WELD COUNTY 2021 MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

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Contents

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EMERGENCY MANAGEMENT

1 Mitigation Strategy

This section of the Plan provides the blueprint for Weld County and its participating municipalities to become less vulnerable to hazards. The mitigation goals, objectives, and actions are based on the general consensus of the Weld County Hazard Mitigation Planning Committee (HMPC) and local stakeholder feedback, along with the findings of the Hazard Identification and Risk Assessment.

1.1 Overview

The intent of the mitigation strategy is to provide Weld County and participating jurisdictions with the goals that will serve as the guiding principles for future mitigation policy and project administration, along with a list of proposed actions deemed necessary to meet those goals and reduce the impact of hazards. It is designed to be comprehensive and strategic in nature. The development of the strategy included a thorough review of hazards and identified actions intended to reduce their future impacts, in addition to helping Weld County and participating jurisdictions achieve compatible economic, environmental, and social goals. The mitigation strategy is composed of the following three pieces:

- **Mitigation goal**s are general guidelines that explain what the County wants to achieve. Goals are usually expressed as broad policy statements representing desired long-term results.
- **Mitigation objectives** describe strategies or implementation steps to attain the identified goals. Objectives are more specific statements than goals; the described steps are usually measurable and can have a defined completion date.
- **Mitigation Actions** provide more detailed descriptions of specific efforts to help the county and its municipalities achieve prescribed goals and objectives.

Based on input from the Weld County HMPC, the mitigation strategy from the 2016 Plan has been modified and updated accordingly. The goals and objectives, while largely the same, have been revised to align with current County strategies and programs. Previously identified actions were reviewed and new actions have been identified by Weld County and its local jurisdictions.

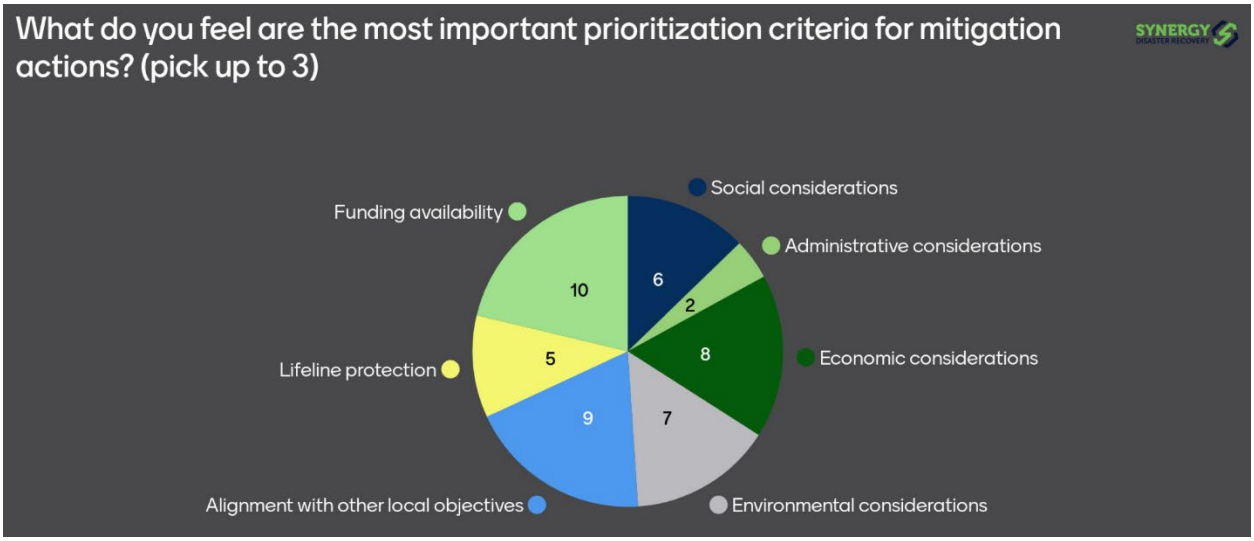
In order to prioritize the mitigation actions in this plan, the County and each participating jurisdiction referred to FEMA's STAPLEE methodology, in addition to a number of additional criteria. This allowed for a careful review of the feasibility of mitigation actions. Ultimately, mitigation actions were prioritized by each community using a three-tiered High, Medium, or Low methodology.

Following is a list of those prioritization criteria that each jurisdiction considered. FEMA mitigation planning requirements indicate that any prioritization system used shall include a special emphasis on the extent to which benefits are maximized according to a cost-benefit review of the proposed projects.

- Positive Cost-Benefit
- Social considerations – life/safety impact
- Administrative considerations – admin/technical assistance
- Economic considerations – project cost/reduce future disaster costs
- Alignment with other local objectives
- Environmental considerations
- Lifeline protection
- Social equity
- Legal considerations
- Availability of local funding

Figure 1 shows the HMPC polling results when asked about action prioritization in their communities.

Figure 1. Action Prioritization Criteria HMPC Poll



In order to ensure that a broad range of mitigation actions were considered for the Mitigation Strategy, the Weld County HMPC analyzed a comprehensive range of specific mitigation actions for each hazard after the risk assessment was complete. This helped to ensure that there was sufficient span and creativity in the mitigation actions considered.

There are four categories of mitigation actions which Weld County considered in developing its mitigation action plan. Those categories include:

- **Structure & Infrastructure Projects**: These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as Lifelines. This type of action also involves projects to construct manmade structures to reduce the impact of hazards. Many of these types of actions are projects eligible for funding through the FEMA Hazard Mitigation Assistance program.
    - Examples include: Removal of structures in hazard areas, elevation of structures in flood prone areas, utility under-grounding, structural retrofits, flood walls and retaining walls, detention and retention structures, culverts, and safe rooms.
- **Local Plans & Regulations**: These actions include government authorities, policies, or codes that influence the way land and buildings are developed and built.
    - Examples include: comprehensive plans, land use ordinances, subdivision regulations, development review, building codes & enforcement, capital improvement programs, open space preservation, and stormwater management regulations & plans.
- **Natural Systems Protection**: These are actions that minimize damage and losses and also preserve or restore the functions of natural systems.
    - Examples include: forest management, sediment & erosion control, stream corridor restoration, conservation easements, wetland restoration & preservation, and defensible space.
- **Education & Awareness Programs**: These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These

actions may also include participation in national programs, such as StormReady or Firewise Communities. These types of actions provide a greater understanding and awareness of hazards and risk among local officials, stakeholders, and the public. This knowledge is likely to lead to implementation of other types of hazard mitigation.

- Examples include: participation in national risk awareness programs, mailing to residents in hazard-prone areas, presentations to local schools, groups, & organizations, websites with maps and information, real estate disclosures, and incentivizing drought tolerant landscaping.

1.2 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. See the Risk Assessment and Appendix B: Municipal Annexes sections of this Plan for additional details. An overall Countywide hazard risk ranking is provided in Table 32.

Table 1. Countywide Hazard Risk Ranking

	Agricultural Hazards	Cyber Hazards	Drought	Earthquake	Extreme Temps.	Flood	Hazmat Release	Land Subsidence	Prairie Fire	Public Health Hazards	Severe Storm	Tornado & Straight-Line
Weld County	High Risk	High Risk	High Risk	Low Risk	Moderate Risk	High Risk	High Risk	Low Risk	High Risk	High Risk	High Risk	Moderate Risk

1.3 Mitigation Goals & Objectives

Together, the goals and objectives identified by the HMPC established the scope and focus of the proposed mitigation actions outlined in this Plan. The following table provides a summary of the updated mitigation goals for the 2021 Plan. It also outlines the planning objectives identified by the HMPC for each goal.

Table 2. 2021 Mitigation Goals & Objectives

Goals	Objectives
GOAL 1: Protect people, property, and natural resources, while decreasing the economic impacts of a disaster.	A. Continue to develop and expand programs for community preparedness and resilience education, including community Lifelines.
	B. Enhance training for hazard prevention, Lifeline impacts and mitigation options.
	C. Incorporate risk reduction principles into policy documents and initiatives, as well as other institutional plans.
	D. Continue to collaborate with area partners through mutual aid agreements and long-term planning efforts.

Goals	Objectives
	E. Reduce the vulnerability of local assets and Lifeline services to the impacts of hazards.
GOAL 2: Improve capabilities within the County and local jurisdictions to maintain delivery of lifeline critical services and reduce disaster losses.	A. Continue to develop and expand programs for community preparedness and resilience education, including community Lifelines.
	B. Enhance training for hazard prevention, Lifeline impacts and mitigation options.
	C. Incorporate risk reduction principles into policy documents and initiatives, as well as other institutional plans.
	D. Continue to collaborate with area partners through mutual aid agreements and long-term planning efforts.
	E. Reduce the vulnerability of local assets and Lifeline services to the impacts of hazards.
GOAL 3: Increase community resilience by engaging the public and community leaders in education about preparedness and mitigation strategy.	A. Continue to develop and expand programs for community preparedness and resilience education, including community Lifelines.
	B. Enhance training for hazard prevention, Lifeline impacts and mitigation options.
GOAL 4: Support the active participation of Weld County communities in ongoing mitigation planning, to maintain eligibility for FEMA, other federal mitigation funding and additional grant funding opportunities.	A. Continue to develop and expand programs for community preparedness and resilience education, including community Lifelines.
	B. Enhance training for hazard prevention, Lifeline impacts and mitigation options.
	C. Incorporate risk reduction principles into policy documents and initiatives, as well as other institutional plans.
	D. Continue to collaborate with area partners through mutual aid agreements and long-term planning efforts.
	E. Reduce the vulnerability of local assets and Lifeline services to the impacts of hazards.

1.4 2016 HMP Action Report

The Weld County HMPC reviewed and reported on the status of mitigation actions included in the 2016 Plan. Table 3 provides a summary of this reporting. 2016 actions from Brighton, Garden City, Gilcrest, and Kersey are not reported as these municipalities did not participate in the planning process for the 2021 update. A number of 2016 mitigation actions are on-going or have been deferred to this updated 2021 Plan. These are highlighted in green throughout the Table.

Table 3. 2016 Mitigation Action Summary

ID	Organization	Action	Status
2016 -01	Weld County	County Resiliency Study	Whole Community Meeting was built up in 2018 and meetings were held every two months to engage members of the 32 jurisdictions and educate on resilience building, we are currently surveying resilience through this group. An actual study has not been completed.
2016 -02	Weld County	Load-limited Bridge Replacements	This project was completed. The bridge replacement list changes annually for load restricted bridges. We modify our annual bridge replacement list to accommodate new bridges being added to the load restricted list.
2016 -03	Weld County	County Road 49 Interchanges	None at this time. On-going project.
2016 -04	Weld County	Drainage Improvements near Parkway	Study was completed, identifying several possible projects, BOCC to prioritize projects. On-going project.
2016 -05	Weld County	Railroad Crossing Improvements	Most have been completed with the exception of 2. On-going project but not included as a 2021 action in this Plan.
2016 -06	Weld County	River Channel Clearing	None at this time. On-going project.
2016 -07	Ault	Storm Ready	Completed.
	Brighton	All	This community did not participate in this Plan update.
2016 -08	Dacono	Design and Construction of Colorado Blvd. Bridge	To date, this project has undergone engineering review and design. Completion of this project will depend on available funding, and it has not yet been scheduled. This project should be continued as a 2021 mitigation action. On-going project.
2016 -09	Dacono	Grandview St. and York St. Flood Mitigation	To date, this project has undergone engineering review and design. Completion of this project will depend on available funding, and it has not yet been scheduled. This project should be continued as a 2021 mitigation action. On-going project.

ID	Organization	Action	Status
2016-10	Erie	Install Emergency Generator	Designed in 2020, installation in 2021.
2016-11	Erie	Install Outdoor Warning Sirens	Project complete, don't have project costs available
2016-12	Erie	Boulder Creek Improvements	Project completed April 2016
2016-13	Erie	Coal Creek Improvements	Preliminary Design is complete. Need funding partners prior to final design and construction. On-going project.
2016-14	Evans	Implement High Priority Actions from Drainage Plan	On-going project. 31st Street Stormwater Outfall & Bay at the Landings Inlet
2016-15	Evans	"Weather Ready Ambassador" status with NOAA	Project complete
2016-16	Evans	Implement Ordinances to Prevent Building in the 100-year Floodplain	Project complete
2016-17	Evans	Mitigation of 49th St. & Industrial Pkwy. Roadways	Completed 2016-17
2016-18	Firestone	Installation of Culverts along 4000 block of Firestone Blvd.	This project was completed in 2017.
2016-19	Firestone	Installation of Culverts at Colorado Blvd. & Pine Cone Ave.	Town of Firestone installed a culvert in this location, but the connection on the west side of the road has not been completed. This action needs to be done by the Town of Frederick and is listed as a new action for them. Complete for Firestone
2016-20	Fort Lupton	Draining Improvements in Storm Drainage Master Plan	Projects completed. Intersection flooding at 6th Street and McKinley – 2017, Localized flooding at Hoover Ave and 7th Street – 2017, Localized flooding issue storm sewer repairs at Hoover Ave and 9th Street – 2017, Localized flooding issue CR 12 and S Denver avenue – 2019. Kahil outfall project under construction currently, On-going project.

ID	Organization	Action	Status
2016-21	Frederick	Box Culvert at Bella Rosa Pkwy.	This project was partially completed in 2018. Damage has been repaired but the lack of adequate box culverts to handle a 100-year flood will result in future damage. The Town of Frederick Stormwater Master Plan will identify this project as a priority. On-going project.
2016-22	Frederick	Snow Removal Capabilities	Complete, another alternative was identified.
2016-23	Frederick	Tipple Pkwy. Box Culvert	Box Culvert on Tipple Pkwy. was completed by the Town of Firestone.
2016-24	Frederick	Tipple Pkwy. Paving	This project was completed in 2018.
	Garden City	All	This community did not participate in this Plan update.
	Gilcrest	All	This community did not participate in this Plan update.
2016-25	Greeley	City-Initiated Floodway Rezone	On-going project.
2016-26	Greeley	Mitigate Severe Repetitive Loss Property	On-going project.
2016-27	Greeley	Cache la Poudre, West Greeley USACE Project	On-going project.
2016-28	Greeley	Poudre River Cleaning	On-going project.
2016-29	Greeley	Hwy. 85 Bridge Replacement	On-going project.
2016-30	Greeley	River Bypass Channel	On-going project.
2016-31	Greeley	Poudre River Flood Mitigation Master Planning	On-going project.
2016-32	Hudson	Update EOP / Crisis Action Guide and Incorporate Hazard Mitigation	Updated into New MAG, On going project

ID	Organization	Action	Status
2016-33	Hudson	Integrated Community Mitigation Planning and 2015 Citizen Survey Review	Not completed
2016-34	Hudson	Develop Resilience - Hazard Awareness & Preparedness Education Plan	Not completed
2016-35	Hudson	Distribution of All Hazards Emergency Alert Radios	Updated to new MAG, Repeater System. On-going project.
2016-36	Keenesburg	Floodplain Training	On-going project.
2016-37	Keenesburg	Notify Travelling Public about Shelter Locations	Shelter information is updated on the community website. On-going project.
2016-38	Keenesburg	Tornado Warning System Public Education	The town does have one siren that is operated by Weld County, education is ongoing. On-going project.
	Kersey	All	This community did not participate in this Plan update.
2016-39	LaSalle	Community Preparedness Education	On-going project.
2016-40	LaSalle	Develop Upkeep Schedule for Emergency Power System	On-going project.
2016-41	LaSalle	Implement Planned Stormwater Improvements	Completed 2017/18.
2016-42	Mead	Policy Group Training for Elected Officials	This will be an ongoing project to train incoming elected officials, and refresher training for those retaining positions in the community. On-going project.

ID	Organization	Action	Status
2016-43	Mead	Acquire Back-up Power for Public Works	Updated: In progress. On-going project. New public works facility.
2016-44	Mead	Update Policies and Plans with Mitigation Principles	Completed
2016-45	Milliken	Josephine Storm Sewer Improvements Project	Completed
2016-46	Milliken	Acquisition of Flood Prone Lands and Structures	Completed and ongoing
2016-47	Milliken	Procurement and Installation of Tornado Sirens	Siren installed at PD, Project ongoing.
2016-48	Milliken	Generators for Public Buildings	Completed
2016-49	Milliken	Stormwater Improvements Throughout Milliken	Completed and on-going project.
2016-50	Milliken	Tornado Shelters in Public Buildings and Parks	Not Completed. Not currently a priority project.
2016-51	Pierce	Community Preparedness Education	Completed annually, On-going project.
2016-52	Pierce	Drainage County Rd. 88 / Hwy. 85	There is no current progress on this project. Project will be ongoing through 2020-2025, with collaboration of county and state and City of Thornton for adjoining property. On-going project.
2016-53	Platteville	Emergency Management Plan	Project was not completed. On-going project.
2016-54	Platteville	Early Warning System for Various Hazards	A fifth tornado siren was installed in 2018 and Platteville now has sufficient emergency warning coverage for the community. Project Completed.

ID	Organization	Action	Status
2016 -55	Platteville	Master Storm Drainage Study	The study was completed in September of 2016 and the Town is pursuing various recommendations. Project Completed.
2016 -56	Severance	Downtown Drainage and Street Improvements	Completed November 2016- Updated towns Master Drainage Plan with includes implementation and finance plan to continue mitigating localized flooding issues
2016 -57	Windsor	John Law Ditch - Flood Mitigation Project	Generator project completed in Oct. 2019, Cost 49k.
2016 -58	Windsor	Acquire Emergency Power System	Generator project completed in 1st Qrt 2019, Transfer switches on all buildings on Public Safety Complex budgeted for 2021 - Cost $49k. On-going project.
2016 -59	Windsor	Conduct LETA 911 Outreach to Residents	Completed 2017- LETA 911 is now known at NOCO Alerts
2016 -60	Windsor	Flood Mitigation on CR 13	Completed and ongoing - budgeted for routine yearly maintenance along the Cache La Poudre River. On-going project.

1.5 2021 HMP Actions

The final, and arguably the most important step in updating the Mitigation Strategy was the creation of new mitigation actions. In preparing their mitigation actions, the County and each participating jurisdiction considered the planning goals and their individual hazard risks, priorities, and capabilities to mitigate identified hazards. The actions below represent the key outcome of the mitigation planning process. A number of 2016 mitigation actions are on-going or have been deferred to this updated 2021 Plan. These are highlighted in green throughout the Table.

The full Mitigation Action Guides (MAGs) for 2021 are included in Appendix A: 2021 Mitigation Action Guides.

Table 4. 2021 Mitigation Actions

ID	Organization	Action	Notes
2021-01	1-Weld county	County Resiliency, Building of Lifelines and Subcomponents in all Jurisdictions	
2021-02	2-Weld County	Lifeline Integration – Health and Medical Resiliency Study	
2021-03	3-Weld County	Floodplain Management	

ID	Organization	Action	Notes
2021-04	4-Weld County	Alert Flood Warning System	
2021-05	5-Weld County	Improve Dam Safety	
2021-06	6-Weld County	Establish an ongoing or annual Public Education Campaign regarding Hazards and Emergency Management	
2021-07	7-Weld County	Inventory Critical Facilities within the Floodplain to Determine if they should be Protected	
2021-08	8-Weld County	Public Warning System - IPAWS Awareness and Training	
2021-09	9- Weld County	StormReady / Weather Safety	
2021-10	1-Weld County - PW	WCR 120,110,108 Low Water Crossing	
2021-11	2-Weld County - PW	Bridge 19/46.5A	
2021-12	3-Weld County - PW	Bridge 54/13A	
2021-13	4-Weld County - PW	Bridge 60.5/49A	
2021-14	5-Weld County - PW	Bridge 34/17A	
2021-15	6-Weld County - PW	Galeton Drainage Project	
2021-16	7-Weld County - PW	Gill Drainage Project	
2021-17	1-Ault	Community Impact Study -Vulnerable Populations-Shelter Capabilities Planning	
2021-18	2-Ault	Hazardous Materials – Community Impact Study	
2021-19	1-Dacono	Design and Construction of CO Blvd Bridge	Completed Engineering Review and Design and On-going

ID	Organization	Action	Notes
2021-20	2-Dacono	Grandview Street and York Street Flood Mitigation	
2021-21	1-Eaton	Drought Plan Development	Target date 12/31/2029
2021-22	2-Eaton	Roundabout Collins Rd & CR35	
2021-23	3-Eaton	Pump Pit	
2021-24	1-Erie	County Line Rd, Tellane to Cheeseman	
2021-25	2- Erie	Coal Creek Improvements Reach 1	
2021-26	3-Erie	Coal Creek Improvements reach 2	
2021-27	4-Erie	Coal Creek Improvements reach 3	
2021-28	5-Erie	Old Town Drainage Improvements	
2021-29	6-Erie	Zone 3 Storage Tank	Updated 11-13 -20 , Designed in 2020, installation in 2021
2021-30	7-Erie	Well Project	
2021-31	8-Erie	Zone 2 Water System Improvements	
2021-32	9-Erie	Zone 3 Storage Tank	
2021-33	10-Erie	Zone 3 Waterline Improvements	
2021-34	11-Erie	Erie Parkway & WCR 7 Intersection Improvements	
2021-35	12-Erie	Signal Communications Project	
2021-36	1-Evans	31st St Stormwater Outfall	

ID	Organization	Action	Notes
2021-37	2-Evans	Bay at the Landings Inlet Flood Mitigation	Some ordinance implemented, some elevations done, on going project
2021-38	3-Evans	Community Impact Study -Vulnerable Populations-Shelter Capabilities Planning	
2021-39	1-Firestone	Installation of Infrastructure Transmission Technologies	
2021-100	2-Firestone	Godding Hollow Tri-Town Basin Outfall Improvements	
2021-101	3-Firestone	Community Connect Program	
2021-41	1-Fort Lupton	Warning Sirens	
2021-42	2-Fort Lupton	Emergency Notification Signs	
2021-43	3-Fort Lupton	Water Storage	
2021-44	4-Fort Lupton	Well Inclusions	
2021-45	5-Fort Lupton	Localized Flooding	
2021-46	6-Fort Lupton	Emergency Shelter Generator	
2021-47	1-Frederick	Box Culvert at Bella Rosa Parkway	
2021-48	2-Frederick	Potable Water System, Emergency Supply	
2021-49	3-Frederick	Town Facilities- Expansion & Modification	
2021-102	4-Frederick	Community Connect Program	
2021-50	1-City of Greeley	Extreme Heat/Drought Resiliency Program Development	
2021-51	2-City of Greeley	Prairie Fire Mitigation Program Development/CWPP	

ID	Organization	Action	Notes
2021-52	1-Greeley- PW	City-Initiated Floodway Rezone	
2021-53	2-Greeley -PW	Mitigate Risk to Severe Repetitive Loss Property	
2021-54	3-Greeley-PW	Cache la Poudre, West Greeley USACE Project	
2021-55	4-Greeley-PW	Poudre River Cleaning	
2021-56	5-Greeley -PW	Hwy 85 Bridge Replacement	
2021-57	6-Greeley -PW	River Bypass Channel	
2021-58	7-Greeley-PW	Poudre River Flood Mitigation Master Planning Project – Ash Ave to 21st Ave	
2021-59	1-Hudson	Community Impact Study -Vulnerable Populations-Shelter Capabilities Planning	
2021-60	2-Hudson	Repeater System	
2021-61	3-Hudson	Updates Comprehensive Plan / Identify Mitigation actions	Combined 2 from Previous update, Updated into New MAG
2021-62	1-Johnstown	Resiliency Study	Updated to new MAG, Repeater System.
2021-63	2-Johnstown	Drainage Improvements Old Town	
2021-64	3-Johnstown	Install Emergency Generator	
2021-65	4-Johnstown	Community Preparedness Education	
2021-66	5-Johnstown	Community Impact Study -Vulnerable Populations-Shelter Capabilities Planning	
2021-67	1-Keenesburg	Floodplain Training	
2021-68	2-Keenesburg	Notify Travelling Public about Shelter Locations	

ID	Organization	Action	Notes
2021-69	3-Keenesburg	Tornado Warning System Public Education	Shelter information is updated on the community website- this is an ongoing project
2021-103	4-Keenesburg	Community Impact Study -Vulnerable Populations-Shelter Capabilities Planning	
2021-70	1-LaSalle	Community Preparedness Education	The town does have one siren that is operated by Weld County, education is ongoing.
2021-71	2-LaSalle	Develop Upkeep Schedule for Emergency Power Systems	
2021-104	3-LaSalle	Community Impact Study -Vulnerable Populations-Shelter Capabilities Planning	
2021-72	1-Mead	Policy Group Training for Elected Officials	
2021-73	2-Mead	Update Policies and Plans with Mitigation Principles - North Creek Flood Plain Analysis	
2021-74	3-Mead	Update Policies and Plans with Mitigation Principles - Emergency Operations Plan	
2021-75	4-Mead	Update Facilities- Public Works facility – Design & Construction	
2021-76	5-Mead	Community Impact Study -Vulnerable Populations-Shelter Capabilities Planning	
2021-77	1-Milliken	Convert acquired land and property in the floodplain to Open Space	
2021-78	2-Milliken	Procurement and Installation of Tornado Sirens	
2021-79	3-Milliken	Storm Water Improvements Throughout Milliken	
2021-80	4-Milliken	Community Impact Study -Vulnerable Populations-Shelter Capabilities Planning	
2021-81	1-Nunn	Master Drainage Plan	
2021-82	2-Nunn	Tornado Shelter to be ADA Compliant	

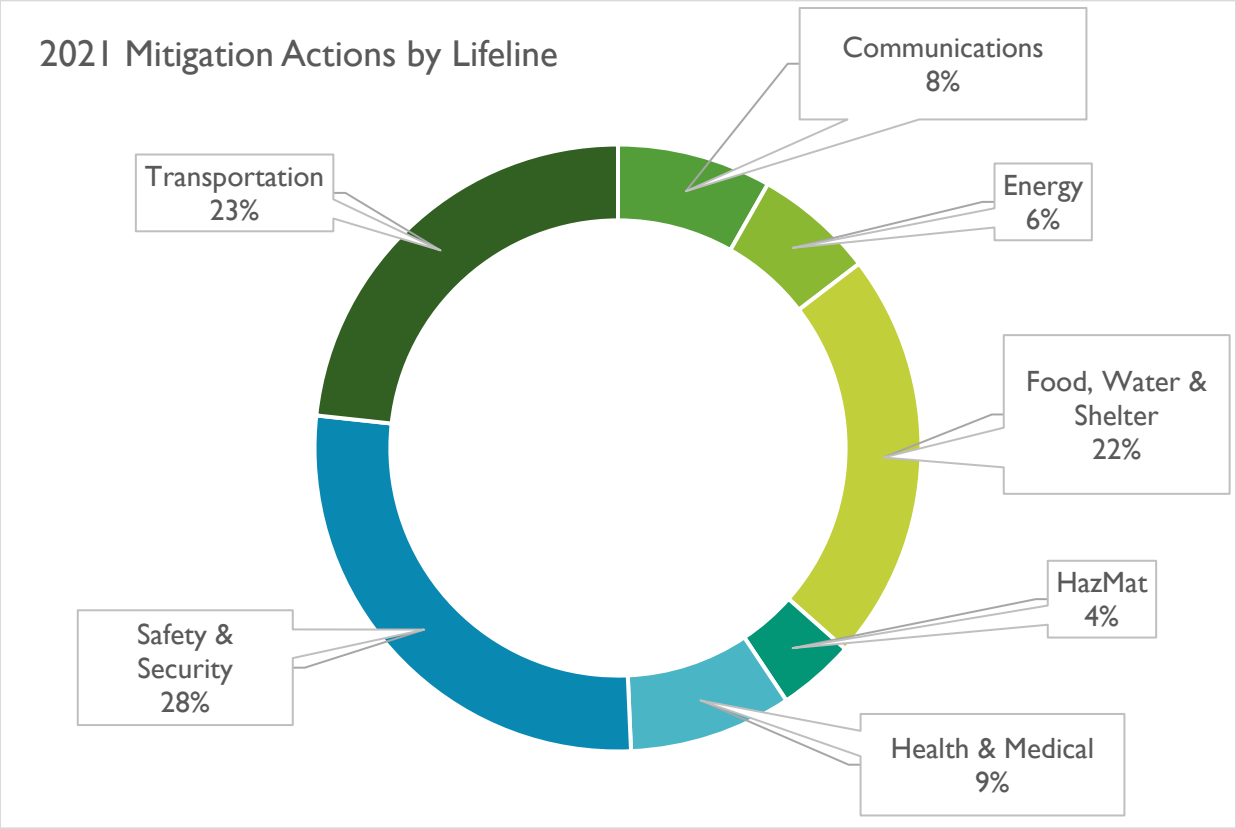
ID	Organization	Action	Notes
2021-83	3-Nunn	Community Impact Study -Vulnerable Populations-Shelter Capabilities Planning	
2021-84	1-Pierce	Community Impact Study -Vulnerable Populations-Shelter Capabilities Planning	
2021-85	2-Pierce	County Road 90 Improvements	
2021-86	3-Pierce	Community Preparedness Education	
2021-87	4-Pierce	Drainage County Rd 88 / Hwy 85	
2021-88	1-Platteville	Comprehensive Plan Update and Training	There is no current progress on this project. Project will be ongoing through 2020-2025, with collaboration of county and state and City of Thornton for adjoining property.
2021-89	2-Platteville	Community Education of updated Early Warning System, Training and Utilization	
2021-90	3-Platteville	Tornado Sirens - Maintenance and testing	
2021-91	4-Platteville	Comprehensive EM Plan - Update and training	
2021-92	5-Platteville	Community Impact Study -Vulnerable Populations-Shelter Capabilities Planning	
2021-93	6-Platteville	Master Storm Drainage Plan	
2021-94	1-Severence	Downtown Drainage and Street Improvements (Phase 2)	
2021-95	2-Severence	Hidden Valley Parkway Crossing	
2021-96	3-Severence	Harmony Regional Drainage Project	
2021-97	1-Windsor	Eastman Park Riverwalk Project	
2021-98	2-Windsor	Acquire Emergency Power System Transfer Switches - Public Safety Complex	Generator project completed in 1st quarter 2019, Transfer switches on all buildings on

ID	Organization	Action	Notes
			Public Safety Complex budgeted for 2021 Cost 49k
2021-99	3-Windsor	Flood Mitigation on CR 13	Completed and ongoing- budgeted for routine maintenance along the Cache La Poudre River- Yearly Maintenance

1.6 Lifeline Mitigation

Through development of the MAG documents, each jurisdiction also worked at identifying those specific Lifelines and Subcomponents applicable to each mitigation action. A summary of these mitigation actions is shown by Lifeline in Figure 2. This information will allow Weld County to better assess and track the mitigation actions included in this plan going forward. During future plan maintenance activities, this Lifeline analysis will provide communities an opportunity to re-evaluate mitigation actions and remaining unmet needs.

Figure 2. 2021 Mitigation Actions by Lifeline



1.7 Mitigation Capabilities

The mitigation capability assessment examines the ability of Weld 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 5. It is important for the County to regularly review each of these tools, to identify opportunities for further risk reduction efforts.

Table 5. Planning & Regulatory Capabilities

Mitigation Capability	Utilized?	Comments
Comprehensive, Master, or General Plan	Yes	Portions updated in 2020
Capital Improvement Program or Plan (CIP)	Yes	Public Works – roads only
Floodplain Management Plan	No	
Stormwater Program / Plan	No	
Community Wildfire Protection Plan (CWPP)	No	
Erosion / Sediment Control Program	No	
Economic Development Plan	No	
Other:	Yes	OEM plans
Building Codes (Year)	Yes	2018 IBC, No Maint. Code, Uniform code abatement of dangerous buildings (1997), No Fire Code
Building Code Effectiveness Grading Schedule (BCEGS) Rating	-	Unknown, this will be further researched as part of this Plan's future maintenance process
Site Plan Review Requirements	Yes	Planning review, County code
Other:		
Zoning Ordinance (Land Use)	Yes	County code
Subdivision Ordinance	Yes	Updating in 2020 County code
National Flood Insurance Program (NFIP) Participant	Yes	County code
Flood Insurance Study / Flood Insurance Rate Map / DFIRM	Yes	There are gaps that need to be studied, County Code
Floodplain Ordinance	Yes	County code
Elevation Certificates for Floodplain Development	Yes	County code
Community Rating System (CRS) Participant	No	
Open Space / Conservation Program	No	
Growth Management Ordinance	No	
Stormwater Ordinance	Yes	County code
Other Hazard Ordinance (steep slope, wildfire, snow loads, etc.)	Yes	Airport Overlay District, Geologic Hazard Overlay
Other:	Yes	Non-conforming structures, County code

Available resources including staff, municipal groups, and technology are all vital for a community to be able to implement hazard mitigation. Weld County is fortunate to have most all of these capabilities identified in Table 6.

