened by the Junkins Fire burn scar, increasing mud and debris flow incidents.

GEOLOGIC HAZARDS – Overall, a minimal concern in the county due to lack of areas with expansive soils and subsidence potential. Erosion and deposition are a continually occurring process, which may see impacts from wildfire aftereffects.

HAZARDOUS MATERIALS RELEASE – Hazardous materials do not present a considerable risk, as there are no fixed storage facilities or designated transport routes in the county. However, it is known that some materials are being illegally transported through the county. Responder and public education are a priority for preparedness.

LANDSLIDE / DEBRIS FLOW / ROCKFALL – Areas prone to flooding, especially flash flooding, and near the Junkins burn scar are at higher risk of debris flow and landslide events. These events have occurred multiple times in the county post-fire and have closed crucial roadways for extended periods. Rockfall is a concern for transportation corridors in the steeper, remote mountainous areas and impact motorist safety.

PUBLIC HEALTH HAZARDS – Impacted by a number of factors. Air quality due to wildfire smoke has had long-term negative impacts. Water quality issues can quickly affect the entire population and drought has been shown to increase the concentration of undesirable metals in water sources. Mental health should be a commonly supported concept across organizations. Epidemic and pandemic will continue to be a risk for the foreseeable future.

SEVERE WINTER WEATHER – The effects of severe winter weather are wide-reaching and dangerous. Each year preparation for severe events is a concern. The county has seen large amounts of damages to property, as well as events that halted day-to-day operations, due to extreme cold and excessive amounts of snow. Those at risk of isolation or inability to handle the effects of an event are a priority, as they are at greater risk of effects.

THUNDERSTORM (HAIL, WIND, LIGHTNING) – Thunderstorms are a frequent occurrence and present multiple risks to people and property. There has been great variance in size of hailstones and wind speeds, both of which have done considerable damage in the county. Two lightning deaths have occurred, one in 2008 and one in 2011.

TORNADO – Tornadoes are infrequent but have occurred multiple times in the county. The largest tornado rating that has been recorded was an F2. Some damages have been reported for tornado events; however, a recent event with numerous damages has no record of property damage losses in weather report databases.

WILDFIRE – One of the most concerning hazards for the county, wildfire is a risk to most areas. Wildfire season is becoming longer in duration and a history of significantly sized fires, most recently the Junkins Fire and fires in neighboring counties, reinforces the ever-present risk of this hazard.

WILDLIFE-VEHICLE COLLISION – Collisions are possible anywhere in the county, highly populated or remote areas. Since 2010, there have been 240 reported collisions, the majority of which resulted in property damages. The roadways in rural and mountainous areas of the county have increased risk of wildlife-vehicle collisions.

MITIGATION GOALS & OBJECTIVES

The following are the hazard mitigation goals and corresponding objectives for this plan. These were reviewed and updated by the Hazard Mitigation Planning Committee (HMPC) to align with current mitigation priorities.

- **Goal 1**: Reduce the vulnerability of the public and community assets / infrastructure from the impacts of hazards in Custer County
  - **Objectives**
    - 1.1: Develop projects focused on preventing loss of life and injuries from hazards
    - 1.2: Protect the western view shed, by identifying projects involving the Wildland Urban Interface (WUI), with state and federal partners
    - 1.3: Identify projects that integrate both interagency collaboration and funding for prescribed burns, mechanical thinning on both public and private lands
    - 1.4: Utilize federal mitigation funding, including FEMA's Hazard Mitigation Assistance (HMA) and High Hazard Potential Dam (HHPD) Grant Program to reduce disaster risk from hazard events
    - 1.5: Identify actions to protect community lifelines, infrastructure, and natural resources
- **Goal 2**: Increase awareness of hazards and their mitigation
  - **Objectives**
    - 2.1: Develop and expand public awareness and information programs for all natural hazards

  - 2.2: Establish and maintain a reliable communications system to notify the public of impending and on-going natural hazard events
  - 2.3: Expand public awareness of wildfire hazards and measures by which people can protect themselves, their property, and their community

- **Goal 3**: Coordinate and enhance hazard mitigation activities among jurisdictions
  - **Objectives**
  - 3.1: Identify means to strengthen connections between hazard mitigation activities; and preparedness, response, and recovery activities among local, state, and federal agencies
  - 3.2: Collaborate with area partners to identify new and/or update policies and procedures
  - 3.3: Strengthen collaboration with neighboring communities, non-governmental agencies, and businesses to improve hazard mitigation & response capabilities and resources
  - 3.4: Continue to identify hazard prone areas and affected populations and track people and resources before and during a natural hazard event
  - 3.5: Identify funding resources to implement hazard mitigation

2017 MITIGATION ACTIONS REPORT

Table 2 presents the current status (as of March 2022) of all mitigation actions included in the 2017 plan. Of the 45 collective actions across that plan's participants, a majority are either on-going or in progress. Those actions labeled as on-going are also included in the 2022 mitigation actions.

Custer County has had numerous successes since identifying their mitigation actions during the previous plan update in 2017. For a rural county to make such progress, it is important to stop and recognize this commitment to improving their community's resilience. Since 2017, some of the work done by Custer County, Silver Cliff, and Westcliffe includes:

- Hosting a variety of workshops and creation of homeowner education programs, on the following topics:
  - hazard awareness (Custer County, Westcliffe)
  - fire mitigation and preparedness (Custer County, Silver Cliff)
  - drought resilience and water conservation (Custer County)
  - soil health (Custer County)
- Purchase of crucial equipment and the creation of critical agreements for disaster response
  - Custer County has an agreement to use a code-compliant facility for emergency response
  - Westcliffe purchased snow removal equipment
  - Custer County purchased an "EOC in a Box" modular trailer unit along with needed equipment
  - Custer County Road and Bridge purchased a chipper for debris management
- Code and ordinance adoptions
  - Westcliffe adopted ordinances and codes to mitigate fire, hail, wind, and lightning risk, ensuring new construction is compliant with IBC codes including wind standards and electrical installation
- Significant progress made on stormwater water management
  - Culvert replacement or installation, over a dozen completed (Custer County, Silver Cliff)
  - Innovative thinking about options other than traditional culverts, such as "cross pans" (Silver Cliff)

- Curb and gutter installation to manage water flow along the "safe route to school" (Westcliffe)
- Storm drain implementation 2021-2023 (Westcliffe)

Also notable are the three large fuel reduction projects completed in collaboration with the United States Forest Service (USFS) and another project covering 18,000 acres in progress.

The HMPC, in the mitigation strategy workshop, reiterated that the regularly held community slash days would continue as part of local level fuel reduction efforts.

Figure 1 provides a summary of the 2017 mitigation actions with an "On-going/In-Progress" status across the county. Of the 45 mitigation actions, 38 are "On-going/In-Progress." For Custer County there were an additional four actions with "No Progress-Continue Action" status and three "Complete" actions.

Figure 1. 2017 On-going/In-Progress Mitigation Action Location

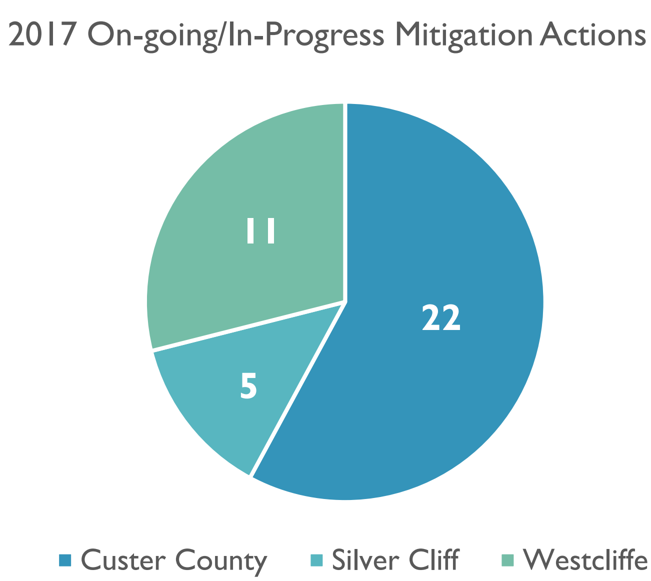

Table 2. 2017 Mitigation Action Status Report

ID	Org.	Title	Description	2022 Status	2022 Notes
CC2017.1	Custer County	Consistent IBC/IRC Building Codes Countywide	The Towns of Silver Cliff, Westcliffe, and Custer County governing boards should adopt/revise codes to a common standard and establish a shared position for inspections and enforcement via MOU/IGA.	On-Going Action	The Townships have adopted the 2006 ICC/IRC. The County encourages its residents to build responsibly and must comply with the 2021-22 Electrical, and Plumbing Codes but not the ICC/IRC. It is unlikely, at this time, that a shared position for inspections and enforcement – other than for fire mitigation will occur between these governing boards.
CC2017.2	Custer County	Inspection and Code Enforcement Staff Position	Towns of Silver Cliff, Westcliffe, and Custer County governing boards to adopt/revise codes to a common standard and establish a shared position for inspections and enforcement via MOU/IGA.	No Progress – Continue Action	The two towns work together to share positions on inspections. The county conducts compliance inspections through its planning/zoning department.
CC2017.3	Custer County	Adopt Consistent Ordinances Countywide	Consistent ordinances, such as weed ordinances, pride ordinances, and others of mutual concern would provide a consistent code enforcement opportunity across political subdivisions, making it easier to allow for enforcement of existing ordinances. Code enforcement is difficult with multiple codes and one LE agency.	No Progress – Continue Action	The towns have the same codes but take different direction on their implementation – i.e., urban vs more rural lifestyle.

ID	Org.	Title	Description	2022 Status	2022 Notes
CC2017.4	Custer County	Water-saving Measures	Provide education on water-saving measures such as but not limited to: installing low-flow water showerheads and toilets; adjusting sprinklers to only water lawn; installing rain capturing devices for irrigation; and checking for leaks in plumbing and fixing	On-Going Action	3 Workshops on water conservation practices were conducted in 2021 and will continue in 2022-23 and beyond. Round Mountain Water and Sanitation District upgraded all water meters in the District. The meters have the ability to detect leaks and constant flows in service lines and households and immediately alert the district. This technology is saving hundreds of thousands of gallons per month. The current process of re-drilling one of the municipal wells will double the water available to our District. The water well and new treatment system will be powered primarily by a solar array.
CC2017.5	Custer County	Soil & Water Conservation Practices	Encourage ranchers, farmers, and livestock owners to implement conservation practices to improve soil health and quality, increase resiliency, and mitigate the impacts of droughts	On-Going Action	Drought Resiliency Workshop is planned for March of 2022.
CC2017.6	Custer County	Public Education on Water Laws	Create an education / awareness program using printed materials and website.	On-Going Action	Soil Health workshops conducted in July 2021 and Jan. 2022.
CC2017.7	Custer County	Incorporate Drought-Tolerant Landscape Design	Create an education / awareness program using printed materials and website; educate landowners on impact of planting lawns and other non-drought resistant landscaping.	On-Going Action	

ID	Org.	Title	Description	2022 Status	2022 Notes
CC2017.8	Custer County	Minimize Wind Damage	Create an education / awareness program and zoning/building regulations to promote site and building design standards to reduce wind damage	On-Going Action	
CC2017.9	Custer County	EOC Compliance to FEMA 361 Standards	Retrofitting or constructing the EOC to FEMA 361 standards to mitigate high wind and tornadoes.	On-Going Action	"EOC in the Box" Modular EOC Funded in 2021 and equipment purchased. No funding available to build an EOC to meet FEMA 361 Standards, but the need is there.
CC2017.10	Custer County	Power Line Protection	Work with electric public utilities and stakeholders to identify mitigation measures such as upgrading overhead utility lines (adjust utility pole size, pole span widths, and/or line strength).	On-Going Action	OEM is collaborating with local utility to upgrade overhead utilities and to reduce hazards from wind, snow, ice and falling trees.
CC2017.11	Custer County	Reduce Impacts to Roadways	Planning for and maintaining adequate road and debris clearing capabilities (equipment acquisition).	On-Going Action	Custer County R&B purchased a Vermeer BC 900 Gas Chipper in 2022 for debris management along county roads.
CC2017.12	Custer County	Winter Weather Risk Awareness	Continue current awareness programs and look for new ways to disseminate essential information, while not disenfranchising the intended audience.	On-Going Action	OEM is working with the NWS to notify the public using the AWS of WX, Fire, and other incidents; and using Twitter and other social media to inform the public.
CC2017.13	Custer County	Full System Capability of Advance Notification Systems	Update GIS and call data, train personnel, fully test the system, and establish an on-going TEP to remain current in system and resolve issues.	On-Going Action	IPAWS, Everbridge, EAS, AMBER, are all active in Custer County. We need to pursue a more active TEP in this area.

ID	Org.	Title	Description	2022 Status	2022 Notes
CC2017.14	Custer County	Back-Up Generators for Local Radio Station	Purchase and install back-up generator for KLZR radio in the Wet Mountain Valley for both its studio and transmitter location. KLZR will seek grant funding to purchase and install permanent back-up power at both sites.	No Progress – Continue Action	Radio station was contacted via email sent on its site to respond as to where it was in this process. There is backup power at the radio stations transmitter site which is located at the Custer County SAR building.
CC2017.15	Custer County	Promote Fire-Resistant Construction Techniques	Encourage, rather than regulate, the use of non-combustible materials, fire resistant roofing, enclosed foundations, and other fire-resistant construction techniques.	On-Going Action	Action is progressing in the Townships. Residents are encouraged to use BMP when building in Custer County and to do annual slash/fuel reduction mitigation within 150ft of their homes.
CC2017.16	Custer County	Implement Fuels Management Program	Collaborate with public landowners and private landowners to cut firebreaks, clear fuels, sponsor local slash and clean-up days, perform prescribed burns and other tasks as identified.	On-Going Action	The OEM is taking a pro-active role with Public LMA to mitigate the impact of wildfires before they happen.
CC2017.17	Custer County	Reduce Risk to Wildfires	Perform arson prevention clean-up in identified areas of abandoned or collapsed structures, accumulated trash, and debris or hazardous materials that could create a wildfire.	On-Going Action	A 2021 CEPA for Custer County identified wildfire as the #1 threat in the County.
CC2017.18	Custer County	Hazard Education and Risk Awareness Outreach	Work with fire departments, utility companies, and others to conduct outreach programs in neighborhoods and schools. Test evacuation procedures and notification systems. Educate home buyers and home builders. Encourage growth within town(s) limits.	On-Going Action	3 Fire Mitigation / Preparedness workshops were conducted in CC in 2021, and 6 are being planned in 2022. The TEP for CC agencies in 2022 will test our evacuation procedures and notification systems.

ID	Org.	Title	Description	2022 Status	2022 Notes
CC2017.19	Custer County	Local Emergency Operations Activities / EOC Capabilities Enhancement	The existing EOC does not meet ADA, building codes, or FEMA requirements. It is not conducive to technology upgrades, acoustics, security, or severe weather hazards. Obtain grant funding for technology aids in the current EOC, while seeking long-term adequate facilities.	On-Going Action	A building use agreement for Lange Hall is in place in the event of an emergency and could be leased during an event. This hall meets ADA, building codes and FEMA requirements.
CC2017.20	Custer County	Replacement and Enlargement of Culverts – Grape Creek	Replace and enlarge culverts at Grape Creek at Horn Road, Schoolfield Road, Hermit Road, and Pines Road. The water flow backs-up due to debris or ice/snow that obstructs the pipes. This can cause access issues to the west side of Grape Creek for emergency services.	On-Going Action	The culvert at Hermit Road was replaced. There are on-going actions to address the other concerns, but funding is limited. The County is currently participating 2021-2023 FEMA funded Flood Mitigation Study.
CC2017.21	Custer County	Replacement and Enlargement of Culverts – Spring Creek	Replace and enlarge culverts at Spring Creek at Hermit Road and Pines Road. The water flow backs-up due to debris or ice/snow that obstructs the pipes. Providing adequate flow will ensure access by EMS to the west side and prevent the loss of the structures and roadways at this location.	On-Going Action	Replacement of sub-standard culvert, and proving adequate flows are being addressed by the local CC Road and Bridge department, under the NFIP and Risk Map Assessment currently being conducted within CC FY 2021-2023.
CC2017.22	Custer County	Provide a shaded fuel break along Highway 78 (12-mile road between Highway 165 and Beulah)	Provide a shaded fuel break along Highway 78 (12-mile road between Highway 165 & Beulah) using a combination of mechanical and prescribed fire treatment as necessary to remove, modify or otherwise reduce the volume of hazardous fuels.	Complete	

ID	Org.	Title	Description	2022 Status	2022 Notes
CC2017.23	Custer County	Fuel Reduction Work near Alvarado Campground and Tanglewood Subdivision	Conduct fuels reduction work near Alvarado Campground and Tanglewood subdivision to affect potential fire behavior in and near values at risk.	Complete	
CC2017.24	Custer County	Hazardous Fuel Reduction – Deer Peak Communicat-ion Site	Reduce fuels around the communication site which serves much of Custer County for cell and radio service. A combination of mechanical and prescribed fire treatment as necessary to remove, modify or otherwise reduce the volume of hazardous fuels.	Complete	OEM closely monitored the USFS Fire Mitigation effort on Deer Peak.
CC2017.25	Custer County	East-Central Wet Mountains Project – Vegetation Treatment	Providing approximately 18,000 acres of vegetation treatment in Custer and Pueblo Counties in and near values at risk.	In Progress	OEM is a collaborating agency on these plans
CC2017.26	Custer County	Locke Mountain Fuels Reduction	Providing approximately 4,000 acres of vegetation treatment in Custer and Fremont Counties.	No Progress – No Longer a Mitigation Priority	
CC2017.27	Custer County	Community Slash Collection Project – San Isabel	USFS land will be used to collect woody debris as a result of adjacent property owners removing, modifying, or otherwise reducing the volume of hazardous fuels on their properties. USFS will burn resulting slash piles at appropriate times.	On-Going Action	The OEM participates / collaborates with the USFS in its collection of woody debris in conjunction with Custer County residents.

ID	Org.	Title	Description	2022 Status	2022 Notes
CC2017.28	Custer County	Community Slash Collection Project – Comanche Trailhead / Alvarado Campground	USFS land to be used to collect woody debris as a result of adjacent property owners removing, modifying, or otherwise reducing the volume of hazardous fuels on their properties. USFS will burn resulting slash piles at appropriate times.	Complete	We did this for about two years, but the effort was not justified by the number of participants.
CC2017.29	Custer County	Lightning-Triggered Wildfire Mitigation	Collaborate with agency partners, as well as local volunteers to map, investigate, and mitigate potential fire ignition from lightning strikes, in high fuel areas, as they occur.	On-Going Action	
SC2017.01	Silver Cliff	Upgrade Drainage at Silver Cliff Ranch	The Town will add five culverts for better drainage at Silver Cliff Ranch.	In Progress	2 culverts installed to date; brush mitigation work needs to be completed in the county right of way, before additional culverts are installed.
SC2017.02	Silver Cliff	Upgrade Drainage throughout Silver Cliff Ranch	The Town will add 20 culverts for new and existing development for the street system.	In Progress	8 of 20 culverts installed. Town is now considering using “pans” instead of culverts
SC2017.03	Silver Cliff	Watershed Management and Drainage Study	The Town will complete a drainage study and survey from Fourth Street south to CR 328 to properly re-zone land. The area will fall into the Silver Cliff Re-zoning Plan for the years of 2021-2026.	In Progress	Change from a low to a medium priority. New study by FEMA is moving along well.
SC2017.04	Silver Cliff	Hazard Education for Homeowners	Provide education on hazard events to homeowners and how to mitigate damages to their homes and property.	On-going – In Progress	Fire Mitigation workshops were conducted in 2021 and are scheduled for the Spring of 2022.

ID	Org.	Title	Description	2022 Status	2022 Notes
SC2017.07	Silver Cliff	Silver Cliff Ranch WUI Project	Reduce fuels around the Silver Cliff Ranch that is in a WUI area. A combination of mechanical and prescribed fire treatment as necessary to remove, modify, or otherwise reduce the volume of hazardous fuels	On-Going	A special community fire mitigation grant application has been submitted to address fuels concerns within Silver Cliff Ranch.
WC2017.01	Westcliffe	Storm Water Retention	Implement storm water retention measures	On-going	Storm Drain Implementation in 2021-23
WC2017.02	Westcliffe	Incorporate Drought-Tolerant Landscape Design	Create an education/awareness program using printed materials and website	On-going	City will work with CSU Extension Office to get a list of drought tolerant species for high elevations.
WC2017.03	Westcliffe	Prevent Hail Damage to Roof Structures	The Town will require hail resistant roofing products on new construction and re-roofs with UL2218 or GM4473, Class 4 ratings.	On-going	New roof construction must conform to 2007 UBC for underlayment materials.
WC2017.04	Westcliffe	Adopt Standards for Residential Construction in High-Wind Regions	Adopt ICC-600 Standard for residential construction in high-wind regions	On-going	New construction must comply with IBC standards for 120 MPH one.
WC2017.05	Westcliffe	Fire Danger Ordinance	The Town will adopt ordinances regulating the burning of rubbish, storage, disposal of wood ashes, cinders, and smoldering coals from wood burning appliances	On-going	Township has adopted ordinances for open burning, debris, and junk removal.
WC2017.06	Westcliffe	Vegetation Clearance on Vacant Property	The Town will assume responsibility for vegetation clearance requirements on vacant and private property of absentee owners to reduce fire danger.	On-going	If necessary private parties are noticed by the Township to clean up their lots. If not, township will perform the work and lien the property.
WC2017.07	Westcliffe	Update Snow Removal Policy and Ordinance	The Town needs to update the snow removal policy and ordinance to reduce vehicle accidents and transportation stoppages.	On-going	Funds are set aside for snow removal using both city crew and contract help.

ID	Org.	Title	Description	2022 Status	2022 Notes
WC2017.08	Westcliffe	Additional Sites for Disposal of Snow	The Town needs to create additional sites for disposal of snow from roadways. Additional snow removal equipment is needed. There are a lot of vehicle accidents, transportation stoppages, and stranded motorists.	In-Progress	Snow removal equipment has been purchased to relocate snow. Funds are set aside for contractual cleanup labor-help.
WC2017.09	Westcliffe	Hazard Education for Homeowners	Provide education on hazard events to homeowners and how to mitigate damages to their homes and property.	In-Progress	A PR campaign called "Did you know?" – provides Hazard Education for homeowners.
WC2017.10	Westcliffe	Improve Stormwater Drainage Capacity	The proposed project includes the addition of two catch basins at the east end of town and two 24-foot drainage culvert running 280 feet to a natural drainage area.	In-progress	New curb and gutter is being installed to manage water in the western portion of Township; and along the "safe route to school."
WC2017.11	Westcliffe	Install Whole-House Surge Protective Devices	Offer incentives to residents and businesses to install whole-house surge protective devices at the meter or at the main electrical panel. This would mitigate the possibility of a building fire from lightning strike.	On-Going	All new construction must comply with the 2021-2022 IBC for electrical installations.

2022 MITIGATION ACTIONS

Table 3 includes all new mitigation actions included in this updated 2023 HMP. In order to prioritize the mitigation actions in this plan, the county and each participating jurisdiction reviewed FEMA's STAPLEE methodology, in addition to a number of additional criteria. This allowed for a careful review of the feasibility of mitigation actions.

There are multiple prioritization criteria considered by the jurisdictions when building a mitigation strategy. According to FEMA mitigation planning requirements, any prioritization system should have a special emphasis on the extent to which benefits are maximized, according to a cost-benefit review of the proposed projects.

Following is a list of the prioritization criteria:

- Positive Cost-Benefit
- Social considerations – life/safety impact

- Administrative considerations – administrative / technical assistance
- Economic considerations – project cost / reductions in future disaster costs
- Alignment with other local objectives
- Environmental considerations
- Lifeline protection
- Legal considerations
- Availability of local funding

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

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

- Moderate to High-risk ranked hazard
- Potential high risk to life safety, property, or the environment
- Critical need for information to move forward with any mitigation measures

The data deficiencies identified are mitigation actions in themselves, since without proper assessment and studies by engineers and subject matter experts, it cannot be determined if the cost-benefit ratio is positive, an action is feasible, and the impact it may have on other areas or hazards.

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

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

In these cases, the factors that played heavily were cost-benefit ratio, considerations for level of risk to life safety and critical facilities, and overall hazard risk.

A "Low" priority would be assigned to low probability hazards in most cases and therefore actions may not be prioritized above or competing with other more practical actions. Also, considering the typically small staff in many organizations in Custer County, utilizing the administrative time would likely not be practical or efficient. There were no actions considered low priority.

As part of the planning process, a *Mitigation Strategy Action Idea* document was developed. This guide identified a number of additional mitigation actions that were considered during development of this mitigation strategy. Many of these actions came from the public and the priorities that held importance within communities. There were several themes within these submissions which aligned with many of the participating communities' areas of focus when determining actions. Appendix E: Mitigation Ideas includes this guide for future reference.

The mitigation actions were developed based on a variety of factors and needs in the community, including the goal of having an action for each High-risk hazard. There are some exceptions to this and those are explained here. Westcliffe ranked Geologic Hazard as a High-risk hazard, but at this time due to available resources in staffing and capacity, the Town chose not to pursue a mitigation action for this HMP. For this reason, as well, Silver Cliff did not pursue an action for the hazards considered High risk, outside of Flood and Wildfire.

This is not to say the Towns are not working toward mitigating hazards, as there is collaboration with the County on a number of actions which address hazards considered by the communities as High risk. As mentioned, small communities are often limited by minimal capacity, such as staff availability and funding resources. While unable to develop more actions now, future efforts will be made by the Towns to leverage available resources, improve capacity, and create feasible, cost effective actions for all High risk hazards.

Table 3. 2022 Mitigation Actions

ID	Org.	Title	Issue / Background	Priority	Goals / Obj. Met	Lead and Support Org.	Hazard(s) Mitigated	Estimated Project Cost	Potential Funding Source	Expected Completion Year
CC2022-01	Custer County	Water Conser-vation Education for Ranchers, Well Owners	Community education on water conservation to include: owners of water wells, ranchers and others who consume water products	M	2.1	CC OEM, CWCB	Drought	Unknown	CC Budget, Grants	2028
CC2022-02	Custer County	Drought Insurance Education	Educate ranchers, farmers, and landowners on the benefits of purchasing drought insurance	M	2.1	CC OEM	Drought	Unknown	CC Budget	2028
CC2022-03	Custer County	Water Law Education	Public education on water laws to include social media strategy to educate public	M	2.1	CC OEM, CWCB	Drought	Unknown	CC Budget, Grants	2028
CC2022-04	Custer County	Prepared-ness Guide for Winter Weather	Prepare winter weather hazards public education campaign to including preparedness guide	M	1.1, 2.1	CC OEM, NOAA / NWS	Severe Winter Weather	Unknown	CC Budget, Grants	2028
CC2022-05	Custer County	Winter Weather Public Commun-ication	Inform the public on high hazard winter weather days and increase outreach via social media	M	1.1, 2.1, 2.2	CC OEM, NOAA / NWS	Severe Winter Weather	Unknown	CC Budget, Grants	2028

ID	Org.	Title	Issue / Background	Priority	Goals / Obj. Met	Lead and Support Org.	Hazard(s) Mitigated	Estimated Project Cost	Potential Funding Source	Expected Completion Year
CC2022-06	Custer County	Snow Removal Wellness Education	Provide education on the various health issues related to snow management	M	1.1, 2.1	CC OEM, CCPHA	Severe Winter Weather	Unknown	CC Budget, CDPHE, Grants	2028
CC2022-07	Custer County	Hazard Resistant Building Education	Minimize /reduce wind damage with public education about wind and hail resistant building materials	M	1.1, 2.1	CC OEM	Hail, Wind	Unknown	CC Budget	2028
CC2022-08	Custer County	Thunder-storm Youth Education Campaign	Develop thunderstorm and lightning education program targeted for children in cooperation with the school district	M	2.1, 3.1, 3.3	CC OEM	Thunder-storm, Lightning	$500	CC Budget, Grants	2028
CC2022-09	Custer County	Pandemic Education and Action Support	Maintaining public health resilience will require continued support of outreach efforts and pandemic public actions including education campaigns, and vaccination encouragement	M	1.1, 2.1	CC Public Health Agency (CCPHA), CC OEM	Public Health Hazards	Unknown	CC Budget	2028

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CCFM2022-01	Custer County	Custer County Shaded Fuel Break Network	Strategic fuel modifications, like shaded fuel breaks, to separate communities or groups of structures from the native vegetation and break up large expanses of flammable fuel into smaller blocks	H	1.1, 1.2, 1.3	Custer County BOCC, CSFS, CC OEM, CSFS, CDFPC, USFS, BLM, CDPW, Private Property Owner Associations, WMFZPD, Wetmore VFD	Wildfire	$14,434,000	Custer County Funds, CSFS, FEMA, Community Wildfire Defense Grant, USFS, BLM,	On-going to 2027
CCFM2022-01a	Custer County	Rainbow Trail Shaded Fuel Break	Wildfire Mitigation	H	see CCFM2022-01	see CCFM2022-01	Wildfire	$4,200,000	see CCFM2022-01	On-going to 2027
CCFM2022-01b	Custer County	Oak Creek Grade Shaded Fuel Break	Wildfire Mitigation	H	see CCFM2022-01	see CCFM2022-01	Wildfire	$1,140,000	see CCFM2022-01	On-going to 2027
CCFM2022-01c	Custer County	Roadside Chipping Fuel Break Project	Wildfire Mitigation	H	see CCFM2022-01	see CCFM2022-01	Wildfire	$257,500	see CCFM2022-01	On-going to 2027
CCFM2022-01d	Custer County	State Route 165 Shaded Fuel Break	Wildfire Mitigation	H	see CCFM2022-01	see CCFM2022-01	Wildfire	$2,300,000	see CCFM2022-01	On-going to 2027
CCFM2022-01e	Custer County	Querida Road Shaded Fuel Break	Wildfire Mitigation	H	see CCFM2022-01	see CCFM2022-01	Wildfire	$572,727	see CCFM2022-01	On-going to 2027

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CCFM2022-01f	Custer County	Bear Basin Shaded Fuel Break	Wildfire Mitigation	H	see CCFM2022-01	see CCFM2022-01	Wildfire	$1,680,000	see CCFM2022-01	On-going to 2027
CCFM2022-01g	Custer County	Highway 96 Shaded Fuel	Wildfire Mitigation	H	see CCFM2022-01	see CCFM2022-01	Wildfire	$3,000,000	see CCFM2022-01	On-going to 2027
CCFM2022-01h	Custer County	County Road 271 Shaded Fuel Break	Wildfire Mitigation	H	see CCFM2022-01	see CCFM2022-01	Wildfire	$1,000,000	see CCFM2022-01	On-going to 2027
CCFM2022-02	Custer County	Wildfire Mitigation, Information, and Education Programs	Effective community fire adaption efforts can take many shapes. Creating local mitigation coalitions such as Firewise-NFPA or Fire Adapted Communities under the National Fire Adapted Communities Program (NFACP) can encourage individuals and community groups to develop CWPP's, shaded fuel breaks, defensible space initiatives, reduce hazardous fuels, and to engage in developing and adopting WUI type codes.	M	1.1, 1.3, 2.3, 3.1, 3.2, 3.3	Custer County BOCC, CSFS, CC OEM, CSFS, CDFPC, USFS, BLM, CDPW, Private Property Owner Associations WMFZPD, Wetmore VFD	Wildfire	$120,000	Custer County Funds, CSFS, FEMA, Community Wildfire Defense Grant, USFS, BLM	On-Going

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CCFM2022-03	Custer County	Community Wildfire Protection Plan Develop-ment and Updates	An assessment of properties in the county identified 36 new CWPP projects and 2 existing projects. The Sangre Foothills and Cuerno Verde projects need revision during the lifecycle of the 2022 HMPR. Development of countywide CWPP (umbrella document).	H	1.1, 1.2, 1.3, 2.3, 3.1, 3.2, 3.3	Custer County BOCC, CSFS, CC OEM, CSFS, CDFPC, USFS, BLM, CDPW, Private Property Owner Associations WMFPD, Wetmore VFD	Wildfire	$344,000	Custer County Funds, CSFS, FEMA, Comm-unity Wildfire Defense Grant, USFS, BLM,	On-Going
CCFM2022-03a	Custer County	Custer County CWPP (Countywide Plan) update	see CCFM2022-03	H	see CCFM2022-03	see CCFM2022-03	Wildfire	see CCFM2022-03	see CCFM2022-03	2024
CCFM2022-03b	Custer County	Bob Lawrence Track - Brush Creek CWPP	see CCFM2022-03	H	see CCFM2022-03	see CCFM2022-03	Wildfire	see CCFM2022-03	see CCFM2022-03	2027
CCFM2022-03c	Custer County	Conquista-dor - Cristo Vista CWPP	see CCFM2022-03	H	see CCFM2022-03	see CCFM2022-03	Wildfire	see CCFM2022-03	see CCFM2022-03	2027
CCFM2022-03d	Custer County	Cuerno Verde CWPP update	see CCFM2022-03	H	see CCFM2022-03	see CCFM2022-03	Wildfire	see CCFM2022-03	see CCFM2022-03	2023

ID	Org.	Title	Issue / Background	Priority	Goals / Obj. Met	Lead and Support Org.	Hazard(s) Mitigated	Estimated Project Cost	Potential Funding Source	Expected Completion Year
CCFM2022-03e	Custer County	Eagle Springs - Puma Canyon CWPP	see CCFM2022-03	H	see CCFM2022-03	see CCFM2022-03	Wildfire	see CCFM2022-03	see CCFM2022-03	2027
CCFM2022-03f	Custer County	Hat Creek Ranch CWPP	see CCFM2022-03	H	see CCFM2022-03	see CCFM2022-03	Wildfire	see CCFM2022-03	see CCFM2022-03	2027
CCFM2022-03g	Custer County	Horn Creek CWPP	see CCFM2022-03	H	see CCFM2022-03	see CCFM2022-03	Wildfire	see CCFM2022-03	see CCFM2022-03	2027
CCFM2022-03h	Custer County	Juniper Hill CWPP	see CCFM2022-03	H	see CCFM2022-03	see CCFM2022-03	Wildfire	see CCFM2022-03	see CCFM2022-03	2027
CCFM2022-03i	Custer County	Macey Creek Ranch CWPP	see CCFM2022-03	H	see CCFM2022-03	see CCFM2022-03	Wildfire	see CCFM2022-03	see CCFM2022-03	2027
CCFM2022-03j	Custer County	San Isabel Region CWPP	see CCFM2022-03	H	see CCFM2022-03	see CCFM2022-03	Wildfire	see CCFM2022-03	see CCFM2022-03	2027
CCFM2022-03k	Custer County	Sangre Foothills CWPP update	see CCFM2022-03	H	see CCFM2022-03	see CCFM2022-03	Wildfire	see CCFM2022-03	see CCFM2022-03	2023
CCFM2022-03l	Custer County	Sierra Mojada CWPP	see CCFM2022-03	H	see CCFM2022-03	see CCFM2022-03	Wildfire	see CCFM2022-03	see CCFM2022-03	2027

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CCFM2022-03m	Custer County	Spread Eagle Ranch - HOA - CWPP - Fire Mitigation Proposal	see CCFM2022-03	H	see CCFM2022-03	see CCFM2022-03	Wildfire	see CCFM2022-03	see CCFM2022-03	2027
CCFM2022-03n	Custer County	Tanglewood Acres - Alpine Colony CWPP	see CCFM2022-03	H	see CCFM2022-03	see CCFM2022-03	Wildfire	see CCFM2022-03	see CCFM2022-03	2027
CCFM2022-03o	Custer County	Taylor Creek Highlands CWPP	see CCFM2022-03	H	see CCFM2022-03	see CCFM2022-03	Wildfire	see CCFM2022-03	see CCFM2022-03	2027
CCFM2022-03p	Custer County	Wet Mountain Hayfield - Grape Creek CWPP	see CCFM2022-03	H	see CCFM2022-03	see CCFM2022-03	Wildfire	see CCFM2022-03	see CCFM2022-03	2027
CCFM2022-03q	Custer County	Wet Mountain North - San Isabel CWPP	see CCFM2022-03	H	see CCFM2022-03	see CCFM2022-03	Wildfire	see CCFM2022-03	see CCFM2022-03	2027
CCFM2022-03r	Custer County	Wetmore Foothills CWPP	see CCFM2022-03	H	see CCFM2022-03	see CCFM2022-03	Wildfire	see CCFM2022-03	see CCFM2022-03	2027
CCFM2022-03s	Custer County	Antelope Valley CWPP	see CCFM2022-03	H	see CCFM2022-03	see CCFM2022-03	Wildfire	see CCFM2022-03	see CCFM2022-03	2027

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CCFM2022-03t	Custer County	Aspen Mountain Ranch CWPP	see CCFM2022-03	H	see CCFM2022-03	see CCFM2022-03	Wildfire	see CCFM2022-03	see CCFM2022-03	2027
CCFM2022-03u	Custer County	Bear Basin CWPP	see CCFM2022-03	H	see CCFM2022-03	see CCFM2022-03	Wildfire	see CCFM2022-03	see CCFM2022-03	2027
CCFM2022-03v	Custer County	Blumenau CWPP	see CCFM2022-03	H	see CCFM2022-03	see CCFM2022-03	Wildfire	see CCFM2022-03	see CCFM2022-03	2027
CCFM2022-03w	Custer County	Copper Gultch CWPP	see CCFM2022-03	H	see CCFM2022-03	see CCFM2022-03	Wildfire	see CCFM2022-03	see CCFM2022-03	2027
CCFM2022-03x	Custer County	Hat Creek - Kelly Tract CWPP	see CCFM2022-03	H	see CCFM2022-03	see CCFM2022-03	Wildfire	see CCFM2022-03	see CCFM2022-03	2027
CCFM2022-03y	Custer County	Ithaka Ranch CWPP	see CCFM2022-03	H	see CCFM2022-03	see CCFM2022-03	Wildfire	see CCFM2022-03	see CCFM2022-03	2027
CCFM2022-03z	Custer County	Jones Creek Ranch - Elk Haven CWPP	see CCFM2022-03	H	see CCFM2022-03	see CCFM2022-03	Wildfire	see CCFM2022-03	see CCFM2022-03	2027
CCFM2022-03aa	Custer County	Mountain Springs - Cottonwood Springs CWPP	see CCFM2022-03	H	see CCFM2022-03	see CCFM2022-03	Wildfire	see CCFM2022-03	see CCFM2022-03	2027

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CCFM2022-03bb	Custer County	One O Five - Bella Vista CWPP	see CCFM2022-03	H	see CCFM2022-03	see CCFM2022-03	Wildfire	see CCFM2022-03	see CCFM2022-03	2027
CCFM2022-03cc	Custer County	Peterson - Dilly Ranch CWPP	see CCFM2022-03	H	see CCFM2022-03	see CCFM2022-03	Wildfire	see CCFM2022-03	see CCFM2022-03	2027
CCFM2022-03dd	Custer County	Silver Cliff Highlands CWPP	see CCFM2022-03	H	see CCFM2022-03	see CCFM2022-03	Wildfire	see CCFM2022-03	see CCFM2022-03	2027
CCFM2022-04	Custer County	N5 Sensor Project - Wildfire Detection & Early Warning	Network of 80 cloud-based connected sensors will allow wildfires to be identified faster; analysis of local conditions for safe and effective initial attack, and assist in the management of firefighting resources.	H	1.1, 1.2, 1.4, 1.5, 3.1, 3.2, 3.4	CCOEM, CCSO, CDFPC, DHSEM, WMFPD, WFD, USFS, BLM, , FSC	Wildfire, Public Health Hazards, Severe Weather, Hazardous Material Release	$340,000	HSG, FEMA, USFS, CWDG	On-Going 2027

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CCIT2022-01	Custer County	Cyber-security Risk Remediation Plan	Develop a security mitigation plan for the use of security policies and processes to reduce the overall risk or impact of a cybersecurity threats.	H	1.5, 3.1, 3.2	CCIT, CISA, CCOEM, CCBOCC, CCSO, DHSEM, RMWSD, Silver Cliff, Westcliffe, CC-C1, WMFPD	Cyber Hazards	$500,000	County, Towns, and Special District Budgets, HSG, FEMA, DOLA	On-Going 2027
CCPH2022-01	Custer County	Air Quality Safe Sites (AQSS)	Equip sites with air purifiers or forced filtered air system to provide temporary relief from caution- or severe-level particulate concentrations (smoke, dust, other irritants) until transportation can be arranged	H	1.1, 3.1, 3.2, 3.3	Custer County Public Health Agency (CCPHA)	Wildfire, Public Health Hazards	Local Facilities / Shelters, Businesses, Private Homes	Local	2022
CCPH2022-02	Custer County	PH Temporary Shelter	Maintain and expand a listing of partners / facilities / organizations to provide sheltering and assistance to people displaced by hazard events	H	1.1, 3.1, 3.3	Custer County Public Health Agency (CCPHA)	All Hazards	$10,000	Local	2022

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CCPH2022-03	Custer County	PH/EPR Air Quality Monitors	Monitors assist in timely communication and effective outreach to those who may experience respiratory difficulties.	H	1.1, 3.1, 3.2, 3.3	CCPHA / EPR / OEM	Wildfire, Public Health Hazards	$18,000	Grants and County	2022
CCPH2022-04	Custer County	Water Quality: Municipal and Private Wells	Study to identify location of any water contaminants that could be injurious to health.	M	1.1, 1.5, 2.1, 3.2,	Round Mountain Water (municipal) and private wells (grant from CO School of mines)	Public Health Hazards, Drought	$3,000, Staff Time	State and Federal Grants	2023
CCPH2022-05	Custer County	Control and Prevention of Waste Water Contamin-ation of Private and Municipal Wells Post Flooding	Planning efforts for post-fire flooding impacts on the watershed and municipality water supply.	H	1.1, 1.5, 3.1, 3.2, 3.3	Custer County Public Health Agency (CCPHA)	Flood, Wildfire, Public Health Hazards	$15,000,000	State and Federal Park Services	On-Going
CCRB2022-01	Custer County	Flood Mitigation - Road & Bridge	Continue to participate in the Flood Mitigation Study conducted by FEMA and the CO DNR	H	1.1, 1.4, 1.5, 2.1, 3.1, 3.2, 3.4	Custer County -BOCC, Road and Bridge, CCSO, OEM	Flood	$3,500,000	FEMA, DOLA, Custer County Budget, R&B	On-Going

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CCRB2022-02	Custer County	Snow Fences for Drifting Snow Mitigation - Road & Bridge	Installation of snow fences to reduce hazard associated with transportation safety and utilities infrastructure	M	1.1, 1.4, 1.5, 2.1, 3.3, 3.4	Custer County -Road and Bridge, BOCC, Sheriff, OEM	Severe Winter Weather	$1,500,000	FEMA, DOLA, Custer County Budget, R&B, OEM/HSG, Utility Companies	On-Going
RM2022-01	Round Mountain Water Sanitation District	Drought, Water Use, and Flood Mitigation Study	Participation is Flood Mapping, Studies of Water Use / Conservation, Urbanization and Hydrology for data to inform mitigation	H	1.1, 1.5, 3.2, 3.4	RMWSD, CDNR, FEMA, Custer County, OEM	Severe Weather, Drought, Flood	$20,000	FEMA, DOLA, District Funds	On-Going
RM2022-02	Round Mountain Water Sanitation District	Water Use and Conserv-ation - Reduction of Annual Evaporation	Utilize Evaporation Control Covers to reduce loss of moisture and mitigate drought conditions	H	1.5, 3.2	RMWSD, CDNR, FEMA, Custer County, OEM	Drought	$150,000	FEMA, DOLA, District Funds	2024

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RM2022-03	Round Mountain Water Sanitation District	Infra-structure Protection Upgrade - Fire Protection Water System Study	Conduct study to determine capabilities of current system, needs / gaps, long term performance based on mitigation strategy	H	1.1, 1.4, 1.5	RMWSD, CDNR, FEMA, Custer County, OEM	Wildfire, Severe Winter Weather	$6 -7 million	FEMA, DOLA, WMFPD, Custer County, District Funds	On-Going
RM2022-04	Round Mountain Water Sanitation District	Emergency Water Availability - Wildfires and Other Disasters	Increase emergency water availability, at lakes and other storage facilities, for use during power loss or utility system failure during wildfire and other natural disasters	H	1.1, 1.2, 1.4, 1.5, 3.2, 3.4	RMWSD, CDNR, FEMA, Custer County, OEM	Wildfire, Drought	$200,000	FEMA, DOLA, RMWSD Funds, OEM/HSG	On-Going
RM2022-05	Round Mountain Water Sanitation District	Protection of Critical Infra-structure During Disaster	Implement mitigation actions to ensure water and sanitation facilities continue to function during a disaster event	H	1.4, 1.5, 3.1, 3.2	RMWSD, CDNR, FEMA, Custer County, OEM	All Hazards, Cyber Security	$150,000	FEMA, DOLA, HSG, OEM/HSG	2025
RM2022-06	Round Mountain Water Sanitation District	Cyber Attack Prepared-ness & Mitigation	Continue to use SCADA system and long-term remote monitoring contractor. Update equipment.	H	1.4, 1.5	RMWSD, IT	Cyber Attack	$150,000 $12,000 (annual)	District Funds, Grants	2025 and Ongoing

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RM2022-07	Round Mountain Water Sanitation District	Drought Resiliency	Maintain current flood mapping and adapt as needed to assist in data for water conservation and available supply	H	2.1, 1.5, 3.3	RMWSD, CDNR, FEMA, Custer County, OEM	Drought	Unknown	FEMA,DOLA, RMWSD Funds, OEM/HSG	2024 and Ongoing
RM2022-08	Round Mountain Water Sanitation District	Continuity of Community Services	Protect District assets to provide community services in times of power outages and maintain back-up generator to run lifts	H	1.4, 1.5, 3.3	RMWSD, CDNR, FEMA, Custer County, OEM	Severe Winter Weather	Unknown	FEMA, DOLA, RMSWD Funds	2023 and Ongoing
RM2022-09	Round Mountain Water Sanitation District	Community Services Prepared-ness & Resiliency	Preparedness of District assets to ensure community services in times of power outages and maintain back-up generator to run lifts	H	1.4, 1.5, 3.3	RMWSD, CDNR, FEMA, Custer County, OEM	Thunder-storm (Hail, High Winds)	Unknown	FEMA, DOLA, RMSWD Funds	2023 and Ongoing
RM2022-10	Round Mountain Water Sanitation District	Reservoir Capacity Increase for Grassland Fighting	Explore additional storage capacity mechanisms to supplement current tanks. Create MOUs with reservoirs	H	1.5, 3.3	RMWSD, CDNR, FEMA, Custer County, OEM	Wildfire	Unknown	FEMA, DOLA, WMFPD, CC, District Funds, RMWSD Funds, OEM/HSG	2023 and Ongoing
RM2022-11	Round Mountain Water Sanitation District	Vehicle Operations & Driver Safety	Communicate WVC safety awareness information to staff. Explore training for safe driving tactics.	H	1.1, 2.1	RMWSD	Wildlife-Vehicle Collision	Unknown	District Funds	2023 and Ongoing

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SC2022-01	Silver Cliff	Flood Mitigation - Silver Cliff Ranch	Drainage upgrade including cleaning culverts out and removing deposits from drainage areas	M	1.1, 1.4, 1.5, 3.4	Silver Cliff Public Works, CWCB, OEM	Flood	$150,000	Federal and State Grants, Town Budget	2025- On-going
SC2022-02	Silver Cliff	Flood Mitigation - Silver Cliff	Drainage upgrade including cleaning out culverts and drainage areas, adding pans and/or culverts as needed	H	1.1, 1.4, 1.5, 3.4	Silver Cliff Public Works, CWCB, OEM	Flood	$300,000	State & Federal Grants, Town Budget	On-going
SC2022-03	Silver Cliff	Stormwater Manage-ment and Drainage Study	Complete drainage study and survey 4th St south to CR 328, using results to properly re-zone land	H	1.1, 1.4, 1.5, 3.4	Silver Cliff Town Board	Flood	$100,000	FEMA, DOLA, Town Funds	On-Going, Long Term
SC2022-04	Silver Cliff	Hazard Education for Home-owners - School Safety Days	Utilize relationships with school district for classroom outreach to educate about all hazards, in addition to Town Hall Meetings, and social media	M	1.1, 2.1, 2.2, 2.3	Silver Cliff Town Board	All Hazards	$10,000	Town Funds, FEMA, HSG	On-going
SC2022-05	Silver Cliff	Silver Cliff Heights CWPP	Develop a Community Wildfire Protection Plan	H	1.1, 1.2, 1.3, 2.3, 3.1, 3.2, 3.3	Silver Cliff Town Board, WMFPD, Public Works, OEM	Wildfire	$20,000	Town Funds, CSFS, FEMA, Comm-unity Wildfire Defense Grant (CWDG)	2027

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SC2022-06	Silver Cliff	Town of Silver Cliff CWPP	Develop a Community Wildfire Protection Plan	H	1.1, 1.2, 1.3, 2.3, 3.1, 3.2, 3.3	Silver Cliff Town Board, WMFPD, Public Works, OEM	Wildfire	$20,000	Town Funds, CSFS, FEMA, Community Wildfire Defense Grant (CWDG)	On-going
SC2022-07	Silver Cliff	Cyber Security Public Education	Develop community education campaign aimed at the general public and businesses about cyber security.	M	1.5	Silver Cliff Town Board, CC OEM, CISA	Cyber Security	Unknown	Silver Cliff Budget, CC Budget, Grants	2028
SC2022-08	Silver Cliff	Town Cyber Security Program	Develop and promulgate employee program about cyber security.	M	1.5	Silver Cliff Town Board, CC OEM, CISA, State IT	Cyber Security	Unknown	Silver Cliff Budget, CC Budget, Grants, CISA, State IT, DHSEM	2028
SC2022-09	Silver Cliff	Water Conser-vation Education for Ranchers, Well Owners	Community education on water conservation to include: owners of water wells, ranchers and others who consume water products	M	2.1, 3.1, 3.3	Silver Cliff Town Board, CC OEM, CWCB, CDA	Drought	Unknown	Silver Cliff Budget, CC Budget, CWCB, CDA, Grants	2028

ID	Org.	Title	Issue / Background	Priority	Goals / Obj. Met	Lead and Support Org.	Hazard(s) Mitigated	Estimated Project Cost	Potential Funding Source	Expected Completion Year
SC2022-10	Silver Cliff	Water Saving Measures Education	Provide education to establish water saving measures such as: low flow toilets and showerheads. Education on water conservation while summer gardening and lawn sprinkling	M	2.1, 3.1	Silver Cliff Town Board, CC OEM	Drought	Unknown	Silver Cliff Budget, CC Budget, Grants	2028
SC2022-11	Silver Cliff	Drought Insurance Education	Educate ranchers, farmers, and landowners on the benefits of purchasing drought insurance	M	2.1	Silver Cliff Town Board, CC OEM, CWCB, CDA, DOLA	Drought	Unknown	CC Budget, CWCB, DOLA, CDA, Grants	2028
SC2022-12	Silver Cliff	Water Law Education	Public education on water laws to include social media strategy to educate public	M	2.1, 3.3	Silver Cliff Town Board, CC OEM, CWCB	Drought	Unknown	Silver Cliff Budget, CC Budget, CWCB, Grants	2028
SC2022-13	Silver Cliff	Earthquake Hazards Education	Public education materials aimed at earthquake hazards	M	2.1	Silver Cliff Town Board, CC OEM, CGS	Earthquake	Unknown	Silver Cliff Budget, CC Budget, CGS, Grants	2028
SC2022-14	Silver Cliff	Equip Cooling Center for Town	Town of Silver Cliff Senior Center will be opened as a cooling shelter as needed. Planning to explore other supplies that would be needed	M	1.1, 2.1,3.3,	Silver Cliff Town Board, CC OEM, CCPHA	Extreme Heat	$45,000	Silver Cliff Budget, CC Budget, CDPHE, DOLA, Grants	2028

ID	Org.	Title	Issue / Background	Priority	Goals / Obj. Met	Lead and Support Org.	Hazard(s) Mitigated	Estimated Project Cost	Potential Funding Source	Expected Completion Year
SC2022-15	Silver Cliff	Public Education and Materials for Geologic Hazards	Develop a brochure for homebuilders and public and update existing packet for "building package" to include information on expanding soil, etc.	M	2.1	Silver Cliff Town Board, CC OEM, CGS	Geologic Hazards	$1,000	Silver Cliff Budget, CC Budget, CGS	2028
SC2022-16	Silver Cliff	Hazardous Material Protocol Education	Review shelter in place guidance and continue to educate on evacuation and re-entry procedures in the event of a hazmat incident	M	1.1, 2.1	Silver Cliff Town Board, CC OEM	Hazardous Materials Release	Unknown	DHSEM, Silver Cliff Budget, CC Budget	2028
SC2022-17	Silver Cliff	Pandemic Education and Action Support	Maintaining public health resilience will require continued support of outreach efforts and pandemic public actions including education campaigns, and vaccination encouragement	M	1.1, 2.1	Silver Cliff Town Board, CC OEM, CCPHA	Public Health Hazards	Unknown	Silver Cliff Budget, CC Budget, CDPHE, DHSEM	2028
SC2022-18	Silver Cliff	Prepared-ness Guide for Winter Weather	Prepare winter weather hazards public education campaign to including preparedness guide	M	1.1, 2.1	Silver Cliff Town Board, CC OEM, NOAA / NWS	Severe Winter Weather	Unknown	Silver Cliff Budget, CC Budget, Grants	2028

ID	Org.	Title	Issue / Background	Priority	Goals / Obj. Met	Lead and Support Org.	Hazard(s) Mitigated	Estimated Project Cost	Potential Funding Source	Expected Completion Year
SC2022-19	Silver Cliff	Winter Weather Public Commu-nication	Inform the public on high hazard winter weather days and increase outreach via social media	M	1.1, 2.1, 2.2	Silver Cliff Town Board, CC OEM, NOAA / NWS	Severe Winter Weather	Unknown	Silver Cliff Budget, CC Budget	2028
SC2022-20	Silver Cliff	Snow Removal Wellness Education	Provide education on the various health issues related to snow management	M	1.1, 2.1	Silver Cliff Town Board, CC OEM, CCPHA	Severe Winter Weather	Unknown	Silver Cliff Budget, CC Budget, CDPHE	2028
SC2022-21	Silver Cliff	Hazard Resistant Building Education	Minimize /reduce wind damage with public education about wind and hail resistant building materials	M	1.1, 2.1	Silver Cliff Town Board, CC OEM	Hail, Wind	Unknown	Silver Cliff Budget, CC Budget, Grants	2028
SC2022-22	Silver Cliff	Thunder-storm Youth Education Campaign	Develop thunderstorm and lightning education program targeted for children in cooperation with the school district	M	2.1, 3.1, 3.3	Silver Cliff Town Board, CC OEM, School Districts	Thunder-storm, Hail, Lightning	$500	Silver Cliff Budget, CC Budget, Grants	2028
SC2022-23	Silver Cliff	Increase Weather Spotters	Explore weather spotter class offerings and develop weather spotter cadre.	M	1.1, 2.1	Silver Cliff Town Board, CC OEM, NOAA / NWS	Severe Winter Weather, Thunderstorm, Hail, Flood	$400	Silver Cliff Budget, CC Budget, Grants	2028

ID	Org.	Title	Issue / Background	Priority	Goals / Obj. Met	Lead and Support Org.	Hazard(s) Mitigated	Estimated Project Cost	Potential Funding Source	Expected Completion Year
SC2022-24	Silver Cliff	Public Education and Materials for Tornados	Design tornado preparedness materials to be included in preparedness guide.	M	2.1	Silver Cliff Town Board, CC OEM, NOAA / NWS	Tornado	$900	Silver Cliff Budget, CC Budget, Grants	2028
WC2022-01	Westcliffe	Flood Risk Mapping, Assessment and Planning Cycle	Continue participation in the Department of Natural Resources Flood Risk Study	H	1.4, 3.2, 3.3, 3.4	Town of Westcliffe CCOEM, CDNR, FEMA	Flood	$150,000	Federal and State Grants, Local Matching Funds	2025
WC2022-02	Westcliffe	Flood Risk Mapping Assessment	Complete flood risk mapping assessment of areas in Westcliffe prone to mass flooding to gain data for improving drainage control systems	H	1.4, 3.2, 3.3, 3.4	Town of Westcliffe CCOEM, CDNR, FEMA	Flood	$10,500,000	Federal and State Grants,, Local Matching Funds	2026
WC2022-03	Westcliffe	Water Conserv-ation & Drought Tolerant and Firewise Landscape Designs	Encourage water conservation and promote drought tolerant landscaping. Install water efficient sprinkler systems in parks to reduce consumption, which could be used for fire suppression or to sustain the ecosystem	H	2.1, 3.1, 3.3	Westcliffe, Round Mountain Water and Sanitation District, OEM, CDNR	Drought	$500,000	Grants, Incentives to purchase water saving devices, Matching Funds	On-Going

ID	Org.	Title	Issue / Background	Priority	Goals / Obj. Met	Lead and Support Org.	Hazard(s) Mitigated	Estimated Project Cost	Potential Funding Source	Expected Completion Year
WC2022-04	Westcliffe	Hail and Wind Roof Damage Mitigation	Continue enforcing zoning regulations, to require the Class 4 - Impact Resistant Roof Shingles, and ICC-600 Standards for residential construction, in hail and high-wind prone areas.	H	3.1, 3.3	Town of Westcliffe, Property Owners, HOAs, Insurance Companies	Thunder-storm (Hail, High Winds)	$1,000,000	Home-owner Insurance, Property Owner, Energy Rebate, Grants	On-Going
WC2022-05	Westcliffe	Town of Westcliffe CWPP and Creating Wildfire Defensible Space Zones	Develop a Community Wildfire Protection Plan and work with partners to create and educate the public on wildfire defensible space zones	H	1.1, 1.2, 1.3, 2.3, 3.1, 3.2, 3.3	Town of Westcliffe, Property Owners, HOAs, Insurance Companies, Custer County, WMFPD CSFS, CDFPC, OEM	Wildfire	$550,000	Comm-unity Wildfire Defense Grants from CSFS	2024
WC2022-06	Westcliffe	Burn Ordinance	Continue regulation of the opening burning of rubbish, and the storage and disposal of wood ashes, cinders, and burning coals from wood burning appliances	H	1.5, 2.3	Town of Westcliffe, CCSO, WMFPD	Wildfire	$5,000	Wildfire Mitigation Grants	On-Going

ID	Org.	Title	Issue / Background	Priority	Goals / Obj. Met	Lead and Support Org.	Hazard(s) Mitigated	Estimated Project Cost	Potential Funding Source	Expected Completion Year
WC2022-07	Westcliffe	Wildfire and Hazard Awareness Programs	The Town will provide on-going education seminars, workshops, and mailers to inform citizens on how to be prepared for disasters including wildfire and floods	H	1.1, 2.1, 2.3, 3.1	Town of Westcliffe, WMFPD, OEM	All Hazards	$5,000	Wildfire Mitigation Grants, General Funds, Donations	On-Going
WC2022-08	Westcliffe	Severe Winter Weather Safety Study – Sidewalk Snow Removal	Conduct a study to address snow removal on sidewalks, the impacts on proper drainage, and contributing factors to icy areas. The goal being to make the Town safer overall and more accessible for those with mobility issues, ADA compliant	H	1.1, 1.4, 3.1, 3.2, 3.3	Town of Westcliffe, Property Owners, Custer County Schools	Severe Winter Weather	$250,000	Feral Grants - ADA Compliant Sidewalks, Safe Streets and Roads Grant Program, General Fund (Match)	2024 On-Going
WC2022-09	Westcliffe	Water Conser-vation Education for Ranchers, Well Owners	Community education on water conservation to include: owners of water wells, ranchers and others who consume water products	M	2.1, 3.1, 3.3	Town of Westcliffe, CC OEM, CWCB, CDA	Drought	Unknown	Westcliffe Budget, CC Budget, CWCB, CDA, Grants	2028

ID	Org.	Title	Issue / Background	Priority	Goals / Obj. Met	Lead and Support Org.	Hazard(s) Mitigated	Estimated Project Cost	Potential Funding Source	Expected Completion Year
WC2022-10	Westcliffe	Water Saving Measures Education	Provide education to establish water saving measures such as: low flow toilets and showerheads. Education on water conservation while summer gardening and lawn sprinkling	M	2.1, 3.1	Town of Westcliffe, CC OEM	Drought	Unknown	Westcliffe Budget, CC Budget, Grants	2028
WC2022-11	Westcliffe	Drought Insurance Education	Educate ranchers, farmers, and landowners on the benefits of purchasing drought insurance	M	2.1, 3.3	Town of Westcliffe, CC OEM, CWCB, CDA, DOLA	Drought	Unknown	Westcliffe Budget, CC Budget, CWCB, DOLA, CDA, Grants	2028
WC2022-12	Westcliffe	Water Law Education	Public education on water laws to include social media strategy to educate public.	M	2.1, 3.3	Town of Westcliffe, CC OEM, CWCB	Drought	Unknown	Westcliffe Budget, CC Budget, CWCB, Grants	2028
WC2022-13	Westcliffe	Pandemic Education and Action Support	Maintaining public health resilience will require continued support of outreach efforts and pandemic public actions including education campaigns, and vaccination encouragement	M	1.1, 2.1	Town of Westcliffe, CC OEM, CCPHA	Public Health Hazards	Unknown	Westcliffe Budget, CC Budget, CDPHE, DHSEM	2028

ID	Org.	Title	Issue / Background	Priority	Goals / Obj. Met	Lead and Support Org.	Hazard(s) Mitigated	Estimated Project Cost	Potential Funding Source	Expected Completion Year
WC2022-14	Westcliffe	Prepared-ness Guide for Winter Weather	Prepare winter weather hazards public education campaign to including preparedness guide	M	1.1, 2.1	Silver Cliff Town Board, CC OEM, NOAA / NWS	Severe Winter Weather	Unknown	Westcliffe Budget, CC Budget, Grants	2028
WC2022-15	Westcliffe	Winter Weather Public Commu-nication	Inform the public on high hazard winter weather days and increase outreach via social media	M	1.1, 2.1, 2.2	Town of Westcliffe, CC OEM, NOAA / NWS	Severe Winter Weather	Unknown	Westcliffe Budget, CC Budget	2028
WC2022-16	Westcliffe	Snow Removal Wellness Education	Provide education on the various health issues related to snow management	M	1.1, 2.1	Town of Westcliffe, CC OEM, CCPHA	Severe Winter Weather	Unknown	Westcliffe Budget, CC Budget, CDPHE	2028
WC2022-17	Westcliffe	Hazard Resistant Building Education	Minimize /reduce wind damage with public education about wind and hail resistant building materials	M	1.1, 2.1	Town of Westcliffe, CC OEM	Hail, Wind	Unknown	Westcliffe Budget, CC Budget	2028
WC2022-18	Westcliffe	Thunder-storm Youth Education Campaign	Develop thunderstorm and lightning education program targeted for children in cooperation with the school district	M	2.1, 3.1, 3.3	Town of Westcliffe, CC OEM, School Districts	Thunder-storm, Lightning	$500	Westcliffe Budget, CC Budget, Grants	2028

ID	Org.	Title	Issue / Background	Priority	Goals / Obj. Met	Lead and Support Org.	Hazard(s) Mitigated	Estimated Project Cost	Potential Funding Source	Expected Completion Year
WC2022-19	Westcliffe	Public Education and Materials for Geologic Hazards	Develop a brochure for homebuilders and public and update existing packet for "building package" to include information on expanding soil, etc.	M	2.1	Town of Westcliffe, CC OEM, CGS	Geologic Hazards	$1,000	Westcliffe Budget, CC Budget, CGS	2028
WM2022-01	Wet Mountain Fire Protection District	Community Wildfire Protection Plan Develop-ment and Updates	Develop a Community Wildfire Protection Plan	H	1.1, 1.2, 1.3, 2.3, 3.1, 3.2, 3.3	WMFPD, CSFS, CC OEM, CDFPC, Private Property Owner Associations	Wildfire	see CCFM2022-03	WMFPD Funds, CSFS, FEMA, Comm-unity Wildfire Defense Grant, USFS, BLM,	2027
WM2022-01a	Wet Mountain Fire Protection District	Beckwith Mountain Ranch CWPP	see WM2022-01	H	see WM2022-01	see WM2022-01	Wildfire	see CCFM2022-03	see WM2022-01	2027
WM2022-01b	Wet Mountain Fire Protection District	Bull Domingo Ranch CWPP	see WM2022-01	H	see WM2022-01	see WM2022-01	Wildfire	see CCFM2022-03	see WM2022-01	2027
WM2022-01c	Wet Mountain Fire Protection District	Centennial Ranch CWPP	see WM2022-01	H	see WM2022-01	see WM2022-01	Wildfire	see CCFM2022-03	see WM2022-01	2027

ID	Org.	Title	Issue / Background	Priority	Goals / Obj. Met	Lead and Support Org.	Hazard(s) Mitigated	Estimated Project Cost	Potential Funding Source	Expected Completion Year
WM2022-01d	Wet Mountain Fire Protection District	Rosita Hill CWPP	see WM2022-01	H	see WM2022-01	see WM2022-01	Wildfire	see CCFM2022-03	see WM2022-01	2027
WM2022-02	Wet Mountain Fire Protection District	Wildfire & Hazard Awareness Programs	Provide on-going education seminars, and workshops to inform citizens on how to be prepared for disasters including wildfire and floods	H	1.1, 2.1, 2.3, 3.1	WMFPD	All Hazards	$5,000	Wildfire Mitigation Grants, General Funds, Donation	On-Going
WM2022-03	Wet Mountain Fire Protection District	Cyber Attack Prepared-ness & Mitigation	Maintain current Cloud-based and remote data storage capabilities and capacities. Upgrade when needed.	H	1.4, 1.5	WMFPD, IT	Cyber Attack	$10,000	County Budget, Grants	On-Going
WM2022-04	Wet Mountain Fire Protection District	Drought Resiliency	Explore supplemental static water supplies (e.g., cisterns, etc.). Formalize MOUs as needed for access to other water supplies (e.g., DeWeese Reservoir, community pool, etc.) for fire suppression waters.	H	2.1, 1.5, 3.3	WMFPD, RMW&SD	Drought	Unknown	FEMA,DOLA, WMFPD, RMWSD Funds, OEM/HSG	2024

ID	Org.	Title	Issue / Background	Priority	Goals / Obj. Met	Lead and Support Org.	Hazard(s) Mitigated	Estimated Project Cost	Potential Funding Source	Expected Completion Year
WM2022-05	Wet Mountain Fire Protection District	Hazardous Materials Response Capability Improve-ment	Train personnel to HAZMAT First Responder Awareness and Operations levels. Consider HazMat Technician level training. Continue with existing Designated Emergency Response Authority (DERA).	H	1.1, 3.1	WMFPD, OEM, SO	Hazardous Materials Release	Unknown	County Budget, Grants	2025
WM2022-06	Wet Mountain Fire Protection District	Search & Rescue Training - Partnered with County	Maintain and expand District training levels to effectively respond to hazard-affiliated incidents. Partner with CC Search & Rescue and Road & Bridge for appropriate rescue training and exercises.	H	3.1	WMPFD, SAR, R&B	Landslide	Unknown	County Budget, Grants	On-Going
WM2022-07	Wet Mountain Fire Protection District	Public Health Prepared-ness and Training	Maintain appropriate levels of training and PPE. Partner with CCPHA and CCEMS for selective training and exercises.	H	1.1, 3.1, 3.2	WMFPD, PHA, EMS, OEM	Public Health Hazards	Unknown	County Budget, Grants	On-Going

ID	Org.	Title	Issue / Background	Priority	Goals / Obj. Met	Lead and Support Org.	Hazard(s) Mitigated	Estimated Project Cost	Potential Funding Source	Expected Completion Year
WM2022-08	Wet Mountain Fire Protection District	Continuity of Community Services	Provide emergency power back-up resources for the main District station. Maintain emergency broadcast watch/warning/alert status updates for severe weather circumstances	H	1.5, 2.2	WMFPD, R&B	Severe Winter	$30,000 (multiple actions included)	County Budget, Grants	2023 and On-Going
WM2022-09	Wet Mountain Fire Protection District	Community Services Prepared-ness & Resiliency	Maintain community wide weather event status updates through emergency broadcast. Maintain back-up power sources to run the main District station in the event of a power outage.	H	1.5, 2.2	WMFPD	Thunder-storm	Included in $30,000 for WM2022-08	County Budget, Grants	2023 and On-Going
WM2022-10	Wet Mountain Fire Protection District	Tornado Safety	Designate "safe space" locations within the interior of the main District station.	H	1.1	WMFPD	Tornado	Included in $30,000 for WM2022-08	County Budget, Grants	2023 and On-Going

ID	Org.	Title	Issue / Background	Priority	Goals / Obj. Met	Lead and Support Org.	Hazard(s) Mitigated	Estimated Project Cost	Potential Funding Source	Expected Completion Year
WM2022-11	Wet Mountain Fire Protection District	Compliance with Industry Require-ments, Programs, and Plans	Maintain current training, certification, qualification, and exercise requirements for all affected District personnel. Maintain current CWPP efforts and seek avenues to expand the CWPP concept. (Reference WM2022-01)	H	1.5, 3.1	WMFPD, OEM, SO	Wildfire	Unknown	County Budget, Grants	2023 and On-Going
USFS-2022-01	USFS	Wet Mountains Potential Control Locations	Provide a network of shaded fuel breaks on USFS lands along collaboratively identified roadways to improve firefighter response and public evacuation and reinforce these Potential Operational Delineations (PODs).	High	1.1, 1.2, 1.3	USFS, Custer County BOCC, CSFS, CC OEM, CSFS, CDFPC, USFS, BLM, CDPW, Private Property Owner Associations , WMFZPD, Wetmore VFD	Wildfire	Unknown	Bipartisan Infra-structure Law, Joint Chiefs' Funding, CSFS, CO-DNR.	On-Going 2027

PLAN MONITORING AND MAINTENANCE

Custer County will actively maintain this HMP by coordinating a review of all mitigation actions semi-annually, which has been updated from the previous schedule of annual reviews. These meetings of the HMPC will occur throughout the lifecycle of this plan, which offers opportunities to assess and discuss the plan effectiveness and continued relevance of priorities for the communities across the county. This process allows jurisdictions to report on progress made towards implementing the mitigation actions identified in this plan. Custer County's Office of Emergency Management Director will present a summary status report to the Custer County Commissioners. This report will be made available to the general public.

Additional stakeholder meetings will be coordinated as needed, as mitigation opportunities are identified. Custer County's Office of Emergency Management Director will also disseminate information relating to potential mitigation funding resources to communities and the HMPC as application periods are identified.

The benefit of holding the semi-annual meetings to review the effectiveness and applicability of the plan allows the HMPC to continually adapt the future content and priorities of the plan for the next five-year update. The planning process of the updated HMP is continuous in this way and will benefit the plan and residents when the HMPC begins the formal update process in year four of the plan lifecycle.

The 2023 Plan will be updated, as required by the Disaster Mitigation Act of 2000, by the FEMA approved five-year anniversary date or following a disaster event. Custer County's Office of Emergency Management will lead these efforts. Future HMP updates will account for any new hazard vulnerabilities, special circumstances, or new information and data that become available. During the five-year review process, the following questions will be considered as criteria for assessing the effectiveness of the Custer County HMP.

- Has the nature or magnitude of hazards affecting the county changed?
- Are there new hazards that have the potential to impact the county?
- Do the identified goals and actions address current and expected conditions?
- Have mitigation actions been implemented or completed?
- Has the implementation of identified mitigation actions resulted in expected outcomes?
- Are current resources adequate to implement the plan?
- Should additional local resources be committed to address identified hazards?

Issues that arise during monitoring and evaluation which require changes to the local hazard, risk and vulnerability summary, mitigation strategy, and other components of the plan will be incorporated during future updates.

PLANNING INTEGRATION

Custer County maintains a comprehensive set of emergency management plans, developed in a multi-disciplinary environment where county departments, jurisdictional agencies and representatives, non-profit and community organizations, and the private sector are included in the planning process. This set of plans encompasses all phases of emergency management and the work done on the 2023 Custer County HMP will be integrated into these efforts moving forward.

Plan integration involves using an intersectional, collaborative, and educational approach to be successful, ensuring the understanding and value of mitigation to all of those involved. Community planning efforts often run parallel to each other, leading to duplication, unnecessary competition for resources, and hindering of progress.

Integrating components of this plan into others, as well as drawing from other plans to strengthen the HMP provides a mechanism for implementing the mitigation goals, objectives, policies, and actions. Using opportunities to involve multiple disciplines, departments, and stakeholders, minimizes strategic conflict and creates an opportunity for dialogue about where goals and efforts overlap.

One focus of integration is to encourage information sharing and progress towards community goals. Opportunities for information sharing are often best seen in potential or recent plan updates. It is crucial to review updates to plans in the community, including master plans (overall Custer County and land use), potential community wildfire protection plan efforts, emergency management plans, transportation plans, buildings codes, annual capital expenditure planning, and public health planning.

The plans mentioned above, as well as others utilized in the plan are shown the following table and includes which chapters were influenced by plan information.

Plan	Chapter
Custer County Master Plan	1 – Mitigation Strategy, 3 – County Profile
FEMA Risk Map Flood Risk Study	4 – HIRA
Colorado Emergency Preparedness Assessment	4 – HIRA
2018 Colorado Drought Plan	4 – HIRA
Community Wildfire Protection Plans	1 – Mitigation Strategy, 4 – HIRA

The committee also identified the importance of integration during Payment in Lieu of Taxes (PILT) federal funding planning, as well as during the updates to the county Health Improvement Plan. To go beyond integration in plans alone, the county will add a mitigation item to the agenda of each of the four annual exercises in the county. By adding this item, further discussion about mitigation will occur after the exercise and be recorded in the form of After Action Reports (AAR). The opportunity to recognize lessons learned, strengths, and areas for improvement is a more tangible way for the county to make forward progress in hazard mitigation.

Open and active information sharing, including when plan updates are occurring, will help to ensure that hazard mitigation is considered during all applicable future county, municipal, and regional planning efforts. The individual one-on-one meetings with the County Office of Emergency Management, municipalities, and districts created a space to specifically discuss collaboration in planning and capability development. These conversations will continue throughout the planning cycle and as mitigation actions are addressed, such as studies completed, the discussion of incorporating the resulting data and the existing HMP will be explored, determining how new policies and procedures can be informed by these resources and how the HMP can be updated.

Custer County has determined that wildfire mitigation is an important focus over the next planning cycle, which can be seen in the Community Wildfire Protection Plan mitigation actions. These plans are discussed in the next section, but it should be pointed out that the HMP and a community wildfire plan are intertwined and the creation of these plans across the county is an opportunity for mutually beneficial information sharing and integration from start to finish.

COMMUNITY WILDFIRE PROTECTION PLANS

The Custer County Community Wildfire Protection Plan (CWPP) is a direct extension of the National Fire Plan authorized by Congress, as a response to the tragic summer wildfires of 2000. As a component of the National Fire

Plan, the CWPP is meant to help coordinate fire readiness efforts between local communities and federal agencies through four major goals.

- Ensure firefighting resources are available.
- Rebuild communities and ecosystems damaged by wildfire.
- Thin vegetation in areas where public lands and developing areas meet.
- Help local residents to reduce fire risk and improve fire protection.

This countywide CWPP has been developed to assist the Sheriff, Emergency Management Director, Fire Officials, and residents of Custer County in the identification of private and public lands at risk of severe wildfire and explore strategies for the prevention and suppression of such fires. The intent of the CWPP was to take a closer look at the scientific factors that influence fire behavior in a particular area or region.

Custer County is served by the Wet Mountain Fire Protection District and the Wetmore Volunteer Fire Department. Rye Fire Protection District and Florence Fire Protection District also provide emergency services to the county. Since the countywide CWPP was created in 2007, a number of localized CWPPs have been developed for specific communities across the county. Current local CWPPs include:

- Sangres Foothills (2018)
- Cuerno Verde (2019)

These plans assist each community in the identification of subdivision and surrounding private and public lands at risk from wildfire. They identify mitigation strategies for reducing wildfire fuels while improving forest health, structure protection, increasing community preparedness, supporting the local economy, and improving firefighting response capabilities.

CONTINUED PUBLIC ENGAGEMENT

To sustain public support of mitigation, it is important to continually engage the community. As mentioned previously, there will be a number of opportunities for public touchpoints during both plan monitoring and integration efforts. These will provide updates on plan implementation activities and will also show how this HMP aligns with other community planning processes.

Some of the actions the HMPC identified for continued engagement include:

- Adding a mitigation agenda item to all future Community Emergency Response Team (CERT) meetings
- Provide mitigation updates and information as part of the annual Wetmore Community BBQ event.
- Develop and hold annual seasonal hazard education events (flood, wildfire)

Additional public education activities will occur through the continued use of county social media and website postings. This content will focus on educating the public about hazards that impact the county and progress made towards mitigating them.

CHAPTER 2: PLANNING PROCESS

The following section reviews the planning process and public outreach efforts that helped to inform the HMP update.

BACKGROUND

The 2023 Custer County HMP is an update to the 2017 Plan. Hazard mitigation plans are community-led efforts designed to identify, manage, and avoid risks through pre-planning. This plan is designed to reduce the risks posed by hazards that affect Custer County communities and must be updated and approved by the Federal Emergency Management Agency (FEMA) every five years to keep it current and to maintain eligibility for FEMA Hazard Mitigation Assistance (HMA) 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. 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, 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 such hazard mitigation actions by state and local governments means building stronger, safer, and smarter communities that will be able to reduce future disaster 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, Custer County and its municipalities 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 2023 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 Custer County and its municipalities to be eligible for funding and technical assistance from state and federal hazard mitigation programs. This Plan will be updated and FEMA-approved within its five-year expiration date.

AUTHORITY

This HMP has been adopted by Custer County and its participating organizations in accordance with the authority granted to counties, municipalities, and special districts by the State of Colorado. This Plan was developed in accordance with current state and federal rules and regulations governing local HMPs. The plan 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

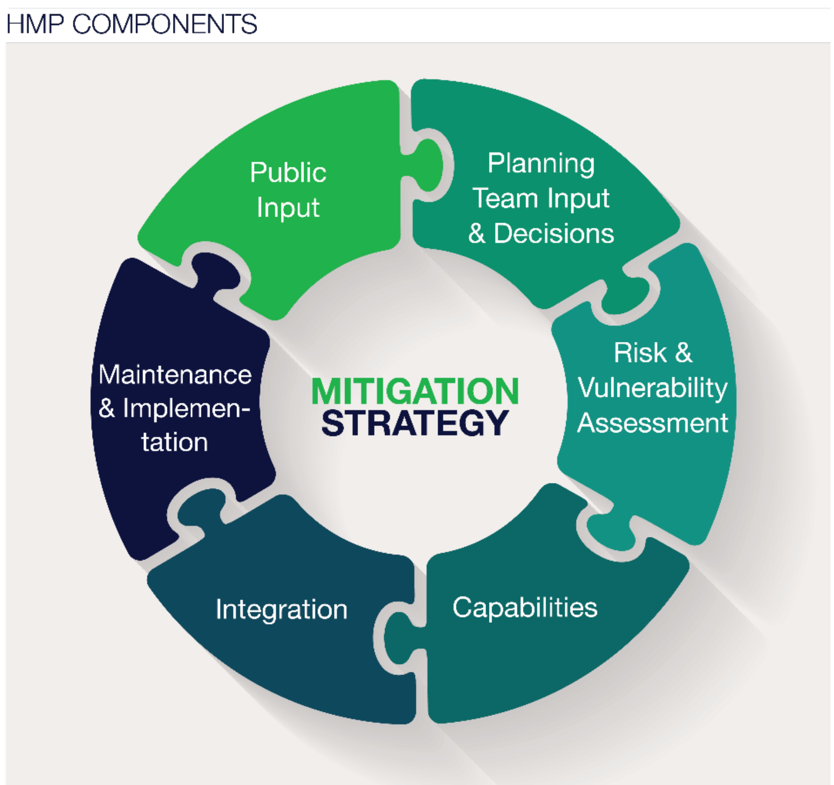
The following Federal Emergency Management Agency (FEMA) guides and reference documents were used to prepare this document:

- FEMA. Local Mitigation Plan Review Guide. October 1, 2011.
- FEMA. Local Multi-Hazard Mitigation Planning Handbook. March 2013.

UPDATE PROCESS AND METHODOLOGY

The planning process included data gathering and analysis while simultaneously meeting with a Hazard Mitigation Planning Committee (HMPC) and gathering public input to support the plan. The following section details the timeline and methods of public outreach, HMPC meetings, and plan development. A high-level summary of the components that assembled into the updated HMP is presented in Figure 2.

Figure 2. HMP Components



From a 'big picture' standpoint, Custer County identified the following overreaching project goals:

- Obtaining FEMA Approval
- Remaining on schedule (especially important given the challenges presented by COVID)
- Broadening jurisdictional collaboration and participation
- Improving public engagement
- Incorporating FEMA's Lifeline construct
- Increasing mitigation grant funding pursuits

Input into the planning process came from a number of entities, shown in Figure 3.

Figure 3. Planning Process Inputs

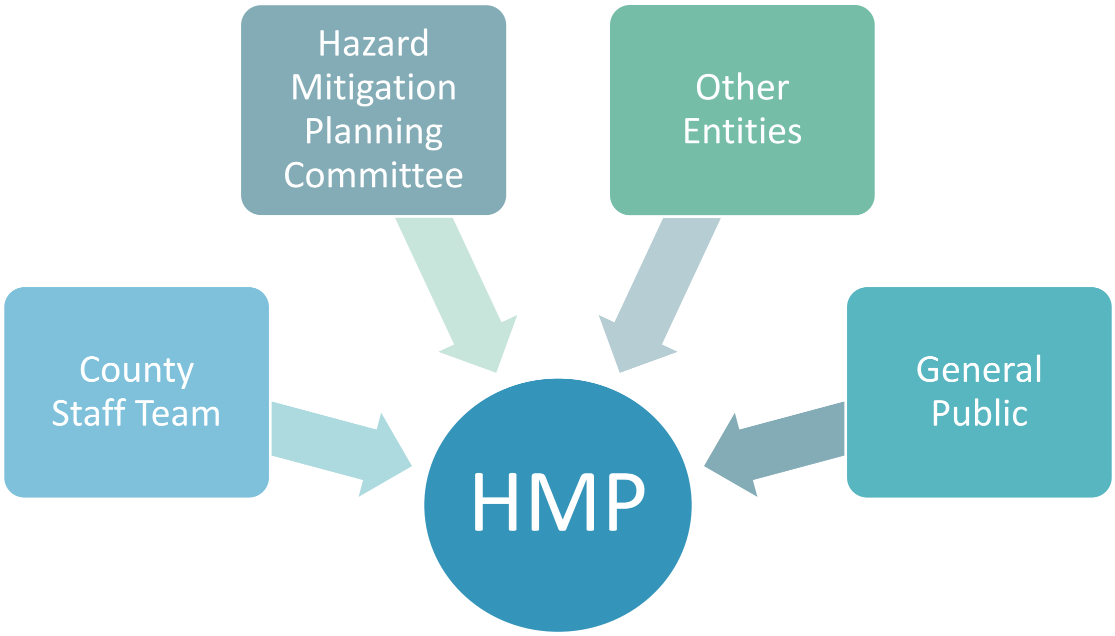


Figure 4 summarizes the project schedule, including HMPC and public touchpoints over the course of the planning process.

Figure 4. Project Timeline

PARTICIPATING ENTITIES

All municipalities and special districts in Custer County were invited by the County to participate in the planning process. They were informed of the participation requirements related to the adoption of the plan and the formation of the HMPC. The following organizations were formal participants in the planning process:

- Custer County
- Town of Silver Cliff
- Town of Westcliffe
- Wet Mountain Fire Protection District
- Round Mountain Water & Sanitation District

Local governments that participated in portions of the planning process included:

- Rye Fire Protection District
- Upper Arkansas Water Conservancy District
- West Custer County Hospital District
- Wet Mountain Fire Protection District

Participation in the planning process was closely tracked to ensure all entities remained engaged across the planning process. Table 4 shows organizational participation at HMP workshops and webinars. It is important to also point out meeting participation from many other agencies and organizations, including four of Custer County's neighboring counties.

Table 4. Planning Meeting Participation

	Kick-Off Webinar	Risk Assessment Workshop	Mitigation Strategy Workshop
Custer County	X	X	X
Town of Silver Cliff	X		
Town of Westcliffe	X	X	
Custer County School District C-1	X		
Round Mountain Water District	X		X
Wet Mountain Fire Protection District	X	X	
Fremont County	X		
Pueblo County	X		
Huerfano County	X		
American Red Cross		X	
CO Dept. of Corrections		X	
CO DHSEM	X	X	
Navaho Nation Fish and Wildlife	X		

San Isabel Land Protection Trust	**X**		
Sangre de Cristo Electric Association		**X**	
USDA – National Resources Conservation Service	**X**		
USFS		**X**	

Hazard Mitigation Planning Committee

The HMPC consisted of members of participating local governments and districts, as well as public stakeholders, federal and state agencies, special interest groups, and county staff. The role of the committee was to review and comment on the content of the plan as it was developed and to weigh in on the big decisions to enhance the plan with local expertise. The HMPC was tasked with participating in meetings, helping to disseminate public outreach materials, and to inform and review plan content. Members of the HMPC participated in development of the risk assessment, mitigation strategy development, plan review, public outreach, and plan maintenance and integration strategies. Table 5 presents a list of the HMPC members who were all invited, via email, to participate in the planning process. In addition, members were invited during conversations, other meetings, and interactions. Those shown with (*) attended meetings.

Table 5. Hazard Mitigation Plan Planning Committee

Name	Title	Organization
Adrian Washington *	OEM Director	Custer County
Amanda Alden	Regions 4 and 5 Coordinator	ARES
Art Nordyke	Coroner	Custer County
Arthur Ellege *	Soil Conservation Technician	NRCS
Beatriz Portillo *	Disaster Program Specialist	American Red Cross
Bill Canda*	Commissioner	Custer County
Bill Duggan	Director	Frecom911 Dispatch
Bob Hollingsworth	Posse Member	Sheriff Posse
Bob McDonald	Manager	Silver West Airport
Bobby Woelz	Emergency Manager	Saguache County
Brittany Ciarlo *	Emergency Manager	Huerfano County
Bryan Fusco	Executive Director	West Custer County Hospital District
Charles Bogle	Chairman, Board of Directors	Round Mountain Water / County Economic Dev
Chris LeCuyer *	Assistant Chief	Wet Mountain Fire Protection District
Chris McGinnis *	Communications Specialist	Sangre de Cristo Electric Association (SDCEA)
Christe Coleman *	South Region Field Manager	DHSEM
Chuck Bradley *	Emergency Manager	Pueblo County
Clifford Brown *	Public Health Director	Custer County
Dave Schneider *	District Manager	Round Mountain Water and Sanitation District
Debbie Adams *	Chair	Custer County Tourism Board

Dennis Page *	Fire Management Officer – San Carlos RD	US Forest Service
Desiree Lipka	Disaster Coordinator	Solvista Health
Destiny Chapman	District Ranger – San Carlos Ranger District	US Forest Service
Elizabeth Fortman	Soil Conservationist	Natural Resources Conservation Services
Emily Palmer *	Planning Specialist	DHSEM
Gabriel Shenk	Town Manager	Westcliffe
Gary Hyde	Road & Bridge	Custer County
Gina Maloney *	Volunteer	Custer County Emergency Management
Guinevere Nelson	Director and Agent	Custer County Extension
H.A. Buck Wenzel	Mayor	Silver Cliff
Irene Merrifield *	Planning Supervisor	DHSEM
Jackie Hobby	Planning Director	Custer County
Janet Smith *	Director	San Isabel Land Protection Trust
Jeff Outhier *	Resource Officer	USFS
Jim Parkes	Posse Member	Sheriff Posse
John Van Doren *	Planning Commission	Westcliffe
John 'Ben' Ingram *	Fire Management Officer – Arkansas	US Forest Service
Jonathan Wiley	Captain	Custer County Search and Rescue
Justin Krall	District Wildlife Manager – Westcliffe District	CO Department of Parks & Wildlife
Kevin Day *	Commissioner	Custer County
Laura Lockhart *	Director	Custer County Dept. of Human Services
Linda Pollack *	Resident	Custer County
Maria Cohen	Manager (Contractor)	Wolf Springs Ranch
Mark Thompson *	State Hazard Mitigation Officer	DHSEM
Matt Nolting *	Chief	Wet Mountain Fire Protection District
Michael McFalls *	Superintendent	Custer County School District – C-1
Mykel Kroll *	Emergency Manager	Fremont County
Patrick Fiore	Member	Custer County Search and Rescue
Peggy Quint *	District Business Manager	Round Mountain Water and Sanitation District
Ralph Scanga, Jr	General Manager	Upper Arkansas Water Conservancy District
Reggie Foster *	Public Information Officer	Custer County Sheriff's Office
Robert (Jeff) Reynolds *	Dispatch Coordinator	Pueblo SO – Regional COM
Robert Hill *	Undersheriff	Custer County Sheriff's Office
Roger Camper *	Building Official	Silver Cliff
Ruth Roper	Volunteer	Wet Mountain FPD / Wetmore Fire

Samuel Diswood *	Manager	Navajo Nation Fish and Wildlife – CO Ranch
Shannon Byerly *	Sheriff	Custer County Sheriff's Office
Stacey Moss *	Safety & Compliance Coord.	Sangre de Cristo Electric Association
Steve Bennett	Chief	Rye Fire Protection District
Tom Flower *	Commissioner	Custer County
Tyler Harkins	Manager	Custer County EMS
Vernon Roth *	IT	Custer County

PLANNING COMMITTEE MEETINGS

The planning process involved three planned HMPC meetings, an additional follow-up meeting, and a number of individual one-on-one discussions with local municipalities.

KICKOFF WEBINAR (SEPTEMBER 21ST, 2021)

The kickoff meeting was held virtually via webinar in September. The meeting started with an introduction to the planning process, schedule, and responsibilities of the HMPC, as well as an overview of hazard mitigation. Discussion then focused on the list of hazards to profile, including debris flow, pandemic, rockfall, and wildlife-vehicle collisions which were not profiled in the 2017 plan. Participants were invited to discuss how the 2017 plan was used and what elements worked well, in addition to other on-going or recently completed community planning projects. Another main topic included an introduction to the public outreach portion of the planning process and the group was encouraged to comment on the public outreach tools and processes that work best. Initial discussions relating to available mitigation grant funding, including FEMA's new Building Resilient Infrastructure & Communities (BRIC) Program, also helped to educate the committee.

Additional topics included an introduction to the Lifeline construct used by FEMA and plan requirements to achieve FEMA approval. Previous hazard events over the last five years and any on-going community mitigation efforts were also discussed by the committee. Group discussion focused on the definition and application of the hazards being added to the 2023 plan, and a review of the participating jurisdictions. To encourage dialogue in a virtual presentation, live polling was used to present the results of polls, in real-time, while gathering input from the HMPC. The results of the polls are included below and throughout this plan to support what was heard.