Table 6. Administrative & Technical Capabilities

Mitigation Capability	Utilized?	Comments
Planning Commission	Yes	
Mitigation Planning Committee	Yes	Hazard Mitigation Plan
Maintenance Programs (tree trimming, clearing drainage, etc.)	Yes	Public Works in Right-of-Way
Emergency Manager	Yes	OEM
Building Official	Yes	Director of Planning
Floodplain Administrator	Yes	Director of Planning
Community Planner	Yes	7 planners plus Director
Transportation Planner	Yes	Public Works
Civil Engineer	Yes	Public Works
GIS Capability	Yes	IT
Resiliency Planner	No	
Other:		
Warning Systems / Services (flood)	Yes	Stream gauges / river warning (6)
Warning Systems / Services (other / multi hazard)	Yes	Code RED, IPAWS, tornado sirens, EAS plan
Grant Writing / Management	Yes	Each Director, per department
Other:		

The ability of a community to implement a comprehensive mitigation strategy is largely dependent on available funding. These related municipal capabilities are outlined in Table 7 and show that the County utilizes a number of these financial tools that can support mitigation activities.

Table 7. Financial Capabilities

Mitigation Capability	Utilized?	Comments
Levy for Specific Purposes with Voter Approval	Yes	Fire Protection Districts
Utilities Fees	No	
System Development / Impact Development Fee	Yes	Impact fees come from Public Works
General Obligation Bonds to Incur Debt	No	
Special Tax Bonds to Incur Debt	No	
Open Space / Conservation Fund	Yes	Conservation fund: lottery $ all goes to municipalities
Stormwater Utility Fees	No	
Capital Improvement Project Funding	Yes	Comes from Public Works
Community Development Block Grants (CDBG)	Yes	Specific to grant applied for
Withheld spending in hazard-prone areas	No	
Other:		

Education and outreach are important capabilities that allow a community to continue the conversation with their public regarding hazard risk and opportunities to mitigate. Table 8 shows that the County does leverage most of these capabilities.

Table 8. Education & Outreach Capabilities

Mitigation Capability	Utilized?	Comments
Public Hazard Education / Outreach Program	Yes	OEM - Community education
Local Citizen Groups That Communicate Hazard Risks	Yes	Whole Community Group, LEPC
Firewise	No	
NOAA StormReady Program	Yes	OEM
Other:		

Each participating municipality has also evaluated their own mitigation capabilities, details are included in Appendix B: Municipal Annexes.

2 Plan Implementation and Maintenance

This chapter discusses how the mitigation strategy will be integrated across other planning efforts and how the overall Hazard Mitigation Plan will be evaluated, maintained, and enhanced over time. This section also discusses how the public and participating stakeholders will continue to be involved in the hazard mitigation planning process.

2.1 Plan Integration

Weld 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 encompass all phases of emergency management and the work done on the 2021 Weld County Hazard Mitigation Plan (HMP) will be integrated into these efforts moving forward.

The 2021 HMP, and especially the hazard and risk assessment within it, will be used to inform the Local Emergency Operations Plan (LEOP) and the Recovery Plan (RP). For example, the highest risk hazards and highest priority actions identified in the HMP influence coordinated planning for response in the LEOP. Additionally, when the LEOP and RP are activated, there will be an opportunity to identify mitigation actions and capability gaps that may be addressed in the HMP. By integrating the HMP with the County's comprehensive set of emergency management plans, a strong foundation for resilience has been set through smart emergency preparedness, mitigation, response, and recovery; before, during, and after an emergency or disaster event.

Additionally, there are a number of other community plans that will benefit from content within this Plan. Integrating components of this hazard mitigation plan across these other community planning efforts will be an ongoing effort and will help to ensure no strategic conflicts are created through other plans. This will also help to ensure that hazard mitigation is considered during all applicable future County, local, and regional planning efforts.

Appendix B: Municipal Annexes also contain some additional content, specific to some municipalities, regarding Plan Integration efforts.

2.2 Plan Maintenance and Implementation

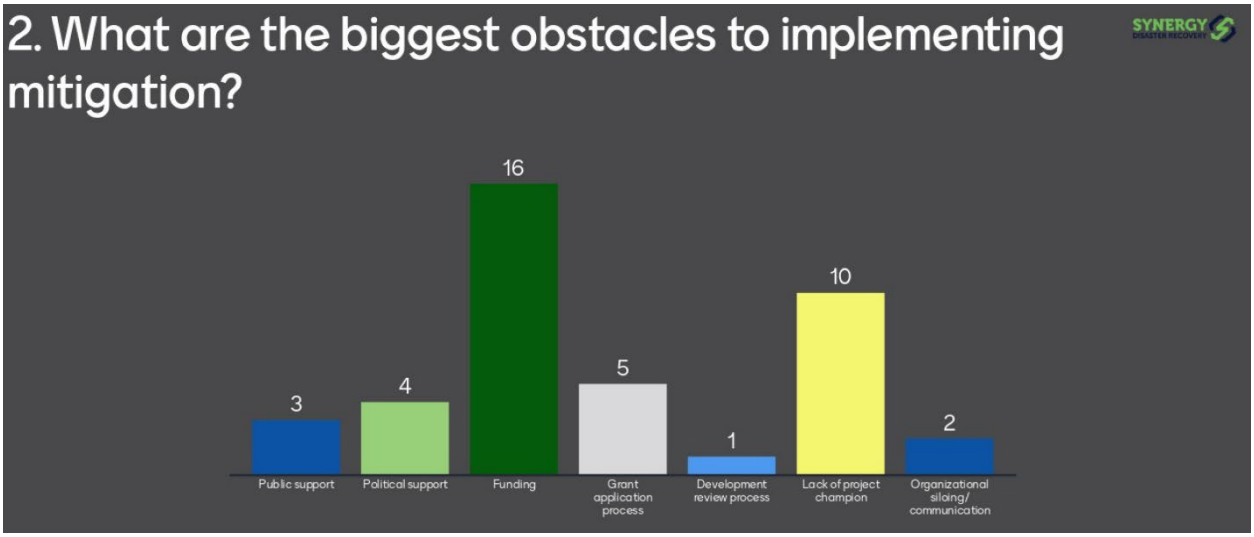
Weld County will actively maintain the hazard mitigation plan by coordinating a review of all mitigation actions annually, and will determine needed updates to other sections of the HMP at the January Multi-Agency Coordinating Group meeting each year. This will include a review of all referenced hazard webmaps cited in the plan as a resource for communities.

Weld County OEM will present a summary status report of the HMP to the Weld County Commissioners annually. This report will be made available to the general public to highlight progress made towards implementation. Additionally, Weld County OEM staff will meet with participating jurisdictions on a bi-monthly schedule to review progress made towards implementing mitigation actions.

As discussed during a HMPC workshop, implementation of mitigation actions is oftentimes challenging. Some of the larger obstacles the HMPC identified were funding and a lack of implementation champions (Figure 3). The funding challenges can potentially be offset through the use of Federal and State grant funding. The Weld County Office of Emergency Management (OEM) will disseminate information relating to potential mitigation funding sources to communities and the HMPC as application periods are identified.

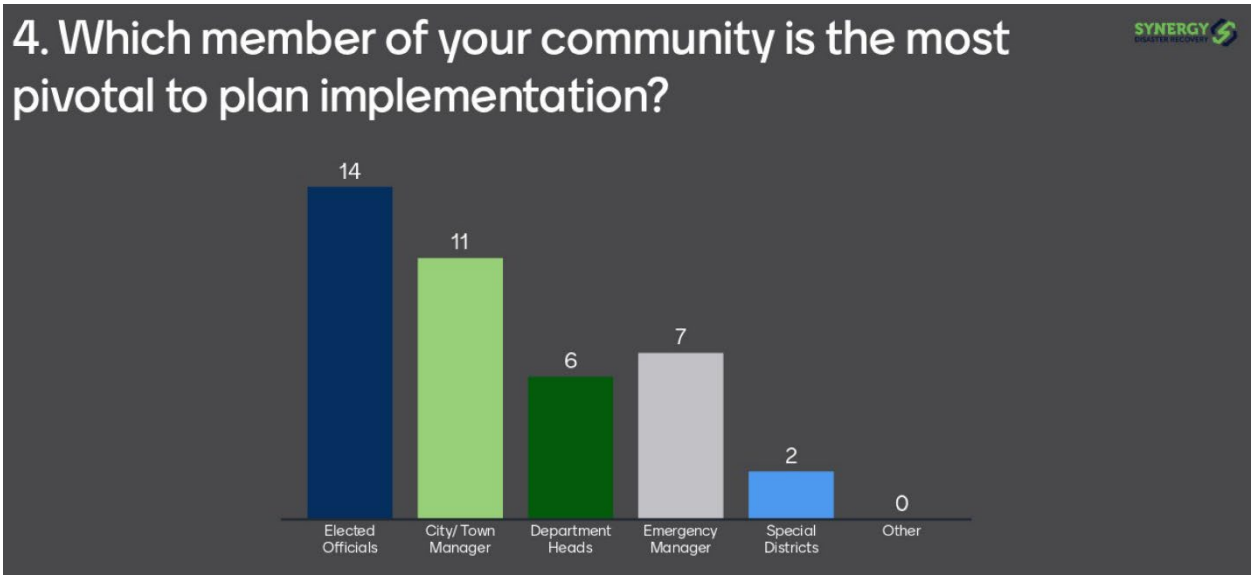
Appendix B: Municipal Annexes also contain some additional content, specific to some municipalities, regarding Plan Maintenance and Implementation efforts.

Figure 3. Implementation Obstacles HMPC Poll



The HMPC was also asked during a workshop which members of their community were the most vital to Plan implementation. Figure 4 shows that many felt elected and non-elected leadership support is the key to successfully implementing mitigation.

Figure 4. Plan Implementation HMPC Poll



Other efforts aimed at continued public participation will include mitigation-specific public outreach and engagement activities (e.g. town hall meetings, information booths at community events, social media campaigns, etc.) These annual efforts (if not more frequent) will be spearheaded by the County to facilitate continued public participation in the plan maintenance process over time.

The 2021 Plan will be updated by the FEMA approved five-year anniversary date, as required by the Disaster Mitigation Act of 2000, or following a disaster event. Future Plan updates will account for any new hazard vulnerabilities, special circumstances, or new information that becomes available. During the five-year review process, the following questions will be considered as criteria for assessing the effectiveness of the Weld County Hazard Mitigation Plan.

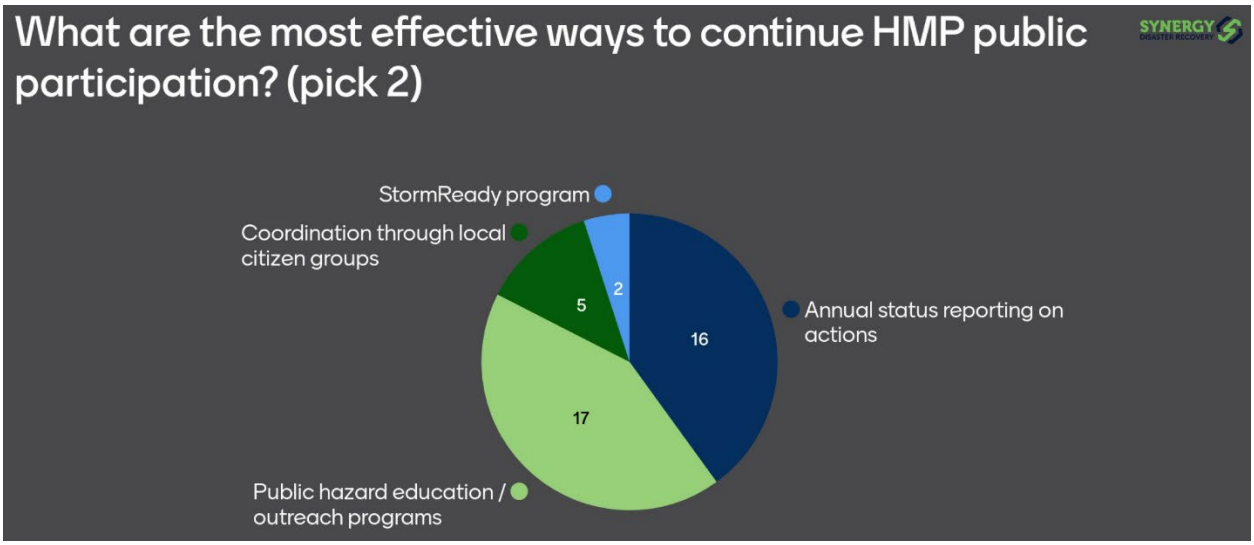
- Has the nature or magnitude of hazards affecting the County changed?
- Are there new hazards that have the potential to impact the County?
- Do the identified goals and actions address current and expected conditions?
- Have mitigation actions been implemented or completed?
- Has the implementation 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.

2.3 Municipal Efforts

Figure 5 presents relevant polling responses that the HMPC provided during the planning workshops, when asked about effective ways to continue public participation.

Figure 5. Continued Public Participation HMPC Poll



Additional poll responses provided other specific ideas for jurisdictions to consider when continuing public HMP participation. Some suggestions included: town hall meetings, social media, booths at events, newsletters / utility bill inserts, websites, push notifications, public information nights, and adding HMP discussions to agendas of regular standing meetings,

Figure 6 and Figure 7 show responses from the HMPC relevant to effective tools for implementing mitigation. Additional responses mentioned creating HMP work groups or advisory boards and integrating mitigation strategy conversations into annual budgeting processes.

Figure 6. Implementation Tools (Plans / Programs) HMPC Poll

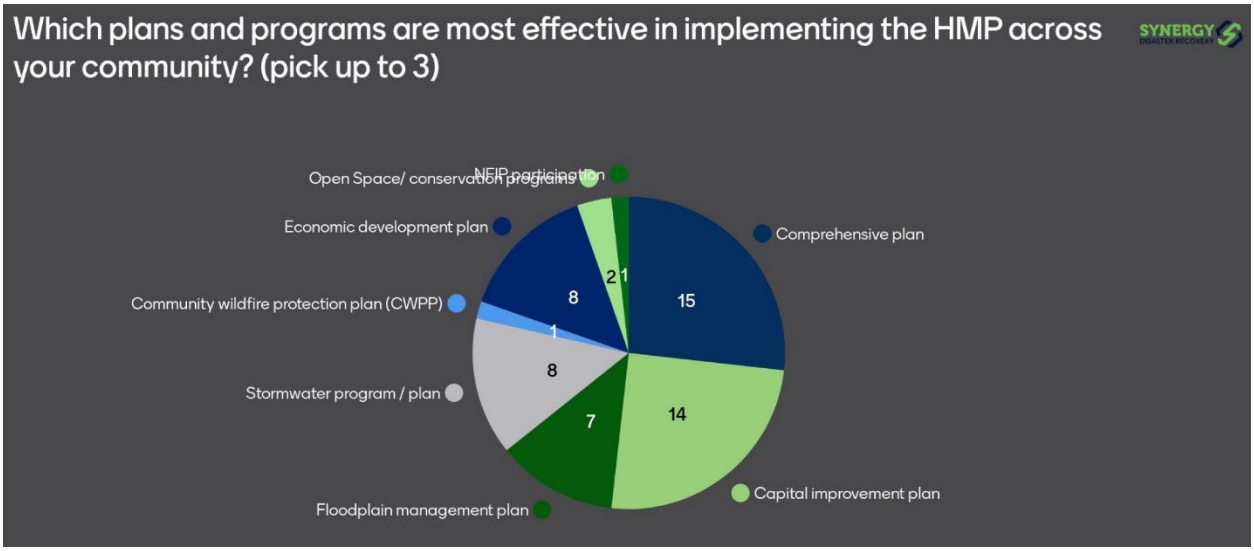
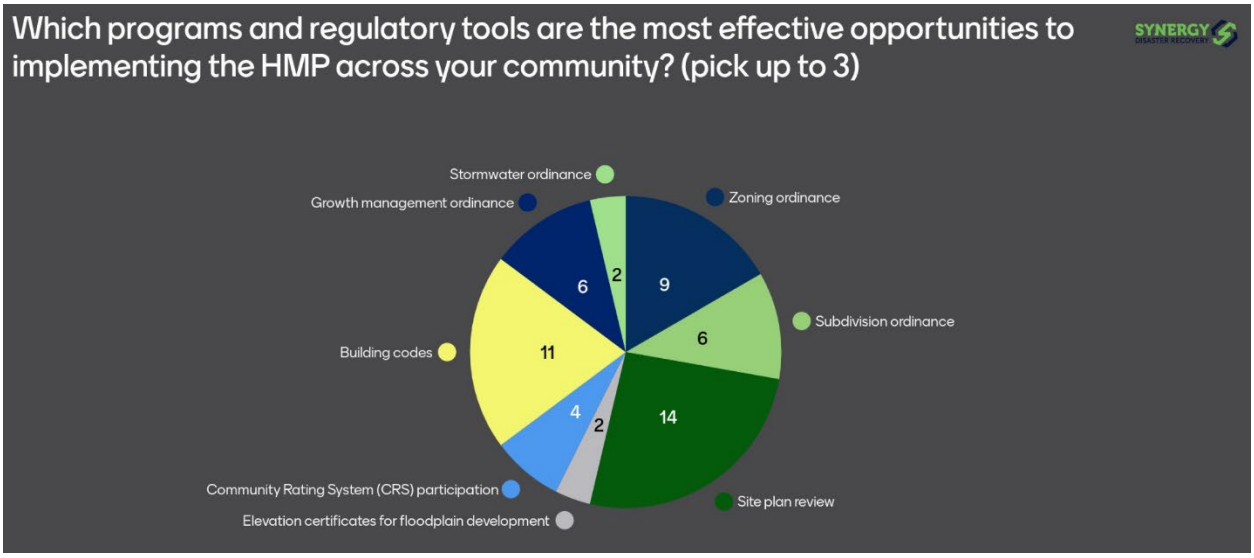


Figure 7. Implementation Tools (Regulatory) HMPC Poll



3 Planning Process

The following section reviews the planning process and public outreach with participating jurisdictions and Weld County to inform the Multi-Jurisdictional Hazard Mitigation Plan.

3.1 Background

The 2021 Weld County Hazard Mitigation Plan (HMP) is an update to the 2016 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 Weld 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 certain federal Hazard Mitigation Assistance (HMA) Grants.

3.1.1 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, tornados, and earthquakes. 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.

3.1.2 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 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, Weld County and its municipalities will benefit from this project 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.

3.1.3 Scope

This 2021 Plan has been prepared to meet requirements set forth by FEMA and the Colorado Division of Homeland Security and Emergency Management (DHSEM) in order for Weld 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.

3.1.4 Authority

This Hazard Mitigation Plan has been adopted by Weld County and its participating jurisdictions in accordance with the authority granted to counties and municipalities by the State of Colorado. This Plan was developed in accordance with current state and federal rules and regulations governing local hazard mitigation plans. 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

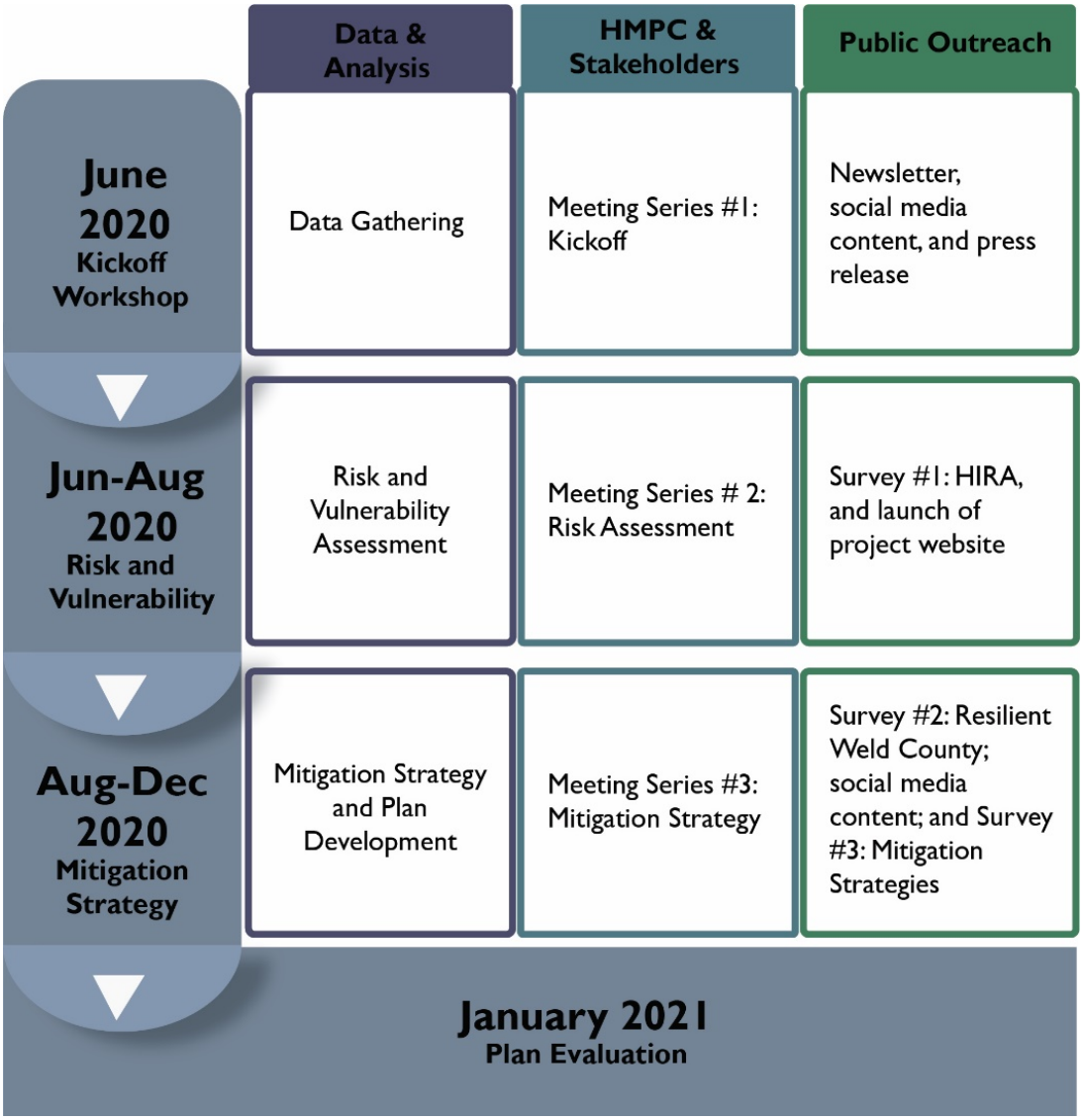
The following Federal Emergency Management Agency (FEMA) guides and reference documents were used to prepare this document:

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

3.2 Update Process and Methodology

The planning process included data gathering and modeling 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, committee meetings and plan development. A high-level summary is presented in Figure 8.

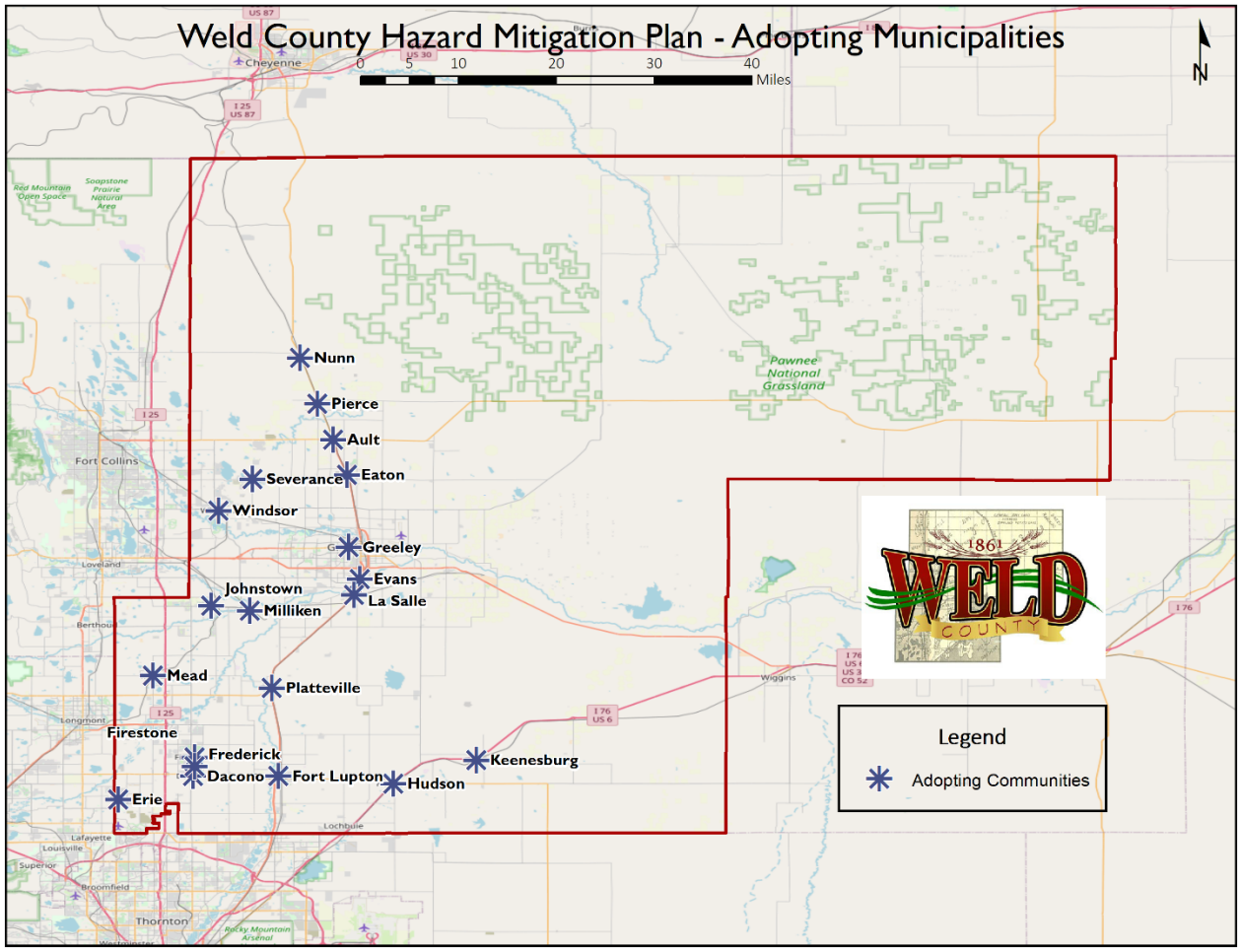
Figure 8. Process Timeline



3.2.1 Participating Organizations

All municipalities and special districts were notified of the participation requirements related to the adoption of the Plan and the formation of the Hazard Mitigation Planning Committee (HMPC). Numerous planning meetings were held to ensure that all information contained in the Plan is correct, and that the input provided by participating agencies, organizations, and the public has been included. The following jurisdictions shown in Figure 9 joined the County and participated in the planning process.

Figure 9. Map of Adopting Communities



Due to the COVID-19 pandemic, modifications were made to the intended outreach formats. To avoid the spread of the virus all HMPC meetings were held in an online interactive format with polling and group discussions. Separate stakeholder meetings were conducted over the phone or in small groups. To ensure public participation, the online surveys, educational materials, and press releases were distributed widely through various social media, direct e-mailing, newsletters, media organizations, and targeted groups for several municipalities.

3.2.2 Incorporation in Community Plans

The current 2018 State of Colorado Natural Hazards Mitigation Plan was reviewed for incorporation into the 2021 Weld County Multi-Jurisdictional Hazard Mitigation Plan in addition to the following documents and resources, as appropriate:

- 2018 Milliken Risk Assessment
- 2018 Colorado Drought Mitigation Response Plan
- 2019 Weld County Office of Emergency Management Hazmat Transportation Plan
- 2019 Economic & Demographic Profile, Weld County, CO
- 2020 Colorado State Demography office
- 2021 Weld County Comprehensive Plan

3.3 Hazard Mitigation Planning Committee (HMPC)

The Weld County HMPC consisted of members of participating local governments and districts, as well as public stakeholders, special interest groups, and County staff. Invitations to participate were broadly distributed across these groups.

Additionally, Weld County invited all neighboring counties and other relevant organizations to also participate in the planning process. County staff extended this invitation regularly during their monthly Northeast Emergency Manager meetings, other coordination calls, and other regional meetings held over the course of 2020. These meetings and calls provided numerous opportunities for Weld County to provide HMP project updates during the planning process. Weld County staff also coordinated directly with neighboring counties whom they share bi-county municipalities with, to ensure these communities are adequately covered by a hazard mitigation plan.

The role of the HMPC 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, to meet one-on-one with Weld County Office of Emergency Management, 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 strategies. Table 9 presents a list of the HMPC members.

Table 9. HMPC Members

Planning Committee	Title	Jurisdiction
Roy Rudisill	OEM - Director and LEPC Chair	Weld County
Denise Bradshaw	Emergency Management Coordinator	Weld County
David Burns	Emergency Management Sr. Coordinator	Weld County
Gracie Marquez	Emergency Management Specialist	Weld County
Adrienne Sandoval	Mayor	Town of Platteville
Andrew Martinez	Mayor	Town of LaSalle
Angela Wilson	Communications Manager	Town of Frederick
Brian Phillips	Police Chief	Town of Johnstown
Bryce Border	Deputy Police Chief	Town of Firestone
Cathy Payne	Town Clerk	Town of Nunn
Colleen Whitlow	Mayor	Town of Mead
Dan Frazen	Emergency Manager - OEM	City of Greeley
Jeff Schreier	Town Administrator	Town of Eaton
Jennifer Finch	Director of Communication	Weld County
Jennifer Krieger	Community Development Director	City of Dacono
Jim Flesher	Long Range Planner - Planning & Zoning	Weld County
Jim Gerdeman	Police Chief	Town of Severance
Joe Clingan	Police Chief	Town of Nunn
John Gates	Mayor	City of Greeley
Kenneth Gfeller	Mayor	Town of Keenesburg
Kris Krazian	Windsor Fire	Town of Windsor
Kristina Duran	Clerk	Town of Pierce

Planning Committee	Title	Jurisdiction
Kurt Boudette	Emergency Manager	City of Evans
Larry Lorentzen	Town Administrator	Town of Gilcrest
Mark Thompson	Mitigation Planning Specialist	DSHEM
Matthew LeCerf	Town Manager	Town of Hudson
Merrie Garner	OEM Coordinator	Carbon Valley EMA (CVEMA) [Dacono, Firestone, Frederick] / Frederick-Firestone FPD
Mike Haefele	Police Commander	Town of Erie
Monica Bortolini		City of Longmont
Nanci Crom	Mayor	Town of Pierce
Nicholas Wharton	Town Administrator/Manager	Town of Severance
Patricia Gavelda	State Mitigation Planning Program Manager	DHSEM
Pepper McClenahan	Community Development Director	Town of Milliken
Rick Klimeck	Police Chief	Town of Windsor
Rob Piotrowski	Mayor	Town of Ault
Shannon McVaney	Emergency Management Coordinator	City of Longmont
Stephanie Hackett	EM Coordinator	City of Brighton
Steve Iacino	Deputy Chief	Frederick-Firestone FPD
Steve Moreno	BOCC	Weld County
Sue Frederickson		Town of Nunn
Todd Hepworth	Flood Plains Administrator	City of Evans
Tom Nissen	Ault Police	Town of Ault
Tom Parko	Planning Director	Weld County
Troy Renken	Town Administrator	Town of Platteville
Zo Stieber	Mayor	City of Fort Lupton

Formal Plan adoptees signed a letter of participation and attended several of the HMPC meetings. Table 10 lists the meetings attended by each participating organizations, in addition to other interactions with non-Adopting communities..

Table 10. Organizational Participation

Jurisdiction	Pre-Kickoff	HMPC #1	HMPC #2	HMPC #3	HMPC #4	Individual One-on-One's
Weld County	x	x	x	x	x	x
Ault		x		x		x
Dacono	x	x	x	x	x	
Eaton						x
Erie					x	x

Jurisdiction	Pre-Kickoff	HMPC #1	HMPC #2	HMPC #3	HMPC #4	Individual One-on-One's
Evans		x		x	x	x
Firestone	x	x	x	x	x	
Fort Lupton		x	x	x		x
Frederick	x	x	x	x	x	
Greeley		x		x	x	x
Hudson			x	x	x	x
Johnstown			x	x		x
Keenesburg		x				x
LaSalle						x
Mead			x	x	x	x
Milliken					x	x
Nunn					x	x
Pierce		x	x	x		x
Platteville			x	x	x	x
Severance						x
Windsor		x		x	x	x

3.3.1 HMPC Meetings

The HMPC had four sets of formal meetings. Meeting dates were identified through an online Doodle Poll to identify the dates available for most participants. Once a set of dates and times was selected, calendar invites and the Weld County (ReadyOP) notification system were used to alert the HMPC members.

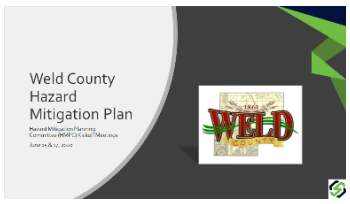
Pre-Kickoff Meetings (March 20th, April 9th 2020)

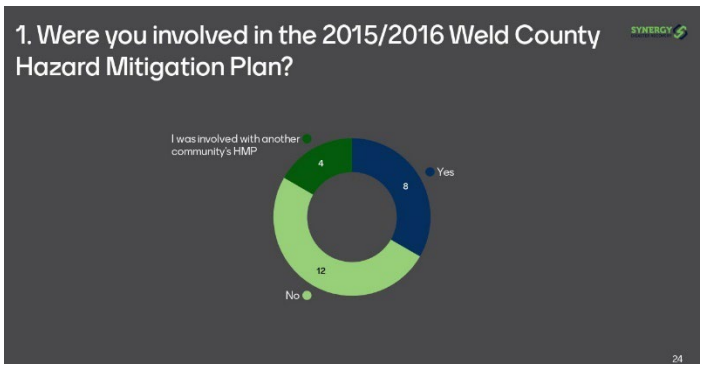
Prior to the first HMPC meeting, two small group meetings occurred on March 20th and April 9th to establish project timelines, goals, stakeholders, and update needs for the project. These pre-kickoff meetings addressed the need for virtual platforms due to the COVID-19 pandemic, an increased jurisdictional collaboration and participation, successes and desired updates from the 2016 Plan, and FEMA approval requirements. Additionally, during these meetings the Lifeline construct was discussed to determine how to best integrate that framework in the HMP.

HMPC Kickoff Meetings (June 15th, 17th 2020)

EMERGENCY MANAGEMENT

The kickoff meeting was held virtually on two separate dates to provide flexibility and encourage participation. The meeting started with an introduction to the planning process, schedule, and responsibilities of the HMPC. Discussion also focused on the list of hazards to profile including agricultural hazards (disease and pests) and cyber threats which were not included in the 2016 plan. Participants were invited to discuss how the 2016 plan is used and what elements work well. Other main topics included an introduction to the public outreach portion of the planning process and the group was encouraged to comment on the public outreach process and tools that work best. Other topics included an introduction to the Lifeline construct used by FEMA and Plan requirements to achieve FEMA approval. Group discussion focused on the definition and application of the hazards being added to the 2021 Plan, and a review of the participating jurisdictions. To encourage dialogue in a virtual presentation, live polling was used through a program 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 shown throughout this documents to support what was heard.



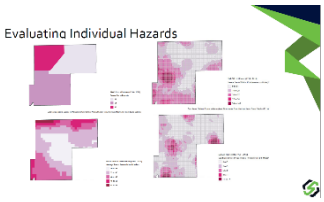


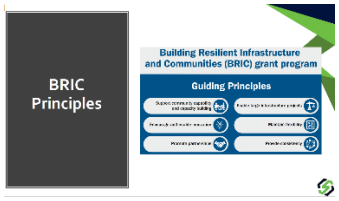
At the end of the meeting, participants were given four action items:

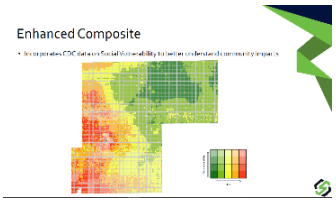
1. Provide the best available hazard data and recent community plans
2. Help expand the HMPC roster
3. Provide input on the public involvement plan
4. Assist with dissemination of public involvement plan messaging

HMPC Hazard Identification and Risk Assessment (HIRA) Meetings (August 18th, 19th 2020)

The HIRA meeting was also held virtually on two separate dates. Discussion in these August meetings focused on the risk inventory and assessment as well as responding to the results of the discussions in the previous June meetings. The kickoff meeting identified funding as the primary obstacle to implementing mitigation. This finding prompted a discussion of assistance programs and an introduction of the new (BRIC) Building Resilient Infrastructure and Communities grant program. The presentation then stepped through the data analytics that were assessed as part of the risk and vulnerability assessment. The discussion then focused on how tools and Lifelines can be assessed to address hazards that pose significant risk. Group discussion focused on how to present the composite risk graphics in the plan, and which municipalities modeled a greater level of risk.







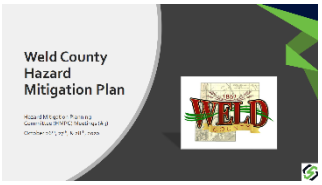
EMERGENCY MANAGEMENT

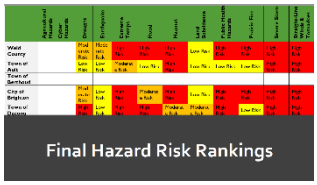
At the end of the meeting, participants were given several action items:

1. Continue to expand the HMPC roster
2. Continue to assist with dissemination of public involvement plan - social media content, newsletter, and survey #1
3. Complete a mitigation capabilities assessment
4. Begin reporting on 2016 mitigation actions

HMPC HIRA Part 2 and Mitigation Strategy Meetings (October 26th, 27th, 28th 2020)

The third meeting was held virtually on three separate dates. The agenda focused on presenting the remaining pieces of the HIRA and initial discussions focused on the Plan's mitigation strategy. Discussion in the October meetings focused again on integrating Lifelines into this Plan.





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

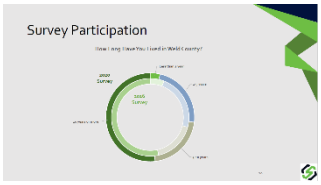
1. Assist with continued dissemination of public involvement plan social media content, newsletter, and survey #2
2. Update and send hazard ranking updates
3. Begin drafting new 2021 mitigation actions

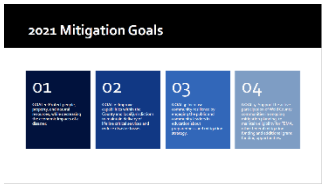
HMP Mitigation Strategy Part 2 Meetings (December 1st, 2nd, 3rd 2020)

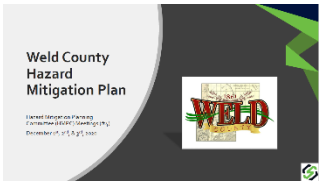
The final HMPC meetings were held virtually on three separate dates. The agenda focused on plan requirements, public outreach responses and survey results, and development of goals, objectives and strategies, mitigation strategy types, and strategy funding mechanisms. Group discussion focused on goal development and the desire to change some wording from the previous plan.

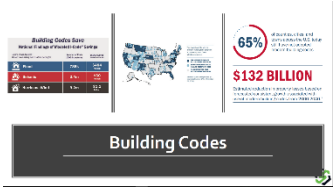
At the end of the meeting, participants were given four action items:

1. Assist with continued public involvement plan messaging and dissemination of survey #3
2. Develop new 2021 mitigation actions
3. Remaining follow-ups from previous requests
4. Provide hazard photos for plan incorporation









HMP Individual Municipality One-on-Ones (on-going throughout planning process)

Weld County OEM also facilitated a number individual community meetings with local municipalities over the course of the planning process. These meetings were vital to planning participation and to ensure municipalities are able to Adopt the updated HMP.

3.3.2 HMPC Review & Comment

The HMPC was provided a review and comment period before the Public Draft Plan was made available. Over 100 comments were received and resolved, as appropriate.

3.4 Public and Stakeholder Participation

Public involvement was a key component to informing the Hazard Mitigation Plan update. Due to COVID-19, in-person events did not occur. However, several techniques listed below were employed to educate the public about the Plan and process and to gather public input on issues and opportunities to make mitigation improvements. The HMPC was asked how best to engage the public in their jurisdiction and the responses highlighted: surveys, social media, providing materials for local groups, newsletters, direct mailers, local press, and community events. The following materials were distributed to communities by the HMPC.

Website

Weld County developed a webpage within the Office of Emergency Management website dedicated to the HMP update. The website provided 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, contact, links to the survey, and ways to stay involved in the process.

Social Media

Text describing the HMP and update process was sent to communities in multiple formats to accommodate: 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.

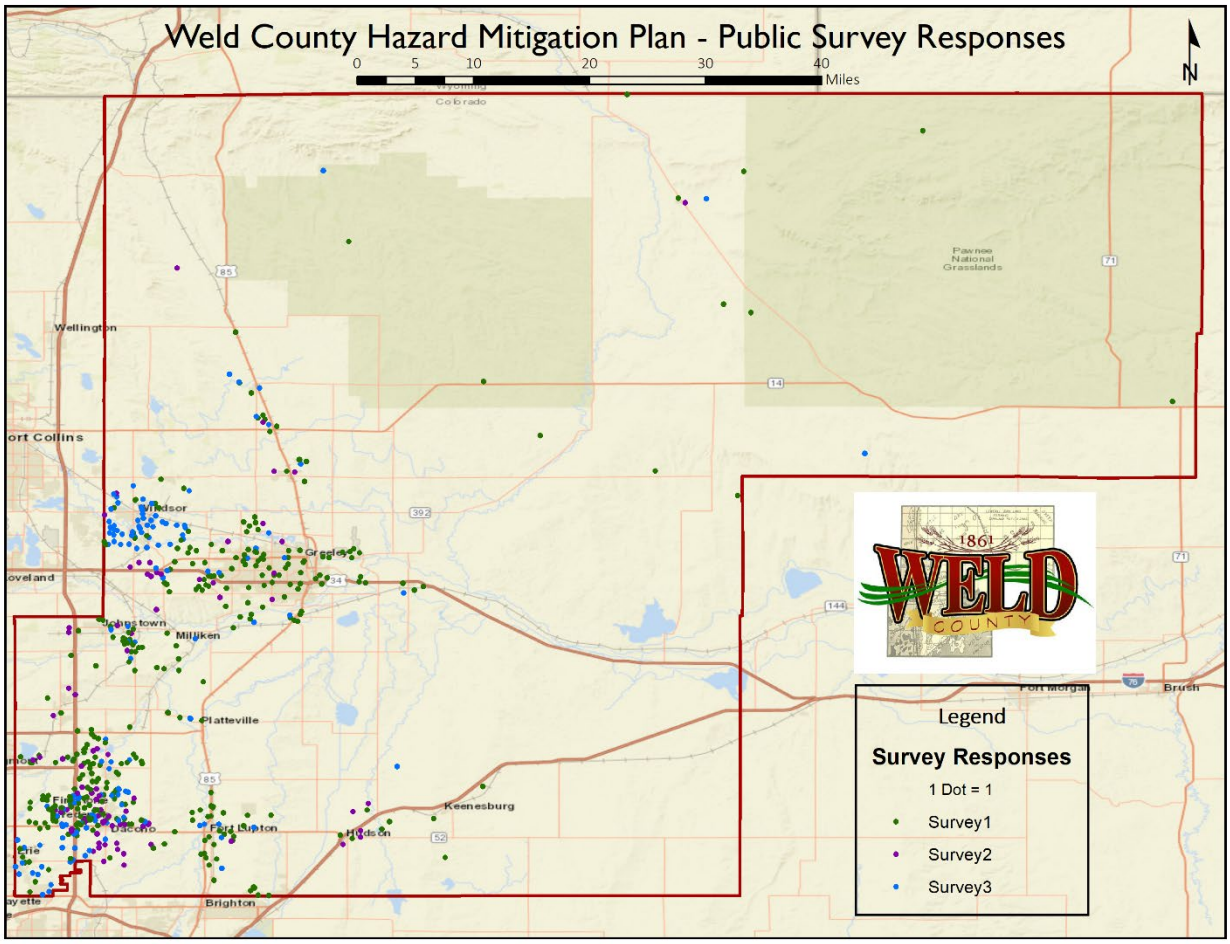
E-mail distribution

Throughout the process Weld County residents signed up to receive project updates. Direct e-mails were sent to those ninety-four individuals with these updates and survey links.

3.4.1 Community Surveys

As part of the outreach process, three surveys were launched to gather community feedback. The first two, "Hazard Risk and Perception Survey" and the "Vision for a Resilient Weld County Survey," were also conducted as part of the 2016 plan, providing opportunities to compare results between years. A map of the survey respondents by survey is shown below. Summaries of the survey results are detailed here.

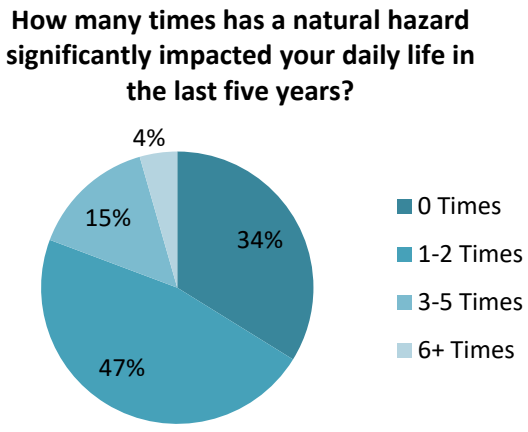
Figure 10. Map of Survey Respondents



3.4.2 Survey #1 Hazard Risk Perception Survey

OPEN JULY 22, 2020 –SEPTEMBER 21, 2020 - The survey received 345 responses.

Figure 11. Survey 1 Responses

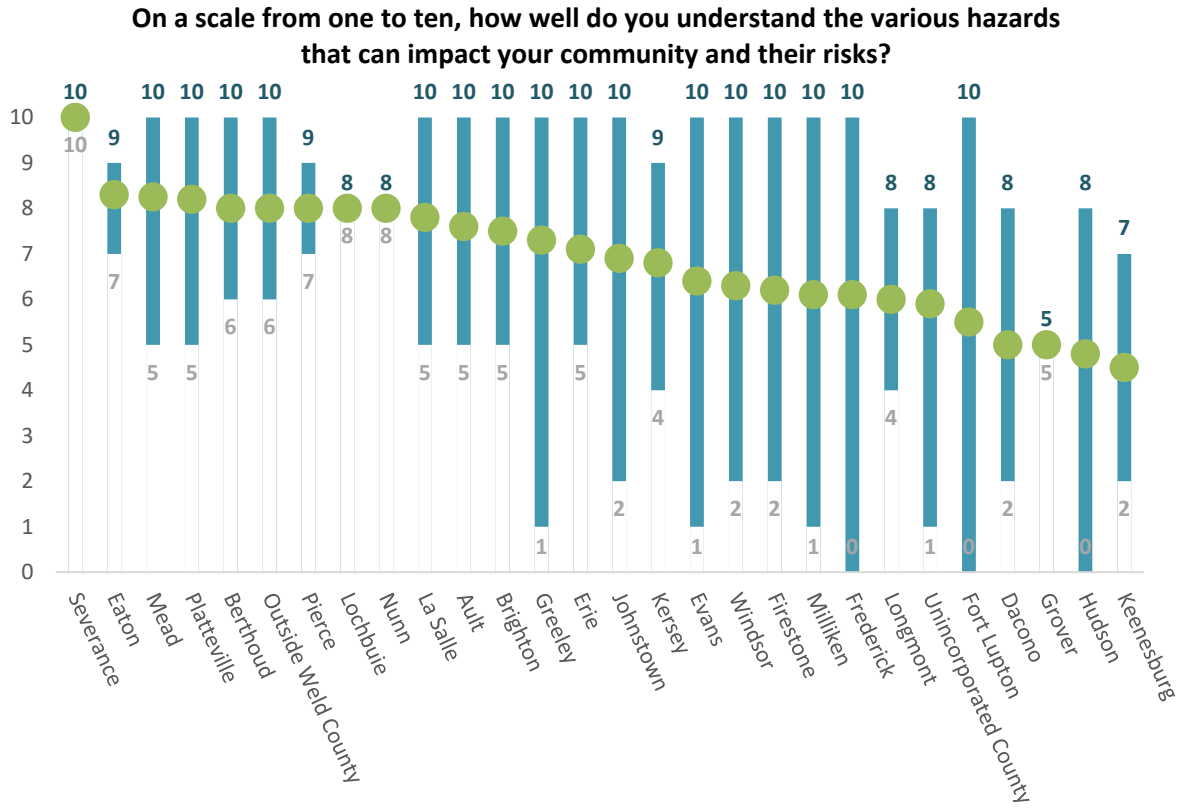


The goal of survey #1 was to understand the public perception of hazards in Weld County. When asked how many times a natural hazard significantly impacted daily life in the last five years within the Northern Colorado region, almost half of those who answered the question stated that 1-2 events have significantly impacted their life in the last five years. Sixty seven percent indicated that one or more events had impacted daily life in the last five years.

Responses to the question "How well do you understand the various hazards that can impact your community and their risks? Zero being the lowest and ten being the highest." The majority of respondents chose the middle score. However, different municipalities had different results. Below is a graph that shows the lowest score, high score,

and the average score for each municipality; low shown in grey and high shown in dark blue. The average is represented as a green circle. Some communities had a high number of responses while others had very few responses, changing the survey sample per community, however, this graph gives a general indication of the range of risk understanding that survey respondents chose.

Figure 12. Survey 1 Responses



Survey respondents were asked about the perception of risk for their community for each hazard reviewed in the plan. Below is a graphic of the responses average for each hazard for each community. Those hazards which the public thought posed the greatest risk include severe storms (lightning and hail), drought, extreme temperatures, public health hazards, wind and tornados, and cyber-attacks. On average for the County, residents were less worried about land subsidence, earthquake, and flood.

EMERGENCY MANAGEMENT

Table 11. Survey 1 Responses

Hazard	Severe Storm	Drought	Public Health Hazards	Wind and Tornados	Cyber Attacks	Extreme Temperatures	Hazardous Materials	Prairie Fire	Agricultural Hazards	Flood	Land Subsidence	Earthquake
Average	7.5	5.9	5.8	5.7	5.6	5.4	4.4	4.2	4.2	3.8	2.8	1.8
Ault	7.2	7.8	4.5	8.0	5.0	3.4	3.5	4.3	4.3	1.5	2.0	1.5
Berthoud	6.0	5.5	8.0	5.5		4.5	5.5	8.0	3.0	7.0	4.5	1.5
Brighton	8.5	6.0	6.7	4.8	5.3	5.0	3.7	3.3	3.3	2.0	2.0	1.0
Dacono	8.0	6.5	3.5	4.3	4.3	6.0	4.5	5.3	5.0	4.0	4.8	2.8
Eaton	6.6	5.0	5.0	5.4	5.3	2.8	1.8	4.5	2.0	3.8	0.8	1.5
Erie	7.8	5.3	7.3	5.0	4.0	4.3	7.5	3.2	2.8	3.4	4.6	2.4
Evans	7.1	6.0	7.7	6.8	5.6	6.2	5.0	3.9	4.8	5.7	2.7	0.7
Firestone	7.4	5.5	5.7	5.4	5.4	5.2	4.8	4.3	4.5	3.7	3.5	1.7
Fort Lupton	7.3	6.0	4.1	5.2	5.5	5.1	3.3	4.3	4.3	2.7	2.2	1.4
Frederick	7.4	5.6	6.4	5.5	5.9	5.6	4.3	3.9	4.3	3.5	3.4	2.2
Greeley	8.0	6.0	6.0	5.7	6.1	5.7	4.5	3.6	4.1	4.0	2.5	2.0
Grover	7.0	10.0	10.0	8.0		10.0	8.0	10.0		2.0	2.0	1.0
Hudson	7.0	6.0	6.0	5.6	4.0	5.6	3.4	4.4	3.7	2.0	1.8	1.6
Johnstown	7.7	5.5	5.3	5.3	6.5	5.4	4.3	4.2	4.4	4.0	3.3	1.9
Keenesburg	7.5	10.0	5.5	5.5	6.0	5.5	2.5	2.5	3.5		2.0	1.0
Kersey	7.8	7.6	3.8	6.8	4.5	5.6	4.4	7.5	5.0	5.4	1.4	0.8
La Salle	9.0	9.0	5.5	7.6	6.2	4.8	6.0	5.5	8.6	5.0	1.0	5.5
Lochbuie	10.0	2.0	3.0	7.5	6.0	5.0	1.0	6.5	1.0	3.5	3.5	1.0
Longmont	8.5	1.0	4.5	2.0	1.5	4.0	4.5	3.0	3.0	4.0	2.0	0.0
Mead	7.0	9.3	7.3	4.0	5.7	9.3	3.3	4.5	6.3	2.8	1.0	0.0
Milliken	7.1	8.3	6.0	6.0	3.7	6.9	5.2	6.0	3.5	4.4	3.3	1.3
Nunn	9.0	3.0	1.0	5.0	4.0	1.0	5.0	1.0	1.0	0.0	1.0	0.0
Pierce	6.0	7.0	7.0	7.5	6.0	6.0	3.5	6.5	5.5	6.0	5.0	3.5
Platteville	6.4	7.6	5.7	7.5	5.0	3.3	4.8	3.4	6.0	4.3	1.0	1.0
Severance	7.5	5.5	4.5	7.0	9.0	5.0	8.0	7.0	3.0	6.5	1.0	0.5
Windsor	6.8	3.4	5.4	5.6	5.0	3.3	3.4	3.1	3.1	3.6	2.5	1.4
Outside Weld County	7.8	4.7	6.3	7.3	7.6	4.8	3.7	4.8	2.5	3.5	2.3	2.0
Unincorporated County	7.1	7.2	7.3	6.2	5.3	6.6	5.0	4.9	4.4	3.6	2.0	1.2

The graph below shows the aggregate County concern for each scenario. Survey respondents were primarily "somewhat concerned" about all scenarios. Respondents were likely to be extremely concerned with lack of clean water and access to medications and doctors. Survey respondents were primarily not concerned with lack of transportation and not receiving emergency alerts.

Table 12. Survey 1 Responses

	Not concerned	Somewhat concerned	Extremely concerned
Lack of food	19%	63%	16%
Lack of clean water	9%	44%	45%
Access to medications/doctors	19%	55%	23%
Lack of transportation	39%	51%	8%
Not receiving emergency alerts	31%	46%	21%

When asked about emergency preparedness, about half of survey respondents indicated that they do have an emergency preparedness kit. More than half of the survey respondent indicated that they have taken mitigation actions at their home, but very few have taken steps in their neighborhood or business.

3.4.3 Survey #2 Visions for a Resilient Weld County Survey

OPEN OCTOBER 1, 2020 –NOVEMBER 30, 2020 - The Survey received 86 responses.

The second survey was designed to gauge public perception of the disaster recovery conditions and resources within the County. The same survey was distributed in 2016, providing the opportunity to see what statements gained and lost agreement in that four-year period. Comparing results between surveys gave an overview of general community opinion changes, however, results did come largely from different communities and 2020 has not been an average year due to the COVID-19 pandemic, months of wildfire, local and national elections, and other related influences. Therefore, some comparative statements are likely influenced by those impacts.

Survey respondents were asked to mark their level of agreement with the following statements. The information below reflects the results of the 2020 survey with a greater percentage of strongly agree and agree at the top.

Table 13. Survey 2 Responses

Description	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	I Don't Know
People in my community help each other.	5%	10%	12%	48%	26%	0%
My community treats people fairly no matter what their background is.	7%	10%	22%	33%	24%	3%
My community supports programs for children and families.	5%	12%	14%	43%	24%	2%
People in my community feel like they belong to the community	2%	6%	17%	47%	23%	5%
People in my community are committed to the well-being of the community	5%	9%	17%	51%	17%	0%

Description	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	I Don't Know
My community keeps people informed about issues that are relevant to them.	10%	14%	20%	36%	16%	3%
People in my community have hope about the future.	6%	5%	21%	44%	15%	9%
My community works with organizations and agencies outside the community.	2%	10%	28%	28%	13%	19%
My community has effective leaders.	13%	15%	26%	31%	12%	3%
My community tries to prevent disasters.	8%	13%	19%	33%	12%	16%
My community has the resources it needs to take care of community problems.	9%	17%	22%	28%	10%	13%
My community has services and programs to help people after a disaster.	9%	20%	20%	19%	9%	23%
If a disaster occurs, my community provides information about what to do.	10%	17%	26%	21%	9%	15%
People in my community communicate with leaders who can help improve the community.	5%	9%	29%	36%	9%	10%
People in my community are able to get the services they need.	6%	21%	23%	27%	8%	14%
My community can provide emergency services during a disaster.	8%	15%	20%	29%	8%	19%
People in my community work together to improve the community.	6%	13%	17%	56%	8%	0%
My community has priorities and sets goals for the future.	3%	13%	30%	38%	7%	8%
People in my community know where to go to get things done.	3%	21%	26%	37%	6%	7%
My community actively prepares for future disasters.	8%	17%	28%	24%	5%	17%
My community looks at its successes and failures so it can learn from the past.	10%	19%	24%	26%	5%	16%
People in my community trust public officials.	10%	19%	36%	26%	3%	6%

The statements that had the greatest percentage of respondents <u>agree or strongly agree</u> include:

1. People in my community help each other. (48% Agree, 26% Strongly Agree)

2. My community treats people fairly no matter what their background is. (33% Agree, 24% Strongly Agree)
3. My community supports programs for children and families. (43% Agree, 24% Strongly Agree)
4. People in my community feel like they belong to the community. (47% Agree, 23% Strongly Agree)
5. People in my community are committed to the well-being of the community. (51% Agree, 17% Strongly Agree)

The top four agree and strongly agree statements in 2020 are the same as the results in 2016. The only difference from 2016 is the fifth statement, which was "People in my community have hope about the future." This statement moved down to the 6th most supported statement in 2020. The COVID-19 pandemic and other current events this year may have had an impact on the community's agreement with this statement.

The statements that had the greatest percentage of respondents <u>disagree or strongly disagree</u> include:

1. My community looks at its successes and failures so it can learn from the past. (Strongly Disagree 10%, Disagree 19%)
2. People in my community trust public officials. (Strongly Disagree 10%, Disagree 19%)
3. My community has services and programs to help people after a disaster. (Strongly Disagree 9%, Disagree 20%)
4. My community has effective leaders. (Strongly Disagree 13%, Disagree 15%)
5. If a disaster occurs, my community provides information about what to do. (Strongly Disagree 10%, Disagree 17%)

There are no statements where the percentages of respondents who disagree or strongly disagree are greater than the neutral, agree, or strongly agree percentages. For statements where the percentages of respondents who agree or strongly agree are not the majority, the number of neutral or don't know responses increased. The list illustrates the smaller percentages of respondents who disagree than the list of agree and strongly agree above. This shows that in this survey there are no statements where the public overwhelmingly feels that there are shortfalls or holes in community support.

Positive Trends since 2016

Because the survey measured the percentage of individuals who agree or disagree with a statement, an overall increase in community support can be measured by tracking a decrease in the population who disagree with a statement or an increase in the percentage of the population who agree with a statement. Below is a list of the biggest positive shift since 2016; showing statements with the greatest decrease in respondents who disagree or strongly disagree, and the statements with the greatest increase in respondents who agree or strongly agree.

These results indicate a slight decrease in the number of people who feel that the community does not communicate with leaders—indicating there is greater communication with leadership. There is also a positive shift toward the statement "People of different backgrounds are treated fairly" with both a decrease in the number of disagree and an increase in the number of people who agree with the statement. 2020 responses also showed a positive shift in people feeling that they know where to go to get things done, and that people work together to improve the community.

Biggest Increase of "Agree" or "Strongly Agree" since 2016

1. People in my community work together to improve the community. (from 57% to 64%) **+7%**
2. My community treats people fairly no matter what their background is. (from 50% to 57%) **+7%**

Biggest Decrease of "Disagree" or "Strongly Disagree" since 2016

1. People in my community communicate with leaders who can help improve the community. (from 23% to 14%) **-9%**
2. My community treats people fairly no matter what their background is. (from 23% to 17%) **-6%**
3. People in my community know where to go to get things done. (from 30% to 24%) **-6%**

Concerning Trends since 2016

Other statements decreased in support. These statements had a greater percentage of respondents that disagree or strongly disagree, or a lower percentage of respondents that agree or strongly disagree. The statements with the greatest drop in support are listed below.

These statements generally indicate a decrease in agreement about available information and programs and services, including those for children and families, during and after a disaster. There was also an increase in the percentage of respondents who disagree with statements about learning from the past and trying to prevent disasters. The greatest overall changes are shown below in the decrease of those who agree or strongly disagree with 20%+ drops in agreement.

Biggest Increase of "Disagree" or "Strongly Disagree" since 2016

1. My community has services and programs to help people after a disaster. (from 22% to 29%) **+7%**
2. My community looks at its successes and failures so it can learn from the past. (from 22% to 29%) **+7%**
3. If a disaster occurs, my community provides information about what to do. (from 22% to 28%) **+6%**
4. My community tries to prevent disasters. (from 15% to 21%) **+6%**
5. My community supports programs for children and families. (from 11% to 16%) **+6%**

Biggest Decrease of "Agree" or "Strongly Agree" since 2016

1. My community can provide emergency services during a disaster. (from 61% to 37%) **-24%**
2. My community has services and programs to help people after a disaster. (from 49% to 28%) **-21%**
3. If a disaster occurs, my community provides information about what to do. (from 49% to 30%) **-19%**

3.4.4 Survey #3 Mitigation Strategy

OPEN DECEMBER 1, 2020 –JANUARY 25, 2021- The Survey received 144 complete responses

Between December 1 and January 25, the Mitigation Strategies Survey was distributed widely through several outreach methods including social media, newsletters, and direct e-mail distribution. The content below lists the questions asked and a brief analysis of community response.

Q1. What community do you live in?

Responses came from many municipalities in Weld with the exception of Brighton, Hudson, Garden City, Gilcrest, Grover, Longmont, Lochbuie, Mead, Nunn, Northglenn, and Raymer. The breakdown in responses by place is listed in the table below.

Table 14. Survey 3 Responses

Location	Responses
Windsor	48
Frederick	22
Erie	18
Firestone	12
Greeley	9
Dacono	6
Fort Lupton	6
Johnstown	5
Unincorporated County	3
Pierce	3

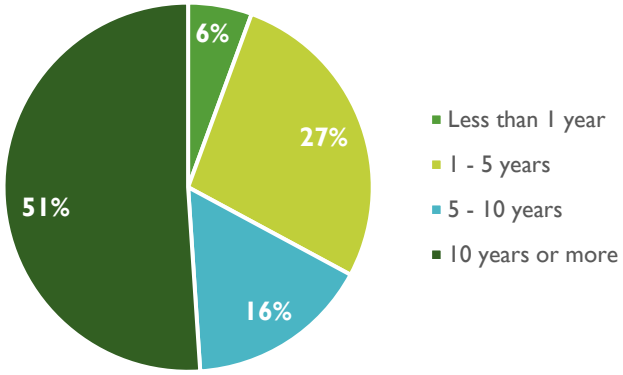
Location	Responses
Ault	2
Platteville	2
Eaton	1
Evans	1
Severance	1
Keensburg	1
Kersey	1
La Salle	1
Milliken	1
Outside Weld County	1

Q2. If you do not live in an incorporated area, what zip code do you live in? Zipcodes include: 80534, 80603, and 80631

Q3. How long have you lived in Weld County?

Just over half of the respondents have lived in Weld County for ten years or more. The responses are shown in the pie chart to the right. This feedback illustrates that many of the survey respondents have lived in Weld County through several major hazard events and were living in Weld at the time of the previous hazard mitigation plan.

Figure 13. Survey 3 Responses



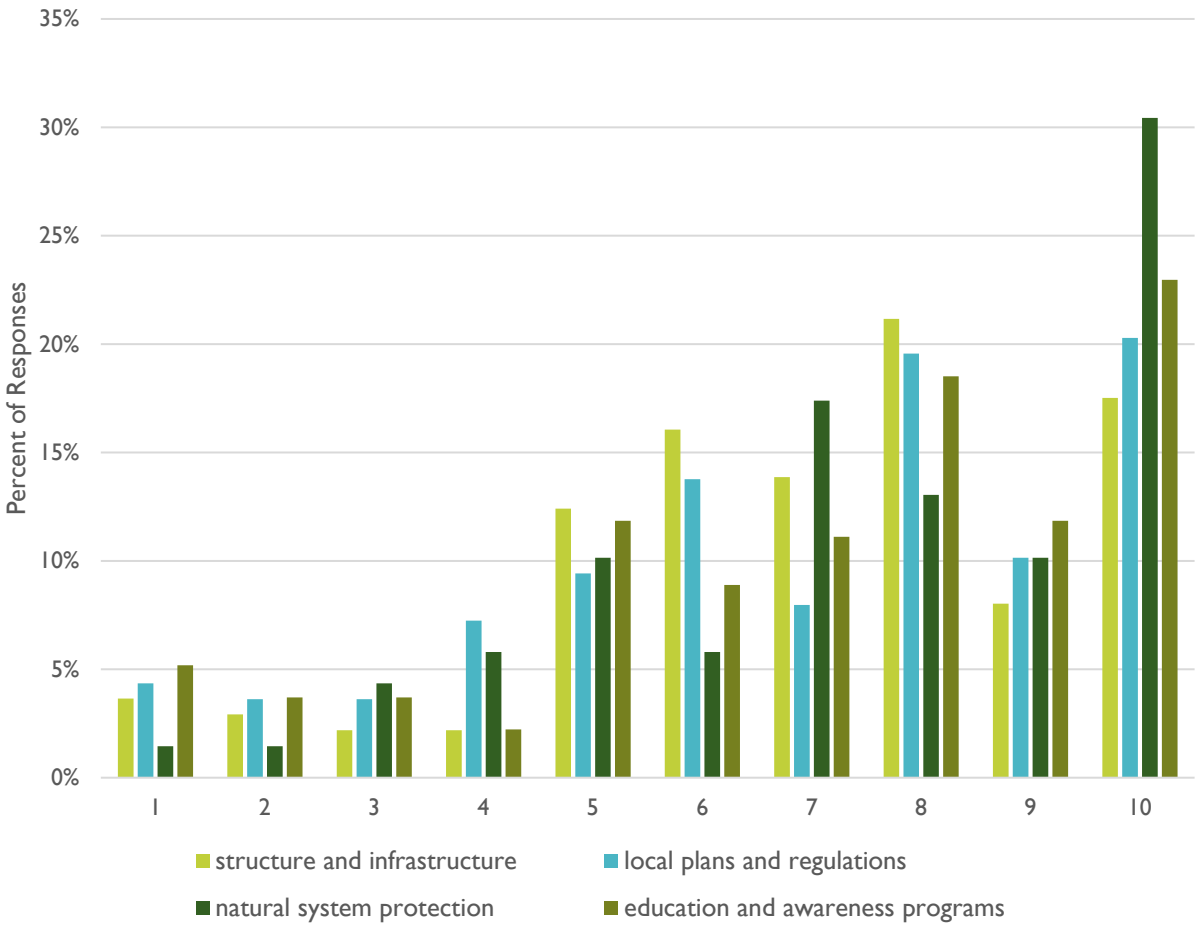
Q4-7. Questions four through seven ask "What is your level of support" for four different mitigation strategy types, from one (lowest) to ten (highest). The strategy types include structure and infrastructure, local plans and regulations, natural system protection, and education and awareness programs.