Figure 5. HMPC Previous Participation

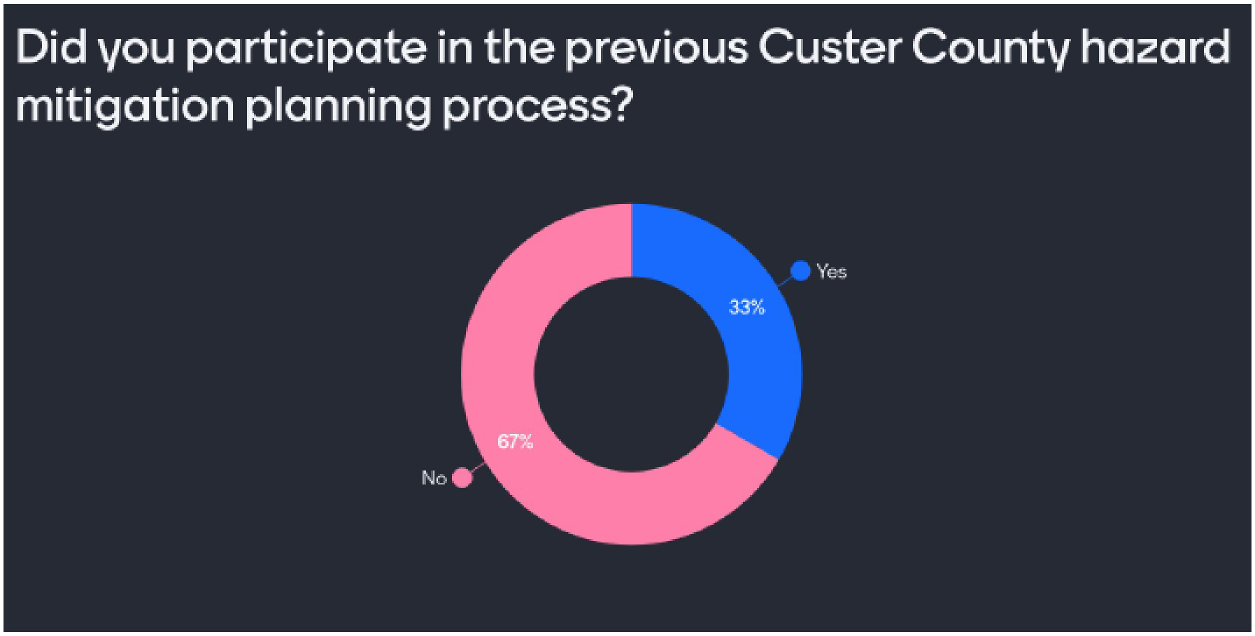


Figure 6. HMPC Responses to Hazard Profile Updates

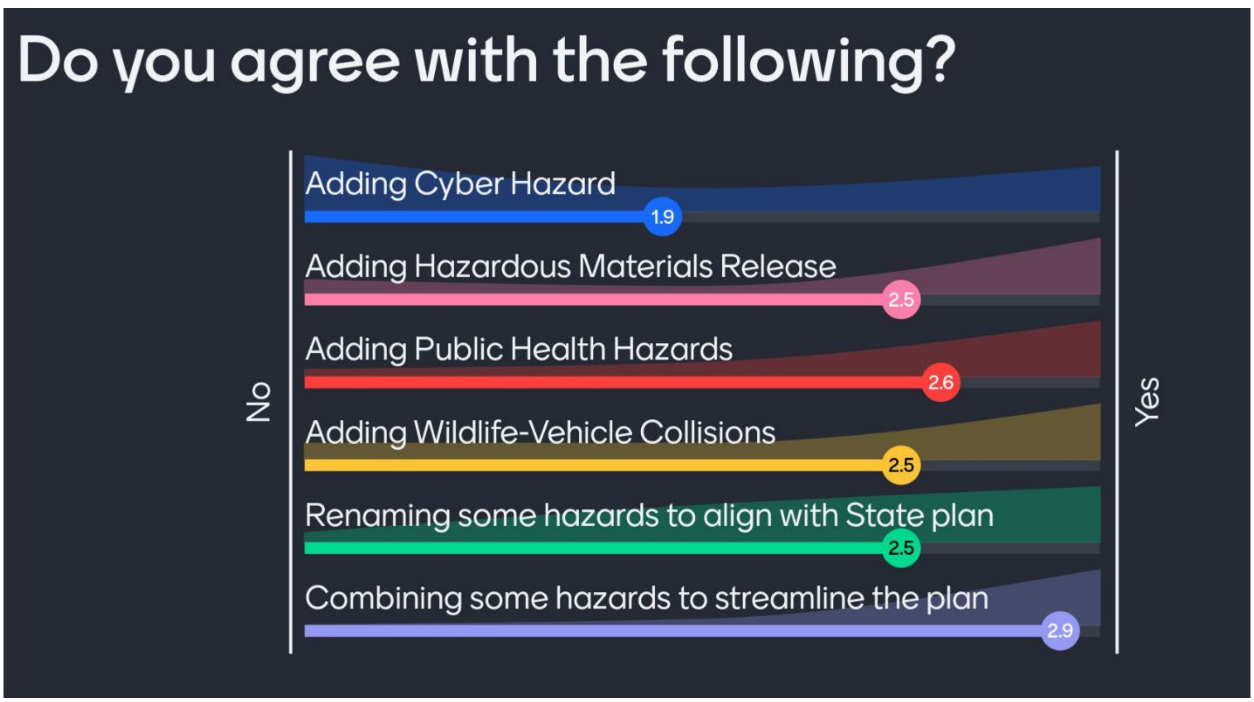
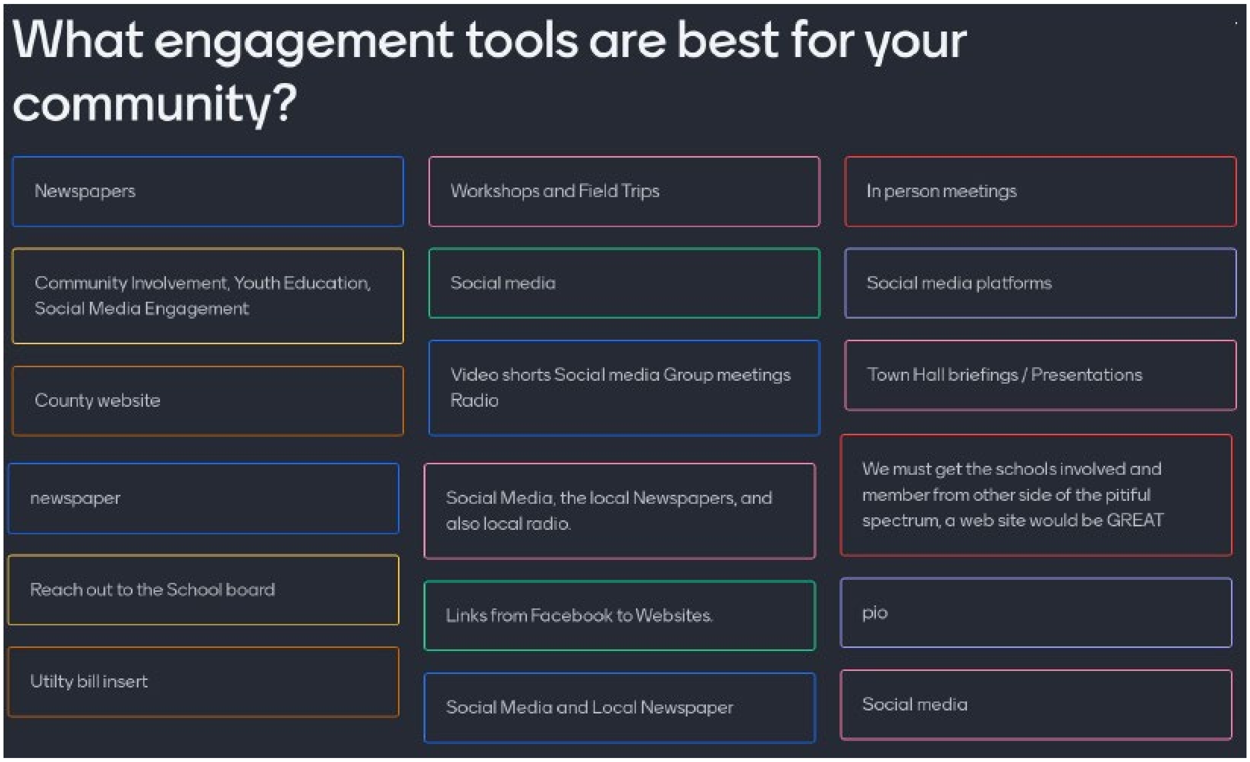


Figure 7. HMPC Responses for Community Engagement Tools



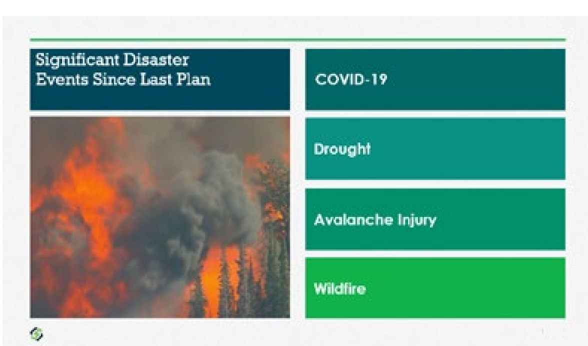
At the end of the meeting, participants were given four action items:

- Provide the best available hazard data and recent / on-going community plans
- Help expand the HMPC roster
- Provide input on the public involvement plan
- Assist with dissemination of the public involvement plan's messaging

HAZARD IDENTIFICATION AND RISK ASSESSMENT (HIRA) WORKSHOP (December 17TH 2021)

The HIRA meeting was held in person in Westcliffe and a webinar connection was provided for those committee members unable to attend in person. Discussion in this meeting focused on the preliminary results of the risk assessment. Each hazard was reviewed, and best available data was presented pertaining to the risk and vulnerability assessment. The results of the Lifeline assessments were also presented. Additional historical events and data gaps were discussed with the committee.

During the kickoff meeting funding was identified as the primary obstacle to implementing mitigation. This recognition prompted continued discussion of FEMA mitigation funding programs. Following this, a lengthy discussion focused on the current plan's mitigation strategy and both the goals and objectives were refined based on committee input. The last main content of the meeting involved reviewing the results of the first public survey and community feedback.



To encourage dialogue as part of the hybrid in-person / remote presentation, live polling was again utilized through an online tool called Mentimeter. The program presents the results of polls asked in real-time to gather input from the HMPC. The results of the polls are included below and throughout this plan to support what was heard. Details of the HMPC risk ranking can be found in Table 22 within the risk assessment overview.

The day prior to the HIRA meeting, a public open house was held in the same hybrid format, which assisted in supplementing the conversation of the community's input. County residents, elected officials, non-profit organizations, and other stakeholders were all represented at the event. The Custer County HMPC held the open house prior to the HIRA meeting to allow residents to be more informed about hazard mitigation and how their involvement benefits the process. More information is available in the Public and Stakeholder Participation section of this plan, including the live polling results from the event.

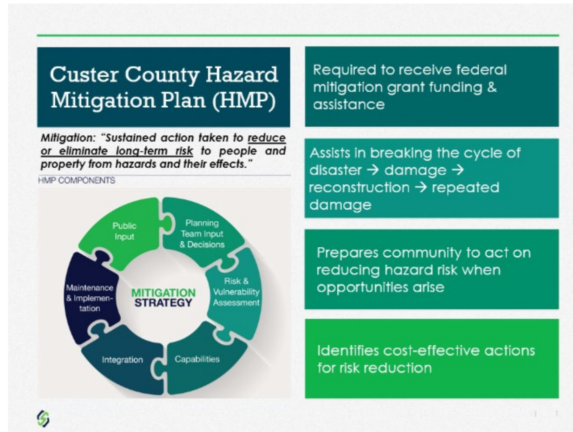


Figure 8. HMPC Polling Responses – Vital Lifelines

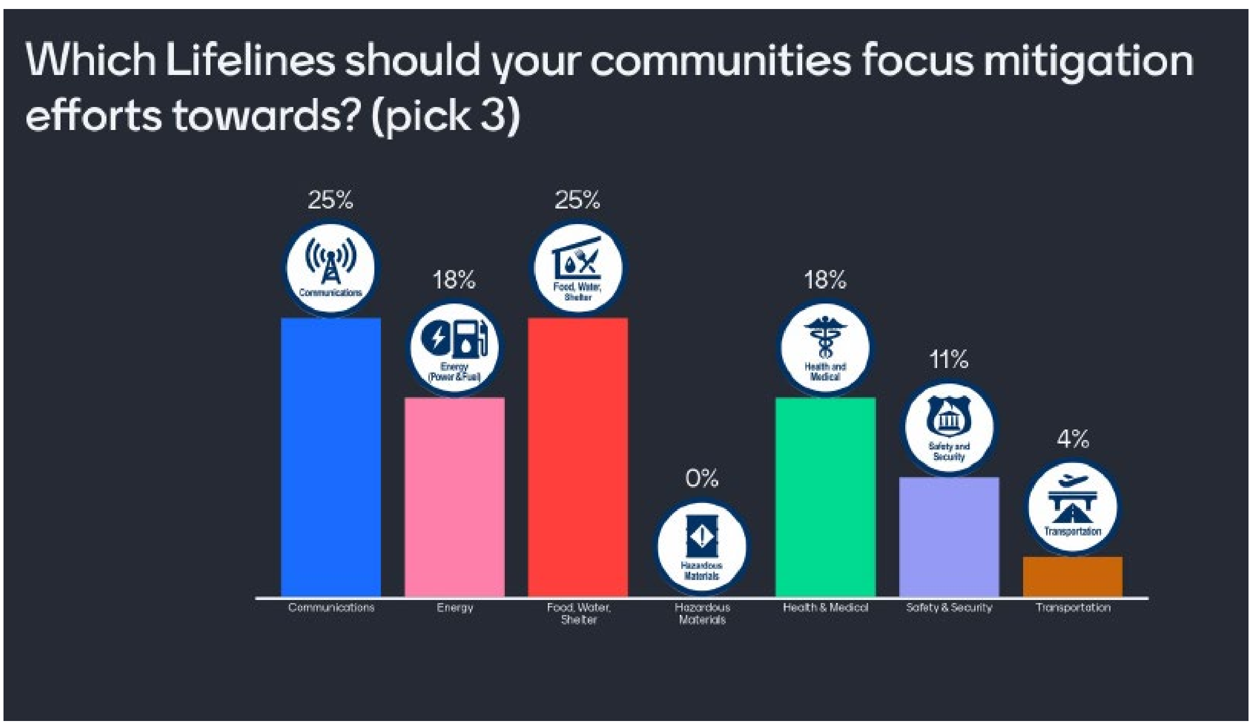


Figure 9. HMPC Polling Responses – Plan Implementation Obstacles

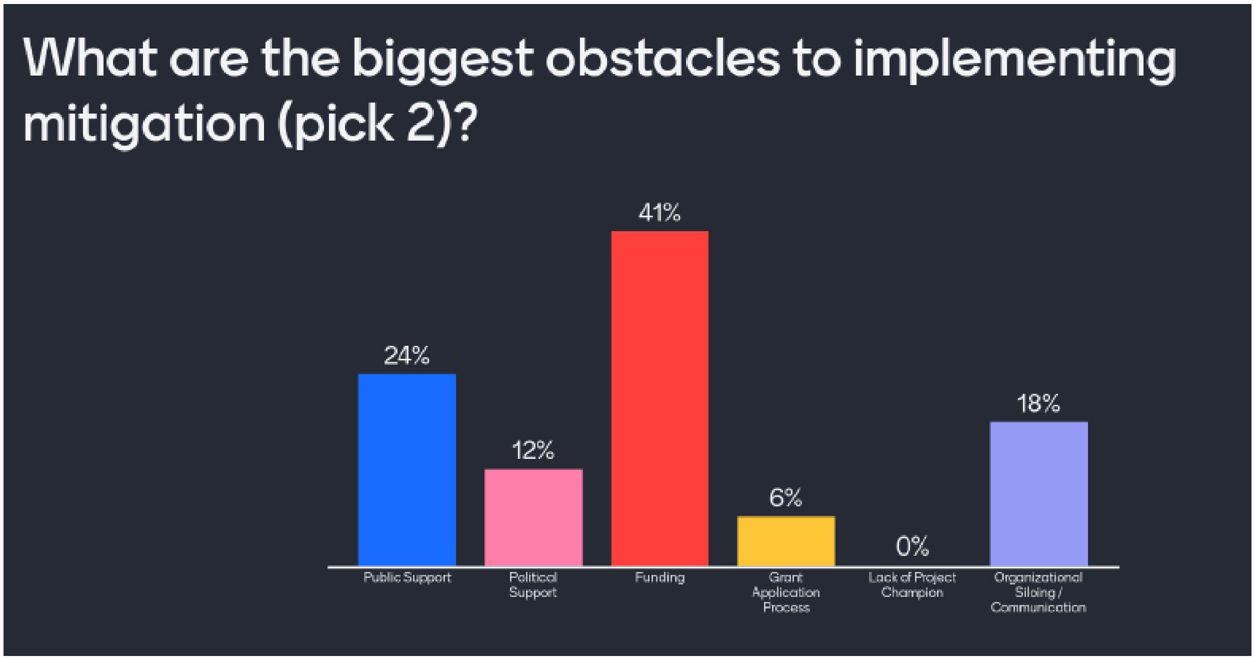
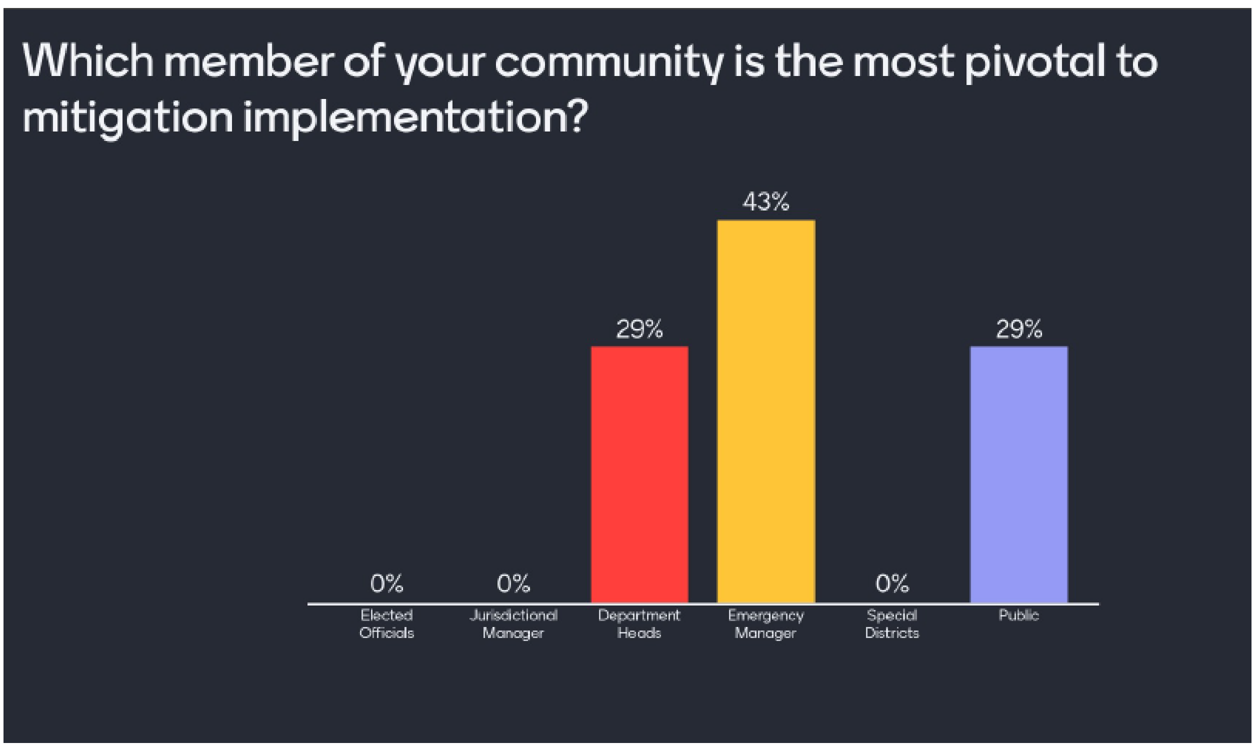


Figure 10. HMPC Polling Responses – Pivotal Community Members for Implementation



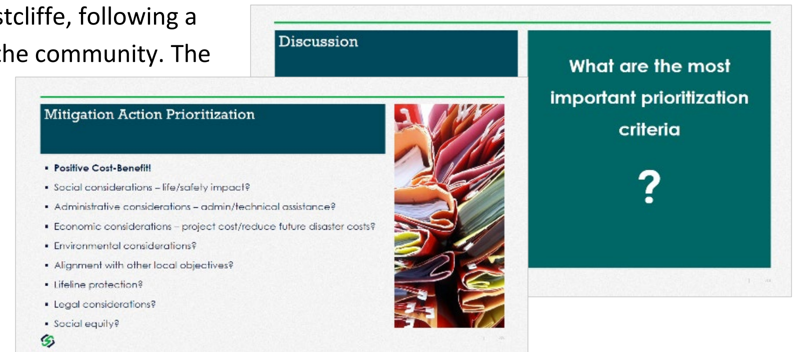
At the end of the meeting, participants were given the following action items:

- Assist with continued dissemination of the public involvement plan's messaging

- Begin drafting new 2022 mitigation actions
- Complete a mitigation capability assessment
- Provide hazard risk rankings specific to their local government
- Begin reporting on 2017 mitigation actions
- Provide additional comments on the mitigation strategy's goals and objectives

MITIGATION STRATEGY WORKSHOP (JUNE 29TH, 2022)

The final HMPC meeting was held in Westcliffe, following a public open house to gather input from the community. The agenda focused on remaining plan requirements, including a discussion about plan maintenance and implementation over the next five years. Additionally, opportunities for plan integration and continued public involvement were talked through.



Conversations from the HIRA meeting pertaining to the mitigation goals and objectives were also revisited to ensure the committee was in agreement on those updates. The conversation then turned to new mitigation actions. As jurisdictions worked on developing new actions, a number of resources and ideas were presented for their consideration. Prioritization of those new actions was then discussed, as the group felt a number of criteria should be evaluated when ranking these actions.

The meeting concluded with time spent further discussing mitigation action ideas, funding opportunities, and how communities can prepare now for future grant applications.

At the end of the meeting, participants were given the following action items:

- Provide final comments on the mitigation strategy
- Assist with continued dissemination of the public involvement plan's messaging
- Continue drafting new 2022 mitigation actions

HMP INDIVIDUAL MUNICIPALITY ONE-ON-ONES (ON-GOING THROUGHOUT PLANNING PROCESS)

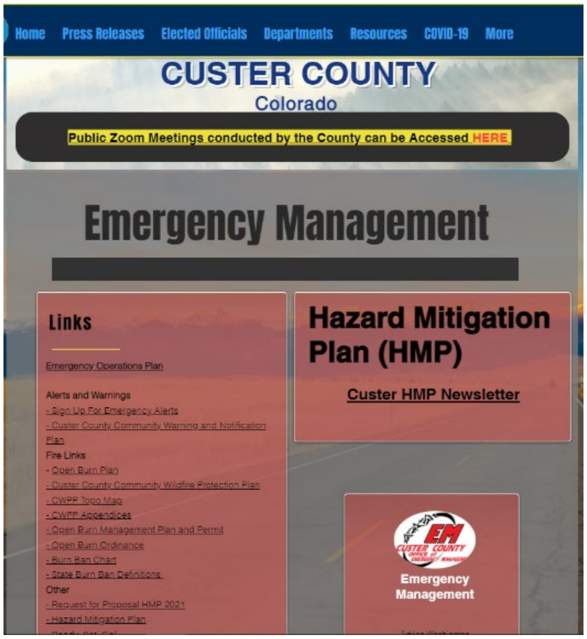
In addition to the scheduled workshops, Custer County Office of Emergency Management and organizational leadership facilitated a number of individual meetings and conversations with Silver Cliff, Westcliffe, and Round Mountain Water and Sanitation District over the course of the planning process. These meetings helped to inform and involve the municipalities and district in the discussion and content of HMPC meetings they were unable to attend, as well as an opportunity for these organizations to go into greater detail regarding their specific risks, concerns, and questions.

It was important to the County that all municipalities were able to meet planning process requirements so they could adopt the plan and remain eligible to pursue mitigation grant funding opportunities. These organizations were each able to strengthen their relationship with the County and further collaboration on mitigation implementation going forward.

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. Comments were received from all adopting communities and were incorporated.

PUBLIC AND STAKEHOLDER PARTICIPATION



Public involvement was a key component to informing the HMP update. A public open house was held in Westcliffe on December 16th, 2021, and throughout the project multiple outreach techniques were utilized. These methods, listed below, aimed to educate the public about the plan and process, as well as gather public input on issues and opportunities for mitigation improvements. The HMPC was asked how best to engage the public in their jurisdiction and the responses highlighted: surveys, social media, and newsletters. The following materials were distributed to communities by the committee.

Website

Custer County utilized its Emergency Management webpage to provide background information, contacts, and links to the surveys and supporting documents.

Newsletter

In order to provide hardcopy materials for small group gatherings or to insert educational material into existing newsletters, project information was sent out to participating municipalities for distribution. The newsletter described the purpose of the project, timeline, contacts, links to the survey, and ways to stay involved in the process.

Social Media & Other Tools

Narrative describing the HMP and update process was sent to communities in multiple formats to accommodate: hardcopy newspapers, e-mail list serves, Facebook, Next Door, and Twitter. Graphic elements were also distributed to allow communities to incorporate educational materials and links to surveys in different media materials.

Custer County Hazard Mitigation Plan Update

Project Newsletter

Custer County is updating the 2017 Multi-Jurisdictional Hazard Mitigation Plan in collaboration with local municipalities, districts, and other community organizations. This plan is designed to reduce the risks posed by hazards that affect our county and must be updated and approved by FEMA every five years to keep it current and to maintain eligibility for certain types of disaster assistance.

What is hazard mitigation?

The term "Hazard Mitigation" describes actions that can help reduce or eliminate long-term risks caused by hazards, such as wildfires, drought, floods, and severe winter storms. Hazard mitigation is best accomplished when based on a comprehensive, long-term plan developed before a disaster strikes.

As the costs of disaster impacts continue to rise, governments and citizens must find ways to reduce hazard risks to our communities. Oftentimes after disasters, repairs and reconstruction efforts 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 such hazard mitigation actions now, by state and local governments, means building stronger, safer, and smarter communities that will be able to reduce future injuries and damages.

Project Benefits

Mitigation is an investment in a community's future safety and sustainability. Recent cost-benefit studies have proven mitigation to be cost effective for communities, with mitigation projects returning $6 for every $1 spent. Mitigation planning helps communities take action now, before a disaster, to reduce impacts when a disaster occurs.

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 harm to existing and future development.
- Maintain community continuity and strengthen the social connections that are essential for recovery.
- Prevent damage to your 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.

Custer County and its municipalities leveraged the following resources to broadcast information and updates pertaining to the HMP: The Valley Beat, Wet Mountain Tribune, Sangre de Cristo Sentinel, and the County's social media presence.


Sangre de Cristo Sentinel | Friday, December 10, 2021

Public Open House

Custer County Hazard Mitigation Plan Update

Thursday, December 16th 5:30-7:00 PM

Hope Lutheran Church, Lange Hall

Custer County is updating the Hazard Mitigation Plan.

What hazards do you think should be the focus?

www.Bit.ly/CusterHMP

Active Survey

Press Release

Custer County is updating its 2017 Multi-Jurisdictional Hazard Mitigation Plan in collaboration with local municipalities and other community organizations. As part of this planning process, a public open house will be held on Thursday, December 16th from 5:30 to 7 p.m.

Residents and businesses are encouraged to stop by to enjoy some free appetizers and learn more about the plan. The event will be held at the Hope Lutheran Church's Lange Memorial Hall at 312 South Third Street in Westcliffe, Colorado.

The term "Hazard Mitigation" describes actions that can help reduce or eliminate long-term risks caused by hazards, such as floods, wildfires, drought, and earthquakes. Hazard mitigation is best accomplished when based on a comprehensive, long-term plan developed before a disaster strikes. This plan is designed to proactively reduce the risk of hazards facing the county by identifying a mitigation strategy for reducing future losses.

Custer County is committed to providing equa[l] access to all programs t[o] ensure nondiscriminatio[n] for individuals with acce[ss] or functional needs. Shoul[d] you require reasonabl[e] accommodation or f[or] more information abo[ut] this event, contact Cust[er] County's Director [of] Emergency Managemen[t] Adrian Washingt[on] (719.269.7958 | adrian[...] custercountygov.com).

Virtual options are al[so] available. For additio[nal] details, see the 'Pub[lic] Zoom Meetings' link [on] the county website.

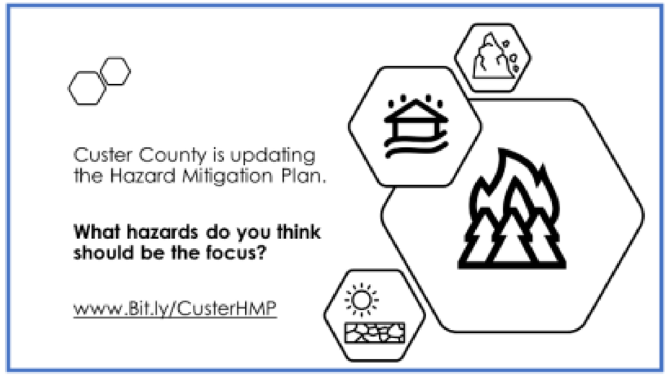
Workshop #2 - Hazard Identification and Risk Assessment (HIRA)

Friday, December 17, 2021 / 9 - 10:30 a.m.

Join on your computer or mobile app (See Custer County website Top of Pa[ge]

COMMUNITY SURVEY

As part of the outreach process, a community survey was developed to gather community feedback. Summaries of the survey results are detailed here.



CUSTER PUBLIC RISK PERCEPTION AND MITIGATION STRATEGY SURVEY (87 RESPONSES)

The survey focused on understanding the community's perception of hazard risk. Details of the public risk ranking can be found in the Hazard Risk Summary section. Additionally, ideas for potential mitigation actions were solicited and 76 responses were submitted. A range of topics was represented in these responses, including public education on hazards and mitigation, ordinance enforcement, mitigation measures, and emergency alert capabilities. The community suggestions are summarized in Appendix E: Mitigation Ideas. The following figures present some of the other survey responses.

Figure 11. Public Survey Responses

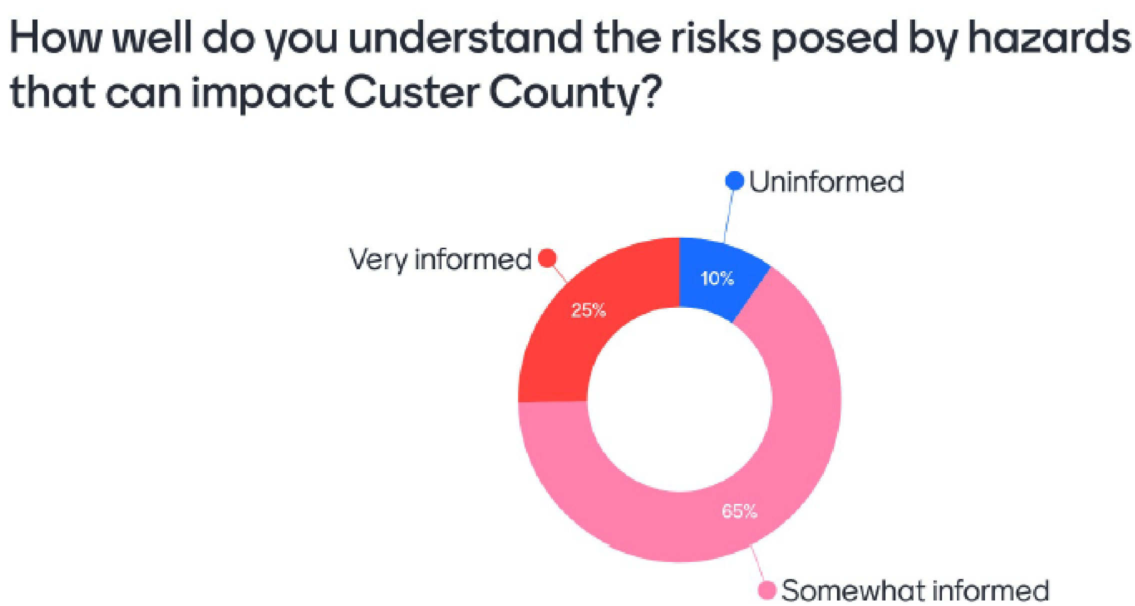


Figure 12. Public Survey Responses

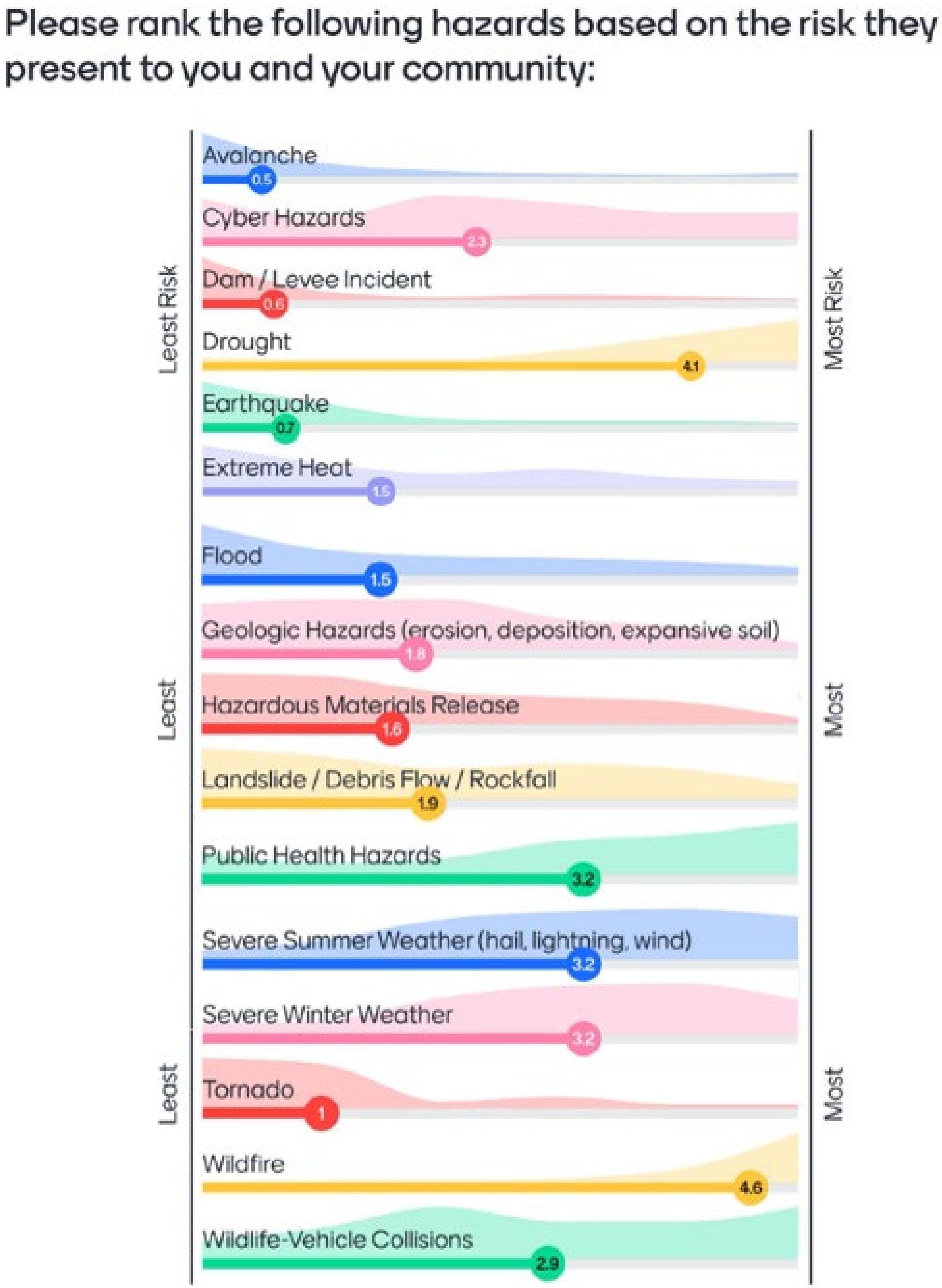


Figure 13. Public Survey Responses

How concerned are you about the following scenarios during and following a disaster?

Figure 14. Public Survey Responses

How vulnerable are you and / or the people living in your household to the impacts of hazard events?

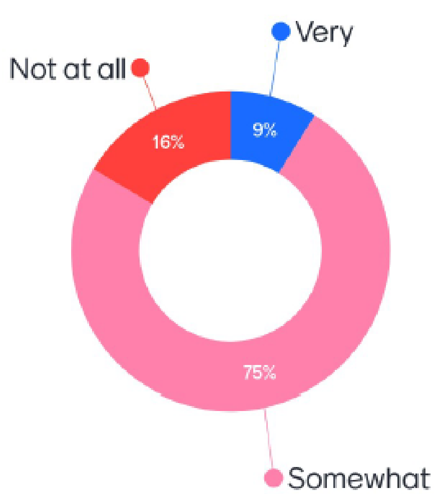


Figure 15. Public Survey Responses

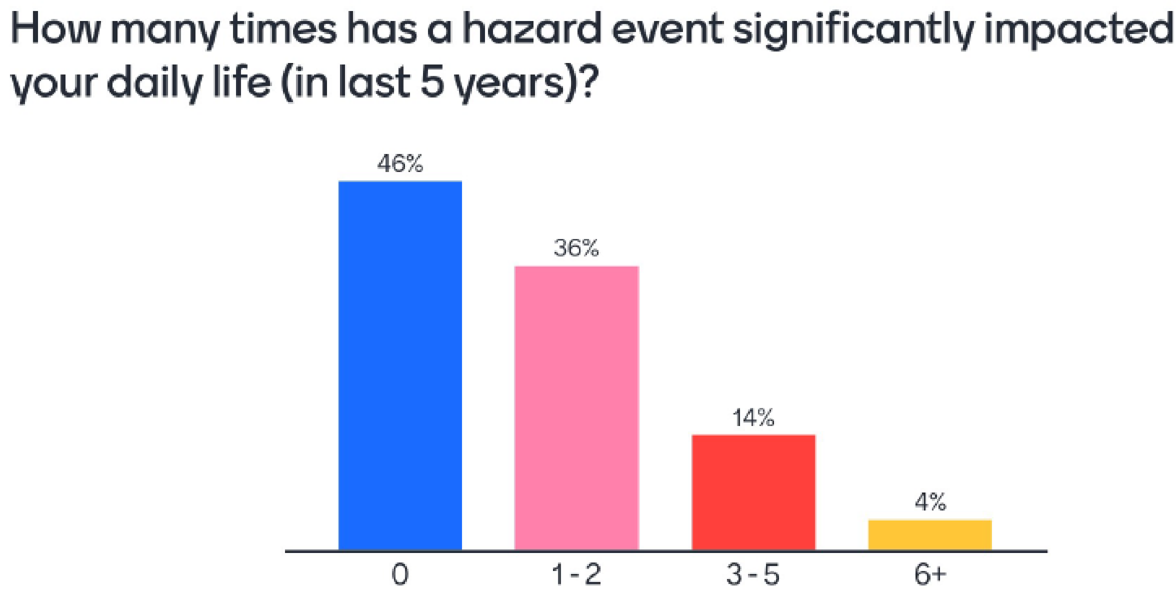


Figure 16. Public Survey Responses

PUBLIC OPEN HOUSE EVENTS

Throughout the planning process the HMPC has recognized the value and importance of public input. The HMPC aimed to connect with community members during two open house events, to engage and educate residents of the county and jurisdictions. These events were held prior to committee meetings, either the day before or day of, which allowed the input from community members to be relevant, timely, and show the immediate concerns, ideas, priorities, and potential actions for the committee to consider.

The open house events presented an opportunity for the community to continue the conversation about risks in their community. Topics included awareness of which hazards affected the community, including the risk and vulnerability associated. Education on mitigation was also a focus and it was explained to the community the critical value they bring to the planning process. An overview of the topic of mitigation strategy was presented to attendees and through live polling they were asked for input, encouraging them to share ideas, priorities, and potential actions. Some of these responses can be seen in Figure 17 through Figure 21.

Figure 17. Community Polling Responses – Public Ideas on Mitigation Definition

Figure 18. Community Polling Responses – Preferred Tool for Mitigation

Figure 19. Community Polling Responses – Support for Mitigation Categories

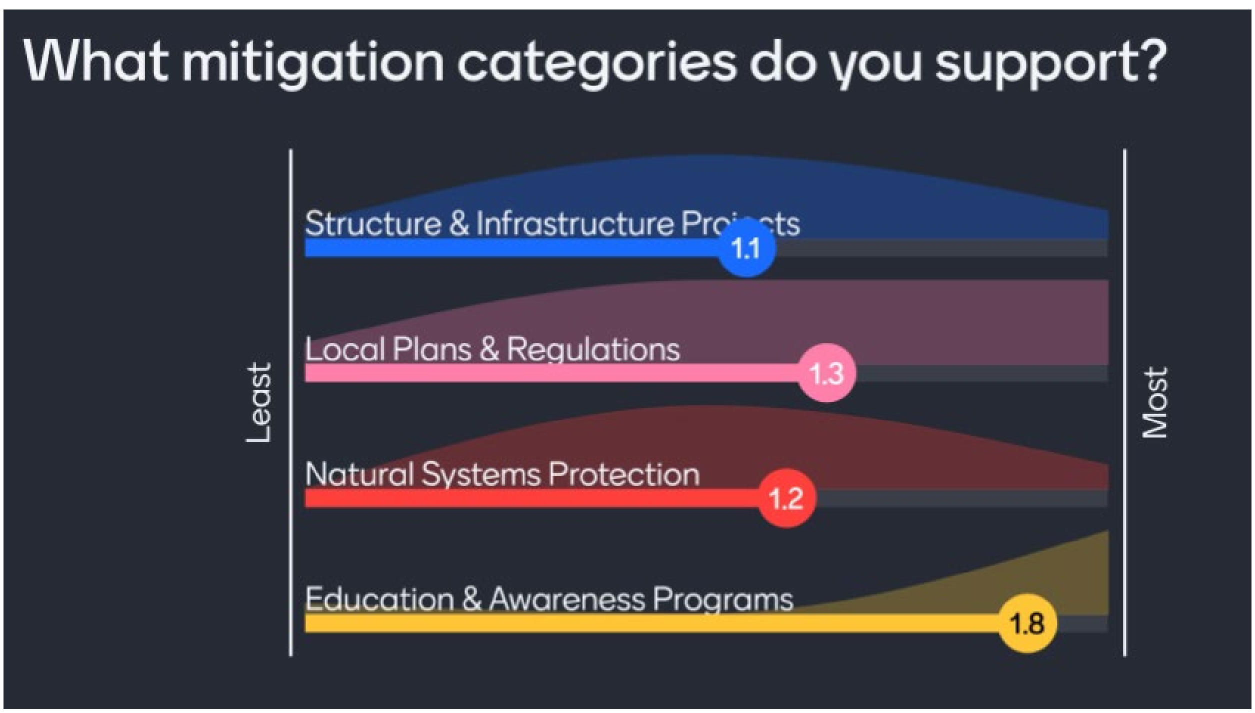


Figure 20. Community Polling Responses – Priority for Mitigation Categories

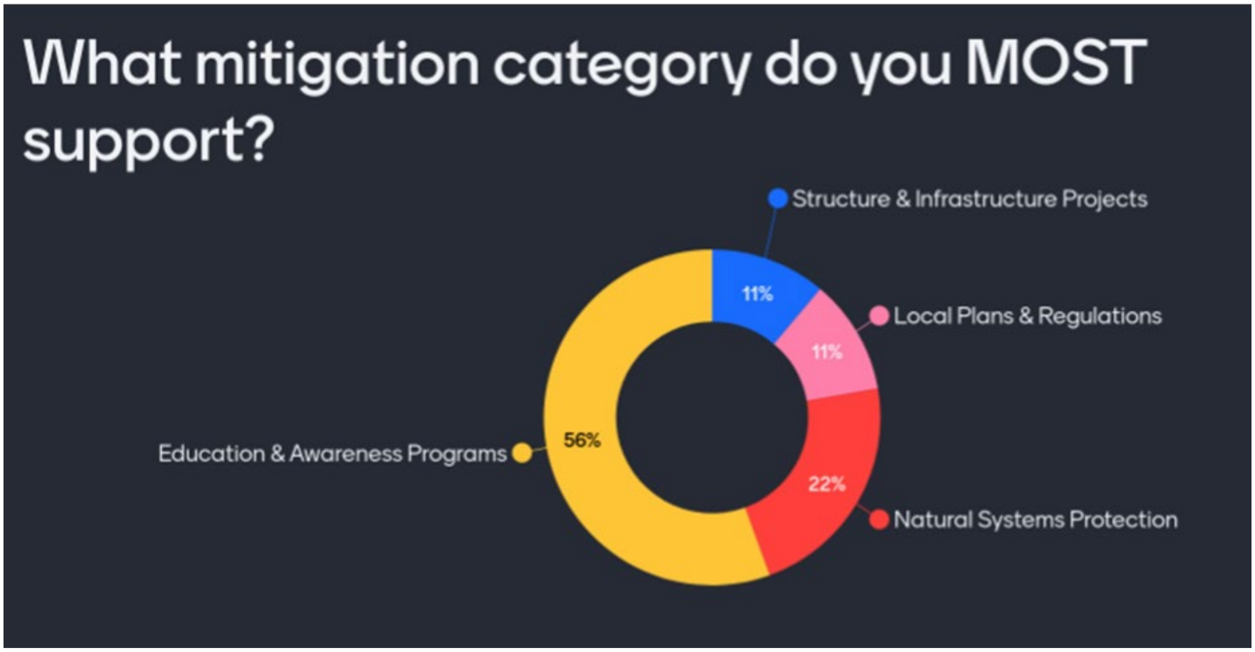


Figure 21. Community Polling Responses – Community Member Mitigation Action Ideas

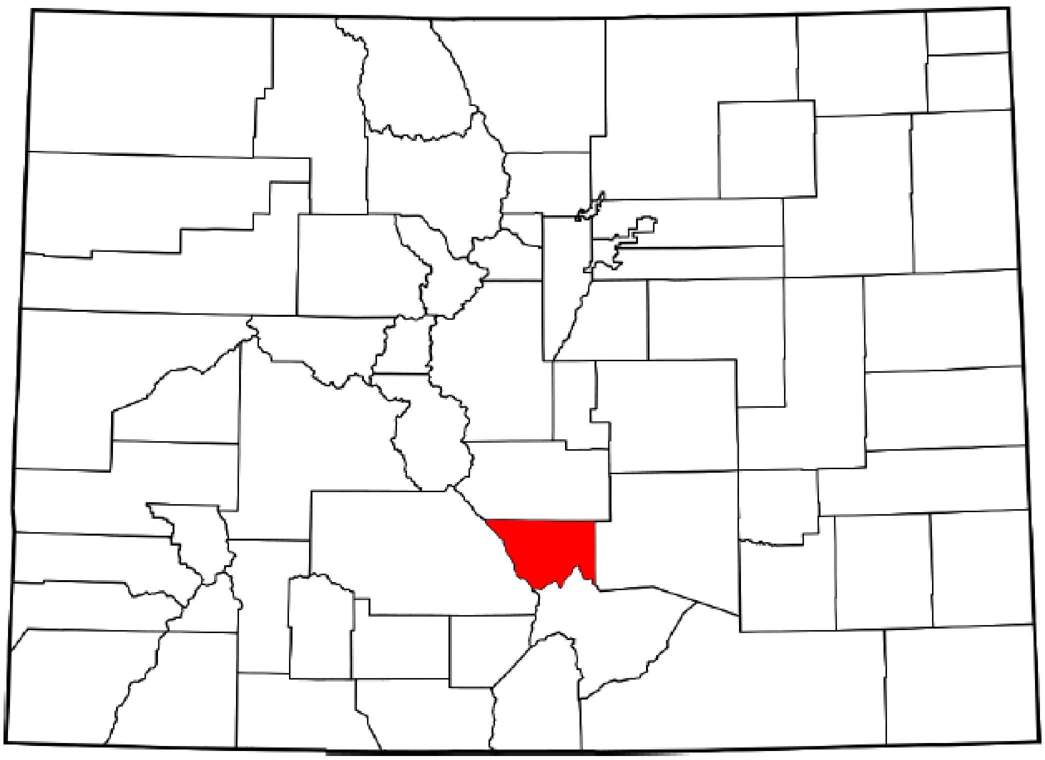
PUBLIC PLAN REVIEW & COMMENT

A public review of the final draft plan was held from 11/18/2022 to 12/2/2022. Two comments were received and addressed as appropriate. News of the public review period was broadly posted throughout the community, utilizing tools including social media postings and local news publications. Hardcopies of the HMP were also posted to the two local libraries.

CHAPTER 3: CUSTER COUNTY PROFILE

Custer County covers approximately 739 square miles of land area and is located in south central Colorado. The majority of the population of Custer County is located in and around the Towns of Westcliffe, the county seat, and Silver Cliff, which are centrally located adjacent to each other. There are multiple unincorporated communities and a few ghost towns left empty after mining stopped in the area.

Figure 22. Location of Custer County within the State of Colorado



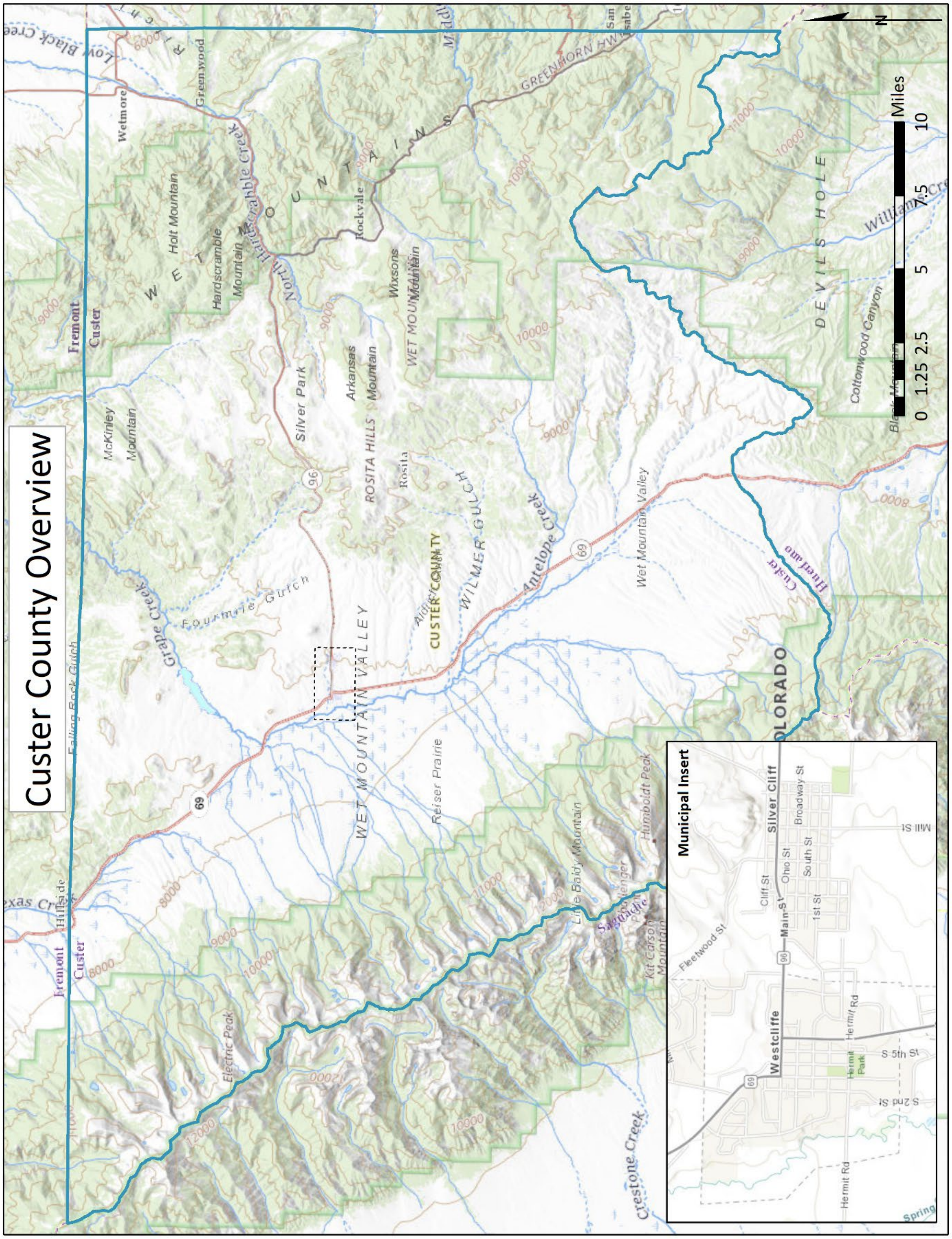
The geography of Custer County is varied, but the majority is mountainous, with the western border following the Sangre De Cristo Range and the northeast corner containing the Wet Mountains. The Towns of Westcliffe and Silver Cliff are located in the Wet Mountain Valley at the base of Sangre De Cristo Range. The only lake is DeWeese Reservoir located at the north end of the Wet Mountain Valley. Elevation ranges from 6,081 feet above sea level in the northeastern portion of the county to the 14,294-foot summit of Crestone Peak in the Sangre De Cristo Range.

Adjacent counties include:

- Fremont County – north
- Huerfano County – south
- Pueblo County – east
- Saguache County – west

Figure 23 is a detailed overview of the geography of Custer County, with an inset map illustrating the layout of both Westcliffe and Silver Cliff.

Figure 23. Custer County Overview Map



The towns and communities of Custer County are served by the volunteer Wetmore Fire Department, the Wet Mountain Fire Protection District, and the Custer County Emergency Medical Services (EMS). County law enforcement oversees public safety and the Custer County Health Center, as well as the County Public Health Agency, provide medical services to the majority of the county.

The main highway transportation routes in the county are State Highway 69 and State Highway 96. State Highway 69 enters the county from the south from Huerfano County and runs along the Wet Mountain Valley, passes through Westcliffe, and continues northwest into Fremont County. State Highway 96 begins in Westcliffe and heads northeast toward the Wet Mountains and the communities of Greenwood and Wetmore, where it continues into Pueblo County. State Highway 165 splits off from Highway 96 and heads southeast to Pueblo County

The Silver West Airport is located in the Wet Mountain Valley, nine miles south of Silver Cliff and Westcliffe off State Highway 69.

HISTORY AND RESOURCE OVERVIEW

Custer County was established on March 9th, 1877, and named for General George A. Custer. Originally, the Ute Indians occupied the region and in 1853 the county was scouted for settlement.

The county benefited from the discovery of gold and silver in the 1880s with mines which brought thousands of people to the area. When the rush ended the population declined and livestock was once again the primary commodity.

Starting in 1970, the population grew with the help of increased tourism in the area and a stable state economy. More recently, between 1990 and 2010, the county population more than doubled.

Custer County is primarily rural and of Custer County's 473,600 acres, 39.9% is public lands and 60.1% is private land. The United States Forest Service (USFS), Bureau of Land Management (BLM), State of Colorado, and the local governments of Custer County, Silver Cliff, and Westcliffe manage the public land. The USFS lands include portions of the San Isabel National Forest, the Greenhorn Wilderness Area, and the Sangre de Cristo Wilderness Area.

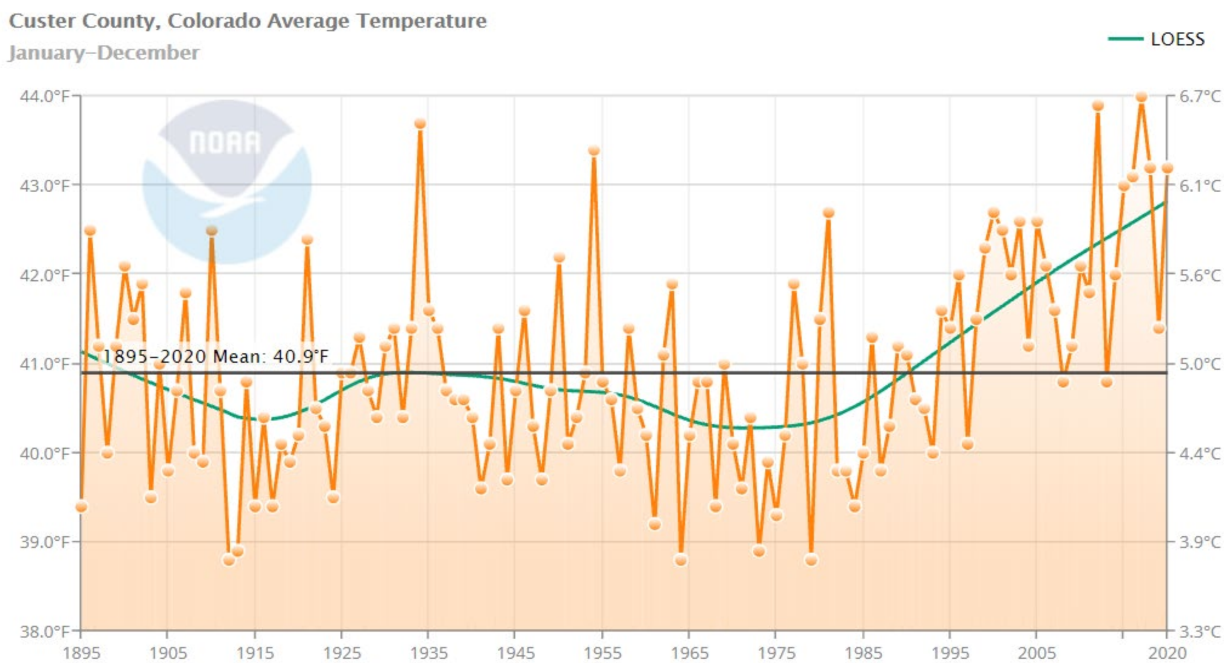
Custer County contains multiple hunting areas that are home to a spectrum of wildlife. Two State Wildlife Areas and five State Trust Lands, also called Game Management Units (state divided hunting areas), add up to thousands of acres in the county. These acres are home to elk, mule deer, pronghorn, black bears, mountain lions, small game, fowl, and waterfowl.

The Towns of Westcliffe and Silver Cliff are certified as an International Dark Sky Community by The International Dark Sky Association, the first of such communities in Colorado and ninth in the world. Dark Sky certification is based on the elimination of light pollution in a community, as well as education and promotion of responsible lighting.

CLIMATE

The climate of Custer County is wide-ranging across its diverse topography and conditions can change quickly. Due to the changes in elevation across the county, temperatures, precipitation, and snow accumulation can vary significantly. The information in this section is based on NOAA long-term average annual data from the weather station in Cañon City.

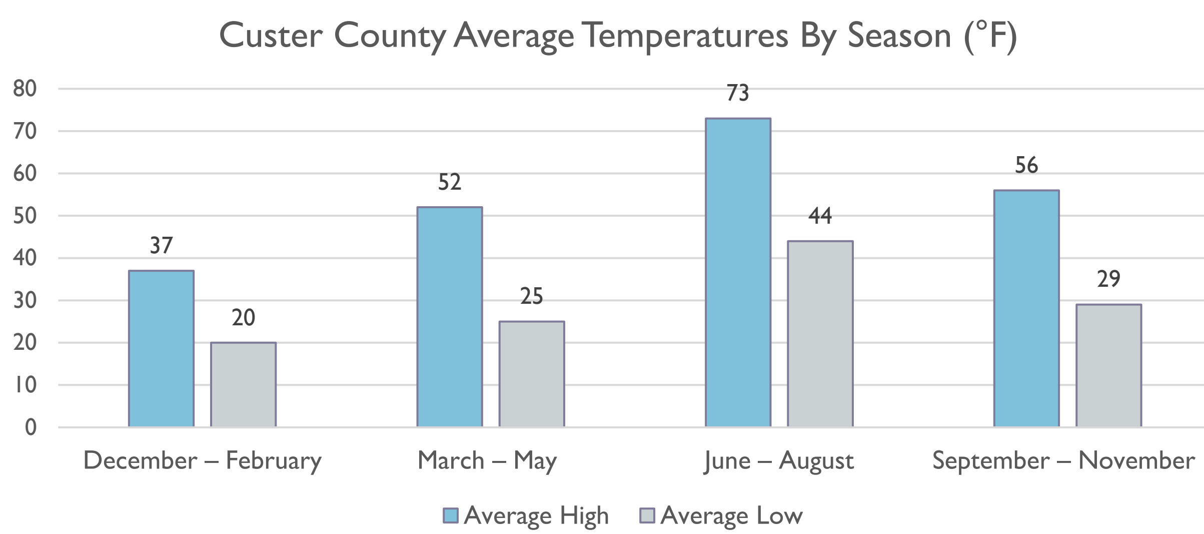
Figure 24. Mean Annual Temperature Trends (1895 – 2020)



Source: NOAA Climate Data Online

Based on NOAA data, beginning in 1895, Figure 24 shows the overall average of each year's temperatures. The same data was used for the annual average seasonal temperature ranges, which are shown in Figure 25. The warmest time of year is between June and August, averaging 73°F highs and lows of 44°F. The season with the lowest average temperature is between December and February, around 37°F highs and lows of approximately 20°F.

Figure 25. Custer County Average Temperatures By Season (°F)



Source: NOAA Climate Data Online

Based on NOAA long-term average data from the weather station in Cañon City, the total average annual precipitation is roughly 20 inches falling primarily in spring and summer, with an average of 12.5 inches falling between March and August. Based on data from the National Weather Service Cooperative Network (COOP) stations, from 1895-2020, the long-term annual average snowfall is around 85 inches for the county. The majority of snowfall occurs between February and April. The highest recorded annual snowfall was in 1959 with 162.5 inches and the lowest was 19 inches in 1921.

Table 6. Snowfall and Precipitation

Season	Average Precipitation (Inches)	Average Snowfall (Inches)
December – February	3.5	10
March – May	6	13
June – August	6.5	0
September – November	4	7
Annual	20	85

Source: NOAA Climate Data Online

COMMUNITY 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.

Each Lifeline category has subcomponents which impact the functionality of the Lifeline and can be addressed in planning at a closer level. 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 26.

Figure 26. Lifeline Categories and Subcomponents

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.

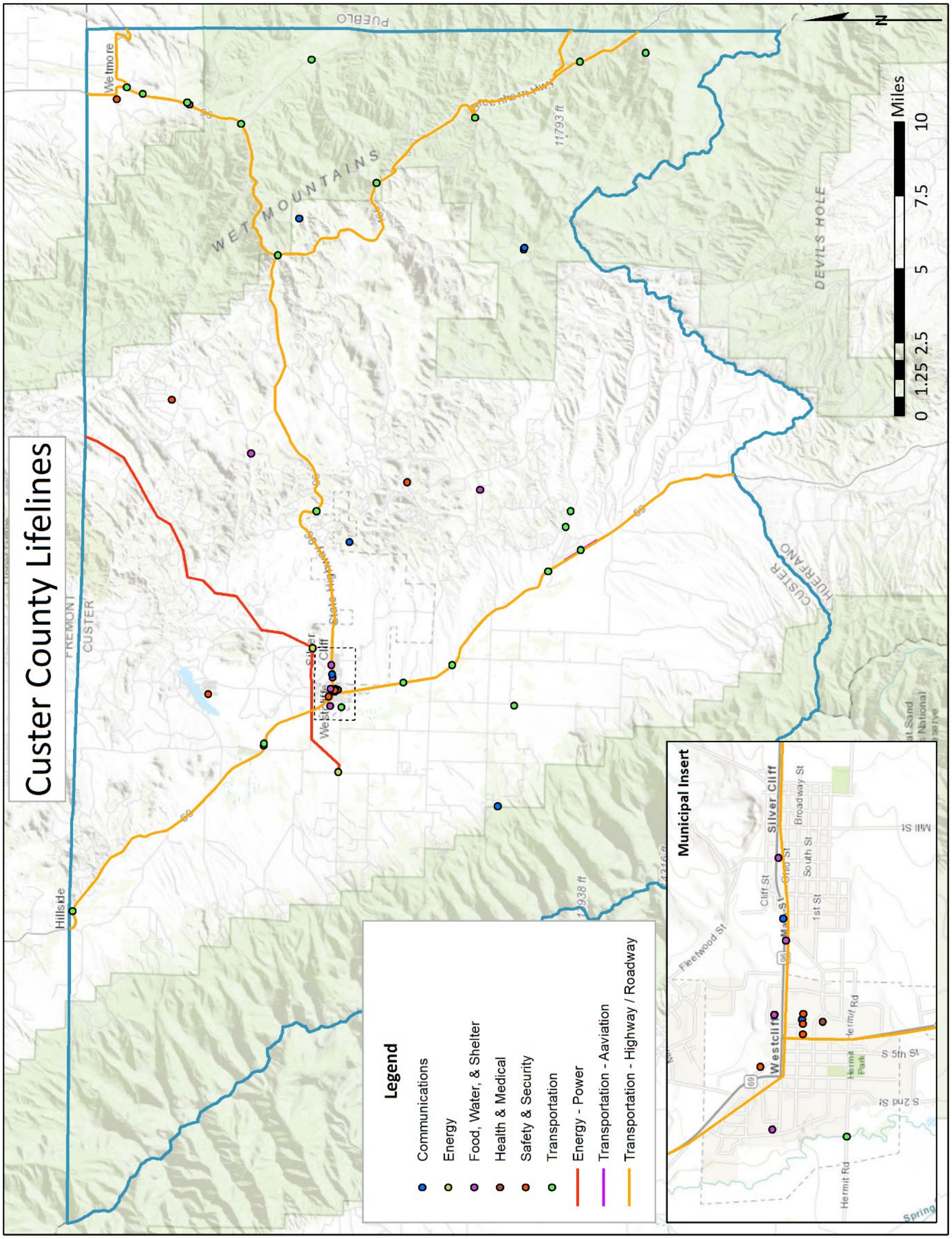
The inclusion of the community Lifelines in planning and mitigation strategy is important to address critical processes and infrastructure specific to Custer County. Identifying the Lifelines across the county creates a better understanding of effects from hazards and risks to assets. Lifeline inputs for Custer County include Communications, Energy, Food, Water & Shelter, Health & Medical, Safety & Security, and Transportation. These categories include infrastructure, types of shelter, various structures and lengths of infrastructure for transportation and energy, as well as critical service locations.

After collecting Lifeline and asset data across the county, GIS mapping and analyses were conducted as part of the risk and vulnerability assessment. Table 7 shows the breakdown of these data points to the subcomponent level of each Lifeline. Figure 27 illustrates those Lifelines identified across the county.

Table 7. Custer County Lifelines Overview by Subcomponent

Lifeline	Subcomponent	Count
Communications	Infrastructure	9
Energy	Infrastructure	2
Energy	Power	16 miles
Food, Water & Shelter	Shelter	14
Health & Medical	Public Health	1
Health & Medical	Medical Care	1
Safety & Security	Government Services	2
Safety & Security	Law Enforcement	1
Safety & Security	Fire Services	5
Transportation	Aviation	2
Transportation	Aviation	1 mile
Transportation	Highway Roadway	20
Transportation	Highway Roadway	79 miles

Figure 27. Custer County Lifelines Assessed



MITIGATION CAPABILITIES

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

Mitigation capabilities are classified into the following types and are detailed in the following Tables.

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

Planning and regulatory capabilities are powerful tools for implementing hazard mitigation. The County currently utilizes or has implemented most of these capabilities shown in Table 8. The County supports the municipalities with the 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. Capabilities relevant to the districts are discussed in Appendix A: Local Government Annexes.

Table 8. Planning & Regulatory Capabilities

Mitigation Capability	Custer County	Silver Cliff	Westcliffe
Comprehensive, Master, or General Plan	Y	N	N
Capital Improvement Program or Plan (CIP)	N	N	N
Floodplain Management Plan	Y	N	N
Stormwater Program / Plan	N	N	N
Community Wildfire Protection Plan (CWPP)	Y	N	N
Erosion / Sediment Control Program	Y	N	N
Economic Development Plan	Y	N	N

Mitigation Capability	Custer County	Silver Cliff	Westcliffe
Other: Emergency Operations Plan	Y	N	N
Building Codes (Year)	N	Y (2006)	Y (2006)
Building Code Effectiveness Grading Schedule (BCEGS) Rating	N	N	N
Site Plan Review Requirements	Y	Y	Y
Other: Sewage and Sanitation	Y	N	N
Zoning Ordinance (Land Use)	Y	Y	Y
Subdivision Ordinance	Y	Y	Y
National Flood Insurance Program (NFIP) Participant	N	N	N
Flood Insurance Study / Flood Insurance Rate Map / DFIRM	Y	Y	Y
Floodplain Ordinance	N	N	N
Elevation Certificates for Floodplain Development	N	N	N
Community Rating System (CRS) Participant	N	N	N
Open Space / Conservation Program	Y	N	N
Growth Management Ordinance	N	N	N
Stormwater Ordinance	N	N	N
Other Hazard Ordinance (steep slope, wildfire, snow loads, etc.)	N	N	N

Available resources including staff, municipal groups, and technology are all vital for a community to be able to implement hazard mitigation. Custer County is fortunate to have the basic capabilities identified in Table 9;

however, there are no staff positions for many of the technical capabilities. The County relies on the integration of many of these capabilities into the Office of Emergency Management role and responsibilities. The municipalities provide support where possible, such as community planning, and utilize resources from the County as needed.

Table 9. Administrative & Technical Capabilities

Mitigation Capability	Custer County	Silver Cliff	Westcliffe
Planning Commission	Y	Y	Y
Mitigation Planning Committee	Y	Y	Y
Maintenance Programs (tree trimming, clearing drainage, etc.)	Y	Y	Y
Emergency Manager	Y	N	N
Building Official	N	N	N
Floodplain Administrator	N	N	N
Community Planner	N	N	N
Transportation Planner	N	N	N
Civil Engineer	N	N	N
GIS Capability	Y	Y	Y
Resiliency Planner	N	N	N
Other: Agricultural Resiliency	Y	N	N
Warning Systems / Services (flood)	Y	Y	Y
Warning Systems / Services (other / multi-hazard)	Y	Y	Y
Grant Writing / Management	Y	Y	Y

The ability of a community to implement a comprehensive mitigation strategy is largely dependent on available funding. The County and municipalities utilize a number of financial tools to support mitigation activities, as shown in Table 10.

Table 10. Financial Capabilities

Mitigation Capability	Custer County	Silver Cliff	Westcliffe
Levy for Specific Purposes with Voter Approval	Y	Y	Y
Utilities Fees	Y	Y	Y
System Development / Impact Development Fee	Y	Y	Y
General Obligation Bonds to Incur Debt	N	N	N
Special Tax Bonds to Incur Debt	Y	Y	Y
Withheld Spending in Hazard-Prone Areas	N	N	N
Open Space / Conservation Fund	Y	N	N
Stormwater Utility Fees	N	N	N
Capital Improvement Project Funding	Y	Y	Y
Community Development Block Grants (CDBG)	Y	Y	Y

Education and outreach are important capabilities that allow continued conversation with the public regarding hazard risk and opportunities to mitigate. Table 11 shows that the County and municipalities leverage most of these capabilities.

Table 11. Education & Outreach Capabilities

Mitigation Capability	Custer County	Silver Cliff	Westcliffe
Public Hazard Education / Outreach Program	Y	Y	Y
Local Citizen Groups That Communicate	Y	Y	Y

Mitigation Capability	Custer County	Silver Cliff	Westcliffe
Firewise	Y	N	N
StormReady	Y	N	N
Other: Recycling Land Field, Solar/Wind/Alternate Energy	Y	N	N

ECONOMY

The Gross Domestic Product for all industries in Custer County, was $125,966,000 according to the U.S. Bureau of Economic Analysis 2019 data.

Table 12. Economic Snapshot of Custer County and the State of Colorado

	Custer County	Colorado
Median Household Income	$53,119	$72,331
Percent of Population over 16 in labor force	44.3%	67.6%
Percent of Persons in Poverty	11.8%	9.3%
Unemployment Rate as of Feb. 2022	3.4%	4%

Sources: U.S. Census Bureau, 2012-2018 American Community Survey, Federal Reserve Bank of St Louis

JOBS

According to the Colorado Department of Local Affairs, as of 2019 there were an estimated 1,819 jobs in Custer County. The five sectors employing the most people are listed in Table 13.

Table 13. Custer County Jobs by Sector (Top 5 Sectors)

Sector	Number of Jobs
Agriculture	292
Government	273
Crops and livestock production	253
Local government	241
Construction	219

Source: Colorado Department of Local Affairs (DOLA), 2021

UNEMPLOYMENT

Prior to the impact of Novel Coronavirus 2019 (COVID-19), the February 2020 unemployment rate in Custer County was 5.1%, just over double the State unemployment rate of 2.5%. Per the most recent data, the unemployment rate for the county was 3.4% and was slightly lower than the State unemployment rate at 4% (U.S. Bureau of Labor

Statistics). The impacts of COVID-19 have been far reaching in the local, state, and national economies, at the time of publishing the unemployment rate continued to fluctuate unpredictably.

DEMOGRAPHICS

The current population of Custer County is 4,074 people, based on 2020 US Census data. Based on estimates and projections from the State Demography Office, over the next three decades, Custer County will see a maximum annual average change of 0.5% in population. By comparison, Colorado percent growth change will range from 0.7% to 1.4% over the same period with the exception of a decrease of 0.4% over the next five years. The projected populations based on these change rates are in Table 14.

Table 14. Population Projections for Custer County and Colorado (5-year increments)

	2025	2030	2035	2040	2045	2050
Custer County	4,946	5,028	5,149	5,251	5,355	5,485
Colorado	6,132,563	6,562,402	6,970,549	7,342,121	7,658,761	7,929,215

Source: Colorado Department of Local Affairs, 2021

A snapshot of some of the demographics of the county (Table 15) shows a few key characteristics including proportions of the ages of the population, disability, poverty, and education attainment. The population of the county has considerable differences in comparison to the state's demographics, with some proportions close to double. The smallest differences, with the county's percentage being minimally higher for both, were for percent of the population in poverty (2.5%) and percent of high school diploma attainment (1.9%).

The most notable difference is the population of Custer County having 33% or almost double the state population proportion 14.6% of people over age 65. Considerably less people are under the age of 18 as well, a 7.8% difference from the state. For the percent of the population overall with a disability, Custer County has 18.4% while the state has 10.6%, a considerable difference.

These figures are important to give attention to when planning for the county and communities. In the Community Inclusion section, the assistance needs and education regarding specific populations are discussed further.

Table 15. Demographic Snapshot of Custer County and Colorado

Demographic	Unincorporated Custer County	Colorado
Population	5,068	5,758,736
Age: 4 and Under (%)	3.5	5.8
Age: Under 18 (%)	13.8	21.9
Age: 65 and Over (%)	33	14.6
Persons in Poverty (%)	11.8	9.3
Persons with a Disability (%)	20.6	19.1
Persons Age 65+ with a Disability (%)	23.5	32.2
Adults who are Obese or Overweight (%)	60.7	57.4
Adults with Diabetes (%)	7.3	7.3
Adults with Asthma (%)	9.5	9.1
Adults with Coronary Heart Disease (%)	5.5	2.7

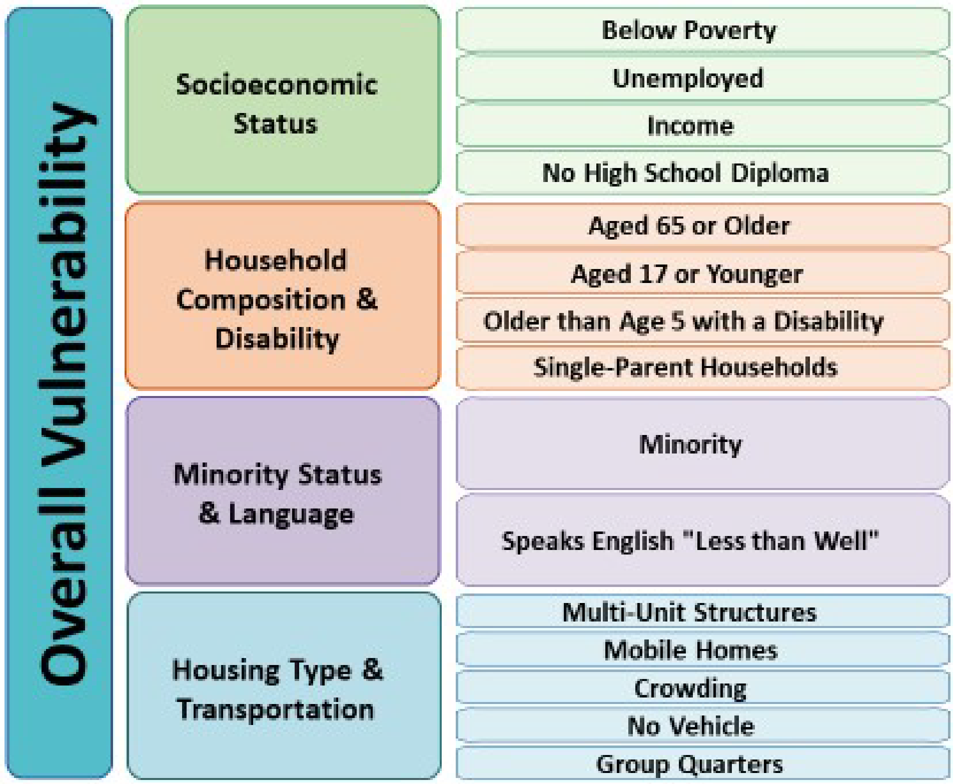
Sources: U.S. Census Bureau, 2018 American Community Survey, Federal Reserve Bank of St Louis

COMMUNITY INCLUSION

Community inclusion in preparedness and response to hazards is a crucial component to the resilience of a community. This is especially important for those in the community who experience access and functional needs (AFN) during disasters. Access and functional needs are the factors which may limit a person, in an emergency situation, in their ability to communicate, maintain their health, act independently, access adequate transportation, or acquire necessary services and support. These needs encompass a variety of social and economic factors, which are critical to consider when developing inclusive emergency systems and planning with those with AFN. Those factors are divided into four main categories: socioeconomic status, household composition & disability, language & minority status, and housing type & access to transportation. The components in these categories directly affect a community's ability to prepare for, respond to, and recover from hazards and disasters.

Figure 28 from the Centers for Disease Control, illustrates the components in the categories for access and functional needs.

Figure 28. Community Inclusion Categories and Components



Source: CDC

Impacts of hazards fall disproportionately on those with access and functional needs in a community, for example: low income or unemployed individuals, children, the elderly, those with disabilities, and underrepresented racial/ethnic groups. This can be seen in situations needing self-evacuation which can be unmanageable for elderly people, people with disabilities and mobility issues, those with independent living difficulty, institutionalized individuals, and those without necessary finances and means of transportation. In considering preparedness actions, individuals and families may have limited resources to invest in residential mitigation actions, their home may be a rental property, or they may not be physically capable of completing the needed actions. Social and economic factors like these have an effect on the safety of community members, decrease the ability of communities to recover from a disaster, and inhibit the building of resilience against future disaster events. Because these factors create unequal conditions outside of disasters too, it is clear that planning with non-traditional community partners who understand everyday community experiences will be critical for planning inclusive emergency responses.

This plan integrates community inclusion by assessing needs of the community using the Community Inclusion in Colorado (CICO) maps created by the Colorado Department of Public Health and Environment. These maps are designed to illustrate the various aspects of demographics and AFN within the population of Colorado and Custer County. These maps are designed to aid in the improvement of local relationship building with organizations supporting access & functional needs, decision making, hazard prioritization, and emergency management activities. By incorporating community inclusion into the risk assessments of individual hazards, local communities are able to identify more vulnerable areas and tailor their mitigation actions to accommodate all members of their community, including groups who may have difficulty accessing information and resources.

HOUSING

Roughly three-quarters of housing in Custer County consists primarily of single unit homes and around 50% of these are owner occupied. The low rental vacancy rate suggests that as the county continues to grow, rents may increase, and there may be pressure for construction of more rental units. The popularity of short-term vacation rentals in the county is important to recognize, as this has impacted both housing availability and the economy.

Table 16. Housing Characteristics of Custer County and Colorado

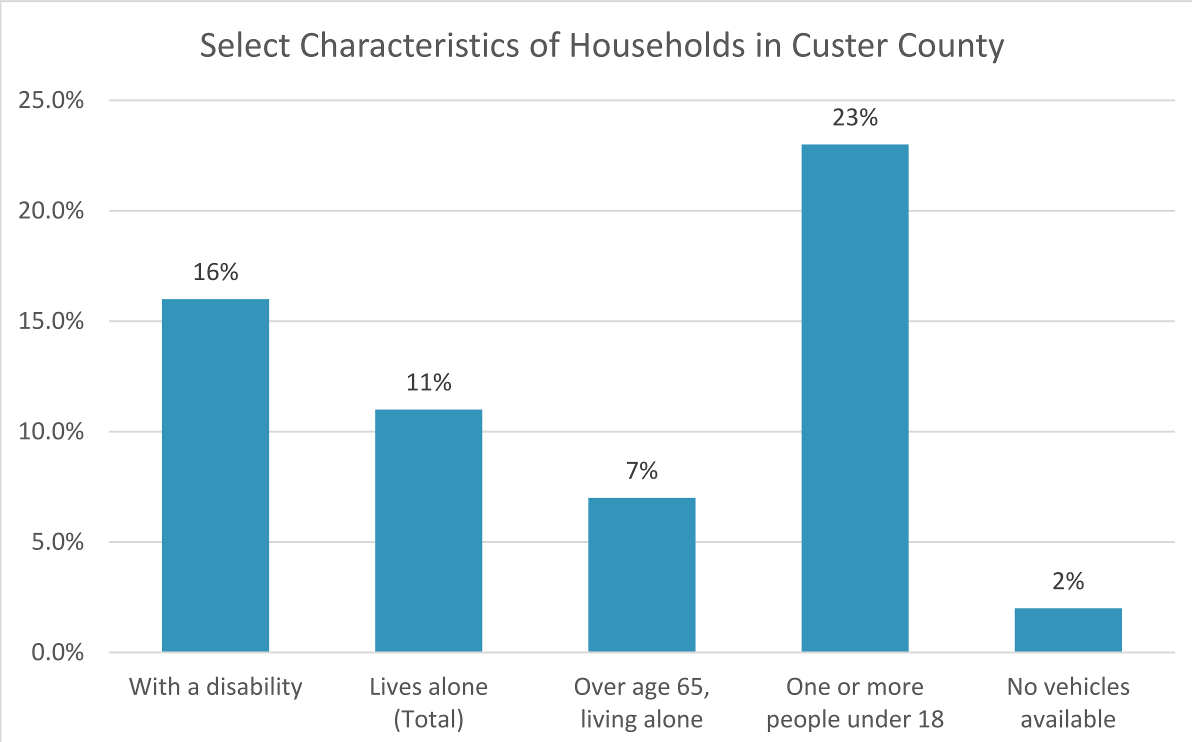
	Custer County	Colorado
Total Housing Units	4,408	2,386,475
Occupied Housing Units	50.2%	90%
Renter Occupied Units	13%	34.8%
Rental Vacancy Rate	18.6%	4.8%
Average Household Size	2.15	2.56
Mobile Homes	6%	4%

Source: US Census Bureau American Community Survey 2019

Household composition information in Custer County is valuable to preparedness, response, and mitigation planning efforts. Understanding the characteristics of your community can offer insight into the needs for specific groups, which can be beneficial for preparedness education and outreach efforts.

For example, Figure 29 shows that in Custer County roughly 7% of the population, or over 350 people, are over the age of 65 and living alone. The ability of the county to reach those specific community members to ensure their understanding of emergency preparedness could be lifesaving should a disaster happen.

Figure 29. Custer County Household Characteristics



Source: US Census Bureau American Community Survey 2019

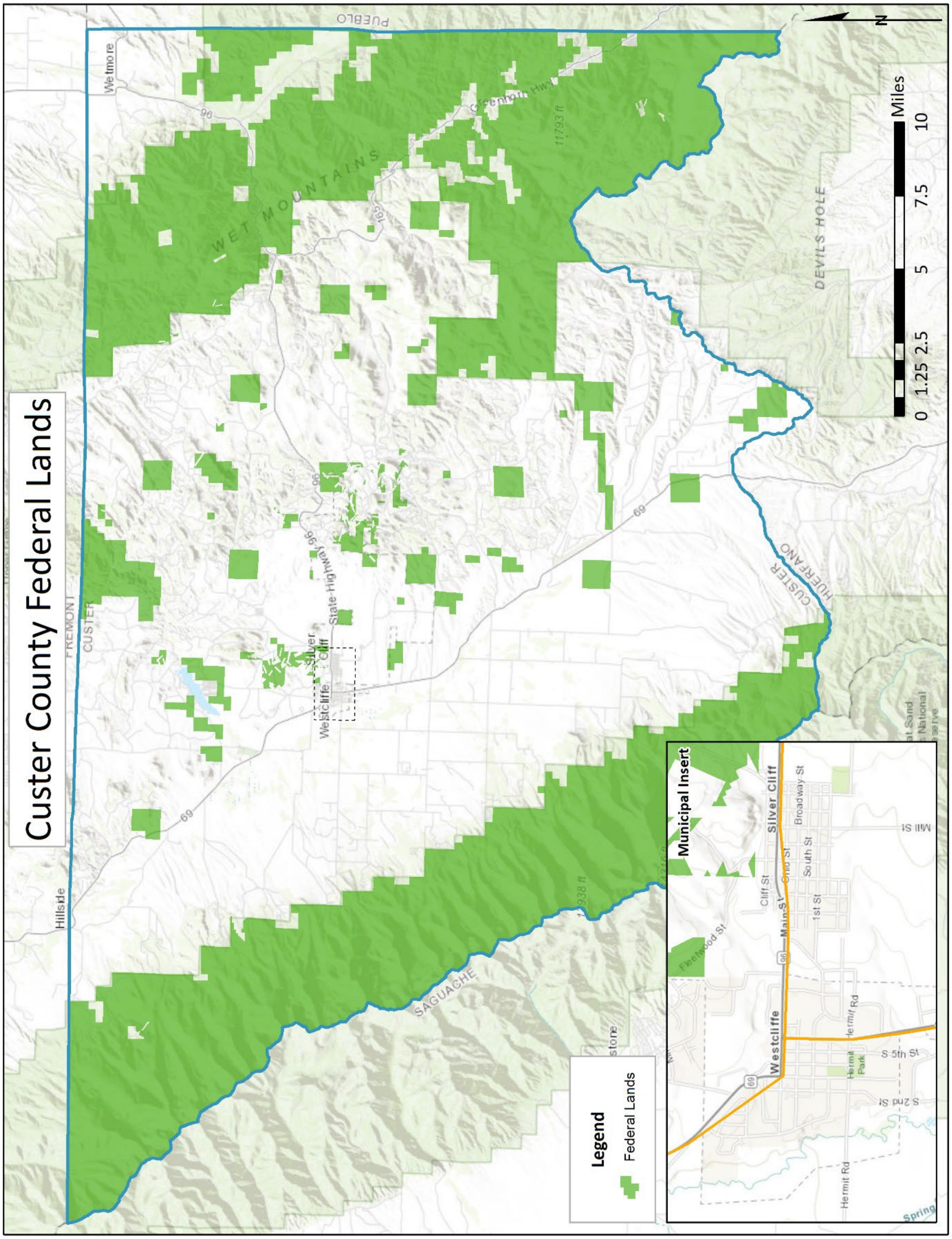
PUBLIC LANDS

A large percentage of Custer County is National Forest lands in both the Sangre De Cristo Range and the Wet Mountains. This is important to note in the context of a hazard mitigation plan, as implementing mitigation actions will require coordination with the multitude of landowners. Additionally, these public lands do safeguard future development from these areas, many of which are hazard prone.

Custer County is primarily a rural county. Of Custer County's 473,600 acres, 39.9% is public land and 60.1% is private land. Public lands are managed by the USFS, BLM, State of Colorado and the local governments of Custer County, and the Towns of Silver Cliff and Westcliffe (Custer County Master Plan 2010 Supporting Document). USFS lands include portions of the San Isabel National Forest, the Greenhorn Wilderness Area, and the Sangre de Cristo Wilderness Area.

The principal products in the county include livestock, grass, hay, and timber. The county has abundant wildlife with mule deer and elk habitat throughout the county.

Figure 30. Custer County Federal Lands



FUTURE DEVELOPMENT

Custer County had a considerable increase in population from 2015-2020, but is expected to grow at a much lower but steady rate of population change starting in 2025.

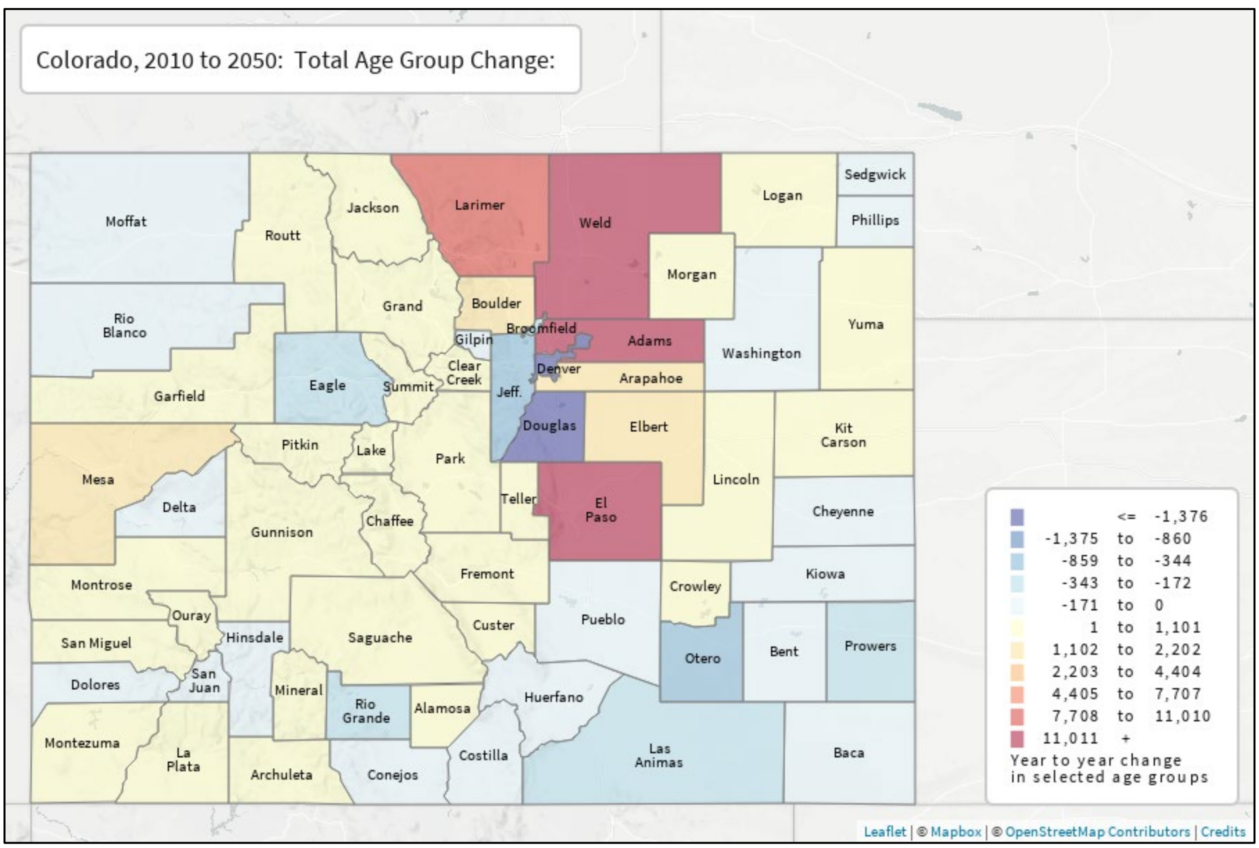
Table 17. Population Change Forecasts for Custer County and Colorado 2015 – 2050

	2015-2020	2020-2025	2025-2030	2030-2035	2035-2040	2040-2045	2045-2050
Colorado	1.9%	1.7%	1.4%	1.3%	1.1%	1.0%	0.8%
Custer County	2.7%	-0.4%	0.3%	0.5%	0.4%	0.4%	0.5%

Source: Colorado Department of Local Affairs (DOLA), 2020

Based on these rates, the population change will be approximately a 1,000 person increase over the period of 2010-2050. In Figure 31, the projected population change for each county in the state is shown. Close to half of the counties, including Custer County, fall into the category of change that shows no decrease but minimal growth.

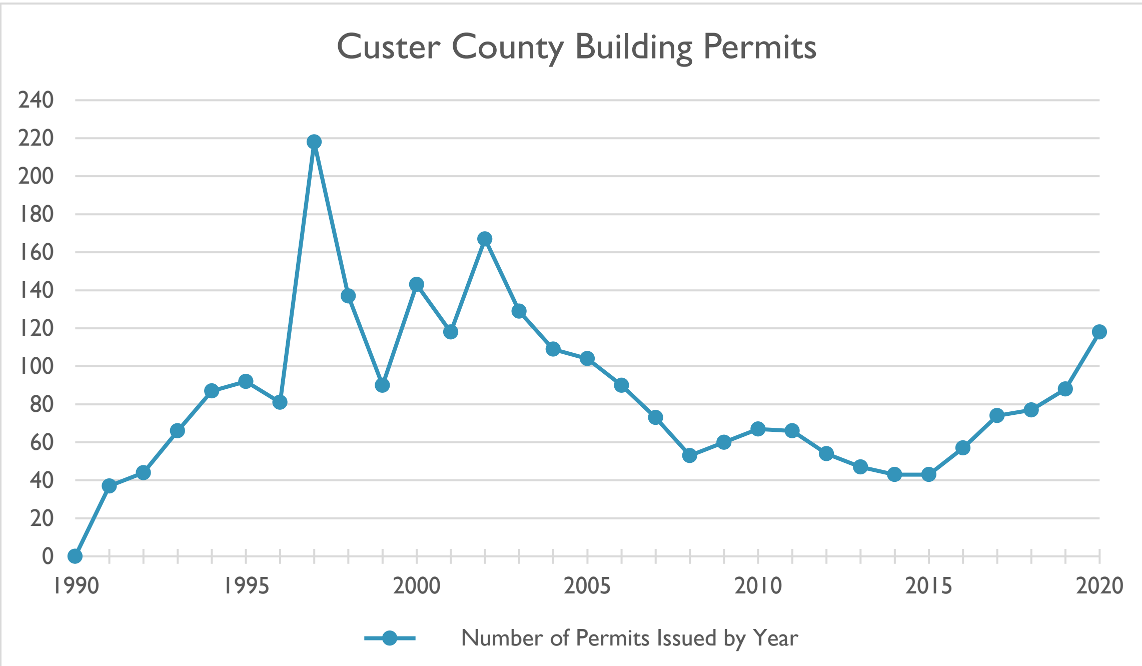
Figure 31. Colorado Projected Population Change Map



Source: Colorado Department of Local Affairs (DOLA), 2020

Custer County has seen a significant increase in the recent number of permits for housing structures issued, with 118 permits issued in 2020 compared to 88 in 2019, or an increase of roughly 25%. Since 1990, the highest number of permits issued was 218 in 1997. Between 1997 and 2005, notable growth was seen with over one hundred permits issued each year except 1998. The lowest number of permits issued was 43 which occurred in both 2014 and 2015. Permits have been increasing since 2016, and the number of permits issued in 2020 is almost triple the number issued in 2015.

Figure 32. Annual New, Private Housing Structure Building Permits Issued in Custer County



Source: U.S. Census Bureau, Building Permits Survey

ZONING

The desire to preserve the rural and agricultural heritage of the county informed the Custer County Zoning Resolution, which was adopted in 2018. Minimizing population density and maintaining the feeling of openness, which is important to residents, were primary considerations when drafting zoning regulations. Indirectly, this planned low density growth will contribute to minimizing increased community vulnerability to hazards overall, as less exposure to a hazard equates to an overall lower hazard risk.