Results indicate that there is strong support for each of the mitigation strategy types. Natural system had the highest number of respondents select level ten support out of any category.

Average Level of Support (out of 10):

- Structure and Infrastructure: **7.0**
- Local Plans and Regulations: **6.9**
- Natural System Protection: **7.5**
- Education and Awareness Programs: **7.1**

Figure 14. Survey 3 Responses

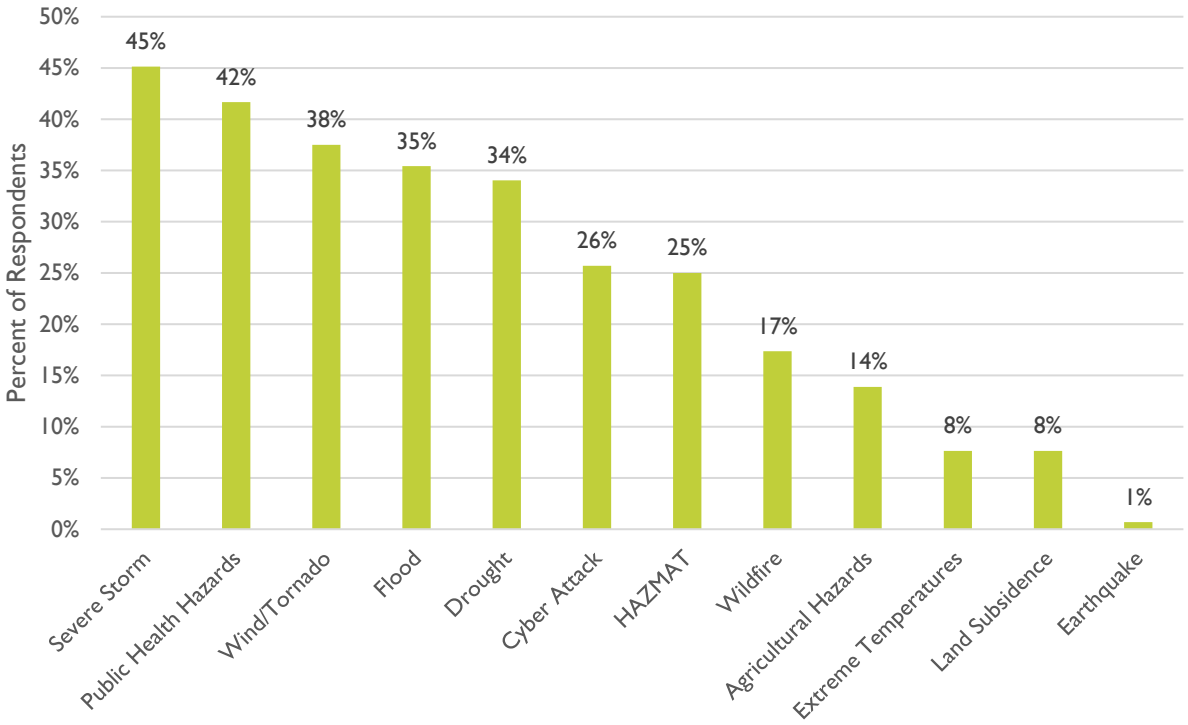


EMERGENCY MANAGEMENT

Q8. Select the top three hazards where you think mitigation efforts should be prioritized.

The graph below indicates the number of respondents who chose each hazard. The hazards that were selected by the fewest number of respondents are earthquakes, land subsidence, and extreme temperatures. The three hazards selected by the greatest number of respondents include sever storm, public health hazards, and wind/tornado. Flood and drought were both identified as a top three hazard by 34-35% of respondents. Mitigation efforts for cyber attacks and HAZMAT were identified by about a quarter of respondents to be prioritized. Agricultural hazards and wildfire were prioritized by less than 20% of respondents.

Figure 15. Survey 3 Responses



Q9. Share your ideas for specific mitigation actions that you would like to see implemented by your government, should funding be available.

Over a third of the respondents provided feedback on specific mitigation actions that they would like to see implemented. Actions included:

Infrastructure

- Tornado sirens were identified in several communities as a needed mitigation improvement.
- Under grounding utility lines.
- Improved street drainage systems.
- Enlarging highway and road culverts and bridges as necessary to accommodate large storm events.
- Review transportation systems to ensure emergency access/egress from natural hazards.

Local regulations and programs

- Rebates for wind/storm resistant building materials.
- Public outreach and cost-effective methods for disposal of trash and debris after an event.
- Increasing the oil and gas buffer around schools, parks, and homes to prevent accidents.
- Temporary shelters for people who are displaced in a crisis with pre-designated reunification locations so people know where and how to reconnect with family and loved ones in crisis situations.
- Implement no-burn days in windy dry weather.
- Limit development in areas with a high hazard potential.
- Cyber security enhancements and upgrades to protect utilities.
- First Responder communications network improvement and coordination.
- Funding assistance for acquiring raw water during drought could provide relief for existing municipal water needs and assist in economic growth for small communities.
- Land surveying for possible land collapse under new build areas yearly.
- Mobile relief unit that is specifically set up to respond to communities that have been hit by hazards etc. this unit should have the ability to supply things like water, food, cloths toothbrushes etc.

Natural systems

- Farmland and small community preservation.
- Fishing and hunting preservation.
- Water conservation.
- Erosion and dust control.
- Flood control.
- Reservoirs for water storage.

Education and awareness

- Increase public education and awareness related to oil and gas, fracking, and groundwater.
- Provide education on the use of methane detectors in crawl spaces.
- Involve oil and gas companies in community safety conversations.
- More community safety events and informational mailers.
- Online water reduction classes with incentives for completion.

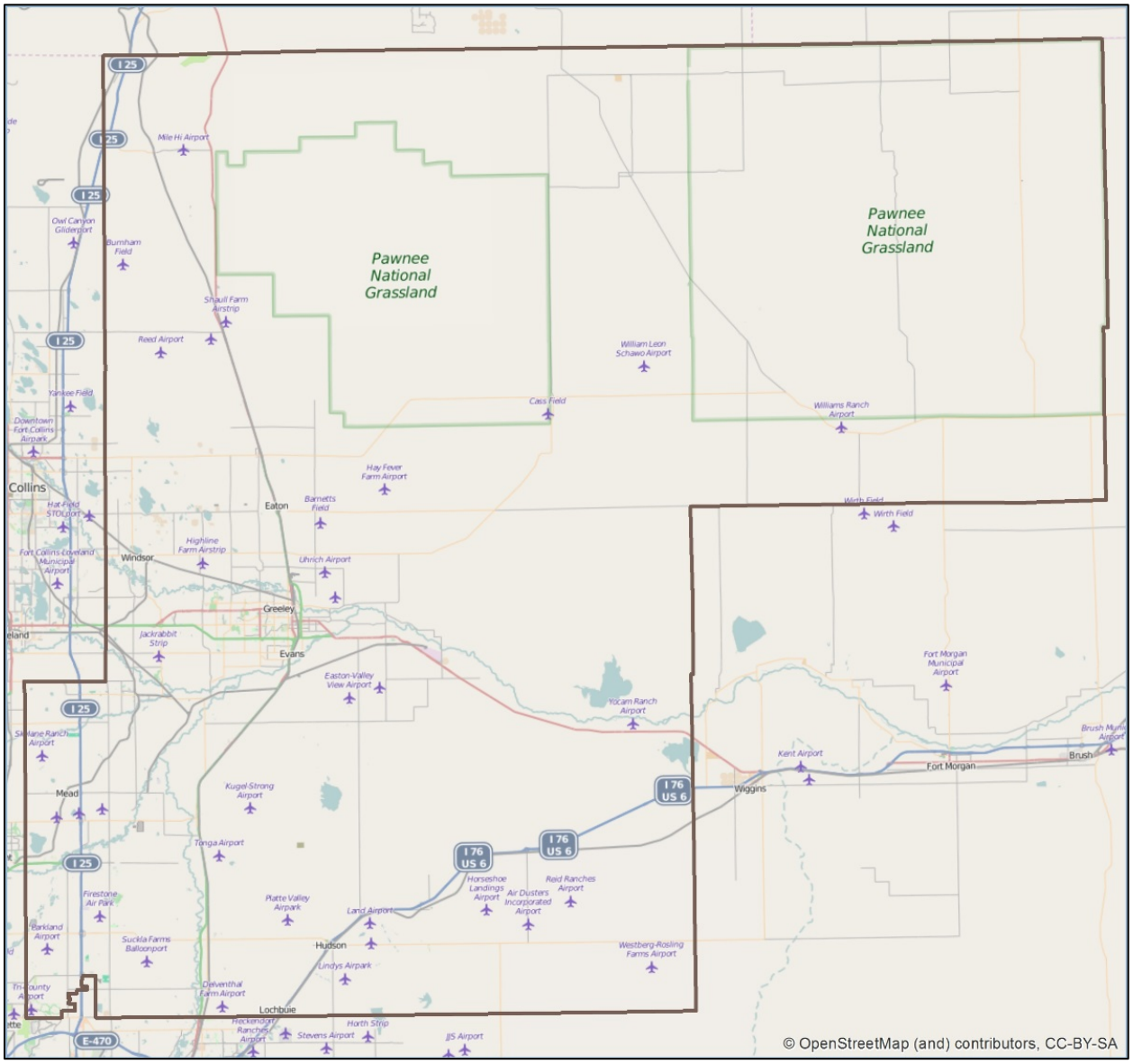
3.4.5 Public Plan Review & Comment

A public review and comment period was held, following the final HMPC review of the HMPC Draft Plan. The comment period was kept open for three weeks and the public was able to access and comment on the plan online. A total of 5 comments were received and vetted through the HMPC.

4 County Profile

Weld County is located in the Northern Front Range of central Colorado. The County spans an area from northern Metro Denver to the Wyoming state line. Slightly less than four thousand square miles in size, the County seat is located in the City of Greeley, and thirty-one incorporated municipalities lie within the County's borders. Weld County is the third largest county in the State in terms of land area and is larger than the size of Rhode Island, Delaware, and the District of Columbia combined.

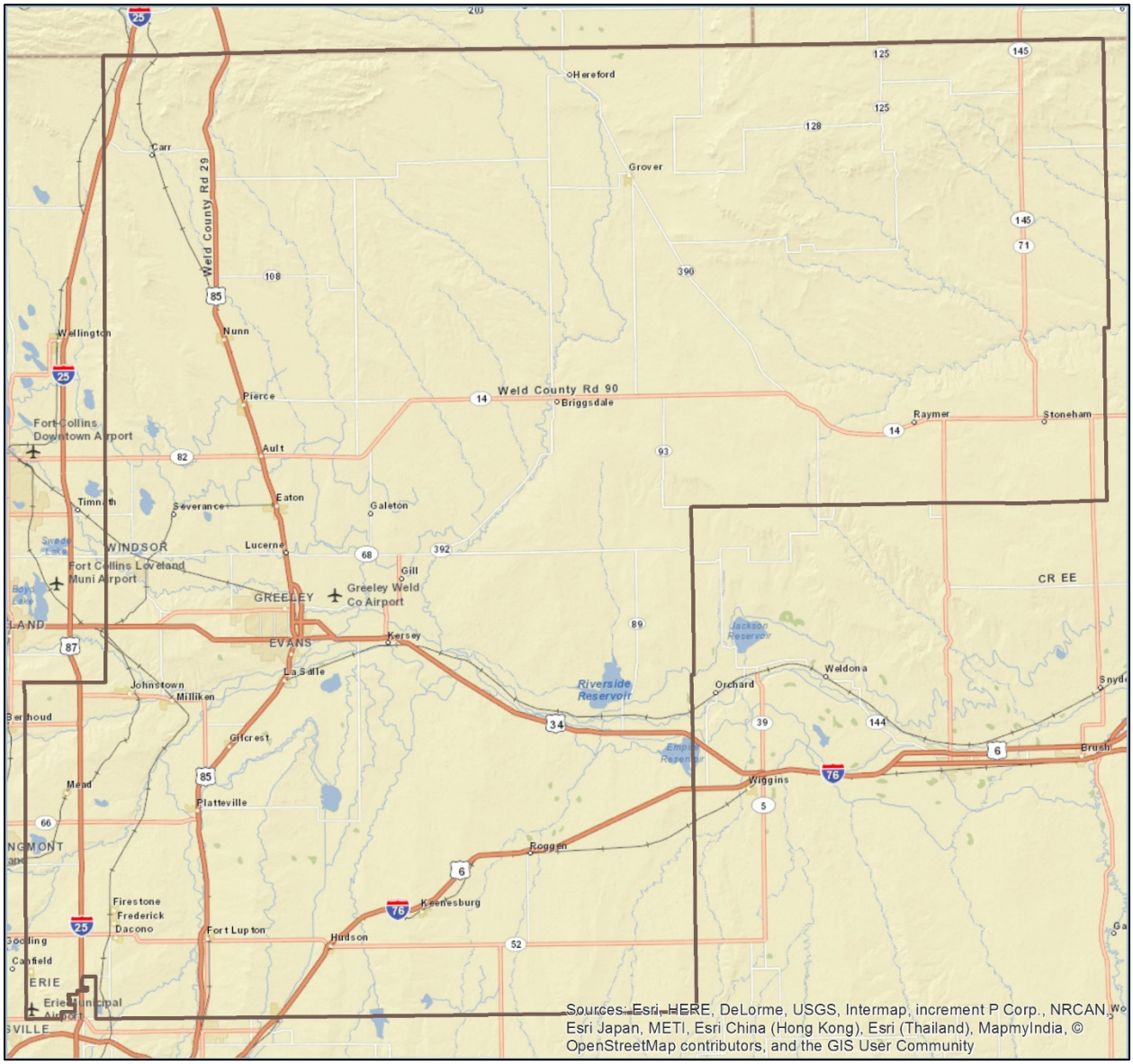
Figure 16. Map of Weld County



Weld County is relatively flat in terms of terrain and topography, as the northeastern portion contains the Pawnee National Grassland. The Pawnee Buttes, two prominent rock formations that stand out against the plains, can be seen while traveling through the Grassland. Two interstate highways run through the County: I-25 (US 87) runs through the southwestern and northwestern corner and I-76 from the south central edge northeastward to the Morgan County border. Other major transportation

routes include US 85 and US 34, which intersect near Greeley, as well as State Highway 14, which runs through Ault. Many of Weld County's incorporated cities and towns are located along these highway corridors although the County consists of numerous gravel roads that serve to connect communities to amenities.

Figure 17. Weld County Transportation Routes



The Platte and Cache la Poudre Rivers are the significant waterways in the County and the most important sources of water in the large, semi-arid region. The agricultural portions of western Weld County are fed by a system of irrigation canals. A broader mixture of land uses and greater concentrations of the population are located in the western third of the County, while the drier eastern landscape remains largely open, less populated, and more uniform in terms of land use.

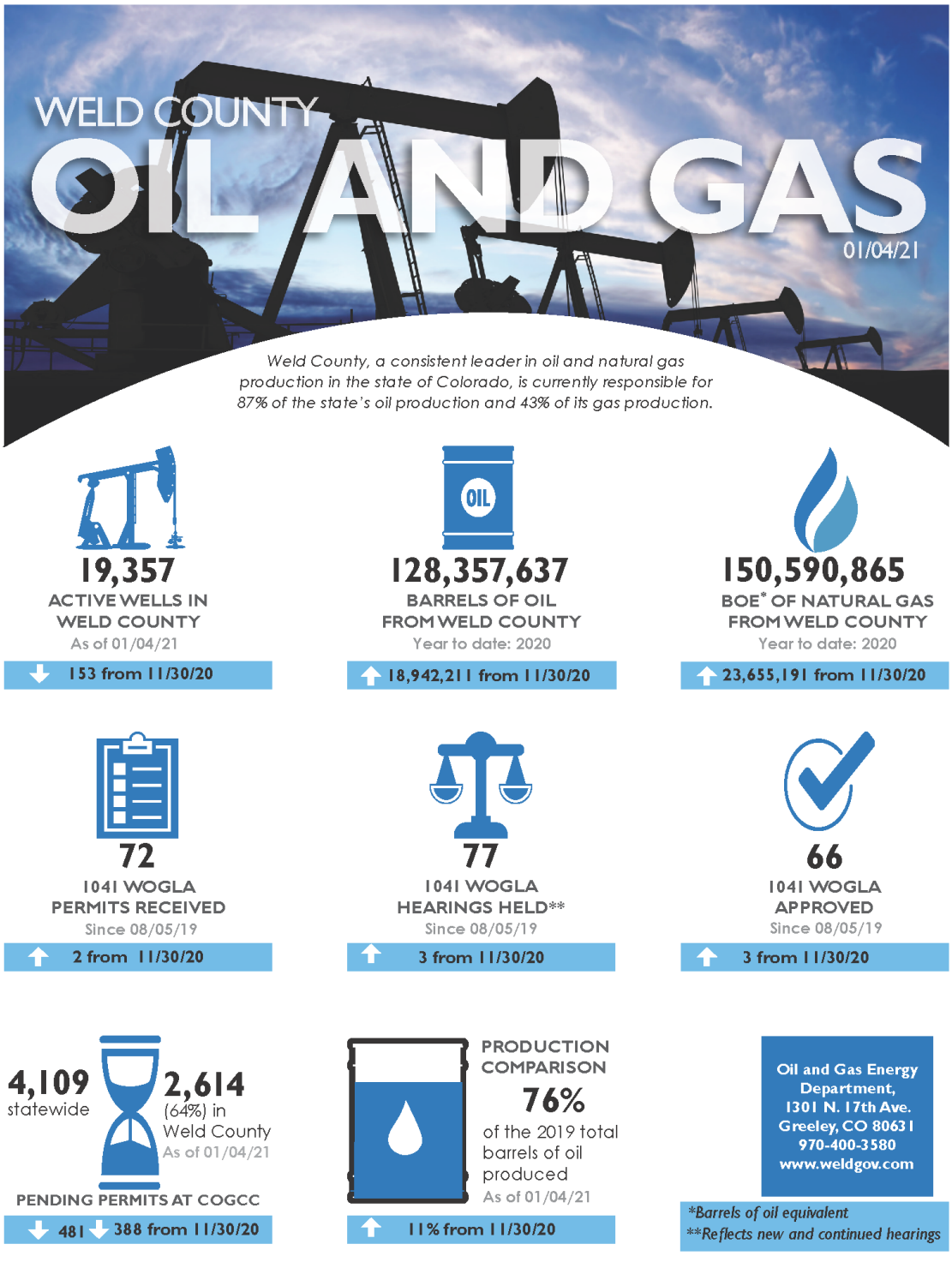
The rural region of the County holds historic resources, including archaeological and cultural sites. As of November 2019, Weld County has a total of 41 properties and districts listed on the National Register

of Historic Places and Historic Districts. Landmark buildings, historic structures and sites, as well as commercial and residential districts can be found in communities across Weld County.

Weld County is one of the top ten economically producing agricultural counties in the United States. Due to the dry climate, mild winters, and warm summers, the County leads the state in the production of grains, beef cattle, and sugar beets. Over eighty percent of Weld County's 2.5 million acres is devoted to agriculture. Weld County farmers are also the state's leading producers of potatoes, poultry, eggs, milk, dry beans, and other dairy products. There are over 4,000 farms in Weld County and the County's agricultural products create over $1 billion of market value each year.

The energy industry is another important driver of Weld County's economy. Due to its location above the Wattenberg Field, oil and gas extraction has been occurring for decades in Weld County. Currently, Weld County has more oil and gas wells than any other county in the state. The County's 2019 oil and gas revenue was $8.9 billion.

Figure 18. Oil and Gas Production Report (12/2020)



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The sheer size of the County's land area presents challenges related to the availability of resources. The distances which must be traveled sometimes delay emergency responses including law enforcement, ambulance, and fire. During a weather event, snow removal priorities mean that roads from subdivisions to arterials may not be cleared for several days. Rural residents are exposed to different hazards (and have different vulnerabilities) than urban or suburban residents and must be more self-sufficient by necessity. When developing and implementing a local hazard mitigation program, it is important to recognize the various differences for rural and urban communities.

4.1 Demographics

Weld County is a relatively young county, with a median population age of 34 years. Between 2010 and 2019 the population of the County grew by 28.3%. The current population of over three hundred thousand residents is expected to reach almost half a million by the year 2030.

Weld County is the ninth most populated county in Colorado. However, rapid growth in the last few years has established the County as one of the 100-fastest growing counties in the nation, according to the US Census. Planners anticipate that much of the coming growth will occur in southwest Weld County, along I-25 and along the southern stretch of US 85.

Table 15. Population Forecasts for Weld County, 2010 - 2050

Area	2010	2020	2030	2040	2050
Colorado	5,050,332	5,819,337	6,562,402	7,342,121	7,929,215
Weld County	254,230	331,895	425,999	550,178	678,612

Source: State Demography Office, Colorado (2020)

The key economic sectors for employment and income in Weld County are:

- Manufacturing
- Agriculture
- Energy Production
- Health and Wellness
- Business Service

Prior to the impact of Novel Coronavirus 2019 (COVID-19), the February 2020 unemployment rate in Weld County was 2.9%, slightly higher than the State unemployment rate of 2.5%. Per the most recent data, the September 2020 unemployment rate for the County was 6.6% and was slightly higher than the State unemployment rate at 6.4% (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 rapidly.

Weld County is adjacent to Adams County, Morgan County, Logan County, Boulder County, Larimer County, the City and County of Broomfield, Laramie County, WY, and Kimball County, NE. Many Weld County residents commute across county boundaries for work. This creates important emergency management considerations both pre- and post-disaster. The top five commuting destinations by workers living in Weld County are as follows (DRCOG Weld County Community Profile):

1. Larimer County
2. Boulder County
3. Denver County

4. Adams County
5. Arapahoe County

The table below provides an economic and demographic snapshot of Weld County.

Table 16. 2019 Economic and Demographic Snapshot

	Weld County
Population (2018 ACS)	324,492
Median Age	34
Median Household Income	$70,908
Unemployment Rate	2.7%
Percent of Population > Age 25 with Bachelor's Degree or Higher	26.7%
Percent of Population with High School Diploma Only	88.1%

Sources: 2019 Economic & Demographic Profile, Weld County, CO. Stats America, EMSI, BLS., U.S. Census Bureau, 2012-2018 American Community Survey

4.2 Community Inclusion

Community inclusion in preparedness, response, recovery and the mitigation of 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 and 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.

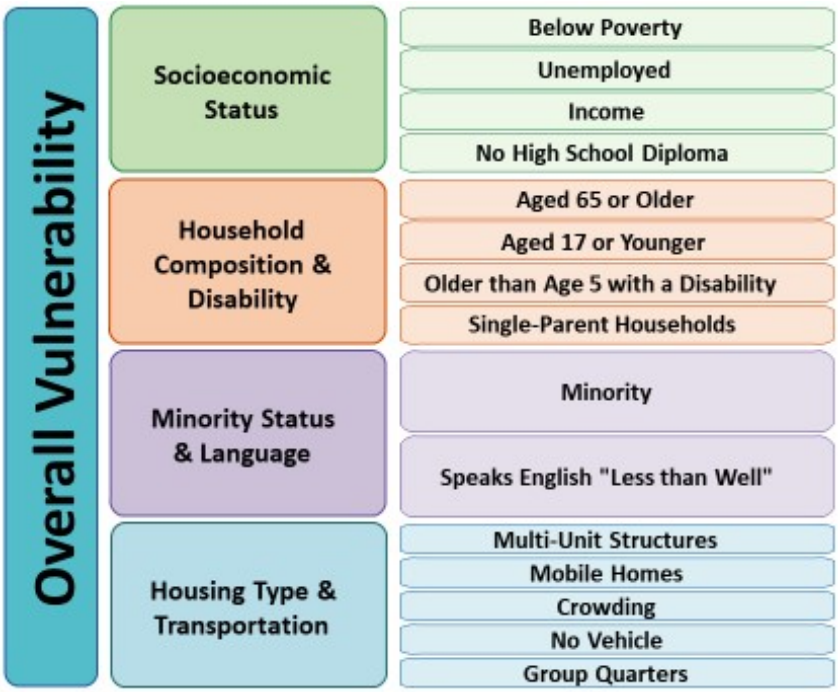
Impacts of hazards fall disproportionately on those with access and functional needs in a community, for example: low income or unemployed individuals, children, the elderly, those with disabilities, and underrepresented racial/ethnic groups. This can be seen in situations needing self-evacuation which 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 into 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.

The Plan update integrates community inclusion by assessing the needs of 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 Weld 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.

Figure 19 was taken from the CDC and illustrates the characteristics within each category for social vulnerability, as well as community inclusion. Social conditions which can contribute to disaster losses can be identified by using social vulnerability indicators. These conditions present varied challenges for people and preparedness planning. All categories should be considered regardless of the perception of the vulnerability, as the impacts of a disaster will disproportionately affect those within these categories.

Figure 19. Overall vulnerability categories and factors



Source: US Census Bureau, American Community Survey (ACS), 2014-2018 (5-year) data

During the risk assessment and mitigation strategy development phases of the 2020 planning process, participating jurisdictions reviewed the social indicator data and maps. The community inclusion information allowed communities to recognize areas with more people with access and functional needs and better prioritize their local mitigation actions. This information also helped communities design effective and appropriate local risk communication and hazard mitigation outreach activities.

The CICO maps are capable of zoning into specific municipalities and communities, where information breakdowns for the community inclusion data can be seen at a local level. The maps can be found here:

http://www.cohealthmaps.dphe.state.co.us/colorado_community_inclusion/

The maps seen in Figure 20-Figure 25, for Weld County are a visual representation of some of the critical groups for community inclusion. These maps are based on US Census Bureau data and are broken into census tracts.

Figure 20. Overall % with a disability (mobility, cognitive, hearing, vision, self-care and independent living)

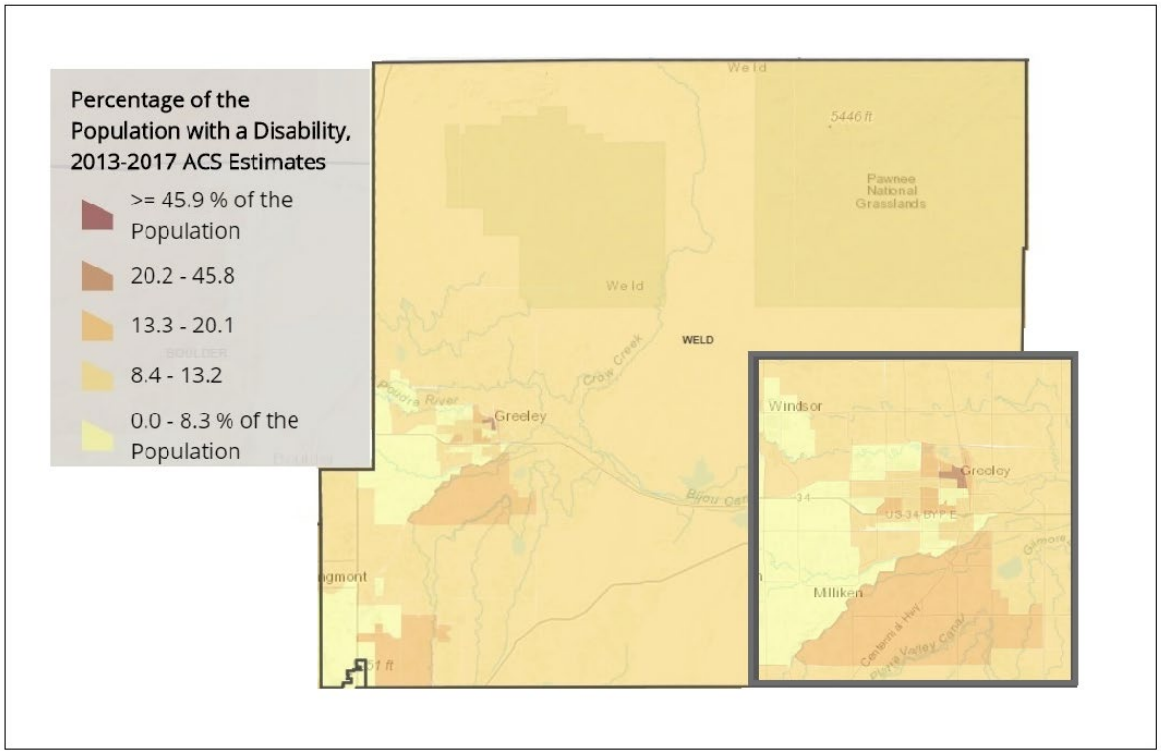


Figure 21. Overall % of people over age 65

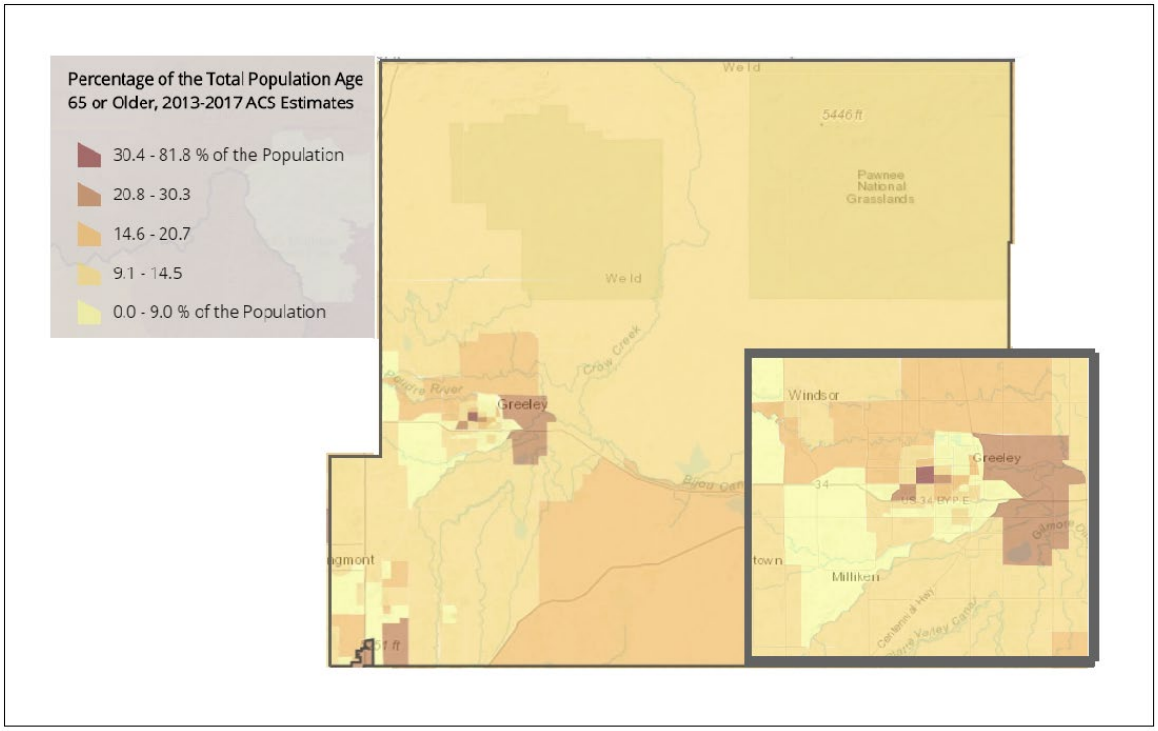


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Figure 22. Overall % of people that speak English less than well