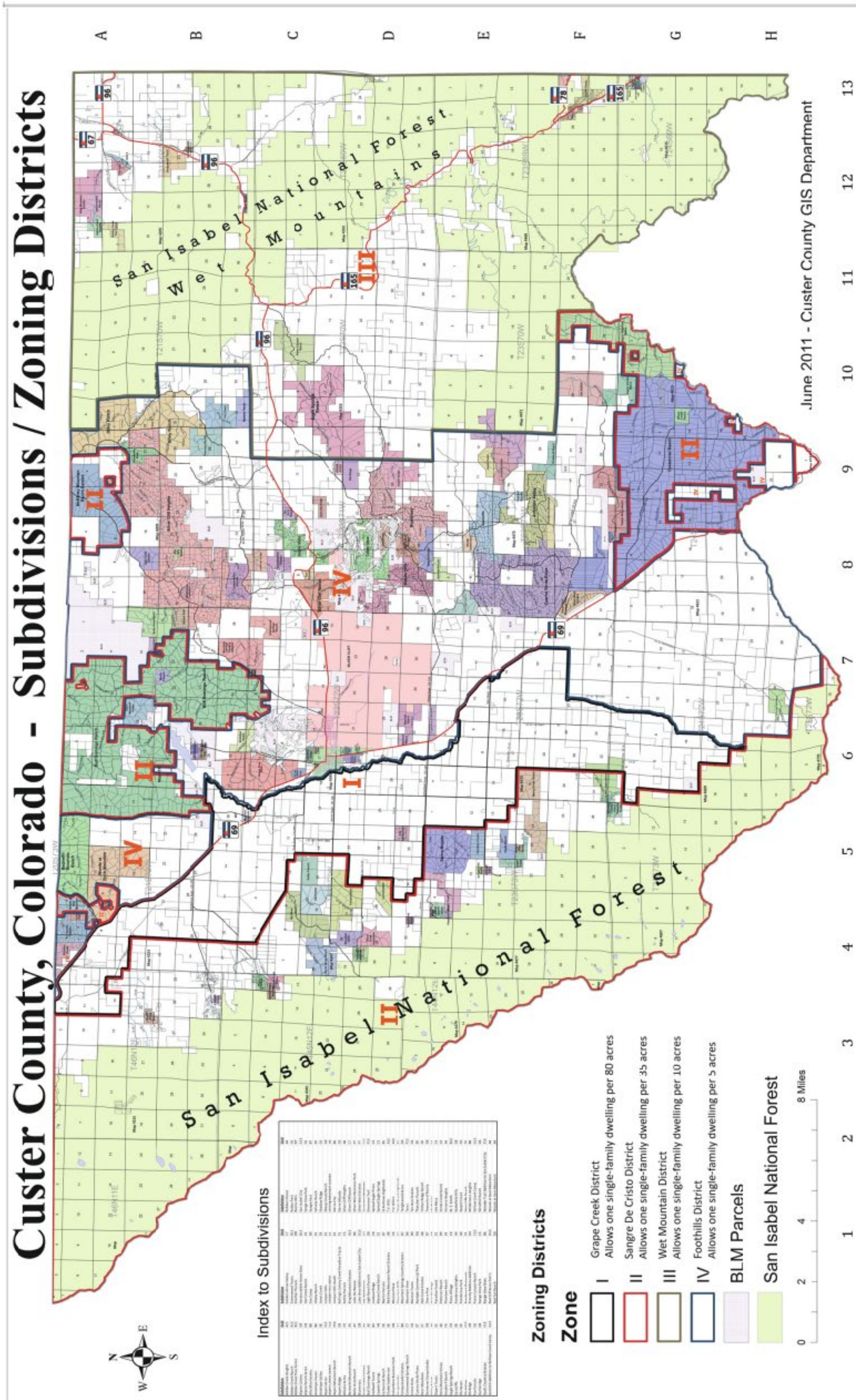
The county is zoned by density acreage allowing land uses (farming, ranching, and residential) by right. The Resolution details four zoning districts within the county and the corresponding regulations. These zones are explained below and can be seen in Table 18.

Table 18. County Zoning Regulations

Zone	District	Minimum Lot Area (acres)	Intended Land Use	Goal
Zone I:	Grape Creek	80* / Sections <640	Agricultural	Agricultural Resource Conservation, Open Space
Zone II.	Sangre de Cristo	35	Residential / Agricultural	Rural Residential Environment Promotion, Agricultural Resource Conservation, Open Space
Zone III.	Wet Mountain / Hardscrabble	10	Limited Residential / Agricultural	Large portions lie in the San Isabel National Forest, limit further concentration of development in Wetmore and San Isabel areas
Zone IV.	Foothills	5	Residential / Agricultural	Established to provide areas of residential development for single-family dwelling units. Main residential area in the county including most of the approved subdivisions

*The minimum lot size may be adjusted where fairness requires to compensate for these irregular Sections

Figure 33. Custer County Zoning Map (2011)



CHAPTER 4: HAZARD IDENTIFICATION & RISK ASSESSMENT

RISK ASSESSMENT OVERVIEW

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

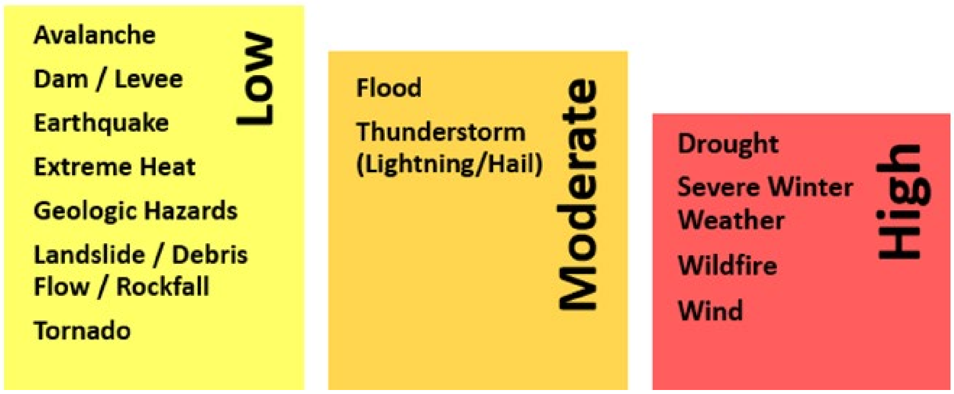
For this plan update, the HMPC considered the full range of natural and human-caused hazards that could impact the planning area and then identified those hazards that present the greatest concern. The process incorporated review of state and local hazard planning documents, as well as information on 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:

- Avalanche
- Cyber Attack
- Dam / Levee Incident
- Drought
- Earthquake
- Extreme Heat
- Flood
- Geologic Hazards
- Hazardous Materials
- Landslide, Debris Flow, Rockfall
- Public Health Hazards
- Severe Winter Weather
- Thunderstorm (hail, high winds, and lightning)
- Tornado
- Wildfire
- Wildlife-Vehicle Collisions

New hazards profiled in this 2022 plan update include: Cyber Attack, Hazardous Materials, Public Health Hazards, and Wildlife-Vehicle Collision.

Figure 34 presents the hazard risk rankings assigned during development of the 2017 HMP. These rankings were determined by the HMPC assessing and assigning values to the probability of an occurrence for the hazard and the potential impacts on people, property, and the economy. Calculation of these values allowed for a holistic picture of risk perception for the county, and the towns of Silver Cliff and Westcliffe.

Figure 34. 2017 Hazard Risk Ranking



A similar methodology was used for the 2022 hazard risk rankings for the jurisdictions and the results can be seen in Table 22 in the Hazard Risk Summary section. Results for the HMPC had two changes in hazard ranking: thunderstorm is now ranked as high risk and includes wind in this HMP update and landslide/ debris flow / rockfall was determined to have a moderate rather than low risk.

Some hazards were previously not ranked including avalanche for Silver Cliff and Westcliffe and dam/levee Incident for Silver Cliff. Silver Cliff considers avalanche to have moderate risk to the community, while Westcliffe considers the hazard low risk. Silver Cliff has ranked dam/levee incident as moderate risk.

Multiple factors may have contributed to this change in rankings including differences in the planning team members, combination of hazards, and variation in application of the methodology.

For the 2023 HMP, the addition of multiple human-caused hazards creates a comprehensive view of the concerns, priorities, and perspectives of hazards impacting Custer County and communities.

MAJOR PAST HAZARD EVENT

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

Custer County has experienced 10 events since 1999 for which federal disaster declarations were issued by FEMA. These events are listed in Table 19.

Table 19. Federal FEMA Disaster Declarations[1]

Disaster	Description	Incident Date(s)	Declaration Type
DR-1276	Flooding	4/29 – 5/19/1999	Major Disaster Declaration
FS-2401	Cuerno Verde Fire	4/30 – 5/15/2002	Fire Suppression Authorization
DR-1421	Spring Fire	6/2 – 6/26/2002	Major Disaster Declaration
EM-3185	Snow	3/17 – 3/20/2003	Emergency Declaration
FM-2566	Mason Fire	7/8 – 7/17/2005	Fire Management Assistance
EM-3224	Hurricane Katrina Evacuation	8/29 – 10/1/2005	Emergency Declaration
EM-3270	Snow	12/18 – 12/22/2006	Emergency Declaration
FM-2923	Duckett Fire	6/15 – 6/24/2011	Fire Management Assistance
FM-5157	Junkins Fire	10/17-10/26/2016	Fire Management Assistance
DR-4498	COVID-19 Pandemic	4/30/2020 – on-going	Major Disaster Declaration

Additionally, the county has experienced U.S. Department of Agriculture (USDA) Secretarial Disaster Designations over 60% of the time since 2003 (with some years receiving multiple declarations). Only “primary” (not “contiguous”) designations are presented for Custer County, listed in Table 20.

Table 20. Federal USDA Disaster Declarations[2]

Crop Year	Declaration	Reason
2003	X	Information not available
2004	X	Information not available
2005	X	Information not available
2006	X	Information not available
2011	X x2	Information not available
2012	X	Drought, Excessive Heat
2013	X	Drought, High Wind, Fire, Excessive Heat, Insects
2018	X	Drought
2019	X	Drought
2020	X	Drought

The 2018 Colorado State Hazard Mitigation Plan lists state disasters declared by the Colorado Governor which are included Table 21. Additional declarations were identified through the Governor’s website.

[1] https://www.fema.gov/disasters/disaster-declarations

[2] https://www.fsa.usda.gov/programs-and-services/disaster-assistance-program/disaster-designation-information/index , 2018 Colorado Drought Mitigation and Response Plan

Table 21. State Disaster Declarations [3]

Year	Hazard	Statewide
1994	Wildfires	X
1999	Flooding, landslides, and mudslides	
2002	Wildfires	X
2002	Drought	X
2003	Snow emergency	X
2005	Wildfire	
2006	Wildfires	
2006	Snow emergencies	
2009	Severe blizzard	X
2009	Severe spring snowstorm	X
2011	Wildfire	
2012	Wildfire	
2013	Winter storm	X
2014	Extreme weather	X
2016	Wildfire	
2017	Wildfire	X
2017	Extreme weather and flooding	
2020	Pandemic – COVID-19	X

Review of these events helps identify targets for risk reduction and ways to increase a community's capability to avoid large-scale events in the future. However, many natural hazard events do not trigger federal or state disaster declaration protocol but have significant impacts on their communities. These events are important to consider in establishing recurrence intervals for hazards of concern. More detailed event tables can be found in the individual hazard profile chapters.

CLIMATE CHANGE

Climate includes patterns of temperature, precipitation, humidity, wind, and seasons. Climate plays a fundamental role in shaping natural ecosystems, and the human economies and cultures that depend on them. "Climate change" refers to changes in temperature, precipitation, humidity, wind, and seasons over a long period of time. It is anticipated that climate change will have a measurable impact on the occurrence and severity of natural hazards around the world. Evidence of these changes are being observed first-hand by communities across the globe. Impacts include the following:

- Snow cover losses will continue, and declining snowpack will affect snow-dependent water supplies and stream flow levels around the world.

[3] 2018 Colorado Hazard Mitigation Plan

- The risk of drought and the frequency, intensity, and duration of heat waves are expected to increase, also leading to an increased number and intensity of wildfires.
- More extreme precipitation is likely, increasing the risk of flooding and other secondary hazards.
- The world's average temperature is expected to increase.

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

This hazard mitigation plan update addresses climate change as a secondary impact for each identified hazard of concern. Each hazard chapter includes a section with a qualitative discussion on the probable impacts of climate change for that hazard.

HAZARD RISK SUMMARY

A qualitative risk ranking was performed by each jurisdiction 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.

Through surveys, the public and Planning Committee were also asked to help rank each hazard based on their perceived level of risk. The data for the public and the HMPC was collected using a simpler methodology, ranking from least risk to most risk that each hazard posed to themselves and their community. The public and HMPC responses overall align to the jurisdictions with some exceptions. Table 22 presents these results.

Table 22. Hazard Risk Rankings

	Public Survey	HMPC	Custer County	Silver Cliff	Westcliffe
Avalanche	0.5	1.7	L	M	L
Cyber Attack	2.3	2.6	M	H	M
Dam Incident	0.6	1.8	M	M	L
Drought	4.1	4	H	H	H
Earthquake	0.7	1.7	M	H	M
Extreme Heat	1.5	2.6	M	H	M
Flood	1.5	3.2	M	H	M
Geologic Hazard	1.8	2.2	M	H	H
Hazardous Materials	1.6	2.2	M	H	M
Landslide, Debris Flow, Rockfall	1.9	3.6	M	M	M
Public Health Hazards	3.2	3.3	H	H	H
Severe Winter Storm	3.2	3.9	H	H	H
Thunderstorm	3.2	3.7	H	H	H
Tornado	1	1.7	M	H	M
Wildfire	4.6	4.7	H	H	M
Wildlife-Vehicle Collision	2.9	2.9	M	H	M

The HMPC was provided with the public risk rankings, as well as the level of concern of various post-disaster situations. It is likely this data impacted the overall rankings for the HMPC as leaders value the input of community members; however, it was not specifically mentioned if this was the case for any committee members.

COLORADO EMERGENCY PREPAREDNESS ASSESSMENT

Custer County recently completed its Colorado Emergency Preparedness Assessment (CEPA) in July 2021. Part of this assessment, which is conducted with the state, includes a risk assessment of all hazards identified in the State of Colorado's Hazard Mitigation Plan. The HMPC for the CEPA was not the same as for this plan, but there was significant membership overlap between the groups.

Figure 35 presents the CEPA risk assessment results. In comparison to the hazard risk rankings for Custer County, Silver Cliff, and Westcliffe, as well as the public and the HMPC, the rankings varied on approximately half of the hazards identified. As the scale and collection of data are different between the two rankings, this was not meant to be a one-to-one comparison, rather an overview of trends. In all cases where rankings differed, the CEPA had a lower risk determination for the hazard.

Both rankings considered wildfire to be one of the highest risks overall and drought had a similar determination. The most notable difference in rankings was public health hazards, shown as pandemic/epidemic in the state HMP. This hazard was ranked high across the board in the county, but in the lower rankings for the CEPA. Severe winter weather and thunderstorm were also ranked high in the county; however, they obtained a middle ranking for the CEPA.

Figure 35. CEPA Risk Assessment

Risk Assessment

Hazard	Likelihood	Consequence	Relative Risk
Wildfire	Very High	High	20
Drought	Very High	Medium	15
Hail	Very High	Medium	15
Animal Disease	High	Medium	12
Flood	High	Medium	12
Hazardous Materials Release	Medium	High	12
Tornadoes	High	Medium	12
Thunderstorms and Lightning	Very High	Low	10
Active Shooter/Threat	Medium	Medium	9
Cyber Attack	Medium	Medium	9
Infrastructure Failure	Medium	Medium	9
Power Failure	Medium	Medium	9
Severe Winter Weather	Medium	Medium	9
Water Contamination	Medium	Medium	9
Extreme Temperature Heat/Cold	High	Low	8
Severe Wind	High	Low	8
Wildlife-Vehicle Collisions	High	Low	8
Dam and Levee Failure	Low	Medium	6
Explosive Attack/Bomb Threat	Low	Medium	6
Pandemic/Epidemic	Low	Medium	6
Chemical, Biological, and Nuclear Attack	Very Low	Very High	5
Erosion and Deposition	Low	Low	4
Pest Infestation	Low	Low	4
Dense Fog	Medium	Very Low	3
Earthquake	Very Low	Low	2
Landslides, Mud/Debris Flows and Rock Falls	Very Low	Low	2
Radon (Rn), Carbon Monoxide (CO), Methane (CH4) Seeps	Very Low	Low	2
Terrorist Attack	Very Low	Low	2
Avalanche	Very Low	Very Low	1
Civil Disorder/Disturbance	Very Low	Very Low	1
Expansive Soils and Heaving Bedrock	Very Low	Very Low	1
Mine Accidents	Very Low	Very Low	1
Radiological Release	Very Low	Very Low	1
Subsidence & Abandoned Mine Lands	Very Low	Very Low	1

HAZARD PROFILES

The following pages provide detailed hazard profile chapters for each of the 16 hazards assessed in this plan. Each profile follows the same outline and addresses the following topics:

- General background
- Past events
- Location
- Frequency

- Severity
- Warning time
- Secondary hazards
- Climate change impacts
- Exposure and vulnerability
- Future trends in development

EXPOSURE ANALYSIS

Throughout this risk assessment, when data allowed, hazard exposure analysis was conducted utilizing best available GIS data compiled from local, state, and federal sources. The Lifeline exposure assessments utilize those components identified and shown previously in Figure 27. The structure exposure analysis utilized publicly available building footprint data from OpenStreetMap, shown in Figure 36.

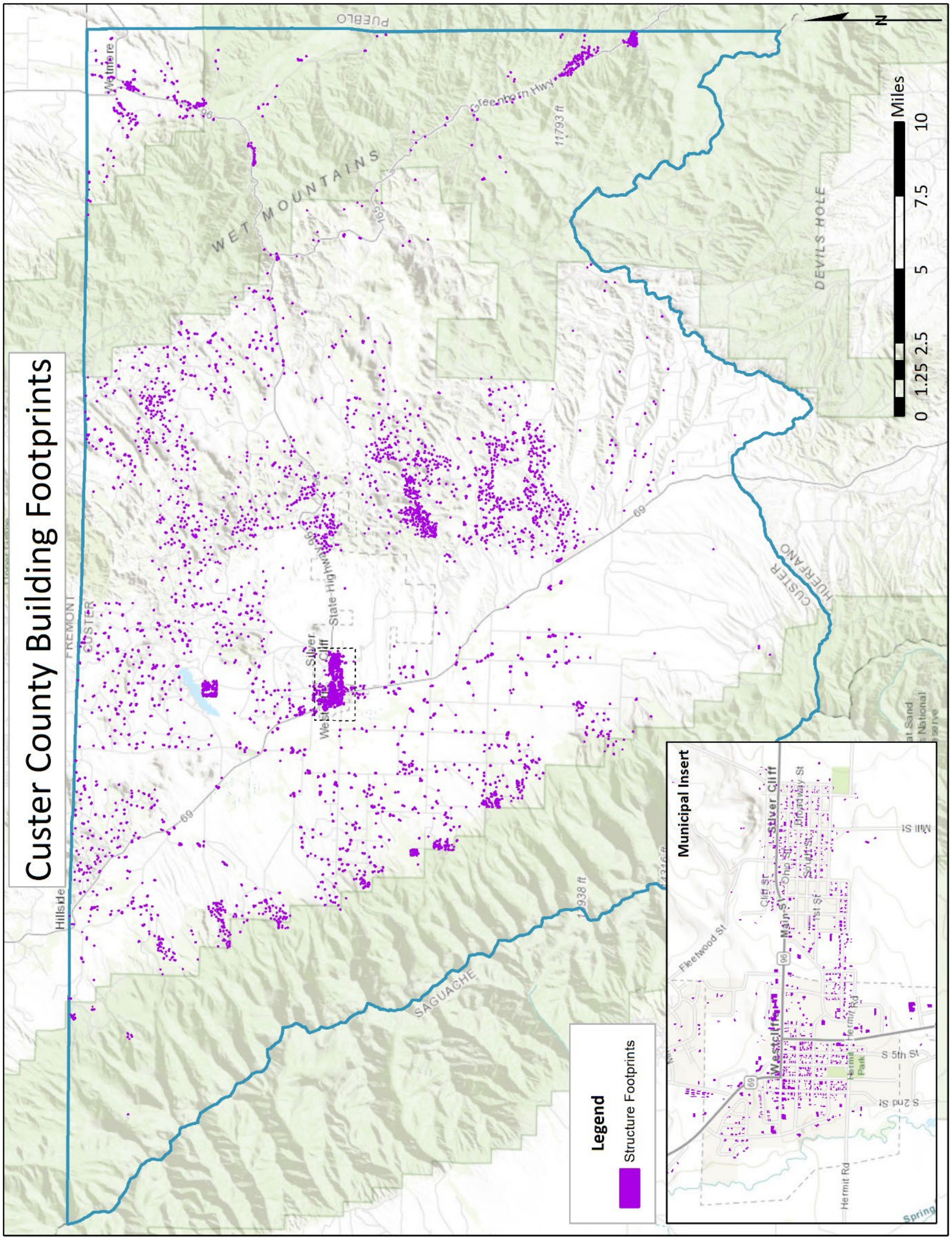
Table 23. Hazard Structure Exposure Count

Hazard	Count of Structures Exposed
Dam and Levee	15
Flood	41 / 121
Geologic Hazards	130
Landslide/Debris Flow/Rock Fall	32
Wildfire	750
Wildland Urban Interface	791

It is important to note the number of structures exposed to the 1% annual chance floodplain was assessed utilizing two different floodplains. The first (41) utilized a draft floodplain modeled utilizing FEMA's Hazus software. A more refined analysis (121) was then made possible with an updated floodplain identified during the planning process. Custer County is currently involved in a flood hazard mapping project through FEMA's Risk MAP program, in collaboration with the Colorado Water Conservation Board (CWCB). A Base Level Engineering (BLE) analysis was conducted across the county, as part of that project, to evaluate the general flood risk and develop approximate (i.e., base level) floodplains. Additional products developed through the Risk MAP project may allow for an even more accurate count of structures exposed in the floodplain and assist future planning efforts.

Not all hazards expose specific structures. Some hazards are regional and put all structures at a similar risk, including Earthquake, Severe Winter Weather, Thunderstorm, and Tornado. Other hazards do not have information for structures exposed due to the nature of the hazard of a lack of risk data, including Avalanche, Cyber Attack, Drought, Extreme Heat, Hazardous Materials, Public Health Events, and Wildlife-Vehicle Collision.

Figure 36. Custer County Building Footprints

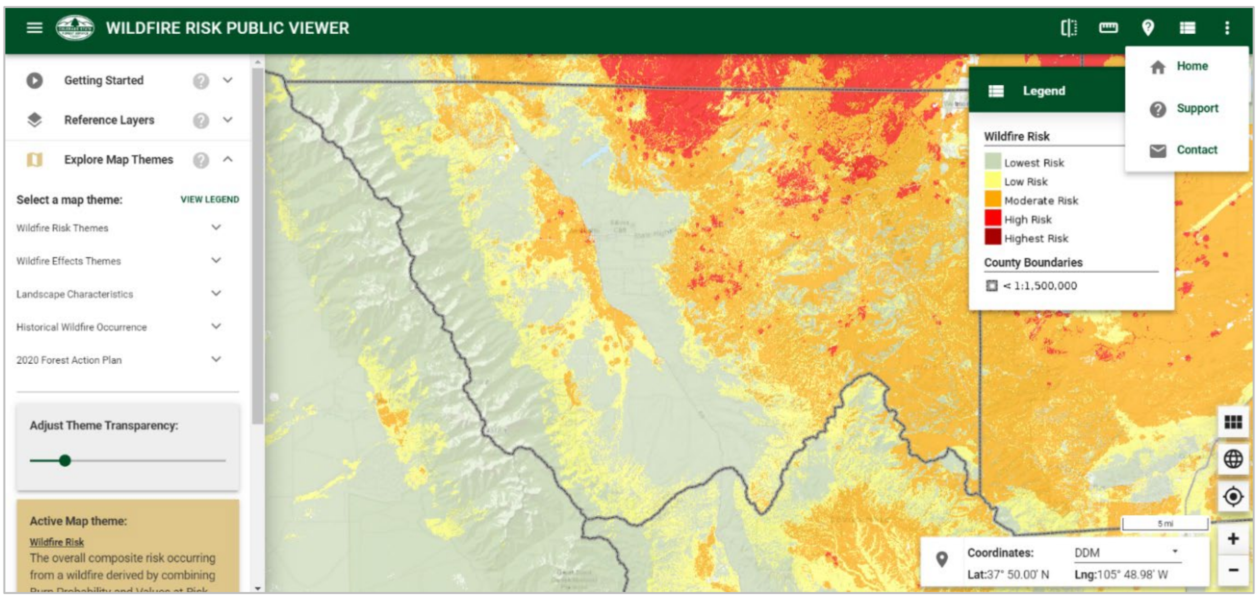


HAZARD DATA VIEWERS

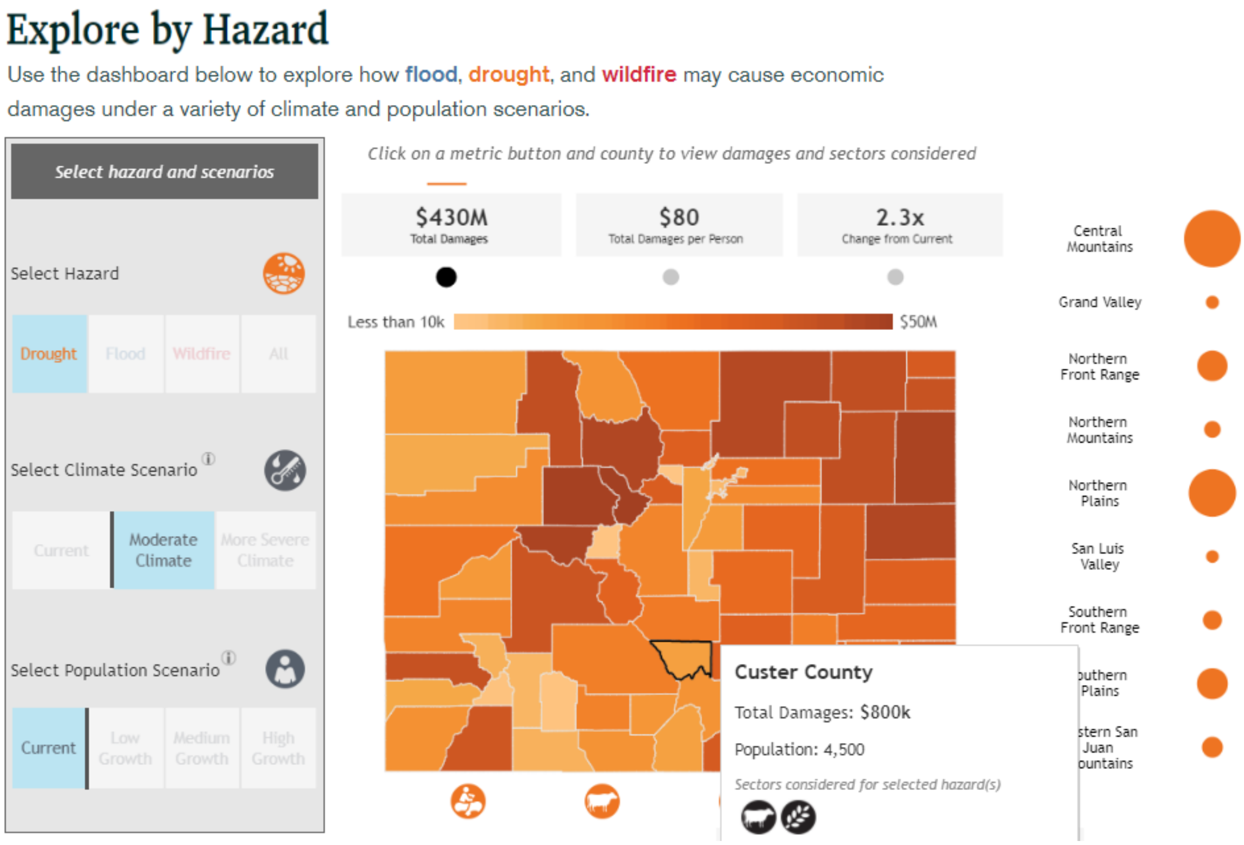
All of the information contained in the following risk and vulnerability assessments is considered a snapshot in time, based upon the best available data during this Plan's development. It is expected that over the 5-year life of this updated Plan many of these data sets will continue to be updated and 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. The following bullets provide details on these currently available tools.

- **Colorado Forest Atlas – Wildfire Risk Viewer:** The 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 estimated losses due to fire, flood, and drought across Colorado. Utilizing models of hazards, population growth, and climate change, data for each county and the sector affected are illustrated.



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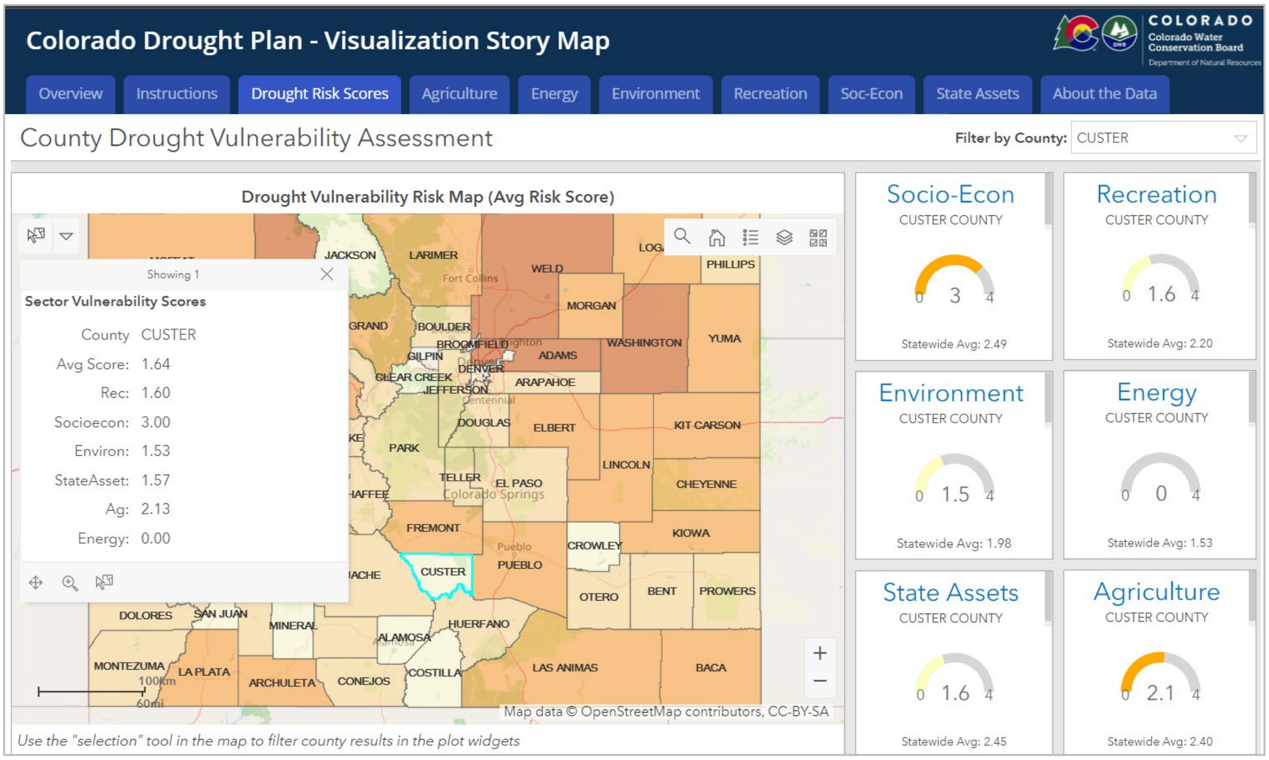
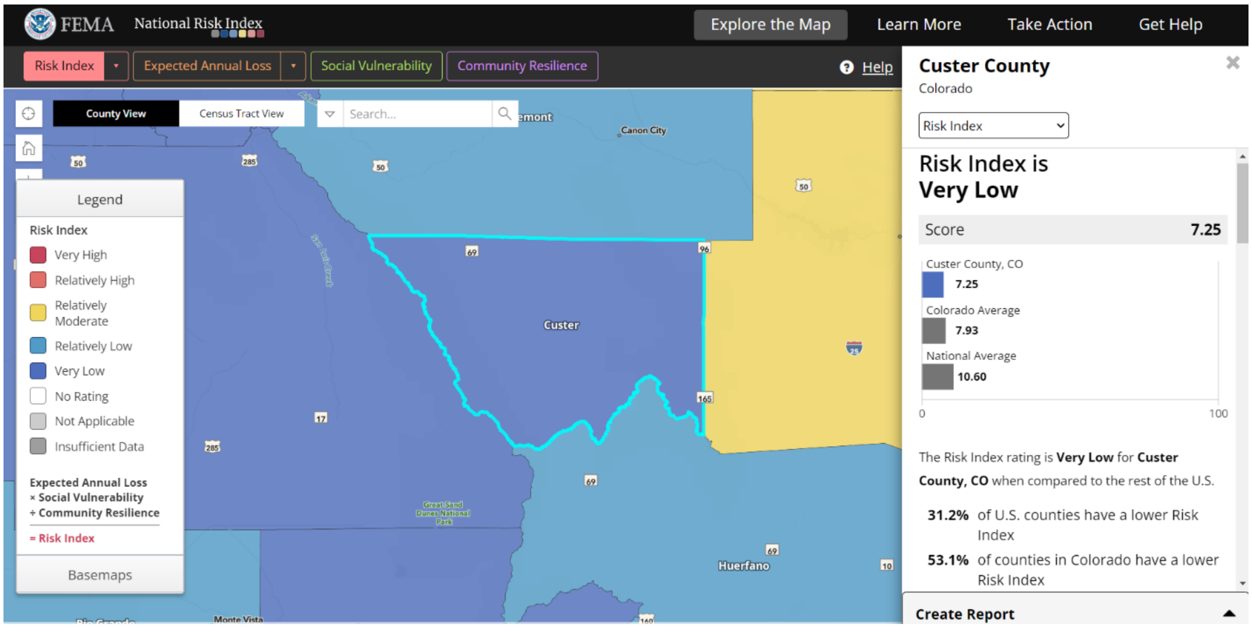
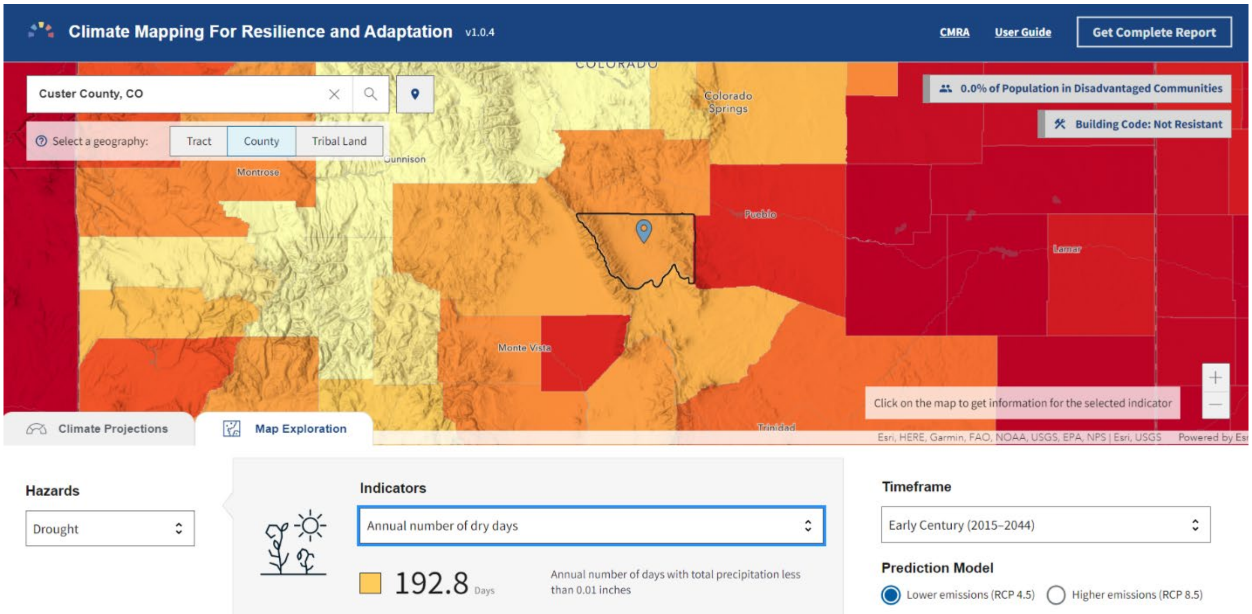
- **Colorado Drought Plan - Visualization Story Map** is an interactive viewer for sector vulnerability to drought in each county. This map shows the vulnerability assessment findings in the 2018 State of Colorado Drought Mitigation and Response Plan (Annex B).



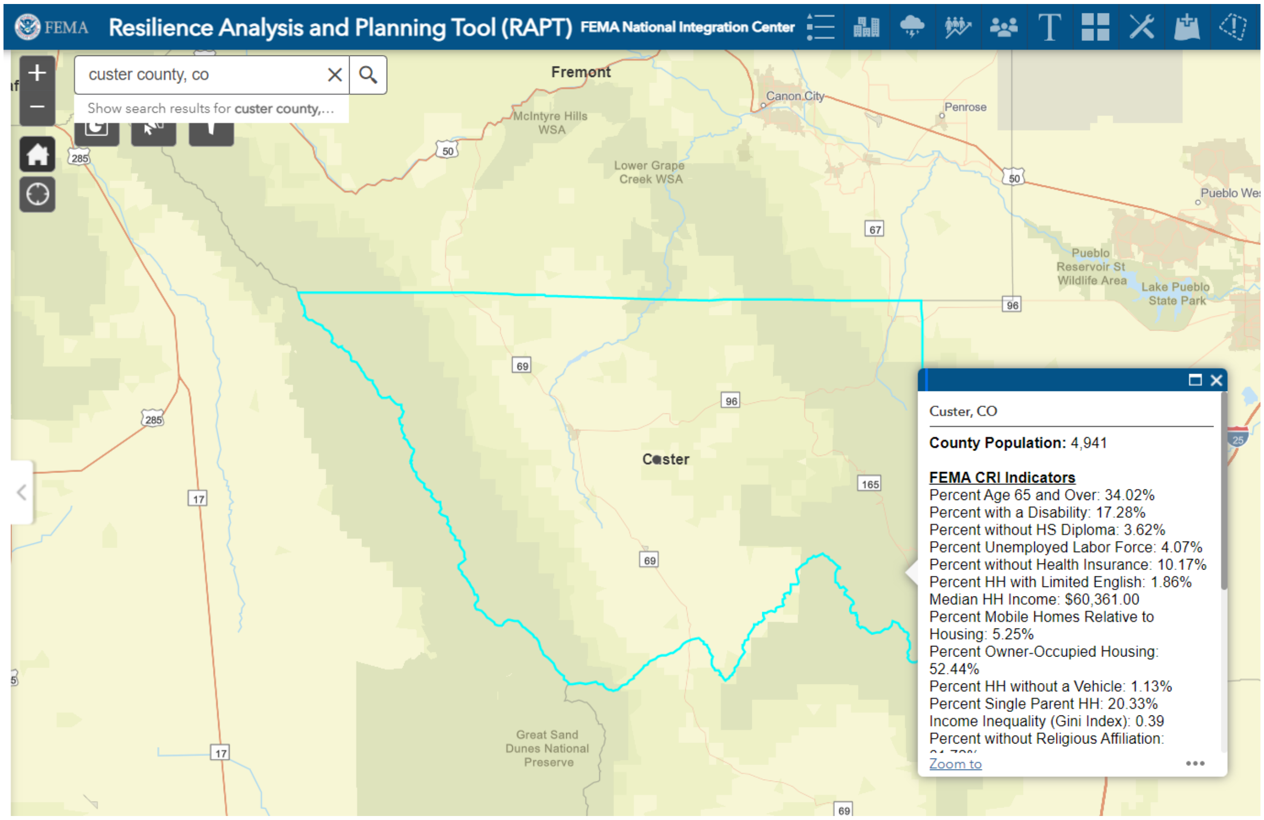
- **FEMA National Risk Index (NRI)** – is a tool to help illustrate the communities most at risk for 18 natural hazards. The Risk Index leverages available source data for natural hazard and community risk factors. The risk equation behind the Risk Index includes three components: a natural hazards component (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.



- **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.



AVALANCHE

LOW RISK

GENERAL BACKGROUND

An avalanche is defined as a mass of snow moving down a slope. An avalanche occurs when the stress (from gravity) trying to pull the snow downhill exceeds the strength (from bonds between snow grains) of the snow cover. There are four ingredients of an avalanche: a steep slope, a snow cover, a weak layer in the snow cover, and a trigger. About 90% of all avalanches start on slopes of 30-45 degrees and about 98% of all avalanches occur on slopes of 25-50 degrees. Avalanches release most often on slopes above timberline that face away from prevailing winds (leeward slopes collect snow blowing from the windward sides of ridges). Avalanches can run; however, on small slopes well below timberline, such as gullies, road cuts, and small openings in the trees. Very dense trees can anchor the snow to steep slopes and prevent avalanches from starting; however, avalanches can release and travel through a moderately dense forest.

Skiers, snowboarders, and snowmobile operators are most commonly associated with avalanche hazards. However, motorists and others not engaging in recreation are also at risk of being caught in an avalanche. Colorado is a top-ranking state for the avalanche hazard because of its snowfall and mountain recreation.

PAST EVENTS

While avalanches in Custer County do occur, they are infrequent. Generally, avalanches in the county are relatively minor and occur in backcountry areas. Based on Colorado Avalanche Information Center (CAIC) data, of the 39 recorded avalanche events, in the Sangre de Cristo zone between 2011 and 2020, only 4 were human triggered.

There have been no recorded fatalities attributable to avalanches in Custer County from 1950 to 2020. However, an avalanche in 2020 caused serious injuries to one person.

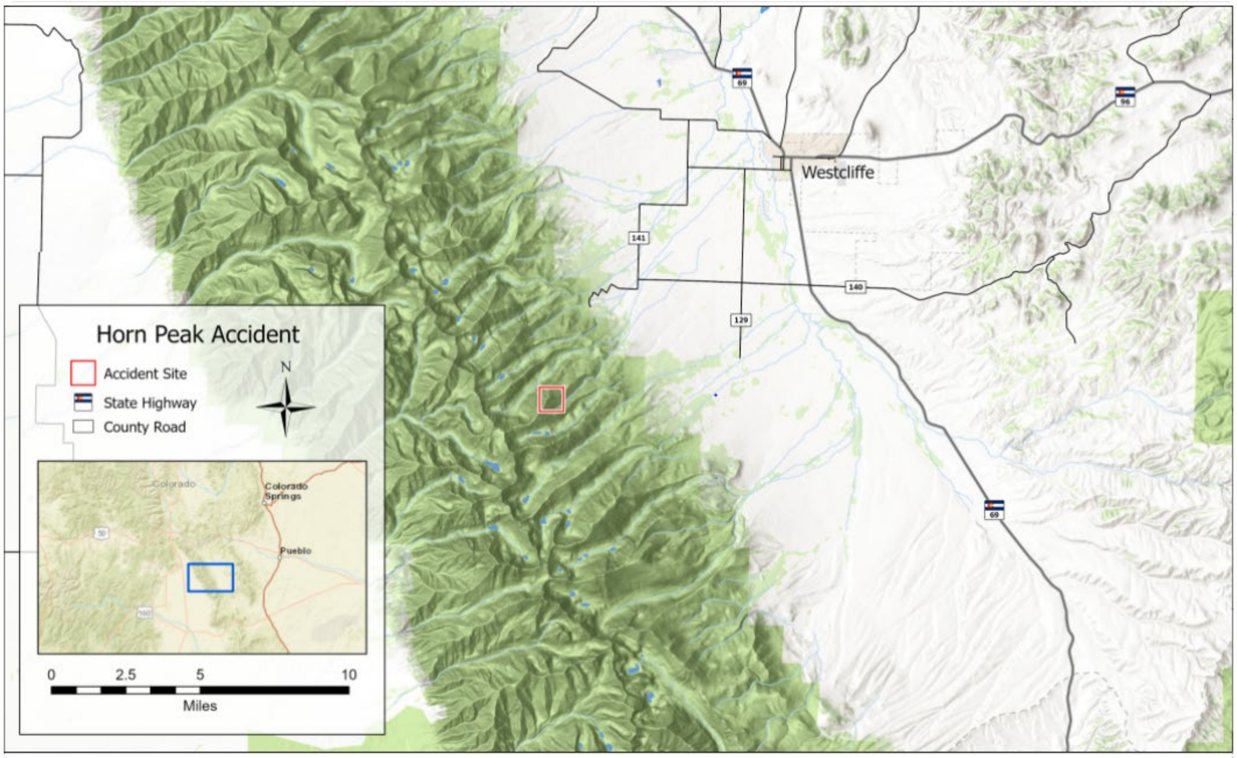
According to the CAIC incident report, on May 2, 2020, a group of seven people climbed Horn Peak and were descending the northeast ridge when they began sliding down a steep, snow covered slope toward a snow-filled gully. The climber who went first triggered a wet avalanche which carried her 1,000 feet. Another climber described the avalanche as a “Class 5 river with 3-foot waves of snow.” She was partially buried and sustained injuries requiring helicopter evacuation.

A Special Avalanche Advisory was in place and the danger was rated “Level 3 – Considerable” on the day of the avalanche. The image below, taken the day after the incident, illustrates the approximate start location of the avalanche, at the red circle, and the path marked by the red dashed line. The image and map of the area are from the CIAC report. [4]

[4] CAIC (state.co.us)

Figure 37. Horn Peak Avalanche Diagram

Figure 38. Horn Peak Accident Area Map



LOCATION

The Colorado Avalanche Information Center (CAIC) provides avalanche forecasting that can be used to indicate the locations of avalanche danger throughout Colorado. The entire western border of the county is located within the Sangre de Cristo region and CAIC provides daily forecasts of avalanche likelihood and severity where necessary. While the majority of unincorporated Custer County has a slope greater than 20% and is therefore considered to have moderate risk of an avalanche, the Towns of Silver Cliff and Westcliffe do not have any avalanche potential.

FREQUENCY

It is likely there will be more avalanche events in Custer County, as they already occur periodically. Considering the effects of climate change, it is possible they could happen more often. Any avalanches that are triggered are more likely to be triggered naturally rather than by human action and will overall continue to pose a low risk to people.

SEVERITY

Severity depends on numerous factors such as proximity to population, snow depth, type, and density, as well as characteristics of the slope. These and other factors dictate the distance an avalanche will travel, how much snow will be carried, and how heavy the snow will be.

The North American Public Avalanche Danger Scale (Figure 39) is used by the U.S. and Canada to communicate the potential for avalanches to cause harm or injury. [5] Understanding avalanche conditions can help prevent injuries from occurring; however, once an avalanche is triggered it has a sudden onset making them difficult to escape from.

Figure 39. North American Public Avalanche Danger Scale

North American Public Avalanche Danger Scale
Avalanche danger is determined by the likelihood, size and distribution of avalanches.

Danger Level	Travel Advice	Likelihood of Avalanches	Avalanche Size and Distribution
5 Extreme	Avoid all avalanche terrain.	Natural and human-triggered avalanches certain.	Large to very large avalanches in many areas.
4 High	Very dangerous avalanche conditions. Travel in avalanche terrain <u>not</u> recommended.	Natural avalanches likely; human-triggered avalanches very likely.	Large avalanches in many areas; or very large avalanches in specific areas.
3 Considerable	Dangerous avalanche conditions. Careful snowpack evaluation, cautious route-finding and conservative decision-making essential.	Natural avalanches possible; human-triggered avalanches likely.	Small avalanches in many areas; or large avalanches in specific areas; or very large avalanches in isolated areas.
2 Moderate	Heightened avalanche conditions on specific terrain features. Evaluate snow and terrain carefully; identify features of concern.	Natural avalanches unlikely; human-triggered avalanches possible.	Small avalanches in specific areas; or large avalanches in isolated areas.
1 Low	Generally safe avalanche conditions. Watch for unstable snow on isolated terrain features.	Natural and human-triggered avalanches unlikely.	Small avalanches in isolated areas or extreme terrain.

Safe backcountry travel requires training and experience. You control your own risk by choosing where, when and how you travel.

WARNING TIME

The time of an avalanche release depends on the condition of the snow pack, which can change rapidly due to precipitation and temperature fluctuations. Although forecasts can provide information regarding when avalanches are more likely to occur, an avalanche can occur with little or no warning.

SECONDARY HAZARDS

Avalanches can cause several types of secondary effects, such as blocking roads which can impede transportation for extended periods. Power and communication failures due to infrastructure damage from the avalanche can pose a threat to public safety, especially during times of extreme cold. Lack of road access and communication to communities can create significant risks for populations with Access and Functional Needs (AFN). Avalanches also can damage rivers or streams, potentially harming water quality, fisheries, and spawning habitat.

[5] https://avalanche.org/avalanche-encylopedia/#extreme-danger

CLIMATE CHANGE IMPACTS

According to the 2018 Colorado State Hazard Mitigation Plan, climate change may impact avalanches in the following way:

"Avalanche officials in several western states have noticed a pattern associated with increased avalanche risk. [6] Snow occurs early in the winter and is then followed by a long period without snow. This creates a thin snowpack that becomes structurally weaker as winter goes on. New layers of snow may not bond well to the weak base layer, creating prime conditions for avalanches. As Colorado experiences winters with higher average temperatures and lower average precipitation, these conditions that increase avalanche risk become more common."

As avalanche forecasters monitor these changes and incorporate them into avalanche predictions and education, it is important that local agencies adequately inform those recreating in hazard areas.

EXPOSURE AND VULNERABILITY

In Custer County, the highest avalanche exposure is to the people participating in backcountry recreation. Mountain communities in hazard areas are exposed, but Westcliffe and Silver Cliff are not exposed to the avalanche hazard. It is unlikely that there are Lifelines exposed, but there may be some infrastructure in mountain communities at risk. There is a small amount of road infrastructure that could be blocked by avalanches and affect the safety of travel. CDOT monitors for high risk of avalanche danger and closes highways accordingly to perform avalanche control measures. Road closures due to avalanche activity can result in serious transportation disruptions and strand travelers, creating the need for shelter and impeding the access of emergency responders.

LIFELINES

The Lifelines most likely affected are Transportation, Communications, and Energy. Avalanches have the potential to take down infrastructure, such as communication towers and power lines, as well as block or significantly damage roadways. Transportation impacts can have extended effects, as some closures may be for long periods depending on clearing of debris or repair. Energy outages threaten the populations affected, especially in extreme cold or severe winter storms. All of these Lifelines are critical to the safety of the population, as some may become isolated and those dependent on energy for medical equipment may need emergency services.

POPULATION

The greatest impact from an avalanche is to people traveling on the Colorado State Highways 78, 96, and 165. However, avalanches are also a danger to hikers, mountain bike riders, and others involved in outdoor sports in mountainous areas. The populations of Silver Cliff and Westcliffe are unlikely to be affected by avalanches.

PROPERTY

Avalanche exposure in the county is minimal. Property and buildings within runout areas are exposed, but of the approximate 4,000 buildings in Custer County, most are not in avalanche runout areas. Property located within the

[6] Freedman, Andrew. "Avalanches Taking Toll; Foreshadowing the Future?" February 24, 2012. http://www.climatecentral.org/news/thin-snowpack-in-the-west-raises-avalancherisks

jurisdictions of the county are located in valley regions and are not at high risk for property damage because of avalanche events.

ENVIRONMENT

Avalanches are a natural event, but they can negatively affect the environment. This includes trees located on steep slopes. A large avalanche can knock down many trees and kill the wildlife that live in the area. In spring, this loss of vegetation on the mountains may weaken the soil, causing landslides and mudflows.

ECONOMY

Avalanches in Custer County would not have a large economic impact across the county. Overall, since most avalanches occur in the back country areas, the chances of damage losses to infrastructure or property are minimal.

FUTURE TRENDS IN DEVELOPMENT

Avalanches primarily occur in the steep, remote, unincorporated portions of the county, and on public land that is not subject to development. The primary concern with the avalanche hazard is the continued interest in backcountry recreation.

Future population change across the county is expected to decrease by 0.4% over the next five years; however, steady 0.3% to 0.5% growth is projected through 2050. The projected growth is expected to occur as municipal infill primarily. Vulnerability to avalanches will increase somewhat as population growth increases but limiting development in areas at risk of avalanches ensures this will be minimal.

CYBER ATTACK

MODERATE RISK

GENERAL BACKGROUND

Society is dependent on technology for day-to-day operations, and a major cyber incident could have significant and widespread impacts. Cyber hazards vary in the method of attack and area of technology targeted. They have been shown to affect a large variety of organizations including hospitals, schools, businesses, and governments. These cyber attacks can result in the drastic slowing or halting entirely of productivity for an agency or organization. Data breach due to an attack is of great concern, not only for privacy reasons, but for the negative impacts that deletion or altering of data can have on future work for the organization.

Physical infrastructure damage is another cyber related hazard which should be considered. The potential cascading effects on the virtual systems that communities rely on could be devastating and long lasting. Extended power outages, fiber optic cable damage and other infrastructure damage or disruption would have widespread consequences for conducting everyday operations. Critical facilities and infrastructure (Community Lifelines) for water distribution and treatment, power and fuel supply delivery, as well as communications could see drastic impacts to capabilities from a cyber attack.

It can often take months to restore a system to its previous functionality, perpetuating disruption even after the initial incident is over. Organizations must rebuild technological infrastructure, recover lost data, and improve cyber security to ward off the possibility of another incident.

PAST EVENTS

Reporting on past events of cyber hazards present a challenge due to a lack of data, as many organizations that have breaches may choose not to report to the FBI for a variety of reasons. Often, due to concerns of public perception, companies will handle the incident internally and are not required to report the situation.

The repercussions of cyber hazards to systems including local government operations, hospitals, and critical infrastructure are immense. Events are occurring across the country, including in Colorado. In 2018 the Colorado Department of Transportation was the recipient of a ransomware cyber attack which impacted the business operations. CDOT did not pay the ransom and fortunately the traffic operations information is stored separately from the business operations. It took a month for the systems to be restored to 80% and the state ultimately paid $1.7 million to their staff for meals, overtime, and equipment during the response.

Other large scale, national events are occurring daily and recently include oil pipeline infrastructure shutdown, disruption of the Georgia court system, access shutdown of 22 local governments in small towns in Texas, City of Baltimore city services freeze, and the complete shutdown of a Utah county government.

Cyber hazards can greatly affect individuals each year. According to the FBI's Internet Crime Complaint Center (IC3) reported losses due to cyber crime exceeded $4.1 billion nationally in 2020, with almost 800,00 victims. In 2020, Colorado ranked 10th in losses per state with a total over $100.7 million.

LOCATION

Cyber attacks can happen anywhere there is technology connected to the internet. All electronics that have internet capabilities have the potential to be attacked. Cyber attacks on victims with out-of-date hardware are often more successful, but as recent events have shown even sophisticated systems can still be breached.

FREQUENCY

Frequency is increasing, whether individual, organization, or government, there are more attacks reported each year. Since the understanding of frequency is based on known events, those events that go unreported could drastically increase that frequency.

SEVERITY

Severity of cyber attacks varies tremendously. In some cases an individual can be the victim of an attack that costs thousands of dollars, while large organizations can be expected to pay millions of dollars in ransom.

The damage aftermath to the equipment also varies greatly depending on the type of attack and the need to replace equipment. In many cases, it takes organizations months to be fully functional after an attack.

WARNING TIME

There is very minimal warning time for a cyber attack and that is heavily dependent on the type of cyber security in place. Most attacks begin with a program embedding over a few days before making it known the attack is happening to the user. Identifying the attack and removing the link to any databases and servers is crucial in minimizing the impact of the attack.

SECONDARY HAZARDS

As more attacks are being aimed at critical infrastructure and large organizations, the secondary hazards could be numerous. If an attack compromised control of a hazardous material facility or control of dam operation for example, the effects could be detrimental and deadly.

CLIMATE CHANGE IMPACTS

Cyber hazards are not likely to be immediately impacted by climate change.

EXPOSURE AND VULNERABILITY

LIFELINES

The Lifeline most immediately impacted by a cyber hazard would be Communication. Society depends on a variety of technology to communicate, much of which is through the internet, servers, and computers. If a cyber hazard disrupted these lines of communication, the results could be detrimental depending on the target.

Energy, Safety & Security, and Health & Medical may be affected depending on the target of the attack. It is possible that critical processes could be disrupted, either by direct loss of control of infrastructure or the impacts of communication and data loss.

POPULATION

Most critically, the safety of individuals may be compromised during an attack on a hospital, as being locked out of access to medical records can result in inadequate care. Hospitals have become a common target for ransomware attacks, due to the urgent nature of regaining access to data.

While large organizations that experience a cyber incident often get attention from the public and media, the majority of incidents are individual attacks on those who may not know how to protect their information. Identity theft is the most known of these individual attacks, but other types of schemes cause even greater losses to more victims.

Notably, elder fraud is a significant cyber issue with 28% of the complaints received by the IC3 in 2020 from victims over the age of 60 with adjusted losses in excess of $966 million.

PROPERTY

Of greatest concern for property in a cyber attack is the ability for a perpetrator to control or damage infrastructure. In the case of physical interference, fiberoptic cables and other infrastructure may be disrupted or destroyed interfering with the operations of organizations and agencies.

If a person or entity were to take over the control system of a facility or business it could result in physical damages, data loss, and dangerous conditions for workers and community members. Many aspects of asset and property management are controlled through technology, from a small scale such as indoor climate conditions to the large scale delivery of power, fuel, and water to entire communities.

There have been cases of local government systems being attacked, which resulted in halting and extensive delays of building permits, ownership paperwork processing, and utility bill payments.

ENVIRONMENT

The environment is not likely to be affected by a cyber hazard.

ECONOMY

The economy of the region could be drastically affected depending on the type, duration, and motive of the attack. Prolonged lack of control to a system can result in losses for businesses and organizations. The longer an organization cannot function as usual, the more money they lose, in some cases by the hour. This does not include any ransom that may have been demanded to return control to the entity.

FUTURE TRENDS IN DEVELOPMENT

As technology continues to rapidly evolve, any new buildings and infrastructure needs to be built to withstand cyber attacks. A better understanding of the technology being installed in new buildings is needed to ensure that it can be maintained and that intervention can be quick should a cyber attack occur.

Training is crucial in cyber security, as human error is the most common way for an attack to breach security. The more dependent upon technology our society becomes, the more imperative that any and all people who use computers be educated in risks and protocols, for existing and future technologies.

DAM / LEVEE INCIDENT

MODERATE RISK

GENERAL BACKGROUND

CAUSES OF DAM INCIDENTS

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

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

The remaining 6 percent of U.S. dam failures is 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 and these threats are under continuous review by public safety agencies.

CAUSES OF LEVEE INCIDENTS

The following information is excerpted from the State of Colorado Flood Mitigation Plan.

> 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 inundate a large area beyond the failed levee with little or no warning.
>
> Earthen levees can be damaged in several ways. For instance, strong river currents and waves can erode the surface. Debris and ice carried by floodwaters—and even large objects such as boats or barges—can collide with and gouge the levee. Trees growing on a levee can blow over, leaving a hole where the root wad and soil used to be. Burrowing animals can create holes that enable water to pass through a levee. If severe enough, any of these situations can lead to a zone of weakness that could cause a levee breach. In seismically active areas, earthquakes and ground shaking can cause a loss of soil strength, weakening a levee and possibly resulting in failure. Seismic activity can also cause levees to slide or slump, both of which can lead to failure. Unfortunately, in the rare occurrence when a levee system fails or is overtopped, severe flooding can occur due to increased elevation differences associated with levees and the increased water velocity that is created. It is also important to remember that no levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure. In some cases, flooding may not be directly attributable to a

river, stream, or lake overflowing its banks. Rather, it may simply be the combination of excessive rainfall or snowmelt, saturated ground, and inadequate drainage. With no place to go, the water will find the lowest elevations – areas that are often not in a floodplain. This type of flooding, often referred to as sheet flooding, is becoming increasingly prevalent as development outstrips the ability of the drainage infrastructure to properly carry and disburse the water flow. Flooding also occurs due to combined storm and sanitary sewers that cannot handle the amount of water.

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

REGULATORY OVERSIGHT

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

Colorado Rules and Regulations for Dam Safety and Dam Construction

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

U.S. Army Corps of Engineers Dam Safety Program

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

Federal Energy Regulatory Commission Dam Safety Program

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

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

Every 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.

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

PAST EVENTS

Colorado has a history of dam failure, with more than 130 known failures since 1890 [7]. The Association of State Dam Safety Officials (ASDSO) reports [8] that since 1978, there have been 69 dam incidents statewide, 14 have been dam failures. Dam safety incidents are situations at dams that require an immediate response by dam safety engineers. Most of the reported incidents in the ASDSO database are from 2011 to the present, with half from the state's 2013 flood event.

Cracking at the embankment dam crest above the sinkhole.[8]

There have been no reported complete dam failures in or near Custer County in the last 85 years. However, in 1996 a partial breach of the Balman Reservoir Dam [9] occurred. The earthfill

[7] 2018 Colorado State Hazard Mitigation Plan

[8] https://www.damsafety.org/incidents

[9] Technical Manual: Conduits through Embankment Dams (damsafety.org) Colorado Division of Water Resources, Dam Safety Engineers Inspection Report Files—Incident Report for Balman Reservoir Dam, 1996.

embankment dam is located in San Isabel National Forest and is owned by the USFS.

On November 4th, 1996, a sinkhole approximately 8 to 10 feet in diameter and 6 to 8 feet deep opened in the reservoir. Cracks began to develop in the embankment dam crest above the sinkhole. The dam was experiencing an internal erosion failure due to past poor operational performance and the worsening condition of the sinkhole. It was determined the water level needed to be lowered to minimize downstream hazard risk, which included a church, campground, hiking trail, and a county road.


Initialization of the breach in the embankment dam[8]

Diversion of the inflow to the reservoir was ineffective in the first attempt to lower the water level and a pump was brought in. The pump operated for 3 days and lowered the water level to 8 feet below the spillway crest. This allowed excavation to begin and the area of the sinkhole and upstream slope were excavated as far in as was possible with the equipment. Further excavation was done to get the breach to water surface level and a small amount of embankment was removed to allow waterflow. This was repeated multiple times, over 2 days, to stabilize waterflow until repairs were able to be made. With the partial breaching of the dam, rather than a complete breach, the reservoir was able to remain for the purpose of silt deposit control and maintenance of a fish habitat. After the repairs, it was no longer considered a potential risk to the public and property.

There have been no reported levee failures in Custer County.

LOCATION

DAMS

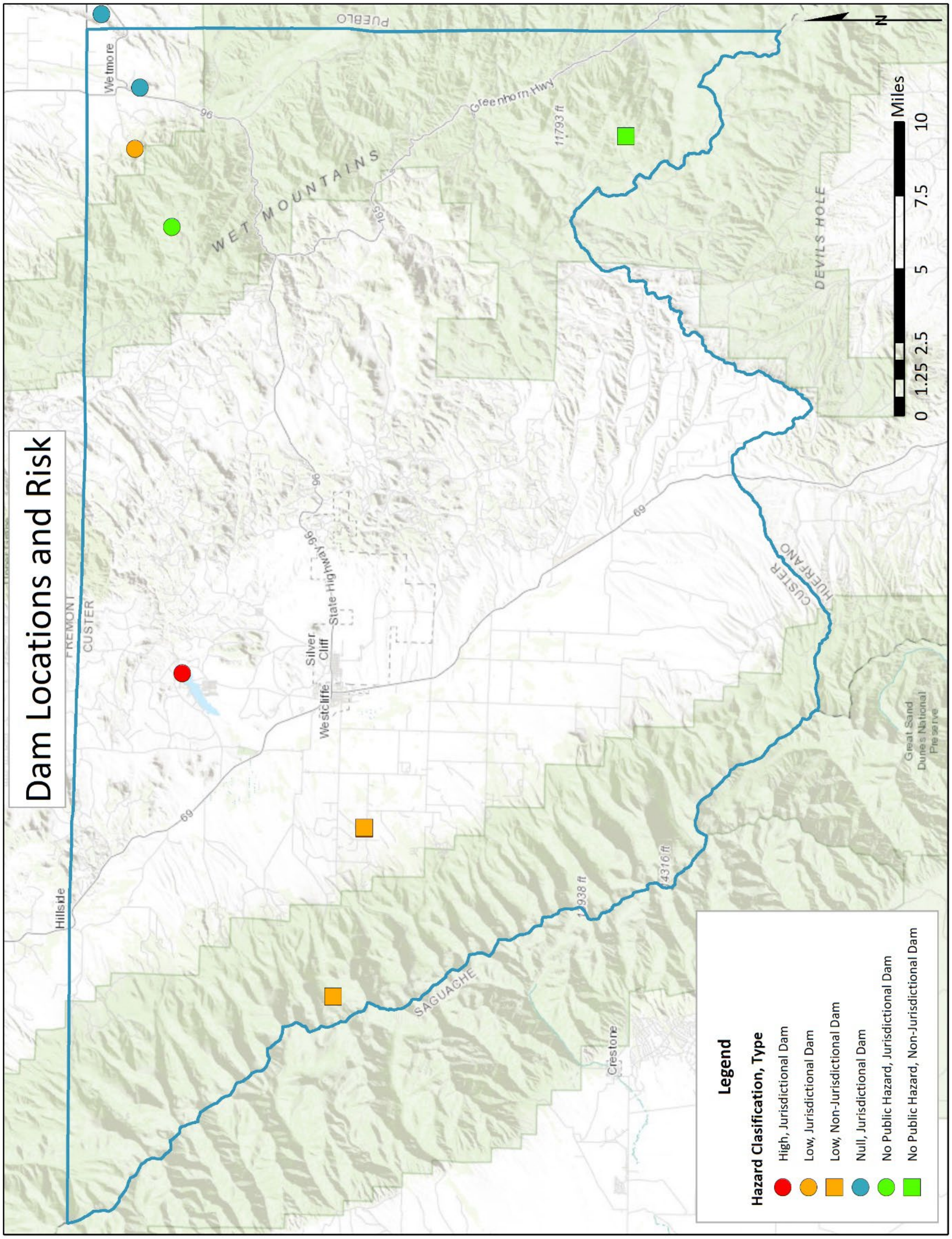
The Colorado Department of Water Resources Dam Safety program identified a total of 15 dams in the county, three of which are not mapped due to lack of latitude and longitude coordinates. Seven of these are 'jurisdictional' dams and most of these dams pose low hazard potential. Cañon City is 19 miles downstream of the High hazard DeWeese Reservoir, which is supplied by Grape Creek.

There are six 'non-jurisdictional' dams, which create a reservoir with a capacity of 100 acre-feet or less and a surface area of 20 acres or less and with a height measured of 10 feet or less (Rules 4.2.5.1 and 4.2.19 C.R.S.). These dams do not store water but may impound water during heavy precipitation events. Non-jurisdictional size dams are regulated and subject to the authority of the State Engineer consistent (37- 87-102 and 37-87-105 C.R.S). While these have the potential to overtop or fail during a significant rainfall event, the extent and risk associated with these dams is not known. The remaining two dams tracked by the state were not built or were intentionally breached.

Figure 40 indicates these dam locations and classifications. There are no mapped levees in the county, according to the USACE National Levee Database [10]; however, it is possible there are levees that are not listed in these databases.

[10] https://levees.sec.usace.army.mil/#/

Figure 40. Dam Locations



FREQUENCY

Based on the single recorded occurrence of a dam or levee incident in the past 100 years in Custer County, it is estimated that there is approximately a 1% chance of future dam failure event in any given year. The fact that much of this infrastructure is aging may increase this frequency going forward.

SEVERITY

The USACE developed the classification system shown in Table 24 for the hazard potential of dam failures. This hazard rating system is based only on the potential consequences of a dam failure and does not take into account the probability of such failures. Of the dams in the county, only one is considered High hazard.

Table 24. Dam Hazard Potential Classifications

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

The potential losses in a dam failure inundation area would be best illustrated when mapped at a scale large enough to be thorough, but not compromise information security or privacy of those in the area.

WARNING TIME

Warning time for dam or levee failure varies depending on the cause of the failure. In events of extreme precipitation or massive snowmelt, evacuations can be planned with sufficient time. In the event of a structural failure due to earthquake, there may be no warning time. A dam's structural type also affects warning time. Earthen dams do not tend to fail completely or instantaneously. Once a breach is initiated, discharging water erodes the breach until either the reservoir water is depleted, or the breach resists further erosion. Concrete gravity dams also tend to have a partial breach as one or more monolith sections are forced apart by escaping water. The time of breach formation ranges from a few minutes to a few hours (U.S. Army Corps of Engineers, 1997).

An emergency action plan (EAP) is on file with the Custer County Office of Emergency Management for the DeWeese Reservoir Dam. Additionally, possible evacuation routes, in the event of a failure, have been identified.

SECONDARY HAZARDS

Dam incidents can cause severe downstream flooding and debris flow, depending on the magnitude of the failure. Other potential secondary hazards of a dam incident are landslides around the reservoir perimeter, bank erosion on the rivers, and destruction of downstream habitat. Spillway overtopping, as dams are designed to do, may also cause downstream flooding in areas not known to be at risk to riverine flooding.

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.

CLIMATE CHANGE IMPACTS

Per the 2018 Colorado State Hazard Mitigation Plan:

> With a potential for increase 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. 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.

EXPOSURE AND VULNERABILITY

LIFELINES

As part of this vulnerability assessment, the county's Lifelines were assessed with the best available dam inundation mapping data. Individual assessments showed there is currently no known Lifeline exposure from dam failure in the county. There are no levee protected areas currently mapped in the county.

POPULATION

Those in the community with access and functional needs (AFN), that are downstream from dam failures may be incapable of evacuating the inundation area within the allowable 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 also be disproportionately impacted by the hazard.

PROPERTY

Vulnerable properties are those closest to the dam inundation or levee protected areas. Based on an evaluation of best available structure footprint data for the county, there are no properties located in dam inundation areas. As previously noted, there are no levee protected areas currently mapped in the county.

Low-lying areas are also vulnerable since these are where waters would collect. Transportation routes, especially those in poor condition, are vulnerable and have the potential to be wiped out, creating isolation issues. This includes all roads, railroads, and bridges in the path of the inundation. Utilities such as overhead power lines as well as cable and phone lines could also be vulnerable. Loss of these utilities could create communication issues for the inundation areas.

ENVIRONMENT

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 and 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.

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

ECONOMY

Economic impacts for dam / levee failure could be quite significant depending on the extent of flooding. Businesses and homes may be damaged, as well as roads and infrastructure needed for day-to-day operations. 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.

FUTURE TRENDS IN DEVELOPMENT

Future population change across the county is expected to decrease by 0.4% over the next five years; however, steady 0.3% to 0.5% growth is projected through 2050. The projected growth is expected to occur primarily as municipal infill. 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.

DROUGHT

HIGH RISK

GENERAL BACKGROUND

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

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

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

PAST EVENTS

Colorado has experienced multiple severe droughts, highlighted as 'dry' years in Table 25. The state is seemingly at the start of another dry period that began in 2018 and continues as of this plan's writing.

Table 25. Historical Dry and Wet Periods in Colorado [11]

Date	Dry	Wet	Duration (years)
1893-1905	X		12
1905-1931		X	26
1931-1941	X		10
1941-1951		X	10
1951-1957	X		6
1957-1959		X	2
1963-1965	X		2
1965-1975		X	10
1975-1978	X		3
1979-1999		X	20
2000-2006	X		6
2007-2010		X	3
2011-2013	X		2

As presented in Table 19 earlier in this chapter, drought reported impacts in Custer County have resulted in USDA Secretarial Disaster Declarations during roughly 67% of years since 2003. In order to receive these designations, damages and losses must have resulted in the production loss of at least 30% of one crop in the county as the result of a natural disaster (Colorado Water Conservation Board, 2013).

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 [12], research has shown that during drought periods levels of arsenic in well waters can increase.

In 2002, severe drought resulted in the shutdown of water supply to irrigation ditches along Grape Creek, which had not occurred since the 1960s.

SHELDUS data from 1960 to 2019, shows damages have only been reported for one drought incident, in 1989. It was reported that there was $1,971,656 (2019 USD) in crop damages.

Based on data from the U.S. Drought Monitor, the history of drought in Custer County is illustrated in Figure 41. The figure shows the severity of drought events, the period drought occurred, and the percentage of the county that was affected during each event.

[11] 2018 Colorado Drought Mitigation and Response Plan

[12] Assessing the Impact of Drought on Arsenic Exposure from Private Domestic Wells 2021 (acs.org)

Figure 41. Custer County Percent Area in U.S. Drought Monitor Categories

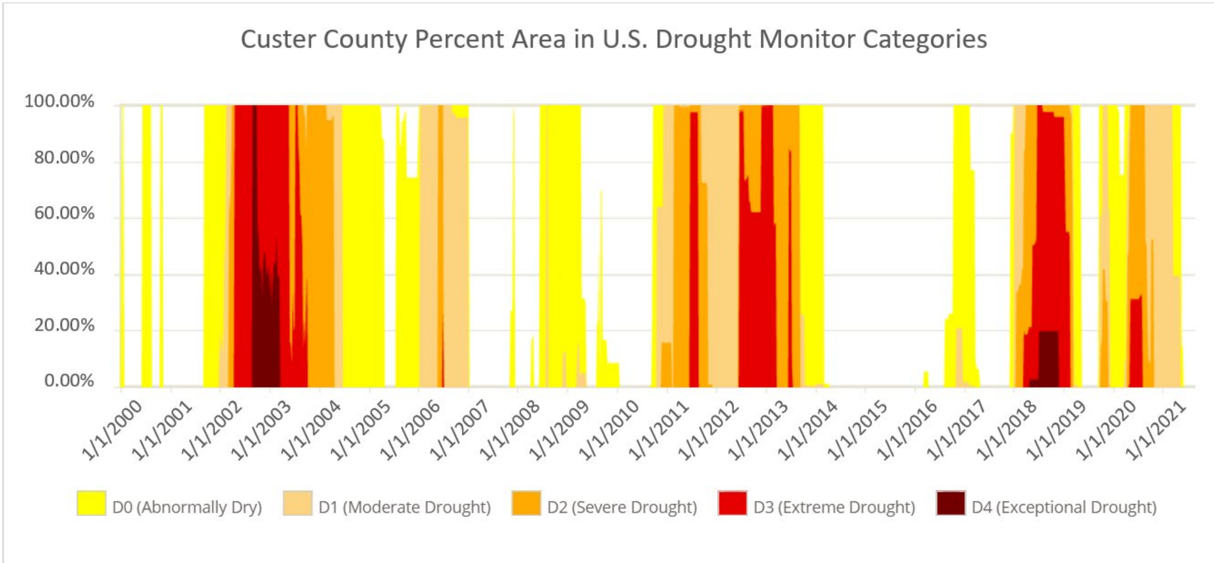
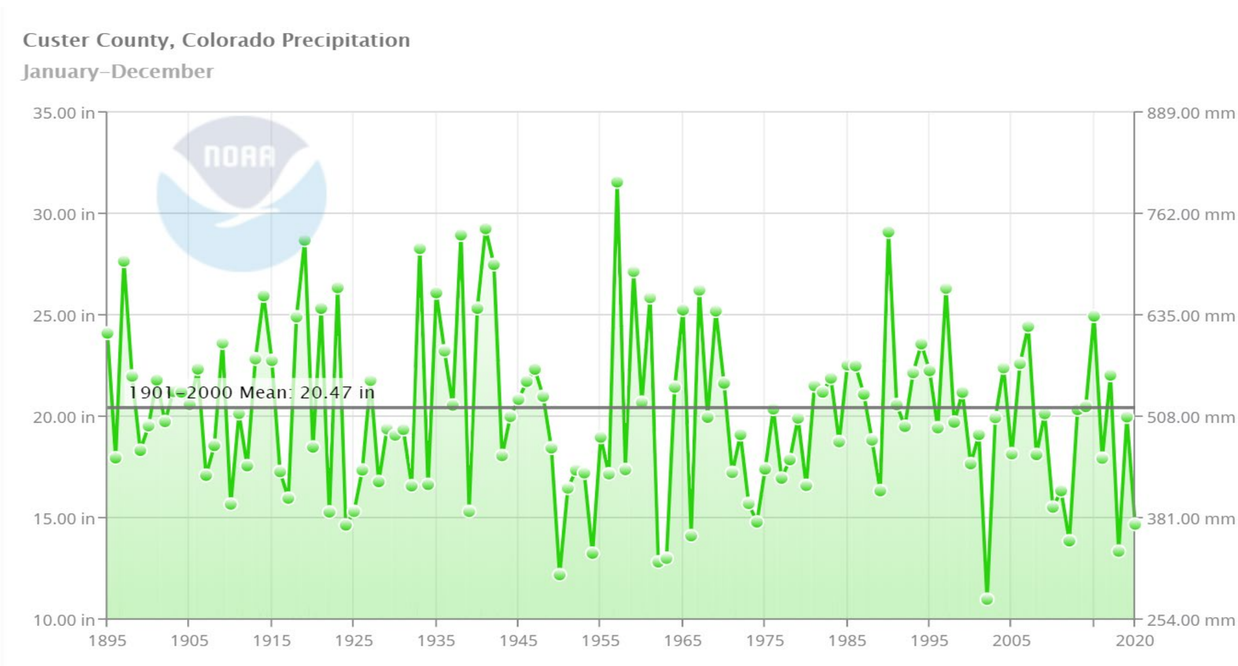


Figure 42 illustrates the historical precipitation since 1895.

Figure 42. Historical Precipitation



Source: NOAA Climate Data Online

LOCATION

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

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

FREQUENCY

According to information from the 2018 Colorado Drought Mitigation and Response Plan, over 120 years (1893 to 2013) there were seven recorded drought incidents that totaled 41 dry years. Based on this historical information, the probability of a drought occurring in any given year is 34 percent. Short duration droughts occur much more frequently. According to a study cited in the Colorado Drought Mitigation and Response Plan, they occur somewhere in Colorado in nearly 9 out of every 10 years. (McKee and others, 2000).

SEVERITY

Drought impacts are wide-reaching and may be economic, environmental, or societal. The most significant impacts associated with drought in Colorado are those related to water intensive activities such as agriculture, wildfire protection, municipal usage, commerce, tourism, recreation, and wildlife preservation. A reduction of electric power generation and water quality deterioration are also potential problems. Drought impacts increase with the length of a drought, as carry-over supplies in reservoirs are depleted and water levels in streams and groundwater decline.

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

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

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

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

The National Oceanic and Atmospheric Administration (NOAA) developed several indices to measure drought impacts and severity:

- The Palmer Crop Moisture Index measures short-term drought on a weekly scale and is used to quantify drought's impacts on agriculture during the growing season.
- The Palmer Z Index measures short-term drought on a monthly scale.
- The Palmer Drought Severity Index (PDSI) measures the duration and intensity of long-term drought-inducing circulation patterns. Long-term drought is cumulative, so the intensity of drought during a given month is dependent on the current weather patterns plus the cumulative patterns of previous months.
- The hydrological impacts of drought (e.g., reservoir levels, groundwater levels, etc.) take longer to develop and it takes longer to recover from them. The Palmer Hydrological Drought Index (PHDI), another long-term index, was developed to quantify hydrological effects. The PHDI responds more slowly to changing conditions than the PDSI.

WARNING TIME

Droughts are climatic patterns that occur over long periods of time. Only generalized warning can take place due to the numerous variables that scientists have not pieced together well enough to make accurate and precise predictions. Empirical studies conducted over the past century have shown that meteorological drought is never the result of a single cause. It is the result of many causes, often synergistic in nature.

Currently, scientists do not know how to predict drought more than a month in advance for most locations. Predicting drought depends on the ability to forecast precipitation and temperature. Anomalies of precipitation and temperature may last from several months to several decades. How long they last depends on the 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.

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.

SECONDARY HAZARDS

The secondary hazard most commonly associated with drought is wildfire. A prolonged lack of precipitation dries out vegetation, which becomes increasingly susceptible to ignition as the duration of the drought extends. According to the State of Colorado 2018 Drought Mitigation and Response Plan, economic impacts may also occur for industries that are water intensive such as agriculture, wildfire protection, municipal usage, commerce, tourism, recreation, and wildfire preservation. Additionally, a reduction of electric power generation and water quality deterioration are also potential effects.

Drought conditions can also cause soil to compact, decreasing its ability to absorb water, making an area more susceptible to flash flooding and erosion. A drought may also 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 on-going drought that severely inhibits natural plant growth cycles may impact critical wildlife habitats. Drought impacts increase with the length of a drought, as carry-over supplies in reservoirs are depleted and water levels in groundwater basins decline (Colorado Water Conservation Board, 2013).

CLIMATE CHANGE IMPACTS

The long-term effects of climate change on Custer County's water sources are not fully understood. Globally, water resources are already experiencing the following stresses regardless of climate change:

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

With a warmer climate, droughts and extreme heat events could become more frequent, more severe, and longer lasting. More frequent extreme events, such as droughts, could end up being more cause for concern than the long-term change in temperature and precipitation averages.

EXPOSURE AND VULNERABILITY

Everything in the planning area would be exposed, to some degree, to the impacts of moderate to extreme drought conditions. Populations living in densely populated urban areas are likely to be more exposed to extreme heat events.

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

A drought vulnerability assessment was conducted by the state to inform the 2018 State of Colorado Drought Mitigation and Response Plan. The assessment determined the vulnerability of multiple sectors to drought for each county. Custer County has an overall average vulnerability score of 1.64, on a scale of 1.0 to 4.0, where 4.0 is the most vulnerable to drought.

Each sector was separated into sub-sectors for quantitative and qualitative analyses and were assessed by spatial density data of each county. There are multiple spatial density metrics for each sector, specific to the sub-sector. For example, the Agriculture Sector had crop data based on the estimation of how many acres of farmland are in production per county and livestock data as the total cattle head count.

The sectors and vulnerability scores for Custer County can be seen in Table 26, along with the statewide average scores. The county was determined to have no vulnerability to drought in the Energy Sector which includes mining and power production. The highest vulnerability score was for the Socioeconomic Sector which includes projected population growth, economic diversity, and behavioral health man-power shortages, or the ability to respond to stress during drought.

Table 26. Drought Vulnerability Scores

Sector	Custer County	Colorado
Socioeconomic	3.0	2.49
Recreation	1.60	2.20
Environment	1.50	1.98
Energy	0.0	1.53
Agriculture	2.10	2.40
State Assets	1.60	2.45
Average Overall	**1.64**	**2.18**

The vulnerability assessment also includes recommendations for adaptations specific to each sector that counties can implement. Understanding the vulnerability of each sector can help Custer County prioritize actions to reduce vulnerability to drought and the state data viewer Colorado Drought Plan - Visualization Story Map can bring awareness to potential sectors neighboring counties may be prioritizing as well.

LIFELINES

Drought directly impacts the Lifeline of Food, Water, & Shelter. Outside of those components, all other Lifelines will continue to remain operational during a drought.

One consideration for the county is the minimal above ground water storage in the valley. While there is a rich aquifer in the valley, one of the largest in the state, there is potential for issues with lack of visibility for the ground water. Pollution is a concern, either unintentionally such as a chemical spill, through agricultural run-off, or an intentional act to alter the water quality, as well as the water level in the aquifer overall.

POPULATION

Inclusive and strategic planning has the ability to minimize impacts on residents and water consumers in the county should several consecutive dry years occur. While no significant life safety impacts are anticipated as a result of drought within the planning area, the public health impacts due to potentially poor air quality during dry periods, lifting dust and silt into the air, could be considerable. Populations with chronic illness, especially asthma, and those with greater risk to pulmonary issues, such as children and those over 65 years of age, could see immediate issues, as well as long-term complications.

PROPERTY

No structures will be directly affected by drought conditions. Droughts can have significant impacts on landscapes, which could cause a financial burden to property owners. However, these impacts are not considered critical in planning for impacts from the drought hazard. An indirect impact from drought can be the increase in fire hazard.

While property may not be directly impacted, the increase in development presents future concerns as wells are created to service new areas. According to data from the Colorado Division of Water Resources (DWR), half of the 203 total well permits issued since 2010 were issued in 2021. Of the permits issued in 2021, all but one are for domestic or household use only, with a single permit having dual commercial and domestic use. There are 5,160 constructed wells in the county, approximately 16% or over 800 of which have expired or cancelled permits, or have been abandoned. Roughly a quarter of the functional wells are used for irrigation and stock.

Per DWR, there are approximately 78,000 exempt wells across the Arkansas Basin (Texas and Grape Creeks). Exempt well permits do not require an underlying water right and they are not curtailed by administration of a water right more senior to them. Non-exempt well permits; however, are subject to curtailment by the Division of Water Resources during times of a water rights river call.

ENVIRONMENT

Environmental losses from drought are associated with damage to plants, animals, wildlife habitat, and poor air and water quality. Drought is also linked with forest and range fires, degradation of landscape quality, loss of biodiversity, and soil erosion. Some of the effects are short-term and conditions quickly return to normal following the end of the drought. Other environmental effects linger for some time or may even become permanent.

Wildlife habitat may be degraded through the loss of wetlands, lakes, and vegetation. While many species will eventually recover from this temporary aberration, the degradation of landscape quality, including increased soil erosion, may lead to a more permanent loss of biological productivity.

Although environmental losses are difficult to quantify, growing public awareness and concern for environmental quality has forced public officials to focus greater attention and resources on these effects. For Custer County this is an important focus as hunting and outdoor recreation are a main source of income to the area. If drought causes wildlife population loss, less hunting licenses will be issued and less people will travel through the county.

ECONOMY

Economic impact from drought will be largely associated with industries that use water or depend on water for their business. Agricultural industries will be impacted if water usage is restricted for irrigation. Landscaping businesses are affected by drought, as the demand for service significantly declines when watering is restricted.

The potential drought damage to natural and recreational areas can drastically affect the local tourist and recreation economy, which is a main driver of income. This is especially true for hunters and others recreating in the thousands of acres of State Wilderness Areas and State Trust Lands, as thousands of permits are issued each year for the GMUs, which brings income to the area as hunters travel through. If game populations are down due to drought, less licenses will be purchased and the number of people traveling through will be decreased.

Over the next 30 years, in any given year, it is possible that Custer County can see an expected annual damage loss of $800,000 due to drought, climate change, and no change in population. This is an average calculation over the time period which means years could have much higher or much lower losses, or none at all. Increased feed cost and decreased crop production are expected to increase with population growth and climate change in Custer County. The FACE viewer can provide a more in-depth exploration of the impact of these variables on Custer County, as well as those from flood and fire hazards.

FUTURE TRENDS IN DEVELOPMENT

Vulnerability to drought will increase as population growth increases, putting more demands on existing water supplies. The recent drastic increase in permits issued for wells is indicative of this future demand.

With agriculture as a prime industry in Custer County, special attention must also be paid to protecting the sustainability of industry production and the water supply. As demand increases for population growth, agriculture could see a greater strain on the water supply upon which they depend.

Critical conversations about the long-term impacts of drought on all types of development, including economic, are necessary for inclusive planning to mitigate them. All stakeholders need a seat at the table to avoid detrimental consequences from future drought conditions.

EARTHQUAKE

MODERATE RISK

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 recur 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.

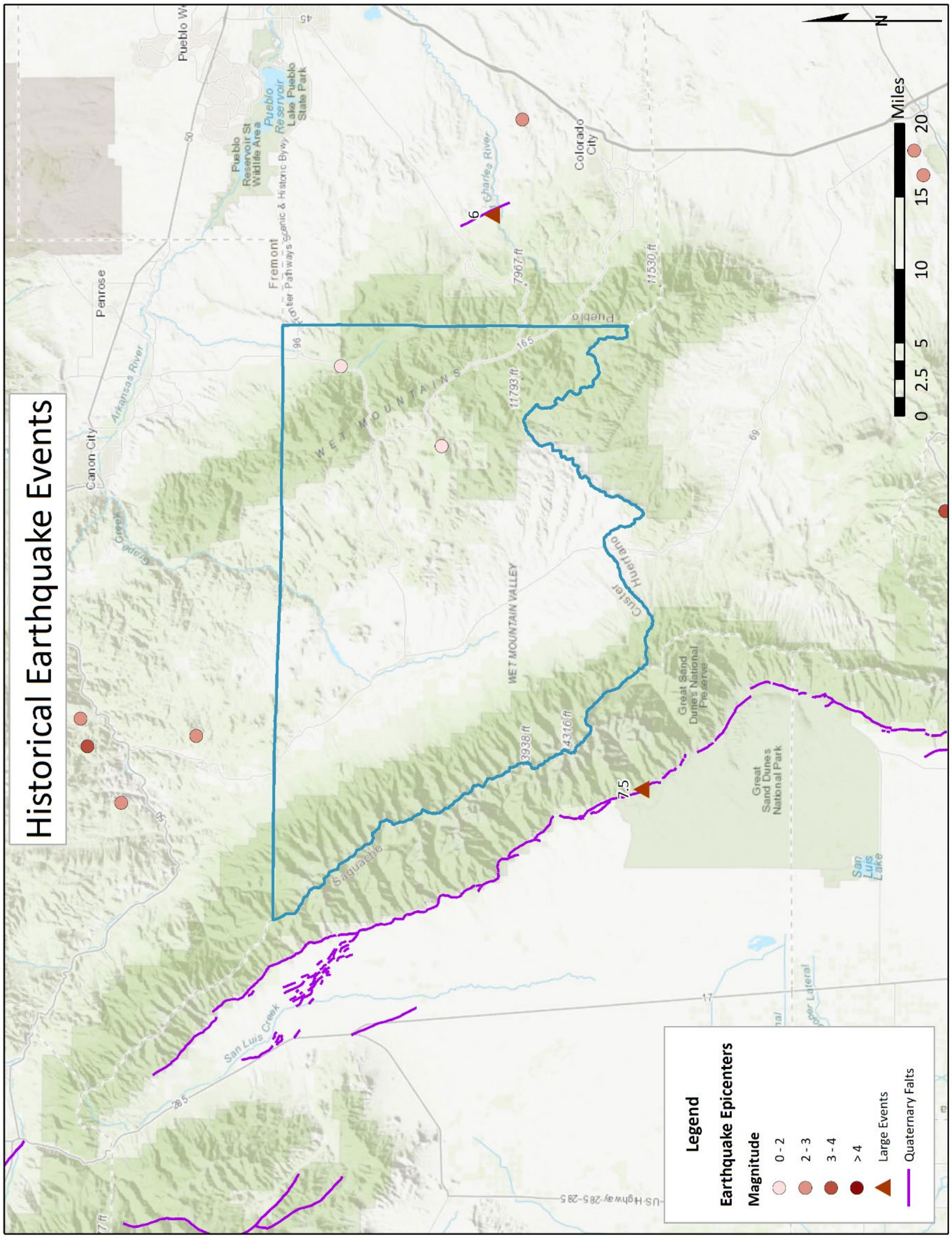
Geologists classify faults by their relative hazards. Active faults, which represent the highest hazard, are those that have ruptured to the ground surface during the Holocene period (about the last 11,000 years). Potentially active faults are those that displaced layers of rock from the Quaternary period (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. In some areas, smaller, local faults produce lower magnitude quakes, but ground shaking can be strong, and damage can be significant as a result of the fault's proximity to the area. In contrast, large regional faults can generate great magnitudes but, because of their distance and depth, may result in only moderate shaking in the area.

PAST EVENTS

Colorado has a relatively short period of historical records for earthquakes. Figure 43 depicts the location of historical epicenters across the county and potentially active faults in the region. There have been two earthquakes with magnitudes between 0 and 2 within Custer County.

Figure 43. Historical Earthquakes and Faults



LOCATION

Known named faults in Custer County include: Alvarado Fault, Dead Mule Gulch Fault, Isle Fault, Johnson Gulch Fault, Northern Sangre de Cristo Fault, Silver Cliff Graben, Westcliffe Fault, and the Wet Mountain Fault. All are classified as Late Cenozoic (activity is older than 23.7 million years ago), the oldest classification of fault and are considered inactive.

FREQUENCY

Research based on Colorado's earthquake history suggests that an earthquake of 6.3 or larger has a one percent (1%) probability of occurring each year somewhere in Colorado (Charlie, Doehring, Oaks Colorado Earthquake Hazard Reduction Program Open File Report 93-01, 1993). According to the U.S. Geological Survey, the probability that a magnitude 6 or greater earthquake will occur in the next 50 years in Custer County is 10% or less. Small earthquakes that cause no or little damage are more likely.

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). Other damage-causing effects of earthquakes include surface rupture, fissuring, settlement, and permanent horizontal and vertical shifting of the ground.

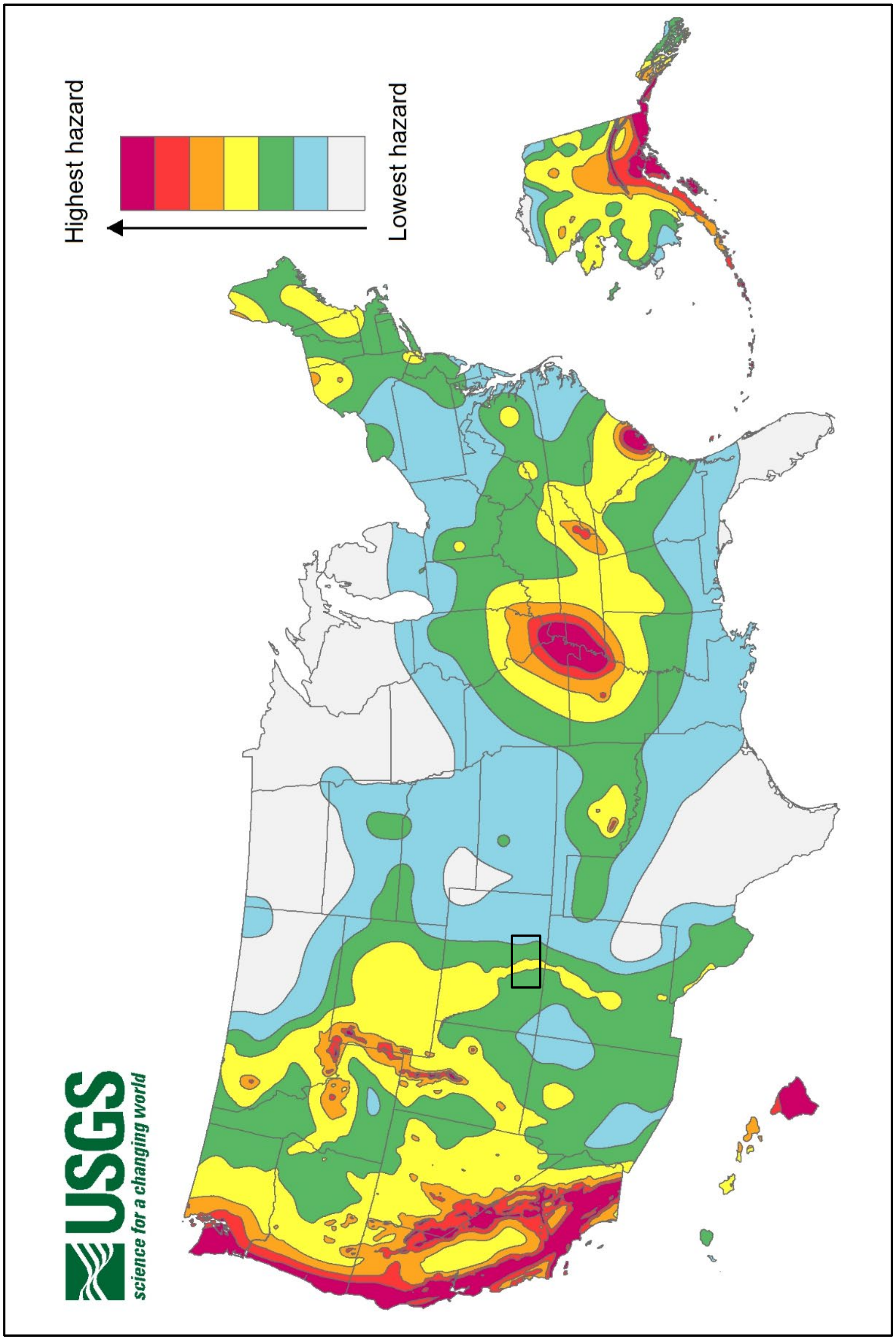
Earthquakes are typically classified in one of two ways: by the impact on people and structures, measured as intensity; or by the amount of energy released, measured as magnitude. Table 27 presents the Modified Mercalli Intensity Scale aligned with the Richter Scale Magnitude to show how these classifications approximately align.

Table 27. Modified Mercalli Intensity Scale

SCALE	INTENSITY	DESCRIPTION OF EFFECTS	PGA (g)	RICHTER SCALE MAGNITUDE
I	Instrumental	Detected only on seismographs	< 0.0017	< 4.2
II	Feeble	Some people feel it	0.0018 – 0.014	
III	Slight	Felt by people resting, like a truck rumbling by		
IV	Moderate	Felt by people walking	0.015 – 0.039	
V	Slightly Strong	Sleepers awake, church bells ring	0.040 – 0.092	< 4.8
VI	Strong	Trees sway, suspended objects swing, objects fall off shelves	0.093 – 0.18	< 5.4
VII	Very Strong	Mild alarm, walls crack, plaster falls	0.19 – 0.34	< 6.1
VIII	Destructive	Moving cars uncontrollable, masonry fractures, poorly constructed buildings damaged	0.34 – 0.65	< 6.9
IX	Ruinous	Some houses collapse, ground cracks, pipes break open	0.65 – 1.24	
X	Disastrous	Ground cracks profusely, many buildings destroyed, liquefaction and landslides widespread	> 1.24	< 7.3
XI	Very Disastrous	Most buildings and bridges collapse, roads, railways, pipes and cables destroyed, general triggering of other hazards	> 1.24	< 8.1
XII	Catastrophic	Total destruction, trees fall, ground rises and falls in waves	> 1.24	> 8.1

Intensity represents the observed effects of ground shaking on people, buildings, and natural features. The USGS has created ground motion maps based on current information about several fault zones. Figure 44 illustrates USGS hazard data across the nation. The PGA is measured in numbers of g's (the acceleration associated with gravity). The 2,500-year return period form the basis of seismic zone maps that are included in building codes, such as the International Building Code. Building codes that include seismic provisions specify the horizontal force due to lateral acceleration that a building should be able to withstand during an earthquake.

Figure 44. National Earthquake Hazard Risk



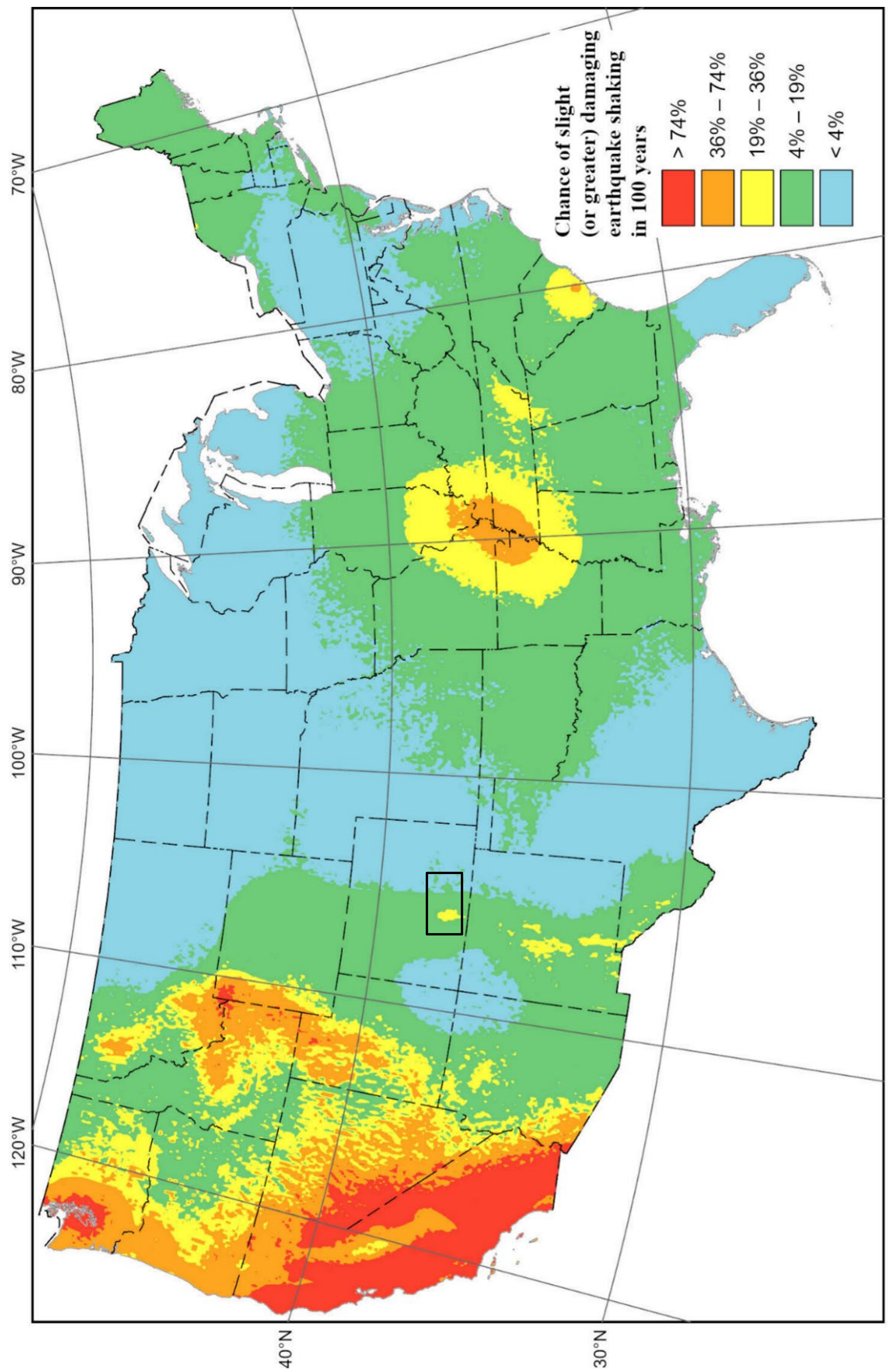
Magnitude is related to the amount of seismic energy released at the hypocenter of an earthquake. It is calculated based on the amplitude of the earthquake waves recorded on instruments. Whereas intensity varies depending on location with respect to the earthquake epicenter, magnitude is represented by a single, instrumentally measured value for each earthquake event.

In simplistic terms, the severity of an earthquake event can be measured in the following terms:

- How hard did the ground shake?
- How did the ground move? (horizontally or vertically)
- How stable was the soil?
- What is the fragility of the built environment in the area of impact?

Figure 45 uses information from the 2018 National Seismic Hazard Model to illustrate the chance of a damaging earthquake with the shaking equivalent of Modified Mercalli Intensity of VI occurring in 100 years. Further explanation of the methods of calculation are below the map. Custer County has <4% - 19% chance of seeing an event of this type and magnitude in the next 100 years, while surrounding areas have up to 36% chance.

Figure 45. Chance of Slight (or Greater) Damaging Earthquake Shaking in 100 Years



Map showing the chance of minor damaging earthquake shaking in 100 years from the 2018 NSHM. The shaking is equivalent to Modified Mercalli Intensity VI and is based on the average 1-second horizontal spectral response acceleration and peak ground acceleration. Ground-motions are amplified using topographic-based V_{S30} values (Wald and Allen, 2007).

WARNING TIME

Part of what makes earthquakes so destructive is that they generally occur without warning. The main shock of an earthquake can usually be measured in seconds, and rarely lasts for more than a minute. Aftershocks can occur within the days, weeks, and even months following a major earthquake.

By studying the geologic characteristics of faults, geoscientists can often 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, accurate estimations of magnitude, timing, or location of future dangerous earthquakes in Colorado are difficult to estimate.

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

SECONDARY HAZARDS

Earthquakes can cause large and sometimes disastrous landslides and mudslides. Stream and river valleys are vulnerable to slope failure, often as a result of loss of cohesion in clay-rich soils. Soil liquefaction occurs when water-saturated sands, silts, or gravelly soils are shaken so violently that the individual grains lose contact with one another and float freely in the water, turning the ground into a pudding-like liquid. Building and road foundations lose load-bearing strength and may sink into what was previously solid ground. Unless properly secured, hazardous materials can be released, causing significant damage to the environment and people. Earthen dams and levees are highly susceptible to seismic events and the impacts of their eventual failures can be considered secondary risks for earthquakes.

CLIMATE CHANGE IMPACTS

The impacts of global climate change on earthquake probability are unknown. Some scientists say that melting glaciers could induce tectonic activity. As ice melts and water runs off, tremendous amounts of weight are shifted on the earth’s crust. As newly freed crust returns to its original, pre-glacier shape, it could cause seismic plates to slip and stimulate volcanic activity according to research into prehistoric earthquakes and volcanic activity. NASA and USGS scientists found that retreating glaciers in southern Alaska may be opening the way for future earthquakes (NASA, 2004).

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

EXPOSURE AND VULNERABILITY

Everything in the planning area would be exposed, to some degree, to the impacts of a large seismic event. The impact of an earthquake on structures and infrastructure is largely a function of ground shaking, distance from the source of the quake, and liquefaction, a secondary effect of an earthquake in which soils lose their shear strength and flow or behave as liquid, thereby damaging structures that derive their support from the soil.

LIFELINES

All Lifelines in the planning area are exposed to the earthquake hazard. Hazardous materials releases can occur during an earthquake from fixed facilities or transportation-related incidents. Facilities holding hazardous materials are of particular concern because of possible isolation of neighborhoods surrounding them should a release occur. Transportation corridors, communication systems, and energy systems can be disrupted during an earthquake.

HAZUS

The most appropriate risk assessment methodology for seismic hazards involves scenario modeling using FEMA's Hazus loss estimation software. Hazus is a very useful planning tool because it provides an acceptable means of forecasting earthquake damage, loss of function of infrastructure, and casualties, among many other factors.

Utilizing Hazus 5.0, an updated earthquake analyses was conducted for Custer County. The Hazus earthquake scenario modeled a magnitude 6 probabilistic event using 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 the "worst case scenario" for Custer County communities.

According to the Hazus inventory, there are an estimated 4,071 buildings in Custer County with a total building replacement value (excluding contents) of over $653 million. Approximately 94% of the buildings (and 85% of the building value) are associated with residential housing.

The Hazus tool performs its earthquake analysis at the Census Tract level. Custer County consists of one Census Tract which distributes losses across the whole county. However, losses will be greater in areas with higher population and larger building stock, especially coupled with the age and type of buildings across those areas.

A number of variables are included in Hazus analyses in order to arrive at the estimated values of loss. For this reason, it is important to note that the Hazus loss estimates detailed below should not be used as a precise measure, but rather viewed from the perspective of the potential magnitudes of expected losses.

Some loss estimates from the Hazus scenario worth noting include:

- Building-related economic losses are estimated to be almost $14.5 Million.
- Transportation system economic losses are calculated to be $600,000.
- Utility system economic losses were assessed to be over $22 Million.
- The vast majority, 74%, of damages are expected to affect residential housing.
- Unreinforced masonry structures will experience ~55% of the expected complete building damages.
- No major damages are modeled for any "Essential Facilities", which includes hospitals, schools, fire and police stations, and EOCs.
- No major damages are expected to any transportation systems or utility facilities, though a number of water utility pipeline leaks and breaks are anticipated.
- 4,000 tons of debris are expected to be generated from this type of event (160 estimated 25-ton truckloads).
- Only 1 household is modeled as being displaced by this event.

For additional loss estimates and further details see Appendix D: Earthquake Hazus Risk Report.

POPULATION

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

PROPERTY

All structures are vulnerable to the impacts from an earthquake. Buildings not constructed to current building codes are the most vulnerable to damages from the ground motion of an event. For Custer County, both Westcliffe and Silver Cliff contain older building stock that would experience increased losses as compared to other portions of the county.

ENVIRONMENT

Secondary hazards associated with earthquakes will likely have some of the most damaging effects on the environment. Earthquake-induced landslides can significantly impact surrounding habitat. It is also possible for streams to be rerouted after an earthquake. This can change the water quality, possibly damaging habitat and feeding areas. There is a possibility of streams fed by groundwater drying up because of changes in underlying geology.

ECONOMY

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.

FUTURE TRENDS IN DEVELOPMENT

Future population change across the county is expected to decrease by 0.4% over the next five years; however steady 0.3% to 0.5% growth is projected through 2050. The projected growth is expected to occur primarily as municipal infill. Vulnerability to earthquakes will increase as population growth increases, but if structures are built to the latest building codes the degree of risk will be reduced.

EXTREME HEAT

MODERATE RISK

GENERAL BACKGROUND

Excessive heat events are defined by the U.S. EPA as “summertime weather that is substantially hotter or more humid than average for a location at that time of year” (EPA, 2006). Criteria that define an excessive heat event may differ among jurisdictions and in the same jurisdiction depending on the time of year. Excessive heat events are often a result of more than just ambient air temperature. Heat index tables (see Figure 46) are commonly used to provide information about how hot it feels, which is based on the interactions between several meteorological conditions. Since heat index values were devised for shady, light wind conditions, exposure to full sunshine can increase heat index values by up to 15°F. Also, strong winds, particularly with very hot, dry air, can be extremely hazardous.

Figure 46. Heat Index

NOAA's National Weather Service
Heat Index

Temperature (°F)

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

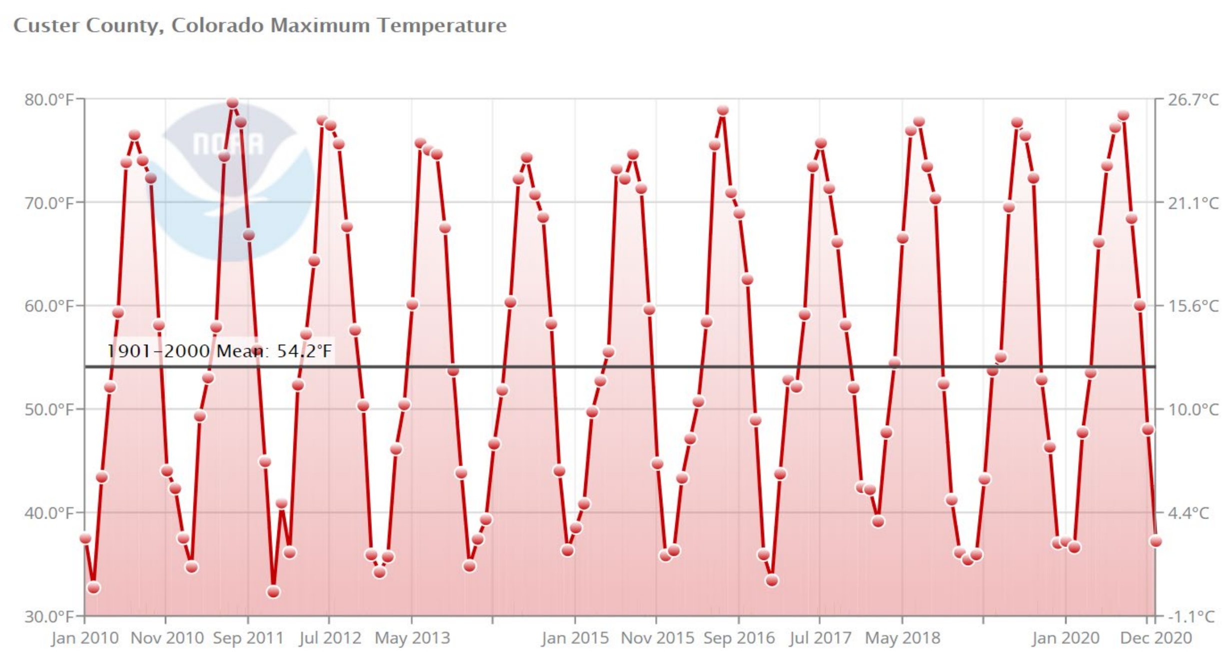
Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution | Extreme Caution | Danger | Extreme Danger

PAST EVENTS

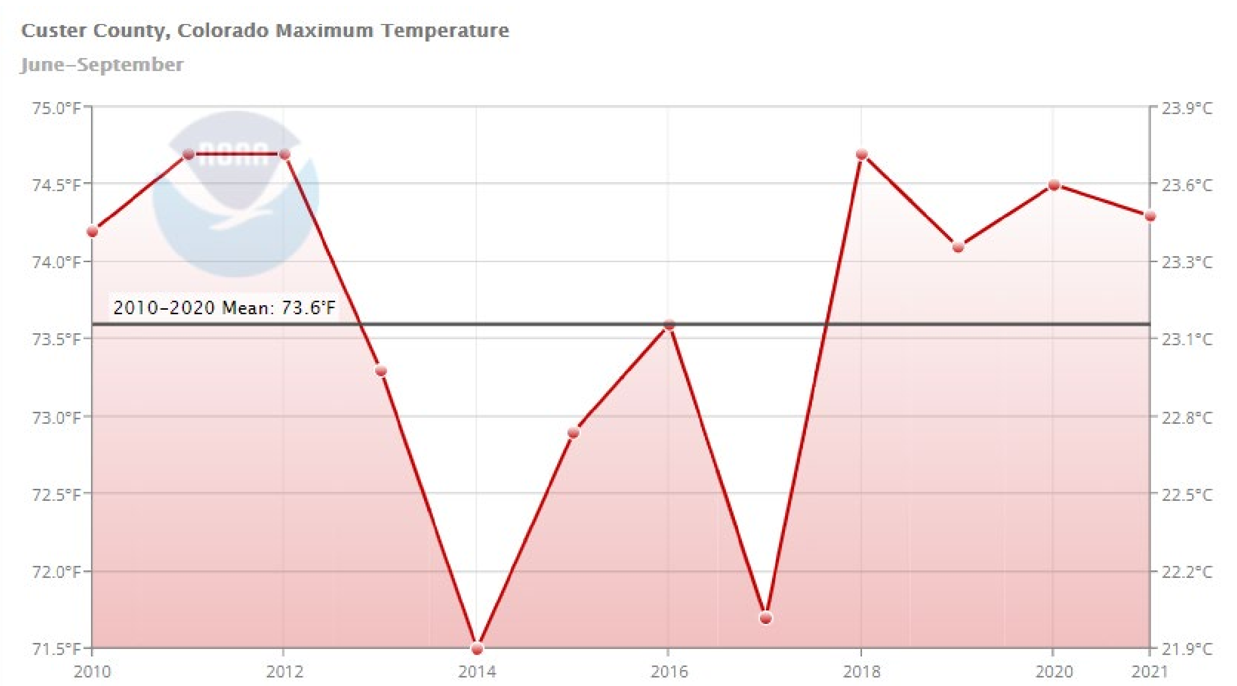
Based on National Weather Service data, Figure 47 contains the maximum temperature for Custer County by month each year from 2010 to 2020. Custer County sees the highest temperatures between June and September with an average of 73.6°F, shown in Figure 48. Table 28 illustrates the time period and consecutive days of temperatures higher than 85°F. This range was chosen based on being over 10°F higher than the average over that same period, as higher temperatures than normal can still have negative impacts.

Figure 47. Maximum Temperatures (2010-2020)



Source: NOAA Climate Data Online

Figure 48. Maximum Temperature between June and September (2010-2020)



Source: NOAA Climate Data Online

Table 28. Days in Custer County over 85°F (2010-2020)

Period	Total Days	High Temperature (°F)	Most Consecutive Days
June 2010	4	86	3
July 2010	7	88	5
June 2011	5	87	3
July 2011	20	90	12
August 2011	7	87	2
June 2012	9	91	5
July 2012	14	90	7
June 2013	7	93	4
July 2013	7	89	2
August 2013	6	88	3
September 2013	3	86	3
July 2014	4	87	2
June 2015	5	90	3
June 2016	7	90	5
July 2016	15	88	5
August 2016	2	89	2
June 2017	5	86	3
July 2017	9	87	3
June 2018	7	91	3
July 2018	17	90	6
June 2019	3	85	3
July 2019	11	89	7
August 2019	3	87	2
September 2019	4	86	3
July 2020	10	91	9
August 2020	19	90	8
September 2020	3	89	3

LOCATION

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

FREQUENCY

The county has seen a recent increase in temperatures and high heat day; however there is no record of an extreme heat day. According to the National Weather Service, data from the Westcliffe observation station show 26 days with 90°F or above highs since 2000. This averages to roughly one day each year. In 2020, there were three days that met those temperatures.

The average high temperature in the summer, between June and September, is 73°F. In 2020, during that period, there were 33 days where the temperature was 85°F and above. Between 2000 until 2020, there were 364 days where the temperature was 85°F and above, an average of approximately 18 days each year.

SEVERITY

Severity depends upon multiple factors, not just meteorological. Wind and the departure from typical temperatures change the actual temperature, but exposure and inability to find respite can make a bad situation turninto a deadly one. The characteristics of each building in which people reside and whether there is air conditioning or other temperature control means. Populations susceptible to heat for health reasons or due to occupation, such as construction, 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 excessive 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.

An excessive heat warning is issued within 12 to 24 hours before the onset of extremely dangerous heat conditions. An excessive heat watch is issued when conditions are favorable for excessive heat in the next 24 to 72 hours. A heat advisory is issued within 12 hours of the onset of dangerous heat conditions.

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.

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. Extreme heat events could become 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.

EXPOSURE AND VULNERABILITY

Everything in the planning area would be exposed, to some degree, to the impacts of moderate to extreme heat conditions. The majority of older homes in Colorado do not have air conditioning, making an extreme heat event even more dangerous.

LIFELINES

Power outages may occur as a result of extreme heat events. Additionally, transportation systems may experience disruption in services. According to the State of Colorado Hazard Mitigation Plan, 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.

POPULATION

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 strenuous manual labor.

It is critical these populations be identified in Custer 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.

PROPERTY

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.

ENVIRONMENT

Extreme heat is a natural phenomenon; however, the frequency and severity are increasing. The environment has evolved to cope with previous heat events, but new patterns could prove detrimental to flora and fauna. Extended periods of extreme heat can have unknown consequences, as well as those seen before such as increased algal blooms which can impact water sources.

ECONOMY

Extreme heat events may increase energy usage and therefore prices could impact the greater the economy.

FUTURE TRENDS IN DEVELOPMENT

Future population change across the county is expected to decrease by 0.4% over the next five years; however, steady 0.3% to 0.5% growth is projected through 2050. The projected growth is expected to occur primarily as municipal infill. Vulnerability to extreme heat will increase as population growth increases, especially in municipal areas, but structures are not expected to see any increased risk from extreme heat events.

FLOOD

MODERATE RISK

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
- mudflows or the sudden collapse of shoreline land

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

The causes of floods relate directly to the accumulation of water from precipitation, rapid snowmelt, or the failure of manmade structures, such as dams or levees. Floods caused by precipitation are further classified as coming from: rain in a general storm system, rain in a localized intense thunderstorm, melting snow, rain on melting snow, and ice jams. Floods may also be caused by structural or hydrologic failures of dams or levees. A hydrologic failure occurs when the volume of water behind the dam or levee exceeds the structure's capacity resulting in overtopping. Structural failure arises when the physical stability of the dam or levee is compromised due to age, poor construction and maintenance, seismic activity, rodent tunneling, or myriad other causes. For more information on floods resulting from dam and levee failure refer to Chapter 8 of this plan.

Flooding in the county is now predominantly the result of snowmelt and cloudbursts which result in flash flooding. Severe flash flooding poses the greatest risk. These rain events are most often microbursts, which produce a large amount of rainfall in a short amount of time. Flash floods, by their nature, occur suddenly but usually dissipate within hours. Despite their sudden nature, the National Weather Service is usually able to issue advisories, watches, and warnings in advance of a flood. In mountainous, rugged terrain runoff can damage drainage systems or cause them to fail.

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.

PAST EVENTS

Table 29 presents SHELDUS (Spatial Hazard Events and Losses Database for the United States) data regarding reported damages per decade since 1960. In Custer County there were no reported damaging flood events between 1960 and 1969 or 1980 and 1989.

Table 29. Historical Damaging Flood Events (1970-2019)

Date Range	Number of Events	Injuries	Deaths	Property Damage*	Crop Damage*
1970-1979	1	0	0	$1000	
1990-1999	4	0	0	$7,160,000	$560,000
2000-2009	6	0	0	$33,000	
2010-2019	12	0	0		

*Adjusted to 2019 US Dollars

The National Centers for Environmental Information's (NCEI) Storm Events Database includes flood events that happened in Custer County between 1991 and 2019, including those resulting in no reported damages. NCEI data are divided into specific "zones", which are areas with multiple counties, therefore some of the damages listed may have been incurred by multiple counties, including Custer County. It should be noted there are some reported damage discrepancies between NCEI and SHELDUS which stems from each source's reporting methodologies. Best available data are used and databases may not include the damage losses for recent events.

Notable incidents are described below:

- Between April 28 and May 1, 1999, heavy thunderstorms produced up to 8 inches of rain in 40 hours with some locations receiving in excess of 13 inches of rain in 48 hours. This led to widespread riverine flooding, especially along the Arkansas River. This event was issued a FEMA Disaster Declaration.

- On July 15, 2018, Hardscrabble Creek experienced extensive flash flooding due to heavy rains and runoff from the Junkins Fire burn scar which carried rock, mud, and vegetation with it. Water overtopped roads and cars were swept away, in some cases over a mile. Highway 96 was closed twice in two days between Westcliffe and Wetmore. The first time was for debris removal and the second was due to a slide which also impacted Colorado 165. No homes were lost.

LOCATION

Custer County is situated in the Arkansas River Basin with five major stream basins: Grape Creek, Texas Creek, Oak Creek, Hardscrabble Creek, and the St. Charles River. Grape Creek, the largest stream basin in Custer County, is fed by snowmelt from the Sangre de Cristo Range and the Wet Mountains. This is also the source that feeds into the DeWeese Reservoir which is the only high hazard dam in Custer County.

Custer County is currently coordinating with the Colorado Water Conservation Board (CWCB) to implement a flood hazard mapping project through FEMA's Risk MAP program. As part of the Discovery phase of this Risk MAP project, a Base Level Engineering (BLE) analysis was conducted across the county to evaluate the general flood risk and develop approximate (i.e., base level) floodplain information for all streams with drainage areas greater than one square mile. Both hydrology and hydraulics of the streams across Custer County were analyzed within BLE analysis models at an equivalent of a FEMA Zone A level of detail. Figure 49 illustrates the results of the Base Level Engineering (BLE) mapping for the county.

Figure 50 illustrates the 1% annual chance flood hazard areas across the county as modeled by FEMA's Hazus software. There are some instances of 'failed modeling reaches' in this figure, which are areas the software was unable to produce a flood depth grid to create the modeled floodplain. The concept of "1% annual chance flood hazard areas" is explained in the Frequency section below.

Figure 49. Risk MAP Base Level Engineering Floodplains

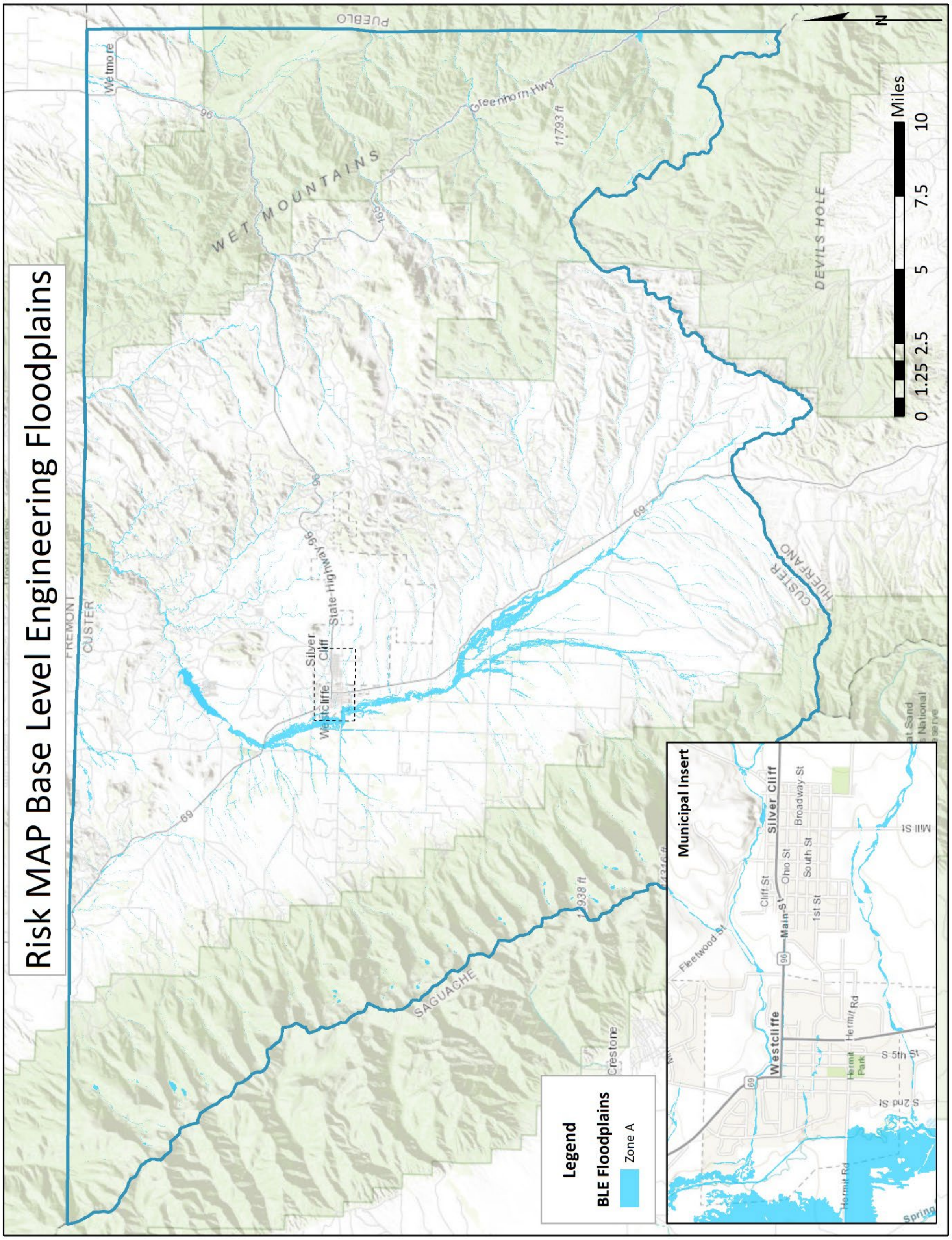
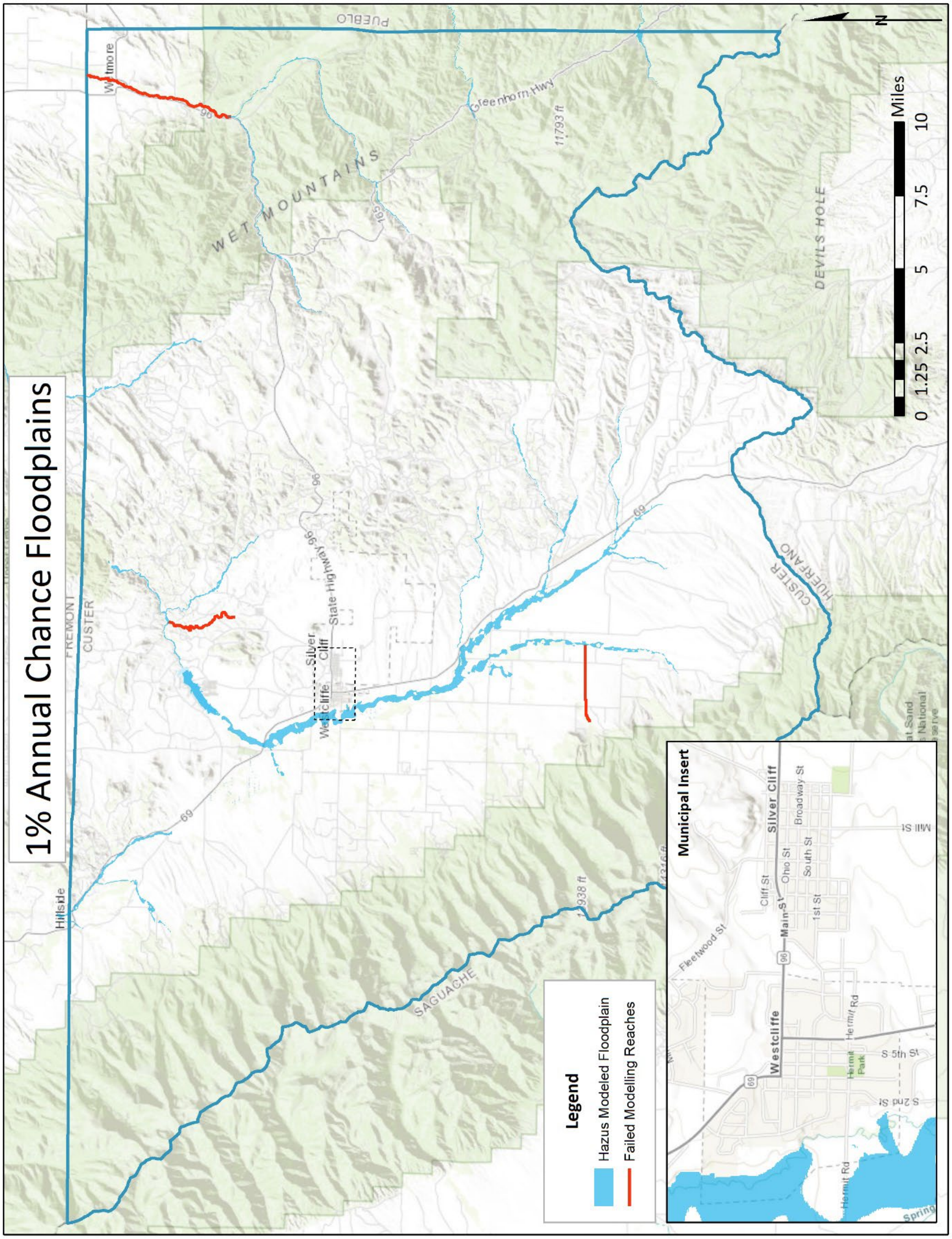


Figure 50. Annual 1% Chance Floodplains



FREQUENCY

Floods and flash floods are considered likely to occur, especially flash flooding which has seen an increase in severity and occurrence. Due to the Junkins burn scar, the potential for flooding has increased in areas that may not have been likely to flood before.

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. Unfortunately, at this time Custer County does not have any engineer-modeled digital floodplain boundaries. The only SFHA's identified exist on old hardcopy FEMA Flood Insurance Rate Map from 1978.

SEVERITY

The depth and velocity of floodwaters, coupled with the length of time areas remain inundated with water, determine the severity of the event. The Junkins burn scar increases the potential severity as areas that were able to take on high precipitation events previously are now more likely to flood due to the runoff over the burned area. This also increases the likelihood of debris to be carried with the flood waters leading to more damage and greater public safety concern.

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

The most problematic secondary hazard for flooding is debris flow. Another would be bank erosion, which in some cases can be more harmful than actual flooding. This is especially true in the upper courses of rivers with steep gradients, where floodwaters may pass quickly and without much damage, but scour the banks, edging properties closer to the floodplain or causing them to fall in. Flooding is also responsible for hazards such as landslides when high flows over-saturate soils on steep slopes, causing them to fail. Hazardous materials spills are also a secondary hazard if storage tanks, such as propane, rupture and spill into streams, rivers, or storm sewers.

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.

EXPOSURE AND VULNERABILITY

LIFELINES

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 getting crews in to make repairs. Bridges washed out or blocked by floods or debris also can cause isolation.

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

As part of this vulnerability assessment, the county’s Lifelines were evaluated compared to the 1% annual chance floodplains modeled by FEMA’s Hazus software. Table 30 presents Lifeline exposure to these hazards. Individual assessments of those exposed Lifelines can help to identify potential mitigation actions to consider implementing.

The most notable exposure of a Lifeline is Transportation, which has 48% of the infrastructure exposed. The Transportation Lifeline includes bridges, both roadway and railroad, and the airport.

Table 30. Lifeline Exposure to Flood

Lifeline	Total Count	Count Exposed	% Exposed to Risk
Communications	8		
Energy	2		
Energy (miles)	16.1	0.43	3%
Food, Water, & Shelter	14		
Health & Medical Facilities	2		
Safety & Security	8		
Transportation	21	10	48%
Transportation (miles)	80.7	1.9	2%

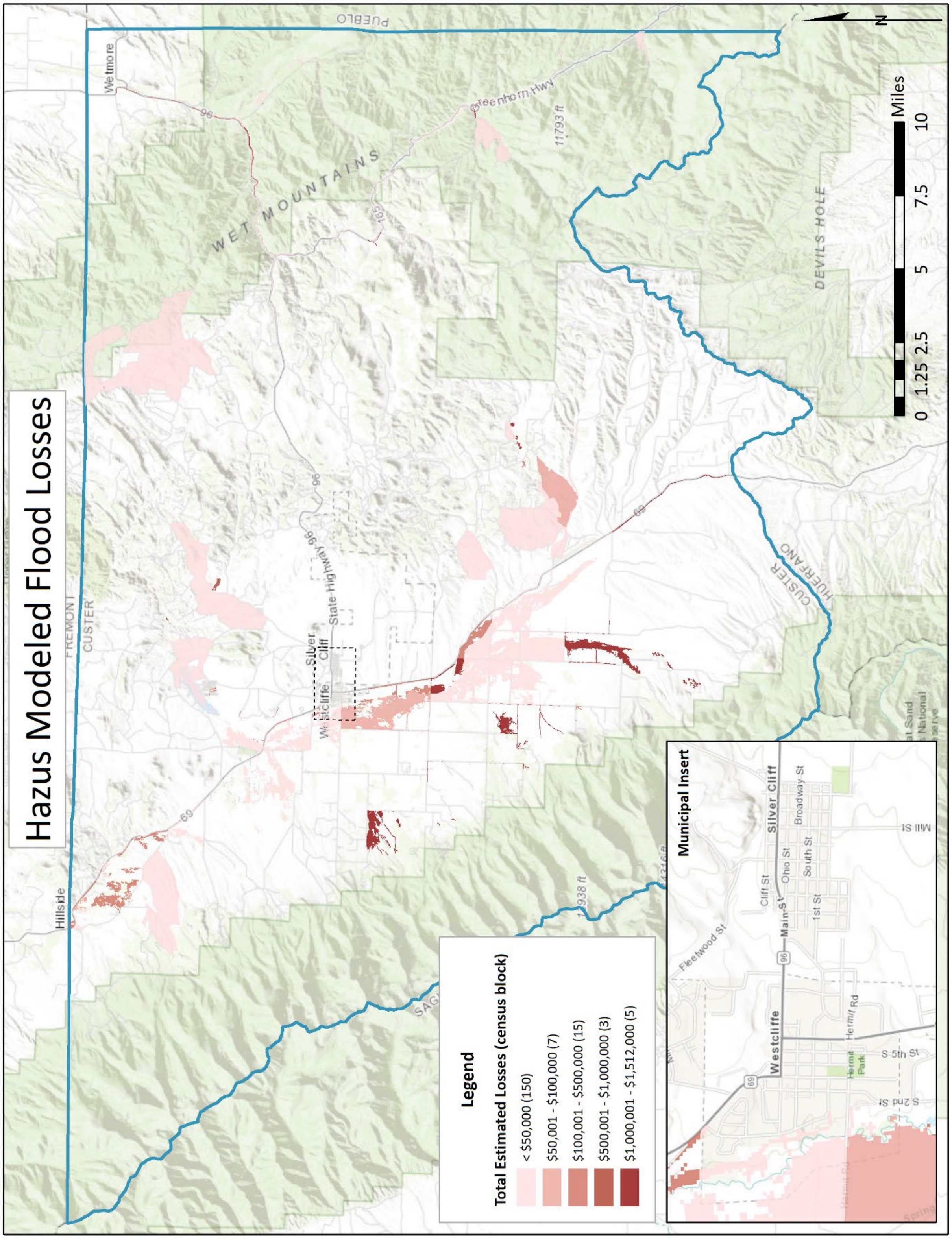
HAZUS

The most appropriate risk assessment methodology for flooding involves scenario modeling using FEMA's Hazus loss estimation software. Hazus is a very useful planning tool because it provides an acceptable means of forecasting flood damage, loss of function of infrastructure, and casualties, among many other factors.

Utilizing Hazus 5.0, an updated flood analysis was conducted for Custer County. The Hazus flood scenario modeled a countywide 1% annual chance flood event (100-year event). According to the Hazus inventory, there are an estimated 4,071 buildings in Custer County with a total building replacement value (excluding contents) of almost $654 million. Approximately 94% of the buildings (and 85% of the building value) are associated with residential housing.

Figure 51 details the estimated total economic losses based upon the 1% annual chance flood scenario. The Hazus tool performs its flood analysis at the Census Block level. It is clear some of the larger estimated flood losses correlate to those flood-prone areas with higher population and building densities, in one instance large losses relate to a commercial ranch located roughly 12 miles from Westcliffe off state route 96. A number of variables are included in Hazus analyses in order to arrive at the estimated values of loss. For this reason, it is important to note that the Hazus loss estimates should not be used as a precise measure, but rather viewed from the perspective of the potential magnitudes of expected losses.

Figure 51. Hazus Flood Estimated Losses



Other loss estimates from the Hazus scenario to note include:

- 117 buildings will be at least moderately damaged, 48 will be completely destroyed
- The analysis modeled no damages for "Essential Facilities" which includes hospitals, schools, fire & police stations, and EOCs
- The model estimates 225 people (75 households) will be displaced due to the flooding with 54 residents seeking shelter
- Total building-related losses are estimated to be almost $20.4 Million of which 78% is residential.
- The estimated business interruption losses total approximately $8.6 Million

For additional loss estimates and further details see Appendix C: Flood Hazus Risk Report.

POPULATION

Those in the community with access and functional needs (AFN), may be incapable of evacuating the flood area within the allowable 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 also be disproportionately impacted by the hazard.

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

PROPERTY

Many properties in the county are vulnerable to flooding, including those that may not be within a mapped floodplain. While some properties may 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 this is where water will collect. Bridges and roads are vulnerable to washout and utilities including power lines, cable and phone lines may be knocked down or rendered unusable by the waters.

Using the Hazus generated 1% annual chance floodplain, an evaluation of best available structure footprint data for the county was conducted. There are 41 structures located in the floodplain, all of which are located in unincorporated Custer County. Further analysis of the floodplain was completed using the BLE (Base Level Engineering) map created for Custer County as part of FEMA's Risk MAP project. This more detailed floodplain data showed 121 structures are exposed and the locations of these can be seen in Table 31. These assessments of exposure are more detailed than Hazus loss estimations, as utilizing building footprints is more accurate than the census block level the Hazus software uses to generalize analysis.

Table 31. Structure Exposure to 1% Annual Chance Floodplain

Location of Structure	Number of Structures
Unincorporated Custer County	116
Westcliffe	5
Total	**121**

ENVIRONMENT

Flooding is a natural event and floodplains provide many natural and beneficial functions. Nonetheless, with human development factored in, flooding can impact the environment in negative ways. Migrating fish can wash onto roads or over dikes into flooded fields, with no possibility of escape. Pollution from roads such as oil and hazardous materials can wash into rivers and streams. During floods, these can settle onto normally dry soils polluting them for agricultural uses.

ECONOMY

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.

Over the next 30 years, in any given year, it is possible that Custer County can see an expected annual damage loss of $600,000 due to flood, climate change, and no change in population. This is an average calculation over the time period which means years could have much higher or much lower losses, or none at all. Damage to bridge structures and buildings are expected to increase with climate change in the county. The FACE viewer can provide a more in-depth exploration of the impact of these variables on Custer County, as well as those from drought and fire hazards.

NATIONAL FLOOD INSURANCE PROGRAM

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.

Custer County and all municipalities in the county do not participate in the NFIP program. There is a countywide FIRM, dated 1978, which the insurance industry uses but it has never been adopted by Custer County. Currently FEMA is conducting updated floodplain mapping across the county and results are expected in 2023.

At this time, the Board of County Commissioners have decided not to participate in the NFIP after evaluating the benefits. Although flood mitigation is still seeing progression as the Custer County Road and Bridge department includes a mitigation action to “continue to participate in the Flood Mitigation Study conducted by FEMA and the CO DNR.”

FUTURE TRENDS IN DEVELOPMENT

Future population change across the county is expected to decrease by 0.4% over the next five years; however, steady 0.3% to 0.5% growth is projected through 2050. The projected growth is expected to occur primarily as municipal infill. It is important for municipalities to fully understand the risk presented by flood to those vulnerable areas to ensure new construction does not increase the county’s collective risk.

GEOLOGIC HAZARDS

MODERATE RISK

GENERAL BACKGROUND

SUBSIDENCE

According to the Colorado State Hazard Mitigation Plan, "ground subsidence is the sinking of land over human caused or natural underground voids and the settlement of native low density soils". Subsidence can occur gradually over time or virtually instantaneously. There are many different types of subsidence; however, in Colorado, there are three types of subsidence that warrant the most concern: settlement related to collapsing soils, sinkholes in karst areas, and the ground subsidence over abandoned mine workings.

Collapsible Soils

Collapsible soils are a group of soils that can rapidly settle or collapse the ground. The most common type of collapsible soil is hydrocompactive soil. According to the Colorado Geological Survey (CGS), "hydrocompactive soils form in semi-arid to arid climates in the western U.S. and large parts of Colorado in specific depositional environments" (CGS, 2014). These soils are low in density and in moisture content and are loosely packed together. Agents that bind these loosely packed particles together, such as clay and silk buttresses, are water sensitive. When water is introduced to these soils, the binding agents may quickly break down, soften, disperse, or dissolve. This results in a reorganization of the soil particles into a denser arrangement, which in turn results in a net volume loss indicated by resettlement or subsidence at the surface (CGS, 2014). Volume loss can be between 10 to 15 percent, which can result in several feet of surface-level displacement.

Karst Areas

Most sinkholes in Colorado are related to the dissolution of evaporite minerals or limestone. Evaporite minerals dissolve in water and include gypsum and halite. Rocks containing limestone also form sinkholes based on dissolution by water. The term "karst" describes a landscape that has been shaped by the dissolution of these types of bedrock (CGS, 2014). According to a newsletter issued by the CGS, "two characteristics of evaporative bedrock are important. One is that evaporative minerals can flow, like a hot plastic, when certain pressures and temperatures are exceeded. The second, and most important to land use and development is that evaporative minerals dissolve in the presence of freshwater. It is this dissolution of the rock that creates caverns, open fissures, streams out letting from bedrock, breccia pipes, subsidence sags and depressions, and sinkholes" (CGS, 2001).

Factors leading to the formation of sinkholes in these landscapes may be natural or may be induced by human activities. Natural contributing factors include the downward percolation of surface water through the rock formation or the lateral movement of water within a water table. Human activities that may contribute to such subsidence include stream channel changes, irrigation ditches, land irrigation leaking or broken pipes, temporary or permanent ponding of surface waters, and mining of soluble materials by means of forced circulation of water (CGS, 2014).

Abandoned Mine Workings

The underground removal of minerals and rock can undermine underground support systems and lead to void spaces. These voids can then be affected by natural and manmade processes such as caving, changes in flowage, or changes in overlying rock and soil material resulting in collapse or subsidence. Hazards from these abandoned sites are complicated by the fact that many “final mine maps” are inaccurate or incomplete (CGS, 2014). Mines operating after August 1997 were required, by federal and state law, to take potential surface subsidence into account; however, mining has been an activity in the state since the 1860s (CGS, 2001). There are some mapped, known mine hazard areas in Colorado and in Custer County; however, it is likely that there are additional hazard areas for which no records exist.

SOIL EROSION AND DEPOSITION

The CGS defines erosion as “the removal and simultaneous transportation of earth materials from one location to another by water, wind, waves, or moving ice” and deposition as “the placing of eroded material in a new location”. According to the CGS, all material that is eroded is later deposited in another location. Both erosion and deposition are continually occurring phenomenon, although the rate of erosion and deposition varies tremendously and can be affected by a variety of factors including rate of scour, type of material being eroded, and the presence or absence of vegetation.

EXPANSIVE SOIL

Expansive and collapsible soils are some of the most widely distributed and costly geologic hazards. Collapsible soils are a group of soils that can rapidly settle or collapse the ground. They are also known as metastable soils and are unsaturated soils that undergo changes in volume and settlement in response to wetting and drying, often resulting in severe damage to structures. The sudden and usually large volume change could cause considerable structural damage.

Expansive soil and rock are characterized by high clay mineral content, which expands in volume as it comes into contact with moisture and shrinks as it dries. The force from this expansion can be anywhere from 15,000 to 30,000 pounds per square foot, which easily affects the integrity of foundations, slabs, and structures. Soil drying and shrinkage can be due to trees and shrubs placed closely to a structure. The parent (source) rock most associated with expansive soils is shale.

PAST EVENTS

SUBSIDENCE

There are no historic sinkholes in Custer County and according to the USGS, the risk of ground collapse is low. The only recorded incidence of a sink hole was in 1996 in the reservoir of the Balman Dam, which ultimately caused a breach.

SOIL EROSION AND DEPOSITION

Soil erosion and deposition events are continually occurring throughout the county.

EXPANSIVE SOIL

Custer County soils are mostly underlain by soils with little to no clays with swelling potential in the mountains. The lower elevation areas are exposed to low risks from expansive soil. Expanding soils can cause structural damage, but past events are difficult to identify and measure due to the slow nature of the hazard’s effects.

LOCATION

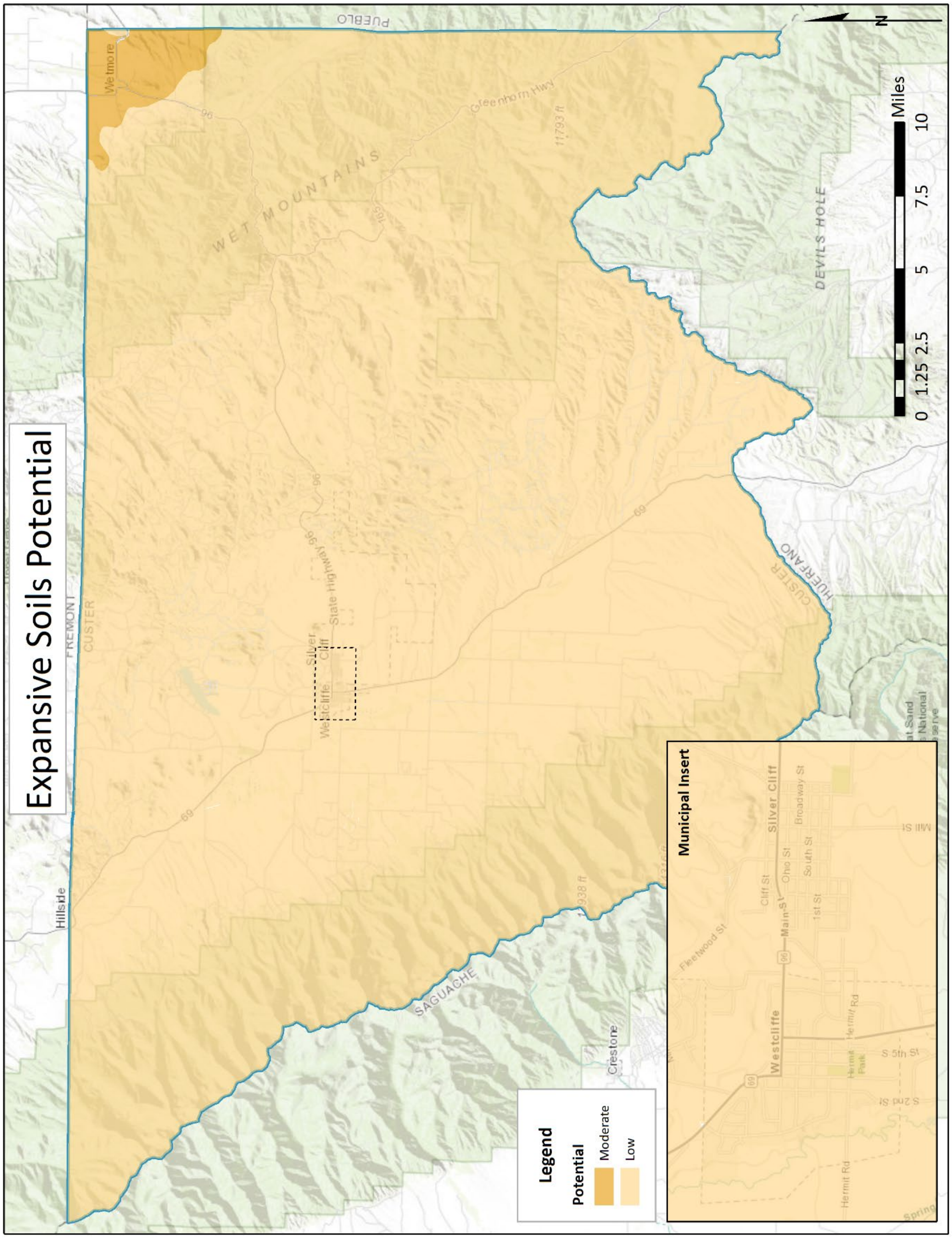
SUBSIDENCE

Custer County has very low risk to subsidence and there are no mapped areas of potential exposure.

EXPANSIVE SOILS

The planning area is exposed to minimal risks from expansive soil since the mountainous terrain of the county have very little underlay of clay soils. Figure 52 shows the potential areas of expansive soils and only the areas with moderate risk were used when assessing Lifeline exposure.

Figure 52. Expansive Soils Potential



EROSION AND DEPOSITION

Soil erosion and deposition occur in all parts of the county. Point sources of erosion often occur in areas where humans interact with exposed areas of the earth's surface, such as construction sites. Waterways are continually involved in erosion and deposition processes. Erosion and deposition may be exacerbated in areas where wildfires have occurred. According to the State of Colorado's Hazard Mitigation Plan, "there is a high risk for erosion in the aftermath of a wildfire event. As a fire burns, it destroys plant material and the layers of litter that blanket the floor of an ecosystem. These materials, as well as trees, grasses, and shrubs, buffer and stabilize the soil from intense precipitation. The plant materials slow runoff to give rainwater time to percolate into the ground. When fire destroys this protective layer, rain and wind wash over the unprotected soil and erosion occurs". Areas in Custer County that were recently burned are more susceptible to exacerbated erosion and deposition. Additionally, areas with high slopes and mountainous regions have a higher susceptibility to soil erosion.

FREQUENCY

Soil erosion and deposition are occurring continuously throughout the county. Subsidence and expansive soil events are rare. Large precipitation events and human activity may influence the frequency of all of these events within the county.

SEVERITY

The severity of subsidence and sinkholes, as well as soil erosion and deposition, is largely related to the extent and location of areas that are impacted. Such events can cause property damage and in some cases loss of life; however, events may also occur in remote areas of the county where there is little to no impact to people or property. According to the CGS, "In general, the type and severity of surface subsidence is governed by the amount of ground surface and the location of removal or compression, and the geological conditions of a particular site".

Expansive soil can have an impact on the integrity of building foundations over a period of time with many wet/dry cycles. However, it is difficult to recognize the impacts until the damage becomes considerable.

WARNING TIME

Subsidence can happen suddenly and without warning or can occur gradually over time. Soil erosion and deposition generally occurs gradually over time; however, these processes may be intensified due to natural or human-induced activities. There are some instances where the rate of subsidence can be calculated, particularly subsidence that occurs due to mining activities (Colorado Geological Survey, 2001).

SECONDARY HAZARDS

Events that cause damage to improved areas can result in secondary hazards, such as explosions from natural gas lines and loss of utilities, such as water and sewer, due to shifting infrastructure. These events could also cause potential failures of reservoir dams. Additionally, these events may occur simultaneously with other natural hazards such as flooding. Erosion can cause undercutting which can result in an increase in landslide or rockfall hazards. Additionally, erosion can result in the loss of topsoil, which can affect agricultural production in the area. Deposition can have impacts that aggravate flooding, bury crops, or reduce capacities of water reservoirs.

CLIMATE CHANGE IMPACTS

Changes in precipitation events and the hydrological cycle may result in changes in the rate of subsidence and soil erosion. According to a 2003 paper published by the Soil and Water Conservation Society (Soil and Water Conservation, 2003):

> The potential for climate change – as expressed in changed precipitation regimes – to increase the risk of soil erosion, surface runoff, and related environmental consequences is clear. The actual damage that would result from such a change is unclear. Regional, seasonal, and temporal variability in precipitation is large both in simulated climate regimes and in the existing climate record. Different landscapes vary greatly in their vulnerability to soil erosion and runoff. Timing of agricultural production practices creates even greater vulnerabilities to soil erosion and runoff during certain seasons. The effect of a particular storm event depends on the moisture content of the soil before the storm starts. These interactions between precipitation, landscape, and management mean the actual outcomes of any change in precipitation regime will be complex.

EXPOSURE AND VULNERABILITY

Overall, subsidence / erosion / expansive soil impacts would be limited in Custer County. These hazards are very localized and exposure is entirely based upon the physical location of assets.

LIFELINES

Any Lifelines located on or near areas of expansive soils, or areas prone to subsidence or soil erosion are exposed to risk from the hazard. Deposition may result in additional exposure.

Subsidence can result in serious structural damage to critical facilities and infrastructure such as roads, irrigation ditches, underground utilities, and pipelines. According to CGS, large ground displacements caused by collapsing soils can completely destroy roads and structures and alter surface drainage. Minor cracking and distress may result as the improvements respond to small adjustments in the ground beneath them. Erosion can also impact structures, such as bridges and roads, by undermining their foundations. Structures and underground utilities found in areas prone to subsidence or soil erosion can suffer from distress. Long term effects of expansive soils can affect the integrity of structural foundations and roadways over time.

As part of this vulnerability assessment, the county's Lifelines were assessed versus those areas identified as having a moderate hazard risk as shown in Figure 52 (note there are no high risk areas in the county). Table 32 presents Lifeline exposure to this hazard. Individual assessments of those exposed Lifelines can help to identify potential mitigation actions to consider implementing.

The Safety & Security and Transportation Lifelines have the only exposure to expansive soil moderate risk areas.

Table 32. Lifeline Exposure to Expansive Soil

Lifeline	Total Count	Count Exposed	% Exposed to Risk
Safety & Security	8	1	13%
Transportation	21	1	5%
Transportation (miles)	80.7	1.8	2%

Due to the nature of subsidence and erosion / deposition, data is unavailable to assess Lifeline exposure.

POPULATION

Individuals living or travelling in areas prone to subsidence and erosion are exposed to the hazard. The risk of injury or fatalities as a result of these hazards are limited, but possible. Spontaneous collapse and opening of voids are rare, but still may occur resulting in death or injury to any people in the area at the time. It is likely that any such injuries would be highly localized to the area directly impacted by an event. Erosion can adversely impact populations who have respiratory issues by reducing air quality, so those with existing respiratory issues are likely to be more vulnerable.

PROPERTY

Structures and other improvements located in areas of expansive soils or areas prone to subsidence or erosion are exposed to risk from these hazards. Additionally, deposition may result in damage to structures and property. Property exposed to subsidence and erosion can sustain minor damages or can result in complete destruction. According to CGS, merely an inch of differential subsidence beneath a residential structure can cause several thousand dollars of damage. Structures may be condemned due to this damage, resulting in large losses. FEMA estimates that there are over $125 million in losses in the U.S. annually as a result of subsidence.

Based on an evaluation of best available structure footprint data for the county, 130 structures are exposed to moderate risk expansive soil areas in unincorporated Custer County. There are no structures exposed in the municipalities.

ENVIRONMENT

Subsidence and erosion are all naturally occurring processes which can still cause damage to the natural environment. Environments located in areas prone to subsidence and erosion are exposed. Ecosystems that are exposed to increased sedimentation from erosion and deposition can experience degraded habitat. However, some erosion and deposition are required for healthful ecosystem functioning. Ecosystems that are already exposed to other pressures, such as encroaching development, may be more vulnerable to impacts from these hazards.

ECONOMY

Damage to infrastructure, critical facilities, and property due to subsidence and erosion could have long term impacts on the economy. If Lifelines are disrupted, such as power, the day-to-day operations of the county may be on hold until the component is restored. The potential loss of property could affect individual businesses or a larger portion of the community. Any prolonged delays in repairing damages could result in losses for businesses, industry, and the local economy.

FUTURE TRENDS IN DEVELOPMENT

The severity of landslide problems is directly related to the extent of human activity in hazard areas. Adverse effects can be mitigated by early recognition and avoiding incompatible land uses in these areas or by corrective engineering. In areas where hazards may be present, permitting processes should require geotechnical investigations to access risk and vulnerability to hazard areas.

Future population change across the county is expected to decrease by 0.4% over the next five years; however, steady 0.3% to 0.5% growth is projected through 2050. The projected growth is expected to occur primarily as municipal infill. As these areas are not at high risk from subsidence / erosion, future development is not expected to greatly increase the risk to this hazard.

HAZARDOUS MATERIALS RELEASE

MODERATE RISK

GENERAL BACKGROUND

A hazardous material (also known as Hazmat) is defined by the U.S. Department of Transportation as "articles or substances which are capable of posing a risk to health, safety, property, or the environment, are listed or classified in the regulations and are transported in commerce."

Hazardous materials are defined and regulated in the United States primarily by laws and regulations administered by the U.S. Environmental Protection Agency (EPA), the U.S. Occupational Safety and Health Administration (OSHA), the U.S. Department of Transportation (DOT), and the U.S. Nuclear Regulatory Commission (NRC). Each has its own definition of a "hazardous material."

For the purpose of tracking and managing hazardous materials, the DOT divides regulated hazardous materials into nine classes. These classes are:

Class 1: Explosives
Class 2: Compressed Gases
Class 3: Flammable Liquids
Class 4: Flammable Solids
Class 5: Oxidizers and Organic Peroxides
Class 6: Toxic Metals
Class 7: Radioactive Material
Class 8: Corrosive Material
Class 9: Miscellaneous

PAST EVENTS

The Pipeline and Hazardous Materials Safety Administration's (PHMSA) Incident Reports Database, shows a single hazardous material incident reported in Custer County in 1990. This transport incident, which occurred in Westcliffe, was due to human error of overfilling roughly 100 gallons of gasoline upon delivery to a gas station.

LOCATION

Hazardous material releases can occur at the facility where they are being stored or utilized, and when in transit via railway, highway, or pipeline.

FREQUENCY

In Custer County, this type of event is very rare, due to the lack of state designated transportation routes and fixed site facilities handling hazardous materials.

SEVERITY

Severity of this hazardous varies greatly as it depends on a variety of factors. The location of the release, whether in transport or fixed site, the proximity to the public and number of people affected, time of day, as well as potential to impact waterways. The type of chemical released and how it releases, liquid or gas, determines if the chemical can be dispersed in the air. Weather conditions are another factor, as winds can carry hazardous gasses to communities nearby and precipitation can wash away materials that need to be remediated in specific ways.

WARNING TIME

Warning time for hazardous materials release is typically short, as human error causes a large amount of events and would not typically have a long onset. Incidents with materials in transport would also have a very short warning time, as an accident would happen with little to no time to react.

SECONDARY HAZARDS

A possible secondary hazard would be fire depending on location of facility or vehicle in transport, as well as the type of chemical and cause of the release. Contamination of a waterway could have public health impacts on safety depending on amount released, proximity to population, and how the water is utilized, recreationally or as drinking water. Air quality could also be impacted based on type of chemical and nature of the release.

CLIMATE CHANGE IMPACTS

Climate change is not expected to greatly impact hazardous material releases; however, erratic weather patterns have the potential to cause more transport accidents.

EXPOSURE AND VULNERABILITY

LIFELINES

Multiple Lifelines can be impacted by a hazardous material release including Transportation, Food, Water & Shelter, and Health & Medical. Transportation is the most likely to be impacted as releases commonly happen in transit. These impacts are typically short term, causing transportation delays and road closures, but depending on the damage from the released material roads may need to be repaired.

Food, Water & Shelter can be impacted if a release contaminates a water supply, or soil, possibly affecting the long-term safety of crops. Evacuations are possible after a release in a populated area and can displace the public until the incident is handled, requiring sheltering resources.

Health and Medical can be impacted if a large group is affected by a release at the same time, putting a strain on specific hazardous material response equipment, medical personnel, and resources.

POPULATION

Exposure to a hazardous materials release can happen in a variety of ways, both direct and indirect. Facilities handling hazardous materials can have releases that greatly differ in size and complexity. Some releases may only put the handler or those in the immediate vicinity at risk. Other releases may require evacuations of the facility and possibly the surrounding area. Air quality can be impacted over great distances depending on the site, the type of hazardous materials, and the wind. If a release ends up in a waterway it can affect the population downstream, both recreational safety and drinking water quality.

The same is true for a release that happens in transit, depending on the chemical, location, weather, and density of population nearby, a release can drastically vary in risk to the public.

PROPERTY

Property damage can be extensive and widespread depending on the release. At the facility, damages can include equipment, the building, and the surrounding area. Releases onto roadways can require recovering of the asphalt depending on the chemical damage, and release into soil or waterways can result in extensive costs due to necessary cleanup protocols. Equipment used for transit can be unusable after an incident, due to chemical or physical damage.

ENVIRONMENT

Impacts from spills and releases can have long lasting effects. Soil and water contamination can occur, necessitating costly remediation. Animals and plants could also be impacted long term and lead to unhealthy ecosystems.

ECONOMY

The economy would likely not be affected long term; however, if a release impacts transportation corridors, pipelines, or rail lines there could be a delay in important commodity transfer. Individual facilities may see an economic impact depending on the extent of the release, which could disrupt or halt operations for an extended period. The clean-up costs could also impact the economy, locally and possibly regionally, as the size of the spill could necessitate multiple agencies responding, construction to repair damages, and the possibility of environmental remediation.

FUTURE TRENDS IN DEVELOPMENT

Future population change across the county is expected to decrease by 0.4% over the next five years; however, steady 0.3% to 0.5% growth is projected through 2050. The projected growth is expected to occur primarily as municipal infill. Future development is not expected to greatly increase the risk to this hazard, as it occurs infrequently and the only incident on record is a single overfilling of a container.

LANDSLIDE / DEBRIS FLOW / ROCKFALL

MODERATE RISK

GENERAL BACKGROUND

LANDSLIDE

A landslide is a general term for a variety of mass-movement processes that generate a downslope movement of soil, rock, and vegetation under gravitational influence. Some of the natural causes of ground instability are stream and lakeshore erosion, heavy rainfall, and poor-quality natural materials. In addition, many human activities tend to make the earth materials less stable and, thus, increase the chance of ground failure. Human activities contribute to soil instability through grading of steep slopes or overloading them with artificial fill, extensive irrigation, construction of impermeable surfaces, excessive groundwater withdrawal, and removal of stabilizing vegetation. Landslides typically have a slower onset and can be predicted, to some extent, by monitoring soil moisture levels and ground cracking or slumping in areas of previous landslide activity.

Landslides are caused by one or a combination of the following factors: change in slope of the terrain, increased load on the land, shocks and vibrations, change in water content, groundwater movement, frost action, weathering of rocks, and removing or changing the type of vegetation covering slopes. In general, landslide hazard areas are where the land has characteristics that contribute to the risk of the downhill movement of material, such as the following:

- A slope greater than 30 percent.
- A history of landslide activity or movement during the last 10,000 years.
- Stream activity, which has caused erosion, undercut a bank, or cut into a bank to cause the surrounding land to be unstable.
- The presence or potential for snow avalanches.
- The presence of an alluvial fan, indicating vulnerability to the flow of debris or sediments.
- The presence of impermeable soils, such as silt or clay, which are mixed with granular soils such as sand and gravel.

Slides and earth flows can pose serious hazard to property in hillside terrain. They tend to move slowly and thus rarely threaten life directly. When they move—in response to such changes as increased water content, earthquake shaking, addition of load, or removal of downslope support—they deform and tilt the ground surface. The result can be destruction of foundations, offset of roads, breaking of underground pipes, or overriding of downslope property and structures.

DEBRIS FLOW

Debris flows are among the most destructive geologic processes that occur in mountainous areas. A debris flow is a mass of water and earth materials that flows down a stream, ravine, canyon, arroyo, or gulch. Technically, if more than half of the solids in the mass are larger than sand grains (e.g., rocks, stones, boulders) the event is called a debris flow, otherwise it is called a mudslide or mudflow. For the purposes of this plan the term debris flow is meant to be a global term to include mudslides/mudflows. Many of Colorado's older mountain communities, built in major mountain valleys, are located on or near debris fans. A debris fan is a conical landform produced by successive mud and debris flow deposits, and the likely spot for a future event. Three of the five conditions necessary for debris flows to occur: (1) steep slopes, (2) loose rock and soil material, and (3) clay minerals, are adequately met by the geography and geology in the Custer County area. The last two conditions for debris-flow occurrence: (4) sufficient antecedent soil moisture, and (5) rainfall of sufficient intensity and duration to initiate slope movement, are provided by snowmelt and intense summer thunderstorms.

The debris flow problem can be exacerbated by wildfires which remove vegetation that serves to stabilize soil from erosion. Heavy rains on the denuded landscape can lead to rapid development of destructive mudflows.

ROCKFALL

A rockfall is the falling of a detached mass of rock from a cliff or down a very steep slope. Weathering and decomposition of geological materials produce conditions favorable to 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. Rockfalls can threaten human life, impact transportation corridors and communication systems, and result in other property damage. Spring is typically the landslide/rockfall season in Colorado as snow melts saturates soils and temperatures enter into freeze/thaw cycles. Rockfalls and landslides are influenced by seasonal patterns, precipitation, and temperature patterns. Earthquakes could trigger rockfalls and landslides too.

PAST EVENTS

The National Centers for Environmental Information's (NCEI) Storm Events Database does not list any landslide / rockfall events that impacted Custer County between 1996 and 2020. Additionally, SHELDUS lists no records of landslide events within the county.

NCEI lists the only debris flow event for the county on August 29th, 2020. It was caused by excessive rainfall over the Junkins Fire burn scar. There were no reported damages, deaths, or injuries.

Local media coverage detailed rockslide on July 23rd, 2019, which closed the road at Highway 96 and County Road 387, causing many commuters traveling to Westcliffe to find alternate routes. Information on how long the closure continued was not available.

According to the USGS, there have been many recorded landslide events in Custer County. The majority of the events have been focused in high mountainous areas, however. Numerous other past events have occurred, but there are currently no official records relating to past events and specifics on their impacts.

LOCATION

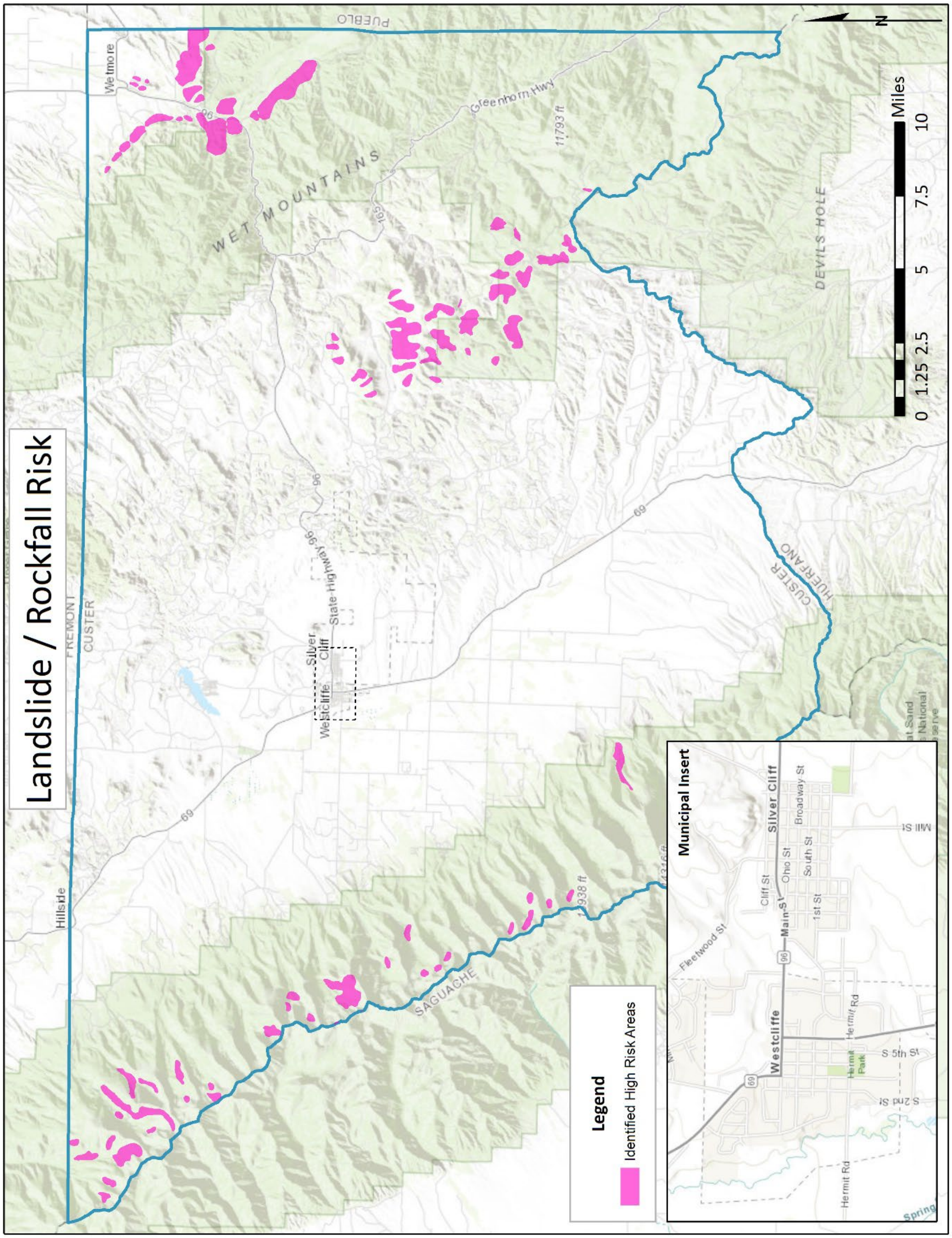
According to the State of Colorado Hazard Mitigation Plan, "Many of Colorado's landslides occur along transportation networks because soil and rock along the transportation corridor has been disturbed by roadway construction. Construction along roads can occur with or without proper landslide hazard mitigation procedures. The cost to maintain, cleanup, monitor, and repair roads and highways from landslide activity is difficult to assess, but the best records come from CDOT, which is responsible for maintaining Colorado roads and highways".

The best available predictor of where movement of slides and earth flows might occur is the location of past movements. Past landslides can be recognized by their distinctive topographic shapes, which can remain in place for thousands of years. Most landslides recognizable in this fashion range from a few acres to several square miles. Most show no evidence of recent movement and are not currently active. A small proportion of them may become active in any given year, with movements concentrated within all or part of the landslide masses or around their edges.

The recognition of ancient dormant mass movement sites is important in the identification of areas susceptible to flows and slides because they can be reactivated by earthquakes or exceptionally wet weather. Also, because they consist of broken materials and frequently involve disruption of groundwater flow, these dormant sites are vulnerable to construction-triggered sliding.

The geographic location of identified landslide / rock fall areas throughout Custer County is isolated and in the backcountry. Figure 53 shows these hazard areas.

Figure 53. Landslide / Rockfall Risk



FREQUENCY

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.

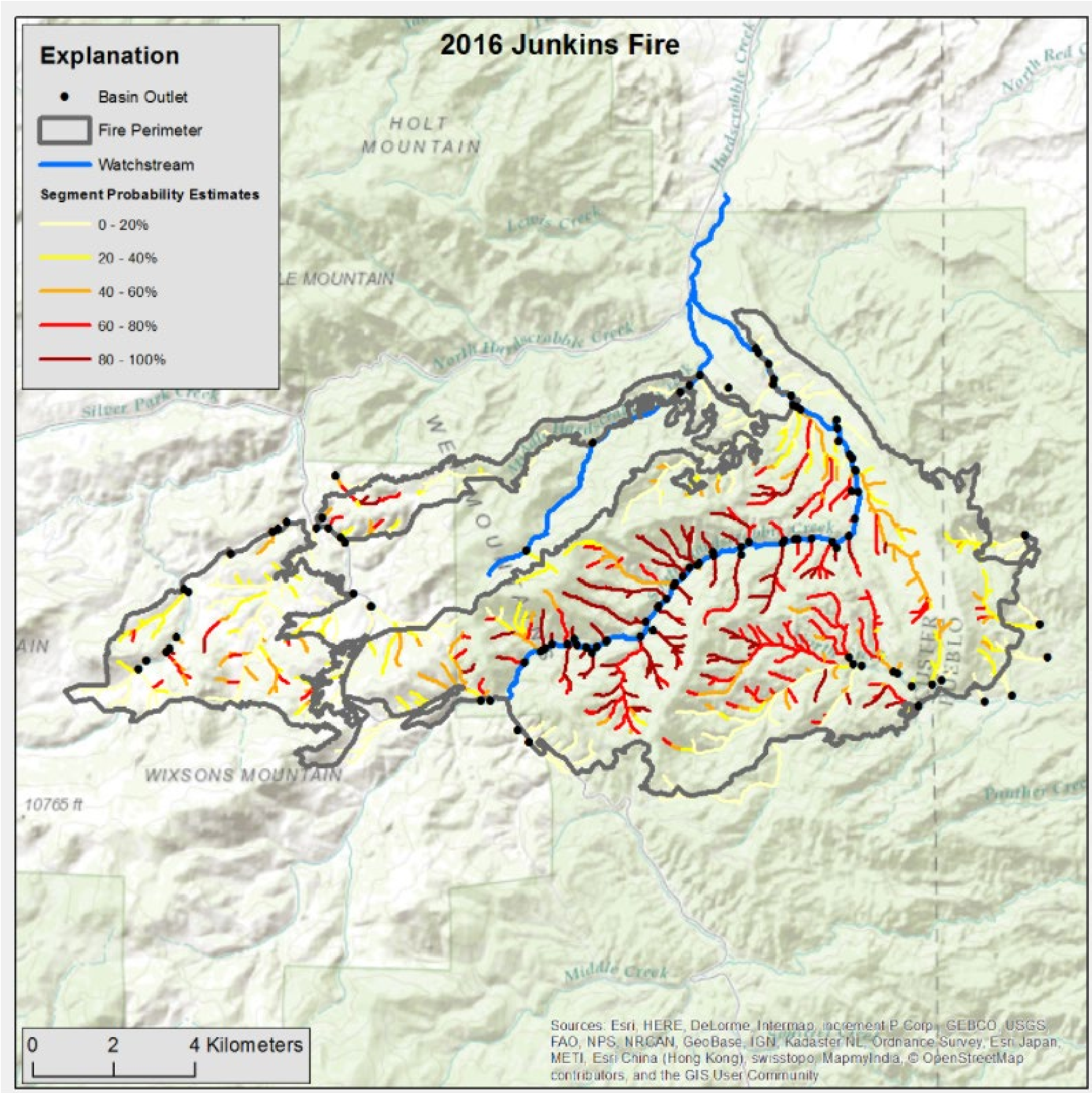
Debris flows can occur rapidly with little warning during torrential rains. Debris and mudflows generally occur with floods and downpours associated with the late summer monsoon season. Quantitative data availability is limited but, future debris flow events are likely to occur across the county regularly.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

With the aftermath burn scar of the Junkins Fire, there is considerable potential for increased debris flows. The USGS, as part of the Landslide Hazard Program, creates maps using data from modeling possible weather conditions and determines areas with high probability of debris flows.

The USGS map below, Figure 54, depicts the likelihood of debris-flow generation (%) in the area affected by the Junkins Fire. Other maps illustrate the estimates of flow magnitude in locations where debris flows initiate, potential volume of debris flow (in m^3), and combined relative debris flow hazard. These predictions are made at the scale of the drainage basin, and at the scale of the individual stream segment. Estimates of probability, volume, and combined hazard are based upon a storm design with a peak 15-minute rainfall intensity of 24 millimeters per hour (mm/h) which is approximately one inch per hour.

The USGS map, along with other interactive maps, data, and an explanation of the modeling process can be found at Emergency Assessment of Post-Fire Debris-Flow Hazards (usgs.gov).

Figure 54. USGS Estimated Debris Flow Likelihood Post Junkins Fire



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.

In 2015, CDOT published a white paper entitled "The Economic Impacts of Geologic Hazard Events on Colorado Transportation Facilities" (CDOT 2015). The document 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.

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, 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 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.

CLIMATE CHANGE IMPACTS

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

Although there is no consensus that annual mean precipitation will increase in Colorado due to climate change, it is possible that precipitation may increasingly come in the form of extreme thunderstorms. These high-intensity rainfall events could lead to increased flash flood conditions, which exacerbates the potential for debris flows. Additionally, climate change is contributing to an increased frequency of high-intensity wildfires across the western United States. These high-intensity wildfires can decimate vegetation, which increases the risk for debris flows during a rain event.

EXPOSURE AND VULNERABILITY

Landslide / rockfalls can damage property, close roads, and cause injuries or death. A road closed due to hazard activity can result in serious transportation disruptions due to the limited number of roads in the county.

Debris flows can damage property, close roads, and cause injuries or death. A road closed due to debris flow activity can result in serious transportation disruptions due to the limited number of roads in the county.

LIFELINES

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

As part of this vulnerability assessment, the county's Lifelines were assessed with the hazard risk areas seen in Figure 53. Individual assessments of those exposed Lifelines can help to identify potential mitigation actions to consider implementing.

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.

Of the Lifelines, transportation systems will be 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.

Based on an evaluation of best available Lifeline data for the county, one transportation structure and less than one mile (0.65) of transportation mileage are in an area of potential landslide exposure.

POPULATION

Exposure to landslide hazard areas is likely limited. Individuals in recreation areas or driving on roadways may also 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.

PROPERTY

Properties can be damaged by landslide events; however, much of the areas where these events occur do not contain a significant amount of structures. Roads and bridges are of the highest concern when considering effects of landslide and debris flow events.

While there may be damage in most events, there will be limited property damage to structures. Based on an evaluation of best available structure footprint data for the county, 32 structures are exposed to landslide susceptible areas in Custer County. All of these structures are in unincorporated areas of the county.

ENVIRONMENT

Environmental problems, as a result of mass movements, can be numerous. Landslides that fall into streams may significantly impact fish and wildlife habitat, as well as affecting water quality and spawning habitat. Hillsides that provide wildlife habitat can be lost for prolonged periods of time due to landslides.

Debris flows can affect the environment by altering waterways with the sediment and other materials that are carried. This may impact water quality and any flooding that may have resulted from the debris flow also poses a risk to drinking water.

ECONOMY

Economic impacts of landslides can be due to the obstruction of transporting goods and the costs of repairs to damaged areas. However, greater impact to the overall economy of the county is not significant.

FUTURE TRENDS IN DEVELOPMENT

The severity of landslide/debris flow problems is directly related to the extent of human activity in hazard areas. Adverse effects can be mitigated by early recognition and avoiding incompatible land uses in these areas, or by corrective engineering. The mountainous topography of the county presents considerable constraints to development, most commonly in the form of steeply sloped areas. These areas are vulnerable to disturbance and can become unstable. Most of these areas are adjacent to roadway systems that are heavily used.

Future population change across the county is expected to decrease by 0.4% over the next five years; however, steady 0.3% to 0.5% growth is projected through 2050. The projected growth is expected to occur primarily as municipal infill. As these areas are not at high risk from landslide / rockfall, future development is not expected to greatly increase the risk to this hazard.

Continued adherence to the land development codes and regulations in the planning area will decrease the risk of future development to landslide hazard areas. Most construction has been limited to non-hazard areas.

PUBLIC HEALTH HAZARDS

HIGH RISK

GENERAL BACKGROUND

Public health hazards are those that can adversely impact the health and environment of a large number of people. These hazards can manifest as primary events by themselves, such as epidemics and pandemics, or they may be secondary to another disaster or emergency, such as a flood, severe thunderstorm or winter weather, or hazardous materials release incident. Environmental components of public health hazards that can affect the health of the community include air and water quality, which can be affected by pollutants, such as disease or smoke from a fire.

Public health hazards affect communities differently, based on the exposure to a hazard and the health and well-being of each resident. Many factors are looked at when determining risk for the public and individuals at the local level including the quality of health, the availability of clinical services, and the level and duration of exposure to a hazard.

There are daily operations in communities which could pose health risks, such as water and air quality, as well as proximity to hazardous materials. Communities live with these everyday but the hazards that garner the most attention are those that affect the population at a greater rate and to a greater extent, such as disease outbreaks.

Disease outbreaks come in many forms, such as bacteria, viruses, and fungi, which can be spread through the air, water, and on surfaces. Outbreaks, including epidemics and pandemics, have the potential to cause serious illness, distress, and death, especially among those who have compromised immune systems due to age or underlying medical conditions.

Epidemics are disease outbreaks that typically only affect members of the local community and do not spread to other areas. A pandemic is an epidemic that spreads to a large population across country borders. These are most often caused by new subtypes of viruses or bacteria for which humans have little or no natural resistance. Consequently, pandemics typically result in more deaths, social disruption, and economic loss than epidemics.

Another public health issue is traumatic events, when a community has a shocking or distressing event which impacts physical, emotional, and psychological well-being. These events can have long-term impacts on the public and require support resources. It is important to recognize behavioral and mental health in the community, in day-to-day life and after an event, to better support the affected population.

PAST EVENTS

As of this plan's writing, the county is in the midst of a pandemic with a new virus, which emerged in China in December 2019 and was named the 2019 Novel Coronavirus (COVID-19). In Custer County, the first COVID case presented on April 2nd, 2020. As of this plan's writing the COVID-19 case count in Custer County is 641 and there have been 19 deaths.

Currently, the COVID-19 pandemic has affected over 1,350,000 in Colorado, with over 13,000 deaths. Vaccines became available in December 2020 and over 73% of Coloradoans are fully vaccinated. Additional details pertaining to this on-going event will be included in the next plan update.

The pandemic of the 2009-2010 Swine Flu (H1N1) was detected in the U.S. in April 2009. All 50 U.S. states reported cases of 2009 H1N1 by June 19th, 2009. A vaccine was created and distribution began in the U.S. in October 2009. By the time the pandemic was declared over, on August 11th, 2010, Colorado saw 1,321 confirmed cases which resulted in 70 deaths. This virus caused 14,286 deaths worldwide and 2,117 laboratory-confirmed deaths in the U.S. according to the CDC.

LOCATION

Public health hazards can occur anywhere. Epidemics can start anywhere in the world and rapidly become pandemics travelling across the globe. Water quality issues are possible in any community and the type of contamination can vary based on local uses, exposure to metals, minerals, and chemicals, and the possibility of a human-made contamination situation.

Air quality is affected by events across the country, where wildfire smoke from California has travelled to Colorado and beyond. In urban areas, air quality is impacted by the amount of cars and other pollutants.

FREQUENCY

Globally, the frequency of pandemics is expected to increase as exposure to new viruses occurs around the world. While pandemics are expected to happen more often in the future, there is no way to predict when, where, or how a virus arises to infect people.

Water quality issues are not frequent but can be highly dangerous, even if rarely occurring. Drought has been shown to increase the concentration of heavy metals in drinking water.

Air quality issues are frequent as wildfires are more frequent and longer in duration, sending more smoke to far-reaching locations.

SEVERITY

Severity of public health hazards is dependent upon many variables. For an infectious outbreak, 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.

Water quality issues can have severe consequences if contaminated or unsafe drinking water is utilized by large populations unknowingly. If boil orders or messaging not to drink the water are not sent out in a timely manner, there is potential for many people to get sick.

Air quality has been shown to have long-term impacts on cardiovascular health, so what may seem like a random occurrence, repeated exposure to pollutants can be a lifelong issue.

WARNING TIME

The warning time for public health hazards depends on a variety of factors.

Water issues can have a rapid onset or a delayed impact, therefore a long period without warning could be dangerous if a water quality issue goes unnoticed. Air quality may have immediate or a day warning time depending on the type of pollutant and the weather occurring at the time. Wildfire smoke for example can alter the air quality drastically from one day to the next depending on winds.

For a pandemic, once a virus has become an epidemic somewhere in the world, surveillance begins through national and global public health organizations. In some cases, this may help to slow the spread of the virus and alert other countries and organizations of the risk of infection. Warning time can vary from a day to months, depending on how quickly a virus is discovered and the proximity of the discovered infection to the location of the initial outbreak. With modern global travel, a virus can be spread across the world in less than 24 hours.

SECONDARY HAZARDS

There are no immediate secondary hazards to public health issues.

CLIMATE CHANGE IMPACTS

Climate change has affected disease transmission globally, according to the World Health Organization. Temperature fluctuations and extreme weather events create conducive conditions for diseases to manifest and spread. Around the world the movement of people out of cities, heat centers, into the rural areas leads to more interactions between humans and animals. These interactions will lead to the continued discovery of never-before-seen disease and will continue to be a concern. Climate change can also contribute to an increase of person-to-person interactions, as the increased number of disaster events leads to more mass evacuations and need for more disaster sheltering.

Climate change is likely to increase exposure of known diseases as well. Pandemics can be caused by a virus that is known in some parts of the world but may be carried to a location with little or no resistance where it can spread.

EXPOSURE AND VULNERABILITY

Public health hazards have the potential to affect every person in the region. There are many ways in which public health can prevent a hazard and education can help to minimize negative impacts on communities.

The global population is vulnerable to exposure of a pandemic disease. Planning with local medical facilities and public health agencies regarding prevention and response can minimize vulnerability. Inclusive and informational communication efforts can also help to educate the community about who is most at risk and limit exposure.

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, Water & 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.

POPULATION

Some of the population are more at risk than others depending on the hazard. Those with chronic conditions, such as diabetes, heart disease, and obesity can struggle with their response to an infectious disease. If there is a water quality issue, children may be more susceptible to the effects of the contaminant. Those with low income, in poverty, the elderly, and those with a disability can struggle to get the care and resources they need in a timely manner.

Traumatic events can affect everyone in the population, and the effects may present very differently from one person to the next. Awareness of the signs of someone struggling with mental health and emotional well-being can save lives if intervention occurs in a timely manner.

Table 33 shows the characteristics of the populations across the county, compared to the state and the United States. These demographics and health indicators are used, along with numerous others, to determine the overall health of the population, as well as gain an understanding of who may be at risk from different public health hazards.

Table 33. Custer County Health Demographic Snapshot

Demographic	Unincorporated Custer County	Colorado	United States
Population	5,068	5,758,736	328,239,523
Age: 4 and Under (%)	3.5	5.8	6
Age: Under 18 (%)	13.8	21.9	22.3
Age: 65 and Over (%)	33	14.6	16.5
Persons in Poverty (%)	11.8	9.3	10.5
Persons with a Disability (%)	20.6	19.1	26
Persons Age 65+ with a Disability (%)	23.5	32.2	43.8
Adults who are Obese or Overweight (%)	60.7	57.4	71.3
Adults with Diabetes (%)	7.3	7.3	8.2
Adults with Asthma (%)	9.5	9.1	7.7
Adults with Coronary Heart Disease (%)	5.5	2.7	4.2

US Census Bureau ACS 2014-2019

The whole population of Custer County is susceptible to contracting a pandemic disease. While every disease is different, the oldest, youngest, and those with underlying medical conditions tend to be the most vulnerable to the effects of infection.