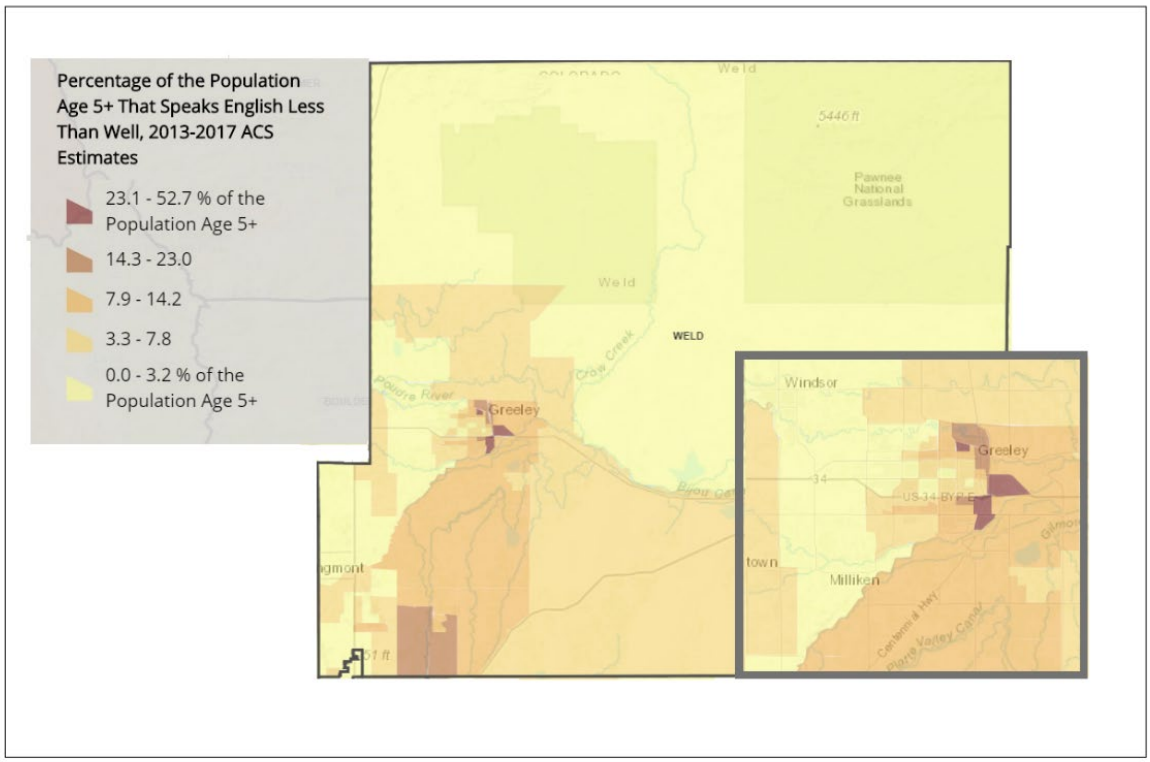

Figure 23. Overall % of people with income below poverty level

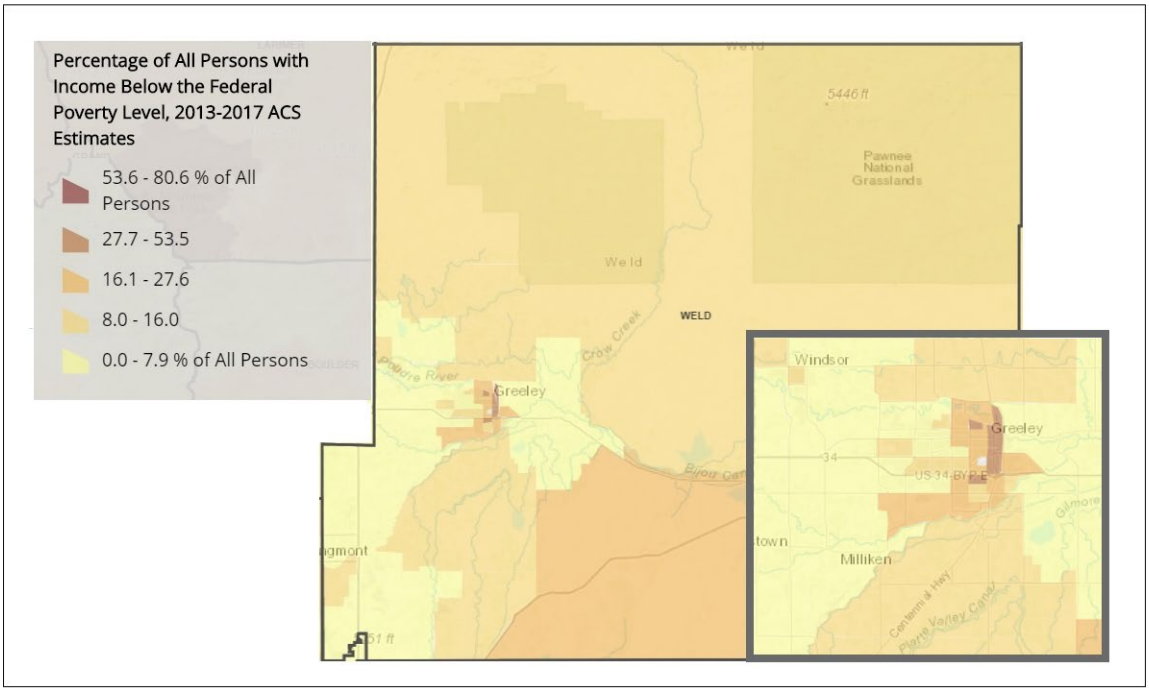

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Figure 24. Overall % of housing that are mobile homes

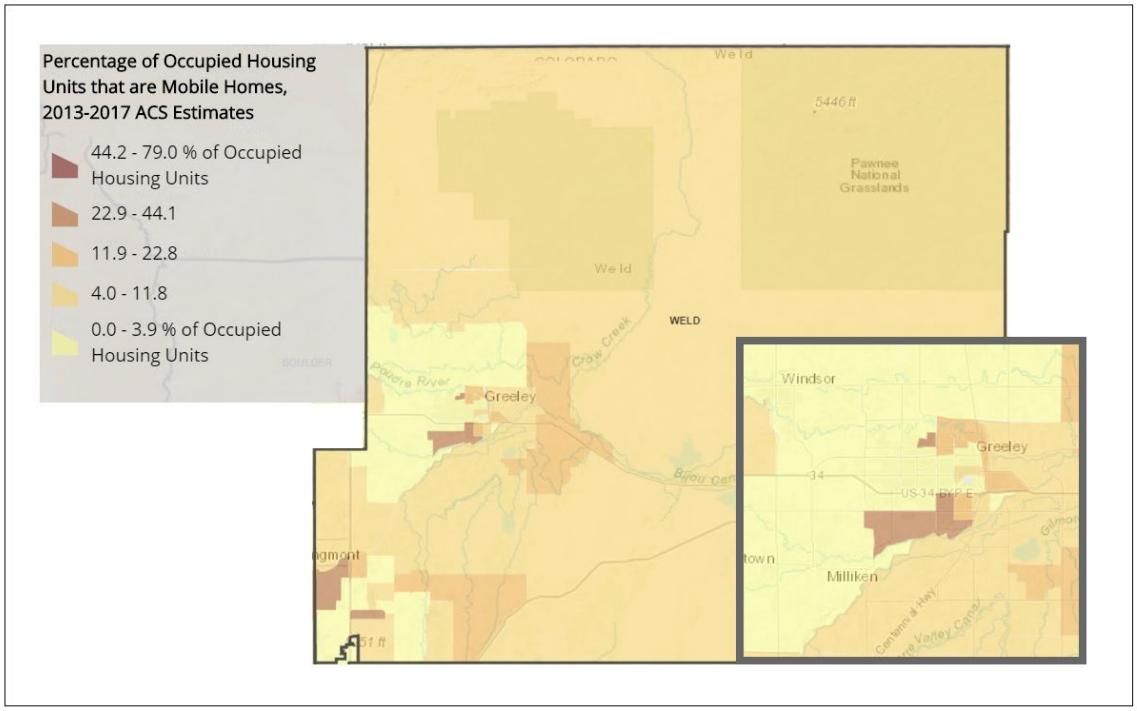
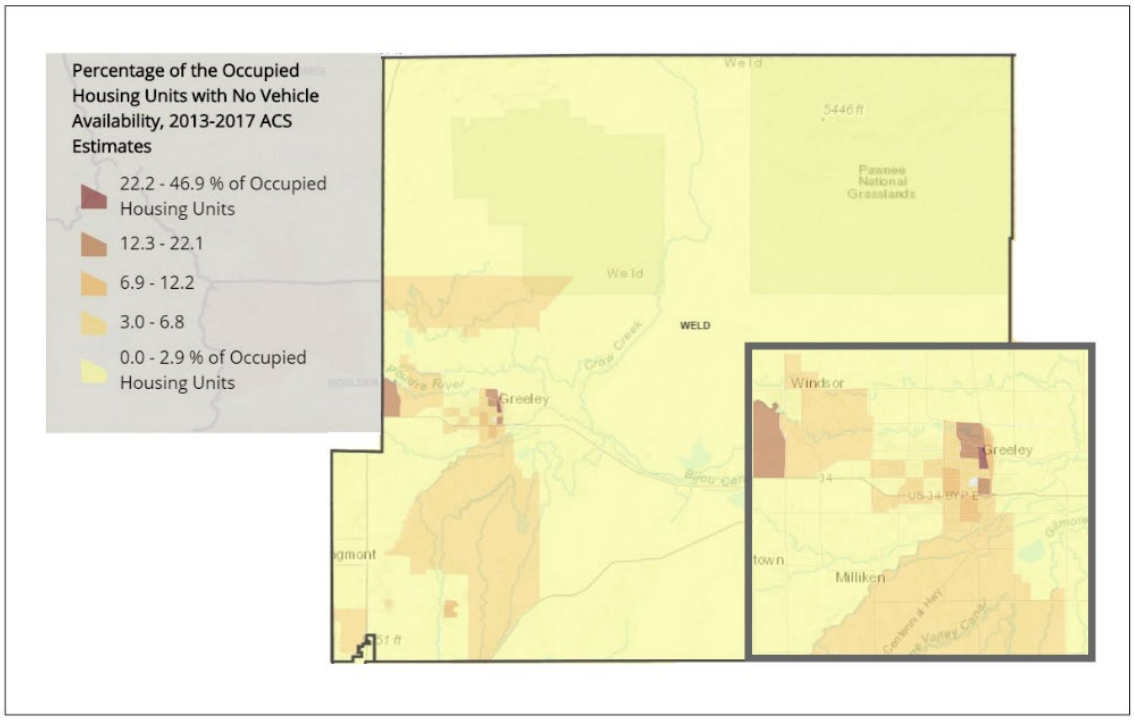


Figure 25. Overall % of households with no vehicle



EMERGENCY MANAGEMENT

4.3 Housing Stock

Colorado Department of Local Affairs keeps data on housing status throughout the state. The Housing Snapshot, in Table 17, highlights the variations and similarities for housing between the state and Weld County.

Weld County's low rental vacancy rate means that as population growth continues to surge, rents are likely to increase, putting pressure on the labor force and potentially leading to more commuters into the County.

Table 17. 2019 Housing Data for Weld County and Colorado

	Weld County	Colorado
Total Housing Units	116,710	2,464,109
Average Household Size	2.78	2.56
Group Quarter Proportion*	4.3%	4.8%
Vacancy Rate	1.9%	4.6%

Source: Colorado Department of Local Affairs (DOLA), U.S. Census Bureau, American Community Survey 2019

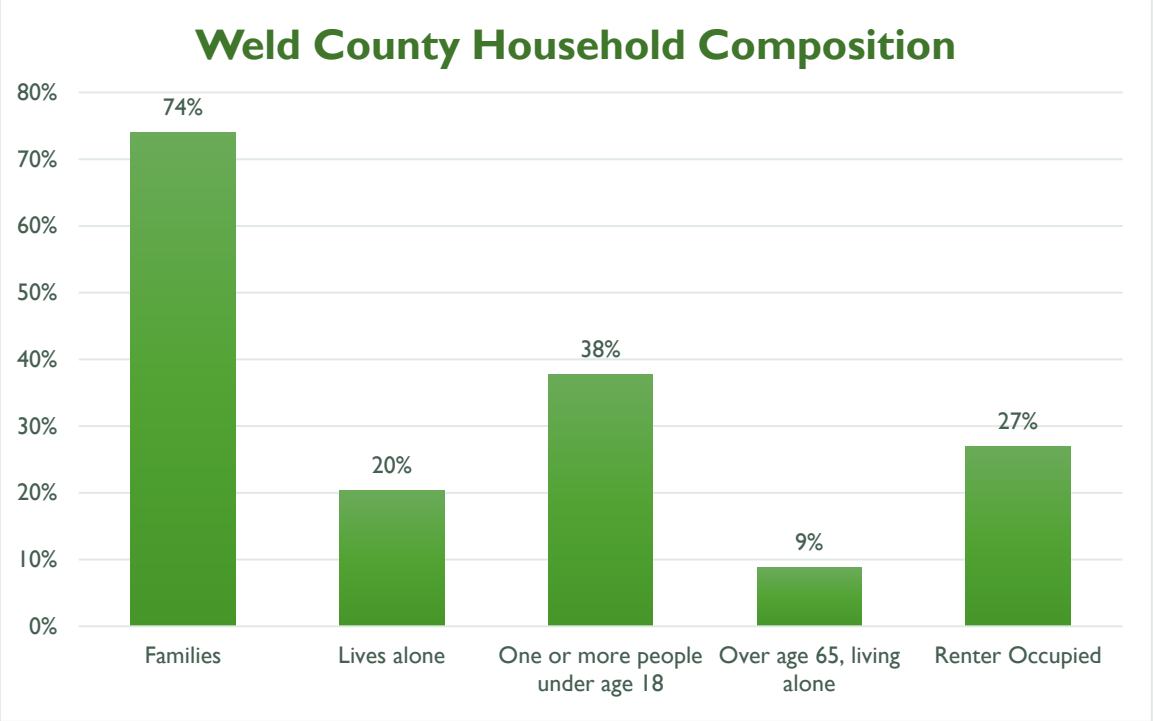
** - Group quarter populations include those living at shelters, care facilities, college campuses, correctional facilities, etc.*

One in three households, or an estimated 35,013 households, in Weld County are defined as "Housing Cost-Burdened Households."[1] These are defined as any household that spends more than 30% of its income on housing. The number of households that are housing cost-burdened has various impacts on a community. For those in the household, the economic strain can result in difficult decisions regarding basic needs such as food and health care. Community members who are struggling in this respect are less likely to invest time and resources into personal disaster preparedness and hazard mitigation activities.

Figure 26 gives insight into who makes up the Weld County households. Understanding not only who lives in your community, but what those households look like can offer awareness into the needs of the community. This is also a factor of community inclusion, knowing how people live can help when planning for public outreach and emergency communications.

[1] Source: Federal Reserve Bank of St. Louis, based on 2018 US Census Bureau, American Community Survey Data

Figure 26. Weld County Household Composition



Source: 2019 US Census Bureau, American Community Survey

4.4 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.

EMERGENCY MANAGEMENT

Each lifeline category has subcomponents which impact the functionality of the lifeline. The lifeline categories and subcomponents are:

- Safety and Security
  - Law Enforcement/Security
  - Fire Service
  - Search and Rescue
  - Government Service
  - Community Safety
- Food, Water and Shelter
  - Food
  - Water
  - Shelter
  - Agriculture
- Health and Medical
  - Medical Care
  - Public Health
  - Patient Movement
  - Medical Supply Chain
  - Fatality Management
- Energy
  - Power
  - Fuel
- Communications
  - Infrastructure
  - Responder Communications
  - Alerts, Warnings, and Messages
  - Finance
  - 911 and Dispatch
- Transportation
  - Highway/Roadway/Motor Vehicle
  - Mass Transit
  - Railway
  - Aviation
  - Maritime
- Hazardous Materials
  - Facilities
  - HAZMAT
    - Pollutants
    - Contaminants

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.

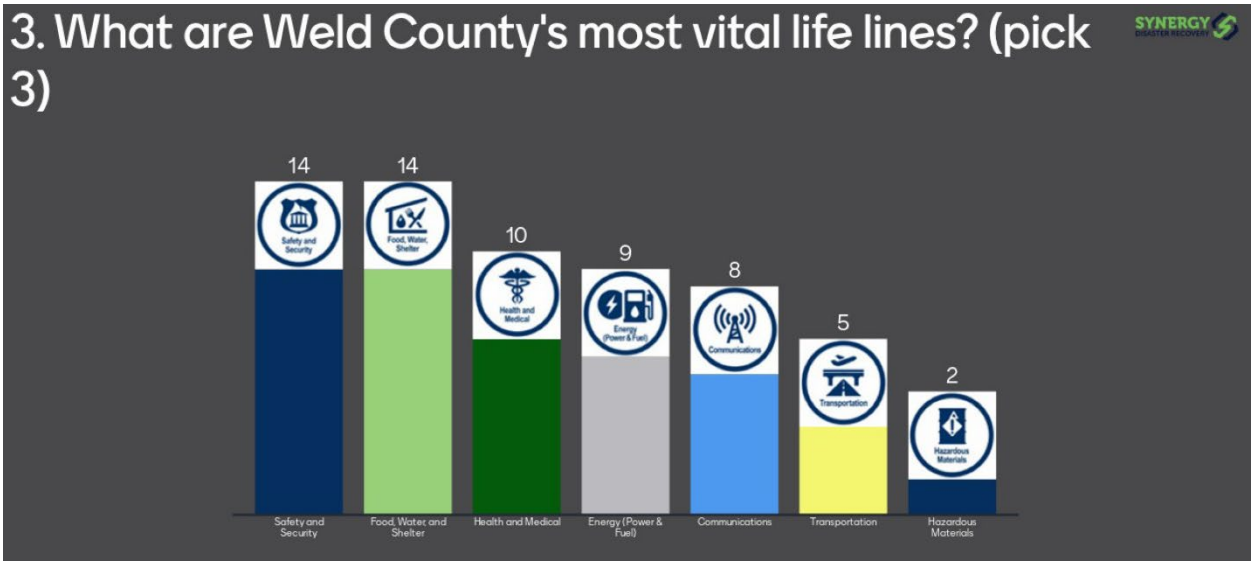
An important component to the lifeline framework is the ability to communicate disaster-related information across all levels of public, private, and non-profit sectors using commonly understood, plain language. This is vital to preparedness education, community engagement, and public outreach.

Weld County uses the Lifelines Framework as a base for emergency management planning, preparedness education, and mitigation planning. The County has worked closely with municipalities to determine the lifeline capabilities that must be considered when planning and the resilience of Lifelines to disruption.

By collecting data for the Lifelines in each community and determining the level of lifeline dependency, the County supports the creation of prioritized, community specific mitigation actions and system redundancies to minimize the impact of any lifeline disruptions.

During one of the HMPC workshops, a poll asked participants what they thought were the County's most vital Lifelines. Figure 27 presents these results, where Safety & Security and Food, Water, & Shelter were thought to be most important to the community, though all Lifelines are by definition vital and each received some votes.

Figure 27. Vital Lifelines HMPC Poll

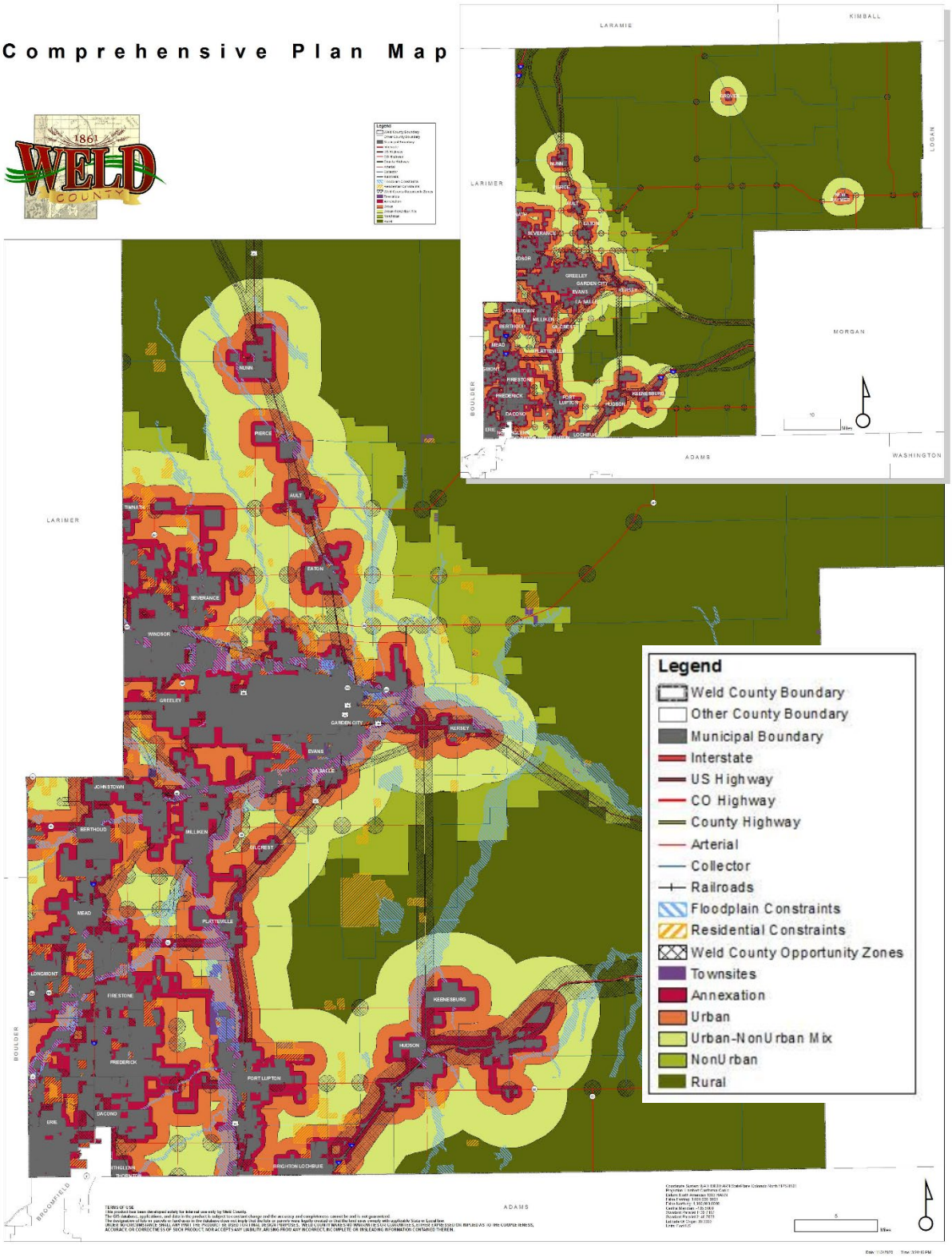


As part of the Plan's Mitigation Strategy, Lifelines and Subcomponents were identified and integrated into each jurisdiction's Mitigation Actions.

4.5 Future Development

A key strategy for reducing future losses in a community is to avoid development in known hazard areas while enforcing the development of safe structures in other areas. The purpose of this strategy is to keep people, businesses, and buildings out of harm's way before a hazard event occurs. The 2020 Weld County Comprehensive Map (Figure 28) highlights areas where future development can be expected. Commercial and industrial development required a zoning change and will be directed towards the identified Opportunity Zones. Residential development needs to be consistent with development scales shown.

Figure 28. 2020 Comprehensive Plan Map



The State Demography Office, a division of the Colorado Department of Local Affairs (DOLA), monitors population growth trends across the state and within counties. Projection data in Table 18 shows that the Weld County population will grow at roughly double the rate of the state population over the next two decades. As a proportion of the state's population, Table 19 shows Weld County's population is expected to increase by around 0.5% each year and by 2045 the County is estimated to make up about 8% of the state population. Currently, based on 2020 data, Weld County residents are an estimated 5.7% of the state population.

Table 18. Population Change Forecasts by Region and County, 2010 - 2050

	Average Annual Percent Change (5-year increments)							
	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50
Colorado	1.7%	1.9%	1.7%	1.4%	1.3%	1.1%	1.0%	0.8%
Weld County	2.2%	3.0%	3.2%	2.9%	2.6%	2.3%	2.1%	1.9%

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

Table 19. State Demographers Office Population Projections by Region and County (2010 – 2045)

	Population Projections (5-year increments)						
	July, 2015	July, 2020	July, 2025	July, 2030	July, 2035	July, 2040	July, 2045
Colorado	5,439,290	5,819,337	6,132,563	6,562,402	6,970,549	7,342,121	7,658,761
Weld County	283,767	331,895	370,012	425,999	487,195	550,178	614,124

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

The first of the following maps (Figure 29) shows population growth rate forecasts for the state of Colorado. Weld County is expected to grow at a faster rate than the majority of Colorado counties between now and 2040. The second map (Figure 30) shows projected population change across the state between 2010 and 2040.

Figure 29. Average Annual Percent Change in Population, Statewide

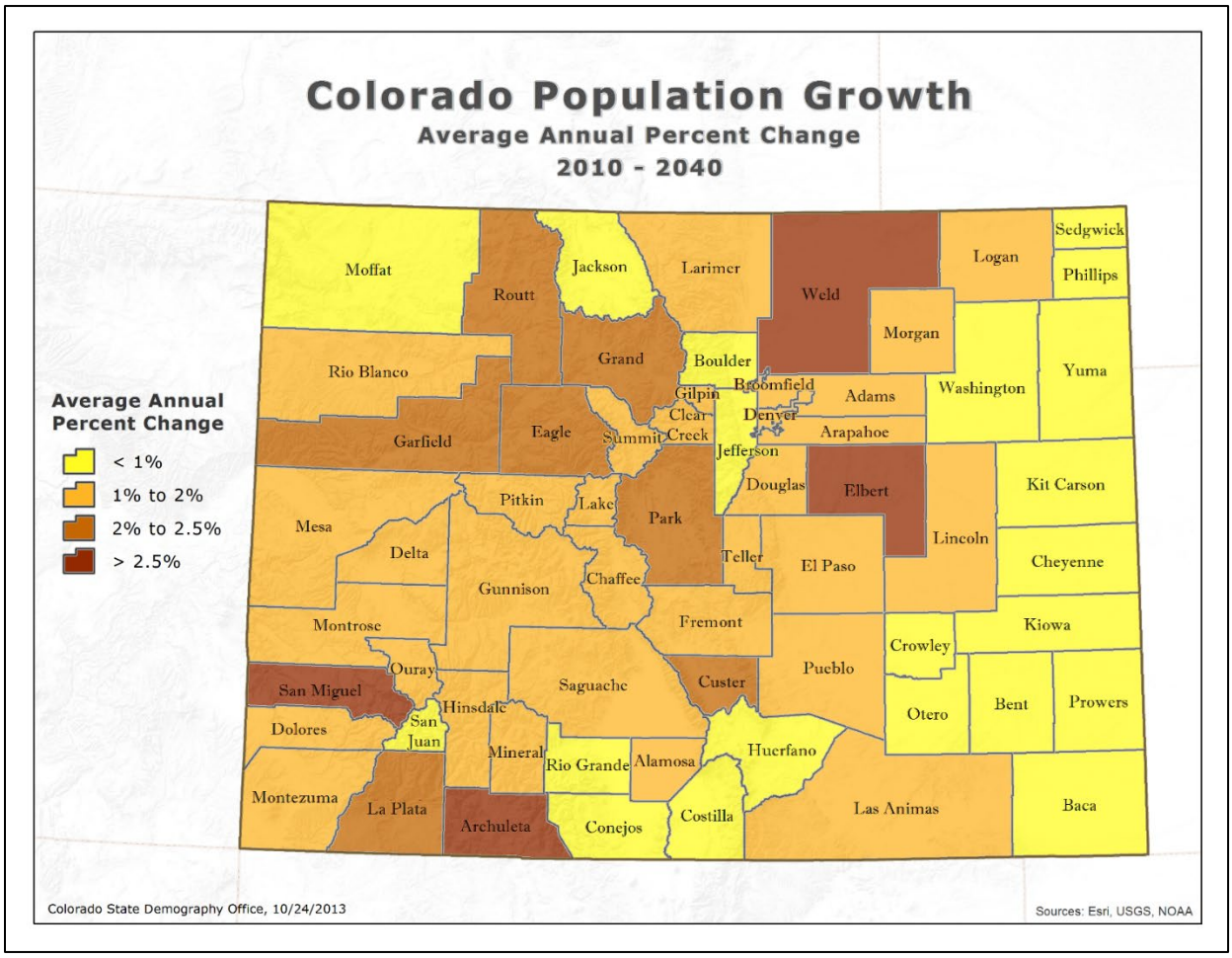
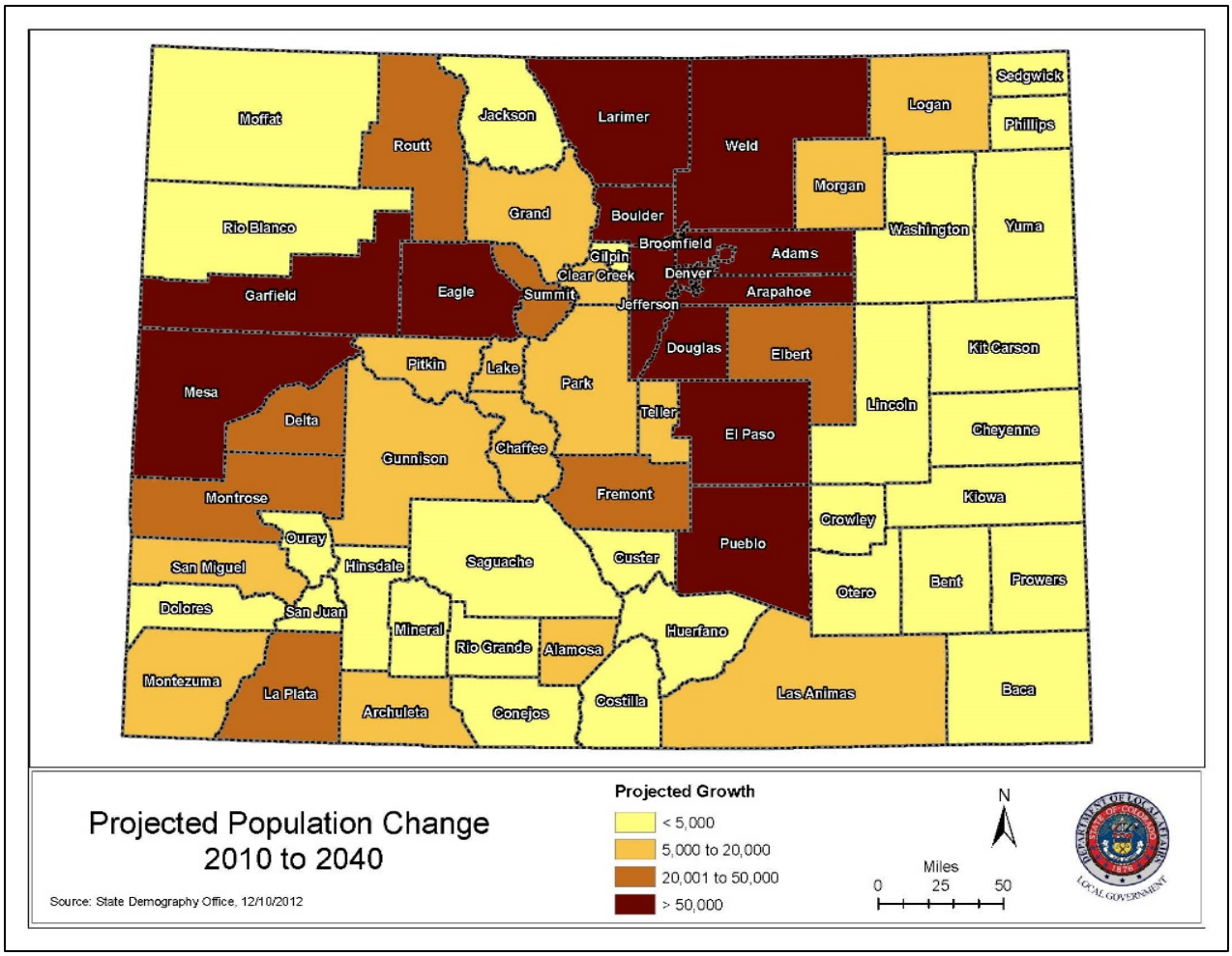


Figure 30. Projected Statewide Population Growth



Weld County has grown significantly in the past decade and is one of the fastest growing counties in the State. The amount of growth that Weld County has seen over the past decade has been dictated by the availability of undeveloped land. Based on observed population growth trends, housing demand within Weld County is expected to remain steady over the next decade.

Since the adoption of the 2016 Plan, new residential and commercial development has continued to occur across the County. Table 20 depicts the number of new residential building permits issued annually in Weld County between 1990 and 2019. Most of the permit-issuing jurisdictions are municipalities, the remainder are county offices.

Based on this permit data, Weld County has had fluctuating increases in issued permits between 2015 and 2019. The number of permits issued in 2016 drastically increased over those issued in 2015 by 790 permits or a 27% increase. The next highest increase in the same period was in 2018, with a 9.9% increase over the previous year. There was a 5.1% increase in 2017 and a 7.6% increase in 2019.

The number of units permitted year over year differed substantially, as well. In 2016, there was a decrease in unit permits issued of -5.8%. The rest of the time period saw varied growth between 6.3% and 17.5%.