Less densely populated areas may benefit from reduced transmission, but there are often less resources to test and treat illnesses if the disease does spread into those rural communities.

PROPERTY

Property is not likely to be affected by a public health hazard. In extreme cases, water quality issues could require remediation actions, such as updating pipes in individual homes or throughout a specific area.

ENVIRONMENT

Environmental impacts of public health hazards can be long standing, such as a water quality issue affecting a large waterway and resulting in damage to ecosystems. Shorter term environmental impacts include air quality impacts from wildfires.

ECONOMY

The economy, regional and local, can be affected in a variety of ways due to public health hazards. In most cases, this is due to the need for operations to cease while a public health issue is addressed, such as water quality. In extreme cases, 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 intercounty commerce is an important part of the local economies. The drop in tourism due to a large public health 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.

FUTURE TRENDS IN DEVELOPMENT

As populations increase, the possible rate of transmission does as well. The more closely people interact, the more likely a disease is to spread. Water quality issues can also stem from new development, if infrastructure is not adequately installed, the materials are not of good quality, or if existing infrastructure is damaged during construction. The increase in wildfires seen around the country contributes to air quality issues, with smoke capable of traveling great distances and affecting populations states away from the wildfire event in some cases.

Emotional and mental well-being should be a focus for all communities as they grow. A strong community can support each other during times of extreme stress and traumatic events. Building partnerships with local crisis support organizations makes resources available during times of need, as well as working closely with the public health department.

SEVERE WINTER WEATHER

HIGH RISK

GENERAL BACKGROUND

Winter storms can include heavy snow, ice, and blizzard conditions. Heavy snow can immobilize a region, stranding commuters, stopping the flow of supplies, and disrupting emergency and medical services. Accumulations of snow can collapse roofs and knock down trees and power lines. In rural areas, homes and farms may be isolated for days, and unprotected livestock may be lost. The cost of snow removal, damage repair, and business losses can have a tremendous impact on cities and towns.

Heavy accumulations of ice can bring down trees, electrical wires, telephone poles and lines, and communication towers. Communications and power can be disrupted for days until damage can be repaired. Even small accumulations of ice may cause extreme hazards to motorists and pedestrians.

Some winter storms are accompanied by strong winds, creating blizzard conditions with blinding wind-driven snow, severe drifting, and dangerous wind chills. Strong winds with these intense storms and cold fronts can knock down trees, utility poles, and power lines. Blowing snow can reduce visibilities to only a few feet in areas where there are no trees or buildings. Serious vehicle accidents can result in injuries and deaths.

Custer County receives varying amounts of snow throughout the area. The Town of Silver Cliff and Westcliffe experience similar winter weather with an annual average of 85 inches of snowfall. The higher elevation areas of the county can experience much greater snowfall, around 400 or more inches

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 and -35°F in the mountains and foothills.

The National Weather Service (NWS) Cooperative Observer Program (COOP) was founded in 1890 and is a weather and climate observing network of almost 9,000 people. There is a COOP station in Westcliffe, as well as a few others around the county. The volunteer observers are members of the community who were given the necessary equipment and training to collect quality data. The following figures are based on the Westcliffe COOP station data, from 1940 to 2020. Figure 55 contains historical low temperatures and Figure 56 shows the total snowfall by year. Since the closest NWS station is in Cañon City, this local data is likely more accurate to the area.

Figure 55. Historical Annual Low Temperature

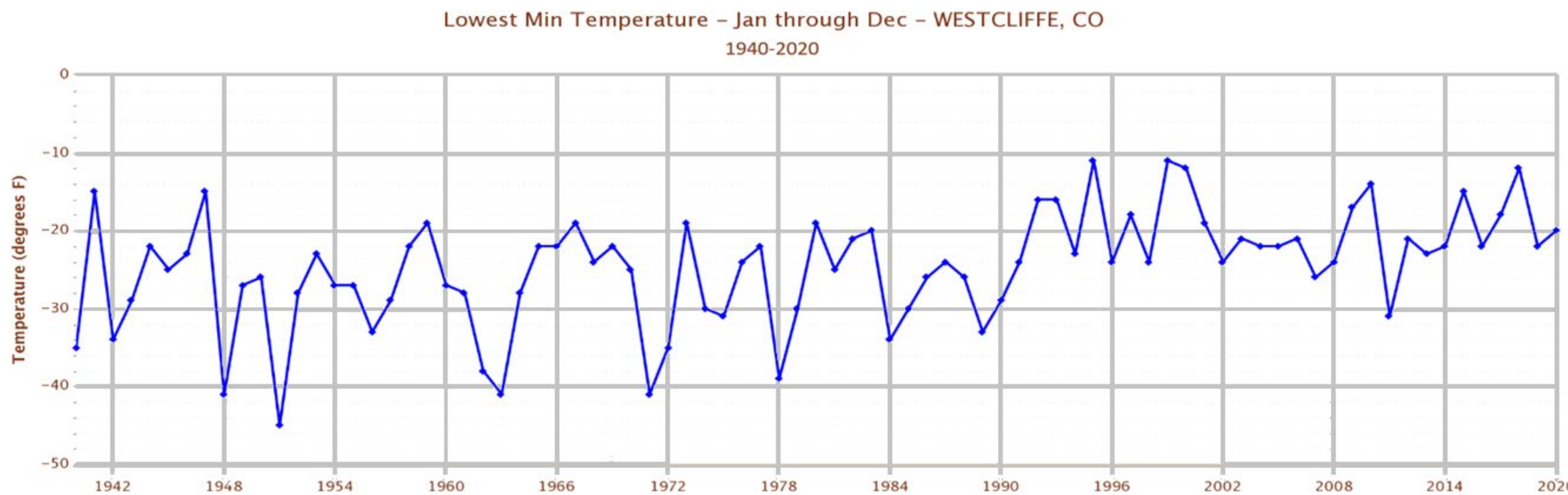
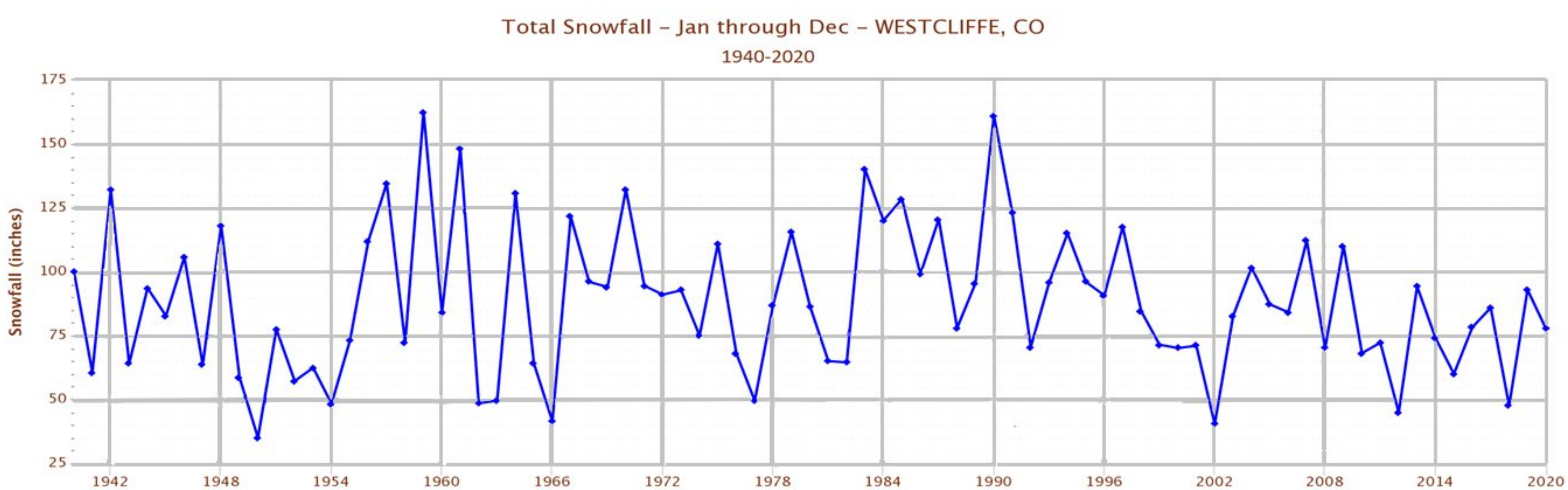


Figure 56. Historical Annual Snowfall Totals



PAST EVENTS

SHELDUS provides details pertaining to severe winter weather events that caused reported damages in Table 34. There have been no reports of damages from severe winter weather since 2001.

Table 34. Historical Severe Winter Weather Events (1960-2019)

Date Range	Number of Events	Injuries	Deaths	Property Damage*	Crop Damage*
1960-1969	8			$ 90,600	$ 96,400
1970-1979	7	1		$ 40,600	$ 27,400
1980-1989	9			$ 2,464,000	$ 187,700
1990-1999	7			$ 264,000	$ 250
2000-2009	1			$ 51,000	$ 0
Total	**32**	**1**		**$ 2,910,200**	**$ 311,750**

*Adjusted to 2019 US Dollars

The following are descriptions of noteworthy past hazard events, according to the National Centers for Environmental Information (NCEI) and SHELDUS. It should be noted there are some reported damage discrepancies between NCEI and SHELDUS, which stems from each source's reporting methodologies.

- On December 18th, 2006, heavy snow and blizzard conditions occurred over the western mountains, eastern mountains, and southeast plains of Southern Colorado. Some of the highest snow totals and snow drifts in the county were in Rosita and San Isabel, 10-15 inches, and around 2 feet over the Spanish Peaks near Silver Cliff. An emergency declaration was declared by FEMA and included Custer County.
- On April 10th, 2005, a powerful early spring blizzard caused snow drifts up to 8 feet and closed schools, businesses, and roads, as well as stranding travelers. Thirty-six inches of snow fell approximately 18 miles to the southeast of Westcliffe and wind gusts up to 50 mph lowered visibility to under a ¼ mile.
- On March 17th, 2003, a large, slow moving, moist system set up over the southern Great Plains, bringing persistent rain and snow to southern Colorado from the evening of March 17th to March 20th. The storm, which was issued a FEMA emergency declaration including Custer County, left 74 inches of snow north of San Isabel Lake on Highway 165 and an estimated 84 inches of snow on the shore of San Isabel Lake.
- On October 26th, 1997, a blizzard created by a powerful low-pressure system with a widespread extent, possibly a 1-in-50 year event, settled in northern New Mexico after travelling from Utah. Artic air moved into eastern Colorado, creating conditions for high winds, below zero wind chills, heavy snow, and overall life-threatening conditions. Heavy snow began on October 24th in the southwest mountains, then spreading to the Eastern San Juan and La Garita Mountains then further into the San Luis Valley, Upper Arkansas Valley, Wet Mountain Valley, and the Sangre de Cristo Mountains. By evening blizzard conditions began in the eastern mountains and across the plains and continued through to the next evening. One or two feet fell in the Eastern San Juan, La Garita, and Sangre de Cristo Mountains, while areas in the Wet Mountains, Beulah, Walsenburg, and around La Junta saw an estimated three feet of snow. The deep snow was blown and piled into drifts between 3 and 15 feet deep.

  Leaving behind extensive damages and several fatalities, the blizzard resulted in a State Emergency Declaration from the Governor. Power lines were brought down by high winds and heavy snow, resulting in power outages, some that lasted up to two days, across the region. School districts remained closed for part or all of the following week. Due to weekend closures of hundreds of businesses, it is estimated that millions of dollars were lost in sales and production. Snow removal costs, for public and private sectors, were in the millions of dollars due to necessary overtime hours. While multiple hay drops completed by the Army and National Guard saved a large number of cattle and calves, an estimated 20,000 died from the storm.

LOCATION

The entire county is susceptible to severe winter storms and heavy snow amounts since the county extends from the high plains at its northeastern corner, across the Wet Mountains, into the Wet Mountain Valley and to the Sangre de Cristo Range. State Highway 69 transects Custer County from north to south and can cause hazardous conditions to motorists if blizzard or severe winter weather conditions occur. State Highway 69 extends from Texas Creek in Fremont County to Walsenburg and Interstate 25 in Huerfano County. These are extremely important corridors to move people, supplies, and equipment into the region and to reach medical facilities outside of the county.

FREQUENCY

Severe winter storms happen nearly every year in Custer County. December, January, and February are when severe winter weather occurs most frequently in the county.

SEVERITY

Severe winter weather in Custer County can result in injuries and illnesses, deaths, property damage, or interruption of essential facilities and services.

In 2001, the NWS implemented an updated wind chill temperature index (see Figure 57). This index describes the relative discomfort or danger resulting from the combination of wind and temperature. Wind chill is based on the rate of heat loss from exposed skin caused by wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature and eventually the internal body temperature.

Figure 57. National Weather Service 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*

WARNING TIME

Meteorologists can often predict the likelihood of a severe winter storm, although forecasts for Custer County are rather limited. Residents generally rely on weather forecasts for Pueblo. 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.

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.

EXPOSURE AND VULNERABILITY

Everything in the planning area would be exposed, to some degree, to the impacts of severe winter weather. Certain areas are more exposed due to geographic location and local weather patterns.

LIFELINES

All Lifelines are likely exposed to severe winter weather and food, water, & shelter is especially of concern. The impacts of severe winter weather can put residents at risk of needing shelter, most commonly due to utility losses. Downed power lines can cause blackouts, leaving large areas isolated and residents potentially without heat. Phone, water, and sewer systems may not function. Roads may become impassable due to ice or snow. Ice accumulation on roadways can create dangerous driving conditions. There are limited county roads that are available to move people and supplies throughout the region. Many of these roads are narrow and curved.

The loss and capacity interruption of roads are the primary transportation failures resulting from severe winter weather, mostly associated with secondary hazards. Snowstorms can significantly impact the transportation system and the availability of public safety services. Of particular concern are roads providing access to isolated areas and those with access and functional needs. Prolonged obstruction of major routes can disrupt the shipment of goods and other commerce. Large, prolonged storms can have negative economic impacts for an entire region.

Severe windstorms, downed trees, and ice can create serious impacts on power and above-ground communication lines. 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 because residents would be unable to call for assistance. Extreme cold can disrupt or impair communications facilities.

POPULATION

The populations most likely to suffer the negative effects of extreme cold are the elderly, young children, people with chronic health and mobility issues, those with independent living difficulty, low income families, non-English speaking residents, and those who live in areas that are isolated from major roads. These 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 or other health needs. Improper portable generator use can result in carbon monoxide fatalities or casualties, when people bring them inside due to extreme cold or power loss. Commuters who are caught in storms may be vulnerable to carbon monoxide poisoning or hypothermia. Additionally, individuals engaged in outdoor recreation during a severe winter event may be difficult to locate and rescue.

Prolonged exposure to the cold can cause frostbite or hypothermia and can become life-threatening. Infants and the elderly are most susceptible, as body temperature regulation is more difficult for them. Pipes may freeze and burst in homes or buildings that are poorly insulated or without heat. Extreme cold can disrupt or impair communications facilities.

PROPERTY

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

ENVIRONMENT

The environment is highly exposed to severe weather events. Natural habitats such as streams and trees risk major damage and destruction. Flooding events caused by snowmelt can produce river channel migration or damage riparian habitat.

ECONOMY

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 which 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.

FUTURE TRENDS IN DEVELOPMENT

All future development will be affected by severe storms. The vulnerability of community assets to severe winter storms is increasing over time as more people enter the planning area. The ability to withstand impacts lies in consistent enforcement of codes and regulations for new construction.

THUNDERSTORM (HAIL, HIGH WIND, LIGHTNING)

HIGH RISK

GENERAL BACKGROUND

THUNDERSTORM / LIGHTNING

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.

Three factors cause thunderstorms to form: moisture, rising unstable air (air that keeps rising when disturbed), and a lifting mechanism to provide the disturbance. The sun heats the surface of the earth, which warms the air above it. If this warm surface air is forced to rise (hills or mountains can cause rising motion, as can the interaction of warm air and cold air or wet air and dry air) it will continue to rise as long as it weighs less and stays warmer than the air around it.

As the air rises, it transfers heat from the surface of the earth to the upper levels of the atmosphere (the process of convection). The water vapor it contains begins to cool and it condenses into a cloud. The cloud eventually grows upward into areas where the temperature is below freezing. Some of the water vapor turns to ice and some of it turns into water droplets. Both have electrical charges. Ice particles usually have positive charges, and rain droplets usually have negative charges. When the charges build up enough, they are discharged in a bolt of lightning, which causes the sound waves we hear as thunder.

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. Positive lightning also has a longer duration, so fires are more easily ignited.

U.S. lightning statistics compiled by the National Oceanic and Atmospheric Administration 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.

HAIL

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 2019, the largest size hailstone record in Colorado was broken, when a hailstone weighing over half a pound and 4.83 inches in diameter was discovered. The largest recorded hailstone in Custer County was 2.75 inches.

HIGH WIND

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 as a result of outflow generated by the thunderstorm downdraft.
- Downdrafts—A small-scale column of air that rapidly sinks toward the ground.
- Downbursts—A strong downdraft with horizontal dimensions larger than 2.5 miles resulting in an outward burst or damaging winds on or near the ground. Downburst winds may begin as a microburst and spread out over a wider area, sometimes producing damage similar to a strong tornado. Although usually associated with thunderstorms, downbursts can occur with showers too weak to produce thunder.
- Microbursts—A small, concentrated downburst that produces an outward burst of damaging winds at the surface. Microbursts are generally less than 2.5 miles across and short-lived, lasting only 5 to 10 minutes, with maximum wind speeds up to 168 mph. There are two kinds of microbursts: wet and dry. A wet microburst is accompanied by heavy precipitation at the surface. Dry microbursts, common in places like the high plains and the intermountain west, occur with little or no precipitation reaching the ground.
- Gust front—A gust front is the leading edge of rain-cooled air that clashes with warmer thunderstorm inflow. Gust fronts are characterized by a wind shift, temperature drop, and gusty winds out ahead of a thunderstorm. Sometimes the winds push up air above them, forming a shelf cloud or detached roll cloud.
- Derecho—A derecho is a widespread thunderstorm wind caused when new thunderstorms form along the leading edge of an outflow boundary (the boundary formed by horizontal spreading of thunderstorm-cooled air). The word “derecho” is of Spanish origin and means “straight ahead.” Thunderstorms feed on the boundary and continue to reproduce. Derechos typically occur in summer when complexes of thunderstorms form over plains, producing heavy rain and severe wind. The damaging winds can last a long time and cover a large area.
- Bow Echo—A bow echo is a linear wind front bent outward in a bow shape. Damaging straight- line winds often occur near the center of a bow echo. Bow echoes can be 200 miles long, last for several hours, and produce extensive wind damage at the ground.

PAST EVENTS

Historical record of hazard events can be found in the tables and figures below. The data on property and crop damage figures is from the SHELDUS database. The SHELDUS data does not represent all events that have occurred, only those that caused reported damages.

Severe storm events which resulted in damages are listed by decade in Table 35. Data indicates that there have not been events, categorized as severe storms, which have caused damage since 1987. The storm in 1987 caused approximately 99% of the total damages to property and crops.

Table 35. Historical Damaging Severe Storm Events (1960-1999)

Date Range	Number of Events	Injuries	Deaths	Property Damage*	Crop Damage*
1960-1969	4	0	0	$141,000	$11,800
1970-1979	4	0	0	$5,600	$40
1980-1989	4	0	0	$1,705,000	$1,759,000

*Adjusted to 2019 US Dollars

HAIL

The National Centers for Environmental Information's (NCEI) Storm Events Database lists 89 hail events in Custer County between 1960 and 2020. During this period, over 90% of hailstorms were reported between the 1990's and 2020.

It should be noted that hail events are most commonly reported by public observation, leading to more observations in populated areas. This drastic increase in reported events, in the 1990's and early 2000's, correlates with the significant increase in building permits issued per year and considerable population growth at the time. Figure 58 displays the locations of historical hail events across the county. Table 36 illustrates the events that resulted in damages by decade, using SHELDUS data. There have been no events with reported damages since 1993.

Table 36. Historical Damaging Hail Events (1960-2020)

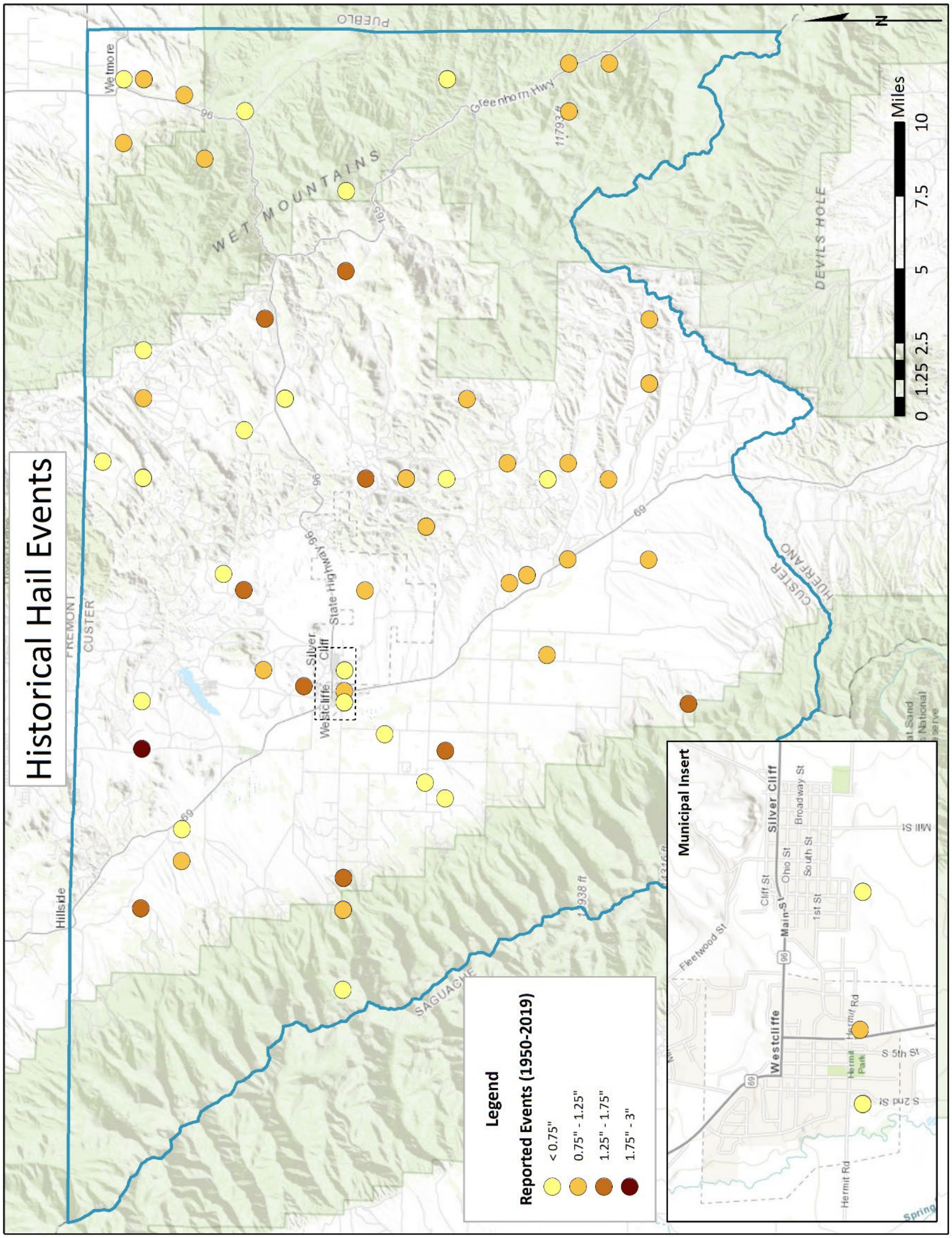
Date Range	Number of Events	Largest Hail (in)	Injuries	Deaths	Property Damage*	Crop Damage*
1960-1969	4	1.75	0	0	$152,000	$12,000
1970-1979	2	.75	0	0	$5,000	$750
1980-1989	1	2.75	0	0	$560	$560
1990-1999	2	1.75	1	0	$92,500	$0
2000-2009	0	-	0	0	$0	$0
2010-2020	0	-	0	0	$0	$0
Total	**9**	**-**	**1**	**0**	**$250,060**	**$13,310**

*Adjusted to 2019 US Dollars

A notable hail event is detailed below:

- On May 10th, 2017, numerous strong to severe storms occurred, producing hail up to the size of golf balls and strong winds. Areas of very heavy rain occurred across portions of Custer, Pueblo, Otero, Bent, and Prowers Counties. The Junkins burn scar was especially hard hit, with 3 to 6 inches of rain, causing a significant flash flood along North Creek into the Beulah Valley.

Figure 58. Historical Hail



HIGH WIND

Historical severe weather data from the NCEI Storm Events Database includes 110 total events, in Custer County between 1960 and 2020. Of those events, 107 were high wind events and three were thunderstorm wind events. The highest recorded wind speed is 91 knots, which is about 105 mph. No events with reported damages have occurred since the last plan update in 2017. Figure 59 displays the locations of historical events across the county.

Data from SHELDUS, in Table 37, illustrates the property and crop damages resulting from high wind events since 1960.

Table 37. Historical High Wind Events (1960-2020)

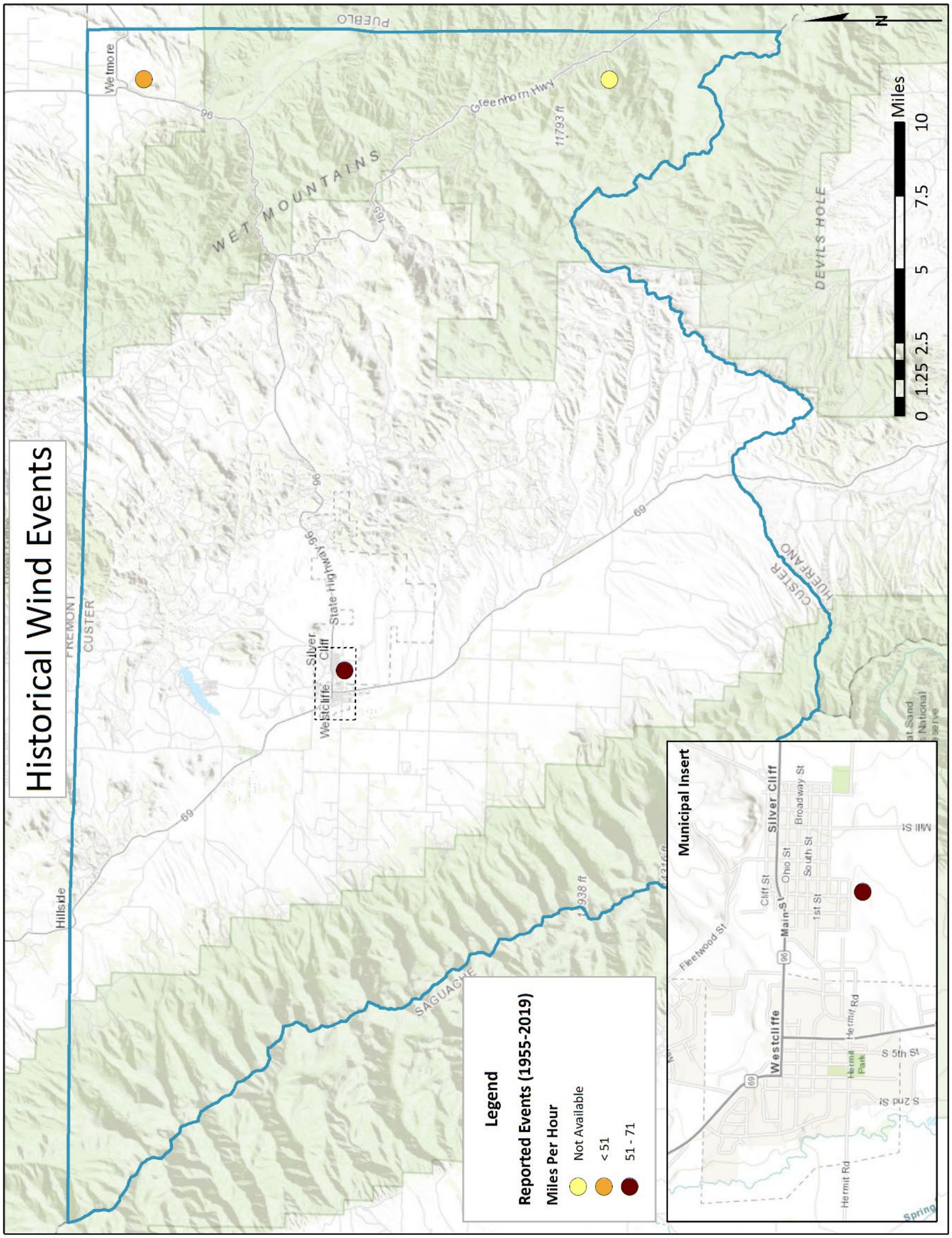
Date Range	Number of Events	Injuries	Deaths	Property Damage*	Crop Damage*
1960-1969	6	0	0	$231,000	$2,800
1970-1979	8	0	0	$771,000	$27,000
1980-1989	10	0	0	$534,000	$57,600
1990-1999	7	1	0	$250,000	$0
2000-2009	2	0	0	$22,500	$0
2010-2019	1	0	0	$288,028	$0

*Adjusted to 2019 US Dollars

Notable events are described below:

- On November 12th, 2011, a strong storm system centered around south central and southeast Colorado. There were widespread power outages and damage. Custer County was under a state of emergency for a time. Numerous trees and power lines were blown down. Barns and sheds were destroyed, cars damaged, and some homes had roof damage and other damage from trees.

Figure 59. Historical High Wind



LIGHTNING

Data from the National Lightning Detection Network ranks Colorado 26th in the nation (excluding Alaska and Hawaii) with respect to the number of cloud-to-ground lightning flashes, with an average number of more than 500,000 cloud-to-ground lightning strikes per year. Custer County has an average of 0.5 to 4 lightning flashes per square kilometer per year, with higher lightning frequency in the eastern part of the county.

According to the NCEI Storm Events Database, two lightning events, resulting in injury or fatality, occurred in the Custer County between 1996 and 2020. In 2008 a boy was struck and killed by lightning near a youth camp. He was riding a bicycle with others. In 2011, two men setting up camp were struck by lightning. One man died and the other was knocked unconscious.

SHELDUS data included these events, as well as an event in 1973 which caused property and crop damage. These events can be seen in Table 38 by decade. There were no reported events between 1980 and 1999 with damages, injuries, or deaths.

Table 38. Historical Lightning Events (1970-2020)

Date Range	Number of Events	Injuries	Deaths	Property Damage*	Crop Damage*
1970-1979	1			$4,000	$40
2000-2009	1		1		
2010-2019	1	1	1		

*Adjusted to 2019 US Dollars

LOCATION

Severe weather events have the potential to happen anywhere in the planning area. The entire extent of Custer County is exposed to some degree of lightning hazard, though exposed points of high elevation have significantly higher frequency of occurrence. Higher elevations could experience the most significant wind speeds, but these areas are generally not developed or populated.

FREQUENCY

Thunderstorms, including both hail and high wind events, happen every year in Custer County. Lightning is most likely to strike in the mountainous areas, which makes reporting difficult. It is likely that lightning will strike somewhere in the county in any given year.

SEVERITY

HAIL

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.

HIGH WIND

High winds, often accompanying severe thunderstorms, can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. Wind storms in Custer County are rarely life threatening but do disrupt daily activities and cause damage to buildings and structures. Winter winds can also cause damage, close highways (blowing snow), and induce avalanches. Winds can also cause trees to fall, particularly those killed by pine beetles or wildfire, creating a hazard to property or individuals outdoors.

LIGHTNING

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.

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. Weather forecasts for the planning area are limited. People generally rely on weather forecasts for the Pueblo, as they are the nearest cities with adequate coverage. However, Custer County has significant altitude, geothermal, and jet stream differences from those areas. At times warning for the onset of severe weather may be limited.

SECONDARY HAZARDS

The most significant secondary hazards associated with severe local storms are floods, debris flow, falling and downed trees, landslides, tornadoes, 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. Fires can occur as a result of lightning strikes. 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 or tornadoes can also result in injury or damage to property. A wildland fire can be accelerated and rendered unpredictable by high winds.

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. 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 thunderstorm events. All of these impacts could have significant economic consequences.

EXPOSURE AND VULNERABILITY

Everything in the planning area would be exposed, to some degree, to the impacts of severe weather. Certain areas are more exposed due to geographic location and local weather patterns.

LIFELINES

All Lifelines exposed to flooding are also likely exposed to risks associated with thunderstorms and hail. Those on higher ground may also be exposed to wind damage or damage from falling trees. The most common problems associated with these weather events are loss of utilities. Downed power lines can cause blackouts, leaving large areas isolated. Phone, water, and sewer systems may not function. Roads may become impassable due to secondary hazards such as landslides. Lightning events can have destructive effects on power and information systems. Failure of these systems would have cascading effects throughout the county.

POPULATION

It can be assumed that the entire planning area is exposed to some extent to thunderstorm, hail, high wind, 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 living at higher elevations, with large stands of trees or power lines may be more susceptible to wind damage and black out, while populations in low-lying areas are at risk for possible flooding. It is not uncommon for residents living in more remote areas of the county to be isolated after such events.

Populations with Access and Functional needs, 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. These populations face isolation and exposure during thunderstorm, wind, and hail events and could suffer more secondary effects of the hazard. Hikers and climbers in the area may also be more vulnerable to severe weather events. Visitors to the area may not be aware of how quickly a thunderstorm can build in the mountains.

PROPERTY

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.

All buildings are considered to be exposed to the thunderstorm, hail, high wind, 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. Building codes can help to mitigate damage from thunderstorm events, including using hail protective roof materials and strengthening of the common building component failure points.

Older buildings are often not retro-fitted to newer building codes due to due cost and capacity, which is typically the case in rural areas where communities were built decades ago.

ENVIRONMENT

The environment is highly exposed to thunderstorms, hail, high wind, and lightning. Natural habitats, such as streams and trees, risk major damage and destruction. Prolonged rains can saturate soils and lead to slope failure. Flooding events can produce river channel migration or damage riparian habitat. Lightning may ignite fires in areas with little or no precipitation nearby.

ECONOMY

Economic impact from thunderstorm, hail, high wind, and lightning hazards is possible, as damage to property, crops and livestock may result in losses. This can occur in any events for these hazards; however, events with large hail have been known to cause the death of livestock and devastate crops. High wind events are also extremely damaging to crops. The losses suffered from a harvest ruined by hail or high 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.

FUTURE TRENDS IN DEVELOPMENT

All future development will be affected by severe storms. The vulnerability of community assets to thunderstorms is increasing through time as more people enter the planning area. The ability to withstand impacts lies in consistent enforcement of codes and regulations for new construction.

According to the county's 2021 Zoning and Regulation information, there is no adopted building code; however, both Westcliffe and Silver Cliff have adopted the 2006 International Building Code, which is equipped to deal with the impacts of severe weather events. Land use policies enforced through zoning code and the permitting process also address many of the secondary impacts (flood and landslide) of the severe weather hazard.

TORNADO

MODERATE RISK

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.

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 (Table 41) was used until 2007, classifying the intensity from the least to most intense, in seven categories (F0-F6). This scale was replaced by the Enhance 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.

The EF scale is a set of wind estimates (not measurements) based on damage. Its uses 3 second gusts estimated at the point of damage based on a judgment of 8 levels of damage to 28 indicators, including the type of structure, infrastructure, or trees that were impacted. These estimates vary with height and exposure. The 3 second gust is not the same wind as in standard surface observations. Standard measurements are taken by weather stations in open exposures, using a directly measured "one minute mile" speed. Table 39 provides details on how the Enhanced Fujita Scale intensities were derived from the previous Fujita Scale.

Table 39. Derived EF 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

Fujita Scale		Derived EF Scale	
F Number	**3 Second Gust (mph)**	**EF Number**	**3 Second Gust (mph)**
3	162-209	**3**	138-167
4	210-261	**4**	168-199
5	262-317	**5**	200-234

PAST EVENTS

The National Centers for Environmental Information's (NCEI) Storm Events Database lists seven tornadoes in Custer County between 1960 and 2020. None of the tornadoes recorded in the county have been rated higher than F2.

SHELDUS data shows that three of the tornadoes in the county have caused property or crop damage.

Table 40. Historical Reported Damaging Tornadoes

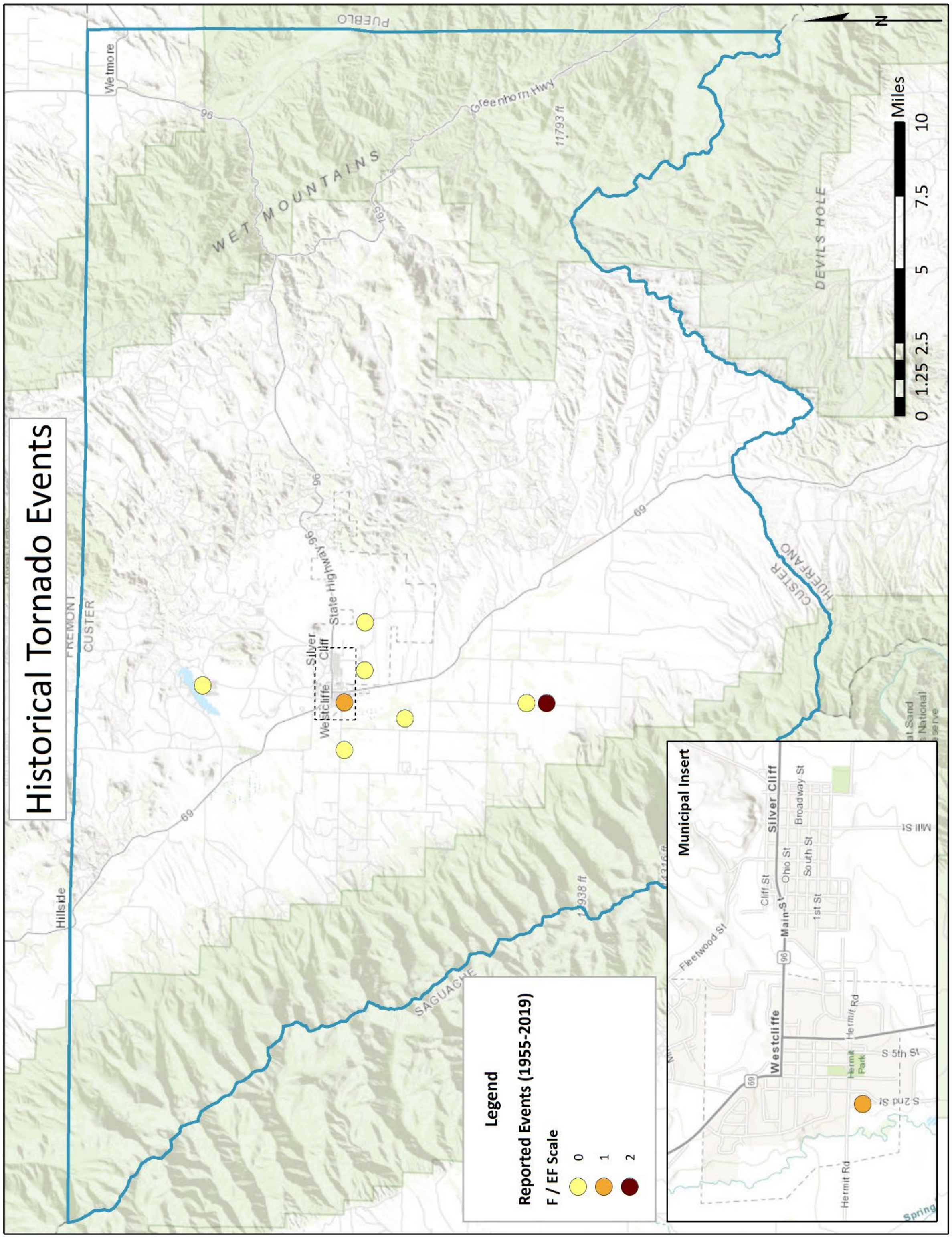
Year	Rating	Injuries	Deaths	Property Damage*	Crop Damage*
1960	F2	0	0	$4,400	$0
1962	F0	0	0	$1,000	$1,000
1966	F0	0	0	$20,000	$0

The best available, reported data is used to complete the damages information. However, events or resulting damages may not be reported for a variety of reasons. This makes listening to county residents about their experiences and details of unreported events a critical part of assessing hazards. Below are the details of a damaging tornado event in 2019, which is not yet listed as having damages in the NCEI or SHELDUS databases.

- On July 22nd, 2019, according to the Custer County Sheriff's Office, a tornado caused considerable damage to homes near Westcliffe. A trailer was torn apart, and another was lifted and moved, collapsing the roof of another home. Multiple garages were damaged or blown off the property entirely. In addition, power lines were downed and an RV was tipped onto its side. It was rated by NWS Pueblo as an EF0 and there were no injuries or deaths.

Figure 60 displays the locations of historical tornado events across the county.

Figure 60. Historical Tornadoes



LOCATION

Recorded tornadoes in the planning area are typically small and short-lived. They are more likely to occur in the central portion of the county.

FREQUENCY

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.

Based on reported data, there is less than a 10% chance of a damaging tornado impacting the county per year.

SEVERITY

Tornadoes are potentially the most dangerous of local storms. If a major tornado were to strike within the populated areas of Custer County, damage could be widespread. Businesses may be damaged or destroyed and 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.

Historically, tornadoes have not typically been severe or caused damage in the planning area. Table 41 presents the damages associated with the various F Scales and is a reference for understanding of the types of damage experienced from past tornado event ratings. the currently utilized Enhanced Fujita scale uses a multipoint system, based on damages after the event, to better categorize tornadoes.

Table 41. Fujita Scale (F Scale)

F-Scale	Intensity Phrase	Character	Wind Speed	Type of Damage
F0	Gale Tornado	Weak	40-72 mph	Light Damage. Some damage to chimneys; branches broken off trees, shallow-rooted trees pushed over, sign boards damaged.
F1	Moderate Tornado	Weak	73-112 mph	Roof surfaces peeled off; mobile homes pushed off foundations or overturned; moving autos pushed off road; attached garages may be destroyed
F2	Significant Tornado	Strong	113-157 mph	Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
F3	Severe Tornado	Strong	158-206 mph	Roofs and some walls torn from well- constructed houses; trains overturned; most trees in forested area uprooted; heavy cars lifted and thrown.
F4	Devastating Tornado	Violent	207-260 mph	Well- constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.

F-Scale	Intensity Phrase	Character	Wind Speed	Type of Damage
F5	Incredible Tornado	Violent	261-318 mph	Strong frame houses lifted off foundations, carried considerable distances, and disintegrated; automobile sized missiles airborne for several hundred feet or more; trees debarked; steel reinforced concrete structures badly damaged
F6	Inconceivable Tornado	Violent	319-379 mph	These winds are very unlikely. The small area of damage they might produce would probably be unrecognizable along with the mess produced by F4 and F5 wind that would surround the F6 winds. Missiles, such as cars and refrigerators would do serious secondary damage that could not be directly identified as F6 damage. If this level is ever achieved, evidence might only be found in some manner of ground swirl pattern, for it may never be identifiable through engineering studies

WARNING TIME

The NOAA's storm prediction center issues tornado watches and warnings for Custer County. A tornado watch meanings that tornadoes are possible and to remain alert for the approaching storm. People are encouraged to watch the sky and stay tuned to the NOAA weather radio, commercial radio or television for more information. Tornado warning means that a tornado has been sighted or indicated by weather radar and to 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.

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".

EXPOSURE AND VULNERABILITY

Everything in the planning area could be exposed, to some degree, to the impacts of a tornado. The eastern portions of the county have increased vulnerability as that is where all historical events have occurred.

LIFELINES

All Lifelines are likely exposed to tornadoes. The most common problems associated with this hazard are utility losses. Downed power lines can cause blackouts, leaving large areas isolated. Phone, water, and sewer systems may not function. Roads may become impassable due to downed trees or other debris.

The destruction of homes and potentially shelters would greatly impact the food, water, and shelter lifeline. The available space for sheltering may be far outnumbered by those residents who need it and the difficulty of feeding large numbers could compounded by lack of facilities. The availability of clean water and sanitation could be an issue if there was damage to water lines.

Tornadoes can cause significant damage to trees and power lines, blocking roads with debris, incapacitating transportation, isolating population, and disrupting ingress and egress. Of particular concern are roads providing access to isolated areas and to the elderly. Any facility that is in the path of a tornado is likely to sustain damage.

POPULATION

It can be assumed that the entire planning area is exposed to some extent to tornadoes. Vulnerable populations are the elderly, those with low income, linguistically isolated populations, people with life- threatening illnesses, and residents living in areas that are isolated from major roads. Power outages can be life threatening to those dependent on electricity for medical support. Isolation of these populations is a significant concern. These populations face isolation and exposure after tornado events and could suffer more secondary effects of the hazard.

Individuals caught in the path of a tornado who are unable to seek appropriate shelter are especially vulnerable. This may include individuals who are out in the open, in cars, or those who do not have access to basements, cellars, or safe rooms.

PROPERTY

All property is vulnerable during tornado events, but properties in poor condition or manufactured housing are at the highest risk. Building codes can help to mitigate the impacts of tornadoes but can be difficult to implement due to cost and capacity. Buy-in from residents is also key as residents may not see a need to retro-fit buildings or adhere to building codes for new construction. Communities built decades ago are often resistant to introduction of new codes or ordinances.

ENVIRONMENT

Environmental features are exposed to tornado risk, although damages are generally localized to the path of the tornado. If tornadoes impact facilities that store hazardous materials, the surrounding areas may be especially vulnerable.

ECONOMY

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 this 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 longer durations. These extended 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.

FUTURE TRENDS IN DEVELOPMENT

All future development can be affected by tornadoes. The vulnerability 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.

Future population change across the county is expected to decrease by 0.4% over the next five years; however, steady 0.3% to 0.5% growth is projected through 2050. The projected growth is expected to occur primarily as municipal infill. As these areas are at a larger risk to future tornadoes, future development is expected to increase the risk to this hazard.

WILDFIRE

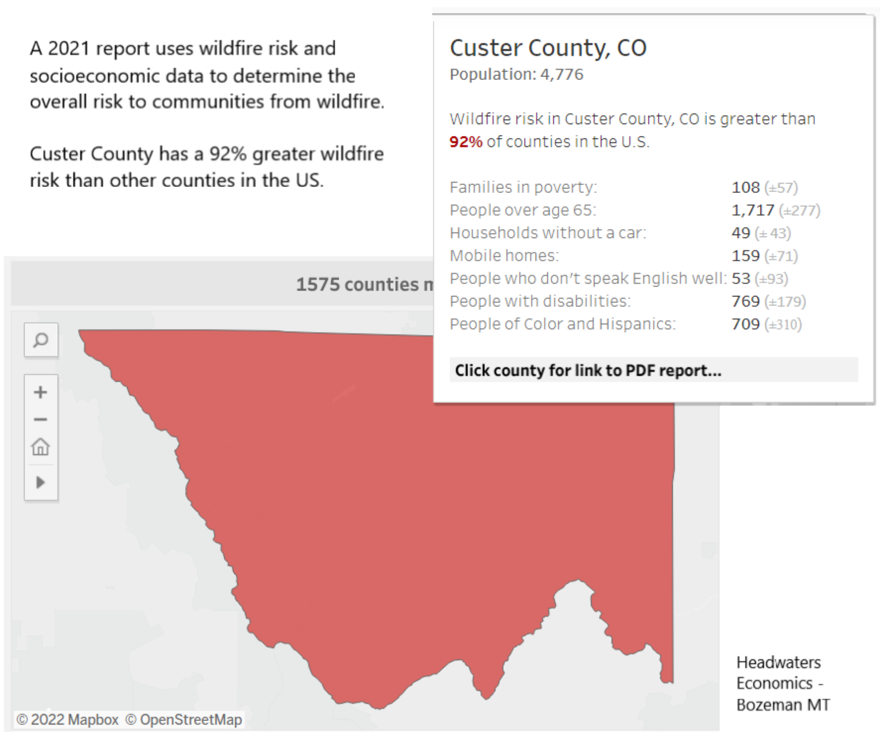
HIGH RISK

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 smaller timber harvests, reduced access to affected recreational areas, and damage to 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.



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Wildfires are of significant concern throughout Colorado. According to the Colorado State Forest Service, vegetation fires occur on an annual basis; most are controlled and contained early with limited damage. For those ignitions that are not readily contained and become wildfires, damage can be extensive. According to the State of Colorado Natural Hazards Mitigation Plan, a century of aggressive fire suppression combined with cycles of drought and changing land management practices has left many of Colorado's forests, including those in Custer 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 wildland-urban interface 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 and becoming more widespread and a serious concern.

Fire protection in Custer County is coordinated between the Wet Mountain Fire Protection District, the Wetmore Volunteer Fire Department, the Sheriff, the Bureau of Land Management, the Colorado State Forest Service and the US Forest Service. The county also has mutual aid agreements with the Rye and Deer Mountain Fire Protection Districts, as well as with the Beulah and Florence Fire Departments. Multiple community wildfire protection plans are in place and are further discussed in the Community Wildfire Protection Plans section.

PAST EVENTS

Table 42 shows Custer County federally reported wildfires that burned 10 acres or more from 1980 through 2020. These fires burned a total of 33,489 acres.

Table 42. Federally Reported Wildfires in Custer County (1960-2020)

Start Date	Name	Cause	Acres
7/2/2018	Adobe Fire	Lightning strike	85
10/17/2016	Junkins Fire	Strong winds downed a powerline	18,762
10/23/2012	Wetmore Fire	Under investigation	2,000
6/12/2011	Duckett Fire	Campfire	4,300
6/14/2006	Tyndall Gulch Fire	Dead tree was blown onto a powerline on BLM land	541
7/6/2005	Mason Gulch Fire	Lightning strike	11,357
4/29/2002	Cuerno Verde Fire	Trash fire	442
July 1993	Lake Creek Fire	Lightning strike	250
1963	Holt Fire	Smoking	65

Source: Historic Fire Database http://giscenter.isu.edu/research/Techpg/HFD/ , HMPC

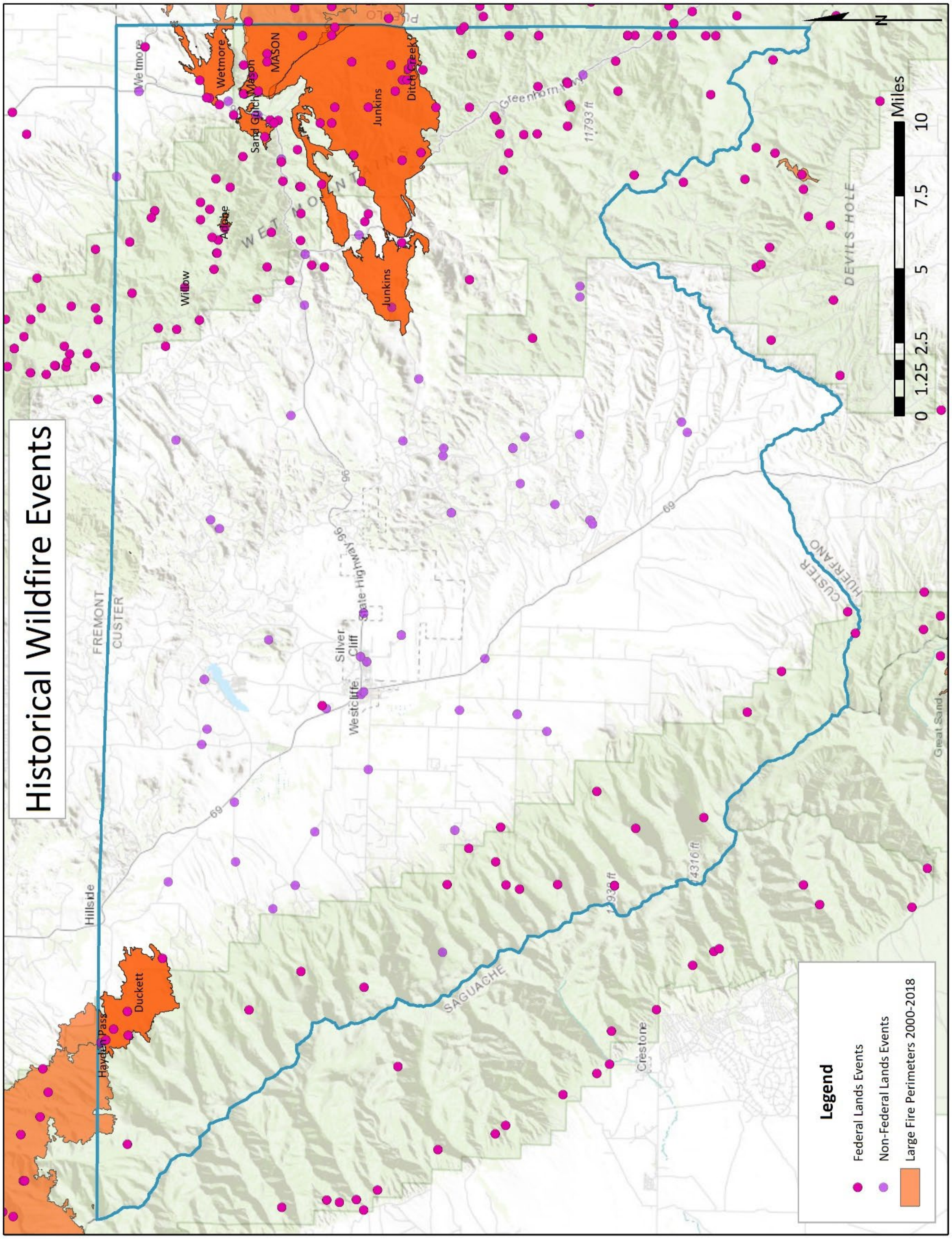
Some recent notable fires, outside of but affecting Custer County, are provided in Table 43.

Table 43. Notable Fires Outside of Custer County

Start Date	Name	Location	Cause	Acres
6/2/2002	Iron Mountain	Fremont County, BLM Land	Human	4,439, 106 structures lost
7/8/2016	Hayden Pass	Fremont County, USFS Land	Lightning strike	16,574
6/3/2019	Reveille Fire	Huerfano County, USFS Land	Lightning strike	219
4/25/2020	Horse Ranch Fire	Huerfano County, USFS Land	Human	43

Figure 61 shows the location of all federally reported wildfires that have burned across the county. Other notable wildfires have occurred in the neighboring counties of Pueblo, Fremont, and Huerfano. It is important to be aware of regional events to better understand how similar forests have burned in this part of the state.

Figure 61. Historical Wildfires



The two most significant wildfires in Custer County are the Mason Gulch Fire in 2005 and the Junkins Fire in 2016. More detailed information about these fires is below.

- On July 6th, 2005, the Mason Gulch Fire was ignited by lightning two miles south of Wetmore. The fire crossed county lines, burning in both Custer and Pueblo counties, and ultimately burned 11,357 acres. Over the course of the response, 822 personnel were assigned to the fire and there were numerous cooperating agencies including Colorado State Parks, State Forest Service, BLM, National Park Service, and seven counties from around central Colorado.
- On October 17th, 2016, a fire that would become the largest in Custer County history started when strong winds downed a powerline 11 miles east of Westcliffe. The fire burned 18,762 acres, required an approximate 600 personnel, and was named the Junkins Fire. A Fire Management Assistance Declaration was declared to provide public assistance to Custer and Pueblo Counties, which was also affected by the fire.

The damage losses for a fire can range drastically, depending on where the fire burns and for how long. The fires with reported damages, from SHELDUS data, are in Table 44. Property and crop damage losses related to the Junkins Fire are not currently listed in SHELDUS or NCEI databases.

Table 44. Wildfire Reported Property and Crop Damage Losses

Date	Event Name	Injuries	Deaths	Acreage	Property Damage	Crop Damage
4/29/2002	Cuerno Verde	0	0	442	$288,000	$0
7/6/2005	Mason Gulch	0	0	11,357	$1,758,000	$0
10/23/2012	Wetmore	0	0	2,000	$565,000	$0

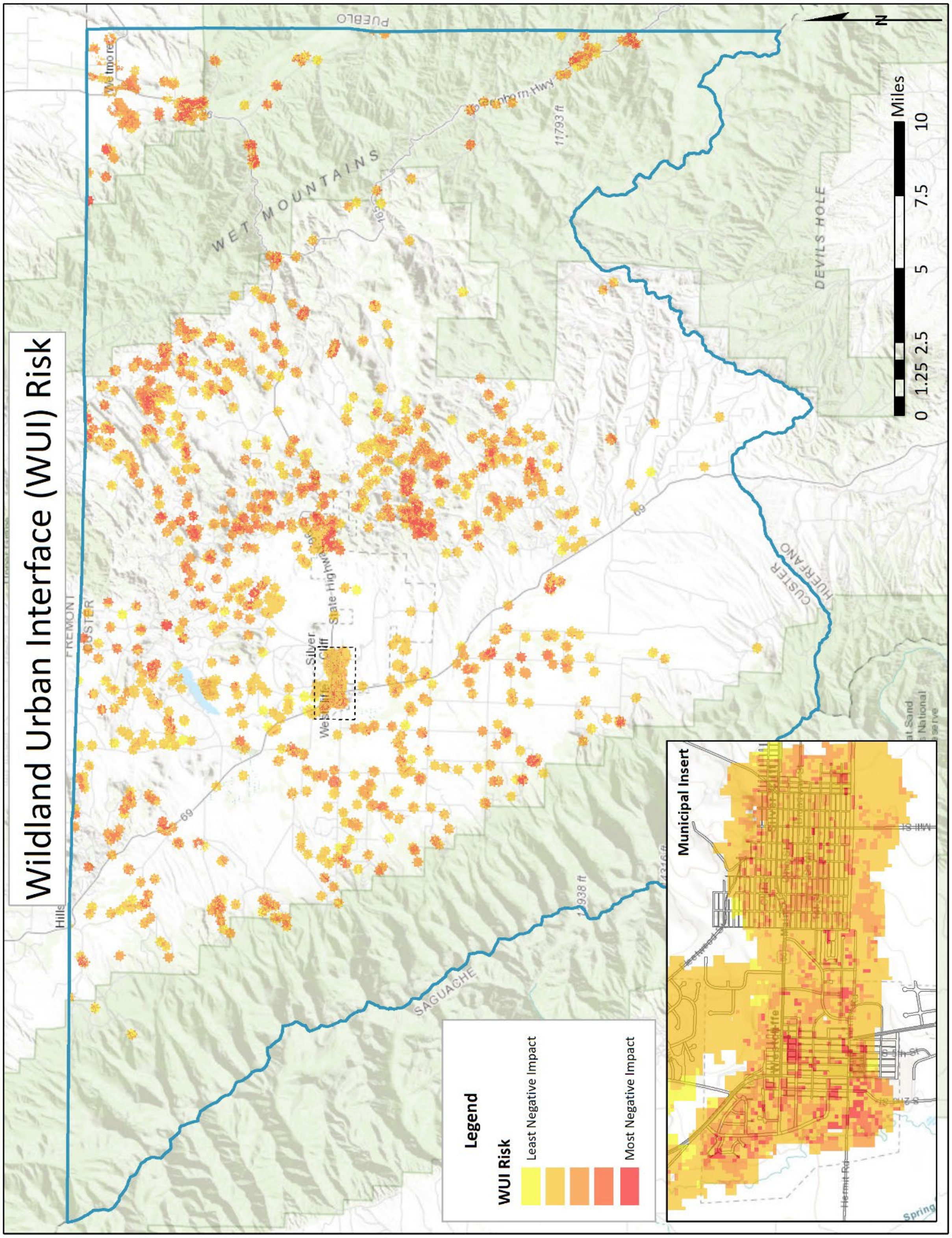
LOCATION

As part of this Plan's risk assessment, the Colorado State Forest Service (CSFS) produced Custer County's Wildfire Risk Assessment (WRA) Summary Report. This report provides many additional details pertaining to wildfire risk across the county. It has been included in Appendix B: Wildfire Risk Assessment Summary Report. Some pieces of this report are also included on the following pages. Readers can visit the Colorado Forest Atlas to learn more and access a web viewer of these various risk maps.

Wildfires can occur anywhere across the county, but the highest vulnerability resides in the WUI. Figure 65 provides an overview of Custer County's WUI. These areas have been identified across the county, with the densest WUI areas surrounding the incorporated municipalities.

Areas of concern have also been identified in the more recent localized CWPPs, which were developed since the county's plan, and include Wet Mountains, Verdemont, Colony, Alvarado, Brush Creek, and Reed Road

Figure 62. Wildland Urban Interface Risk



FREQUENCY

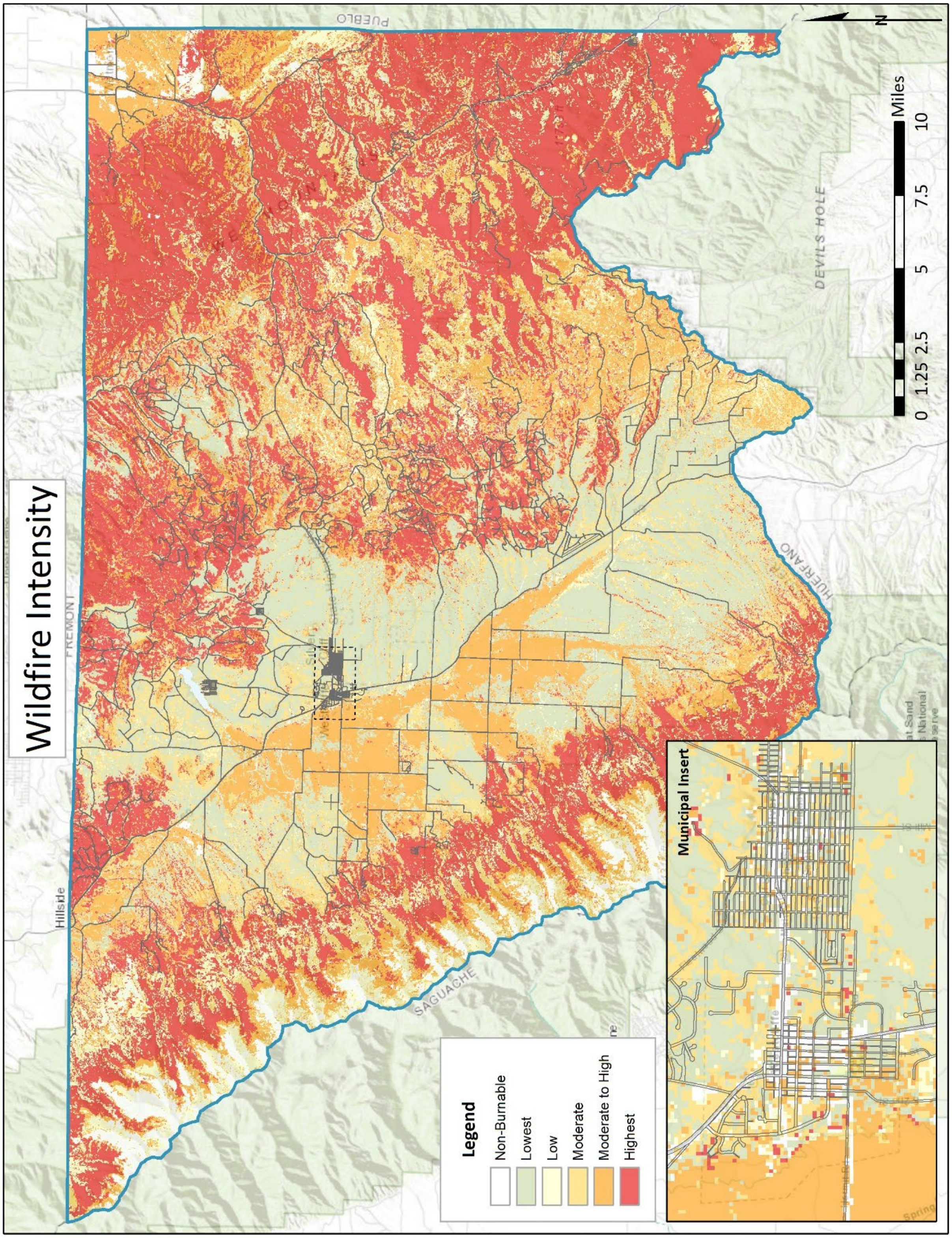
According to the WRA for Custer County, there is a 100-percent chance that at least one wildfire will occur each year across the county. Many of these fires will be 5 acres and less.

SEVERITY

Based on the widespread impacts, the magnitude/severity of severe wildfires is considered critical. Disaster events can result in isolated deaths and multiple injuries, major or long-term property damage that threatens structural stability, interruption and destruction of Lifelines, and economic impacts due to loss of tourism.

The WRA's fire intensity scale 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. Figure 63 presents this information showing Custer County has a large percentage of the state's highest fire intensities modeled across most of the county.

Figure 63. Fire Intensity Scale



WARNING TIME

Wildfires are often caused by humans, either intentionally or accidentally. There is no way to predict when one might break out. Because fireworks often cause brush fires, extra diligence is warranted around the Fourth of July when the use of fireworks is highest. Dry seasons and droughts are factors that greatly increase fire likelihood. Dry lightning may trigger wildfires. Severe weather can be predicted, so special attention can be paid during weather events that may include lightning or high wind. Reliable 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. The impacts of climate change are causing fires to become harder to fight at night and continue to burn the same throughout the day. Once a fire has started, fire alerting is reasonably rapid in most cases. Enhancements to communication technologies have further contributed to a significant improvement in warning time.

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. They have the potential to drive increased animal movement, which could create more chances for wildlife-vehicle collisions.

Most damaging, they strip slopes of vegetation, exposing them to greater amounts of runoff. This in turn can weaken soils and cause failures on slopes. Major landslides can occur several years after a wildfire. Most wildfires burn hot and for long durations 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.

CLIMATE CHANGE IMPACTS

Fire in western ecosystems is affected by climate variability, local topography, and human intervention. Climate change has the potential to affect multiple elements of the wildfire system: fire behavior, ignitions, fire management, and vegetation fuels. Hot, dry spells create the highest fire risk. Increased temperatures may intensify wildfire danger by warming and drying out vegetation. When climate alters fuel loads and fuel moisture, forest susceptibility to wildfires changes. Faster fires are harder to contain, and thus are more likely to expand into residential neighborhoods.

According to the 2018 State of Colorado Hazard Mitigation Plan, “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.

EXPOSURE AND VULNERABILITY

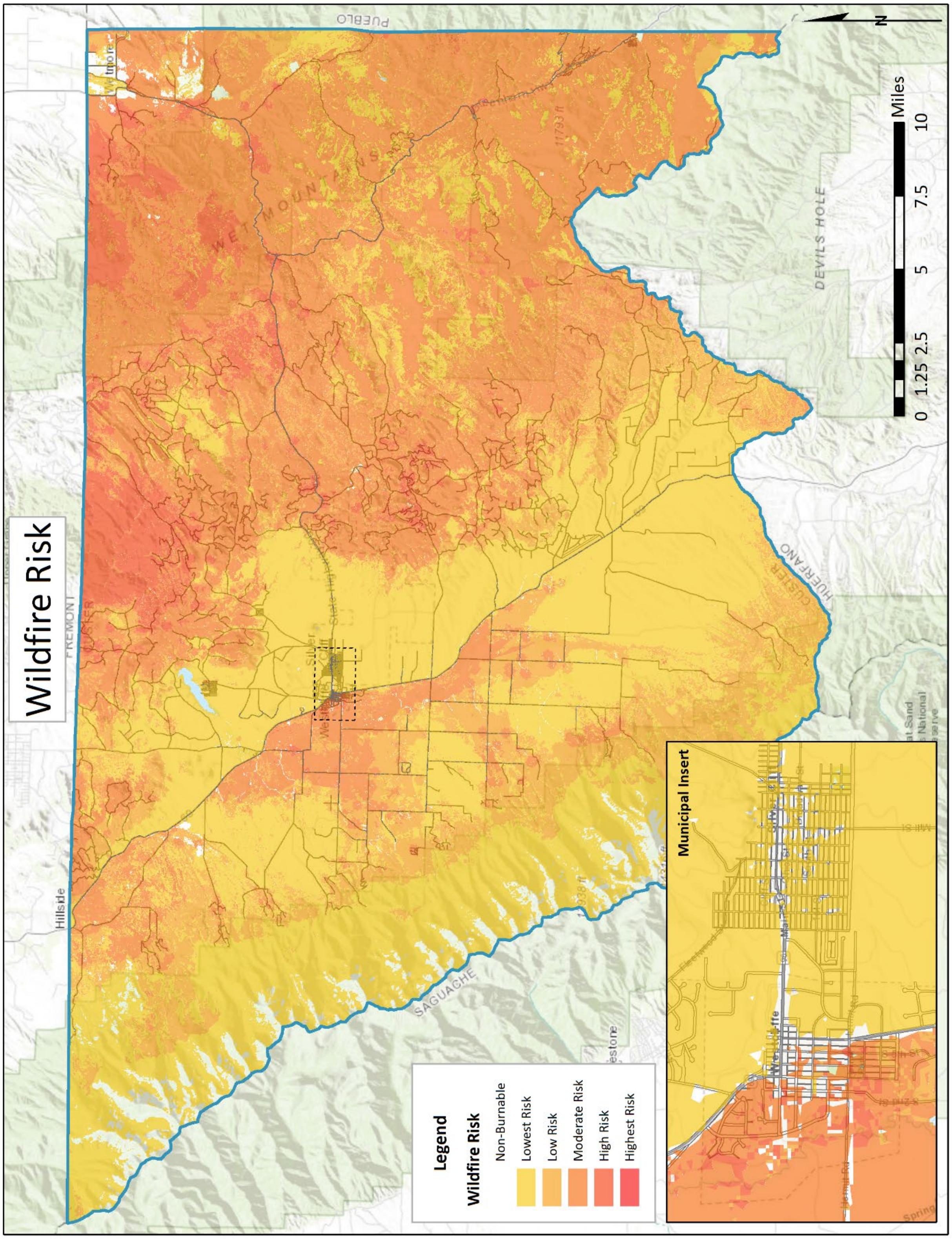
"Wildfire Risk" represents the possibility of loss or harm occurring from a wildfire. It identifies areas with the greatest potential impacts from a wildfire, taking into account the WUI Risk, Drinking Water Risk, Forest Assets Risk, and Riparian Areas Risk. Figure 64 presents this information for Custer County.

Wildfire is indiscriminate in the areas it can spread and areas of High and Highest Risk cover a good portion of the county and parts of all municipalities.

The "Wildland-Urban Interface (WUI) Risk" is a rating of the potential impact of a wildfire, specifically on people and their homes. **Error! Reference source not found.** shows which areas in the county's WUI are at risk of negative impacts from a wildfire event. It is worth noting the numerous areas, within Silver Cliff and Westcliffe, identified as areas at risk of the most negative impacts.

The figures show all classes of statewide wildfire risk, from lowest to highest, but the exposure analysis of structures and Lifelines presented in this section was for only those areas containing the highest (top 20%) statewide wildfire risk. Similarly, the WUI Risk exposure assessment evaluated only the highest (top 33%) statewide WUI risk areas.

Figure 64. Wildfire Risk



The commission that drafted the Custer County Community Wildfire Protection Plan (CWPP) analyzed and rated the fire hazard for each of the 17 Landscape Neighborhoods. Landscape Neighborhoods are defined as those areas which have a more frequently used common access in the area, as well as by common topographic and vegetative features.

While all neighborhoods in the county showed portions of extreme wildfire risk, there were seven that were identified as the highest priority fire hazard areas and are listed below. All but one of the priority Neighborhoods are located in the WUI. Additionally, the more recent localized CWPPs that have been developed since the county's plan identify other areas of concern.

1. Wet Mountains
2. Verdemont
3. Colony
4. Alvarado
5. Brush Creek
6. Reed Road

A report titled: *'Ahead of the Fire: Where will the West's next deadly wildfire strike? The risks are everywhere."*[13] was published in July 2019, by The Arizona Republic. The study, spurred by the devastating Camp Fire in Paradise, California, looked across 5,000 small communities across 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.

Westcliffe has results from the analysis which are shown in Figure 65. 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. The information was compiled from the US Census Bureau data and Department of Homeland Security infrastructure data. Note that the demographic data utilized aligns with access and functional needs (AFN) categories.

A summary report was not available for Silver Cliff.

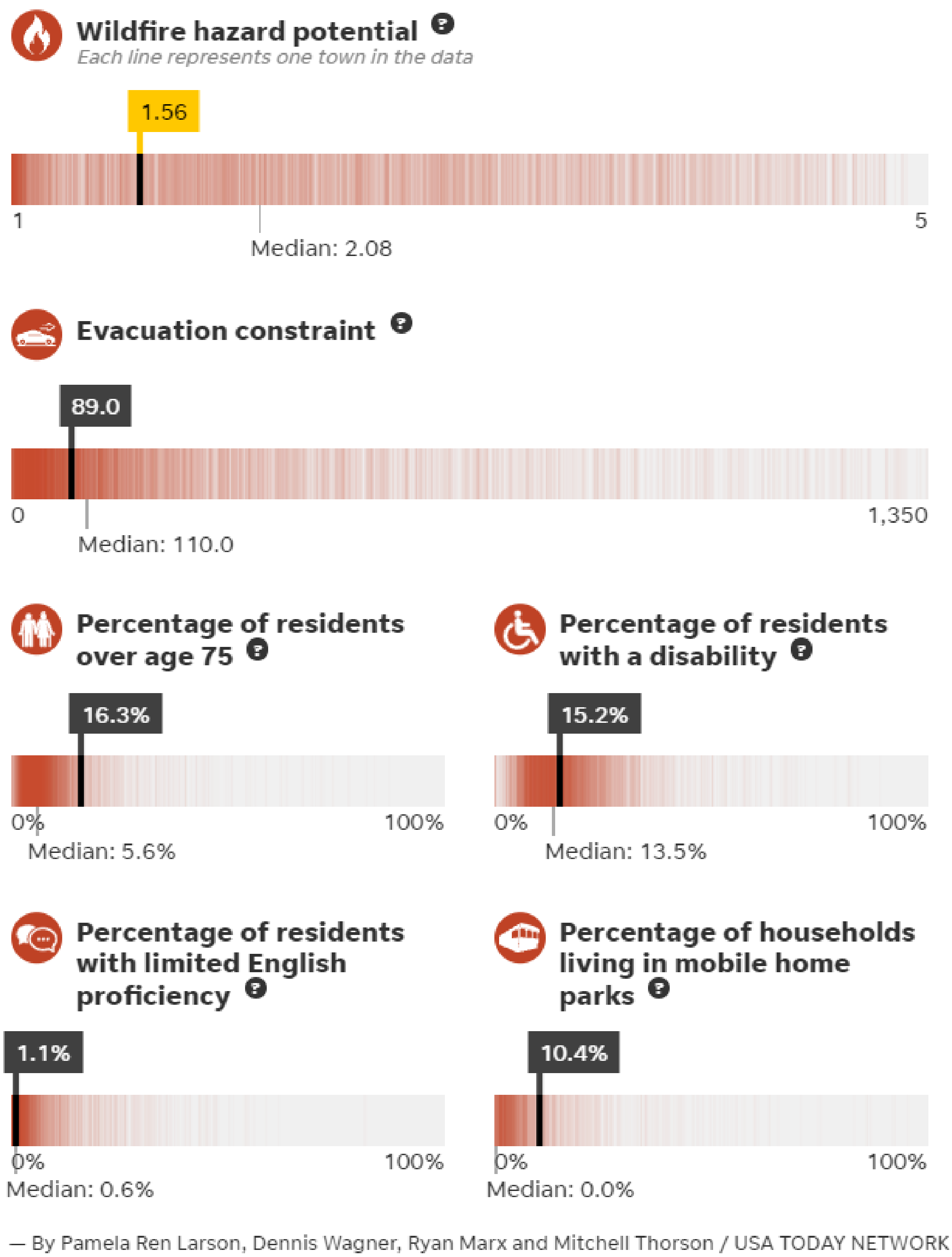
Westcliffe has a lower wildfire hazard potential than the median but is above average in multiple categories. The percentage of residents with a disability is only slightly higher than the median and percentage of population with

[13] https://www.azcentral.com/in-depth/news/local/arizona-wildfires/2019/07/22/wildfire-risks-more-than-500-spots-have-greater-hazard-than-paradise/1434502001/

limited English proficiency is similar. However, percentage of residents aged over 75 is nearly three times the median figure. Percentage of households living in a mobile home park is just over 10%, with a median of zero.

Evacuation constraint is below the median which is based on if there are limited routes out of a community, which can lead to mass congestion during evacuation.

Figure 65. Westcliffe 'Ahead of the Fire' Summary Report



LIFELINES

Most roads and railroads would be without damage except in the worst scenarios. Power lines are the most at risk to wildfire because most power poles are made of wood and susceptible to burning. In the event of a wildfire, pipelines could provide a source of fuel and lead to a catastrophic explosion. Structural Lifelines of wood frame construction are especially vulnerable during wildfire events.

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

As part of this vulnerability assessment, the county's Lifelines were assessed with the high and highest statewide wildfire risk areas shown in Figure 64. Individual assessments of those exposed Lifelines can help to identify potential mitigation actions to consider implementing.

The Lifeline infrastructure located in high and highest wildfire risk areas includes energy distribution lines which have 20% exposure, while transportation has 1% exposure of mileage.

POPULATION

Smoke and air pollution from wildfires can be a severe health hazard, especially for sensitive populations, including children, the elderly, and those with respiratory and cardiovascular diseases. Smoke generated by wildfire consists of visible and invisible emissions that contain particulate matter (soot, tar, water vapor, and minerals), gases (carbon monoxide, carbon dioxide, 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.

Those in the community with access and functional needs (AFN), may be incapable of evacuating the fire area within the allowable 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 also be disproportionately impacted by the hazard.

PROPERTY

Property damage from wildfires can be severe and can significantly alter entire communities. Based on an evaluation of best available structure footprint data for the county, there are 750 buildings across the county identified as being within the county's high and highest wildfire risk areas. A similar analysis of WUI risk areas shows that 791 buildings are located in the highest (top 33%) statewide WUI risk areas. Table 45 and Table 46 show the locations of these structures.

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 45. Structures Identified Within the County's High and Highest Wildfire Risk Areas

Location of Structure	Number of Structures
Unincorporated Custer County	682
Silver Cliff	20
Westcliffe	48
Total	**750**

Table 46. Structures Located in the Highest (Top 33%) Statewide WUI Risk Areas

Location of Structure	Number of Structures
Unincorporated Custer County	577
Silver Cliff	91
Westcliffe	123
Total	**791**

ENVIRONMENT

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

- Damaged Fisheries – Critical fisheries can suffer from increased water temperatures, sedimentation, and changes in water quality.
- Soil Erosion – The protective covering provided by foliage and dead organic matter is removed, leaving the soil fully exposed to wind and water erosion. Accelerated soil erosion 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.

In Custer County, the variety of wildlife is critical to the environment and the economy. Each year hunting licenses are issued for the Game Management Units 69 and 84, which include areas in the county, for elk, deer, and other game. A wildfire has the potential to damage the habitat of these animals, affecting population, migration, and access to food and water.

ECONOMY

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.

Damage to natural and recreational areas can drastically affect the local economy, it may no longer be a preferred destination for visitors, which is a main driver of income. This is especially true for hunters and others recreating in the thousands of acres of State Wilderness Areas and State Trust Lands, as thousands of permits are issued each year for the GMUs, which brings income to the area as hunters travel through. If populations are down due to fire damage or animals fleeing, less licenses will be purchased and less people will travel through.

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.

Over the next 30 years, in any given year, it is possible that Custer County can see an expected annual damage loss of $1 million due to fire, climate change, and no change in population. This is an average calculation over the time period which means years could have much higher or much lower losses, or none at all. Damage buildings and increased suppression costs are expected to grow with climate change in the county. The FACE viewer can provide a more in-depth exploration of the impact of these variables on Custer County, as well as those from flood and drought hazards.

FUTURE TRENDS IN DEVELOPMENT

Future population change across the county is expected to decrease by 0.4% over the next five years; however, steady 0.3% to 0.5% growth is projected through 2050. The projected growth is expected to occur primarily as municipal infill. 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.

The Custer County Community Wildfire Protection Plan identified several actions that would directly influence future development in the planning area:

- Action #1 Recommendation – Have the CWPP continuing process address strategies that can be used by every Landscape Neighborhood, and then specifics tailored to each smaller neighborhood.
- Action # 3 Recommendation – Evaluate first priorities for action by life threats in each neighborhood, including access and evacuation, ability to fight fire, imminent fire danger and severity, location and material type, and an emergency contact system for those in wildfire zones.
- Action #12 Recommendations – a. Implement educational and achievement recognition programs by Custer County government. b. Adopt minimum wildfire fuel, forest health, and access treatment standards for new construction and subdivisions. c. Adopt a system identifying highest-risk parcels and notifying owners.

Resources for community planning are developed and updated as the need for risk assessment planning continues to increase. Fire Adapted Communities Network is an organization that focuses on education and connecting communities for wildfire resilience. To assist communities in these efforts, a framework and community facilitation guide were created and can be found here.

WILDLIFE-VEHICLE COLLISIONS

MODERATE RISK

GENERAL BACKGROUND

Wildlife-vehicle collisions (WVCs) are a hazard with increased risk as development encroaches on wildlife habitats. Growth in traffic along roadways has created more opportunities for incidents to occur, especially in areas where wildlife congregate, breed and migrate through. Large animals including elk, deer, moose, bears, bighorn sheep, and cows are associated with the most property damage and potential danger. However, smaller animals including raccoons, skunks, beavers, coyotes, bobcats, and foxes are a major factor in the overall number of incidents and can also lead to dangerous outcomes.

While WVCs can happen in urban and suburban settings, rural areas with long stretches of roadway may see incidents with more impact due to increased speeds of travel. Collisions can happen any time of day but are typically more common in dawn or dusk hours, as well as dark-unlighted conditions.

PAST EVENTS

Wildlife-vehicle collisions happen year-round. Over the past ten years, the Colorado Department of Transportation (CDOT) has seen an average of 3,300 reported wildlife hits each year.[14] This number varies from about 2,000 to 4,000 each year and does not include hits that went unreported to law enforcement. There is always an increase in WVCs during migration season and particularly during the hours between dusk and dawn. These collisions are a matter of safety but can cause expensive property damage as well.

Based on data from CDOT and the Custer County Sheriff's Office, between 2010 and 2020, 240 WVCs occurred in Custer County. Approximately 87% resulted in property damages and approximately 4% resulted in injury. There were no fatalities during this period.

LOCATION

Wildlife-vehicle collisions can happen anywhere in Colorado, including urban areas which may have substantial small animal populations, such as raccoons and skunks. In addition to small animal incidents, larger animal collisions may occur in suburban areas as the wildland urban interface expands. However, most large animal incidents are likely to happen on roadways through more remote wildlife areas, especially areas of migration and breeding.

FREQUENCY

Development of areas in the county, especially in more remote areas, may increase the frequency of WVCs. Collisions are dependent on a variety of factors but are mostly driven by animal behaviors. During periods of migration, as larger numbers of animals move over great distances, collisions are more common. Migration patterns are aligned with seasonal changes, with the greatest movement in the fall and spring, which coincides with the shortening of daylight hours. Traffic on the roads during the dawn and dusk hours are at a greater risk of

[14] https://www.codot.gov/programs/environmental/wildlife/wildlifeonthemove

collisions during these migration periods. The increase in traffic from community growth is another factor that amplifies this risk.

Across Colorado, in 2016, 4.600 deer were killed on highways, according to Colorado Parks and Wildlife data. This number was over a 50% increase from the 3,000 deer killed in 2013. While numbers can fluctuate from year to year, the recent 2020 data shows 4,400 deer killed on highways. [15]

A 2020 State Farm study found there was an estimated 1.5 million insurance claims for vehicle collisions with deer nationwide. Across the state, Colorado drivers had a one in 209 chance of an animal collision between 2019 and 2020. This is compared to the one in 116 chance for all U.S. drivers. While deer make up the majority of collisions, this data included all animals. [16]

SEVERITY

Collisions can lead to serious injury, death, and extensive vehicle damage. However, typically the only direct impact is to a small geographic area and only few people at once. In most cases, only one vehicle is impacted, but the resulting obstruction on the roadway can impact a larger area, such as backing up traffic. People may be indirectly affected by road closures or congestion and there may be a risk of other accidents in the area.

WARNING TIME

By the nature of a wildlife-vehicle collision, there is very little to no warning time. As vehicles travel on roadways at any speed, the unpredictability of wildlife takes response time down to milliseconds.

SECONDARY HAZARDS

A secondary hazard of a WVC may be due to fluid leakage post collision. While the leakage is not likely to be in quantities that pose a large risk to people, wildlife, waterways or large areas, any fluids from the vehicle(s) should be handled per standard operating procedure.

CLIMATE CHANGE IMPACTS

Climate change may impact wildlife-vehicle collisions, as temperatures and seasons fluctuate in unexpected ways. Migration patterns and the availability of food and water may be altered by the effects of climate change, leading to animals traveling more often and over greater distances.

EXPOSURE AND VULNERABILITY

All vehicles on the road have the potential to be in a wildlife-vehicle collision. This risk is increased by various factors including what type and number of wildlife may be present in the area and the chances of these animals crossing roadways. WVCs can be dangerous to people and damaging to property regardless of speed of the vehicle and the type of animal involved. While large animals, such as elk and deer, may typically cause more damage, the possibility of drivers losing control of the vehicle during any collision creates a risk to life safety and property.

[15] https://www.codot.gov/programs/environmental/wildlife/data/annual-roadkill-reports/roadkill-data-2020.pdf

[16] https://newsroom.statefarm.com/animal-collision/

LIFELINES

This hazard may impact the Transportation Lifeline. WVCs can block roadways, sometimes for extended periods, and vehicles involved in a collision have the potential to cause damage to roads and bridges.

POPULATION

Custer County residents are all vulnerable to wildlife-vehicle collisions, as they can happen on any roadway at any time. People who often drive during dawn and dusk hours, such as commuters, likely have more exposure to this hazard.

PROPERTY

It is possible that a collision could result in a vehicle damaging roads, bridges, or infrastructure, such as electric poles. However, a majority of the time, most property damage only involves personal vehicles and can range greatly in the impact on the vehicle's value. Transportation companies, who operate using large trucks, have the potential to be impacted, either directly from a collision or indirectly due to possible traffic issues resulting from the collision.

ENVIRONMENT

After a collision, environmental damage may occur when vehicles leave the roadways. Damaged vehicles may leak engine fluids onto the ground, though likely not in large enough quantities to cause extensive or long-term environmental damage.

ECONOMY

The local economy may not see any noticeable impact from WVCs, but residents may be burdened by the loss of transportation, temporary or otherwise, the costs of repair or replacement, and any medical costs resulting from the collision.

According to the Highway Loss Data Institute, between 2006 and 2018 the claims costs for animal strikes steadily increased, likely due to the increase in vehicle prices. In 2018, the average claim was for $3,875, compared to $2,424 in 2006. [17] This is significant to most families in the U.S. and the scope of this hazard is evident when looking at national data.

Based on available national data, the Federal Highway Administration estimates the total annual cost associated with wildlife-vehicle collisions, specifically for deer, is $8.3 billion. [18] This includes vehicle and medical costs, as well as the overhead for towing and law enforcement. This number also figures in the monetary value of the animal, as public agencies may incur financial losses due to the death of the animal.

FUTURE TRENDS IN DEVELOPMENT

Future population change across the county is expected to decrease by 0.4% over the next five years; however, steady 0.3% to 0.5% growth is projected through 2050. The projected growth is expected to occur primarily as municipal infill. There are currently no identified new developments or roads in Custer County.

[17] https://www.iihs.org/media/ef6738c2-07dd-422a-b0da-47599762ed27/NAdp_Q/HLDI%20Research/Bulletins/hldi_bulletin_36.04.pdf

[18] https://www.fhwa.dot.gov/publications/research/safety/08034/exec.cfm

Any growth has the consequence of increased vehicular traffic, presenting more opportunities for exposure of animal populations. If development expands into areas that animal populations are used to living in, the potential to cut off migration corridors, as well as access to food and water, is an issue. Animals may be unaware of the increased human risk and may not avoid roadways or developed areas.

APPENDIX A: LOCAL GOVERNMENT ANNEXES

The following annexes provide additional, specific information that is unique to each adopting local government included in this HMP.

Communities are encouraged to leverage available web map viewers to access the most recent hazard data as they reference this plan. This will ensure users are consulting the best available data which they can view at multiple scales, allowing hazard risk to be reviewed across the entire community, within specific neighborhoods, or for site specific assessments. Additional details and links are provided in the HAZARD DATA VIEWERS section of this Plan.

TOWN OF SILVER CLIFF

OVERVIEW

The Town of Silver Cliff has a population of over 600 people and is a close neighbor of Westcliffe.

RISK RANKING

Silver Cliff's overall qualitative risk rankings for the hazards profiled in this plan are presented in Table 47. The top hazards of concern include cyber attack, drought, earthquake, extreme heat, flood, geologic hazards, hazardous materials release, public health hazards, severe winter weather, and thunderstorm (including hail, high wind, and lightning), tornado, wildfire, and wildlife-vehicle collision.

Table 47. Hazard Risk Ranking

	Avalanche	Cyber Attack	Dam / Levee Incident	Drought	Earthquake	Extreme Heat	Flood	Geologic Hazards	Hazardous Materials Release	Landslide / Debris Flow / Rockfall	Public Health Hazards	Severe Winter Weather	Thunderstorm (hail, wind, lighting)	Tornado	Wildfire	Wildlife-Vehicle Collision
Silver Cliff	M	H	M	H	H	H	H	H	H	M	H	H	H	H	H	H

VULNERABILITY ASSESSMENT

Silver Cliff has a similar risk to the rest of the county; however, with a high population density the vulnerability increases. Many hazards can cause immediate threat to public safety and damage to property. Silver Cliff utilized the methodology from the risk ranking, considering probability and impacts to people, property / environment, and the economy. The population density of the town played a role in this methodology as the impacts to people are likely to be greater, especially for certain hazards.

When assessing hazards for Silver Cliff, it became clear that earthquake, extreme heat, flood, severe winter weather and thunderstorms, tornado, and wildfire are all considered high risk by the community. These events can devastate the area, impacts hundreds in mere moments, and are capable of downing power lines, damaging homes and infrastructure, and creating dangerous conditions for individuals who may be outside during an event.

Other natural hazards which pose a high risk to the community, but a slower impact include drought and geologic hazards. These hazards still affect the community and its safety but are less likely to severely damage properties.

Public health hazards are also impacted by population density, as people living in close quarters with daily interactions can spread an illness more rapidly. Public health ties to drought as well, if water availability is an issue the impact on the safety of the public can be considerable. This includes water quality issues from contaminants, which can increase during drought. Sanitation can also be greatly impacted.

Cyber attack, hazardous materials release, and wildlife-vehicle collision are all human caused and there are numerous factors for each hazard that determines the risk posed to public health and safety.

Silver Cliff has multiple structures exposed to wildfire risk. The structures exposed to wildfire include 20 structures located in the county's high and highest wildfire risk areas and 91 structures located in the wildland urban interface (WUI).

MITIGATION CAPABILITIES

Capabilities for the Town of Silver Cliff are shown in the Mitigation Capabilities section.

TOWN OF WESTCLIFFE

OVERVIEW

The Town of Westcliffe is the county seat of Custer County, with a population of over 600 people.

RISK RANKING

Westcliffe's overall qualitative risk rankings for the hazards profiled in this plan are presented in Table 48. The top hazards of concern include drought, geologic hazards, public health hazards, severe winter weather, and thunderstorm (including hail, high wind, and lightning).

Table 48. Hazard Risk Ranking

	Avalanche	Cyber Attack	Dam / Levee Incident	Drought	Earthquake	Extreme Heat	Flood	Geologic Hazards	Hazardous Materials Release	Landslide / Debris Flow / Rockfall	Public Health Hazards	Severe Winter Weather	Thunderstorm (hail, wind, lighting)	Tornado	Wildfire	Wildlife-Vehicle Collision
Westcliffe	L	M	L	H	M	M	M	H	M	M	H	H	H	M	M	M

VULNERABILITY ASSESSMENT

Westcliffe has a similar risk to the rest of the county; however, with a high population density the vulnerability increases. This is especially true for severe winter weather and thunderstorms, which are capable of downing power lines, damaging homes and infrastructure, and creating dangerous conditions for individuals who may be outside during an event.

Public health hazards are also impacted by population density, as people living in close quarters with daily interactions can spread an illness more rapidly. Public health ties to drought as well, if water availability is an issue the impact on the safety of the public can be considerable. This includes water quality issues from contaminants, which can increase during drought. Sanitation can also be greatly impacted.

In addition, Westcliffe has multiple structures exposed to flood and wildfire risk. There is a total of 5 structures exposed in the 1% annual chance floodplain and multiple structures exposed to wildfire risk. The structures exposed to wildfire include 48 structures located in the county's high and highest wildfire risk areas and 123 structures located in the wildland urban interface (WUI).

MITIGATION CAPABILITIES

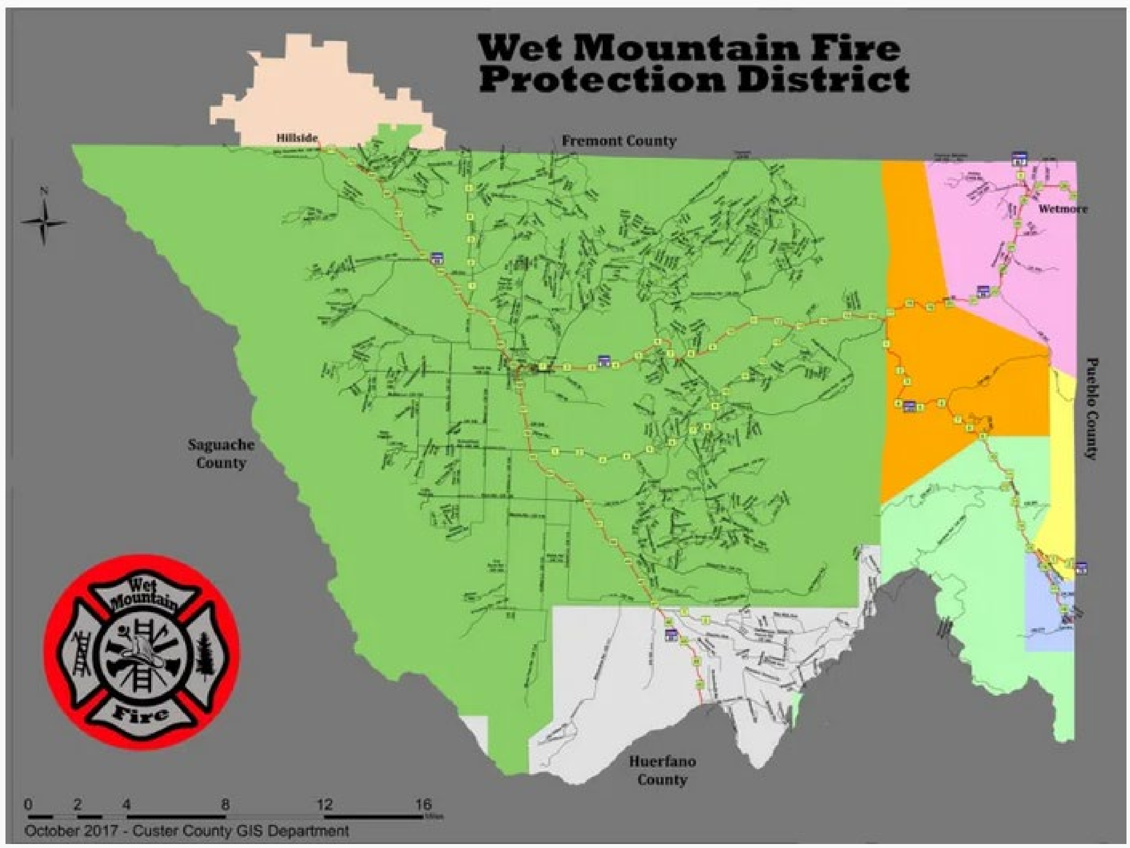
Capabilities for the Town of Westcliffe are shown in the Mitigation Capabilities section.

WET MOUNTAIN FIRE PROTECTION DISTRICT

OVERVIEW

The Wet Mountain Fire Protection District encompasses roughly 650 square miles in the county and an inclusion area in southern Fremont County. Approximately 30 volunteers respond to all types of emergencies within the district from motor vehicle accidents to structure and wildland fires. Figure 66 shows the areas the Wet Mountain Fire Protection District serves.

Figure 66. Map of District



RISK RANKING

Wet Mountain Fire Protection District's overall qualitative risk rankings for the hazards profiled in this plan are presented in Table 49. The top hazards of concern include cyber attack, drought, hazardous materials release, landslide / debris flow / rockfall, public health hazards, severe winter weather, thunderstorm (including hail, high wind, and lightning), tornado, and wildfire.

Table 49. Hazard Risk Ranking

	Avalanche	Cyber Attack	Dam / Levee Incident	Drought	Earthquake	Extreme Heat	Flood	Geologic Hazards	Hazardous Materials	Landslide / Debris Flow / Rockfall	Public Health Hazards	Severe Winter Weather	Thunderstorm (hail, wind, lighting)	Tornado	Wildfire	Wildlife-Vehicle Collision
Wet Mountain FPD	M	H	M	H	M	M	M	M	H	H	H	H	H	H	H	M

VULNERABILITY ASSESSMENT

Wet Mountain Fire Protection District has much of the same exposure to hazards as the rest of the county, since they cover a large region. However, when considering vulnerability of the district it is important to focus on the exposure of the individual first responders who address these hazards head on. For example, hazardous materials release presents a far lower vulnerability to the average county resident, than to the responders who are deployed for containment and cleanup.

Due to the nature of their work, the most extreme of these vulnerabilities is wildfire and threat to the safety of these men and women when they respond to protect their communities. This increases as wildfire events are likely to occur more often in the future.

The vulnerability to the other hazards that the Wet Mountain FPD sees as high risk are based on the impact of their ability to respond and the exposure to the volunteers upon responding to a hazard event. A majority of these hazards present minimal risk to assets including structures and equipment. The District addresses these vulnerabilities in the Wet Mountain FPD 2022 mitigation actions.

Hazard	Vulnerability Assessment
Cyber Attack	Main station communications and computer systems, comms tower (VHF & 800 MHz) - potential susceptibility, but protective measures in place - refer to mitigation actions information.
Drought	Cisterns are underground and dedicated to fire suppression and exist as static/available supply. Overall susceptibility due to inherent risk of maintaining adequate suppression capacity during prolonged drought.
Hazardous Materials	Minimal risk, but potential susceptibility to personnel & equipment
Landslide / Debris Flow	Minimal risk, but potential susceptibility to personnel & equipment
Public Health Hazards	Minimal risk, but potential susceptibility to personnel & equipment
Severe Winter Weather	Minimal risk, but potential susceptibility to personnel & equipment
Thunderstorm	Minimal risk, but potential susceptibility to personnel & equipment
Tornado	Minimal risk, but potential susceptibility to personnel & equipment
Wildfire	Minimal risk to structures, but potential susceptibility to personnel & equipment

MITIGATION CAPABILITIES

The capabilities of a district are significantly different than those of a jurisdiction or municipality. Depending on the type of service a district represents, some capabilities, tools, or plans may not be practical to develop and maintain. Many districts rely on partnerships to fulfill gaps in capabilities and assist partners, as well. These collaborative efforts illustrate that a capability may not be specifically listed, but is not necessarily out of reach for an organization.

Planning and regulatory capabilities are powerful tools for implementing hazard mitigation and the district has a Community Wildfire Protection Plan (CWPP). While there are other plans under the planning and regulatory capabilities category, the fire district maintains the most critical plan for their work and authority. However, it is important for the Wet Mountain Fire Protection District (Wet Mountain FPD) to regularly review the tools and plans of various entities as opportunities to collaborate on further risk reduction efforts.

For administrative and technical capabilities, the district writes and manages grants in-house. They current do not have GIS capabilities and do not run a maintenance program at this time. The district does not have the financial capabilities of funding through utilities fees, stormwater utilities fees, or capital improvement project funding. As the ability of a district to implement a comprehensive mitigation strategy is largely dependent on available funding, they consistently pursue all relevant grant fundings. Education and outreach are important capabilities that allow a district to continue the conversation with their public regarding hazard risk and opportunities to mitigate. Recently, a new position for a wildland coordinator was filled and educating the public on FireWise is a priority task.

ROUND MOUNTAIN WATER & SANITATION DISTRICT

OVERVIEW

The Round Mountain Water and Sanitation District provides water and sanitation services to the towns of Westcliffe and Silver Cliff, serving a population of approximately 1,000 residents.

RISK RANKING

Round Mountain Water and Sanitation District 's overall qualitative risk rankings for the hazards profiled in this plan are presented in Table 50. The top hazards of concern include cyber attack, drought, severe winter weather, thunderstorm (including hail, high wind, and lightning), wildfire, and wildlife-vehicle collision.

Table 50. Hazard Risk Ranking

	Avalanche	Cyber Attack	Dam / Levee Incident	Drought	Earthquake	Extreme Heat	Flood	Geologic Hazards	Hazardous Materials	Landslide / Debris Flow / Rockfall	Public Health Hazards	Severe Winter Weather	Thunderstorm (hail, wind, lighting)	Tornado	Wildfire	Wildlife-Vehicle Collision
Round Mountain Water	L	H	M	H	M	M	M	M	M	M	M	H	H	M	H	H

VULNERABILITY ASSESSMENT

Round Mountain Water and Sanitation District has a similar risk to the rest of the county to the identified hazards. The risk rankings identify high hazards the district may be more vulnerable to and these were assessed. A majority of these hazards present minimal risk to assets including structures and equipment. The District addresses these vulnerabilities in the Round Mountain Water and Sanitation District 2022 mitigation actions.

Hazard	Vulnerability Assessment
Cyber Attack	Minimal risk, but potential susceptibility to personnel & equipment
Drought	Minimal risk given current capacity of source wells and reservoir. Overall systems susceptibility due to inherent risk of maintaining adequate supply / capacity during prolonged periods of drought.
Severe Winter Weather	Power outages are primary concern. Minimal risk to structures, but potential susceptibility to personnel & equipment
Thunderstorm	Power outages are primary concern. Minimal risk, but potential susceptibility to personnel & equipment
Wildfire	Minimal risk to structures and other physical assets due to geographic dispersal, but potential susceptibility to personnel & equipment
Wildlife Vehicle Collision	Minimal risk, but potential susceptibility to personnel & equipment

MITIGATION CAPABILITIES

The capabilities of a district are significantly different than those of a jurisdiction or municipality. Depending on the type of service a district represents, some capabilities, tools, or plans may not be practical to develop and maintain. Many districts rely on partnerships to fulfill gaps in capabilities and assist partners, as well. These collaborative efforts illustrate that a capability may not be specifically listed, but is not necessarily out of reach for an organization.

Planning and regulatory capabilities are powerful tools for implementing hazard mitigation. While the district does not have formal plans under the planning and regulatory capabilities, they are working on upgrading systems for which will require cross sector collaboration and planning. The district also completes all the necessary land use and ordinance inspections.

The district has recently implemented the following improvements to mitigate potential hazards:

1. Purchase and implementation of a GIS platform that displays and manages RMWSD water and wastewater infrastructure.
2. Installed water saving “smart meters” track leaks and unusual usage.
3. Installing a new municipal well and water treatment system that operates primarily on a solar array system, providing community water in power outage situations
4. Hired a computer security and IT firm to mitigate potential cyber security attacks

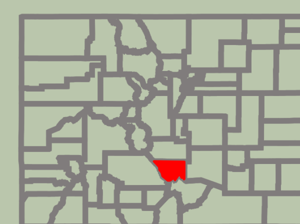
Financial capabilities and funding are limited; however, the district has adjusted water / sanitation fees to cover organization costs.

The district does not list any public outreach or education programs; however, they have the potential to partner with the county regarding drought education.

APPENDIX B: WILDFIRE RISK ASSESSMENT SUMMARY REPORT

2022
Colorado Wildfire Risk Assessment Summary Report

CusterHMP



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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
Wildfire Risk	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
Fire Intensity Scale	Quantifies the potential fire intensity by orders of magnitude
Wildland Urban Interface	Housing density depicting where humans and their structures meet or intermix with wildland fuel
Wildland Urban Interface Risk	Annual probability of any location burning due to wildfire
Values at Risk Rating	A composite rating of values and assets that would be adversely impacted by a wildfire by combining the four main risk outputs
Suppression Difficulty Rating	Reflects the difficulty or relative cost to suppress a fire given the terrain and vegetation conditions that may impact machine operability
Drinking Water Risk Index	A measure of the risk to Drinking Water Risk Index Areas (DWIA) based on the potential negative impacts from wildfire
Forest Assets Risk Index	A measure of the risk to forested areas based on the potential negative impacts from wildfire
Riparian Assets Risk Index	A measure of the risk to riparian areas based on the potential negative impacts from wildfire
Characteristic Flame Length	A measure of the expected flame length of a potential fire

COWRA Product	Description
Characteristic Rate of Spread	A measure of the expected rate of spread of a potential fire
Fire Type Extreme Weather	Represents the potential fire type under the extreme percentile weather category
Surface Fuels	A measure of the expected rate of spread of a potential fire
Characteristic Rate of Spread	Characterization of surface fuel models that contain the parameters for calculating fire behavior outputs
Vegetation	General vegetation and landcover types
Forest Assets	Identifies forested land categorized by susceptibility or response to fire
Riparian Assets	Forested riparian areas characterized by functions of water quantity and quality, and ecology
Drinking Water Importance Areas	A measure of quality and quantity of public surface drinking water categorized by watershed

Wildland Urban Interface

Description

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.

For the **CusterHMP** project area, it is estimated that **4,602** people or **100.0 %** percent of the total project area population (4,602) live within the WUI.

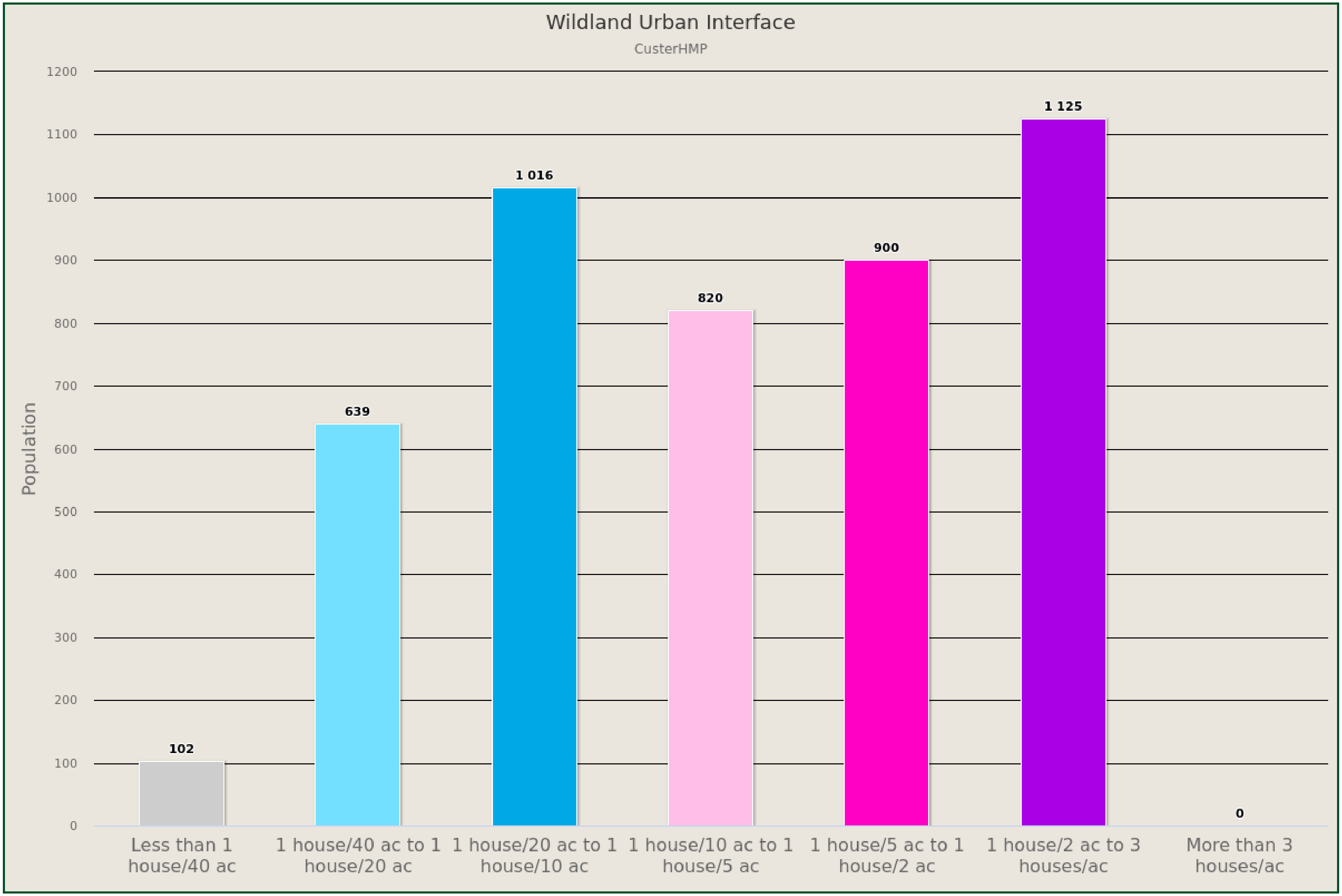
The Wildland Urban Interface (WUI) layer reflects housing density depicting where humans and their structures meet or intermix with wildland fuels. In the past, conventional wildland-urban interface datasets, such as USFS SILVIS, have been used to reflect these concerns. However, USFS SILVIS and other existing data sources did not provide the level of detail needed by the Colorado State Forest Service and local fire protection agencies.

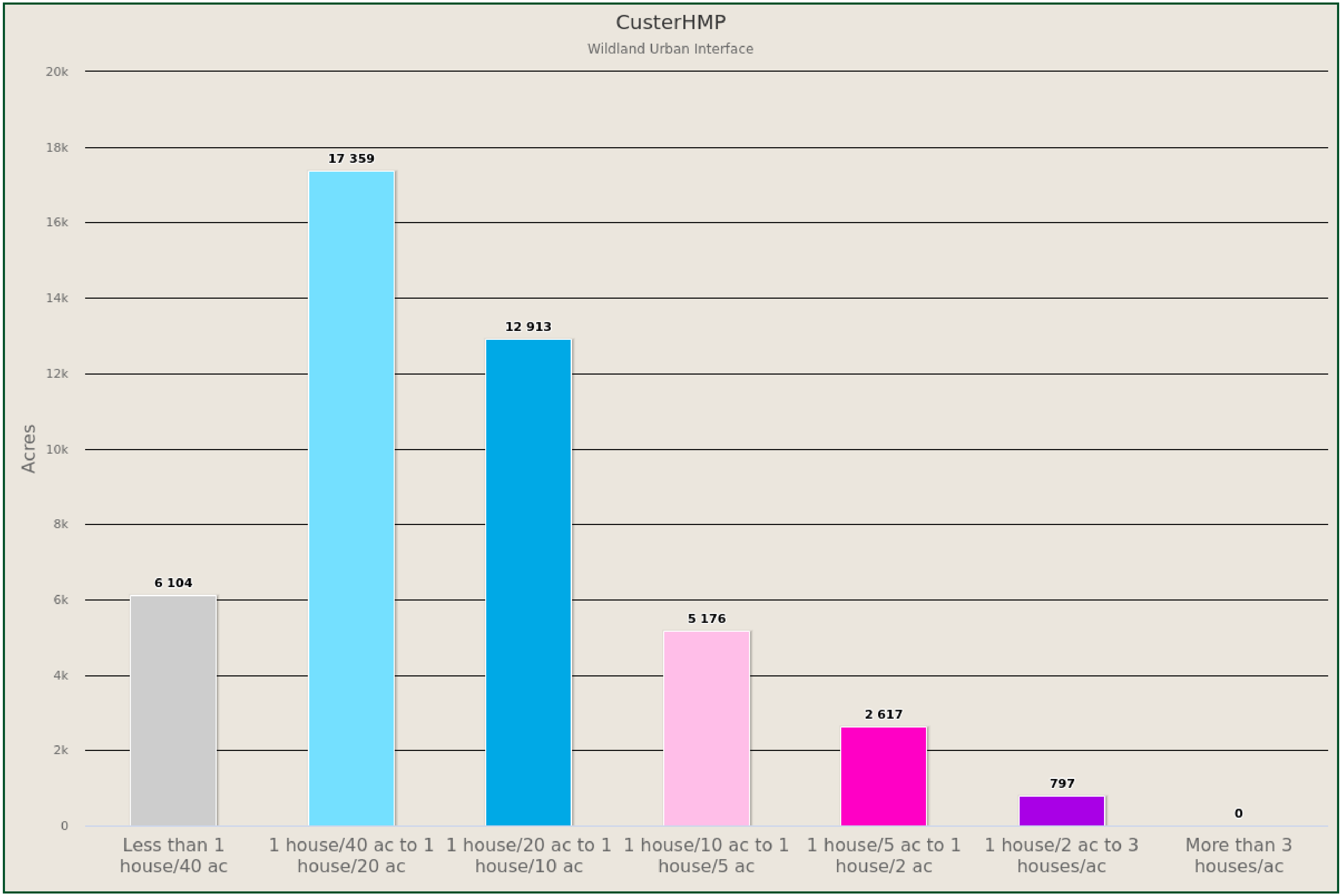
The new WUI dataset is derived using advanced modeling techniques based on the Where People Live dataset and 2016 LandScan USA population count data available from the Department of Homeland Security, HSIP dataset. WUI is simply a subset of the Where People Live dataset. The primary difference is populated areas surrounded by sufficient non-burnable areas (i.e. interior urban areas) are removed from the Where People Live dataset, as these areas are not expected to be directly impacted by a wildfire. This accommodates WUI areas based on encroachment into urban areas where wildland fire is likely to spread.

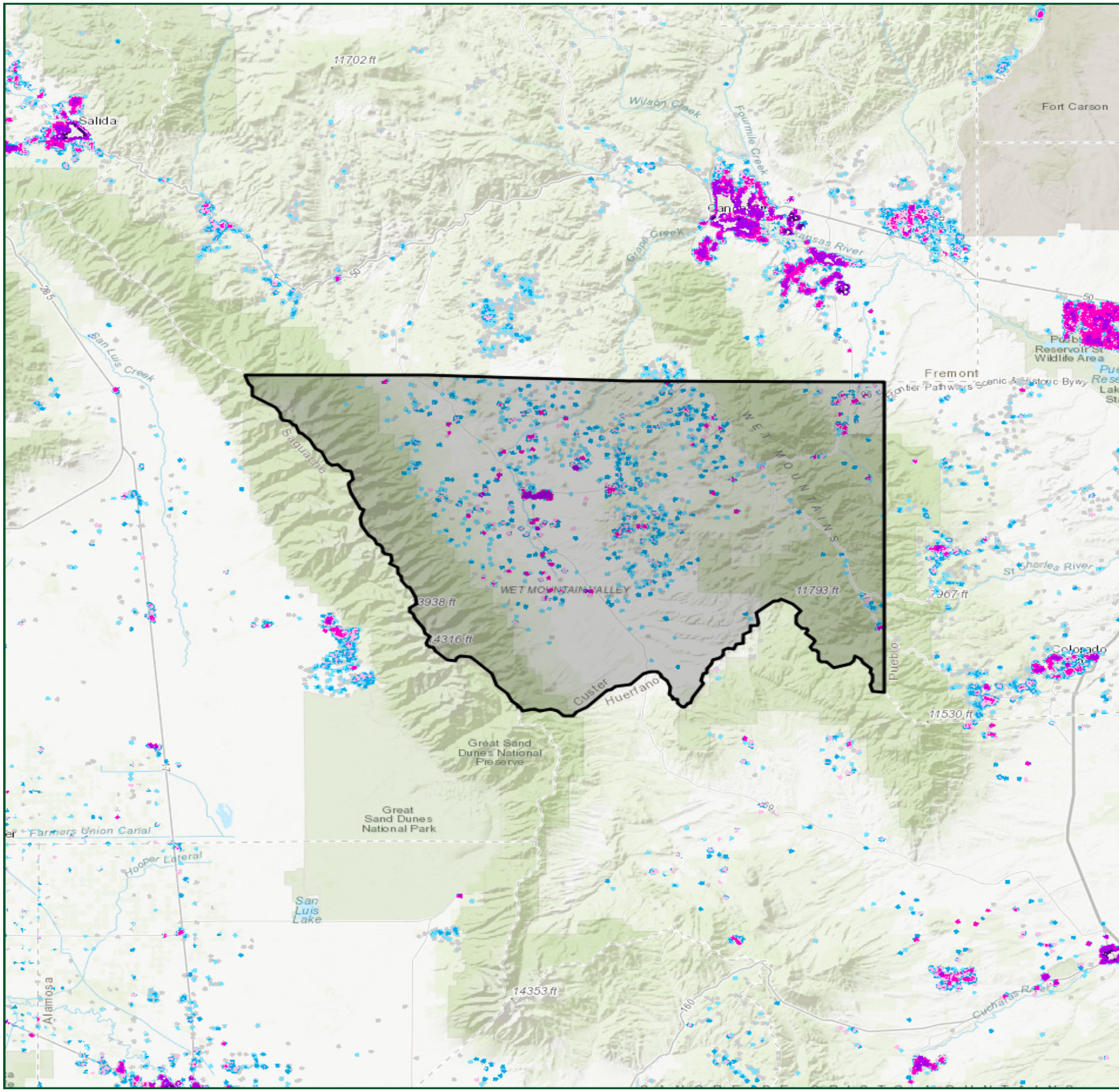
A more detailed description of the risk assessment algorithms is provided in the Colorado Wildfire Risk Assessment (Colorado WRA) Final Report, which can be downloaded from www.ColoradoForestAtlas.org.

Data are modeled at a 30-meter cell resolution (30 m2 or 900 m area per map cell), which is consistent with other Colorado WRA layers. The WUI classes are based on the number of houses per acre. Class breaks are based on densities understood and commonly used for fire protection planning.

Housing Density	WUI Population	Percent of WUI Population	WUI Acres	Percent of WUI Acres
Less than 1 house/40 ac	102	2.2 %	6,104	13.6 %
1 house/40 ac to 1 house/20 ac	639	13.9 %	17,359	38.6 %
1 house/20 ac to 1 house/10 ac	1,016	22.1 %	12,913	28.7 %
1 house/10 ac to 1 house/5 ac	820	18.1 %	5,176	11.5 %
1 house/5 ac to 1 house/2 ac	900	19.7 %	2,617	5.8 %
1 house/2 ac to 3 houses/ac	1,125	24.5 %	797	1.8 %
More than 3 houses/ac	0	0.0 %	0	0 %
Total	**4,602**	**100.0 %**	**44,967**	**100.0 %**


Wildland Urban Interface
CusterHMP
Population
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
102
639
1 016
820
900
1 125
0
Less than 1 house/40 ac
1 house/40 ac to 1 house/20 ac
1 house/20 ac to 1 house/10 ac
1 house/10 ac to 1 house/5 ac
1 house/5 ac to 1 house/2 ac
1 house/2 ac to 3 houses/ac
More than 3 houses/ac


CusterHMP
Wildland Urban Interface
Acres
20k
18k
16k
14k
12k
10k
8k
6k
4k
2k
0
17 359
12 913
6 104
5 176
2 617
797
0
Less than 1 house/40 ac
1 house/40 ac to 1 house/20 ac
1 house/20 ac to 1 house/10 ac
1 house/10 ac to 1 house/5 ac
1 house/5 ac to 1 house/2 ac
1 house/2 ac to 3 houses/ac
More than 3 houses/ac



CusterHMP

Wildland Urban Interface

- Less than 1 house/40 ac
- 1 house/40 ac to 1 house/20 ac
- 1 house/20 ac to 1 house/10 ac
- 1 house/10 ac to 1 house/5 ac
- 1 house/5 ac to 1 house/2 ac
- 1 house/2 ac to 3 houses/ac
- More than 3 houses/ac

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Wildland Urban Interface (WUI) Risk Index

Description

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.

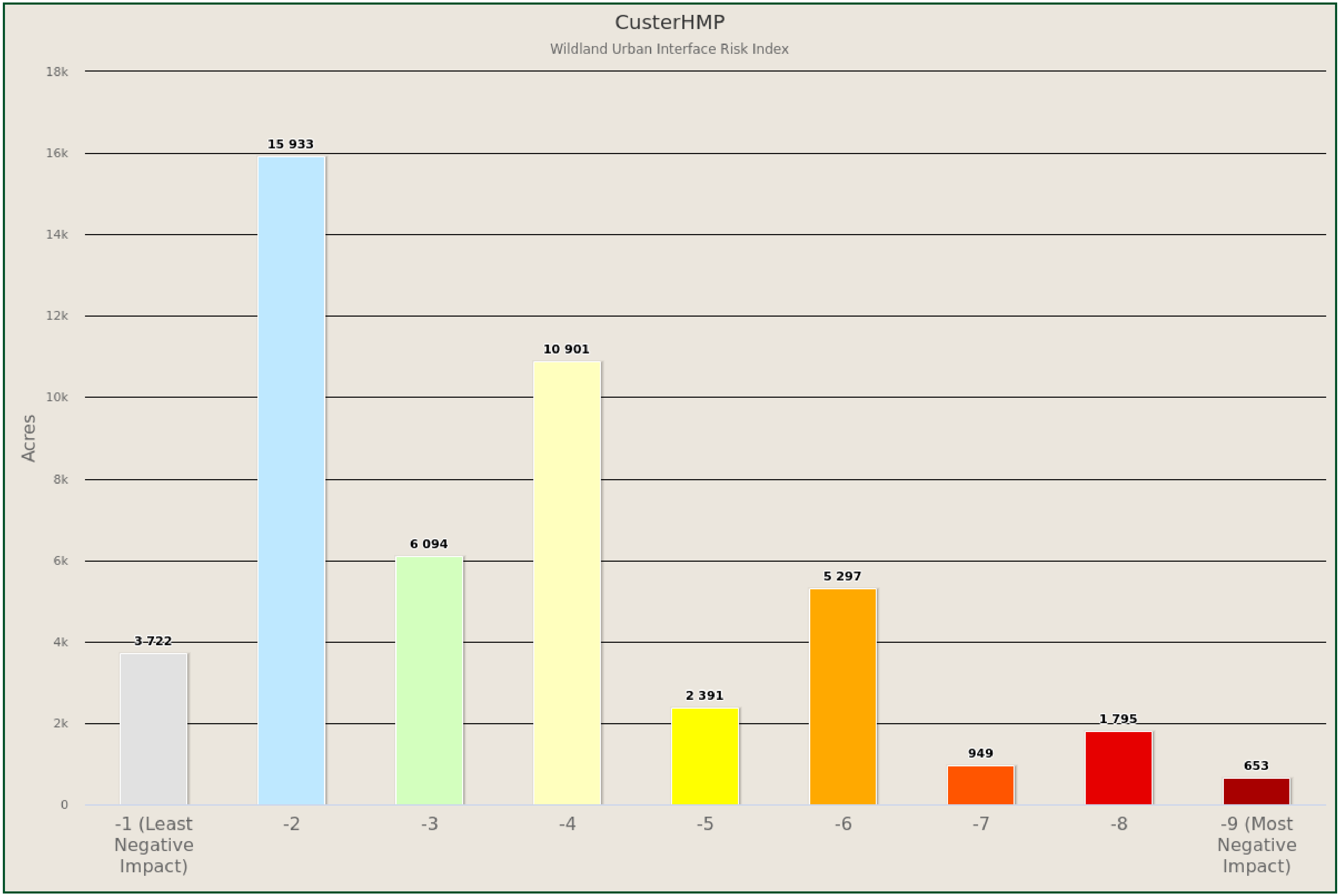
To calculate the WUI Risk Index, the WUI housing density data were combined with flame length data and response functions were defined to represent potential impacts. The response functions were defined by a team of experts led by Colorado State Forest

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.

The range of values is from -1 to -9, with -1 representing the least negative impact and -9 representing the most negative impact. For example, areas with high housing density and high flame lengths are rated -9, while areas with low housing density and low flame lengths are rated -1.

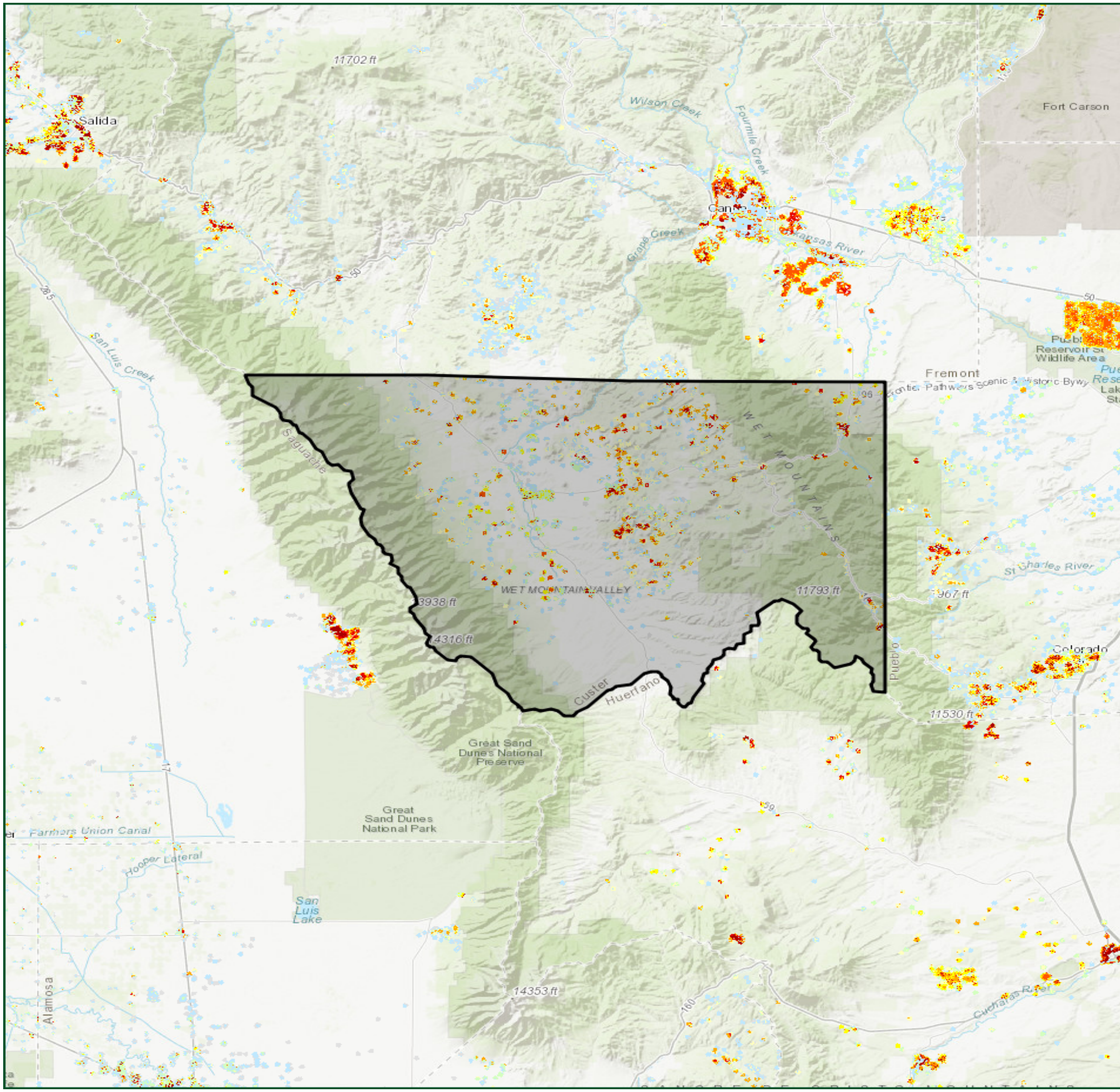
The WUI Risk Index has been calculated consistently for all areas in Colorado, which allows for comparison and ordination of areas across the entire state. Data are modeled at a 30-meter cell resolution, which is consistent with other Colorado WRA layers.

WUI Risk Class	Acres	Percent
-1 (Least Negative Impact)	3,722	7.8 %
-2	15,933	33.4 %
-3	6,094	12.8 %
-4	10,901	22.8 %
-5	2,391	5.0 %
-6	5,297	11.1 %
-7	949	2.0 %
-8	1,795	3.8 %
-9 (Most Negative Impact)	653	1.4 %
Total	**47,734**	**100 %**



CusterHMP
Wildland Urban Interface Risk Index
Acres
18k
16k
14k
12k
10k
8k
6k
4k
2k
0
15 933
10 901
6 094
5 297
3 722
2 391
1 795
949
653
-1 (Least Negative Impact)
-2
-3
-4
-5
-6
-7
-8
-9 (Most Negative Impact)

CusterHMP



Wildland Urban Interface Risk

- -1 (Least Negative Impact)
- -2
- -3
- -4
- -5
- -6
- -7
- -8
- -9 (Most Negative Impact)

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Firewise USA®

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:

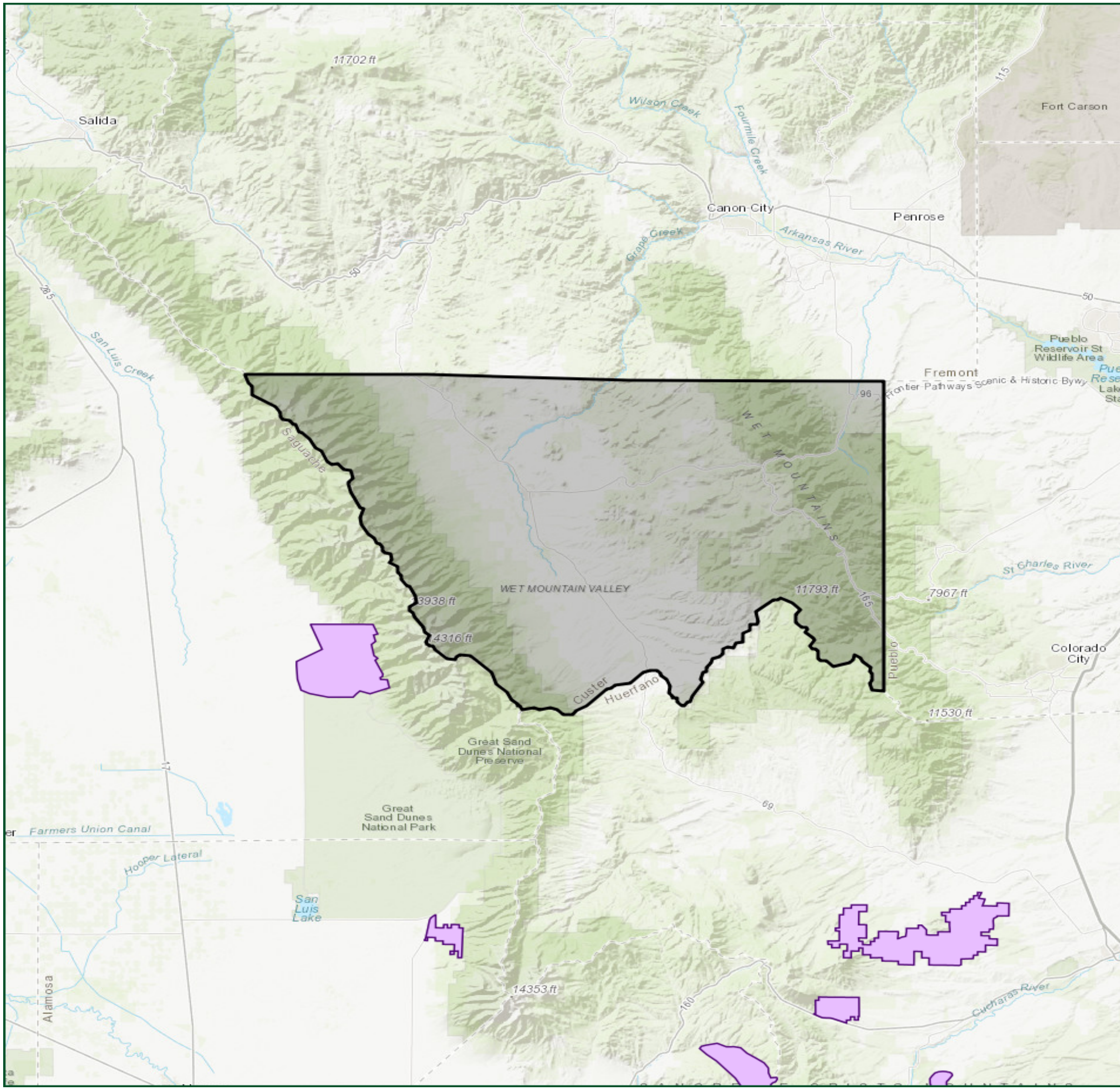
1. Form a Firewise board or committee
2. Obtain a wildfire risk assessment from the CSFS or local fire department, and create an action plan
3. Hold a Firewise event once per year
4. Invest a minimum of $24.14 per dwelling unit in local Firewise actions annually
5. Create a National Fire Prevention Association (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.

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.



CusterHMP

Fire Wise Communities

Fire Wise Communities 2018

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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

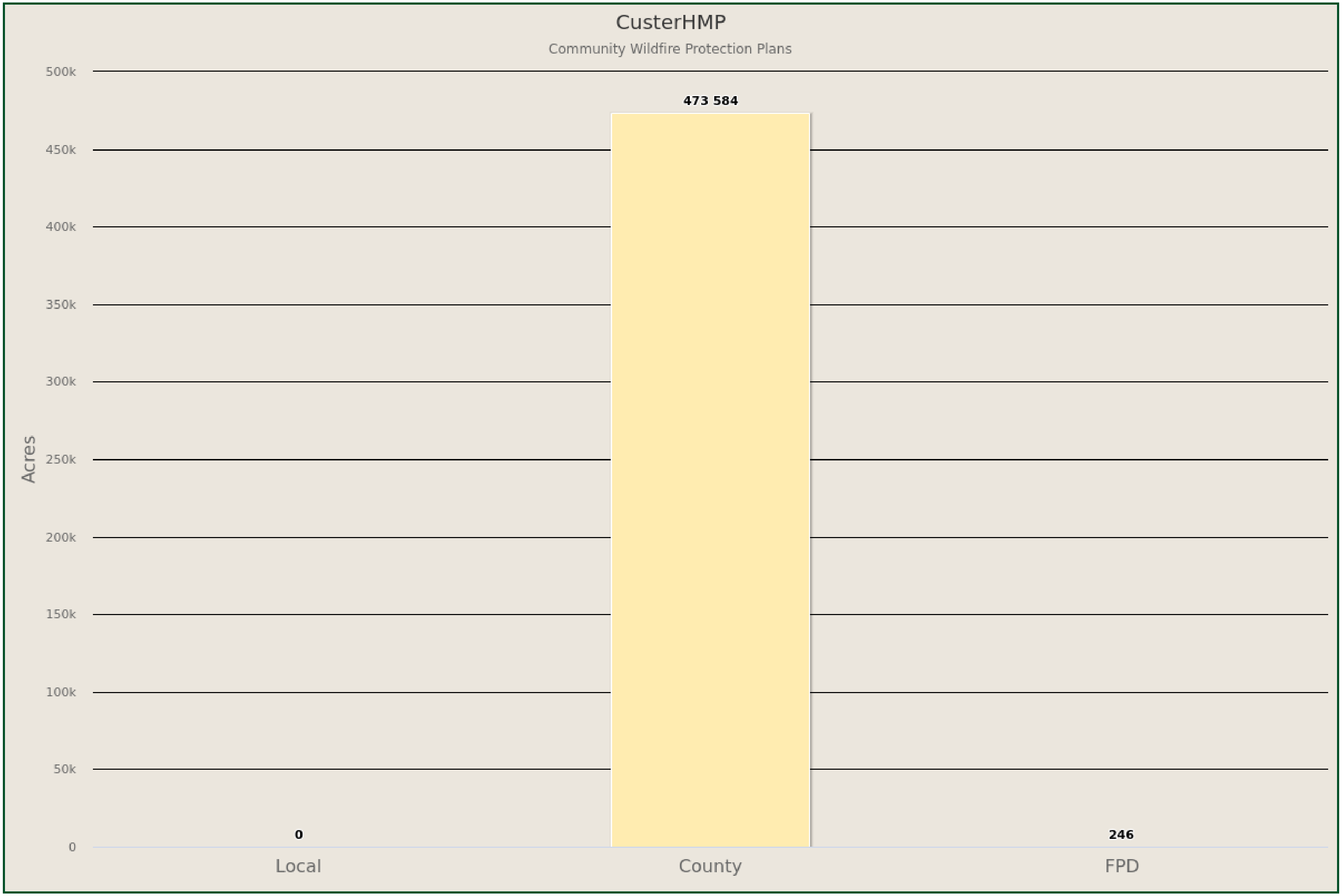
Community input is the foundation of a Community Wildfire Protection Plan that identfies community needs and garners community support.

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.

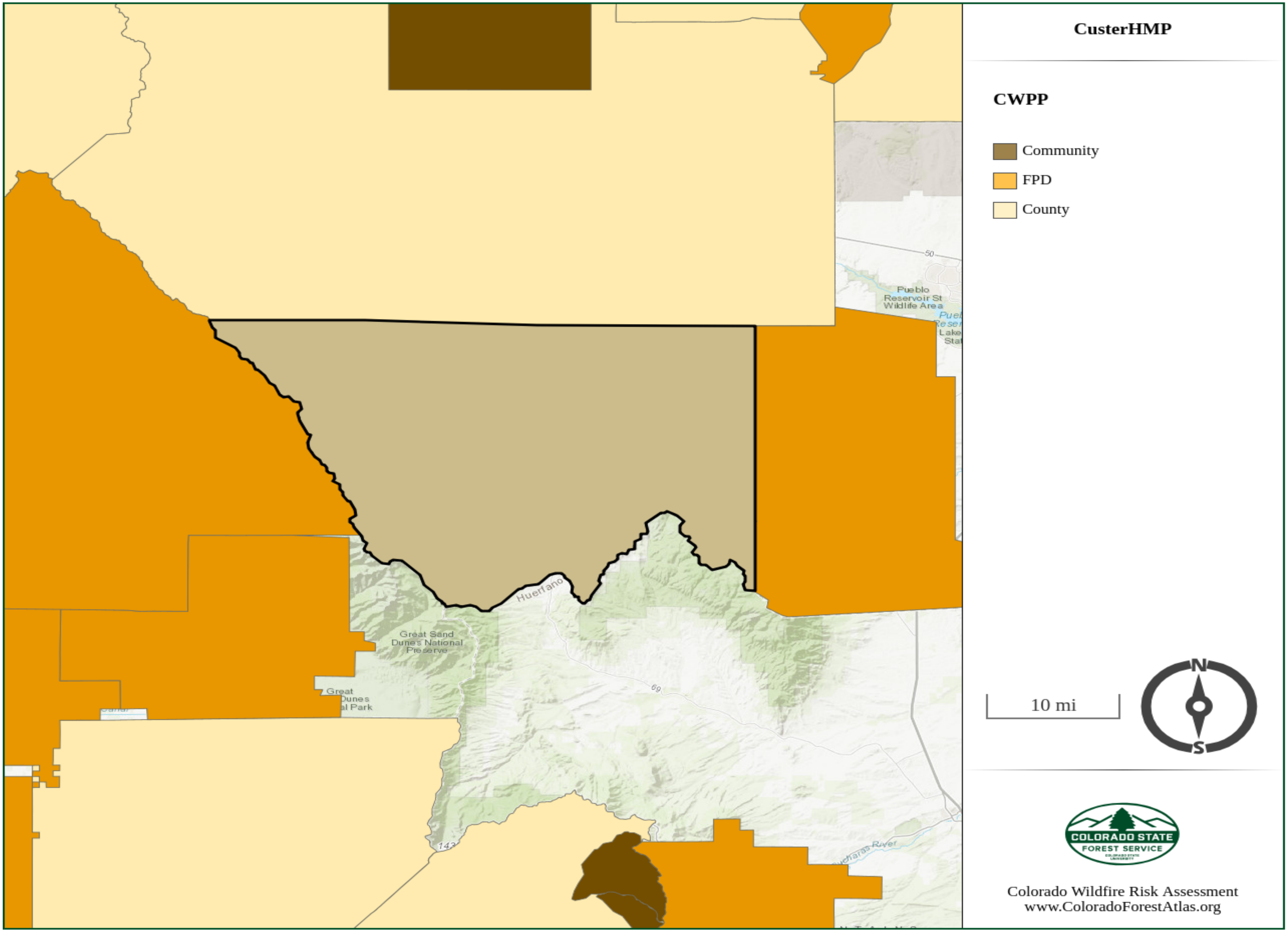
If your community is in an area at risk from wildfire, now is a good time to start working with neighbors on a CWPP and preparing forfuture wildfires. Contact your local CSFS district to learn how to start this process and create a CWPP for your community: http://csfs.colostate.edu/pages/your-local-forester.html

For the CusterHMP test project area, there are 4 CWPPs areas that are totally or partially in the defined project area.

Community CWPP Name	CWPP Type	CSFS District	Acres inside project area	Total Acres
Fremont County	County	Canon City	15	980,970
Custer County	County	Canon City	473,570	473,187
Southwest Pueblo County	FPD	Canon City	243	264,925
Northern Saguache County FPD CWPP	FPD	Alamosa	4	1,048,408
Total Acres			**473,830**	**2,767,491**



CusterHMP
Community Wildfire Protection Plans
Acres
500k
450k
400k
350k
300k
250k
200k
150k
100k
50k
0
473 584
0
246
Local
County
FPD


CusterHMP
CWPP
Community
FPD
County
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www.ColoradoForestAtlas.org
Pueblo Reservoir St Wildlife Area
Huerfano
Great Sand Dunes National Preserve
69
50

Wildfire Risk

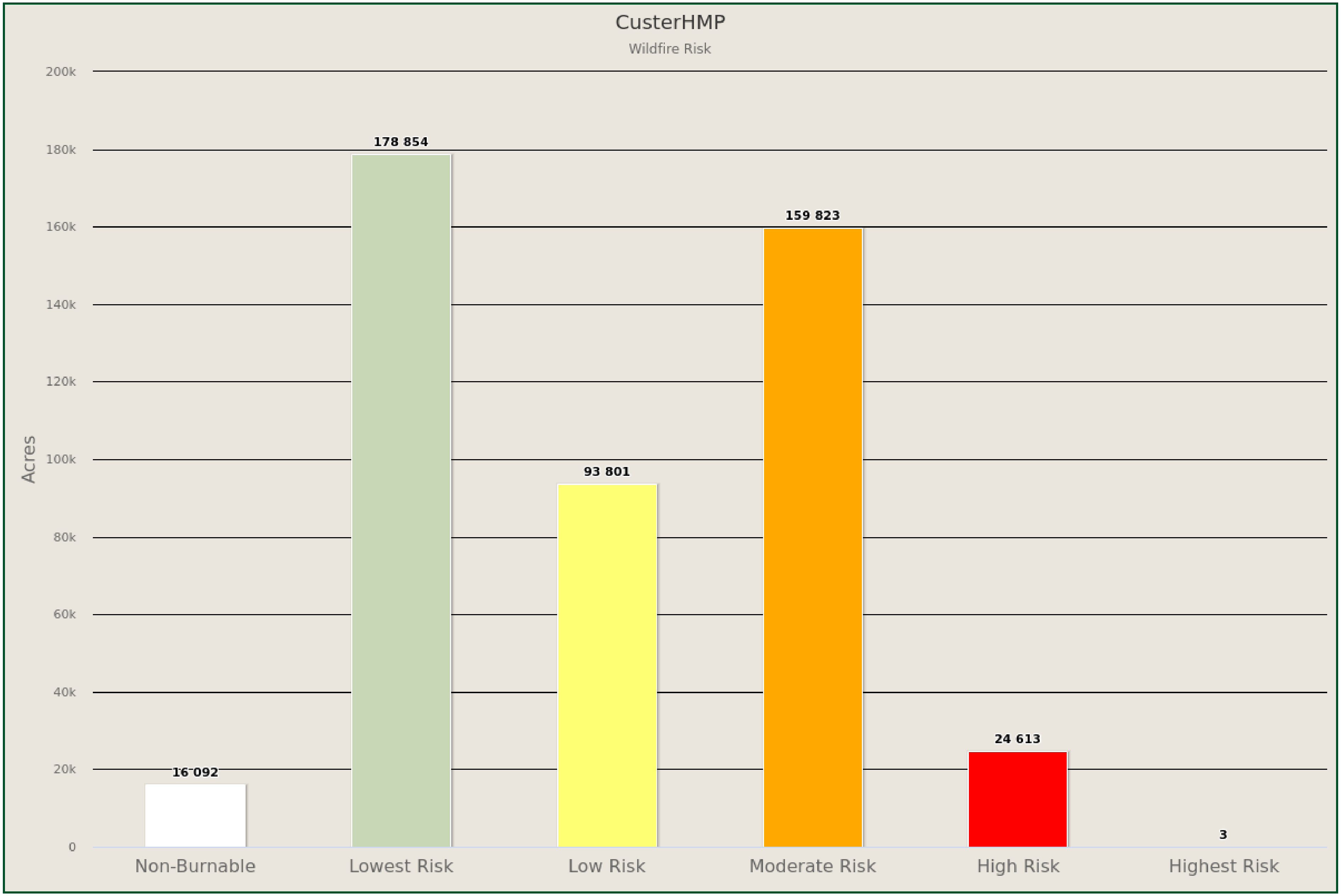
Description

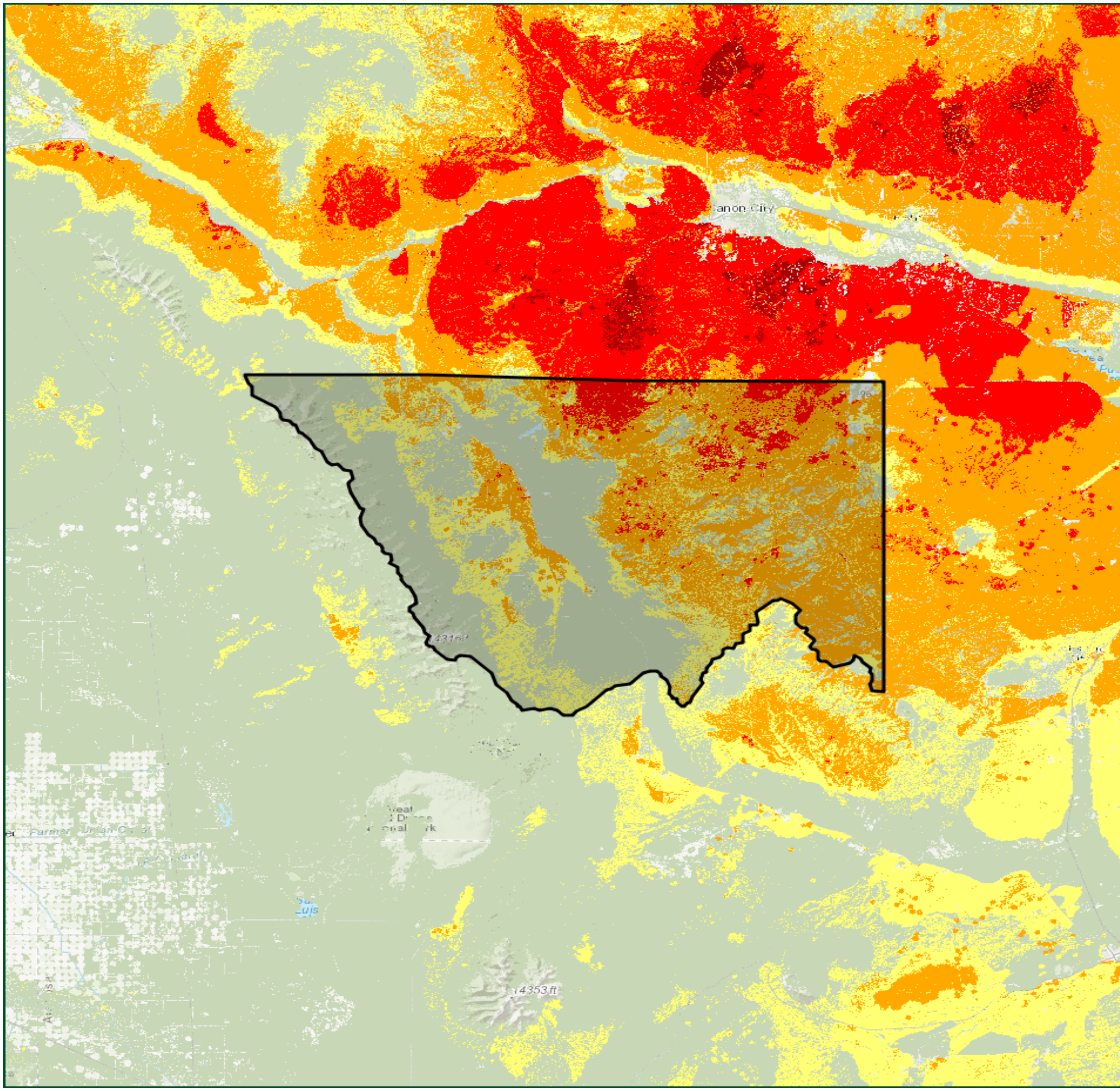
Wildfire Risk is a composite risk rating obtained by combining the probability of a fire occurring with the individual values at risk layers. Risk is defined as the possibility of loss or harm occurring from a wildfire. It identifies areas with the greatest potential impacts from a wildfire – i.e. those areas most at risk - considering all values and assets combined together – WUI Risk, Drinking Water Risk, Forest Assets Risk and Riparian Areas Risk.

Since all areas in Colorado have risk calculated consistently, it allows for comparison and ordination of areas across the entire state. The Values at Risk Rating is a key component of Wildfire Risk. The Values at Risk Rating is comprised of several inputs focusing on values and assets at risk. This includes Wildland Urban Interface, Forest Assets, Riparian Assets and Drinking Water Importance Areas (watersheds).

To aid in the use of Wildfire Risk for planning activities, the output values are categorized into five (5) classes. These are given general descriptions from Lowest to Highest Risk.

Wildfire Risk Class	Acres	Percent
Non-Burnable	16,092	3.4 %
Lowest Risk	178,854	37.8 %
Low Risk	93,801	19.8 %
Moderate Risk	159,823	33.8 %
High Risk	24,613	5.2 %
Highest Risk	3	0.0 %
Total	473,186	100 %


CusterHMP
Wildfire Risk
Acres
200k
180k
160k
140k
120k
100k
80k
60k
40k
20k
0
16 092
178 854
93 801
159 823
24 613
3
Non-Burnable
Lowest Risk
Low Risk
Moderate Risk
High Risk
Highest Risk



CusterHMP

Wildfire Risk

- Non-Burnable
- Lowest Risk
- Low Risk
- Moderate Risk
- High Risk
- Highest Risk

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Burn Probability

Description

Burn Probability (BP) is the annual probability of any location burning due to a wildfire. BP is calculated as the number of times that a 30-meter cell on the landscape is burned from millions of fire simulations. The annual BP was estimated by using a stochastic (Monte Carlo) wildfire simulation approach with Technosylva's Wildfire Analyst software (www.WildfireAnalyst.com).

A total number of 3,200,000 fires were simulated across the state, including those fires outside the Colorado border which were used in a buffer area around the state, to compute BP with a mean ignition density of 8.68 fires/km2. The simulation ignition points were spatially distributed evenly every 500 meters across the state. Only high and extreme weather conditions were used to run the simulations. All fires simulations had a duration of 10 hours.

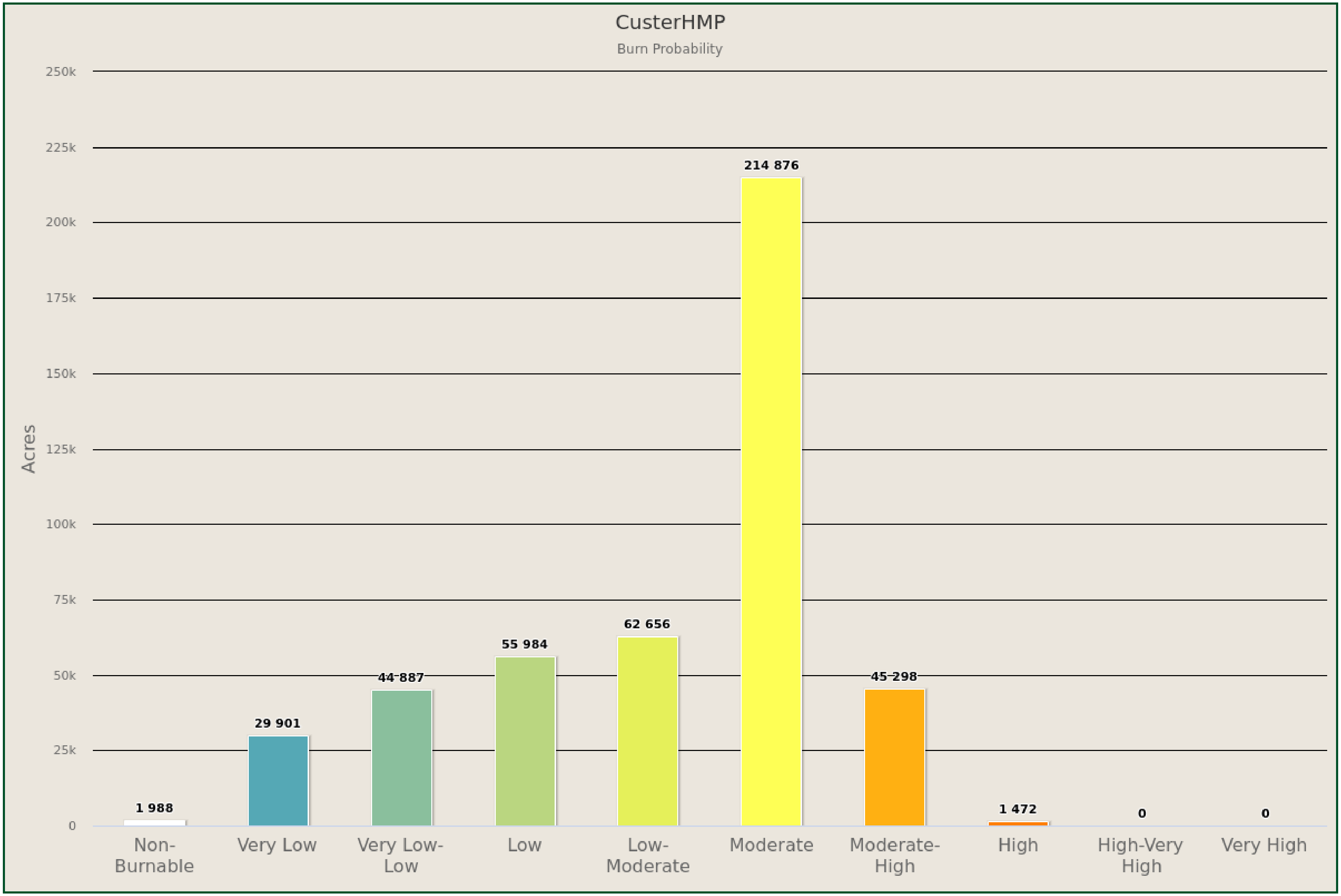
The Wildfire Analyst fire simulator considered the number of times that the simulated fires burned each cell. After that, results were weighted by considering the historical fire occurrence of those fires that burned in high and extreme weather conditions. The weighting was done by assessing the relationship between the annual historical fire ignition density in Colorado and the total number of simulated fires with varying input data in the different weather scenarios and the historical spatial distribution of the ignition points.

The probability map is derived at a 30-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 planning.

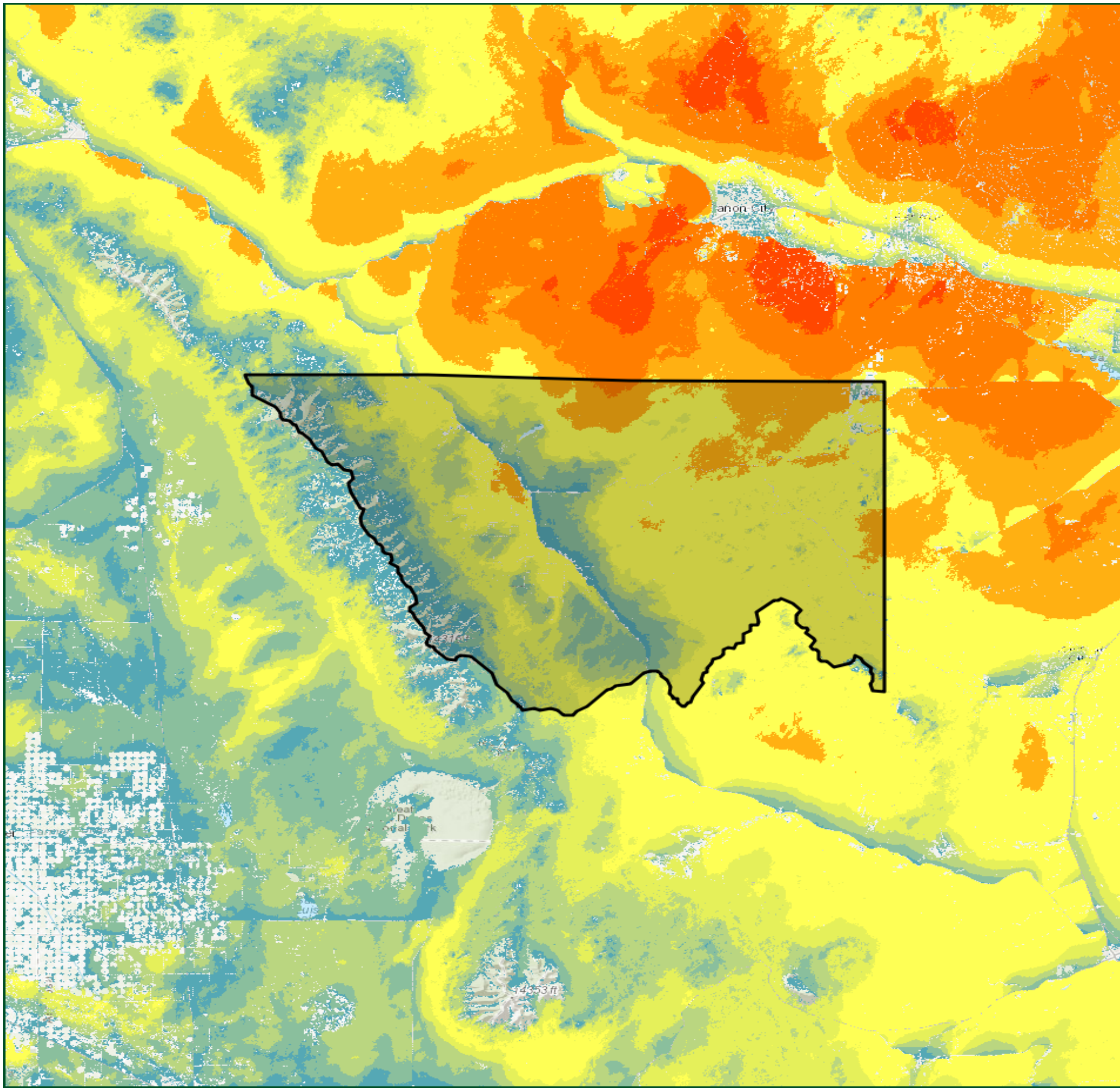
To aid in the use of Burn Probability for planning activities, the output values are categorized into 10 (ten) classes. These are given general descriptions from Lowest to Highest Probability.

A more detailed description of the risk assessment algorithms is provided in the Colorado WRA Final Report, which can be downloaded from www.ColoradoForestAtlas.org.

Burn Probability Class	Acres	Percent
Non-Burnable	1,988	0.4 %
Very Low	29,901	6.5 %
Very Low-Low	44,887	9.8 %
Low	55,984	12.2 %
Low-Moderate	62,656	13.7 %
Moderate	214,876	47.0 %
Moderate-High	45,298	9.9 %
High	1,472	0.3 %
High-Very High	0	0 %
Very High	0	0 %
Total	**457,060**	**100 %**



CusterHMP
Burn Probability
Acres
250k
225k
200k
175k
150k
125k
100k
75k
50k
25k
0
1 988
29 901
44 887
55 984
62 656
214 876
45 298
1 472
0
0
Non-Burnable
Very Low
Very Low-Low
Low
Low-Moderate
Moderate
Moderate-High
High
High-Very High
Very High



CusterHMP

Burn Probability

- Non-Burnable
- Very Low
- Very Low-Low
- Low
- Low-Moderate
- Moderate
- Moderate-High
- High
- High-Very High
- Very High

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Values at Risk Rating

Description

Represents those values or assets that would be adversely impacted by a wildfire. The Values at Risk Rating is an overall rating that combines the risk ratings for Wildland Urban Interface (WUI), Forest Assets, Riparian Assets, and Drinking Water Importance Areas into a single measure of values-at-risk. The individual ratings for each value layer were derived using a Response Function 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. A resource or asset is any of the Fire Effects input layers, such as WUI, Forest Assets, etc. These net changes can be adverse (negative) or positive (beneficial).

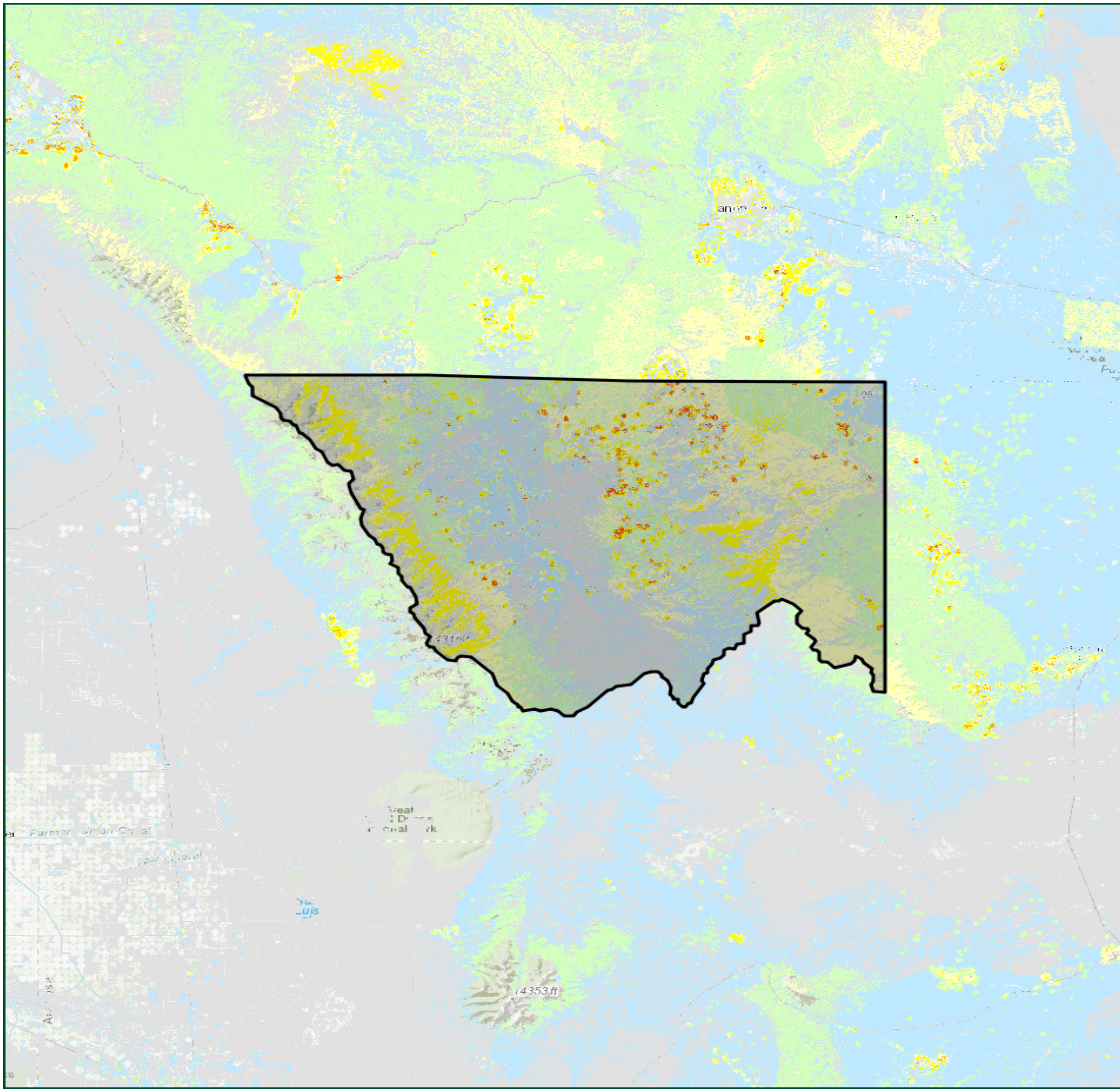
Calculating the Values at Risk Rating at a given location requires spatially defined estimates of the intensity of fire integrated with the identified resource value. This interaction is quantified through the use of response functions that estimate expected impacts to resources or assets at the specified fire intensity levels. The measure of fire intensity level used in the Colorado assessment is flame length for a location. Response Function outputs were derived for each input dataset and then combined to derive the Values Impacted Rating.

Different weightings are used for each of the input layers with the highest priority placed on protection of people and structures (i.e. WUI). The weightings represent the value associated with those assets. Weightings were developed by a team of experts during the assessment to reflect priorities for fire protection planning in Colorado. Refer to the Colorado WRA Final Report for more information about the layer weightings.

Since all areas in Colorado have the Values at Risk Rating calculated consistently, it allows for comparison and ordination of areas across the entire state. The data were derived at a 30-meter resolution.

Values at Risk Class	Acres	Percent
-1 (Least Negative Impact)	134,299	29.3 %
-2	89,297	19.5 %
-3	91,996	20.1 %
-4	101,092	22.1 %
-5	34,961	7.6 %
-6	4,372	1.0 %
-7	1,873	0.4 %
-8	20	0.0 %
-9 (Most Negative Impact)	0	0 %
Total	**457,911**	**100 %**

CusterHMP
Values at Risk Rating
Acres
160k
140k
120k
100k
80k
60k
40k
20k
0
134 299
89 297
91 996
101 092
34 961
4 372
1 873
20
0
-1 (Least Negative Impact)
-2
-3
-4
-5
-6
-7
-8
-9 (Most Negative Impact)



CusterHMP

Values at Risk Rating

- Non-Categorized
- -1 (Least Negative Impact)
- -2
- -3
- -4
- -5
- -6
- -7
- -8
- -9 (Most Negative Impact)

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Suppression Difficulty Rating

Description

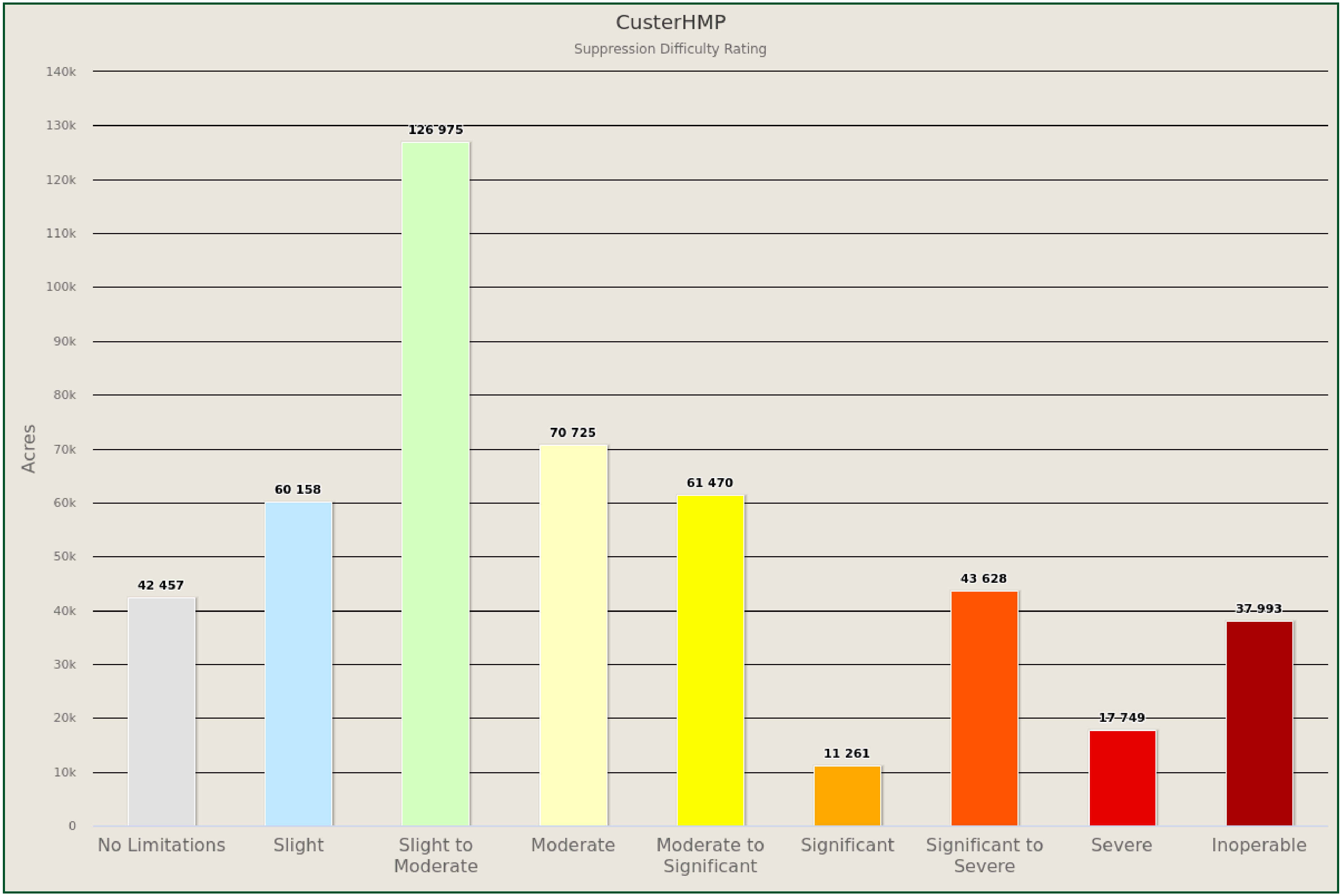
Reflects the difficulty or relative cost to suppress a fire given the terrain and vegetation conditions that may impact machine operability. This layer is an overall index that combines the slope steepness and the vegetation/fuel type characterization to identify areas where it would be difficult or costly to suppress a fire due to the underlying terrain and vegetation conditions that would impact machine operability (in particular Type II dozer).

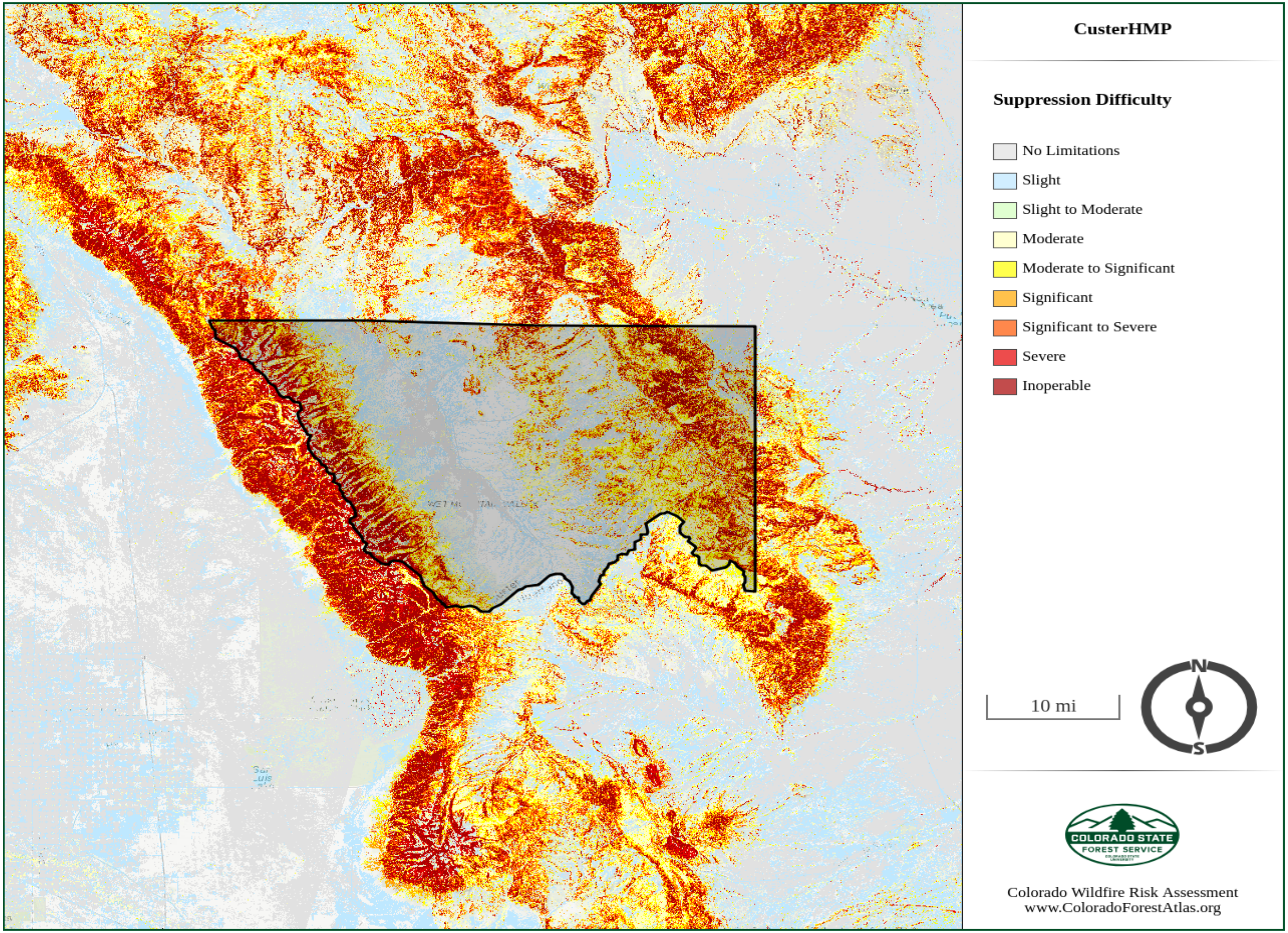
The rating was calculated based on the fireline production rates for hand crews and engines with modifications for slope, as documented in the NWCG Fireline Handbook 3, PMS 401-1.

The burnable fuel models in the Colorado WRA were grouped into ten categories: Grass, Grass/Shrub, Shrub/Regeneration, Moderate Forest, Heavy Forest, Swamp/Marsh, Agriculture, Barren, Urban/Developed, Water/Ice.

Fireline production capability on six slope classes was used as the basic reference to obtain the suppression difficulty score. The response function category is assigned to each combination of fuel model group and slope category.

SDR Class	Acres	Percent
No Limitations	42,457	9.0 %
Slight	60,158	12.7 %
Slight to Moderate	126,975	26.9 %
Moderate	70,725	15.0 %
Moderate to Significant	61,470	13.0 %
Significant	11,261	2.4 %
Significant to Severe	43,628	9.2 %
Severe	17,749	3.8 %
Inoperable	37,993	8.0 %
Total	**472,417**	**100 %**


CusterHMP
Suppression Difficulty Rating
Acres
140k
130k
120k
110k
100k
90k
80k
70k
60k
50k
40k
30k
20k
10k
0
42 457
60 158
126 975
70 725
61 470
11 261
43 628
17 749
37 993
No Limitations
Slight
Slight to Moderate
Moderate
Moderate to Significant
Significant
Significant to Severe
Severe
Inoperable


CusterHMP
Suppression Difficulty
No Limitations
Slight
Slight to Moderate
Moderate
Moderate to Significant
Significant
Significant to Severe
Severe
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Fire Occurrence

Description

Fire Occurrence is an ignition density that represents the likelihood of a wildfire starting based on historical ignition patterns. Occurrence is derived by modeling historic wildfire ignition locations to create an ignition density map.

Historic fire report data were used to create the ignition points for all Colorado fires. The compiled fire occurrence database was cleaned to remove duplicate records and to correct inaccurate locations. The database was then modeled to create a density map reflecting historical fire ignition rates.

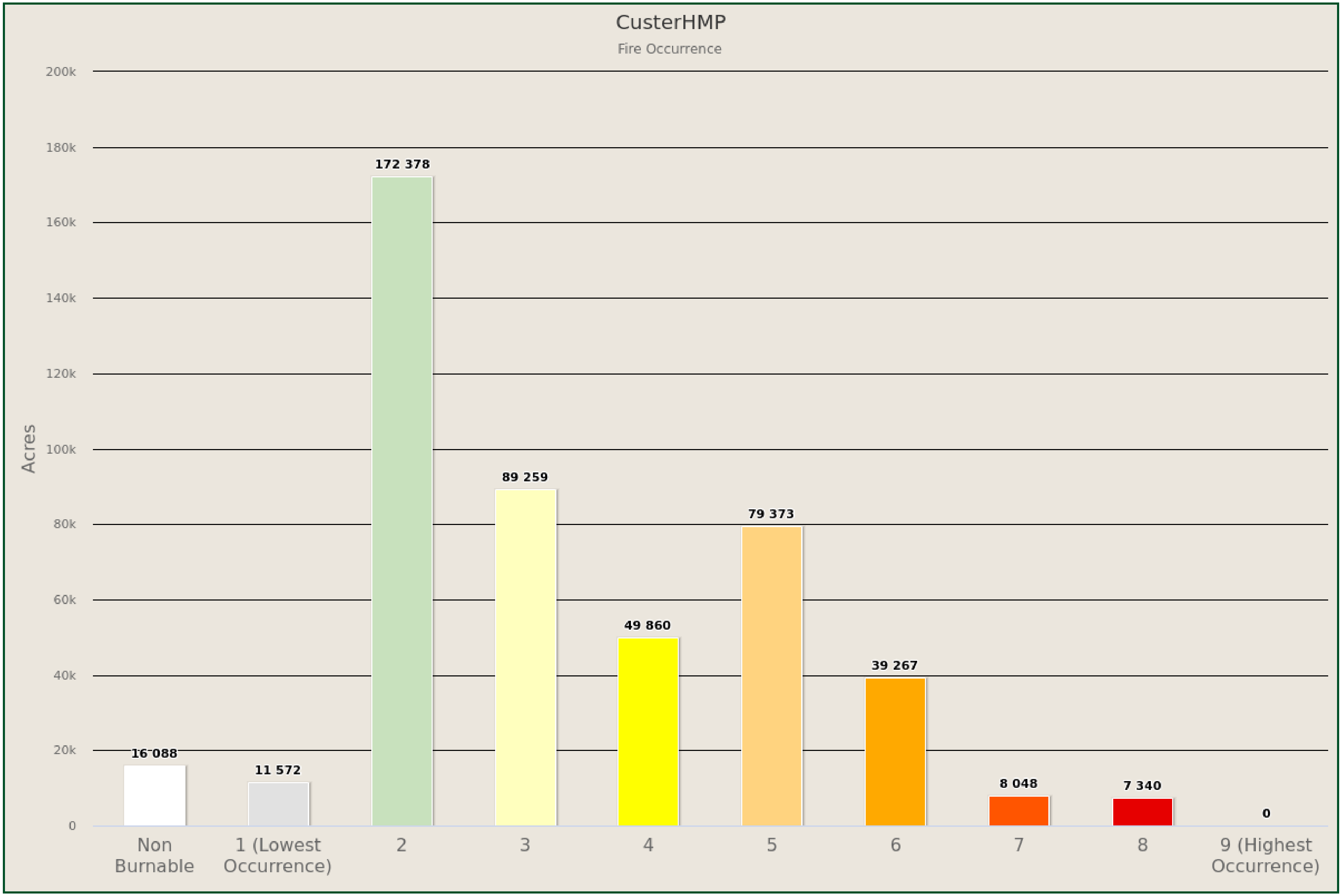
Historic fire report data were used to create the ignition points for all Colorado fires. This included both federal and non-federal fire ignition locations.

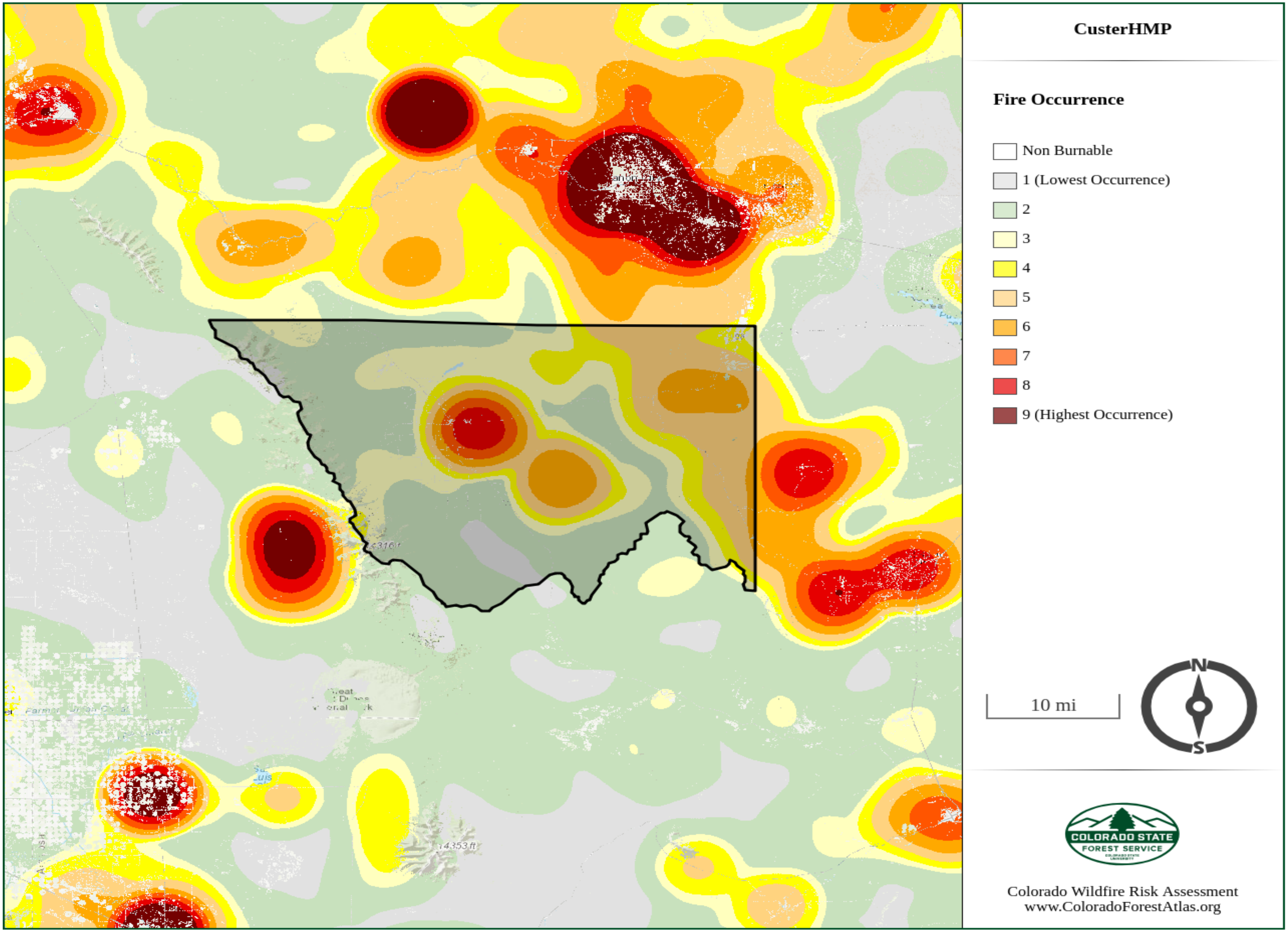
The class breaks are determined by analyzing the Fire Occurrence output values for the entire state and determining cumulative percent of acres (i.e. Class 9 has the top 1.5% of acres with the highest occurrence rate). Refer to the Colorado WRA Final Report for a more detailed description of the mapping classes and the methods used to derive these.

The Fire Occurrence map is derived at a 30-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 sufficient for site specific analysis, it is appropriate for regional, county or local protection mitigation or prevention planning.

A more detailed description of the risk assessment algorithms is provided in the Colorado WRA Final Report, which can be downloaded from www.ColoradoForestAtlas.org.

Fire Occurrence Class	Acres	Percent
Non Burnable	16,088	3.4 %
1 (Lowest Occurrence)	11,572	2.4 %
2	172,378	36.4 %
3	89,259	18.9 %
4	49,860	10.5 %
5	79,373	16.8 %
6	39,267	8.3 %
7	8,048	1.7 %
8	7,340	1.6 %
9 (Highest Occurrence)	0	0 %
Total	**473,186**	**100 %**


CusterHMP
Fire Occurrence
Acres
200k
180k
160k
140k
120k
100k
80k
60k
40k
20k
0
16 088
11 572
172 378
89 259
49 860
79 373
39 267
8 048
7 340
0
Non Burnable
1 (Lowest Occurrence)
2
3
4
5
6
7
8
9 (Highest Occurrence)


CusterHMP
Fire Occurrence
Non Burnable
1 (Lowest Occurrence)
2
3
4
5
6
7
8
9 (Highest Occurrence)
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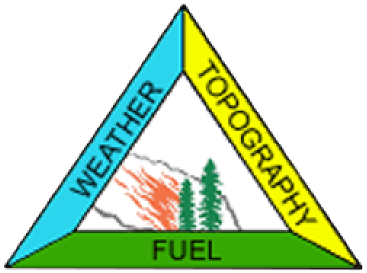
Fire Behavior

Description

Fire behavior is the manner in which 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 2017 assessment uses the latest 2017 calibrated fuels for Colorado.
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

Environmental weather parameters needed to compute fire behavior characteristics include 1-hour, 10-hour and 100-hour time-lag fuel moistures, herbaceous fuel moisture, woody fuel moisture and the 20-foot, 10-minute average wind speed. To collect this information, Weather data (1988-2017) from NCEP (National Center for Environmental Prediction) was used to analyse potential weather scenarios in which assessing fire behavior and spread. In particular, the North American Regional Reanalysis (NARR) product from NCEP was selected because of it provides high resolution weather data for all of Colorado. The following percentiles (97th, 90th, 50th and 25th) were analysed for each variable in each 30km NARR point to create four weather scenarios to run the fire behavior analysis: “Extreme”, “High”, “Moderate” and “Low”. After computing the weather percentiles of the NARR variables, an IDW algorithm was used to derive 30m resolution data to match the surface fuels dataset.

The four percentile weather categories are intended to represent low, moderate, high and extreme fire weather days. Fire behavior outputs are computed for each percentile weather category to determine fire potential under different weather scenarios.

For a detailed description of the methodology, refer to the 2017 Colorado Wildfire Risk Assessment Final Report at www.ColoradoForestAtlas.org.