Table 20. Annual New, Privately-Owned Residential Building Permits Issued in Weld County

Year	Permits/Buildings	Units
2019	3,668	4,387
2018	3,389	4,107
2017	3,051	3,646
2016	2,893	3,009
2015	2,103	3,186
2014	2,053	2,708
2013	1,650	1,935
2012	1,192	1,241
2011	807	889
2010	802	863
2009	726	761
2008	867	980
2007	1,572	1,847
2006	2,609	2,922
2005	4,127	4,279
2004	3,915	4,414
2003	3,691	3,963
2002	3,891	4,411
2001	3,991	4,301
2000	4,001	4,369
1999	3,413	3,557
1998	2,839	3,069
1997	1,832	2,117
1996	1,710	1,856
1995	1,326	1,470
1994	1,103	1,164
1993	862	965
1992	511	521
1991	335	357
1990	256	271

Source: U.S. Census Bureau, Building Permits Survey, Colorado Department of Local Affairs (DOLA)

5 Risk Assessment

5.1 Introduction

A key step in preventing future disaster losses in Weld County is developing a comprehensive understanding of the hazards that pose risks to local communities. The following terms facilitate comparisons between communities and can be found throughout the Plan.

Table 21. Key Risk Assessment Terminology

Hazard:	Event or physical conditions that have the potential to cause fatalities, injuries, property damage, infrastructure damage, agricultural loss, damage to the environment, interruption of business, other types of harm or loss
Risk:	Product of a hazard's likelihood of occurrence and its consequences to society; the estimates impact that a hazard would have on people, services, facilities, and structures in a community
Vulnerability:	Degree of susceptibility to physical injury, harm, damage, or economic loss; depends on an asset's construction, contents, and economic value of its functions

Source: Federal Emergency Management Agency, 2001

The Hazard Identification and Risk Assessment (HIRA) summary is a method for evaluating risk as defined by probability and frequency of occurrence of a hazard event, exposure of people and property to the hazard, and consequences of that exposure. Different methodologies exist for assessing the risk of hazard events, ranging from qualitative to quantitative approaches.

Weld County and its communities are vulnerable to a wide range of natural and human-caused hazards that threaten life and property. The hazards identified by the HMPC for inclusion in the Plan are those determined to be of actual potential threat to Weld County and its municipalities. They are consistent with the hazards identified by the State of Colorado and the Federal Emergency Management Agency for this part of the State and this region of the country. The hazards profiled for the 2021 Plan include:

- Agricultural Hazards (Including Disease & Pests)
- Cyber Hazards
- Drought
- Earthquake
- Extreme Temperatures
- Flood (Including Dam & Levee Failure)
- Hazmat Release
- Land Subsidence
- Prairie Fire
- Public Health Hazards
- Severe Storm (Including Hail, Lightning, & Winter Storm)
- Tornado & Straight-Line Wind

The HMPC agreed to add Agricultural Hazards and Cyber Hazards to this updated Plan. All other hazards were included in the 2016 Plan. Some of these hazards can be interrelated (for example, severe

storms can cause flooding, drought can lead to wildfire), and thus discussion of these hazards may overlap where necessary throughout the Risk Assessment.

5.2 Disaster Declarations

The following table presents a list of all federal FEMA disaster and emergency declarations that have occurred in Weld County since 1953. This list presents the foundation for identifying what hazards pose the greatest risk to the County and to its local jurisdictions. Weld County has experienced 16 declarations in total, with only two (both relating to the current COVID-19 pandemic) occurring since the last Plan update.

Table 22. Federal FEMA Disaster and Emergency Declarations in Weld County

Declaration #	Date	Event Details
FEMA-4498-DR	1/20/2020 – present	COVID-19 pandemic
FEMA-3436-EM	1/20/2020 – present	COVID-19 pandemic
FEMA-4145-DR	09/14/2013	Severe Storms, Flooding, Landslides, and Mudslides
FEMA-3365-EM	09/12/2013	Severe Storms, Flooding, Landslides, and Mudslides
FEMA-1762-DR	05/26/2008	Severe Storms and Tornadoes
FEMA-3224-EM	09/05/2005	Hurricane Katrina Evacuation
FEMA-EM-3185	04/09/2003	Snowstorm
FEMA-1421-DR	06/19/2002	Wildfires
FEMA-1374-DR	05/17/2001	Severe Winter Storms
FEMA-1276-DR	05/17/1999	CO Flooding 4/30/1999
FEMA-1186-DR	08/01/1997	Severe Storms, Heavy Rain, and Flash Floods, Flooding, Mudslides
FEMA-517-DR	08/02/1976	Severe Storms and Flash Flooding
FEMA-385-DR	05/23/1973	Heavy Rain, Snowmelt, Flooding
FEMA-379-DR	05/08/1973	Dam Failure
FEMA-261-DR	05/19/1969	Severe Storms, Flooding
FEMA-200-DR	06/19/1965	Tornadoes, Severe Storms, Flooding

Source: FEMA Disaster Declarations Summary

Additionally, the county has experienced U.S. Department of Agriculture (USDA) Secretarial Disaster Designations. There have been eight crop years since 2006 when Weld County received such designations. Additional details can be found in the Drought Profile (Table 37).

The following table presents state disaster declarations that have impacted Weld County. There have been four declarations since the last Plan update. One concerns the ongoing global COVID-19 pandemic, another was a statewide wildfire declaration, and the other two related to winter storms.

Table 23. State Disaster Declarations in Weld County

Year	Hazard	Statewide?
2020	COVID-19 pandemic	X
2017	Snow, heavy rains	
2017	Wildfire	X
2016	Blizzard	

Year	Hazard	Statewide?
2014	Extreme weather	X
2013	Flooding	
2013	Winter storm	X
2009	Severe spring snowstorm	X
2009	Severe blizzard	X
2008	Severe tornadoes	
2003	Snow emergency	X
2002	Wildfires	X
2002	Drought	X
1999	Flooding, landslides, mudslides	
1997	Flooding	
1995	Flooding	
1994	Wildfires	X
1986	Winter storm	
1982	Severe winter storm	
1981	Tornadoes	
1981	Dam safety	
1980	Flooding	
1980	Grasshopper infestation	

Source: CO State Hazard Mitigation Plan, Governor Executive Orders

5.3 Update Summary

As part of this Plan's five-year update, the risk assessment was updated across this document as best available data allowed. The HMPC also revisited the hazard risk rankings performed in 2016 and have updated these accordingly.

Additionally, the County utilized data analytics to improve the quantitative risk assessment and serve as an additional input into community risk assessments.

5.3.1 Hazard Events Since 2016 Plan

The following section details the larger hazard events that have occurred across Weld County since development of the 2016 Plan's risk assessment.

5.3.1.1 Events Summary

Table 24 presents summary information relating to hazard events that have occurred since the previous Plan update in 2016. This is the best available data, as sourced from the HMPC and available hazard databases and resources. It is important to note that this only includes hazard events that have been reported and is not a full picture of the occurrences of less disruptive hazard events.

Table 24. Hazard Event Summary (2015 – 2020)

Hazard	Count	Deaths	Injuries	Property Damages	Crop Damages
Flood	10	0	0	$1.57 M	$425 K
Flood (Dam Failure)	1	0	0	$0	$0
Public Health Hazards (COVID-19)	1	145	0	$0	$0
Severe Storms (Hail)	248	0	0	$15 K	$0
Severe Storms (Lightning)	1	0	0	$5 K	$0
Severe Storms (Winter)	42	0	0	$0	$0
Tornado	25	0	0	$0	$0
Wind	74	0	1	$300 K	$0

Source: NOAA (1/1/2015 – 6/30/2020), Weld County (COVID losses current as of 12/10/2020)

5.3.1.2 Damaging Events

Additional details relating to reported losses from damaging hazard events since the 2016 Plan are presented below.

Table 25. Damaging Events (2015 – 2020)

Date	Hazard	Location	Property Damages	Crop Damages
3/11/2020 (ongoing)	Pandemic, Cascading Public Health Issues	Global	$0	$0
COVID-19 is caused by infection with a new coronavirus, SARS-CoV-2. As of this plan's writing, this global pandemic continues to rage on. As of 12/10/2020 there have been 16,578 reported cases across Weld County, resulting in 145 deaths. While not causing direct damages to any property or crops, this virus has caused major impacts to local economies. Additional details will be added in future plan updates when the pandemic has ended.				
9/25/2020	Flood (Dam Failure)	Johnstown	$0	$0
On 09-25-2020 Weld OEM was informed of a dam failure at Johnstown Reservoir. The State Dam Inspector was doing an inspection and noticed it was leaking badly. The reservoir was near capacity. An evacuation was not needed however it required an urgent response. The Emergency Response Plan was activated. At 12:35 a conference call took place between Weld OEM, FRFR, Town of Johnstown, Public Works, and members of the State Division of Water Resources. The plan was to stop the leak in the short term, and a long term solution would be coordinated between the Town and State. No injuries, no deaths were reported. Front Range Fire Rescue arrived at 14:41 and proceeded to reduce the leak to a manageable level. Town staff worked with dam safety personnel to arrange for a more permanent fix to be completed the following morning. No property damage dollar amount is available at this time. Long term repairs have not yet been completed. Public works estimates they will be completed in 2021. Estimated cost for the repairs: $ 425k.				
6/18/2018	Flood, Hail, Lightning	Multiple	$10 K	$0
In Weld County, several communities received hail damage and flooding due to severe thunderstorms: Frederick, Firestone, Hudson, Keenesburg, and Prospect Valley. Lightning struck an				

Date	Hazard	Location	Property Damages	Crop Damages
injection well northeast of Hudson, sparking a fire. First responders worked this incident for several hours. Weld County had several road closures due to flash flooding including Hudson, Keenesburg, Roggen, and Prospect Valley. Some of the road closures included: County Road 46 from between County Roads 45 to 47, County Road 63 from County Roads 16 to 16.5. Trained spotters measured storm total rainfall from 2.93 inches to 5.53 inches. Several roads were damaged. The frontage road at Interstate 76 and Weld County Road 53 was inundated by floodwaters and completely washed. County Roads 16 and 63, and County Road 49 and State Highway 52 were partially flooded.				
5/8/2017	Hail, Flood, Lightning	Countywide	$505 K	$50 K
Hail and heavy rain clogged drains and caused flash flooding throughout Greeley. Up to three feet of water covered the roadway near U.S. 34 and U.S. 85. Flooding was reported throughout Greeley. The Greeley Fire Department received 30 calls of flooding. Firefighters helped several residents get out of garden level apartments that had flooded. Several other businesses and buildings suffered flood damage, including Greeley City Hall and an apartment complex in Evans. The Greeley Mall was extensively damaged when water poured into the mall from the roof and debris inundated the main floor. The Frontier Academy Elementary School was also flooded, with administrators canceling classes the following day to clean up the damage. Windsor-Severance Fire Protection District had multiple reports of lightning strikes, including one that hit near Windsor Middle School and set off the school's fire alarms.				
3/7/2017	Wind	Countywide	$100 K	$0
Strong winds blew over a semi-tractor trailer on Interstate 25 near the Wyoming border, no injuries were reported. The high winds and very dry conditions continued across the northeast plains of Colorado. In west Greeley, a building under construction completely collapsed. The 5,000 square-foot addition to a church swayed under the force of the wind then collapsed. Some of the debris pinned a construction worker; he suffered minor injuries. Peak wind gusts included: 66 mph, 4 miles southwest of Sterling; 64 mph at Briggsdale and Crook; 63 mph, 8 miles south of Holyoke; 62 mph, 8 miles south-southwest of Grover; 60 mph, 2 miles south-southeast of Denver International Airport; 58 mph at Akron Municipal Airport and 55 mph at Greeley Airport.				
8/19/2016	Hail	Multiple	$15 K	$0
Severe thunderstorms also produced damaging wind and hail across parts of Adams, Larimer, Lincoln and Weld Counties. Large hail dented cars, damaged shingles and broke windows.				
7/17/2016	Flood, Hail	Multiple	$5 K	$10 K
Severe thunderstorms produced large hail, from 1 to 2 inches in diameter; along with intense straight-line winds. Flash flooding was also observed 10 miles northeast of New Raymer. The combination of heavy rain and hail produced flash flooding along small creeks and streams.				
6/13/2015	Flood, Hail	Multiple	$15 K	$10 K
Flash flooding forced numerous road closures in and around Milliken and Platteville. Water, up to 3 ft deep, was observed at Division Rd and State Highway 66. State Highway 60 and Forest Rd were also closed due to floodwaters. Severe thunderstorms produced large hail, up to quarter size. Flash flooding was also observed which forced several road closures.				
6/2/2015	Flood	Multiple	$25 K	$50 K

Date	Hazard	Location	Property Damages	Crop Damages
A prolonged period of heavy rainfall coupled with snowmelt produced flooding along the Cache La Poudre and South Platte Rivers. The Cache la Poudre near Greeley crested at 9.05 feet on the 13th. The South Platte River near Kersey crested at 11.24 feet on the 14th. Both the Cache La Poudre and South Platte Rivers crested over a foot above flood stage. In Greeley, 6th Avenue was closed due to flooding. The water levels forced the closure of Weld County Road 53. The waters also flooded some nearby homes and farmland.				
5/20/2015	Flood	Multiple	$500 K	$200 K
The Cache La Poudre and South Platte River rose above flood stage producing a prolonged period of minor to moderate lowland flooding. Numerous county roads along the rivers remain closed due to floodwaters.				
5/9/2015	Flood	Multiple	$515 K	$105 K
Areal flooding developed along the Cache La Poudre and South Platte River Basins as a combination of heavy rainfall and spring runoff inundated the region. The Cache La Poudre reached flood stage from the 10th to the 14th. The South Platte rose above flood stage at Kersey from the 9th to the 15th. Flooding resulted in numerous road closures in the vicinities of Barnesville, Briggsdale, Firestone, Frederick, Ft Lupton, Gill, Highland Lake, Keenesburg, Kersey, Mead, New Raymer, Riverside Reservoir near Masters, Roggen, Riverside Reservoir near Masters, and Windsor. The next day heavy rain produced additional flooding along already swollen creeks and streams in southwestern Weld County. Mandatory evacuations were ordered at the St. Vrain Campground in Weld County along with numerous roads closures across southern, central and eastern portions of Weld County.				

Source: NOAA (1/1/2015 – 6/30/2020)

The HMPC was also polled during a workshop on recent hazard events, which are summarized in Figure 31.

Figure 31. Recent Hazard Events HMPC Poll

5.3.2 Data Analytics

The risk analysis commonly relies on the expertise and industry knowledge of community-based planning teams, including local government officials, public stakeholders and county residents. While the knowledge and input from these community-based planning teams provides irreplaceable insight, a shift towards data-driven analyses and analytics can lead to significant improvements in the risk identification step.

Why is analytics beneficial? Analytics offers many advantages, including:

- Objective, data-driven outcomes;
- Flexible and open methods;
- Reproducible workflows and results;
- Easily updated analyses over time and after events; and
- Defensible outputs.

With the use of data analytics, the risk identification step is less subjective and the analysis can be easily updated, transferred, and explained. The outcome of the analysis is not dependent on the participation of individuals or on knowledge transfer between individuals – any turnover, retirements, etc. that may have occurred within the community over time will not affect the analyses. Also, once the analytics process is established, the analysis can be easily rerun with updated or new data without the need for time and labor-intensive events, such as planning meetings. The analytics framework allows for flexibility as existing parameters can be easily modified and new hazard types or datasets can be easily incorporated into the existing model. Further, the use of analytics allows for defensible outputs as all results can be tracked to data and calculated transformations.

Given the above advantages, a portion of the hazard risk analysis for Weld County uses data analytics and GIS technology. Specifically, a composite risk map for Weld County was created by inputting multiple hazard-specific datasets into a suitability model.

5.3.2.1 Suitability Model

The risk analysis for the updated Plan was performed using a suitability model that was created in the GIS software, Esri ArcGIS. In general, a suitability model is used to identify the most fitting areas based on specified criteria. The analysis holds value in a wide variety of sectors, including retail, housing, biology, and health, due to its flexibility and scalability. For example, park rangers can consider factors such as elevation, foot traffic, proximity to streams, and vegetative cover to identify areas for bear relocation that will reduce the chances of bear interactions with park visitors. Regardless of the application, a suitability model ingests desired criteria at varying weights and outputs corresponding scores based on how closely the area of analysis adheres to the criteria.

A suitability model was employed to answer the following question: Where are the areas of highest risk?

The suitability model was performed using a 1 kilometer by 1 kilometer resolution and the following workflow.

1. Determine and prepare the criteria data:
   The criteria data was gathered from over 10 different agencies, including NOAA, FEMA, USGS, EPA and CDPHE, to represent 9 different hazards. The datasets were also processed in various ways to derive necessary parameters; for example, annual snowfall data from the past 12 years was averaged to determine the average annual snowfall accumulation, while EPA RCRA facility

data was used to determine the minimum amount of hazardous waste being generated throughout the county.

2. Transform the values of each criterion to a common hazard scale:
   The data from the previous step was transformed to a common hazard scale of 1 to 9 with 1 denoting areas with the lowest hazard and 9 denoting areas with the highest hazard. One of three transformation methods: unique categories, range of classes, and continuous functions, was used for each dataset.
   - Unique categories: one-to-one matching of the criterion value to the hazard value that is best used for categorical data (e.g. FEMA flood zones)
   - Range of classes: ranges of values grouped into homogeneous classes are assigned the same hazard value (e.g. depth to mines)
   - Continuous functions: applies linear and non-linear functions to transform the values continuously to the hazard scale (e.g. distance to hazardous materials routes)
3. Weight criteria relative to one another and combine them to create a risk map:
   Each hazard type was weighted based on the population likely affected by the corresponding hazard.

5.3.2.2 Hazard Types

The Plan considers 12 hazard types, but due to the nature of some hazards and data limitations, the suitability model only included nine. For example, an appropriate data source to evaluate the cyber hazard was not available, while drought does not vary enough throughout the county to be appropriate for the model. The following table shows the 12 hazards of interest to Weld County and a reason for exclusion in the model, if applicable.

Table 26. Hazards Included in Suitability Model

Natural Hazard	Included	Exclusion Reason
Agriculture Hazards	Yes	
Cyber Hazards	No	Data Limitation
Drought	No	No Geographic Variability
Earthquake	Yes	
Extreme Temperatures	No	No Geographic Variability
Flood	Yes	
Hazmat Release	Yes	
Land Subsidence	Yes	
Prairie Fire	Yes	
Public Health Hazards	Yes	
Severe Storm	Yes	
Tornado & Straight-Line Wind	Yes	

For the hazard types included in the suitability model, Figure 32 details the data sources used in the model. The hazards were combined at varying weights to determine the composite risk, with the weights assigned based on the potential magnitude of the population that would be affected in the case of the respective hazard event. The general classes of affected population can be seen in Table 27.

Figure 32. Flowchart Illustrating the Composition of the Composite Risk Score; Population Data Used to Determine the Weights of Each Hazard

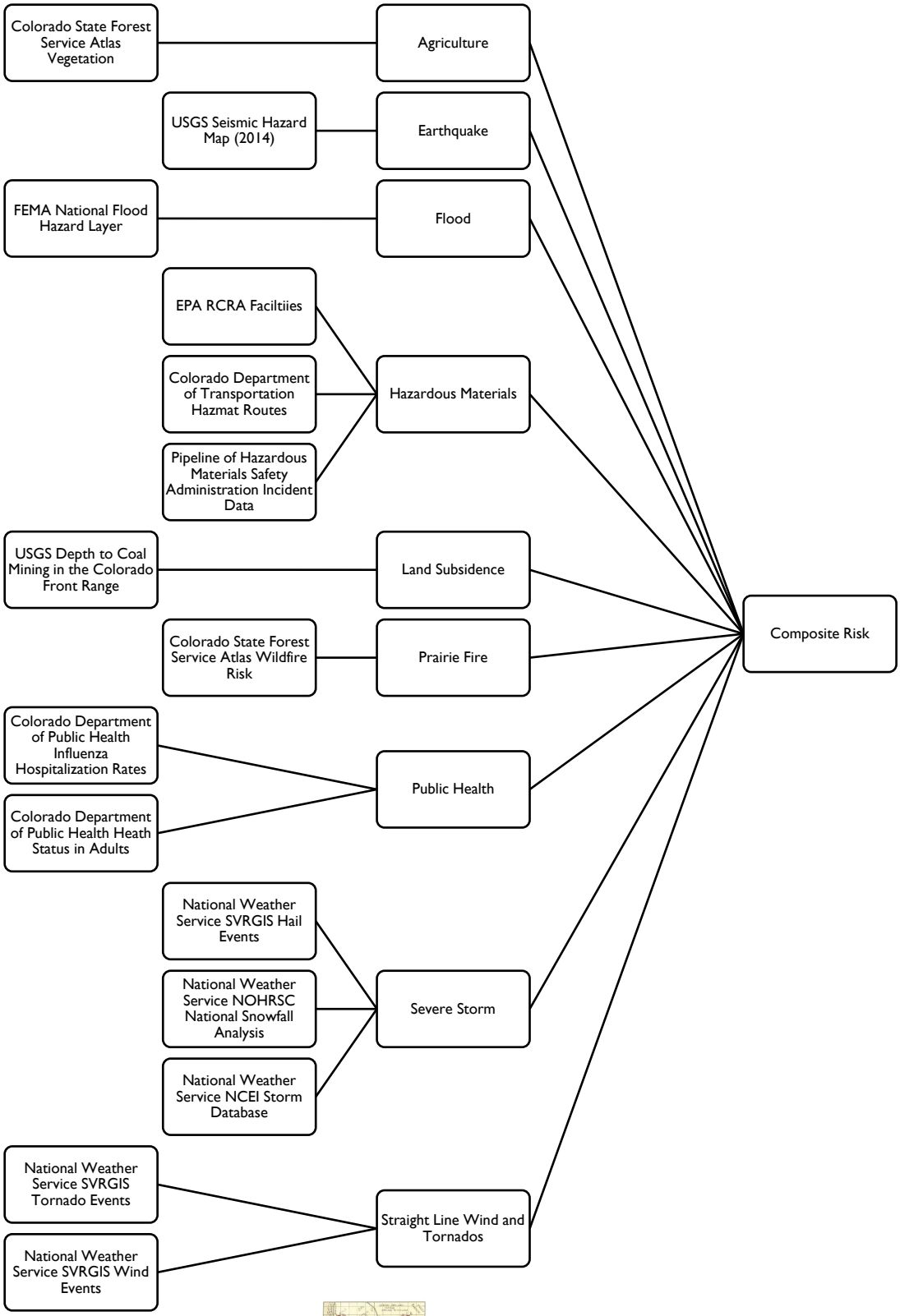


Table 27. Classes of Affected Population and Hazard Type

Percentage of Population Potentially Affected	Hazard Type(s)
50 to 100	Hazardous Material, Severe Storm, Straight-Line Wind/Tornado
15 to 50	Agriculture, Prairie Fire
5 to 15	Earthquake, Flood, Public Health
0 to 5	Land Subsidence

5.3.2.3 Analytic Results

Summary results are available below in Table 28 for the unincorporated County areas and 31 municipalities full or partially located within the County. In addition, the resulting composite risk layer from the suitability model can be seen visually in Figure 33. Further, the composite risk layer was combined with the County's social vulnerability index layer from the Centers for Disease Control and Prevention and can be seen in Figure 34.

Table 28. Composite Risk Across Jurisdictions

Town/City	Lowest Risk	Low Risk	Moderate Risk	High Risk	Highest Risk
Unincorporated County	15.20%	32.09%	23.21%	19.54%	9.95%
Ault	0.00%	0.00%	0.00%	25.00%	75.00%
Berthoud	0.00%	0.00%	21.43%	78.57%	0.00%
Brighton	0.00%	0.00%	0.00%	0.00%	100.00%
Dacono	0.00%	0.00%	0.00%	4.17%	95.83%
Eaton	0.00%	0.00%	0.00%	87.50%	12.50%
Erie	0.00%	0.00%	0.00%	4.65%	95.35%
Evans	0.00%	0.00%	0.00%	34.48%	65.52%
Firestone	0.00%	0.00%	0.00%	44.74%	55.26%
Fort Lupton	0.00%	0.00%	0.00%	21.21%	78.79%
Frederick	0.00%	0.00%	0.00%	22.86%	77.14%
Garden City	0.00%	0.00%	0.00%	21.92%	78.08%
Gilcrest	0.00%	0.00%	0.00%	0.00%	100.00%
Greeley	0.00%	0.00%	0.00%	25.38%	74.62%
Grover	100.00%	0.00%	0.00%	0.00%	0.00%
Hudson	0.00%	0.00%	0.00%	78.57%	21.43%
Johnstown	0.00%	0.00%	11.54%	84.62%	3.85%
Keenesburg	0.00%	0.00%	60.00%	40.00%	0.00%
Kersey	0.00%	0.00%	0.00%	83.33%	16.67%
La Salle	0.00%	0.00%	0.00%	100.00%	0.00%
Lochbuie	0.00%	0.00%	0.00%	0.00%	100.00%
Longmont	0.00%	0.00%	0.00%	56.25%	43.75%
Mead	0.00%	0.00%	9.09%	69.70%	21.21%
Milliken	0.00%	0.00%	15.63%	71.88%	12.50%
New Raymer	0.00%	100.00%	0.00%	0.00%	0.00%
Northglenn	0.00%	0.00%	0.00%	0.00%	100.00%

Town/City	Lowest Risk	Low Risk	Moderate Risk	High Risk	Highest Risk
Nunn	0.00%	0.00%	0.00%	35.71%	64.29%
Pierce	0.00%	0.00%	0.00%	60.00%	40.00%
Platteville	0.00%	0.00%	0.00%	100.00%	0.00%
Severance	0.00%	0.00%	0.00%	8.00%	92.00%
Timnath	0.00%	0.00%	0.00%	0.00%	100.00%
Windsor	0.00%	0.00%	0.00%	15.52%	84.48%

Figure 33. Composite Risk Score

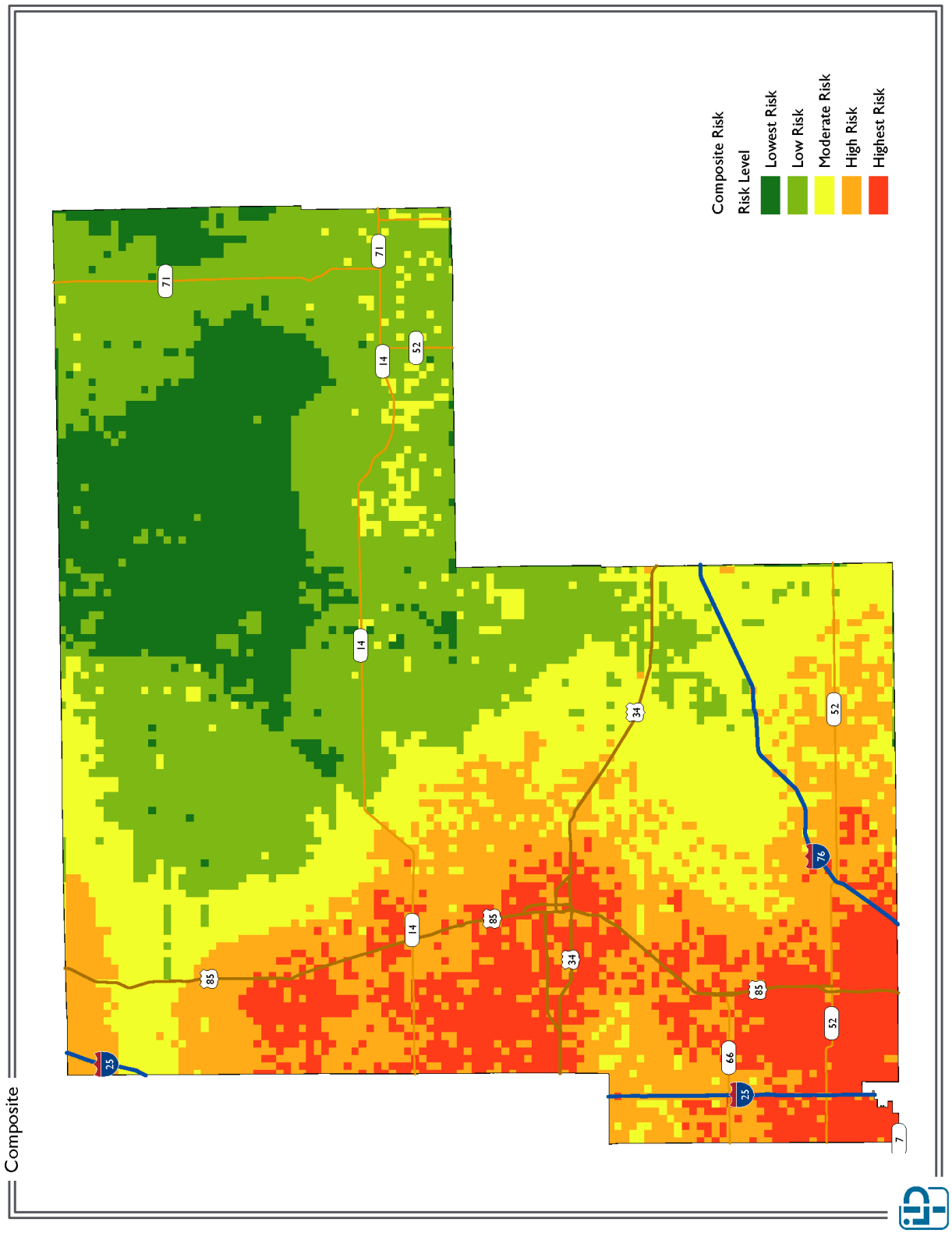


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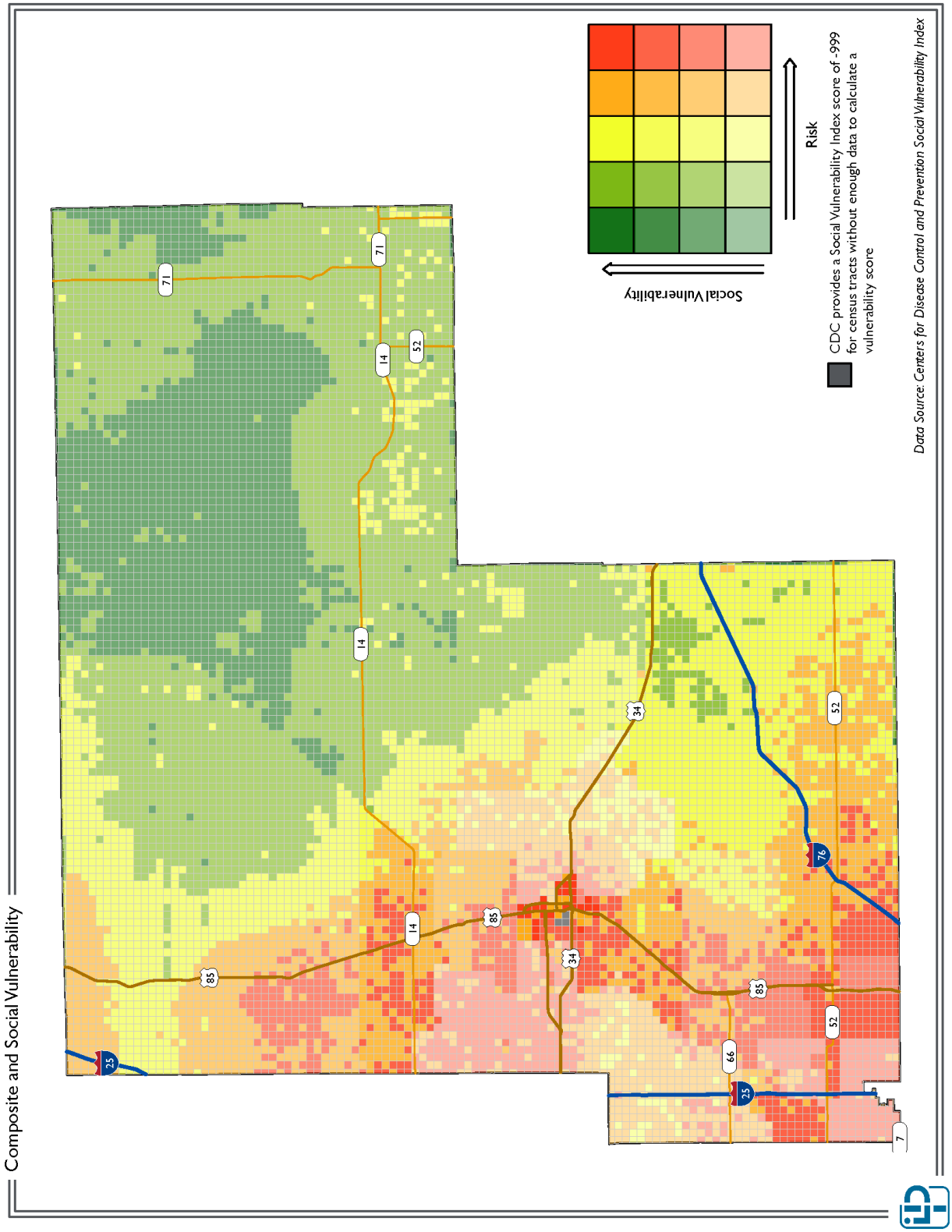
Figure 34. Composite Risk Score and Social Vulnerability



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Overall across both Figures, it is apparent that hazard risk varies across the County. This risk does somewhat align with more densely populated areas, though there are multiple additional factors at play. The intent of this data is to be used at a countywide scale, enabling communities to determine the relative hazard risk that they face compared to other Weld jurisdictions. This enables consideration of the question: "Why are we at higher risk than our neighboring communities and what is driving that risk?"