Topography

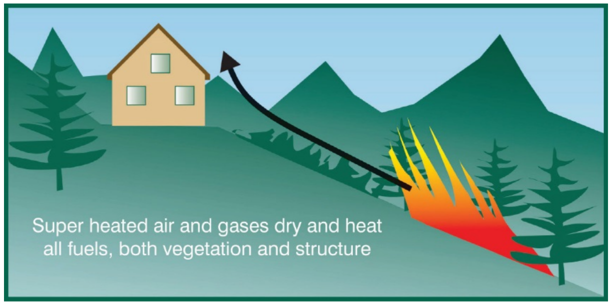
Topography datasets required to compute fire behavior characteristics are elevation, slope and aspect.

FIRE BEHAVIOR CHARACTERISTICS

Fire behavior characteristics provided in this report include:

- **Characteristic Rate of Spread**
- **Characteristic Flame Length**
- **Fire Intensity Scale**
- **Fire Type – Extreme Weather**

Characteristic Rate of Spread

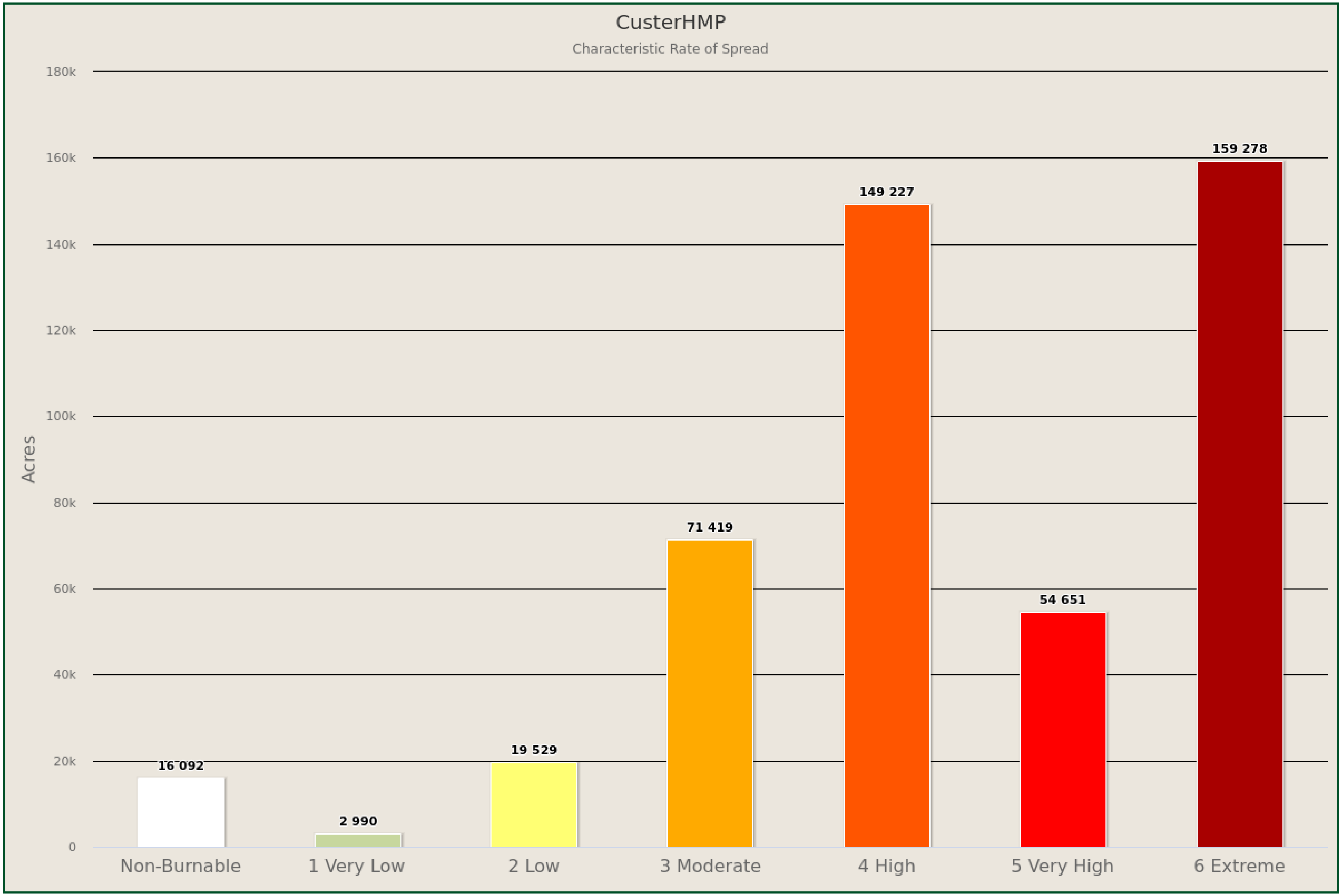


Characteristic Rate of Spread is the typical or representative rate of spread of a potential fire based on a weighted average of four percentile weather categories. Rate of spread is the speed with which a fire moves in a horizontal direction across the landscape, usually expressed in chains per hour (ch/hr) or feet per minute (ft/min). For purposes of the Colorado WRA, this measurement represents the maximum rate of spread of the fire front. Rate of Spread is used in the calculation of Wildfire Threat in the Colorado WRA.

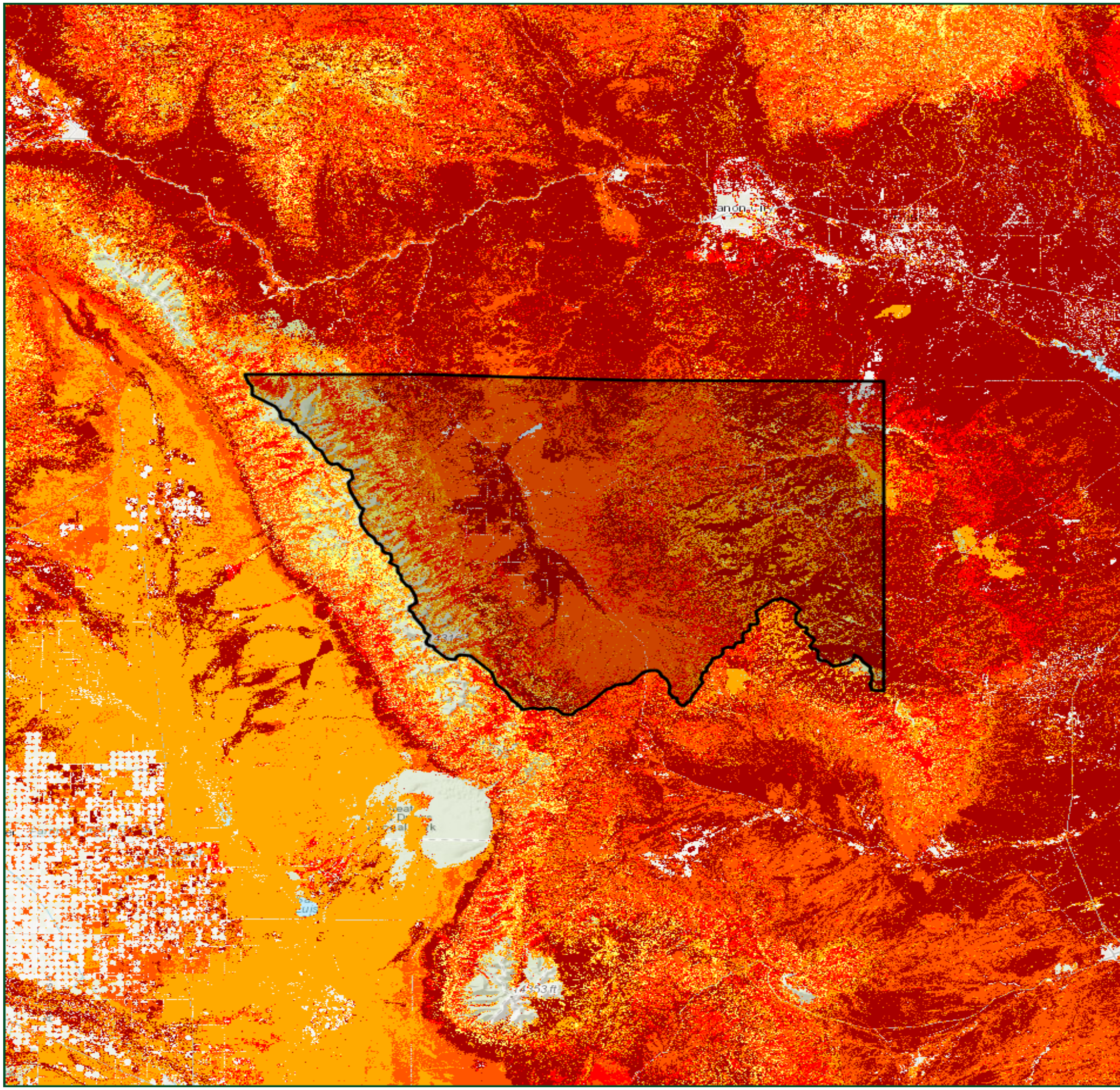
Rate of spread is a fire behavior output, which is influenced by three environmental factors - fuels, weather, and topography. Weather is by far the most dynamic variable as it changes frequently. To account for this variability, four percentile weather categories were created from historical weather observations to represent low, moderate, high, and extreme weather days for each 30-meter cell in Colorado. Thirty (30) meter resolution is the baseline for the Colorado WRA, matching the source surface fuels dataset.

The "characteristic" output represents the weighted average for all four weather percentiles. While not shown in this report, the individual percentile weather ROS outputs are available in the Colorado WRA data.

Rate of Spread	Acres	Percent
Non-Burnable	16,092	3.4 %
1 Very Low	2,990	0.6 %
2 Low	19,529	4.1 %
3 Moderate	71,419	15.1 %
4 High	149,227	31.5 %
5 Very High	54,651	11.5 %
6 Extreme	159,278	33.7 %
Total	**473,186**	**100 %**


CusterHMP
Characteristic Rate of Spread
Acres
180k
160k
140k
120k
100k
80k
60k
40k
20k
0
16 092
2 990
19 529
71 419
149 227
54 651
159 278
Non-Burnable
1 Very Low
2 Low
3 Moderate
4 High
5 Very High
6 Extreme

CusterHMP



Characteristic Rate of Spread

- 1 Very Low
- 2 Low
- 3 Moderate
- 4 High
- 5 Very High
- 6 Extreme

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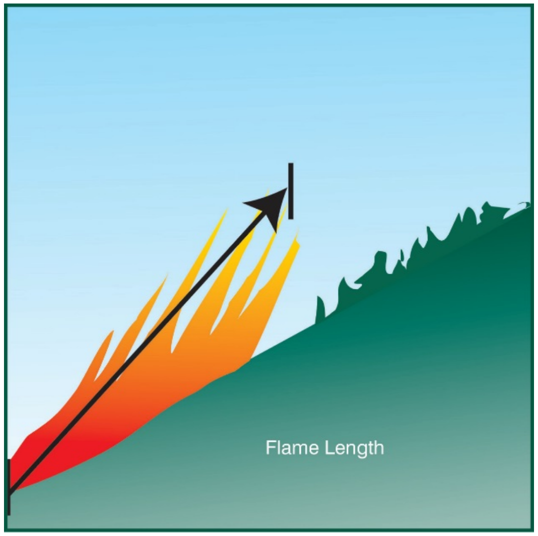
Characteristic Flame Length

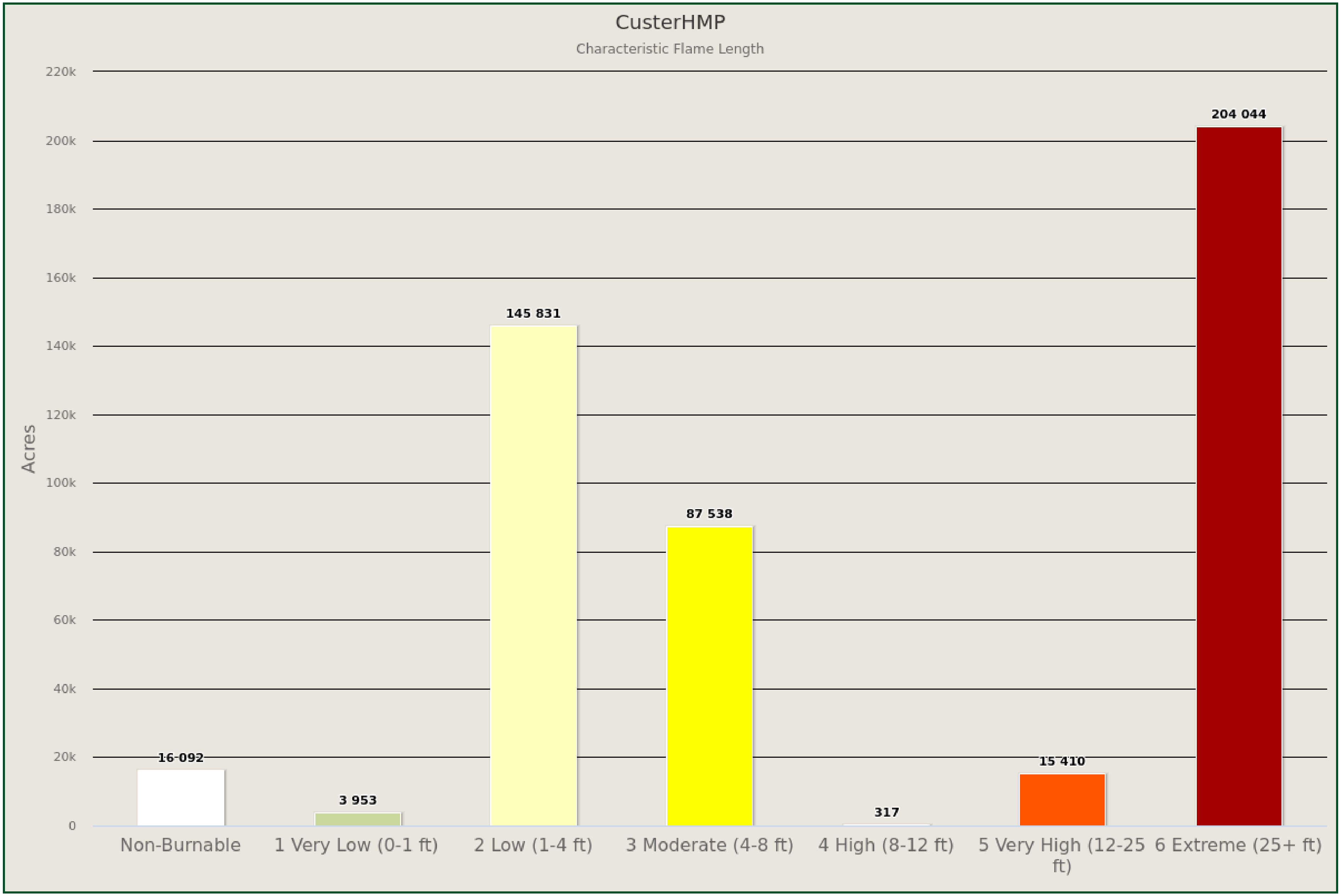
Characteristic Flame Length is the typical or representative flame length of a potential fire based on a weighted average of four percentile weather categories. Flame Length is defined as the distance between the flame tip and the midpoint of the flame depth at the base of the flame, which is generally 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 (ft). Flame length is the measure of fire intensity used to generate the Fire Effects outputs for the Colorado WRA.



Flame length 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 each 30-meter cell in Colorado.

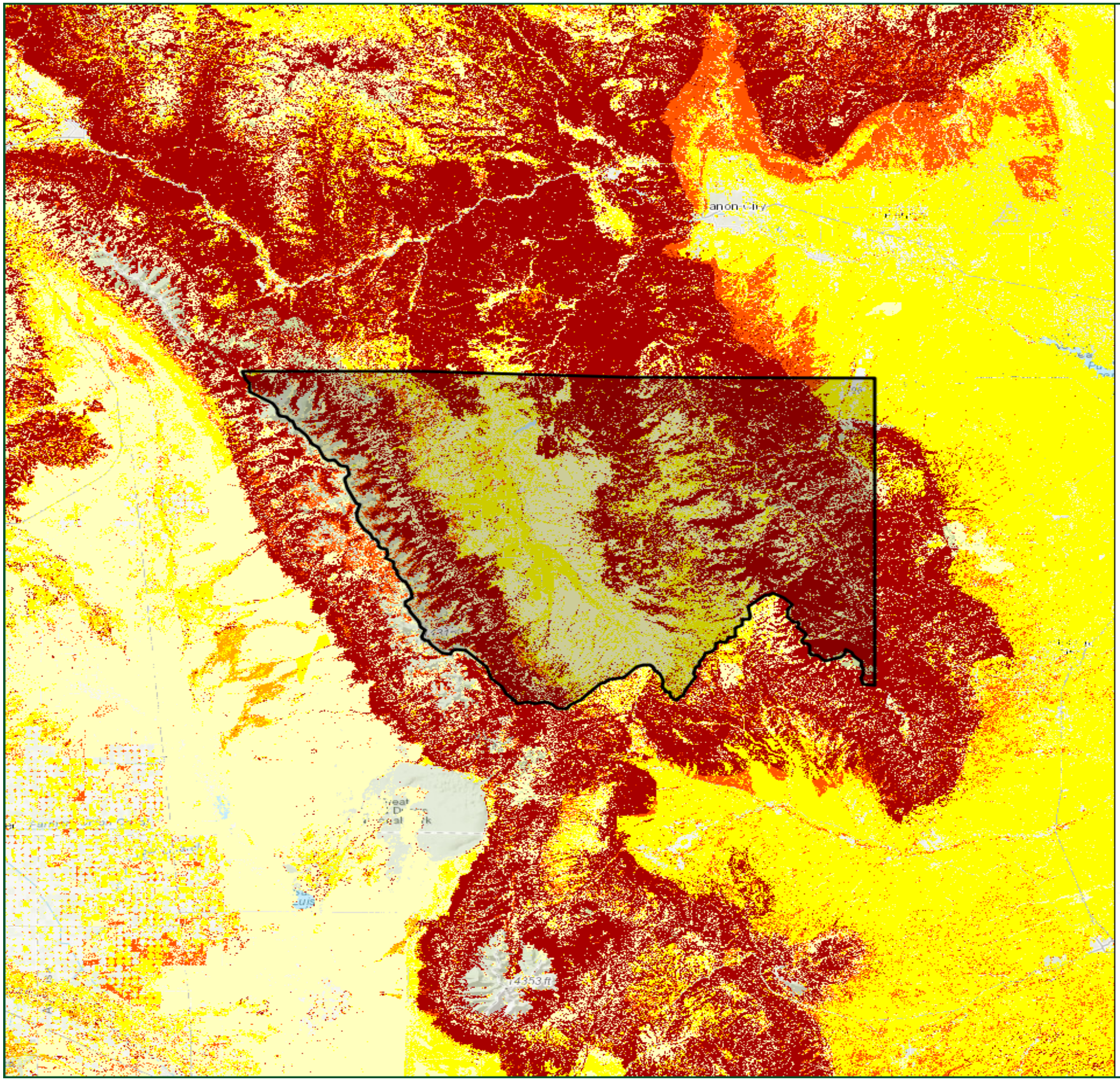
This output represents the weighted average for all four weather percentiles. While not shown in this report, the individual percentile weather Flame Length outputs are available in the Colorado WRA data.

Flame Length	Acres	Percent
Non-Burnable	16,092	3.4 %
1 Very Low (0-1 ft)	3,953	0.8 %
2 Low (1-4 ft)	145,831	30.8 %
3 Moderate (4-8 ft)	87,538	18.5 %
4 High (8-12 ft)	317	0.1 %
5 Very High (12-25 ft)	15,410	3.3 %
6 Extreme (25+ ft)	204,044	43.1 %
Total	**473,186**	**100 %**



CusterHMP
Characteristic Flame Length
Acres
220k
200k
180k
160k
140k
120k
100k
80k
60k
40k
20k
0
16 092
3 953
145 831
87 538
317
15 410
204 044
Non-Burnable
1 Very Low (0-1 ft)
2 Low (1-4 ft)
3 Moderate (4-8 ft)
4 High (8-12 ft)
5 Very High (12-25 ft)
6 Extreme (25+ ft)

CusterHMP



Characteristic Flame Length

- Non-Burnable
- 1 Very Low (0-1 ft)
- 2 Low (1-4 ft)
- 3 Moderate (4-8 ft)
- 4 High (8-12 ft)
- 5 Very High (12-25 ft)

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Fire Intensity Scale

Description

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. **Class2, 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 1. 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. 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.

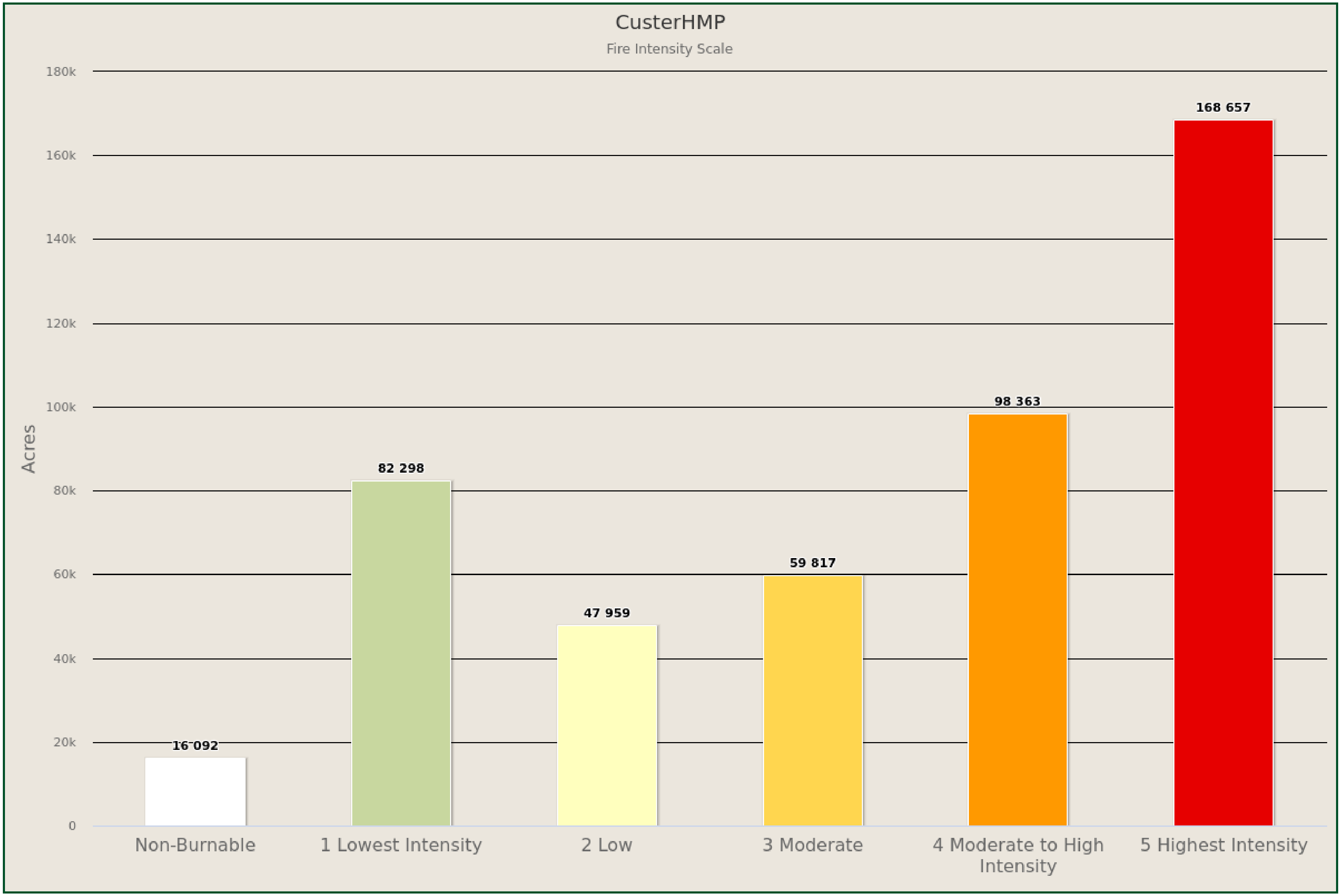
Since all areas in Colorado have fire intensity scale calculated consistently, it allows for comparison and ordination of areas across the entire state. For example, a high fire intensity area in Eastern Colorado is equivalent to a high fire intensity area in Western Colorado.

Fire intensity scale is a fire behavior output, which is influenced by three environmental factors - fuels, weather, and topography. Weather is by far the most dynamic variable as it changes frequently.

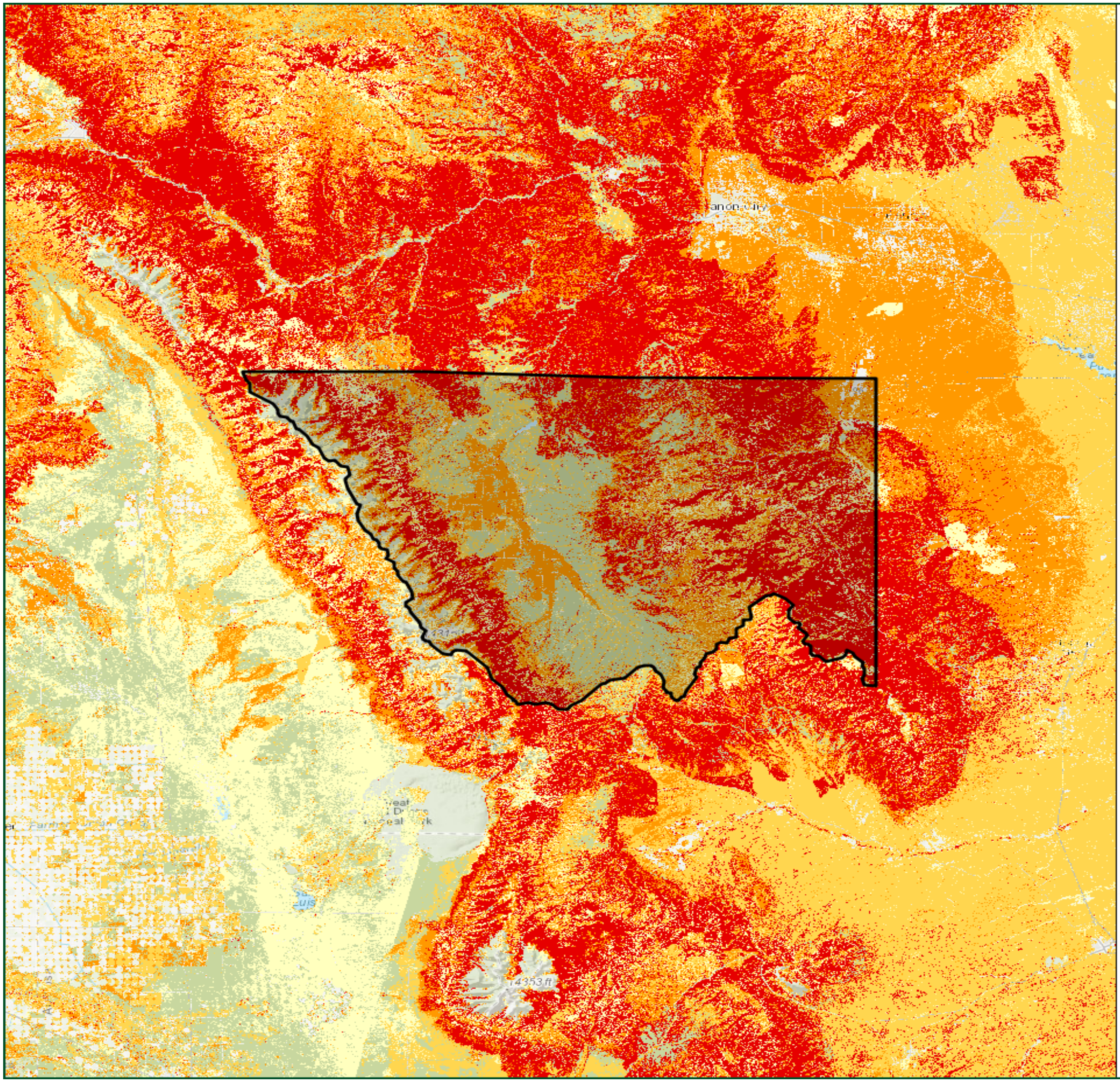
To account for this variability, four percentile weather categories were created from historical weather observations to represent low, moderate, high, and extreme weather days for each 30-meter cell in Colorado. The FIS represents the weighted average for all four weather percentiles.

The fire intensity scale map is derived at a 30-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
Non-Burnable	16,092	3.4 %
1 Lowest Intensity	82,298	17.4 %
2 Low	47,959	10.1 %
3 Moderate	59,817	12.6 %
4 Moderate to High Intensity	98,363	20.8 %
5 Highest Intensity	168,657	35.6 %
Total	**473,186**	**100 %**



CusterHMP
Fire Intensity Scale
Acres
180k
160k
140k
120k
100k
80k
60k
40k
20k
0
16 092
82 298
47 959
59 817
98 363
168 657
Non-Burnable
1 Lowest Intensity
2 Low
3 Moderate
4 Moderate to High Intensity
5 Highest Intensity



CusterHMP

Fire Intensity Scale

- Non-Burnable
- 1 Lowest Intensity
- 2 Low
- 3 Moderate
- 4 Moderate to High Intensity
- 5 Highest Intensity

10 mi

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Fire Type – Extreme Weather

Fire Type – Extreme represents the potential fire type under the extreme percentile weather category. The extreme percentile weather category represents the average weather based on the top three percent fire weather days in the analysis period. It is not intended to represent a worst-case scenario weather event. Accordingly, the potential fire type is based on fuel conditions, extreme percentile weather, and topography.

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. Typically canopy fires occur in extreme weather conditions. The Fire Type – Extreme 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.

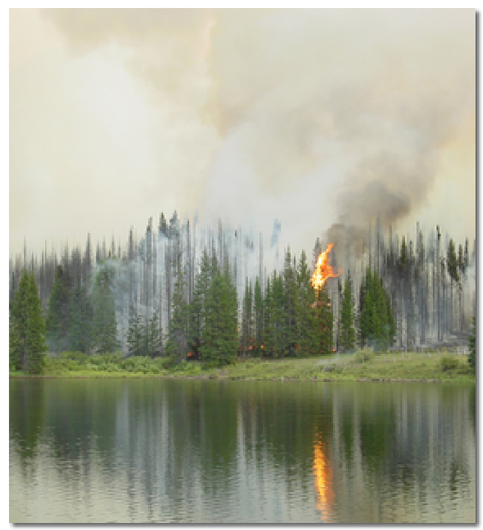
There are two primary fire types – surface fire and canopy fire. Canopy fire can be further subdivided into passive canopy fire and active canopy fire. A short description of each of these is provided below.

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).

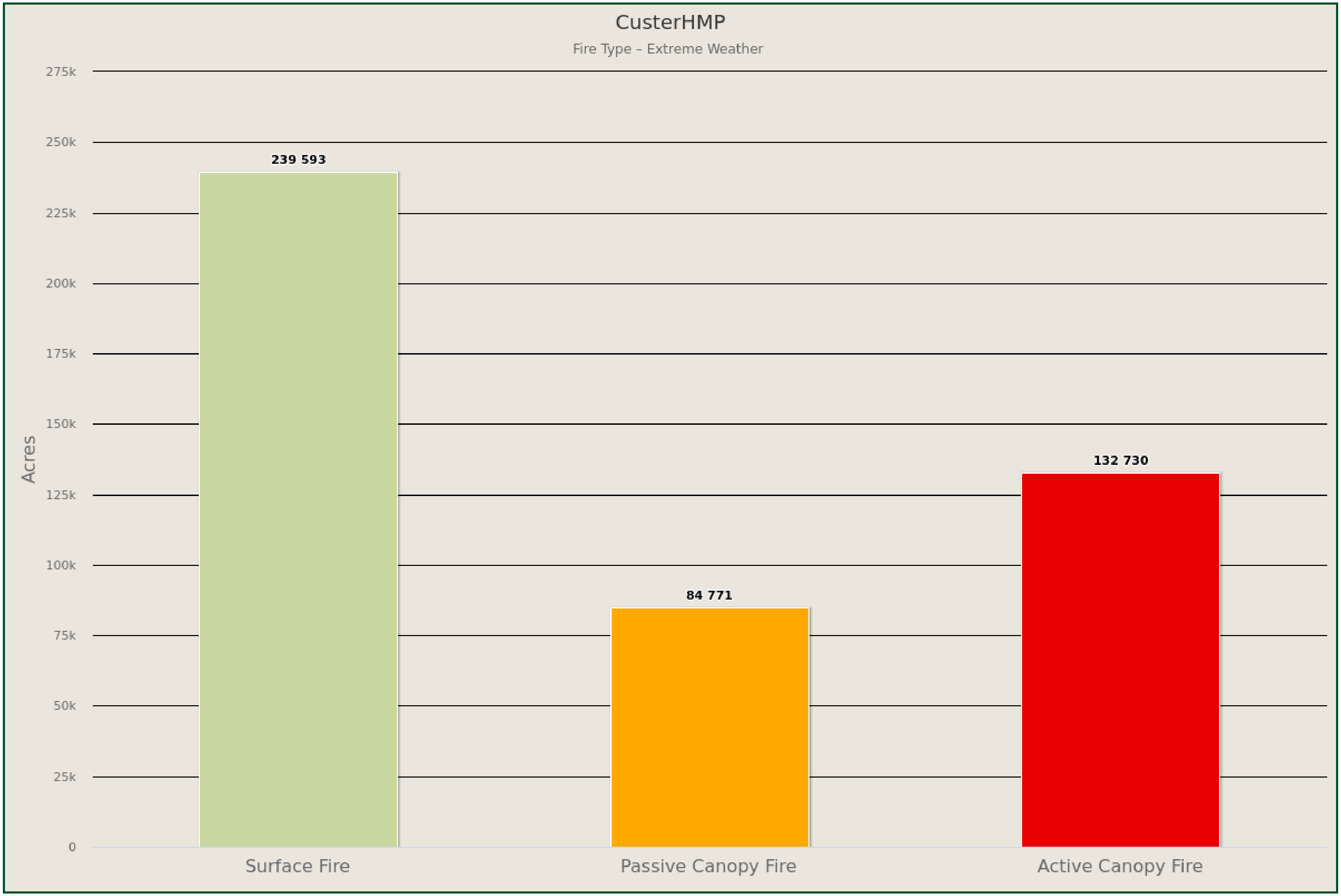


Active Canopy Fire

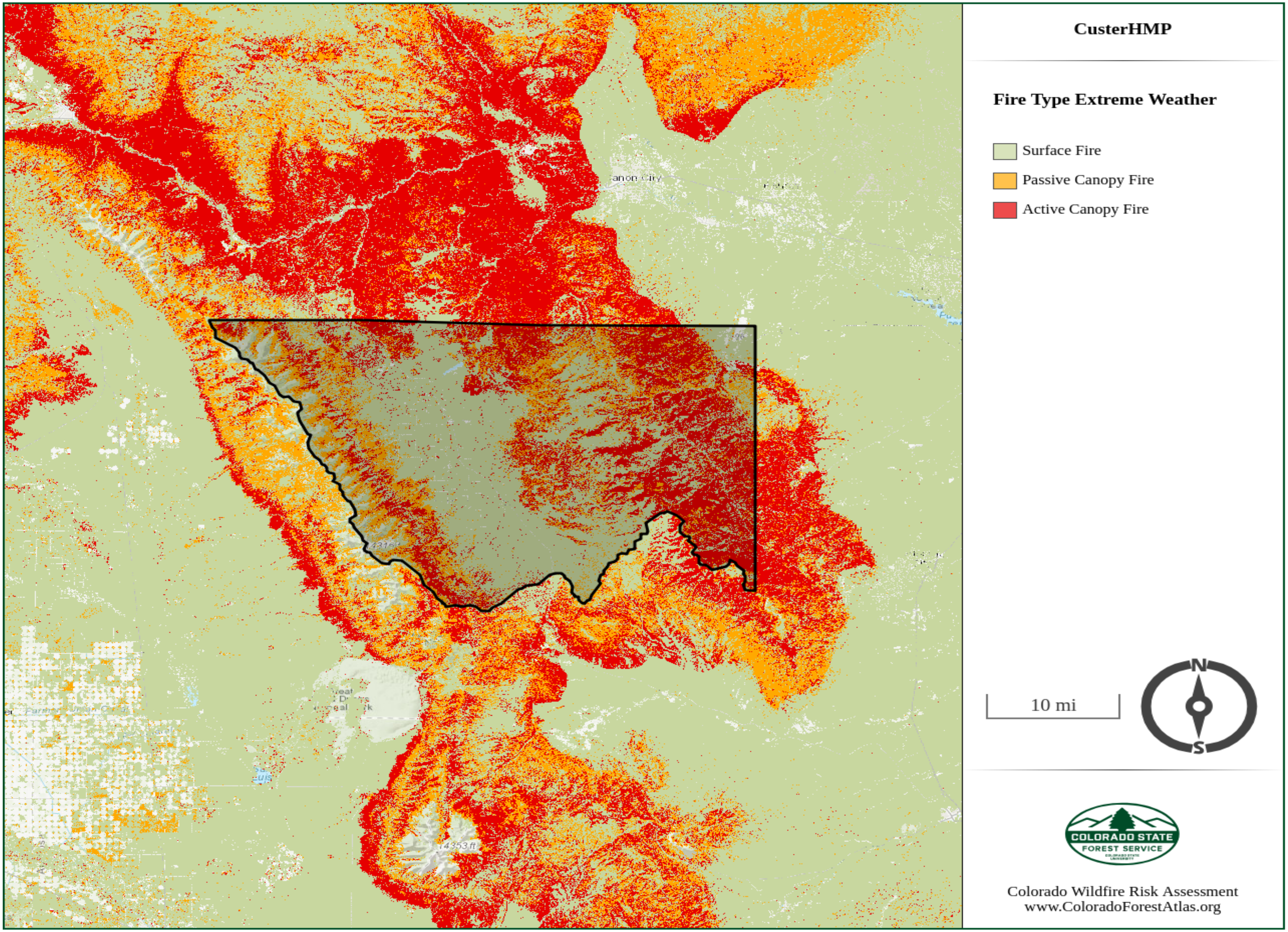
A crown fire in which the entire fuel complex (canopy) is involved in flame, but the crowning phase remains dependent on heat released from surface fuel for continued spread (Scott & Reinhardt, 2001).

The Fire Type - Extreme Weather map is derived at a 30-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.

Fire Type - Extreme Weather	Acres	Percent
Surface Fire	239,593	52.4 %
Passive Canopy Fire	84,771	18.5 %
Active Canopy Fire	132,730	29.0 %
Total	457,094	100 %



CusterHMP
Fire Type – Extreme Weather
Acres
275k
250k
225k
200k
175k
150k
125k
100k
75k
50k
25k
0
239 593
84 771
132 730
Surface Fire
Passive Canopy Fire
Active Canopy Fire


CusterHMP
Fire Type Extreme Weather
Surface Fire
Passive Canopy Fire
Active Canopy Fire
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Surface Fuels

Description

Surface fuels, or fire behavior fuel models as they are technically referred to, contain the parameters required by the Rothermel (1972) surface fire spread model to compute surface fire behavior characteristics, including 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 Colorado WRA accounts for both surface and canopy fire potential in the fire behavior outputs. However, only surface fuels are shown in this risk report.

Surface fuels typically are 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. Two standard fire behavior fuel model sets have been published. The Fire Behavior Prediction System 1982 Fuel Model Set (Anderson, 1982) contains 13 fuel models, and the Fire Behavior Prediction System 2005 Fuel Model Set (Scott & Burgan, 2005) contains 40 fuel models. The Colorado WRA uses fuel models from the 2005 Fuel Model Set.

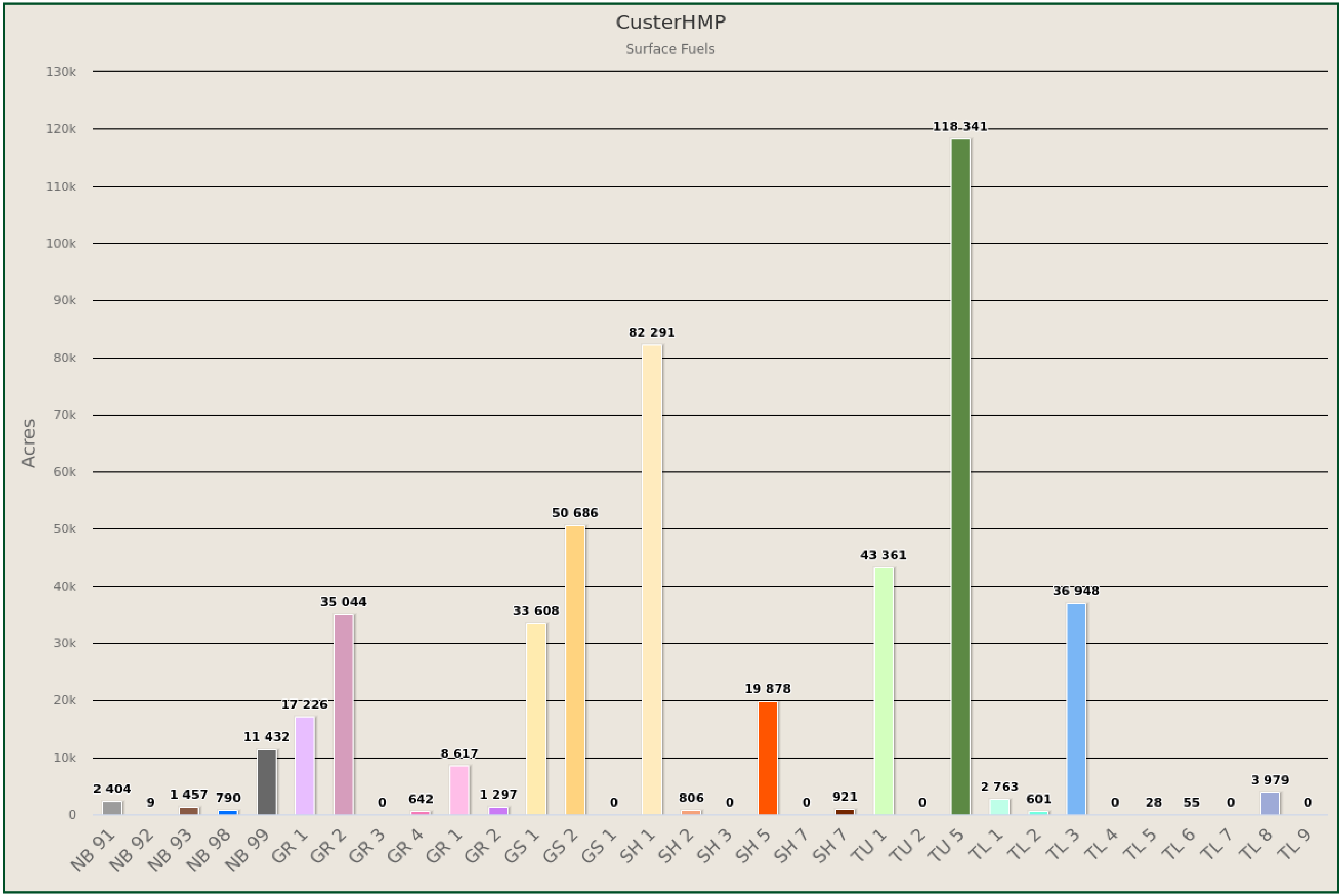
Unmanaged forest with dead and downed trees and branches

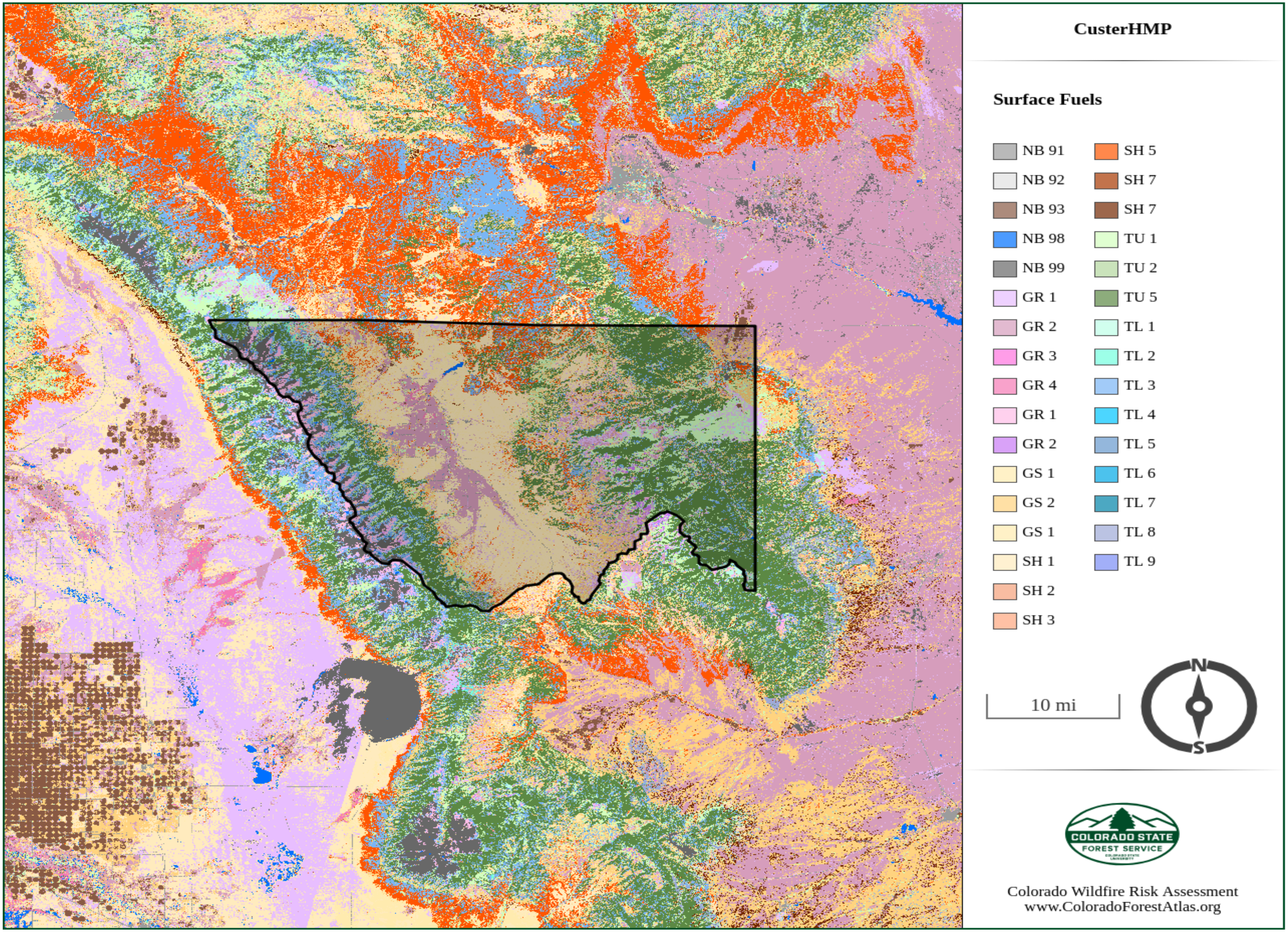
Slash on the ground indicates that forest management treatments have occurred in this area

The 2017 Colorado Surface Fuels were derived by enhancing the baseline LANDFIRE 2014 products with modifications to reflect local conditions and knowledge. A team of fuels and fire behavior experts, led by the CSFS, conducted a detailed calibration of the LANDFIRE 2014 fuels datasets. This calibration involved correcting LANDFIRE mapping zone seamlines errors; adding recent disturbances from 2013 to 2017 for fires, insect and disease, and treatments; correcting fuels for high elevations; adjusting fuels for oak-shrublands and pinyon-juniper areas; and modifying SH7 fuel designations. This calibration effort resulted in an accurate and up-to-date surface fuels dataset that is the basis for the fire behavior and risk calculations in the 2017 Colorado Wildfire Risk Assessment Update.

A detailed description of the fuels calibration methods and results is provided in the CSFS 2017 Fuels Calibration Final Report (July 2018).

Surface Fuels		Description	Acres	Percent
	NB 91	Urban/Developed	2,404	0.5 %
	NB 92	Snow/Ice	9	0.0 %
	NB 93	Agriculture	1,457	0.3 %
	NB 98	Water	790	0.2 %
	NB 99	Barren	11,432	2.4 %
	GR 1	Short, sparse, dry climate grass	17,226	3.6 %
	GR 2	Low load, dry climate grass	35,044	7.4 %
	GR 3	Low load, very coarse, humid climate grass	0	0 %
	GR 4	Moderate load, dry climate grass	642	0.1 %
	GR 1	GT 10,000 ft elevation	8,617	1.8 %
	GR 2	GT 10,000 ft elevation	1,297	0.3 %
	GS 1	Low load, dry climate grass-shrub	33,608	7.1 %
	GS 2	Moderate load, dry climate grass-shrub	50,686	10.7 %
	GS 1	GT 10,000 ft elevation	0	0 %
	SH 1	Low load, dry climate shrub	82,291	17.4 %
	SH 2	Moderate load, dry climate shrub	806	0.2 %
	SH 3	Moderate load, humid climate shrub	0	0 %
	SH 5	High load, humid climate shrub	19,878	4.2 %
	SH 7	Very high load, dry climate shrub	0	0.0 %
	SH 7	Oak Shrubland without changes	921	0.2 %
	TU 1	Light load, dry climate timber-grass-shrub	43,361	9.2 %
	TU 2	Moderate load, humid climate timber-shrub	0	0 %
	TU 5	Very high load, dry climate timber-shrub	118,341	25.0 %
	TL 1	Low load, compact conifer litter	2,763	0.6 %
	TL 2	Low load, broadleaf litter	601	0.1 %
	TL 3	Moderate load, conifer litter	36,948	7.8 %
	TL 4	Small downed logs	0	0 %
	TL 5	High load, conifer litter	28	0.0 %
	TL 6	Moderate load, broadleaf litter	55	0.0 %
	TL 7	Large downed logs	0	0 %
	TL 8	Long-needle litter	3,979	0.8 %
	TL 9	Very high load, broadleaf litter	0	0 %
Total			**473,186**	**100 %**


CusterHMP
Surface Fuels
Acres
130k
120k
110k
100k
90k
80k
70k
60k
50k
40k
30k
20k
10k
0
2 404
9
1 457
790
11 432
17 226
35 044
0
642
8 617
1 297
33 608
50 686
0
82 291
806
0
19 878
0
921
43 361
0
118 341
2 763
601
36 948
0
28
55
0
3 979
0
NB 91
NB 92
NB 93
NB 98
NB 99
GR 1
GR 2
GR 3
GR 4
GR 1
GR 2
GS 1
GS 2
GS 1
SH 1
SH 2
SH 3
SH 5
SH 7
SH 7
TU 1
TU 2
TU 5
TL 1
TL 2
TL 3
TL 4
TL 5
TL 6
TL 7
TL 8
TL 9


CusterHMP
Surface Fuels
NB 91
NB 92
NB 93
NB 98
NB 99
GR 1
GR 2
GR 3
GR 4
GR 1
GR 2
GS 1
GS 2
GS 1
SH 1
SH 2
SH 3
SH 5
SH 7
SH 7
TU 1
TU 2
TU 5
TL 1
TL 2
TL 3
TL 4
TL 5
TL 6
TL 7
TL 8
TL 9
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Vegetation

Description

The Vegetation map describes the general vegetation and landcover types across the state of Colorado. In the Colorado 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 LANDFIRE 2014 version of data products (Existing Vegetation Type) was used to compile the Vegetation data for the Colorado WRA. This reflects data current to 2014. The LANDFIRE EVT data were classified to reflect general vegetation cover types for representation with CO-WRAP.

Oak shrublands are commonly found along dry foothills and lower mountain slopes, and are often situated above Piñyon-juniper.

Piñyon-juniper woodlands are common in southern and southwestern Colorado.

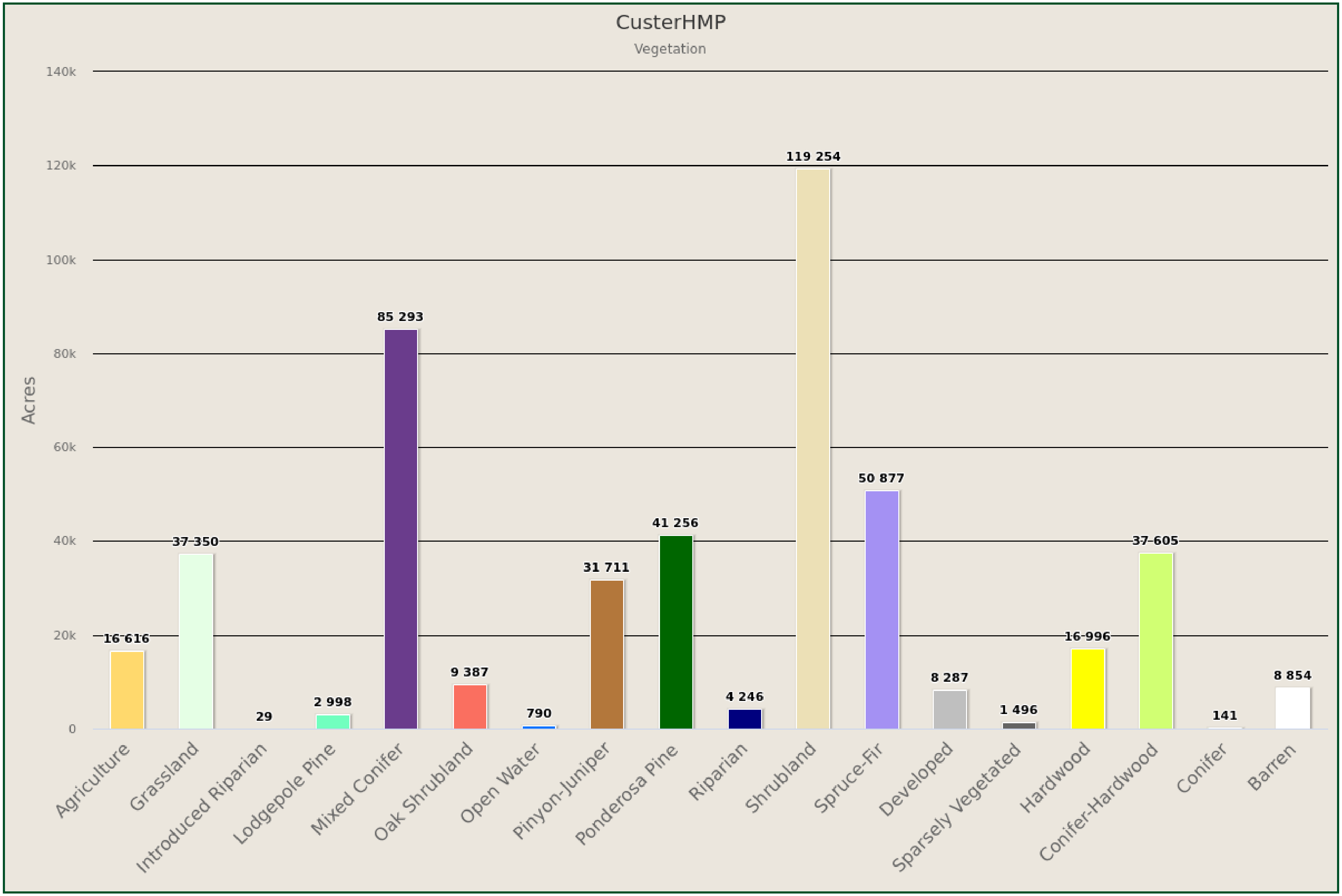
Douglas-fir understory in a ponderosa pine forest.

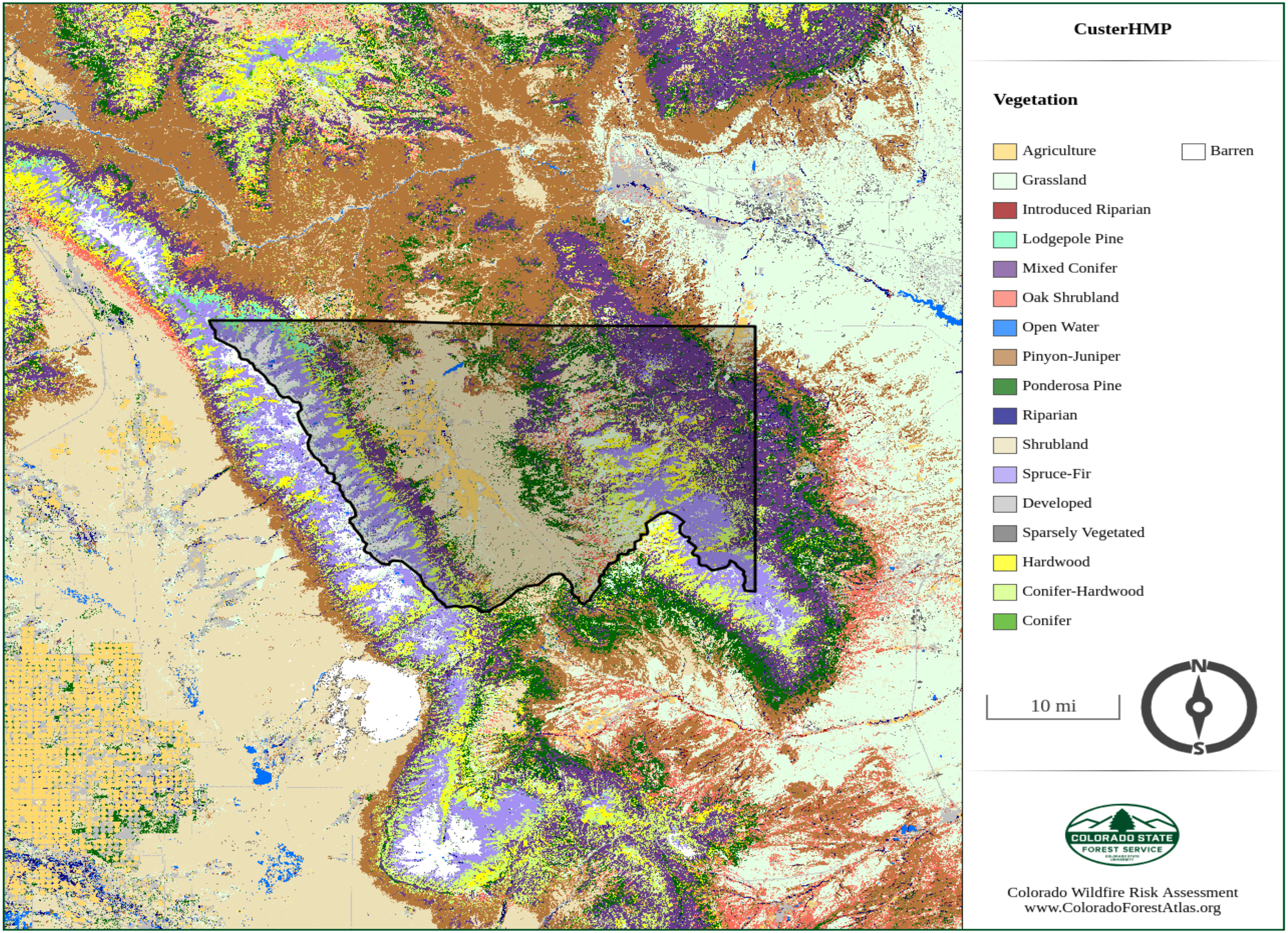
Grasslands occur both on Colorado's Eastern Plains and on the Western Slope.

Wildland fire threat increases in lodgepole pine as the dense forests grow old.

Overly dense ponderosa pine, a dominant species of the montane zone.

Vegetation Class		Acres	Percent
	Agriculture	16,616	3.5 %
	Grassland	37,350	7.9 %
	Introduced Riparian	29	0.0 %
	Lodgepole Pine	2,998	0.6 %
	Mixed Conifer	85,293	18.0 %
	Oak Shrubland	9,387	2.0 %
	Open Water	790	0.2 %
	Pinyon-Juniper	31,711	6.7 %
	Ponderosa Pine	41,256	8.7 %
	Riparian	4,246	0.9 %
	Shrubland	119,254	25.2 %
	Spruce-Fir	50,877	10.8 %
	Developed	8,287	1.8 %
	Sparsely Vegetated	1,496	0.3 %
	Hardwood	16,996	3.6 %
	Conifer-Hardwood	37,605	7.9 %
	Conifer	141	0.0 %
	Barren	8,854	1.9 %
Total		**473,186**	**100 %**


CusterHMP
Vegetation
Acres
140k
120k
100k
80k
60k
40k
20k
0
16 616
37 350
29
2 998
85 293
9 387
790
31 711
41 256
4 246
119 254
50 877
8 287
1 496
16 996
37 605
141
8 854
Agriculture
Grassland
Introduced Riparian
Lodgepole Pine
Mixed Conifer
Oak Shrubland
Open Water
Pinyon-Juniper
Ponderosa Pine
Riparian
Shrubland
Spruce-Fir
Developed
Sparsely Vegetated
Hardwood
Conifer-Hardwood
Conifer
Barren


CusterHMP
Vegetation
Agriculture
Barren
Grassland
Introduced Riparian
Lodgepole Pine
Mixed Conifer
Oak Shrubland
Open Water
Pinyon-Juniper
Ponderosa Pine
Riparian
Shrubland
Spruce-Fir
Developed
Sparsely Vegetated
Hardwood
Conifer-Hardwood
Conifer
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Drinking Water Importance Areas

Description

Drinking Water Importance Areas is the measure of quality and quantity of public surface drinking water categorized by watershed. This layer identifies an index of surface drinking water importance, reflecting a measure of water quality and quantity, characterized by Hydrologic Unit Code 12 (HUC 12) watersheds. The Hydrologic Unit system is a standardized watershed classification system developed by the USGS. Areas that are a source of drinking water are of critical importance and adverse effects from fire are a key concern.

The U.S. Forest Service Forests to Faucets (F2F) project is the primary source of the drinking water data set. This project used GIS modeling to develop an index of importance for supplying drinking water using HUC 12 watersheds as the spatial resolution. Watersheds are ranked from 1 to 100 reflecting relative level of importance, with 100 being the most important and 1 the least important.

Several criteria were used in the F2F project to derive the importance rating including water supply, flow analysis, and downstream drinking water demand. The final model of surface drinking water importance used in the F2F project combines the drinking water protection model, capturing the flow of water and water demand, with a model of mean annual water supply.

The values generated by the drinking water protection model are simply multiplied by the results of the model of mean annual water supply to create the final surface drinking water importance index.

Water is critical to sustain life. Human water usage has further complicated nature's already complex aquatic system. Plants, including trees, are essential to the proper functioning of water movement within the environment. Forests receive precipitation, utilize it for their sustenance and growth, and influence its storage and/or passage to other parts of the environment.

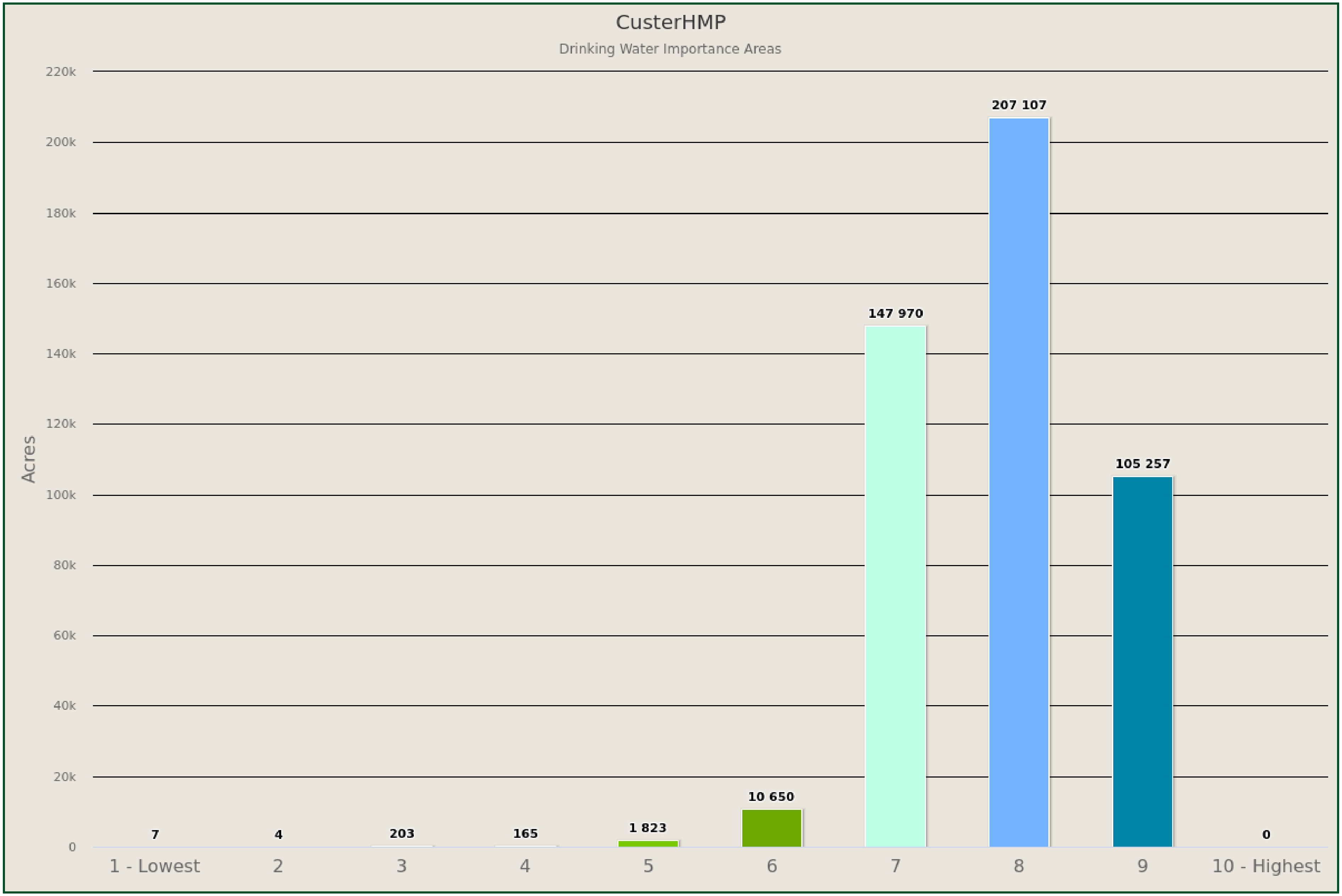
Four major river systems – the Platte, Colorado, Arkansas and Rio Grande – originate in the Colorado mountains and fully drain into one-third of the landmass of the lower 48 states. Mountain snows supply 75 percent of the water to these river systems.

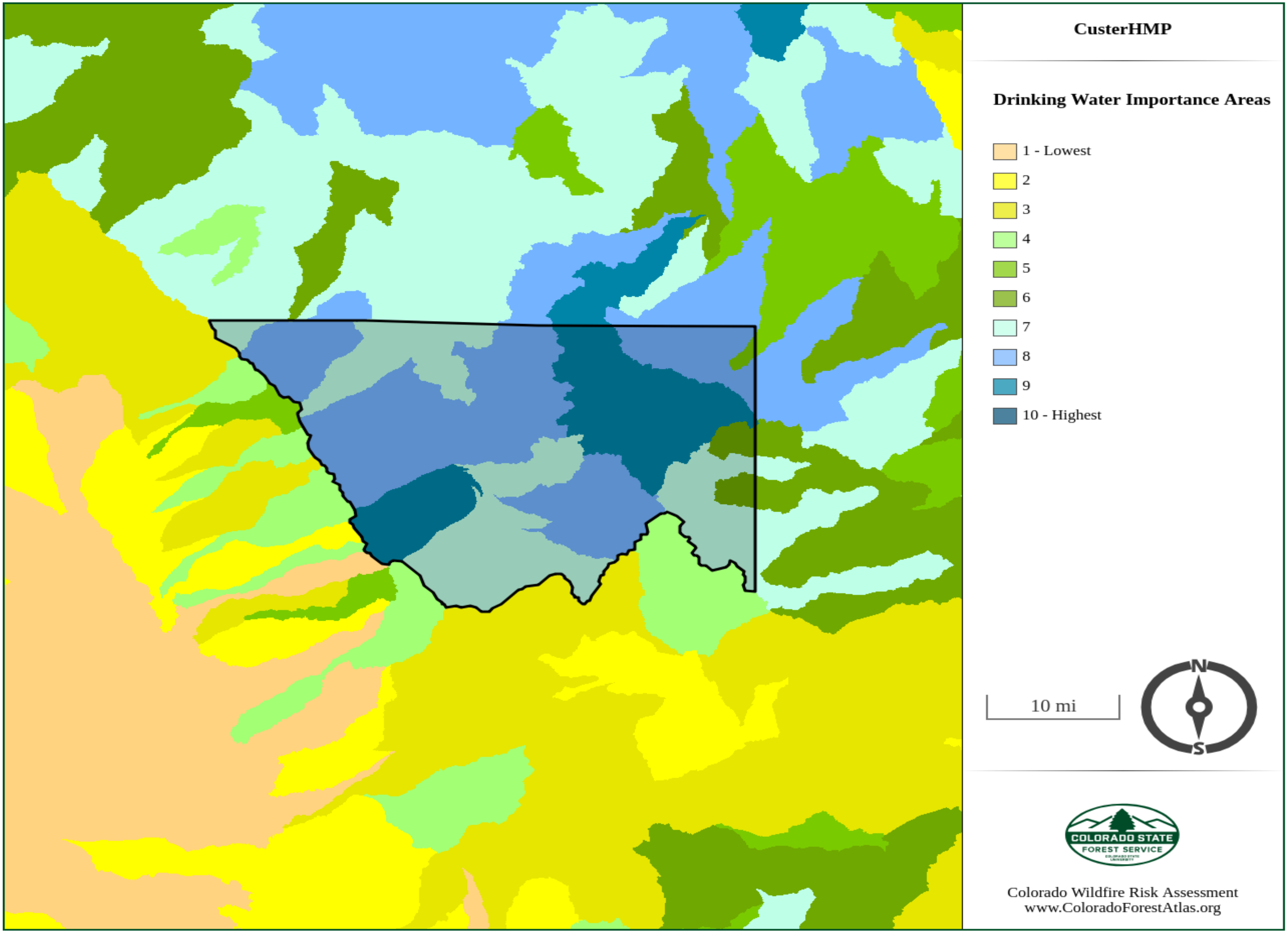
Virtually all of Colorado's drinking water comes from snowmelt carried at some point by a river.

The headwaters of the Animas River begin near Silverton, CO at elevations greater than 12,000 feet.

Approximately 40 percent of the water comes from the highest 20 percent of the land, most of which lies in national forests. National forests yield large portions of the total water in these river systems. The potential is great for forests to positively and negatively influence the transport of water over such immense distances.

Drinking Water Class		Acres	Percent
	1 - Lowest	7	0.0 %
	2	4	0.0 %
	3	203	0.0 %
	4	165	0.0 %
	5	1,823	0.4 %
	6	10,650	2.3 %
	7	147,970	31.3 %
	8	207,107	43.8 %
	9	105,257	22.2 %
	10 - Highest	0	0 %
Total		**473,186**	**100 %**


CusterHMP
Drinking Water Importance Areas
Acres
220k
200k
180k
160k
140k
120k
100k
80k
60k
40k
20k
0
7
4
203
165
1 823
10 650
147 970
207 107
105 257
0
1 - Lowest
2
3
4
5
6
7
8
9
10 - Highest


CusterHMP
Drinking Water Importance Areas
1 - Lowest
2
3
4
5
6
7
8
9
10 - Highest
10 mi
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Drinking Water Risk Index

Description

Drinking Water Risk Index is a measure of the risk to DWIAs 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.

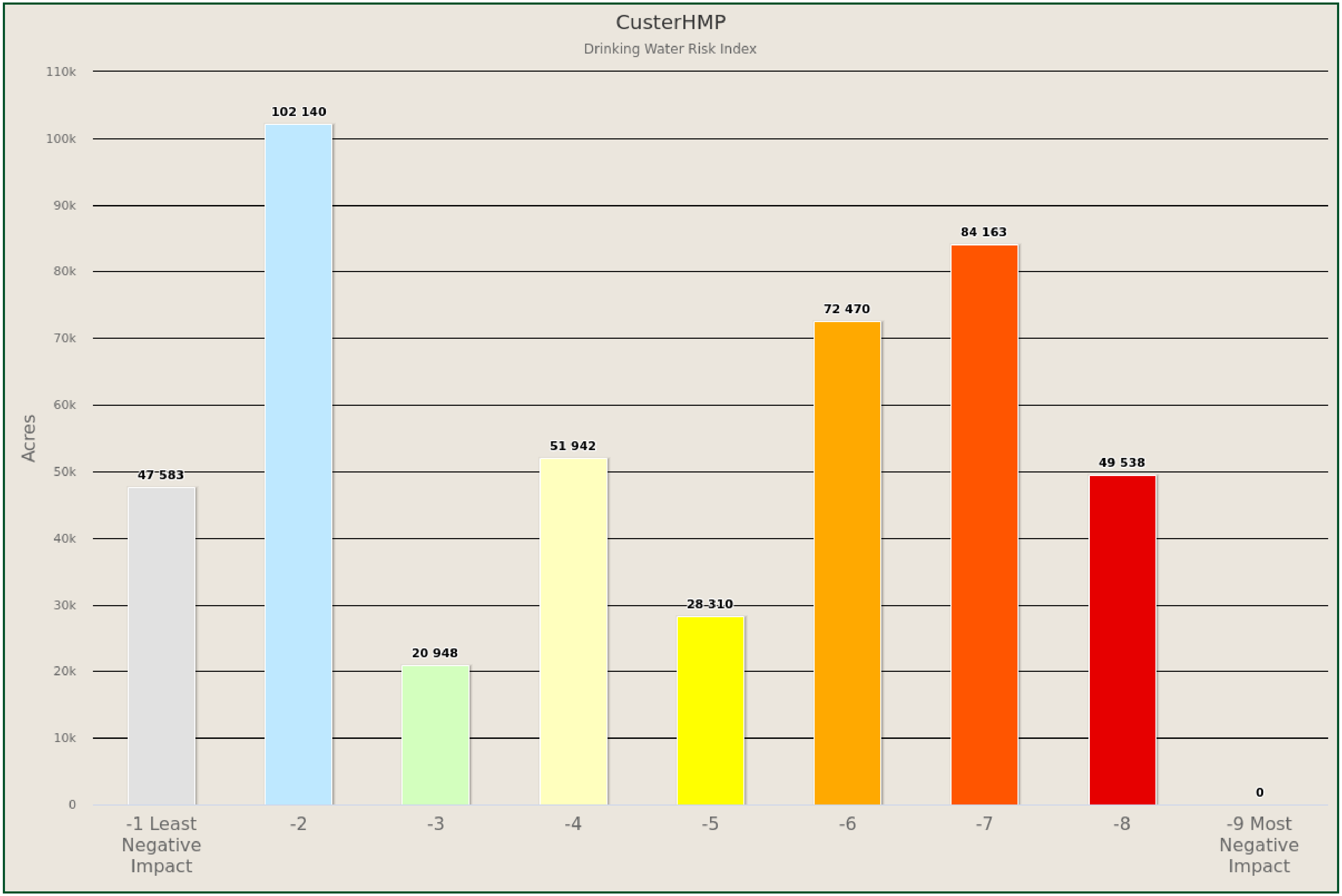
The loss of critical surface vegetation leaves forested slopes extremely vulnerable to large-scale soil erosion and flooding during subsequent storm events. In turn, these threats can impact the health, safety and integrity of communities and natural resources downstream. The likelihood that such a post-fire 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.

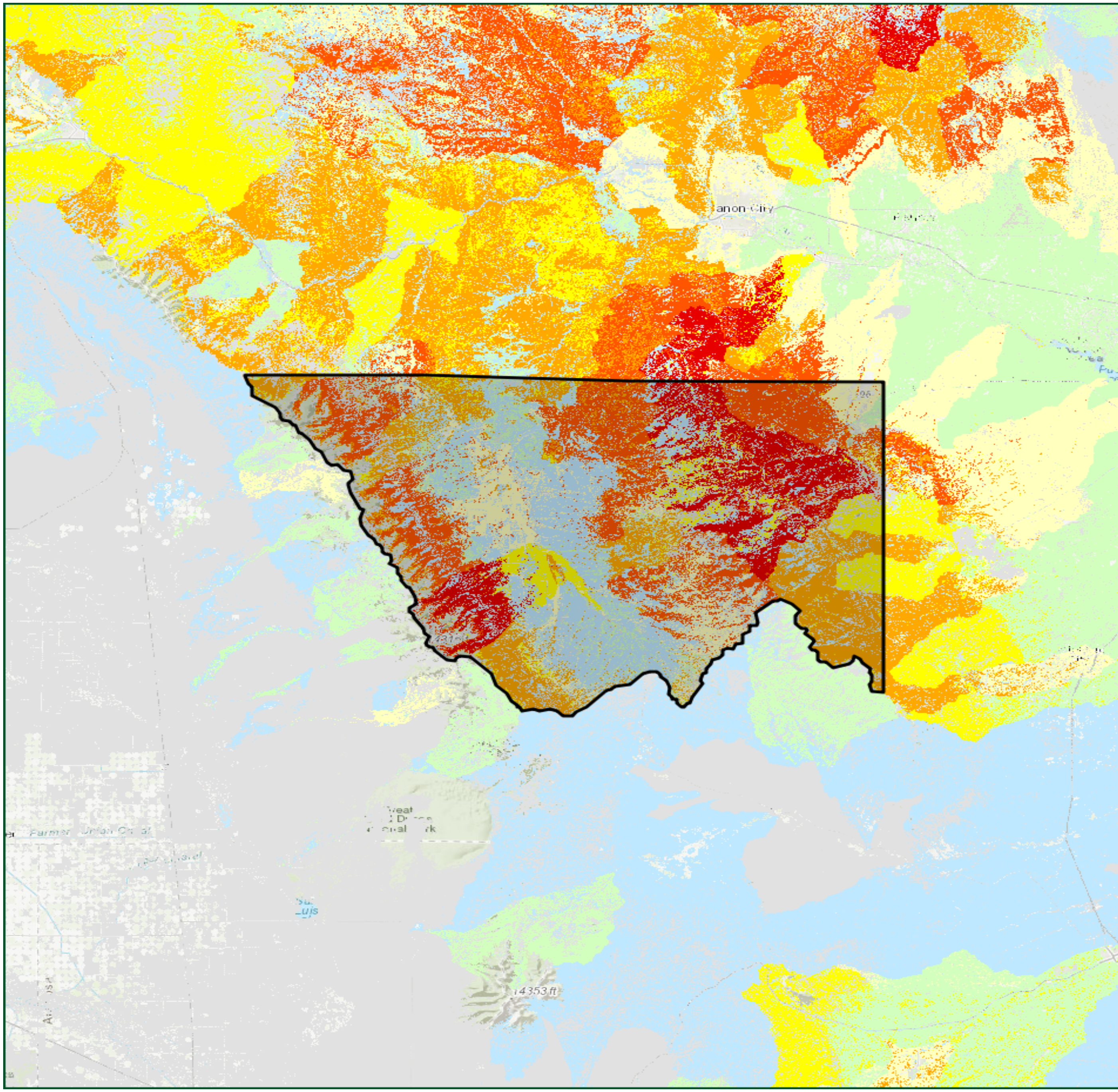
In the aftermath of the 2002 fire season, the Colorado Department of Health estimated that 26 municipal water storage facilities were shut down due to fire and post-fire impacts.

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 range of values is from -1 to -9, with -1 representing the least negative impact and -9 representing the most negative impact.

Class	Acres	Percent
-1 Least Negative Impact	47,583	10.4 %
-2	102,140	22.3 %
-3	20,948	4.6 %
-4	51,942	11.4 %
-5	28,310	6.2 %
-6	72,470	15.9 %
-7	84,163	18.4 %
-8	49,538	10.8 %
-9 Most Negative Impact	0	0 %
Total	**457,094**	**100 %**


CusterHMP
Drinking Water Risk Index
Acres
110k
100k
90k
80k
70k
60k
50k
40k
30k
20k
10k
0
47 583
102 140
20 948
51 942
28 310
72 470
84 163
49 538
0
-1 Least Negative Impact
-2
-3
-4
-5
-6
-7
-8
-9 Most Negative Impact



CusterHMP

Drinking Water Risk Index

- -1 Least Negative Impact
- -2
- -3
- -4
- -5
- -6
- -7
- -8
- -9 Most Negative Impact

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Riparian Assets

Description

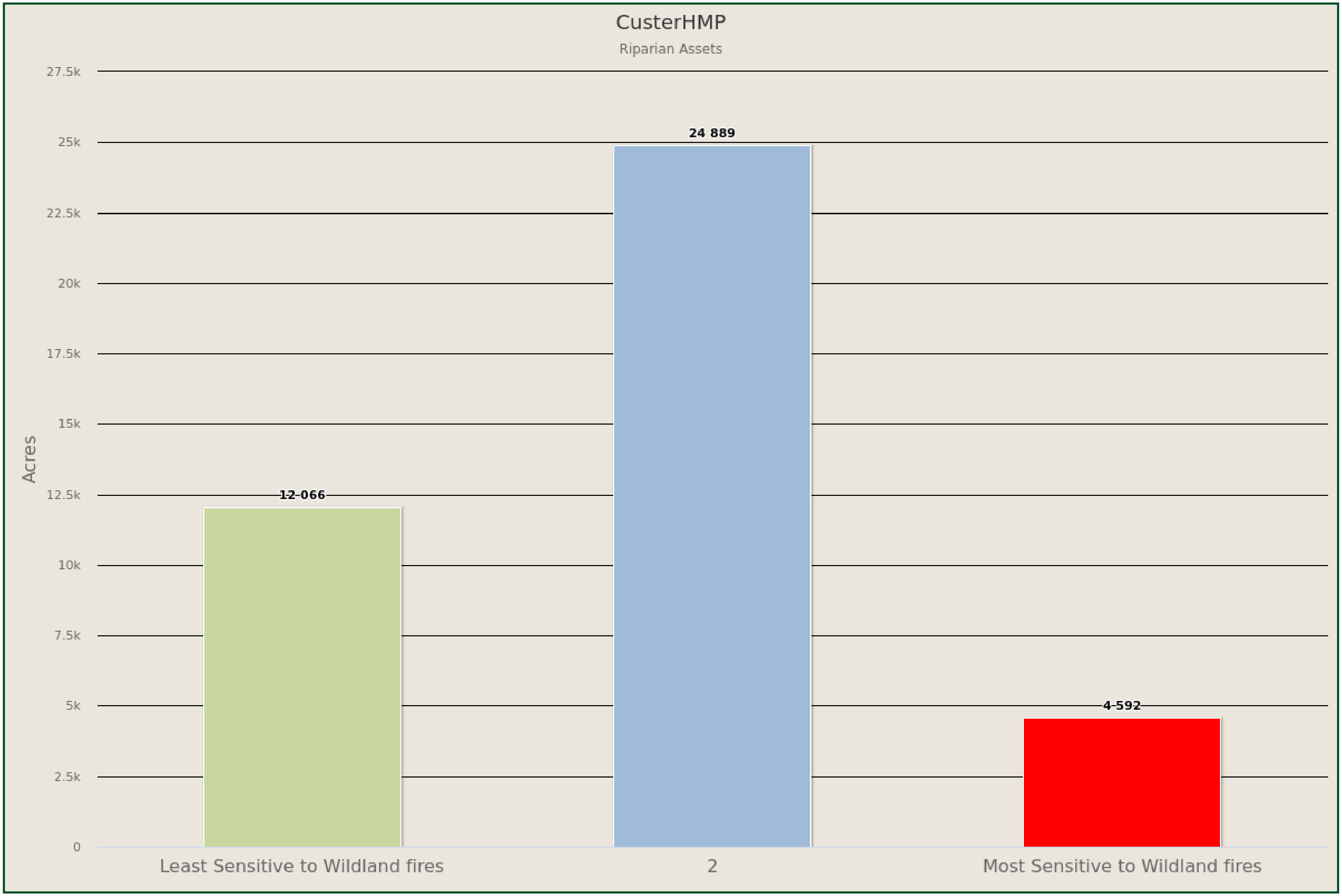
Riparian Assets are forested riparian areas characterized by functions of water quantity and quality, and ecology. This layer identifies riparian areas that are important as a suite of ecosystem services, including both terrestrial and aquatic habitat, water quality, water quantity, and other ecological functions. Riparian areas are considered an especially important element of the landscape in the west. Accordingly, riparian assets are distinguished from other forest assets so they can be evaluated separately.

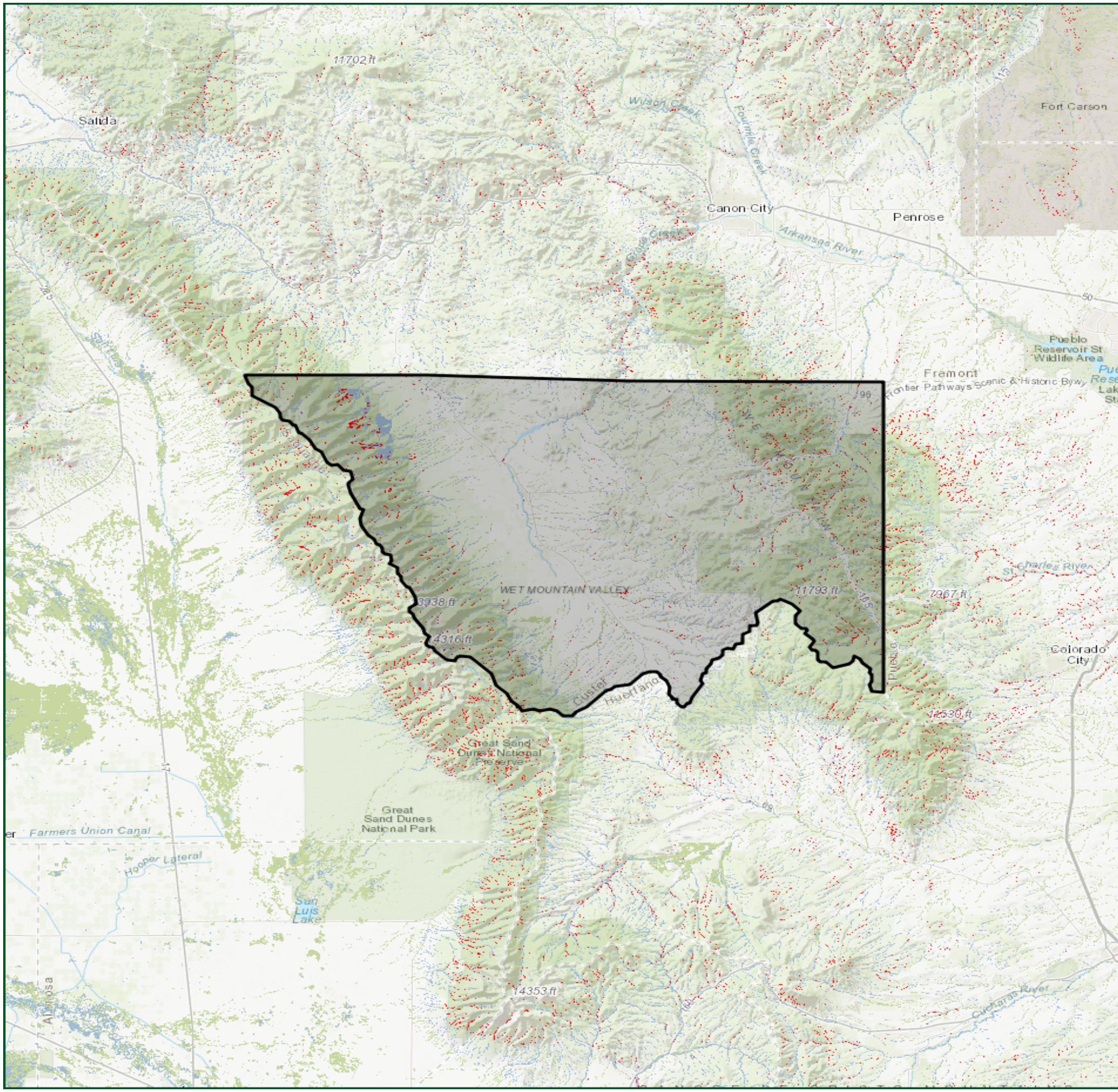
The process for defining these riparian areas involved identifying the riparian footprint and then assigning a rating based upon two important riparian functions – water quantity and quality, and ecological significance. A scientific model was developed by the West Wide Risk Assessment technical team with in-kind support from CAL FIRE state representatives. Several input datasets were used in the model including the National Hydrography Dataset and the National Wetland Inventory.

The National Hydrography Data Set (NHD) was used to represent hydrology. A subset of streams and water bodies, which represents perennial, intermittent, and wetlands, was created. The NHD water bodies dataset was used to determine the location of lakes, ponds, swamps, and marshes (wetlands).

To model water quality and quantity, erosion potential (K-factor) and annual average precipitation was used as key variables. The Riparian Assets data are an index of class values that range from 1 to 3 representing increasing importance of the riparian area as well as sensitivity to fire-related impacts on the suite of ecosystem services.

Riparian Assets Class	Acres	Percent
Least Sensitive to Wildland fires	12,066	29.0 %
2	24,889	59.9 %
Most Sensitive to Wildland fires	4,592	11.1 %
Total	**41,547**	**100 %**


CusterHMP
Riparian Assets
Acres
27.5k
25k
22.5k
20k
17.5k
15k
12.5k
10k
7.5k
5k
2.5k
0
24 889
12 066
4 592
Least Sensitive to Wildland fires
2
Most Sensitive to Wildland fires



CusterHMP

Riparian Assets

- Least Sensitive to Wildland fires
- 2
- Most Sensitive to Wildland fires

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Riparian Assets Risk Index

Description

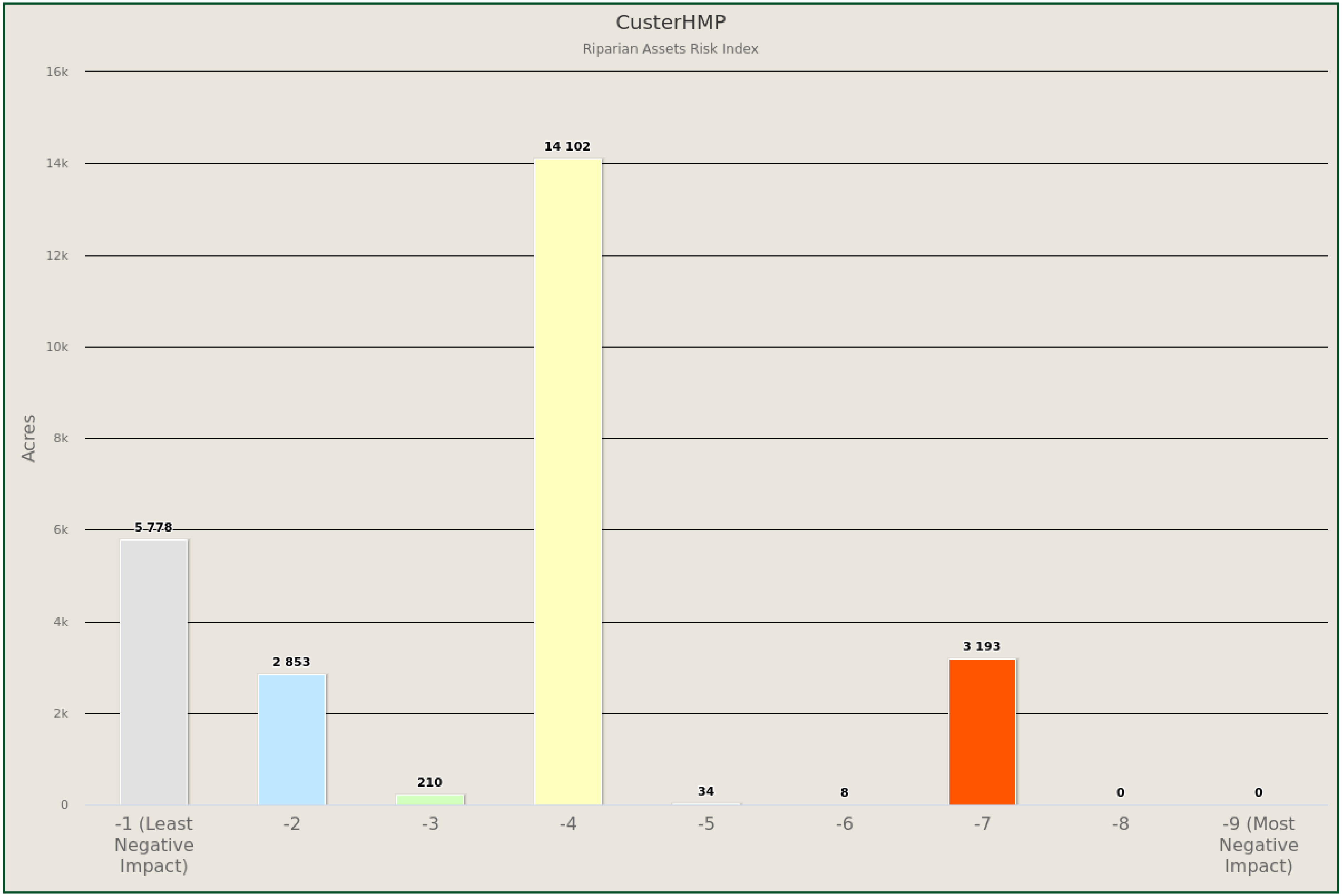
Riparian Assets Risk Index is a measure of the risk to riparian areas based on the potential negative impacts from wildfire. This layer identifies those riparian areas with the greatest potential for adverse effects from wildfire.