The individual hazard inputs into the suitability model are included across the applicable hazard profiles later in this chapter.

5.4 Hazard Rankings

Hazards were ranked in order to provide guidance during development of this Plan's updated mitigation strategy. This ranking was both quantitative and qualitative. First, the quantitative analysis considered all the historical and geospatial hazard-specific data available. Then, a qualitative method, the Risk Factor (RF) approach, was used to provide additional insights on the specific risks associated with each hazard. This process also served as a valuable cross-check and validation of the quantitative analysis performed.

The RF approach combines historical experiences, local knowledge, and consensus opinions to produce numerical values that allow identified hazards to be ranked against one another. For the 2021 Plan update, this same RF approach was followed.

RF values are obtained by assigning varying degrees of risk to five categories for each hazard: *probability, impact, spatial extent, warning time*, and *duration*. Each degree of risk is assigned a value ranging from 1 to 4 and a weighing factor for each category was agreed upon by the HMPC (documented in the following Table). Based upon any unique concerns for the planning area, the HMPC may also adjust the RF weighting scheme. To calculate the RF value for a given hazard, the assigned risk value for each category is multiplied by the weighting factor. The sum of all five categories equals the final RF value, as demonstrated in the following example equation:

RF Value = [(Probability x .30) + (Impact x .30) + (Spatial Extent x .20) + (Warning Time x .10) + (Duration x .10)]

Table 29. Risk Factor Criteria

Risk Assessment Category	Level	Degree of Risk Level	Index	Weight
PROBABILITY *What is the likelihood of a hazard event occurring in a given year?*	Unlikely	Less than 1% annual probability	1	30%
	Possible	Between 1 - 10% annual probability	2	
	Likely	Between 10 - 99% annual probability	3	
	Highly Likely	100% annual probability	4	
IMPACT *In terms of injuries, damage, or death, would*	Minor	Very few injuries, if any. Only minor property damage & minimal disruption of quality of	1	30%

Risk Assessment Category	Level	Degree of Risk Level	Index	Weight
you anticipate impacts to be minor, limited, critical, or catastrophic when a significant hazard event occurs?		life. Temporary shutdown of Lifelines.		
	Limited	Minor injuries only. More than 10% of property in affected area damaged or destroyed. Complete shutdown of some Lifelines for more than one day.	2	
	Critical	Multiple deaths / injuries possible. More than 25% of property in affected area damaged or destroyed. Complete shutdown of some Lifelines for more than one week.	3	
	Catastrophic	High number of deaths / injuries possible. More than 50% of property in affected area damaged or destroyed. Complete shutdown of some Lifelines for more than one month.	4	
SPATIAL EXTENT *How large of an area could be impacted by a hazard event? Are impacts localized or regional?*	Negligible	Less than 1% of area affected	1	20%
	Small	Between 1 - 10% of area affected	2	
	Moderate	Between 10 - 50% of area affected	3	
	Large	Between 50 - 100% of area affected	4	
WARNING TIME *Is there usually some lead time associated with the hazard event? Have warning measures been implemented?*	More than 24 hours	Self-defined	1	10%
	12 – 24 hours	Self-defined	2	
	6 – 12 hours	Self-defined	3	
	Less than 6 hours	Self-defined	4	
DURATION *How long does the hazard event usually last?*	Less than 6 hours	Self-defined	1	10%
	Less than 24 hours	Self-defined	2	

Risk Assessment Category	Level	Degree of Risk Level	Index	Weight
	Less than 1 week	Self-defined	3	
	More than 1 week	Self-defined	4	

According to the weighting scheme applied, the highest possible RF value is 4.0. The methodology illustrated above lists categories that are used to calculate the variables for the RF value.

The following table summarizes the results of the RF ranking exercise performed by Weld County. The results represent the relative risk of different hazards within the County from the perspective of local stakeholders and subject matter experts. Note the final RF Ranking values in this table include the weighting factors previously mentioned.

Table 30. Risk Factor Results for Weld County

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	RF Ranking
Agricultural Hazards	2	3	4	1	4	2.8
Cyber Hazards	3	3	3	4	3	3.1
Drought	3	2	3	1	4	2.6
Earthquake	2	1	2	4	1	1.8
Extreme Temps.	3	1	4	1	3	2.4
Flood	3	2.5	3	1	3	2.7
Hazmat Release	4	2	2	4	2	2.8
Land Subsidence	2	1	1	4	3	1.8
Prairie Fire	3	2	2	4	2	2.5
Public Health Hazards	3	2.5	3	4	4	3.1
Severe Storms	4	3	3	2	1	3.0
Tornado & Wind	3	1.5	2	4	1	2.3

The conclusions drawn from the qualitative assessment carried out by the HMPC are organized into three categories shown in Table 31 and provide a summary of hazard risk for Weld County as a whole - based on High, Moderate, or Low risk designations. This process helped frame ongoing planning discussions around local and regional hazard risks and assisted with the development of the Plan's updated mitigation strategy.

Table 31. Hazard Risk Conclusions for Weld County

HIGH RISK (2.5 or higher)	**Agricultural Hazards, Cyber Hazards, Drought, Flood, Hazmat Release, Prairie Fire, Public Health Hazards, Severe Storm**
MODERATE RISK (2.0 – 2.4)	**Extreme Temperatures, Tornado & Straight-Line Wind**
LOW RISK (1.9 or lower)	**Earthquake, Land Subsidence**

A majority of the hazards profiled in this Plan have been determined to be High Risk for the County. This is primarily due to the high probability of these hazards occurring, coupled with the wide spatial extent of their potential damages and impacts.

Comparing the updated ranking to those from 2016, many of the High Risk hazards remain the same, with the additions of the two newly profiled hazards (agricultural and cyber hazards). Two hazards previously considered Moderate Risk are now also rated as High Risk (Drought, Public Health Hazards), as both on-going hazards are currently impacting the County.

The hazards of extreme temperatures and tornado & straight-line wind were determined to now be a Moderate Risk to the County, as opposed to the High Risk they were previously labeled. The two Low Risk hazards remain the same.

Table 32 presents each participating jurisdictions' final individual hazard risk ranking. This ranking originated through the RF approach. Additional individual qualitative and quantitative community inputs then lead to the final hazard risk conclusions.

The remaining sections of this chapter present individual hazard profiles and risk assessments for each of the twelve hazards identified by the HMPC for the 2021 Plan update. The hazards are presented in alphabetical order rather than by their levels of risk. Additionally, individual municipal risk assessments are included in Appendix B: Municipal Annexes, which focuses on those specific High Risk hazards impacting each jurisdiction.

Table 32. Risk Factor Results by Jurisdiction

	Agricultural Hazards	Cyber Hazards	Drought	Earthquake	Extreme Temps.	Flood	Hazmat Release	Land Subsidence	Prairie Fire	Public Health Hazards	Severe Storm	Tornado & Straight-Line Wind
Weld County	High Risk	High Risk	High Risk	Low Risk	Moderate Risk	High Risk	High Risk	Low Risk	High Risk	High Risk	High Risk	Moderate Risk
Town of Ault	Low Risk	Low Risk	Moderate Risk	Low Risk	Moderate Risk	Low Risk	High Risk	Low Risk	Moderate Risk	Moderate Risk	Moderate Risk	Low Risk
City of Dacono	High Risk	High Risk	High Risk	Low Risk	Moderate Risk	High Risk	Moderate Risk	Low Risk	Moderate Risk	High Risk	High Risk	High Risk
Town of Eaton	High Risk	High Risk	High Risk	Moderate Risk	Moderate Risk	Low Risk	High Risk	Low Risk	Moderate Risk	High Risk	High Risk	High Risk
Town of Erie	High Risk	High Risk	High Risk	Moderate Risk	High Risk	High Risk	Moderate Risk	Low Risk	Low Risk	High Risk	High Risk	Moderate Risk
City of Evans	Low Risk	High Risk	High Risk	Low Risk	Low Risk	High Risk	High Risk	Low Risk	Low Risk	High Risk	High Risk	High Risk
Town of Firestone	High Risk	High Risk	High Risk	Low Risk	Moderate Risk	High Risk	Moderate Risk	Low Risk	Moderate Risk	High Risk	High Risk	High Risk
City of Fort Lupton	Low Risk	High Risk	High Risk	High Risk	High Risk	Moderate Risk	Moderate Risk	Low Risk	Moderate Risk	High Risk	High Risk	High Risk
Town of Frederick	High Risk	High Risk	High Risk	Low Risk	Moderate Risk	High Risk	Moderate Risk	Low Risk	Moderate Risk	High Risk	High Risk	High Risk
City of Greeley	High Risk	High Risk	High Risk	Low Risk	High Risk	Moderate Risk	High Risk	Low Risk	High Risk	High Risk	High Risk	Moderate Risk
Town of Hudson	Low Risk	High Risk	Moderate Risk	High Risk	High Risk	Low Risk	High Risk	Low Risk	High Risk	High Risk	High Risk	High Risk
Town of Johnstown	Moderate Risk	Moderate Risk	Moderate Risk	Low Risk	Moderate Risk	Moderate Risk	Low Risk	High Risk	Moderate Risk	High Risk	Moderate Risk	Moderate Risk
Town of Keenesburg	High Risk	High Risk	High Risk	Moderate Risk	High Risk	High Risk	High Risk	Low Risk	Moderate Risk	High Risk	High Risk	High Risk

	Agricultural Hazards	Cyber Hazards	Drought	Earthquake	Extreme Temps.	Flood	Hazmat Release	Land Subsidence	Prairie Fire	Public Health Hazards	Severe Storm	Tornado & Straight-Line Wind
Town of LaSalle	Low Risk	Moderate Risk	High Risk	Low Risk	Moderate Risk	High Risk	High Risk	Low Risk	Low Risk	High Risk	High Risk	High Risk
Town of Mead	High Risk	High Risk	High Risk	Moderate Risk	High Risk	High Risk	High Risk	Low Risk	Moderate Risk	High Risk	High Risk	High Risk
Town of Milliken	Low Risk	Moderate Risk	High Risk	Low Risk	Moderate Risk	High Risk	High Risk	Low Risk	Moderate Risk	Low Risk	Moderate Risk	Moderate Risk
Town of Nunn	Moderate Risk	Moderate Risk	Moderate Risk	Moderate Risk	Moderate Risk	Low Risk	High Risk	Low Risk	Moderate Risk	High Risk	High Risk	Moderate Risk
Town of Pierce	Low Risk	Moderate Risk	High Risk	Moderate Risk	High Risk	Moderate Risk	High Risk	Low Risk	Low Risk	Moderate Risk	High Risk	High Risk
Town of Platteville	Low Risk	Moderate Risk	Low Risk	Moderate Risk	High Risk	Moderate Risk	High Risk	Low Risk	Moderate Risk	Low Risk	High Risk	High Risk
Town of Severance	Moderate Risk	High Risk	High Risk	Low Risk	High Risk	High Risk	High Risk	Moderate Risk	Moderate Risk	High Risk	Moderate Risk	Moderate Risk
Town of Windsor	Low Risk	High Risk	High Risk	Low Risk	Moderate Risk	High Risk	High Risk	Low Risk	Low Risk	High Risk	High Risk	Moderate Risk

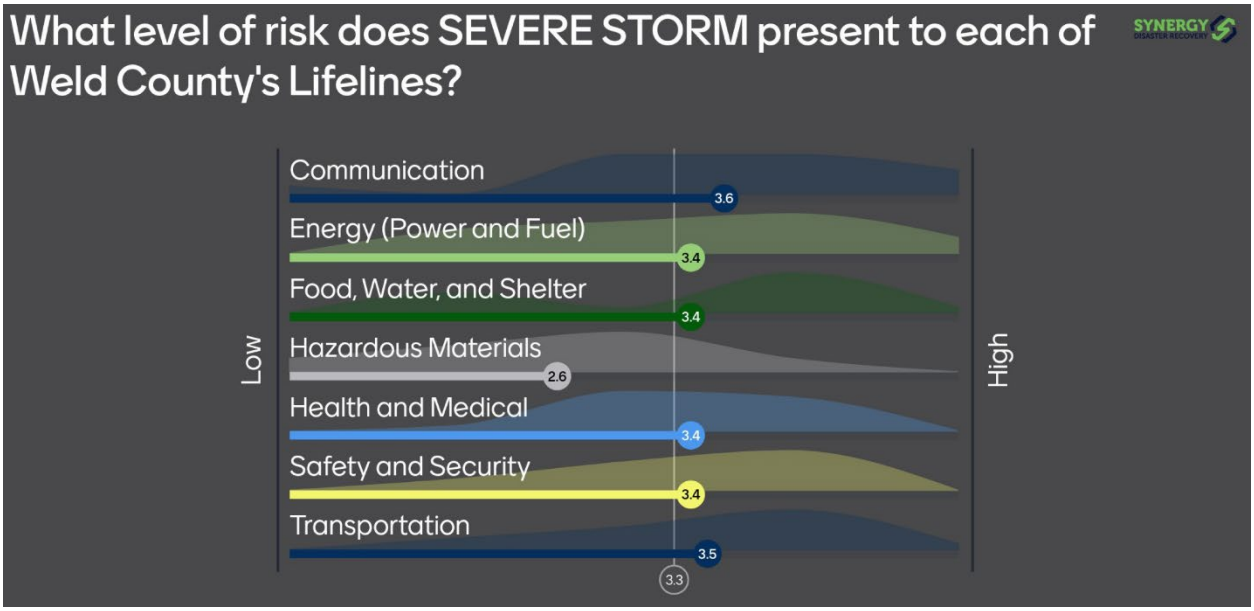
5.5 Lifeline Hazard Rankings

Hazards pose varied levels of risk to a community and its abilities to protect life safety, prevent property damages or loss, and support Lifelines. Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. The integrated network of assets, services and capabilities that provide lifeline services are used to support the day-to-day needs of the community and enable society to function cohesively. Lifelines are separated into the following categories:

- Communications
- Energy (Power and Fuel)
- Food, Water and Shelter
- Hazardous Material
- Health and Medicine
- Safety and Security
- Transportation

As shown in Table 33 the HMPC members ranked the risk of each hazard on a scale of 1-5, based on the perceived effect of the hazard on each specific Lifeline. Figure 35 shows an example of the polling results.

Figure 35. Lifeline Risk Rankings HMPC Poll



These rankings were averaged, to gain an understanding of the overall risk that each hazard poses to these Lifelines. For example, the highest risk to all Lifelines comes from cyber attack (3.4). Other hazards posing a higher risk to Lifelines include severe storms, straight-line winds and tornadoes, Hazmat release, and flood.

The other side of determining risk is the level of risk the Lifeline itself holds. Each Lifeline encompasses agencies, organizations, and infrastructure crucial to meeting the specific needs of the community. Based on the criticality of the Lifeline, as well as the vulnerabilities within its systems, each Lifeline carries its own risk of being disrupted. For example, the HMPC rankings determined that, on average, the Lifeline

with the highest risk for disruption is Food, Water, & Shelter (3.2), followed by Health & Medical and Safety & Security.

Ultimately, the risk posed by hazards to Lifelines is best assessed individually. Every Lifeline is unique and composed of its own complex network of people, equipment, materials, structures, and infrastructure. To fully understand the risk, each component of a Lifeline's network needs to be evaluated against hazard risk.

Table 33. Lifeline Risk Ranking

Hazard	Communication	Energy (Power and Fuel)	Food, Water, and Shelter	Hazardous Materials	Health and Medical	Safety and Security	Transportation	Hazard Average
Agricultural Hazards	1.8	2.3	3.4	2.6	2.6	2.4	2.1	2.5
Cyber Hazards	4.5	3.5	2.6	2.1	3.4	4.4	3.1	3.4
Drought	1.4	2.3	4.1	1.5	2.3	2.1	1.5	2.2
Earthquake	2.2	2.9	2.7	2.7	2.7	3	3.1	2.8
Extreme Temperatures	1.9	3	3.5	2.1	3.2	2.4	2.1	2.6
Flood	2.5	3.3	3.7	2.9	2.9	3	3.7	3.1
Hazmat Release	2.3	2.6	3.3	4.4	3.8	3.1	2.8	3.2
Land Subsidence	1.6	2.1	2.1	1.9	1.7	2.1	2.4	2.0
Prairie Fire	2.4	2.6	2.3	2.4	2.7	2.9	2.1	2.5
Public Health Hazards	2.9	2.2	2.9	2.3	4.4	3.4	2.1	2.9
Severe Storm	3.6	3.4	3.4	2.6	3.4	3.4	3.5	3.3
Tornado & Straight-Line Wind	3.4	3.6	3.9	2.5	3.1	3.4	3.4	3.3
Lifeline Average	2.5	2.8	3.2	2.5	3.0	3.0	2.7	

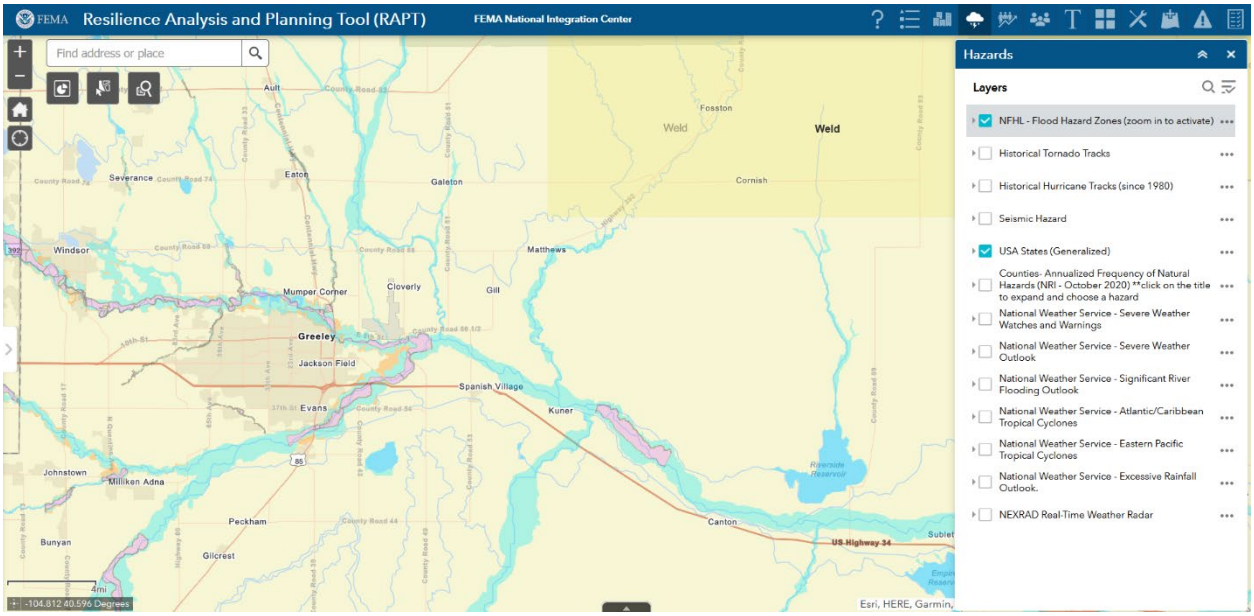
5.6 Hazard Data Viewers

All of the information contained in the following risk and vulnerability assessments is considered a snap-shot in time, based upon the best available data during the time of 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.

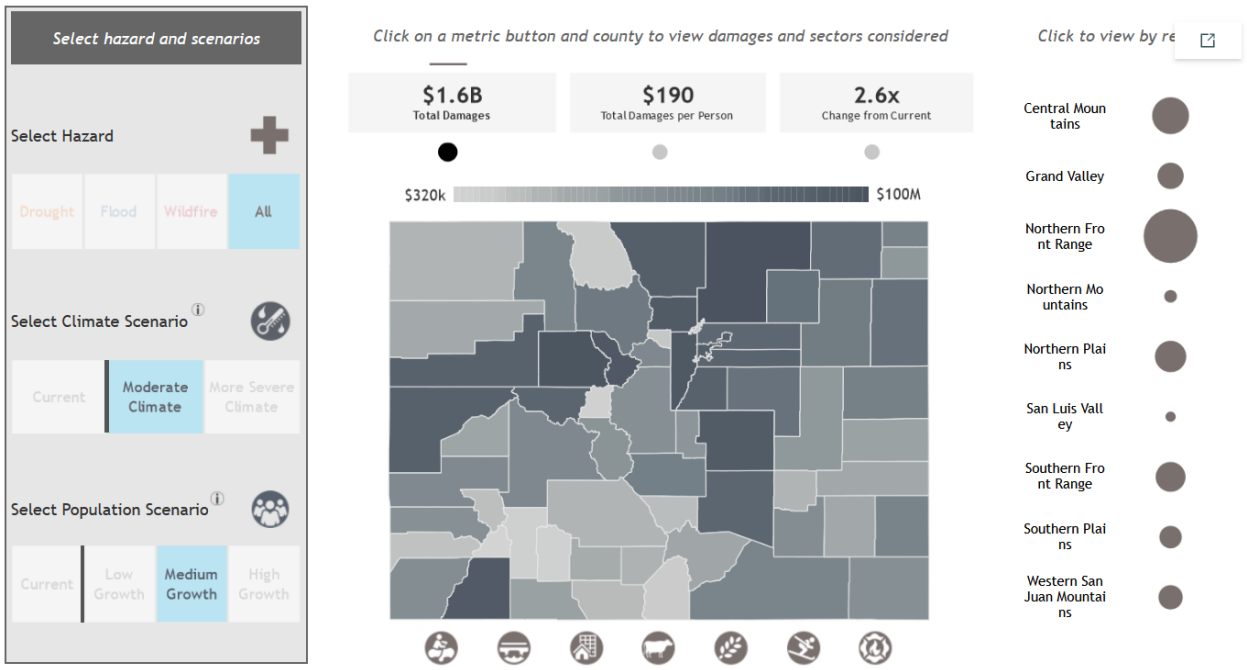
Fortunately, communities are now able to leverage state and federal web map viewers to assess the most current hazard mapping available for many of the hazards profiled in this Plan. The following bullets provide details on these tools.

- **FEMA's Resilience Analysis and Planning Tool (RAPT)**: The RAPT Viewer is a free GIS web map that allows communities to examine the interplay of census data, infrastructure

locations, and hazards, including real-time weather forecasts, historic disasters and estimated annualized frequency of hazard risk.

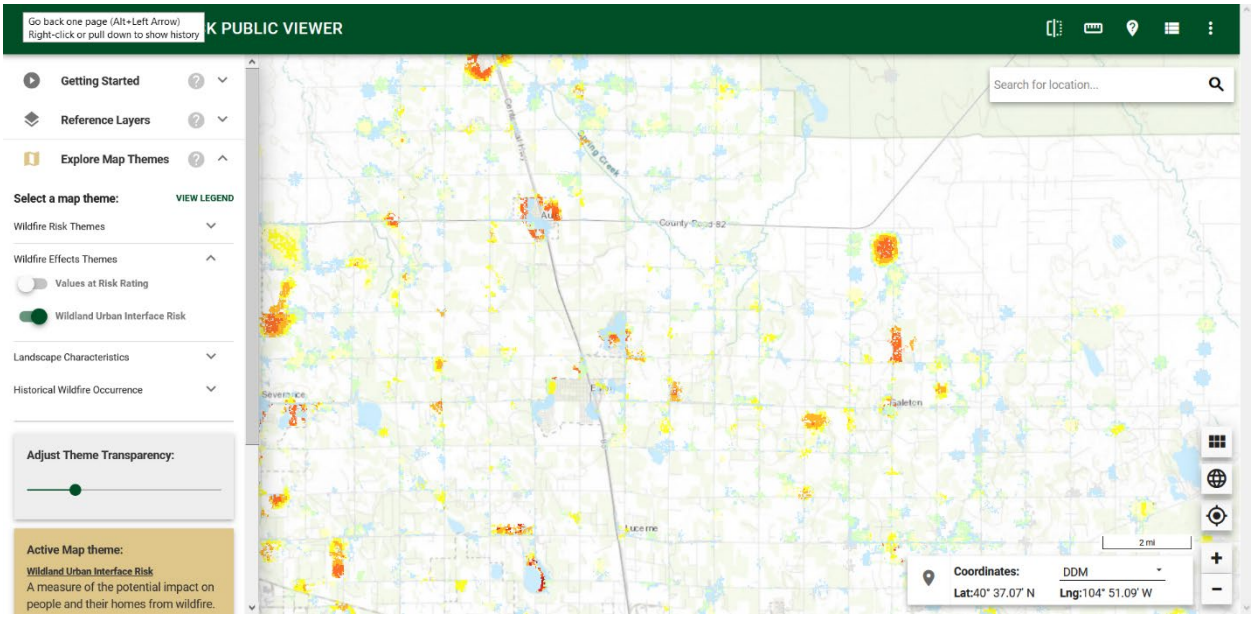


- **Colorado Future Avoided Cost Explorer (FACE):** The FACE Viewer is a public web map that presents the results of a statewide study concerning the direct impacts of flood, drought, and wildfire on select sectors of the Colorado economy. It is intended to help inform preparedness and resilience policies, support recovery and adaptation investments, and provide decision-makers with tools to quantify the growing cost in inaction.



EMERGENCY MANAGEMENT

- **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 a 1/2-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.



EMERGENCY MANAGEMENT

5.7 Agricultural Hazards (including Disease & Pests)

HIGH RISK HAZARD

5.7.1 Hazard Identification

As agriculture is the one of the largest economic drivers for Weld County, hazard risks are a significant concern, specifically disease and pests. An outbreak of disease is when a parasite or pathogen infects animals and livestock, or in some cases crops, creating an illness that causes harm and possibly death. In the case of a pest infestation, this can include insects, animals (mammals and birds), or organisms (such as fungi and other invasive plant species, including noxious weeds) which negatively impact crop health and yield.

Diseases can include those that are known and required as reportable to the State Department of Agriculture, but can also involve those that are newly emerging. For some diseases, protocols are already put into place at the state level to minimize spread and negative impact, but it can be difficult to hold individual operations accountable to follow them.

Pest populations are impacted by climate and weather, which means they can vary greatly from year to year. Pests can be vectors for disease, such as flies and mosquitoes, or can damage agricultural products directly, such as grasshoppers and the Wheat Stem Sawfly.

Invasive plant species are those that are introduced to the agricultural area and begin to take resources, such as moisture, nutrients, and sunlight, from crops and the local ecosystem. Specifically, noxious weeds can be both non-native or indigenous to Colorado, based on the growth and range of a species throughout Colorado.

5.7.2 Previous Occurrences

There was a significant disease outbreak in 2019 of vesicular stomatitis virus (VSV) which affected counties across the State. According to the Colorado Department of Agriculture, in Weld County, this resulted in 73 quarantined animals. In 2014, 97 farms and ranches in Weld County were placed under quarantine for VSV.

The virus primarily affects horses and cattle, but exposure was shown in other animals, including swine, sheep, goats, llamas, and alpacas. There is a human risk of exposure, but it is rare. While VSV is seldom fatal, it can lead to malnutrition, dehydration, and weight loss. The mechanism of spread is unknown, however insects, specifically mites and flies, are the suspected vectors. Presently, there is no vaccine available. VSV is likely to have reoccurrence, however protocols are in place to minimize spread.

Grasshoppers are an annual occurrence and depending on the extent of population size can pose a risk to crops. Since 2005, Weld County has received USDA Secretarial Disaster declarations for insect infestation in 2006, 2012, and 2013. Weld County also experienced minimal damage to crops in 2011.

The Wheat Stem Sawfly was an issue in 2010 and 2011, where it infested the winter wheat. Data for crop loss is not available, so it is unknown how significant the impact was on the harvests for those years. The Wheat Stem Sawfly has a continuous presence in Colorado and neighboring states and has spread to other counties in Colorado, therefore it is continually a threat to wheat production in Weld County.

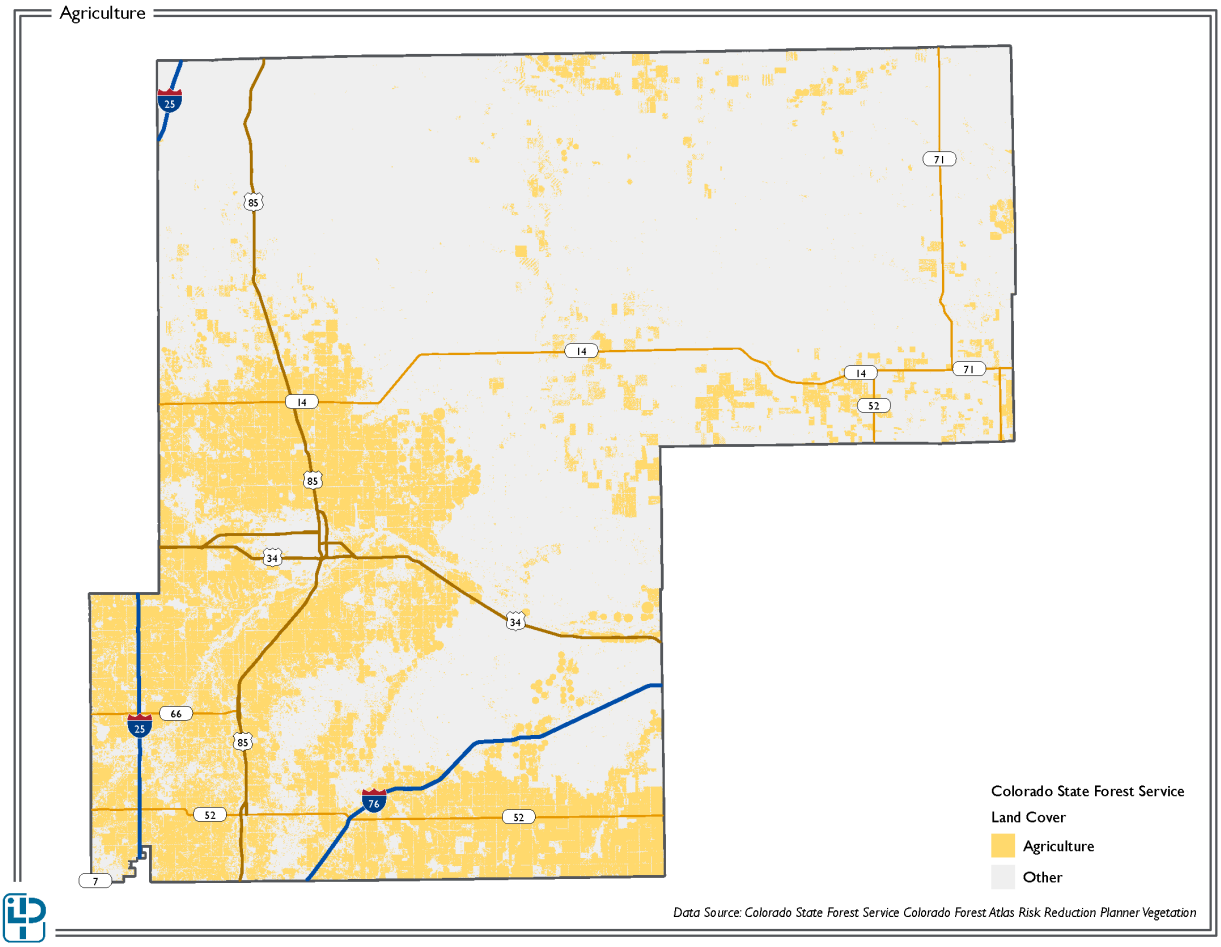
Invasive plant species or noxious weeds outbreaks are not tracked but are common throughout Colorado and Weld County. Weld County has a Weed Management Department which works with community members to identify plant species and avoid any rapid growth in the area.

In 2015, $68,000 in grant funding was used to control and remove noxious, invasive weeds along County roads in northern Weld County. This effort was jointly funded by the County, the Colorado Department of Agriculture, the US Forest Service, Pawnee National Grassland and area landowners.

5.7.3 Data Analytics

The input into the composite risk layer developed with the data analytics suitability model for agricultural hazards is shown in Figure 36.

Figure 36. Composite Risk Layer Agricultural Hazards Input



5.7.4 Inventory Exposed

In a 2017 census by the USDA, Weld County had 4,062 farms which make up 2,098,803 acres in land and employ 7,232 producers from the community. The total market value of products sold was $2,047,177,000 and accounted for 27% of the state agriculture sales.

5.7.5 Potential Losses

The agriculture industry in Weld County is a major contributor to the economy of the State and to the nation. The negative impact of an outbreak of disease, or impact of a natural or man-made disaster could

result in economic losses of enormous scale. The losses associated with an animal disease outbreak would not only directly impact the livestock value, but also the network of farming, transportation, processing, and animal medical industries that directly supports Colorado's farmers.