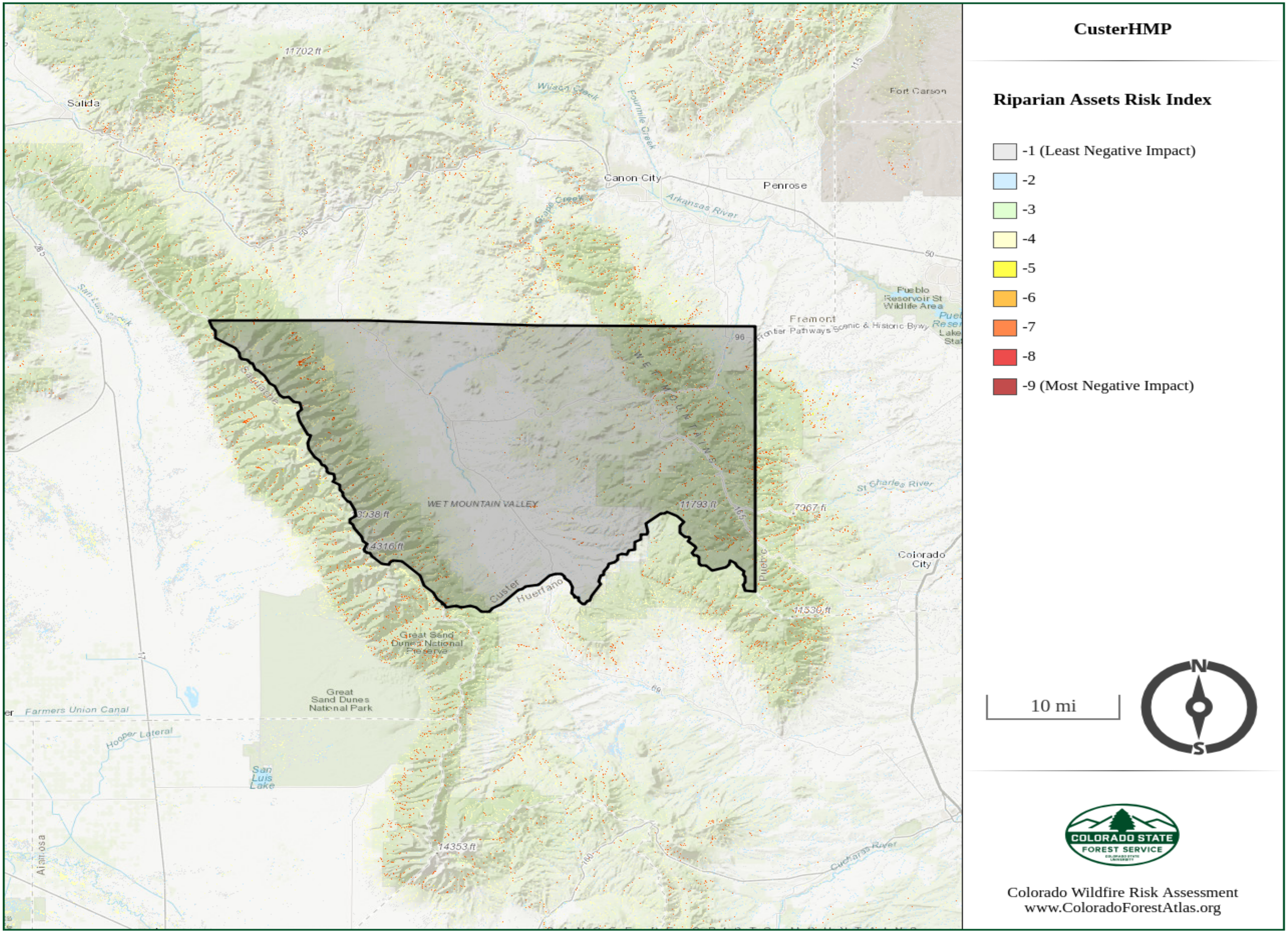
The range of values is from -1 to -9, with -1 representing the least negative impact and -9 representing the most negative impact.

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.

This risk output is intended to supplement the Drinking Water Risk Index by identifying wildfire risk within the more detailed riparian areas.

Riparian Assets Risk Class	Acres	Percent
-1 (Least Negative Impact)	5,778	22.1 %
-2	2,853	10.9 %
-3	210	0.8 %
-4	14,102	53.9 %
-5	34	0.1 %
-6	8	0.0 %
-7	3,193	12.2 %
-8	0	0 %
-9 (Most Negative Impact)	0	0 %
Total	**26,179**	**100 %**


CusterHMP
Riparian Assets Risk Index
Acres
16k
14k
12k
10k
8k
6k
4k
2k
0
14 102
5 778
2 853
210
34
8
3 193
0
0
-1 (Least Negative Impact)
-2
-3
-4
-5
-6
-7
-8
-9 (Most Negative Impact)


Salida
Canon City
Penrose
Fort Carson
Wilson Creek
Fourmile Creek
Grape Creek
Arkansas River
Pueblo Reservoir St Wildlife Area
Fremont
Frontier Pathways Scenic & Historic Byway
WET MOUNTAIN VALLEY
Custer
Huerfano
St Charles River
Colorado City
Great Sand Dunes National Preserve
Great Sand Dunes National Park
Farmers Union Canal
Hooper Lateral
San Luis Lake
Alamosa
Cucharas River
11702 ft
11793 ft
7067 ft
11536 ft
14316 ft
14353 ft
CusterHMP
Riparian Assets Risk Index
-1 (Least Negative Impact)
-2
-3
-4
-5
-6
-7
-8
-9 (Most Negative Impact)
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Forest Assets

Description

Forest Assets are forested areas categorized by height, cover, and susceptibility/response to fire. This layer identifies forested land categorized by height, cover and susceptibility or response to fire. Using these characteristics allows for the prioritization of landscapes reflecting forest assets that would be most adversely affected by fire. The rating of importance or value of the forest assets is relative to each state's interpretation of those characteristics considered most important for their landscapes.

Canopy cover from LANDFIRE 2014 was re-classified into two categories, open or sparse and closed. Areas classified as open or sparse have a canopy cover less than 60%. Areas classified as closed have a canopy cover greater than 60%.

Canopy height from LANDFIRE 2014 was re-classified into two categories, 0-10 meters and greater than 10 meters.

Response to fire was developed from the LANDFIRE 2014 existing vegetation type (EVT) dataset. There are over 1,000 existing vegetation types in the project area. Using a crosswalk defined by project ecologists, a classification of susceptibility and response to fire was defined and documented by fire ecologists into the three fire response classes.

These three classes are sensitive, resilient and adaptive.

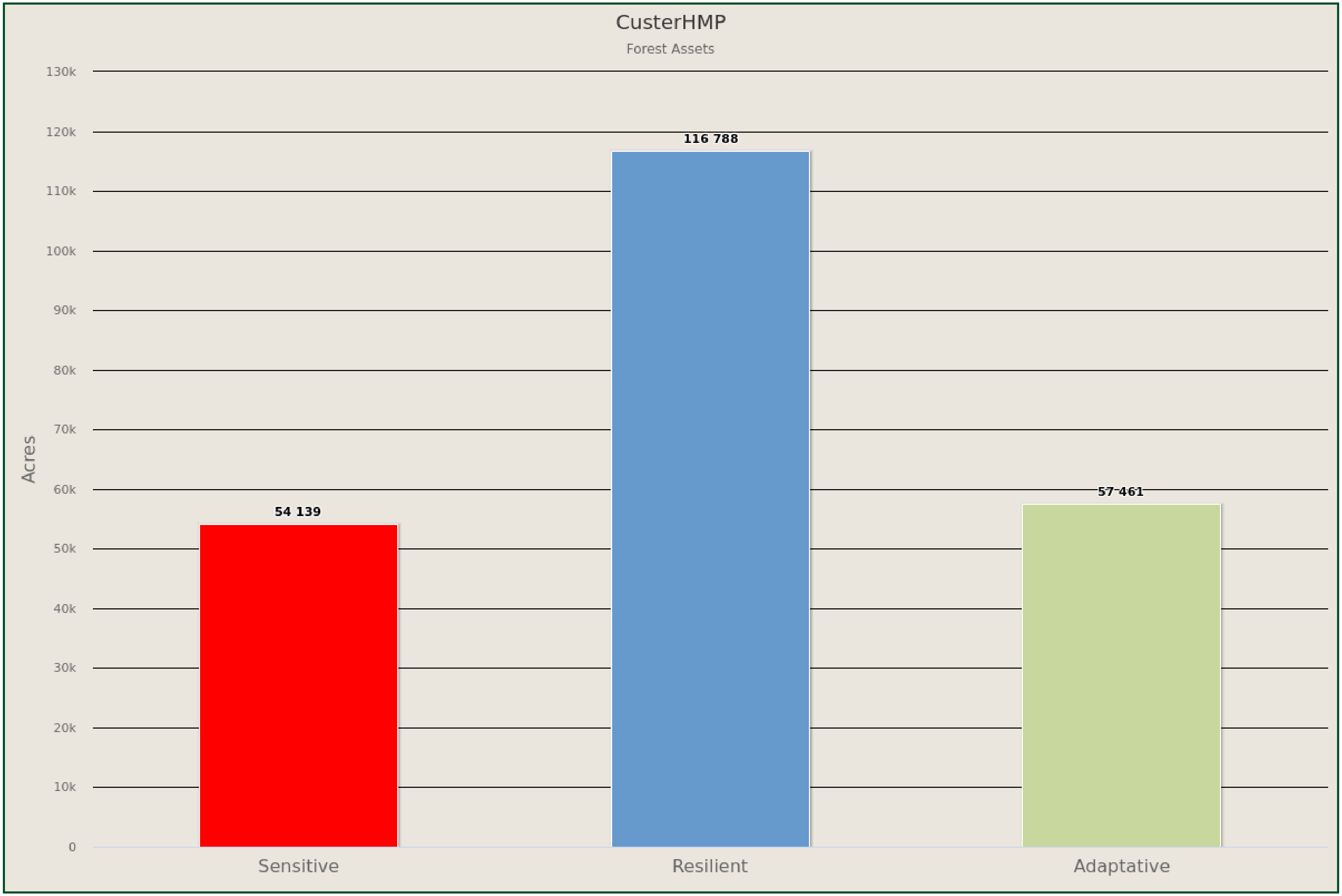
- **Sensitive** = These are tree species that are intolerant or sensitive to damage from fire with low intensity.
- **Resilient** = These are tree species that have characteristics that help the tree resist damage from fire and whose adult stages can survive low intensity fires.
- **Adaptive** = These are tree species adapted with the ability to regenerate following fire by sprouting or serotinous cones

The range of values is from -1 to -9, with -1 representing the least negative impact and -9 representing the most negative impact.

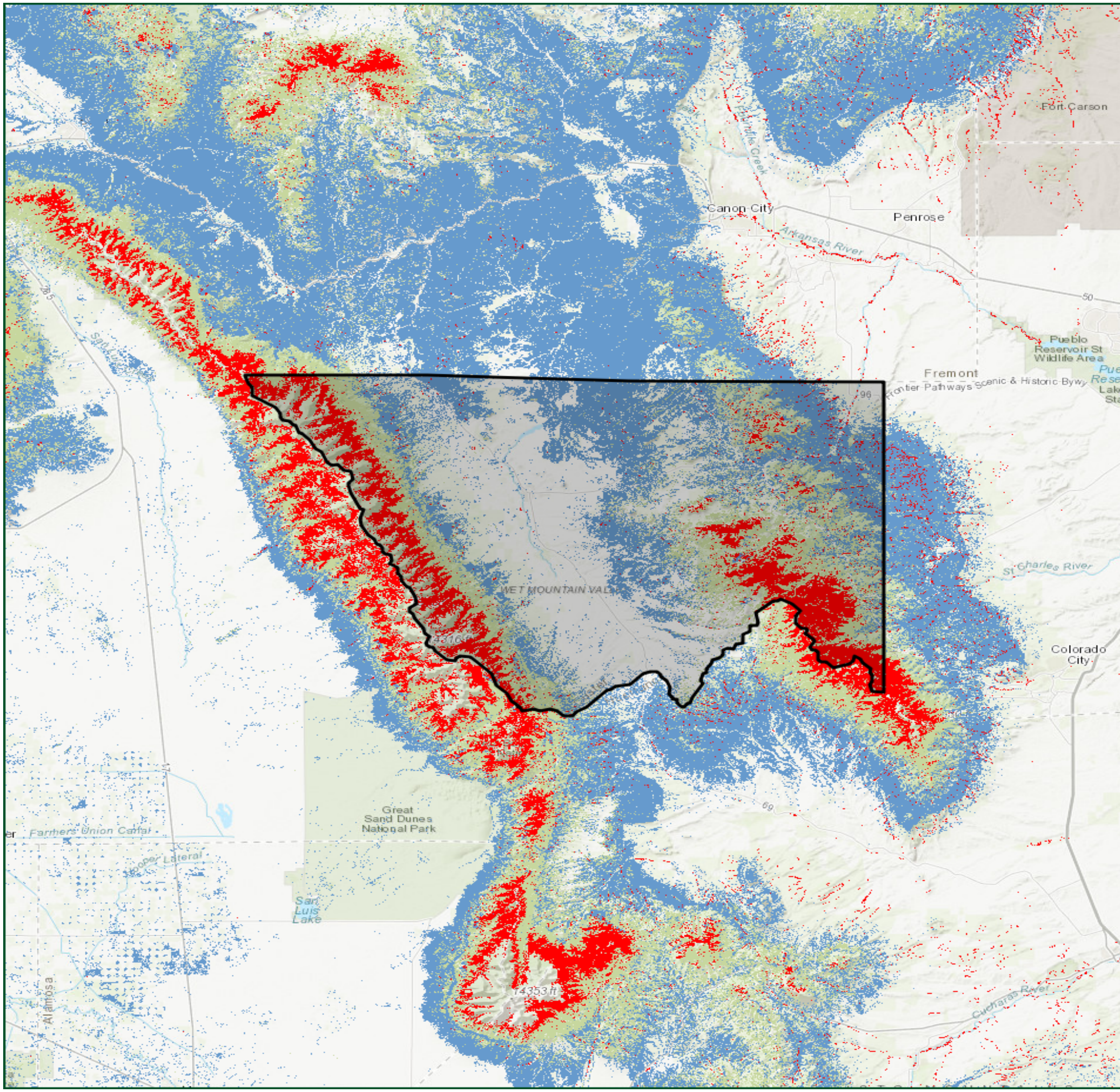
The risk index has been calculated by combining the Forest Assets data with a measure of fire intensity using a Response Function approach. Those areas with the highest negative impact (-9) represent areas with high potential fire intensity and low resilience or adaptability to fire. Those areas with the lowest negative impact (-1) represent those areas with low potential fire intensity and high resilience or adaptability to fire.

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	Acres	Percent
Sensitive	54,139	23.7 %
Resilient	116,788	51.1 %
Adaptative	57,461	25.2 %
Total	**228,388**	**100 %**


CusterHMP
Forest Assets
Acres
130k
120k
110k
100k
90k
80k
70k
60k
50k
40k
30k
20k
10k
0
116 788
54 139
57 461
Sensitive
Resilient
Adaptative

CusterHMP



Forest Assets

- Sensitive
- Resilient
- Adaptative

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Forest Assets Risk Index

Description

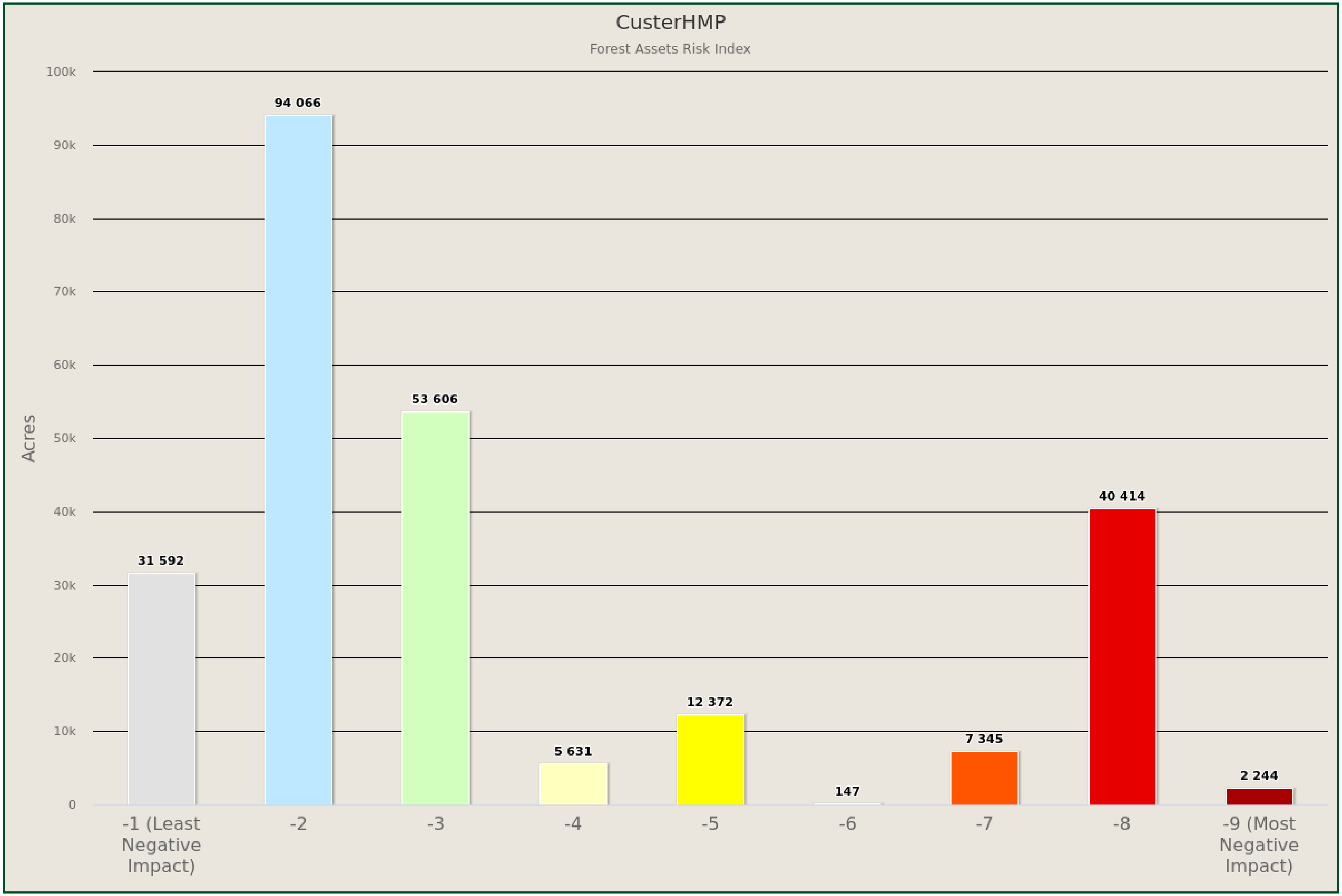
Forest Assets Risk Index is a measure of the risk to forested areas based on the potential negative impacts from wildfire. This layer identifies those forested areas with the greatest potential for adverse effects from wildfire.

The range of values is from -1 to -9, with -1 representing the least negative impact and -9 representing the most negative impact.

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.

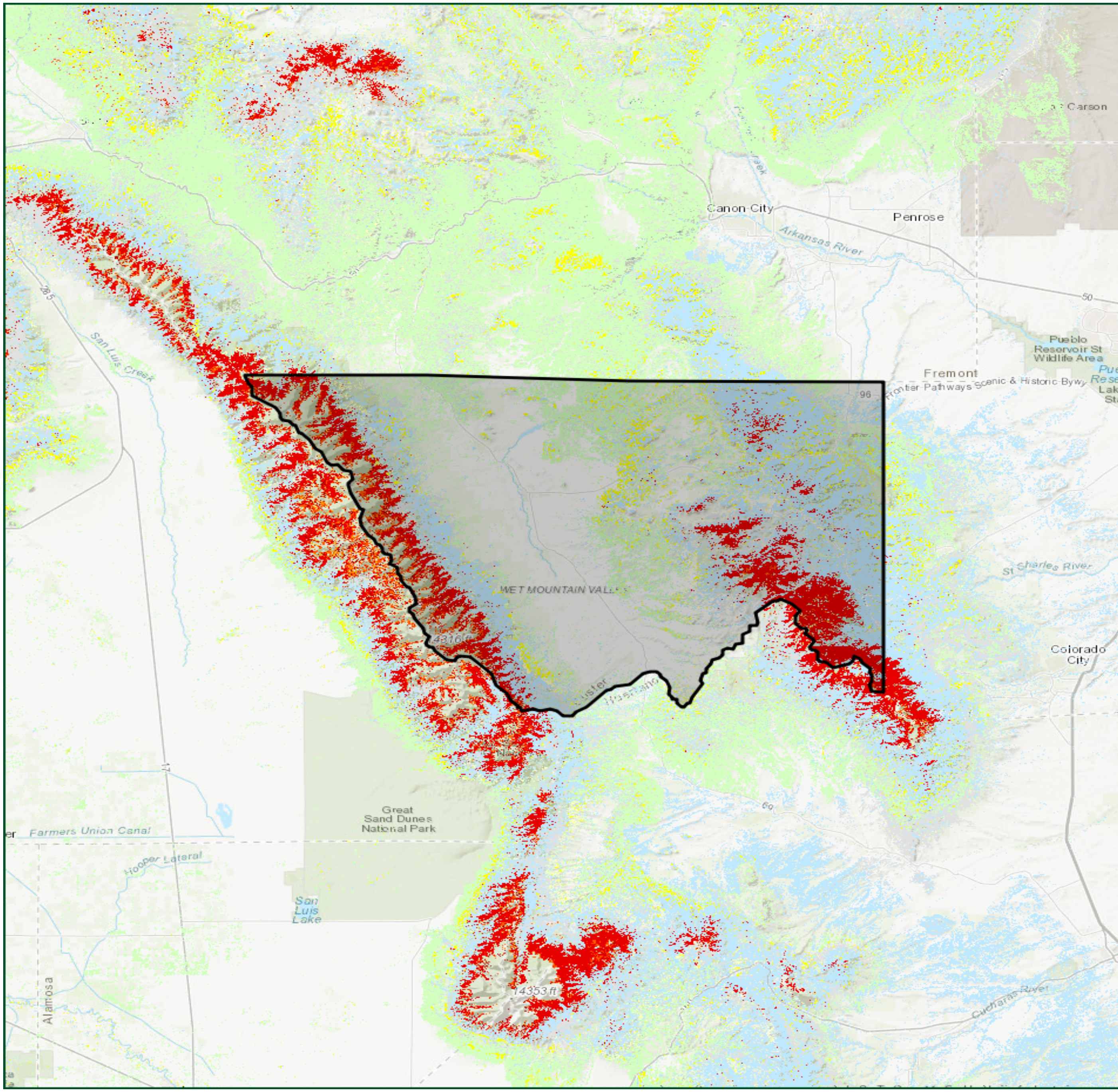
This risk output is intended to provide an overall forest index for potential impact from wildfire. This can be applied to consider aesthetic values, ecosystem services, or economic values of forested lands.

Forest Assets Risk Class	Acres	Percent
-1 (Least Negative Impact)	31,592	12.8 %
-2	94,066	38.0 %
-3	53,606	21.7 %
-4	5,631	2.3 %
-5	12,372	5.0 %
-6	147	0.1 %
-7	7,345	3.0 %
-8	40,414	16.3 %
-9 (Most Negative Impact)	2,244	0.9 %
Total	**247,418**	**100 %**



CusterHMP
Forest Assets Risk Index
Acres
100k
90k
80k
70k
60k
50k
40k
30k
20k
10k
0
94 066
53 606
31 592
5 631
12 372
147
7 345
40 414
2 244
-1 (Least Negative Impact)
-2
-3
-4
-5
-6
-7
-8
-9 (Most Negative Impact)

CusterHMP



Forest Assets Risk Index

- -1 (Least Negative Impact)
- -2
- -3
- -4
- -5
- -6
- -7
- -8
- -9 (Most Negative Impact)

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APPENDIX C: FLOOD HAZUS RISK REPORT

Hazus: Flood Global Risk Report

Region Name: CusterCOFL

Flood Scenario: 100yr

Print Date: Monday, June 21, 2021

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Flood. These results can be improved by using enhanced inventory data and flood hazard information.

Table of Contents

General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). 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 flood loss estimates provided in this report were based on a region that included 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 approximately 740 square miles and contains 1,206 census blocks. The region contains over 2 thousand households and has a total population of 4,255 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 4,071 buildings in the region with a total building replacement value (excluding contents) of 654 million dollars. Approximately 93.98% of the buildings (and 84.69% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 4,071 buildings in the region which have an aggregate total replacement value of 654 million dollars. Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	553,751	84.7%
Commercial	50,275	7.7%
Industrial	16,420	2.5%
Agricultural	4,778	0.7%
Religion	16,094	2.5%
Government	5,351	0.8%
Education	7,185	1.1%
Total	**653,854**	**100%**

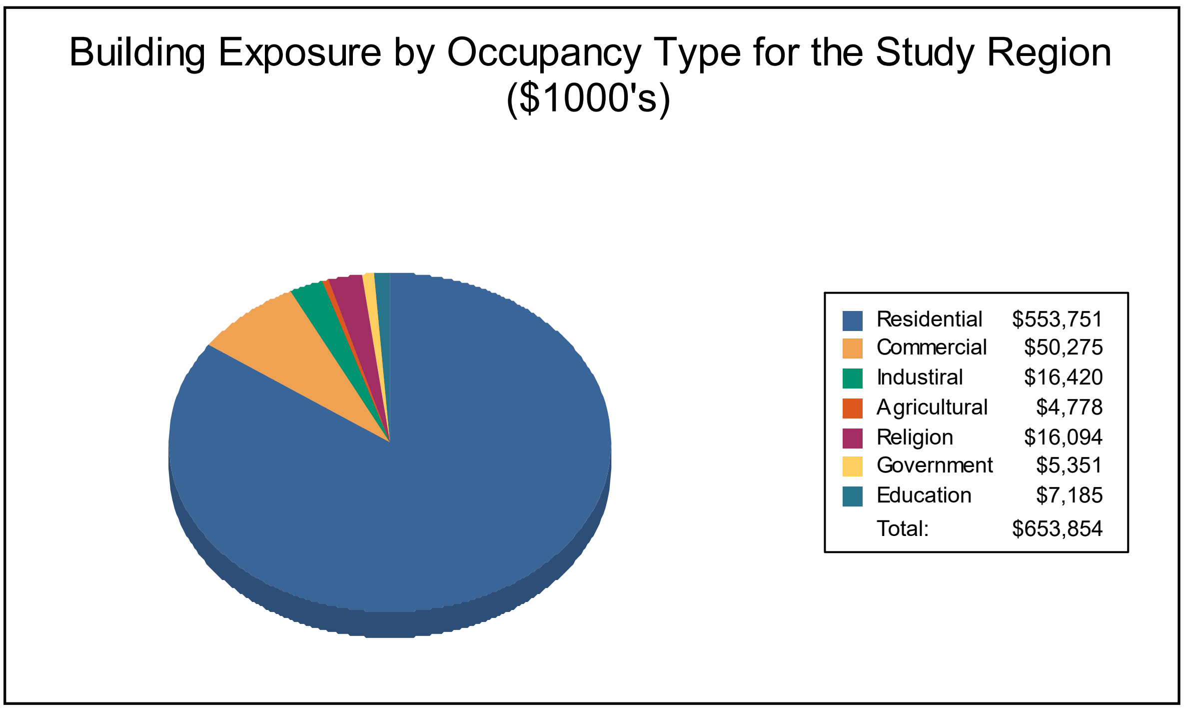
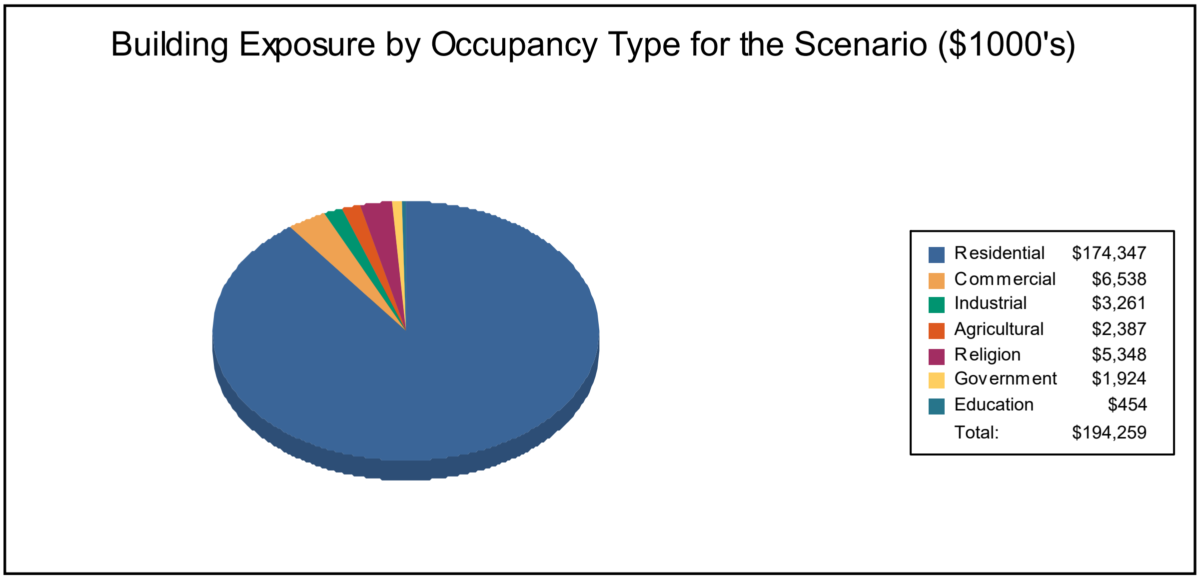


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	174,347	89.7%
Commercial	6,538	3.4%
Industrial	3,261	1.7%
Agricultural	2,387	1.2%
Religion	5,348	2.8%
Government	1,924	1.0%
Education	454	0.2%
Total	**194,259**	**100%**



Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 3 schools, 7 fire stations, 1 police station and 1 emergency operation center.

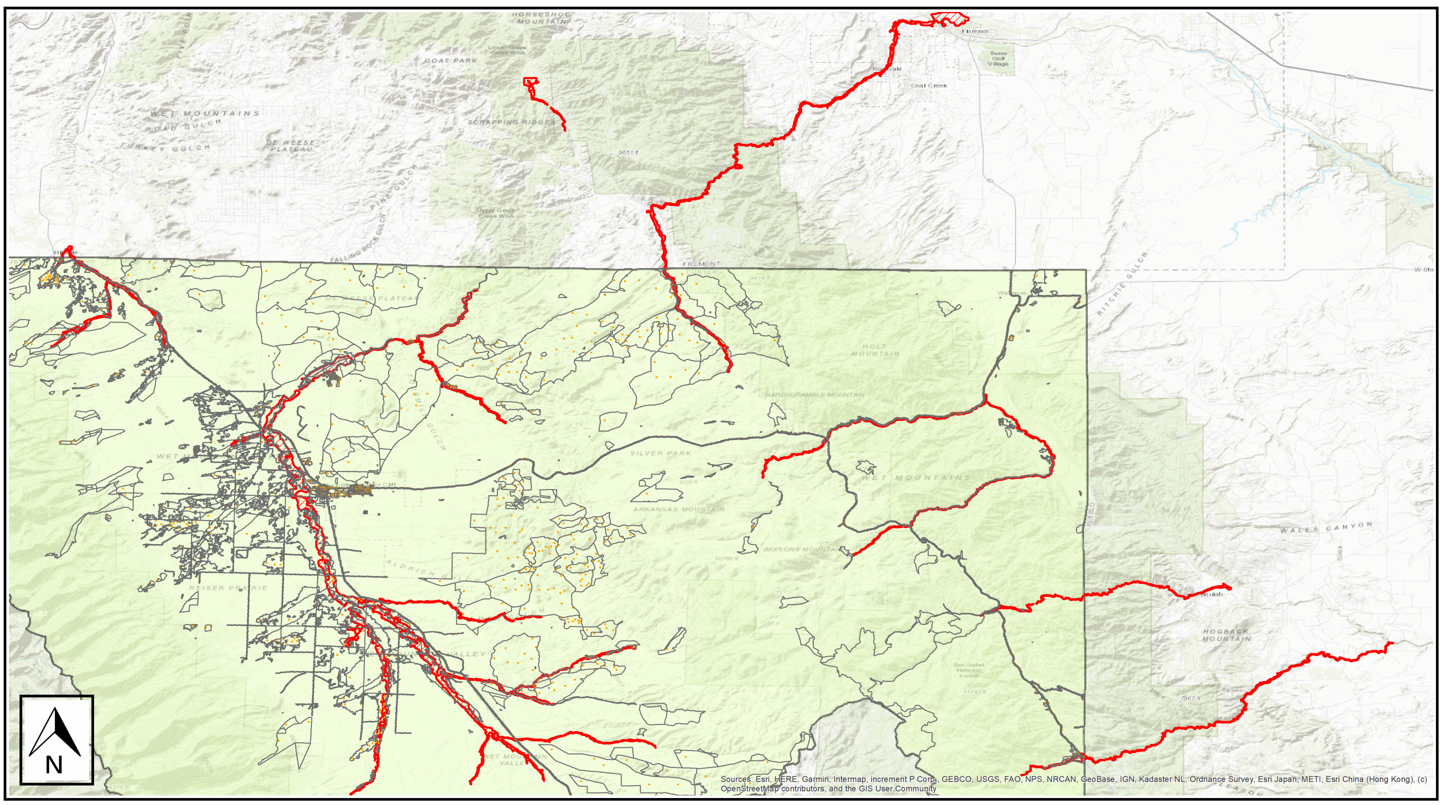
Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	CusterCOFL
Scenario Name:	100yr
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 117 buildings will be at least moderately damaged. This is over 39% of the total number of buildings in the scenario. There are an estimated 48 buildings that will be completely destroyed. The definition of the ‘damage states’ is provided in the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

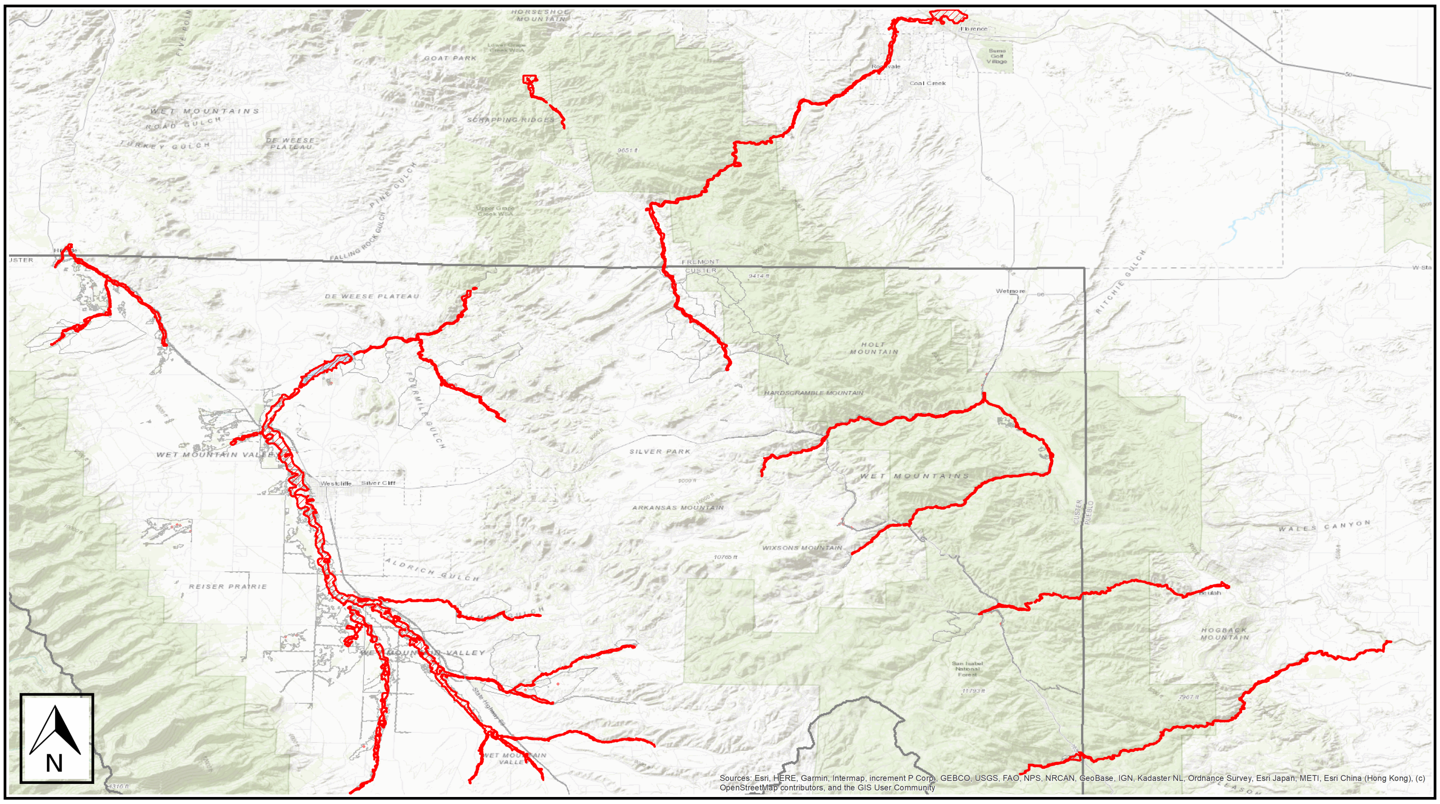


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		>50	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	0	0	0	0	0	0	0	0	0	0	0	0
Education	0	0	0	0	0	0	0	0	0	0	0	0
Government	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0	0	0	0
Religion	0	0	0	0	0	0	0	0	0	0	0	0
Residential	16	12	26	20	15	11	17	13	11	8	48	36
Total	**16**		**26**		**15**		**17**		**11**		**48**	

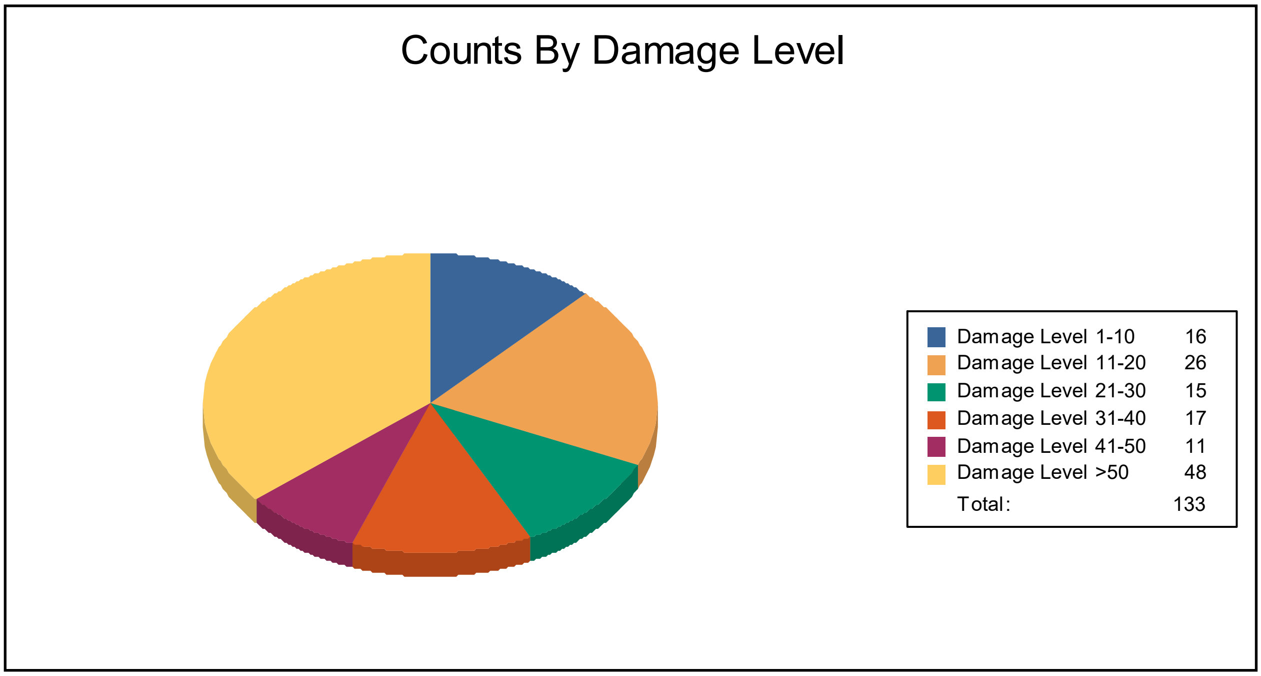


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		>50	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	5	100
Masonry	2	8	5	20	2	8	3	12	2	8	11	44
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	14	14	21	20	13	13	14	14	9	9	32	31

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Emergency Operation Centers	1	0	0	0
Fire Stations	7	0	0	0
Hospitals	0	0	0	0
Police Stations	1	0	0	0
Schools	3	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

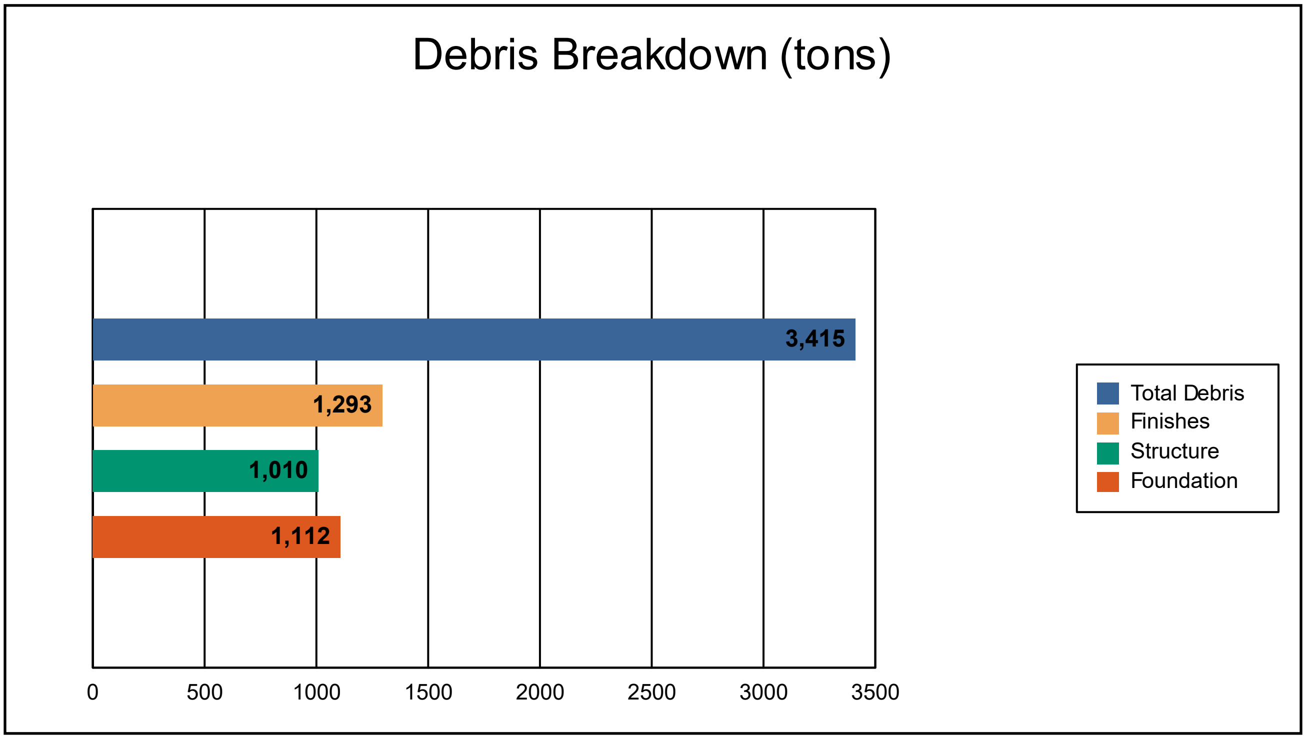
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

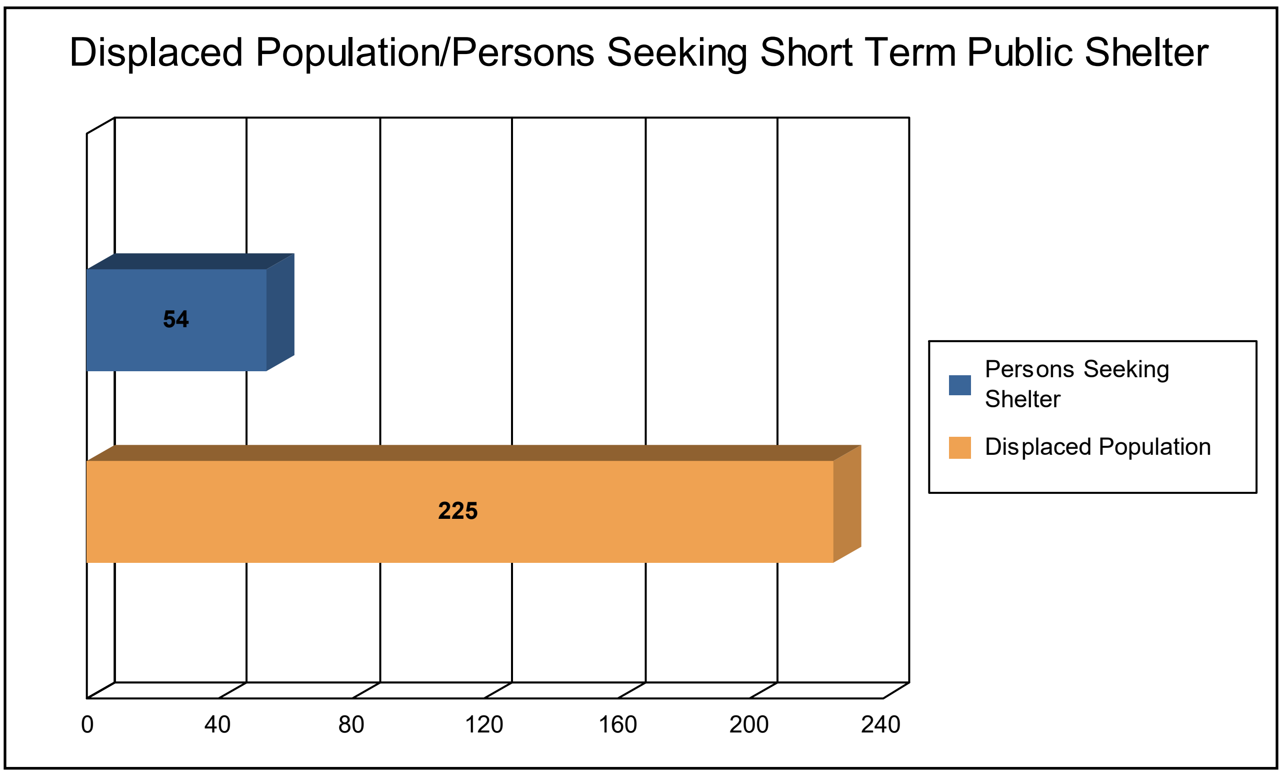


The model estimates that a total of 3,415 tons of debris will be generated. Of the total amount, Finishes comprises 38% of the total, Structure comprises 30% of the total, and Foundation comprises 33%. If the debris tonnage is converted into an estimated number of truckloads, it will require 137 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 75 households (or 225 of people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 54 people (out of a total population of 4,255) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 28.93 million dollars, which represents 14.89 % of the total replacement value of the scenario buildings.

Building-Related Losses

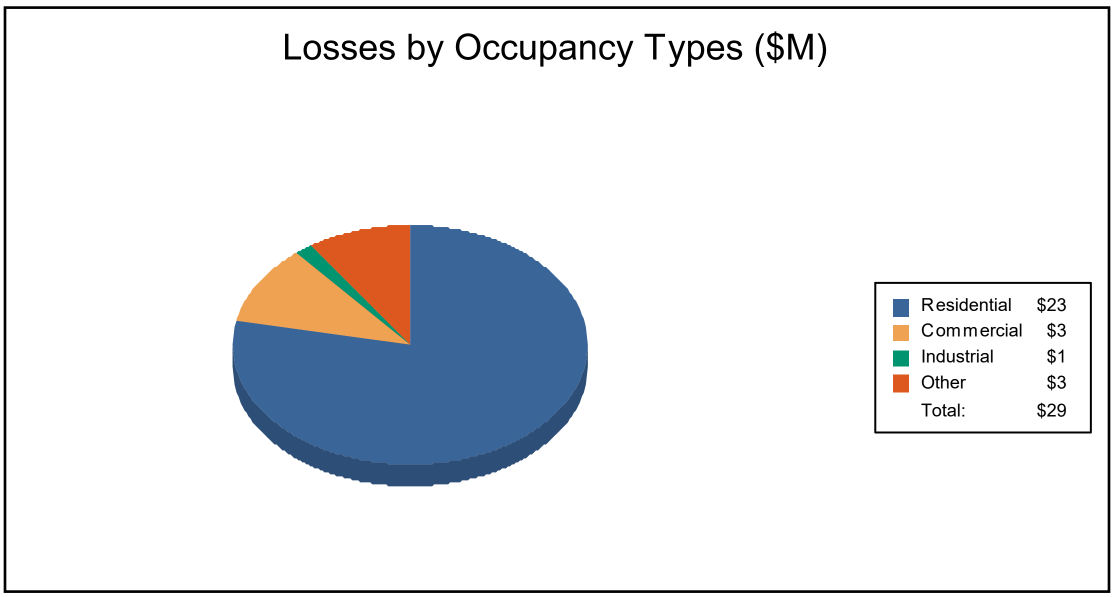
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 20.38 million dollars. 30% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 78.43% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	11.71	0.44	0.19	0.25	12.59
	Content	5.85	0.86	0.26	0.72	7.69
	Inventory	0.00	0.02	0.04	0.05	0.11
	Subtotal	**17.57**	**1.32**	**0.49**	**1.02**	**20.38**
Business Interruption						
	Income	0.08	0.86	0.01	0.24	1.19
	Relocation	3.58	0.13	0.01	0.07	3.78
	Rental Income	1.28	0.10	0.00	0.01	1.39
	Wage	0.19	0.60	0.02	1.39	2.19
	Subtotal	**5.13**	**1.68**	**0.04**	**1.70**	**8.55**
ALL	**Total**	**22.69**	**2.99**	**0.53**	**2.72**	**28.93**



Appendix A: County Listing for the Region

Colorado

- Custer

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars) Residential	Non-Residential	Total
Colorado				
Custer	4,255	553,751	100,103	653,854
Total	**4,255**	**553,751**	**100,103**	**653,854**
Total Study Region	**4,255**	**553,751**	**100,103**	**653,854**

APPENDIX D: EARTHQUAKE HAZUS RISK REPORT

Hazus: Earthquake Global Risk Report

Region Name Custer_County

Earthquake Scenario: Custer_County_6

Print Date: June 29, 2021

Disclaimer:

This version of Hazus utilizes 2010 Census Data.

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

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 739.73 square miles and contains 1 census tracts. There are over 1 thousand households in the region which has a total population of 4,255 people (2010 Census Bureau data). The distribution of population by Total Region and County is provided in Appendix B.

There are an estimated 4 thousand buildings in the region with a total building replacement value (excluding contents) of 653 (millions of dollars). Approximately 94.00 % of the buildings (and 85.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 602 and 382 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 4 thousand buildings in the region which have an aggregate total replacement value of 653 (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 66% 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 0 hospitals in the region with a total bed capacity of beds. There are 3 schools, 7 fire stations, 1 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 984.00 (millions of dollars). This inventory includes over 80.78 miles of highways, 20 bridges, 4,056.93 miles of pipes.

Table 1: Transportation System Lifeline Inventory

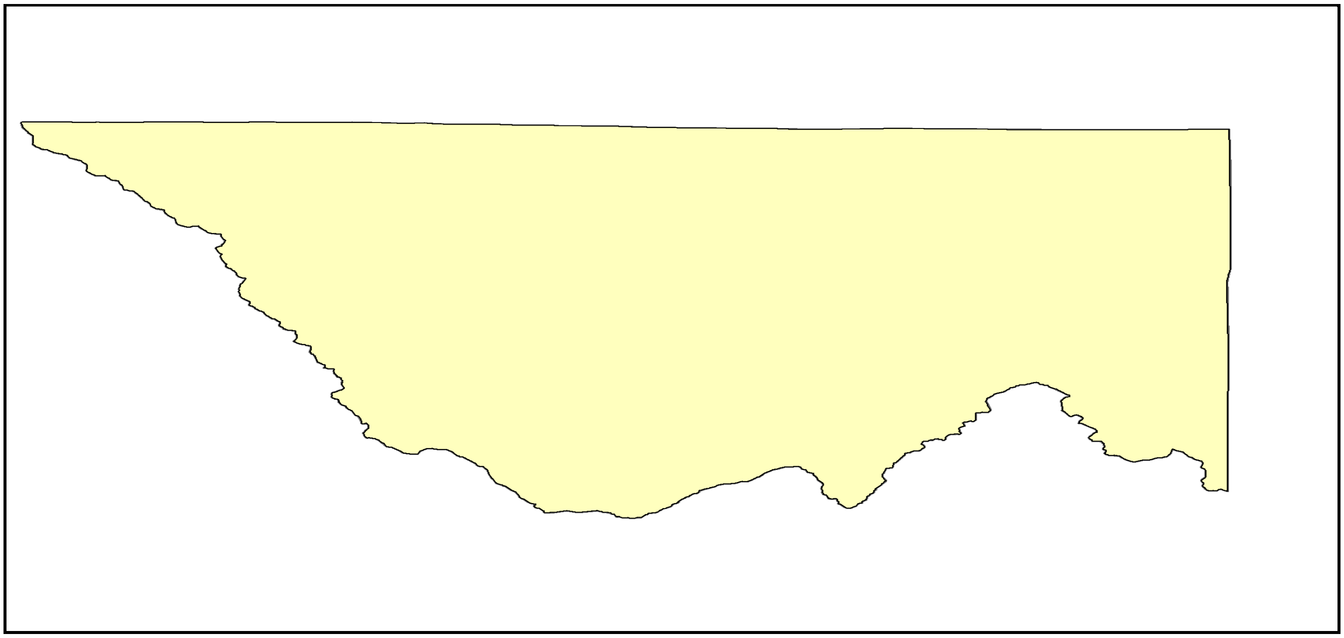
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	20	8.4449
	Segments	9	557.3535
	Tunnels	0	0.0000
		Subtotal	**565.7984**
Railways	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	0	0.0000
	Tunnels	0	0.0000
		Subtotal	**0.0000**
Light Rail	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	0	0.0000
	Tunnels	0	0.0000
		Subtotal	**0.0000**
Bus	Facilities	0	0.0000
		Subtotal	**0.0000**
Ferry	Facilities	0	0.0000
		Subtotal	**0.0000**
Port	Facilities	0	0.0000
		Subtotal	**0.0000**
Airport	Facilities	1	4.4101
	Runways	1	32.0477
		Subtotal	**36.4578**
		Total	**602.30**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	65.2936
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**65.2936**
Waste Water	Distribution Lines	NA	39.1762
	Facilities	2	252.2609
	Pipelines	0	0.0000
		Subtotal	**291.4371**
Natural Gas	Distribution Lines	NA	26.1174
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**26.1174**
Oil Systems	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**0.0000**
Electrical Power	Facilities	0	0.0000
		Subtotal	**0.0000**
Communication	Facilities	0	0.0000
		Subtotal	**0.0000**
		Total	**382.80**

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	Custer_County_6
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	6.00
Depth (km)	NA
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	NA

Direct Earthquake Damage

Building Damage

Hazus estimates that about 268 buildings will be at least moderately damaged. This is over 7.00 % of the buildings in the region. There are an estimated 1 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

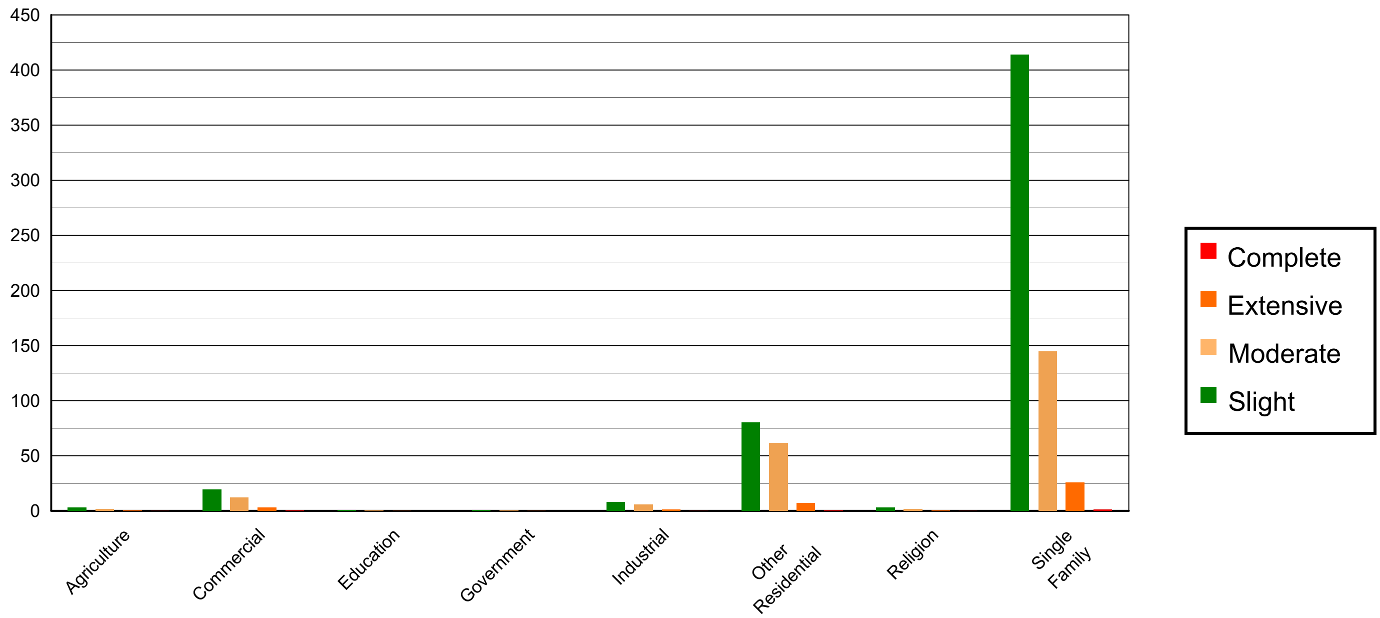


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	16.96	0.52	2.85	0.54	1.75	0.77	0.42	1.09	0.02	1.10
Commercial	98.27	3.00	19.33	3.65	12.29	5.38	2.93	7.70	0.18	9.15
Education	4.62	0.14	0.78	0.15	0.49	0.21	0.10	0.28	0.01	0.29
Government	4.58	0.14	0.82	0.15	0.51	0.22	0.10	0.25	0.01	0.27
Industrial	40.88	1.25	8.08	1.53	5.60	2.45	1.38	3.62	0.07	3.36
Other Residential	249.84	7.63	80.38	15.20	61.60	26.96	6.90	18.14	0.28	14.17
Religion	16.95	0.52	2.91	0.55	1.76	0.77	0.35	0.93	0.02	1.02
Single Family	2841.47	86.80	413.81	78.23	144.46	63.23	25.85	67.98	1.40	70.64
Total	**3,274**		**529**		**228**		**38**		**2**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	2287.83	69.89	332.17	62.80	65.56	28.70	4.53	11.90	0.27	13.69
Steel	40.59	1.24	6.45	1.22	4.83	2.11	0.88	2.32	0.06	2.81
Concrete	30.18	0.92	6.46	1.22	3.94	1.72	0.63	1.65	0.02	1.08
Precast	26.18	0.80	5.31	1.00	5.70	2.50	2.01	5.28	0.07	3.57
RM	593.49	18.13	78.53	14.85	71.15	31.14	18.07	47.51	0.21	10.46
URM	75.54	2.31	24.15	4.57	17.23	7.54	5.33	14.01	1.10	55.22
MH	219.77	6.71	75.89	14.35	60.04	26.28	6.59	17.33	0.26	13.17
Total	**3,274**		**529**		**228**		**38**		**2**	

*Note:
RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had hospital beds available for use. On the day of the earthquake, the model estimates that only hospital beds (%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, % of the beds will be back in service. By 30 days, % will be operational.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	0	0	0	0
Schools	3	0	0	3
EOCs	1	0	0	1
PoliceStations	1	0	0	1
FireStations	7	0	0	7

Transportation Lifeline Damage

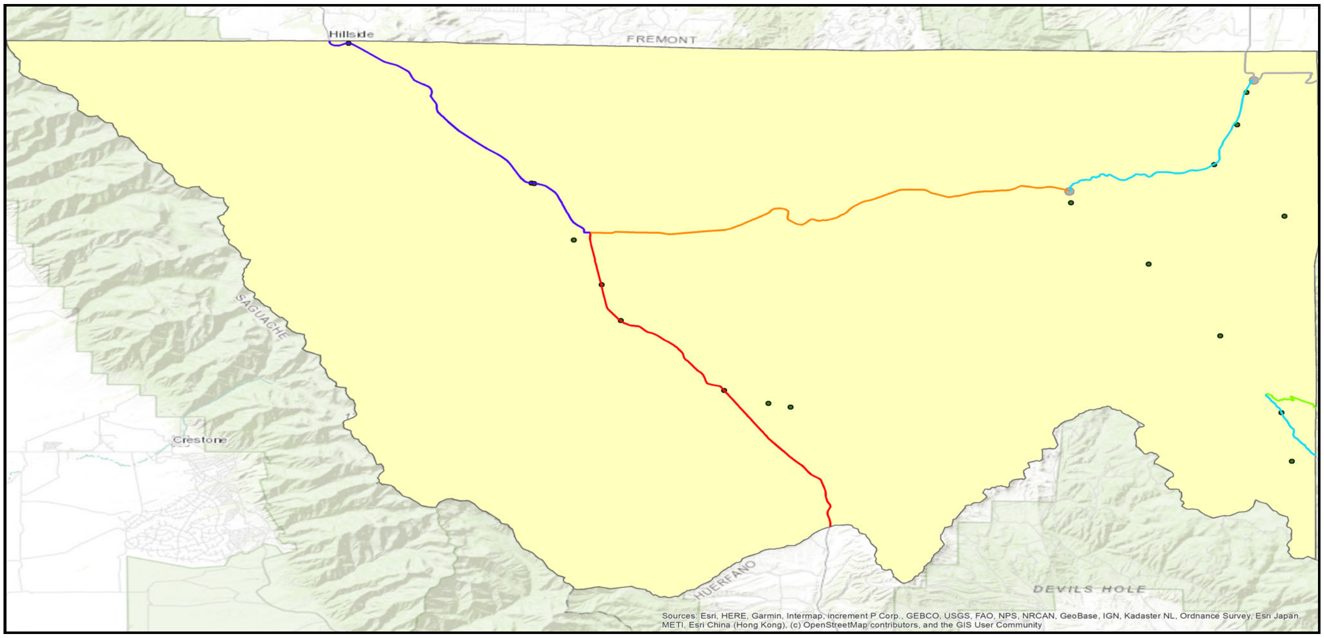


Table 6: Expected Damage to the Transportation Systems

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	9	0	0	9	9
	Bridges	20	0	0	20	20
	Tunnels	0	0	0	0	0
Railways	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	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	0	0	0	0	0
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	1	0	0	1	1
	Runways	1	0	0	1	1

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	0	0	0	0	0
Waste Water	2	0	0	0	2
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	0	0	0	0	0
Communication	0	0	0	0	0

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	2,029	30	7
Waste Water	1,217	15	4
Natural Gas	811	5	1
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	1,925	0	0	0	0	0
Electric Power		0	0	0	0	0

Induced Earthquake Damage

Fire Following Earthquake

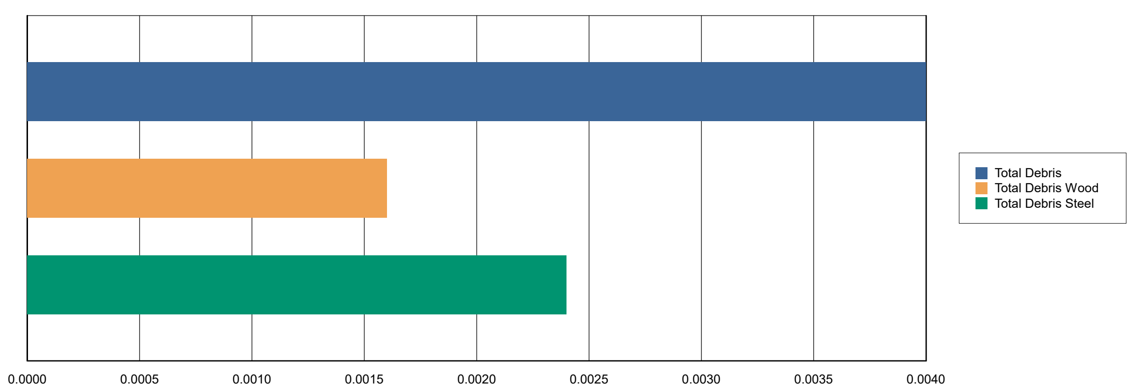
Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there 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 4,000 tons of debris will be generated. Of the total amount, Brick/Wood comprises 40.00% 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 160 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)



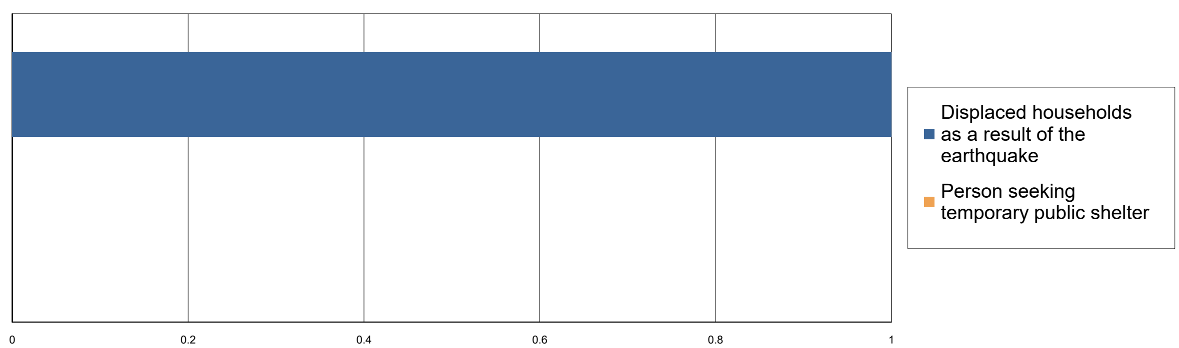
Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
0.00	0.00	0.00	160 (@25 tons/truck)

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 1 households to be displaced due to the earthquake. Of these, 0 people (out of a total population of 4,255) 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
1	0

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	0.02	0.00	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	0.02	0.00	0.00	0.00
	Other-Residential	0.28	0.03	0.00	0.00
	Single Family	1.13	0.14	0.01	0.02
	Total	**1**	**0**	**0**	**0**
2 PM	Commercial	1.24	0.18	0.02	0.03
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.23	0.03	0.00	0.01
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.17	0.02	0.00	0.00
	Other-Residential	0.06	0.01	0.00	0.00
	Single Family	0.27	0.03	0.00	0.00
	Total	**2**	**0**	**0**	**0**
5 PM	Commercial	0.91	0.14	0.01	0.02
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.01	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.11	0.02	0.00	0.00
	Other-Residential	0.10	0.01	0.00	0.00
	Single Family	0.44	0.06	0.00	0.01
	Total	**2**	**0**	**0**	**0**

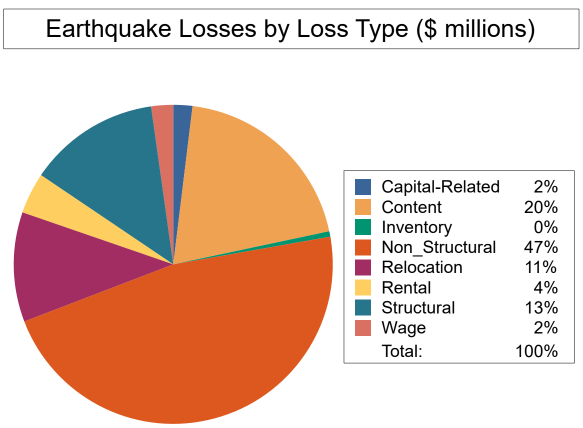
Economic Loss

The total economic loss estimated for the earthquake is 37.51 (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 14.49 (millions of dollars); 19 % 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 74 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.



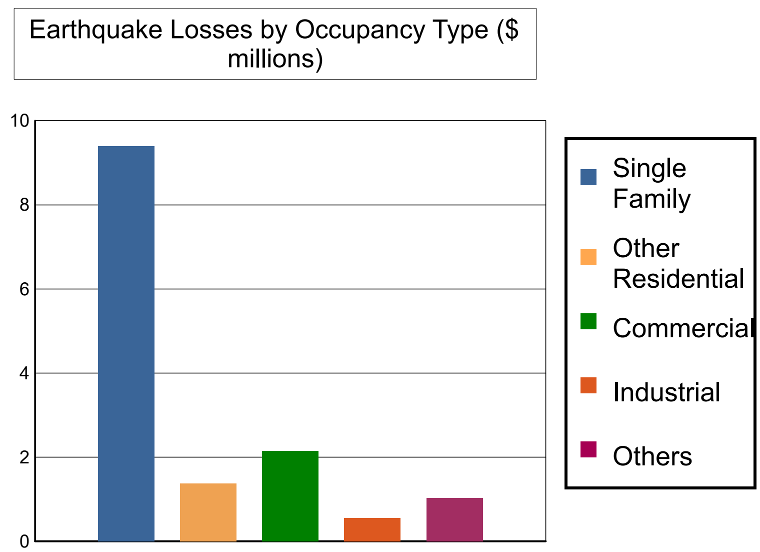


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	0.0556	0.2141	0.0132	0.0459	0.3288
	Capital-Related	0.0000	0.0237	0.2368	0.0077	0.0083	0.2765
	Rental	0.3126	0.0908	0.1542	0.0040	0.0153	0.5769
	Relocation	1.1110	0.1217	0.2116	0.0298	0.1311	1.6052
	Subtotal	**1.4236**	**0.2918**	**0.8167**	**0.0547**	**0.2006**	**2.7874**
Capital Stock Losses							
	Structural	1.2742	0.2056	0.2465	0.0675	0.1513	1.9451
	Non_Structural	4.8004	0.7083	0.6731	0.2427	0.4045	6.8290
	Content	1.8958	0.1675	0.3985	0.1532	0.2643	2.8793
	Inventory	0.0000	0.0000	0.0106	0.0336	0.0058	0.0500
	Subtotal	**7.9704**	**1.0814**	**1.3287**	**0.4970**	**0.8259**	**11.7034**
	Total	**9.39**	**1.37**	**2.15**	**0.55**	**1.03**	**14.49**

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	557.3535	0.0000	0.00
	Bridges	8.4449	0.0082	0.10
	Tunnels	0.0000	0.0000	0.00
	Subtotal	**565.7984**	**0.0082**	
Railways	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**	
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	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Ferry	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Port	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Airport	Facilities	4.4101	0.5922	13.43
	Runways	32.0477	0.0000	0.00
	Subtotal	**36.4578**	**0.5922**	
	Total	**602.26**	**0.60**	

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	0.0000	0.0000	0.00
	Distribution Line	65.2936	0.1330	0.20
	Subtotal	**65.2936**	**0.1330**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	252.2609	22.1939	8.80
	Distribution Line	39.1762	0.0668	0.17
	Subtotal	**291.4371**	**22.2607**	
Natural Gas	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Line	26.1174	0.0229	0.09
	Subtotal	**26.1174**	**0.0229**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Electrical Power	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Communication	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
	Total	**382.85**	**22.42**	

Appendix A: County Listing for the Region

Custer,CO

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Colorado					
	Custer	4,255	553	100	653
Total Region		**4,255**	**553**	**100**	**653**

APPENDIX E: MITIGATION IDEAS

Mitigation Strategy Action Ideas

The following ideas for mitigation actions were identified over the course of the hazard mitigation planning process. This list was informed by:

- Community Survey of the residents of Custer County (87 participants)
- HMP and Discovery Planning processes
- 2018 Master Plan
- 2017 Hazard Mitigation Plan
- 2016 USFS Blueprint for Mitigation
- 2019 Cuerno Verde Owner's Association Community Wildfire Protection Plan (CWPP)
- 2018 Sangres Foothills Community Wildfire Protection Plan (CWPP)

- **All Hazards**
    - Evacuation and sheltering planning, including food and water distribution
    - Provide support for vulnerable populations during evacuations, include in planning
    - Actionable evacuation pre-planning for large animals and pets, ensure resources are available
    - Education and resources for homeowners to complete mitigation projects
    - Improve public information programming and proactively provide preparedness and response messaging throughout the year
    - Test the Everbridge emergency alert system annually
    - Implement coordinated alerts and follow-up messaging
    - Increase resident relationships and communication to alert neighbors to hazards
    - GIS mapping project that visualizes hazards based on location within the county
    - Train and equip Community Emergency Response Teams (CERT)
    - Improve communication and public alerts by increasing cell towers in the county
    - Develop multi-lingual disaster education PSA's and educational videos
    - Incorporate an Emergency Telephone Notification System (ETNS) into the County Emergency Communications Center
    - Construct a new Emergency Operations Center
    - Work with County Businesses to develop a Disaster Resistant Business Program
    - Develop a comprehensive public education program on the dangers of carbon monoxide during extended power outages
    - Develop and begin to implement a systematic process to evaluate and upgrade aging infrastructure
    - Alerts/mailings for emergency notification signups and update, family evacuation plans, home inventories
    - Countywide community educational programs and events for evacuation planning and emergency notification signups
    - Consider adopting building codes and development regulations
    - Educate property owners on insurance availability and type
    - Ensure community members understand their responsibility in preparedness and response
    - Plan for and exercise communication coordination across multiple agencies and jurisdictions
    - Conduct a study to evaluate populations that need additional assistance in terms of hazard mitigation, preparation, evacuation, recovery

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Mitigation Strategy Action Ideas

- Create clear and concise maps in digital and print forms and make them available to public
- Continue to update and improve the Geographic Information System (GIS) and provide such information to local, state, and federal agencies as determined.
- Maintain a safe road system within funding limits and including access provided for emergency vehicles where feasible.
- Include the installation of critical facility generators for FEMA Hazard Mitigation Grant Program projects
- Identify other potential local hazard mitigation funding sources
- Hire a grant writer/manager
- Utilize PILT funding to establish a hazard mitigation fund for local match
  - https://www.naco.org/advocacy/action-centers/payments-lieu-taxes-action-center
  - Can be used as local match for BRIC/etc - https://www.doi.gov/pilt/chapter-69
- Identify buildings with the potential for sheltering and obtain agreements for use
- Utilize local subject matter experts to plan for power redundancy and equipment as needed
- Develop a hazard events database for documenting damaging events for inclusion into future HMP updates
- Develop a Master Generator Plan for the county

- **Avalanche**
  - Ensure hazard maps are current and updated on a regular basis
  - Continue to educate the public on the avalanche hazard and appropriate risk reduction alternatives.
- **Dam / Levee Incident**
  - Develop a Dam/Levee Public Education and Evacuation Plan for targeted areas of the community
  - Continue to update and revise Basin-wide Master Drainage Plans where changed conditions warrant revisions.
  - Develop an outreach program aimed at identifying and assisting private dam owners with repairing or decommissioning at-risk dams.
  - Work with operators to ensure common response operations planning
- **Drought**
  - Community outreach and awareness about water usage, especially new county residents
  - Drought restriction plans for municipal utilities & wells
  - Enforcement of rules/laws concerning residential wells to prevent all water usage for hot tubs, gardens, greenhouses, etc.
  - Build a water treatment facility
  - Invest in an atmospheric water generator, which pulls moisture from the air to collect water
  - Implementing gray water / home treatment measures to mitigate drought
  - Develop a public education on drought resistance
  - Identify alternative water supplies for time of drought. Mutual aid agreements with alternative suppliers.
  - Consider providing incentives to property owners that utilize drought resistant landscapes in the design of their homes.
  - Develop standards that require drought resistant landscapes on county and community owned facilities

Mitigation Strategy Action Ideas

- Implement stormwater retention in regions ideally suited for groundwater recharges.
- Develop a residential and local business program to modify plumbing systems - i.e., water saving kits
- Aquifer monitoring and potential recharge

- **Earthquake**
  - Incorporate earthquakes in the Office of Emergency Management public outreach strategy.
  - Work with Colorado Geological to continue the study and analyze earthquakes related to appropriate levels of seismic safety in building codes and practices.
  - Further enhance seismic risk assessment to target high hazard buildings for mitigation opportunities.
  - Develop a post disaster action plan that includes grant funding and debris removal components.
- **Extreme Heat**
  - Review the safety of playground materials
  - Educate county residents on heat exposure symptoms and best practices
  - Plan for a cooling center in the case of residents needing respite from extreme heat
- **Flood**
  - Improve storm water drainage
  - Clear debris from Macey Creek to reduce overflow
  - Join and maintain compliance with FEMA's National Flood Insurance Program (NFIP), to ensure residents and businesses are able to access flood insurance
  - Work with RMWSD to address the Adams Blvd. undersized culvert, a single point of failure for Silver Cliff & Westcliffe
  - Assess and improve areas of concern along Chloride Gulch
  - Mitigation actions for areas damaged by fires, erosion control
  - Improved storm water drainage for communities
  - Form a Stormwater Utility District for funding Stormwater projects
  - Provide maintenance and improvements to existing drainage channels and other pertinent storm drainage conveyances.
  - Implement flood containment structures, require designs/engineering to reduce flood risk
  - Improve infrastructure on county roads to minimize washout
  - Continued road maintenance for improved evacuation routes
  - Find alternative to gravel for road maintenance to avoid clogging drainage systems
  - Education and assistance in homeowner responsibility to maintain ditches
  - Increase flood improvement projects
  - Consider establishing an administrative procedure or change in County/City codes for requiring builders to develop a site drainage plan ensuring "no adverse impact" when they apply for permits for new residential construction.
  - Complete GIS and other automated inventories for stormwater, problem drainage areas, DFIRM and other City assets.
  - Evaluate repetitive loss properties and potential solutions to mitigate existing conditions.
- **Geologic Hazards**
  - Research the applicability of establishing an administrative procedure or change in County codes for requiring builders to check for expansive soils when they apply for permits
  - Educate homeowners located in areas of exposure of the potential effects of expansive soil

Mitigation Strategy Action Ideas

- **Hazardous Materials Release**
    - Public education on hazardous materials and shelter-in-place procedures
- **Landslide, Debris Flow, Rockfall**
    - Improve Hardscrabble area (Hwy 96) for mudslides, safer shoulders and vehicle pullouts
    - Work with Colorado Geological Survey to determine hazard areas and potential mitigation actions
- **Public Health Hazards**
    - Improve ability to test large amounts of the population with timely results
    - Improve ability to contact trace those with confirmed cases of the disease
    - Provide education and outreach to the community to improve compliance with public health orders
    - Monitor air pollution during fires
    - Monitor water quality, especially if aquifers reach extreme lows
- **Severe Winter Weather**
    - Improve winter road maintenance
    - Removal / trimming of trees in rights of way
        - Address county and town responsibility in trimming and removing trees that present a risk to community members and private property.
        - Zoning and planning to enforce mitigation of tree maintenance
    - Education about not using heaters inside
- **Thunderstorm (hail, wind, lightning)**
    - Improve storm water drainage
    - Prepare roads by grading and ditching to minimize road washout
    - Install Lightning Warning & Alert Systems in public recreation areas
    - Install lightning rods on public structures
- **Tornado**
    - Removal / trimming of trees
        - County and town responsibility in trimming and removing trees that present a risk to community members and property.
    - Develop a SafeRoom plan for county/community facilities
    - Individual SafeRoom rebate program
    - Develop a program which encourages residents to trim or remove trees that could affect power lines
    - Develop a program which encourages residents to obtain a NOAA weather radio
    - Secure emergency generators (or alternative power sources) for all critical and vital facilities
    - Develop a program which encourages residents to be prepared including generators, 72-hour self-sufficiency kits, NOAA radios, etc.
    - Establish and enforce building codes that require all roofs to withstand high wind loads
    - Modify land use and environmental regulations to support vegetation management activities that improve reliability in utility corridors
    - Modify landscape and other ordinances to encourage appropriate planting near overhead power, cable, and phone lines

Mitigation Strategy Action Ideas

- **Wildfire**
  - Establish fuel breaks along county roads by removing excess fuels in the right of way, especially heavy traffic roads that are ingress/egress for high density residential areas
  - Complete an updated countywide CWPP coordinated with the 5-year HMP update
  - Free slash disposal or chipping services for property owners completing mitigation
  - Provide and support low-cost or free options for property owners to complete fire mitigation
  - Complete fuel thinning in the forest to reduce fire risk
  - Community education around wildfire and mitigation, including Firewise
  - Establish a countywide Wildfire Council educate on and implement mitigation measures, apply for grant opportunities
  - Consideration of WUI codes by the planning commission, potentially adopt building codes
  - Complete assessments on majority of properties within county during HMP planning period.
  - Use large goat herds to assist in mitigation by reducing fuels
  - Require fire mitigation from all property owners
  - Clear dead trees from the range
  - Enforce Westcliffe regulation that weeds be removed from empty lots
  - Mow tall weeds within Westcliffe and hedge tall grasses around homes and propane tanks
  - Community sheltering plan in the case of large fires
  - Consider ingress/egress issues for Rosita Rd and potential reopening of Della Fox Rd
  - Bury powerlines
  - Build a wetland "barrier" created by a beaver habitat along the eastern slopes of the Sangres
  - Mow right-of-way along public roads, open spaces twice per year and clear all grasses and fine fuels 3-5 ft from around street signs, light poles, and mailboxes
  - Landscape public areas with Firewise plants and educate community on the principles
  - Educate elected officials and the public on continued need for improved water supplies
  - Complete vegetation mitigation and structural hardening at the Verdemont Radio Tower Site
  - Replace plastic culverts for safety, due to melting during fires
  - Review operating plans to determine annual project needs, apply for grant funding as available
  - Provide owners with information on the use and benefits of fire-resistant construction materials
  - Assist homeowners with installing approved, reflective address signs at driveway entrance
  - Educate owners on composition and benefits of a healthy forest and actions to maintain it
  - Seek funding to purchase equipment to assist with fuel reduction and maintain efforts
  - Coordinate with Sangre de Cristo Electric Co-op to clear and maintain open space around transformers within subdivisions
  - Install emergency evacuation road signage, including dead end identification
  - Collaborate with community officials to improve county owned subdivision roads, with emphasis on widening to NFPA standards and removal of obstructive vegetation
  - Support community in obtaining funding for the installation of engineered National Fire Protection Association (NFPA) compliant emergency dry barrel fire use cisterns
  - Post maps in accessible locations to "paint the picture" of wildfire risk and demonstrate successes to partners and citizens – include past and planned mitigation projects
  - Create and train a Subject Matter Experts group on the CWPP to educate the community
  - Identify and engage community leaders or "champions" to increase capacity and mitigation
  - Train individuals to conduct Home Ignition Zone assessments and provide education

Mitigation Strategy Action Ideas

- Engage community members beyond media messaging about risk, such as events
- Offer incentives such as cost-share funds, free home risk assessment, on-site advice
- Coordinate with neighborhoods and communities to identify individual preparation steps, fuel reduction, emergency access and egress, evacuation plans and safe zones.
- Promote community preparedness, not only defensible space
- Utilize chipper rental programs or request programs
- Encourage consistent address signage and driveway access for emergency services and wildfire protection.
- Add Jet type A fuel availability at airport (wildfire suppression)
- Utilize building codes / fire-specific codes - Defensible space – 4291-CA code
- Establish air quality monitoring program

- **Wildlife-Vehicle Collisions**
    - Coordinate with CDOT to evaluate potential animal crossing structures
    - Develop a program to manage deer population (culling)

APPENDIX F: MEETING AGENDAS, INVITES, & PARTICIPANTS

Custer County Hazard Mitigation Plan 2022 Update

HMP Kickoff Webinar

Tuesday, September 21, 2021 / 9-10:30 am:
Join on your computer or mobile app: click here to join the meeting
Or call in (audio only): 1.872.242.8065 / ID: 312 275 867#

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. Hazard & Risk Viewers
10. Mitigation Strategy
11. Lifelines
12. Mitigation Grant Funding
13. Mitigation Resources
14. Next Steps

Hazard Mitigation Planning Committee (HMPC) Post-Meeting Requests:

- Best Available Hazard Data
- Recent Community Plans
- HMPC Roster Additions
- Help to Share Public Engagement Content
- Hazard / Disaster / Mitigation Photos
- 2017 Mitigation Action Reporting

QUESTIONS, COMMENTS, CONCERNS? –

CONTACT PROJECT MANAGER MICHAEL GARNER AT ANY POINT THROUGHOUT THE PLANNING PROCESS:
303.710.9498 | MGARNER@SYNERGY-DR.COM

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Name	Email	Phone
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KEVIN V. DAY		719-371-1488
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Chris LeCuyer	wmfpdinventory@gmail.com	719-371-4714
Janet Smith	janet@sanisabel.org	719-783-3018
Samuel Diswood	sdiswood@nndfw.org	
Dave Schneider	~~dschneidermwsd.com~~ dschneider@rmwsd.com	

Full Name	User Actior	Timestamp
Mike Garner	Joined	9/21/2021, 8:41:21 AM
Mike Garner	Left	9/21/2021, 10:36:25 AM
Mike Garner	Joined	9/21/2021, 10:48:51 AM
Adrian - Custer County OEM (Guest)	Joined befc	9/21/2021, 8:41:21 AM
+1 303-877-1447	Joined	9/21/2021, 8:41:29 AM
+1 303-877-1447	Left	9/21/2021, 8:45:03 AM
Adrian - Custer County OEM (Guest)	Joined	9/21/2021, 8:44:07 AM
Adrian - Custer County OEM (Guest)	Left	9/21/2021, 8:56:10 AM
Mykel Kroll (Guest)	Joined	9/21/2021, 8:45:52 AM
Mykel Kroll (Guest)	Left	9/21/2021, 9:29:43 AM
Adrian - Custer County OEM (Guest)	Joined	9/21/2021, 8:46:11 AM
Adrian - Custer County OEM (Guest)	Left	9/21/2021, 9:01:10 AM
Caitlin Langmead	Joined	9/21/2021, 8:49:32 AM
Caitlin Langmead	Left	9/21/2021, 10:36:25 AM
Adrian - Custer County OEM (Guest)	Joined	9/21/2021, 8:52:08 AM
Bradley, Chuck	Joined	9/21/2021, 8:53:00 AM
Bradley, Chuck	Left	9/21/2021, 9:53:10 AM
Shannon Byerly	Joined	9/21/2021, 8:56:50 AM
Christe Coleman (Guest)	Joined	9/21/2021, 8:57:06 AM
Christe Coleman (Guest)	Left	9/21/2021, 10:36:16 AM
Reggie Foster (Guest)	Joined	9/21/2021, 8:58:18 AM
+1 303-877-1447	Joined	9/21/2021, 8:59:19 AM
+1 303-877-1447	Left	9/21/2021, 9:11:48 AM
Michael McFalls	Joined	9/21/2021, 8:59:52 AM
Michael McFalls	Left	9/21/2021, 10:36:22 AM
Mark Thompson (Guest)	Joined	9/21/2021, 9:01:30 AM
Mark Thompson (Guest)	Left	9/21/2021, 9:59:55 AM
Linda (Guest)	Joined	9/21/2021, 9:01:36 AM
Linda (Guest)	Left	9/21/2021, 9:56:55 AM
Ellege, Arthur - FPAC-NRCS, Silver Cliff, CO	Joined	9/21/2021, 9:02:07 AM
Ellege, Arthur - FPAC-NRCS, Silver Cliff, CO	Left	9/21/2021, 10:18:39 AM
+1 559-323-5768	Joined	9/21/2021, 9:02:51 AM
Laura Lockhart (Guest)	Joined	9/21/2021, 9:03:06 AM
Brittney Ciarlo (Guest)	Joined	9/21/2021, 9:06:00 AM
Brittney Ciarlo (Guest)	Left	9/21/2021, 10:36:25 AM
VR (Guest)	Joined	9/21/2021, 9:06:17 AM
+1 303-877-1447	Joined	9/21/2021, 9:13:53 AM
+1 303-877-1447	Left	9/21/2021, 10:15:38 AM
Linda (Guest)	Joined	9/21/2021, 10:16:03 AM

Custer County Hazard Mitigation Plan
2022 Update

HMP Workshop #2 – Hazard Identification and Risk Assessment (HIRA)

Friday, December 17, 2021 / 9-10:30 am:
Join on your computer or mobile app: click here to join the meeting
Or call in (audio only): 1.872.242.8065 / ID: 244 862 501#

Agenda:

1. Project Overview & Updates
2. Public Involvement Strategy
3. Risk and Vulnerability Assessment
4. Mitigation Strategy
5. Mitigation Funding
6. Planning Resources
7. Next Steps

Hazard Mitigation Planning Committee (HMPC) Post-Meeting Requests:

- Mitigation Capabilities Assessment
- 2017 Mitigation Action Reporting (outstanding)
- Review draft HIRA
- Community Hazard Ranking Survey
- Dissemination of Public Engagement Messaging
- HMPC Roster Additions

QUESTIONS, COMMENTS, CONCERNS? –

CONTACT PROJECT MANAGER MICHAEL GARNER AT ANY POINT THROUGHOUT THE PLANNING PROCESS:
303.710.9498 | MGARNER@SYNERGY-DR.COM

Custer County HMPC Meeting - Risk Assessment Workshop Chat Files Details Meeting notes Whiteboard +

Meeting started 12/17 8:45 AM

Stacey Moss (Guest) has temporarily joined the chat.

Mark Thompson (Guest) has temporarily joined the chat.

Deb Adams (Guest) has temporarily joined the chat.

Irene Merrifield - DHSEM (Guest) has temporarily joined the chat.

Matt (Guest) has temporarily joined the chat.

Irene Merrifield - DHSEM (Guest) no longer has access to the chat.

Irene Merrifield - DHSEM (Guest) has temporarily joined the chat.

Chris McGinnis (Guest) has temporarily joined the chat.

John Van Doren (Guest) has temporarily joined the chat.

Emily Palmer, DHSEM (Guest) has temporarily joined the chat.

Cliff Brown (Guest) has temporarily joined the chat.

DA Deb Adams (Guest) 12/17 9:06 AM
Deb Adams with CC Tourism

IM Irene Merrifield - DHSEM (Guest) 12/17 9:06 AM
Irene Merrifield - DHSEM Mitigation

CM Chris McGinnis (Guest) 12/17 9:06 AM
Chris McGinnis, Sangre de Cristo Electric Association

M Matt (Guest) 12/17 9:06 AM
Matt Nolting Wet Mountain Fire

SM Stacey Moss 12/17 9:07 AM
Stacey Moss Sangre de Cristo Electric

Cliff Brown (Guest) has temporarily joined the chat.

Linda Pollack (Guest) has temporarily joined the chat.

Brittney (Guest) has temporarily joined the chat.

Irene Merrifield - DHSEM (Guest) no longer has access to the chat.

Irene Merrifield - DHSEM (Guest) has temporarily joined the chat.

Stacey Moss (Guest) no longer has access to the chat.

Brittney (Guest) no longer has access to the chat.

DA Deb Adams (Guest) 12/17 10:29 AM
Thank you for a very informative presentation.

Custer County Hazard Mitigation Plan 2022 Update

HMP Workshop #3 – Mitigation Strategy

Wednesday, June 29, 2022 / 2:00-4:00 pm
Hope Lutheran Church, Lange Hall, Westcliffe
Public open house being held prior, from 12:00-2:00 pm

Agenda:

1. Project Overview & Updates
2. Local Government Participation
3. Plan Integration / Implementation
4. Plan Maintenance / Continued Public Engagement
5. Past Mitigation Action Progress
6. Updated Mitigation Strategy
7. Mitigation Grant Funding
8. Mitigation Resources
9. Next Steps

Hazard Mitigation Planning Committee (HMPC) Post-Meeting Requests:

- New Mitigation Action Development
- Hazard Ranking Survey (1 outstanding)
- Mitigation Capability Assessment (multiple outstanding)

QUESTIONS, COMMENTS, CONCERNS? –

CONTACT PROJECT MANAGER MICHAEL GARNER AT ANY POINT THROUGHOUT THE PLANNING PROCESS:
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SYNERGY DISASTER RECOVERY

Hazard Mitigation Planning Committee – Mitigation Strategy Workshop

Hope Lutheran Church, Lange Hall, 312 South Third Street, Westcliffe

Name	Title / Organization	E-Mail	Present
1. Dennis Page	District Fire Mngt Officer/USDA Forest Service	dennis.page@usda.gov	✓
2. John "Ben" Ingram	Forest Asst. Fire Management Officer Ouachita NF Arkansas	john.bingram@usda.gov	✓
3. KEVIN V. DAY	CUSTER COUNTY COMMISSIONER	KEVIN@CUSTERCOUNTYGOV.COM	X
4. Stacey Moss	Sangre de Cristo Elect.		X
5. CLIFF BROWN	CUSTER COUNTY PUBLIC HEALTH	CLIFFORD@CUSTERCOUNTYGOV.COM	X
6.			
7.			
8.			
9.			
10.			

Public Open House – Hazard Mitigation Plan Update

Hope Lutheran Church, Lange Hall, 312 South Third Street, Westcliffe

Name	Title / Organization	E-Mail	Present
1. Linda Stoughton	Public	stoughton7@gmail.com	
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3. Elliot Jackson	WMT	elliot@wetmountaintribune.com	
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APPENDIX G: FEMA APPROVAL & ADOPTIONS