As agricultural losses are oftentimes a cascading hazard impact, it is important to recognize the relationship. The following Table presents insured crop losses caused by hazards from 2015 through the end of 2018. It is clear that outside of the agricultural hazards profiled in this section, severe storms (including hail) are the most potentially destructive hazard to the agricultural sector.

Table 34. Weld County Insured Crop Losses

Date	Indemnity Payments (2018 $'s)	Per Capita	Recorded Events
Drought	$1,510,192	$4.96	89
Flooding	$3,249	$0.01	1
Hail	$14,834,013	$48.79	158
Heat	$2,088,057	$7.15	57
Severe Storm / Thunder Storm	$7,837,009	$27.26	216
Wildfire	$982	$0.00	4
Wind	$669,368	$2.30	37
Winter Weather	$1,595,755	$5.55	53

Source: SHELDUS v19.0

5.7.6 Probability of Future Occurrences

The probability of future occurrences is high. The large amount of imports and exports in Weld County increases the risk of introduction of invasive species and previously unseen diseases.

Reportable diseases are closely monitored to ensure early detection of an outbreak, should one occur. One of the key responsibilities of the Animal Health Division, a branch of the Colorado Department of Agriculture, is to prepare for, control, and mitigate livestock disease outbreaks. The division has a number of preparedness and response plans for the various livestock sectors in Colorado.

The USDA's Animal and Plant Health Inspection Service (APHIS) branch is responsible for monitoring pests and diseases that pose high risks to agricultural resources. They base their preparedness and response plans from the feedback of stakeholders, however there is not a required list of reportable pests.

5.7.7 Land Use and Development

Although communities located in the eastern region of Weld County are less populated than many communities located to the west, the largely agricultural area is more susceptible to the impacts of health hazards that affect livestock and plants. In these communities, the spread of a highly destructive livestock disease or plant pest/disease could have devastating consequences to the local economy and environment. Early detection and a rapid response to a pest or disease infestation are critical to limiting the economic, social, environmental and public health impacts of such an incident.

5.8 Cyber Hazards

HIGH RISK HAZARD

5.8.1 Hazard Identification

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, businesses and both state and local 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.

5.8.2 Previous Occurrences

Previous occurrences for cyber attacks are hard to track, as there is not a mandatory reporting structure for cyber incidents. Organizations often shield any incidents from public knowledge due to concerns about public perception of security.

5.8.3 Data Analytics

Cyber hazards were not able to be utilized as an input into the composite risk layer due to data limitations.

5.8.4 Inventory Exposed

All systems and communities are exposed to cyber hazards, either directly or indirectly, as so much of our current society is technologically dependent. Cyber hazards can impact government operations, release sensitive information, and impact Lifelines. Cyber attacks could interfere with emergency response activities in the event of a disaster and an attack may reduce the public's trust in the government. In some cases, hospitals have been attacked putting patient lives at risk, with no access to their medical records and treatment plans. Impacts specific to the County's municipalities would not vary from those of the County.

5.8.5 Potential Losses

It is difficult to predict potential losses without much publicly available previous occurrence data. Losses could vary significantly based on the event, with the potential for numerous cascading impacts across all community sectors. Losses could also be incurred through paying an attacker or through fines from regulators. Additionally, a large-scale attack could cause economic losses if services are impacted through an attack.

The Federal Bureau of Investigations oversees incidents that are voluntarily reported to them. According to their nationwide data, the incidents reported in 2019 added up to estimated losses of $3.5

billion in the U.S. Per the 2019 Internet Crime Report, Colorado ranked 11th in the nation for self-reported incidents, which resulted in losses of over $65 million.

5.8.6 Probability of Future Occurrences

Although there have been very few publicly reported previous occurrences, cyber attacks (especially ransomware attacks) are becoming more common, particularly geared towards local governments and hospitals. Therefore, the probability is assumed to be likely.

Many organizations handle cyber situations internally, which makes tracking the number of incidents that have occurred difficult to quantify and therefore it is difficult to quantify possible increases in incidents. However, per the FBI data, nationwide, almost 470,000 incidents were self-reported in 2019, or around 1,250 per day. This was a substantial increase from the 2018 number of the roughly 350,000 reported. While the actual number of incidents that has occurred each year is unknown, we can assume it is much higher than reported and growing exponentially annually.

5.8.7 Land Use and Development

With the significant population increases in the County, more people are exposed to the impacts of a potential cyber-hazard. The need for more critical infrastructure increases as population grows, which creates more opportunities for cyber-hazards to disrupt processes crucial to day to day operations.

As information technology becomes increasingly integrated with physical infrastructure operations, there is an increased risk for wide-scale or high-consequence events that could cause harm or disrupt services upon which our economy and the daily lives of millions of Americans depend. In light of the risk and potential consequences of cyber events, strengthening the security and resilience of cyberspace has become an important homeland security mission. Education for citizens and community partners is key in supporting the battle against cyber hazards.

5.9 Drought

HIGH RISK HAZARD

5.9.1 Hazard Identification

Drought is a normal part of virtually all climates, including areas with high and low average rainfall. It is caused by a deficiency of precipitation and can be aggravated by other factors such as high temperatures, high winds, and low relative humidity.

Droughts can be grouped as meteorological, hydrologic, agricultural, and socioeconomic. Representative definitions commonly used to describe the various types of drought are summarized below.

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

The Palmer Drought Severity Index (PDSI) was developed by Wayne Palmer in the 1960s and uses temperature and rainfall information in a formula to determine dryness. Over time it has become the semi-official drought index for risk assessment and hazard analysis. The Palmer Index is most effective in determining long term drought (a matter of several months) and is not used for short-term forecasts (a matter of weeks). It uses a 0 as normal conditions, and drought is shown in terms of negative numbers; for example, -2 is moderate drought, -3 is severe drought, and -4 is extreme drought. The following table provides an overview of the Palmer Index compared to other classifications.

Table 35. Drought Severity Classification

Drought Severity	Return Period (years)	Description of Possible Impacts	Drought Monitoring Indices		
			Standardized Precipitation Index (SPI)	NDMC* Drought Category	Palmer Drought Index
Minor Drought	3 to 4	Going into drought; short-term dryness slowing growth of crops or pastures; fire risk above average. Coming out of drought; some lingering water deficits; pastures or crops not fully recovered.	-0.5 to -0.7	D0	-1.0 to -1.9
Moderate Drought	5 to 9	Some damage to crops or pastures; fire risk high; streams, reservoirs, or wells low, some water shortages developing or imminent, voluntary water use restrictions requested.	-0.8 to -1.2	D1	-2.0 to -2.9
Severe Drought	10 to 17	Crop or pasture losses likely; fire risk very high; water shortages common; water restrictions imposed	-1.3 to -1.5	D2	-3.0 to -3.9
Extreme Drought	18 to 43	Major crop and pasture losses; extreme fire danger; widespread water shortages or restrictions	-1.6 to -1.9	D3	-4.0 to -4.9
Exceptional Drought	44 +	Exceptional and widespread crop and pasture losses; exceptional fire risk; shortages of water in reservoirs, streams, and wells creating water emergencies	Less than -2	D4	-5.0 or less

Source: National Drought Mitigation Center

5.9.2 Previous Occurrences

With its semi-arid climate, drought is a natural part of the Colorado environment. Because of natural variations in regional climate and precipitation, it is rare for the entire state to be deficient in moisture at the same time. Single season droughts that cover portions of the state, however, are fairly common.

Drought impacts can cover large areas and may come in many forms. The most significant drought impacts in Colorado are related to water-intensive activities including agriculture, municipal use, wildfire protections, recreation, wildlife preservation, commerce, and tourism. Drought conditions can lead to the compaction of soil, increasing erosion potential and decreasing water quality. The impacts associated with drought magnify as the duration of the event increases, as supplemental supplies in reservoirs are depleted and water levels in groundwater aquifers decline.

The State of Colorado has experienced severe, widespread drought several times since the late 1800s. The 2018 State of Colorado Drought Mitigation and Response Plan included a comprehensive description of the major droughts that have occurred in Colorado, including the Dust Bowl of 1930s,

the 1950s drought of the Great Plains, and the Colorado drought of 2002. The table below summarizes the duration of historical dry and wet periods in Colorado.

Table 36. Historical Dry and Wet Periods in Colorado

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
1978-1999		X	20
2000-2006	X		6
2007-2010		X	3
2011-2013	X		3

Source: 2018 Colorado Drought Mitigation and Response Plan

The previous table highlights seven multi-year droughts in Colorado since 1893. The most dramatic drought event occurred in the late 1930s and 1950s when a number of states in the region were affected by a several-year drought.

The Colorado drought of 2002 was the single most intensive year of drought in Colorado's history.[2] Statewide snowpack was at or near all-time lows, and the year is considered the driest single year recorded in Colorado history. What made the 2002 drought event so unusual was that all of the State was dry at the same time. Regional soil moisture was depleted and reservoirs dropped to extremely low levels. The dramatic drought conditions prompted widespread water restrictions that were heavily enforced and regulated. These restrictions included limits to watering lawns, washing cars, or the use of water for any other non-essential uses. Some municipalities offered incentives for property owners to remove their lawns and adopt xeriscaped landscape designs. Ultimately, it was the wet period of the late 1990s and the increased reservoir storage during that time that helped Colorado to survive the drought of 2002.

More recently, severe drought conditions have impacted the State of Colorado. Based on the U.S. Drought Monitor, approximately 50% of Colorado was already experiencing drought conditions by the start of 2012. Minimal accumulations of snow worsened conditions further, as below average snowfall and above average temperatures occurred in February and March. In April and May of 2012, warm temperatures caused early runoff as the thin snowpack melted rapidly. The entire State of Colorado was under drought conditions by the end of May 2012 and stream flows measured only slightly better compared to the extreme drought years of 1934, 1954, 1977 and 2002.

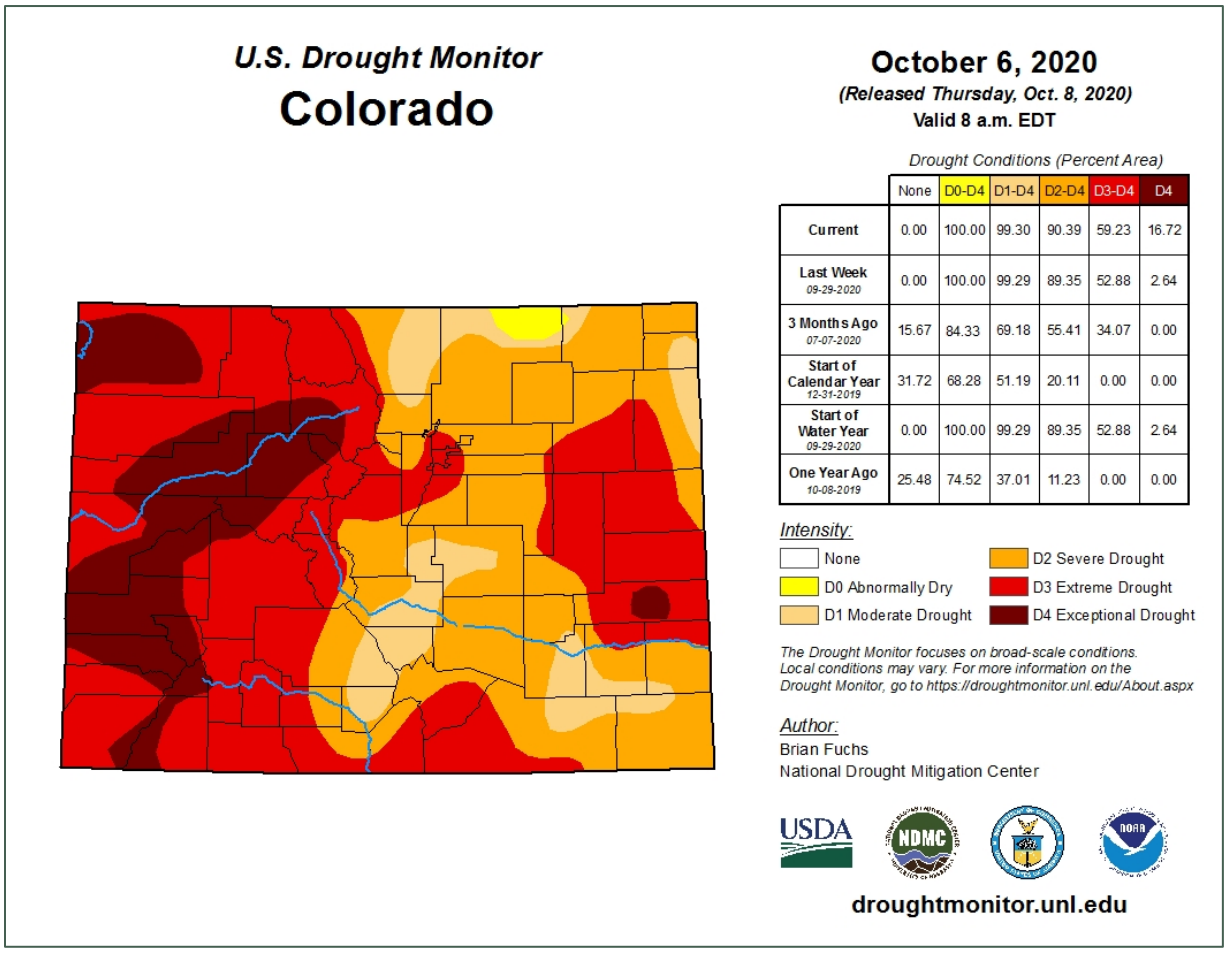
[2] Pielke and Doesken, 2003. The Drought of 2002 in Colorado.

Local agricultural production was heavily impacted by the 2011-2013 drought. Because soil moisture was low and temperatures high on the plains during the spring planting season, many crops struggled to take root and failed to survive the summer. Agricultural drought impacts were exacerbated by limited water availability for summer irrigation diversions due to less snowpack and runoff. In the eastern plains of Colorado, June temperatures were consistently over 100°F. As hay production decreased to 10% - 50% of average supply, prices increased dramatically. For example, corn prices increased 43% over two years as neighboring corn-producing regions in other states also struggled with drought. By early June 2013, many areas of the Eastern Plains normally covered by crops or cattle were barren. Many ranchers sold their herds as grasses had gone dormant and hay was expensive and in short supply.

In addition to having a devastating economic impact on Colorado agriculture and tourism, the 2011-2013 drought period contributed to elevated wildfire risk across the state. Two of the State's most destructive wildfires occurred during the 2012 drought period: the High Park Fire and the Waldo Canyon Fire. Dry conditions on the Eastern Plains contributed to an extended grass fire season that threatened homes and property.

As of the fall of 2020, large portions of the State are experiencing extreme and exceptional drought conditions. The entire State is experiencing some type of ongoing drought condition. A large majority of Weld County is experiencing severe drought, with the northwest corner of the County being less severe (abnormally dry and moderate drought). Figure 37 presents the current drought situation as of the fall of 2020.

Figure 37. U.S. Drought Monitor (October 2020)



During drought conditions Secretarial Disaster Declarations are used to make low interest loans and other emergency assistance available to those who have been affected (largely farmers and ranchers). Under the process laid out by the Farm Services Agency (FSA), a USDA Disaster Declaration can be made if any portion of a county has experienced eight consecutive weeks of severe drought according to the U.S. Drought Monitor.[3] The following Table lists the disaster declarations that have affected Weld County since 2003. Declarations have been made in four of the last five years since the previous Plan update.

[3] The 2018 Colorado Drought Mitigation Response Plan

Table 37. USDA Secretarial Disasters Affecting Weld County 2005 - Present

Year	Type
2020	Drought
2018	Drought, Flood, Excessive Rain, Hail, High Winds, Tornadoes, Lightning
2017	Drought
2016	Hail
2013	Drought, High Winds, Wildfire, Excessive Heat, Insect Infestation
2012	Drought, Hail, High Winds, Flood, Wildfire, Excessive Heat, Insect Infestation
2008	Drought, Hail
2006	Drought, Heat, High Winds, Wildfire, Excessive Heat, Insect Infestation, Crop Disease

Source: USDA – Colorado Farm Services Agency

Numerous drought declarations occurred between 2006 and 2020. One of the most significant disaster periods occurred in early July 2012, in which 62 of the State's 64 counties were included in a Secretarial disaster designation due to the 2011-2013 drought. Farmers in designated counties were able to apply for Farm Service Agency emergency loans for the next eight months.

Because drought is usually considered a regional hazard, all jurisdictions are assumed to have the same risk level within Weld County. Drought risk is based on a combination of the frequency, severity, and spatial extent (the physical nature of drought) and the degree to which a population or activity is vulnerable to the effects of drought. The degree of Weld County's vulnerability to drought depends on the environmental and social characteristics of the region and is measured by its ability to anticipate, cope with, resist, and recover from drought.

The National Drought Mitigation Center assesses the impacts caused by drought conditions. Following is a summary of the impact categories:

Agriculture: Drought impacts associated with agriculture, farming, aquaculture, horticulture, forestry or ranching. Examples of drought-induced agricultural impacts include: damage to crop quality; income loss for farmers due to reduced crop yields; reduced productivity of cropland; insect infestation; plant disease; increased irrigation costs; cost of new or supplemental water resource development (wells, dams, pipelines) for agriculture; reduced productivity of rangeland; forced reduction of foundation stock; closure/limitation of public lands to grazing; high cost or unavailability of water for livestock, Christmas tree farms, forestry, raising domesticated horses, bees, fish, shellfish, or horticulture.

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

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

Fire: Drought impacts contributing to forest, range, rural, or urban fires, fire danger, and burning restrictions. Examples of fire impacts include: Enactment/easing of burning restrictions, fireworks ban, increased fire risk, occurrence of fire (number of acres burned, number of wildfires compared to

average, people displaced, etc.), increase in firefighting personnel, state of emergency during periods of high fire danger, closure of roads land due to fire occurrence or risk.

Plants and Wildlife: Drought impacts associated with unmanaged plants and wildlife, fisheries, forests, and other fauna. Examples of drought-induced impacts on plants and wildlife include: loss of biodiversity of plants or wildlife; loss of trees from rural or urban landscapes, shelterbelts, or wooded conservation areas; reduction and degradation of fish and wildlife habitat; lack of feed and drinking water; greater mortality due to increased contact with agricultural producers, as animals seek food from farms and producers are less tolerant of the intrusion; disease; increased vulnerability to predation (from species concentrated near water); migration and concentration (loss of wildlife in some areas and too many wildlife in other areas); increased stress to endangered species; salinity levels affecting wildlife, wildlife encroaching into urban areas, loss of wetlands.

Relief, Response, and Restrictions: Drought effects associated with disaster declarations, aid programs, requests for disaster declaration or aid, water restrictions, fire restrictions. Impacts include: Disaster declarations, aid programs, USDA Secretarial disaster declarations, Small Business Association disaster declarations, government relief and response programs, state-level declarations, county-level declarations, a declared "state of emergency," requests for declarations or aid, non-profit organization-based relief, water restrictions, fire restrictions, declaration of drought watches or warnings.

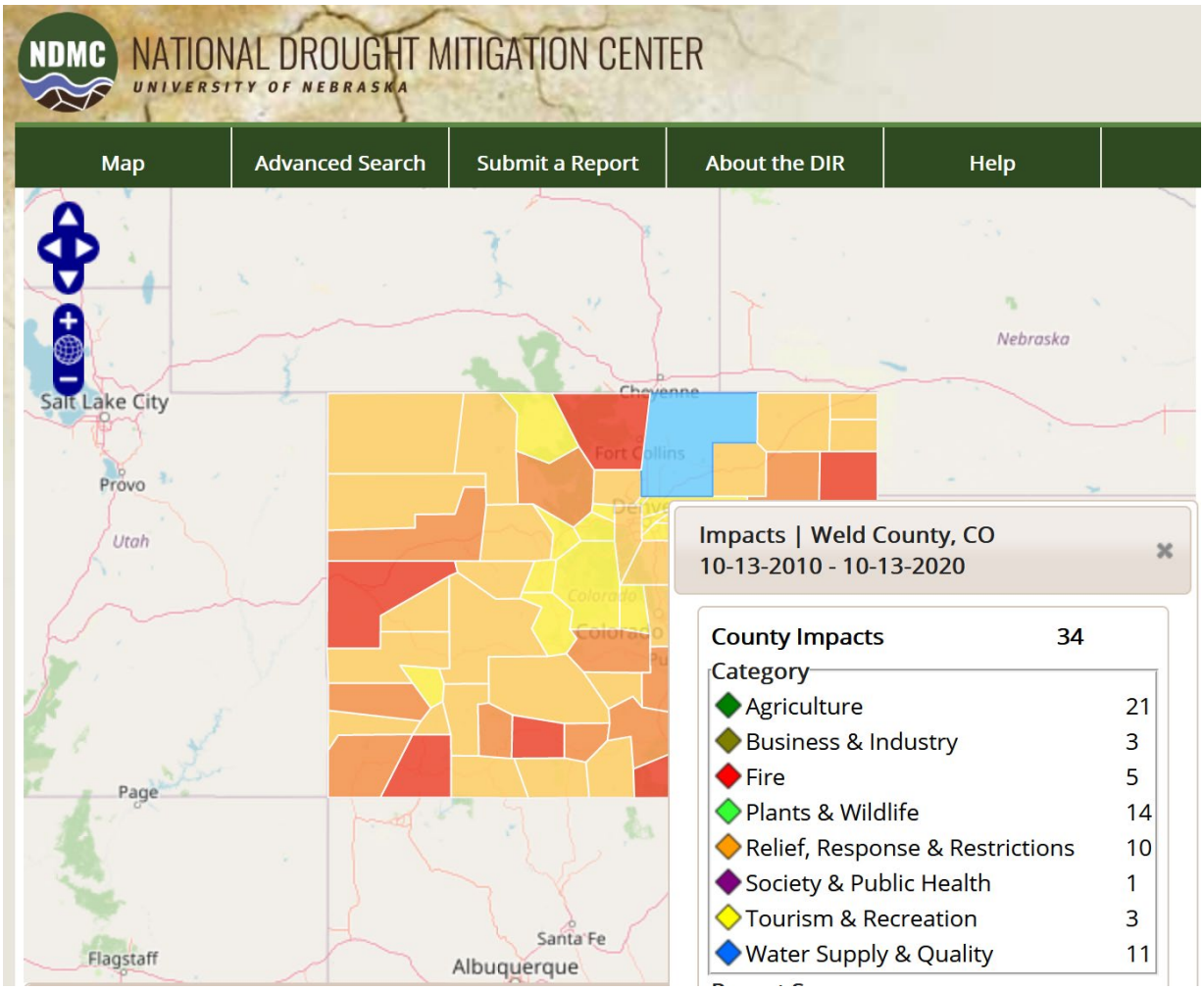
Society and Public Health: Drought effects associated with public and human health. Examples of drought-induced social impacts include: health-related problems related to reduced water quantity and/or quality, such as increased concentration of contaminants; loss of human life (e.g., from heat stress); increased respiratory ailments; increased disease caused by wildlife concentrations; population migration (rural to urban areas, migrants into the United States); loss of aesthetic values; change in daily activities (non-recreational, like putting a bucket in the shower to catch water), elevated stress levels, meetings to discuss drought, communities creating drought plans, lawmakers altering penalties for violation of water restrictions, demand for higher water rates, cultural/historical discoveries from low water levels, cancellation of fundraising events, cancellation/alteration of festivals or holiday traditions, stockpiling water, public service announcements and drought information websites, protests.

Tourism and Recreation: Drought effects associated with recreational activities and tourism. Examples of drought-induced tourism and recreation impacts include: water access or navigation problems for recreation; bans on recreational activities; reduced license, permit, or ticket sales (e.g. hunting, fishing, ski lifts, etc.); losses related to curtailed activities (e.g. bird watching, hunting and fishing, boating, etc.); reduced park visitation; delayed opening for ski resorts; increase in artificial snow generation; cancellation or postponement of sporting events.

Water Supply and Quality: Drought effects associated with water supply and water quality. Examples of drought-induced water supply and quality impacts include: Dry wells, water restrictions, changes in water rates, easing of water restrictions, increase in requests for new well permits, changes in water use due to water restrictions, greater water demand, decrease in water allocation or allotments, installation or alteration of water pumps or water intakes, changes to allowable water contaminants, water line damage or repairs due to drought stress, drinking water turbidity, change in water color or odor, declaration of drought watches or warnings, mitigation activities.

Based on data collected by the National Drought Mitigation Center (NDMC), the state-wide impact assessment, Weld County has recorded major impacts from drought since 1935.[4] Figure 38 summarizes these impacts over the last decade. A majority of the impacts affect agriculture, with other common impacts focused on: plants & wildlife; relief, response, & restrictions; and water supply & quality.

Figure 38. Weld County Drought Impacts (2010-20)



Source: NDMC Drought Impact Reporter

The National Oceanic and Atmospheric Administration Paleoclimatology Program studies drought by analyzing records from tree rings, lake and dune sediments, archaeological remains, historical documents, and other environmental indicators to obtain a broader picture of the frequency of droughts in the United States. According to their research, "paleoclimatic data suggest that droughts as severe as the 1950's drought have occurred in central North America several times a century over the past 300-400 years, and thus we should expect (and plan for) similar droughts in the future. The paleoclimatic record also indicates that droughts of a much greater duration than any in the 20th century have

[4] 2018 Colorado Drought Mitigation and Response Plan

occurred in parts of North America as recently as 500 years ago." Based on this research, the 1950's drought situation could be expected approximately once every 50 years or a 20% chance every ten years. An extreme drought, worse than the 1930's "Dust Bowl," has an approximate probability of occurring once every 500 years or a 2% chance of occurring each decade.[5] A 500-year drought with a magnitude similar to that of the 1930's that destroys the agricultural economy and leads to wildfires is an example of a high magnitude event.

5.9.3 Data Analytics

Drought was not utilized as an input into the composite risk layer due to the hazards lack of geographic variability.

5.9.4 Inventory Exposed

Drought typically does not have a direct impact on structures and infrastructure, though certain Lifelines can be affected. Lifelines impacted by drought include Food / Water, with indirect impacts to Health & Medical, and Safety & Security. Drought conditions evolve slowly over time and communities typically have ample time to prepare for the effects. Should a drought affect the water available for public water systems or individual wells, the availability of clean drinking water could be compromised. This situation would require emergency actions and could possibly overwhelm the local government and financial resources.

Impacts from drought can include the following:

- Economic losses to agricultural producers (crops and livestock)
- Physical and mental health issues
- Water supply interruption for business and industry
- Water quality problems
- Reduced soil and vegetation moisture
- Vegetation mortality, insect infestations
- Impacts to fish and wildlife populations
- Increase in wildland fires and associated losses

5.9.5 Potential Losses

Possible losses/impacts to facilities include the loss of critical function due to low water supplies. Severe droughts can negatively affect drinking water supplies. Should a public water system be affected, the losses could total into the millions of dollars if outside water is shipped in. Private springs/wells could also dry up. Possible losses to infrastructure include the loss of potable water.

Although drought events rarely pose immediate risks to public health, they can impact local public health in numerous ways. Examples of drought-induced public health impacts include: increased respiratory ailments due to increased particulate matter in the air; sickness due to decreased availability of clean water; increased disease caused by wildlife concentrations; population migrations (rural to urban areas); loss of human life (e.g. from heat stress, suicides); and impacts on behavioral health (due to unemployment in the agricultural sector, stress on the tourism and other businesses related to the natural environment and/or water).

[5] National Oceanic and Atmospheric Administration, 2003

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

Due to the nature of drought, all jurisdictions within Weld County are expected to experience similar physical impacts from drought conditions. However, local communities with large agricultural, livestock, and tourism-based economies are expected to bear the brunt of drought effects in the county.

5.9.6 Probability of Future Occurrences

Due to the nature of drought, it is an extremely difficult hazard to predict. However, identifying various indicators of drought, and tracking these indicators, provides a crucial means of monitoring drought. Additionally, understanding the historical frequency, duration, and spatial extent of drought assists in determining the likelihood and potential severity of future droughts. The characteristics of past droughts provide benchmarks for projecting similar conditions into the future. The probability of Weld County and its municipalities experiencing a drought event can be difficult to quantify. However, based on historical record of 7 drought-related USDA Secretarial Disasters affecting Weld County between 2006 and 2020, this type of event has occurred once every 2 years.

Historic frequency suggests that there is a 50% chance of this type of event occurring each year. The Colorado Climate Report, published by the Colorado Water Conservation Board (CWCB), include climate models that project Colorado will warm by 2.5°F by 2025 and 4°F by 2050, relative to the 1950-99 baseline. If these projections are accurate, changes in the quantity and quality of water are likely to occur due to warming, even in the absence of precipitation changes.

5.9.7 Land Use and Development

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

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

Related to both current land use and future development trends, the use of turf grass affects the available water supplies. Maintaining lush, green lawns in the semi-arid climate of the Front Range requires large amounts of water. Urban lawn watering is the single largest water demand on most municipal supplies. Outdoor water use accounts for about 55 percent of the residential water use in the

Front Range urban area, most of which is used on turf. [6] Residential and commercial landscaping can greatly impact future drought events and future water use regulations may be able to mitigate this trend.

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

[6] http://www.ext.colostate.edu/pubs/consumer/09952.html

5.10 Earthquake

LOW RISK HAZARD

5.10.1 Hazard Identification

An earthquake is the motion or trembling of the ground produced by sudden displacement of rock usually within the upper 10 – 20 miles of the Earth's crust. Earthquakes can affect hundreds of thousands of square miles, cause damage to property measured in the tens of billions of dollars, result in loss of life and injury to hundreds of thousands of people, and disrupt the social and economic functioning of the affected area. Most property damage and earthquake-related deaths are caused by the failure and collapse of structures due to ground shaking which is dependent upon amplitude and duration of the earthquake.

Regardless of the source of the earthquake, the associated energy travels in waves radiating outward from the point of release. When these waves travel along the surface, the ground shakes and rolls, fractures form, and water waves may be generated. Earthquakes generally last a matter of seconds but the waves may travel for long distances and cause damage well after the initial shaking at the point of origin has subsided.

Breaks in the crust associated with seismic activity are known as "faults" and are classified as either active or inactive. Faults may be expressed on the surface by sharp cliffs or scarps or may be buried below surface deposits.

"Foreshocks," minor releases of pressure or slippage, may occur months or minutes before the actual onset of the earthquake. "Aftershocks," which range from minor to major, may occur for months after the main earthquake. In some cases, strong aftershocks may cause significant additional damage, especially if the initial earthquake impacted emergency management and response functions or weakened structures.

The damage associated with each earthquake is subject to four primary variables:

Seismic Activity: The properties of earthquakes vary greatly from event to event. Some seismic activity is localized (a small point of energy release), while other activity is widespread (e.g., a major fault shifting or slipping all at once). Earthquakes can be very brief (only a few seconds) or last for a minute or more. The depth of release and type of seismic waves generated also play roles in the nature and location of damage; shallow quakes will hit the area close to the epicenter harder, but tend to be felt across a smaller region than deep earthquakes.

Geology and Soils: The surface geology and soils of an area influence the propagation (conduction) of seismic waves and how strongly the energy is felt. Generally, stable areas (e.g., solid bedrock) experience less destructive shaking than unstable areas (e.g., fill soils). The siting of a community or even individual buildings plays a strong role in the nature and extent of damage from an event**.**

Development: An earthquake in a densely populated area which results in many deaths and considerable damage may have the same magnitude as a shock in a remote area that has no direct impacts. Large magnitude earthquakes that occur beneath the oceans may not even be felt by humans.

Time of Day: The time of day of an event controls the distribution of the population of an affected area. On work days, the majority of the community will transition between work or school, home, and

the commute between the two. The relative seismic vulnerability of each location can strongly influence the loss of life and injury resulting from an event.

Additional damages from an earthquake can stem from the following processes:

Shaking: During minor earthquake events, objects often fall from shelves and dishes rattle. In major events, large structures may be torn apart by the forces of the seismic waves. Structural damage is generally limited to older structures that are poorly maintained, poorly constructed, or improperly (or not) designed for seismic events. Un-reinforced masonry buildings and wood frame homes not anchored to their foundations are typical victims of earthquake damage.

Loose or poorly secured objects also pose a significant hazard when they are loosened or dropped by shaking. These "non-structural falling hazard" objects include bookcases, heavy wall hangings, and building facades. Home water heaters pose a special risk due to their tendency to start fires when they topple over and rupture gas lines. Crumbling chimneys may also be responsible for injuries and property damage.

Dam and bridge failures are significant risks during stronger earthquake events, and due to the consequences of such failures, may result in considerable property damage and loss of life. In areas of severe seismic shaking hazard, shaking Intensity levels of VII or higher (see Table 38) can be experienced even on solid bedrock. In these areas, older buildings especially are at significant risk.

Ground Displacement: Ground displacement can also occur due to shaking, resulting in similar damages as mentioned previously.

Landslides: Even small earthquake events can cause landslides. Rock falls are common as unstable material on steep slopes is shaken loose, but significant landslides or even debris flows can be generated if conditions are ripe. Roads may be blocked by landslide activity, hampering response and recovery operations.

Liquefaction and Subsidence: Soils may liquefy and/or subside when impacted by the seismic waves. Fill and previously saturated soils are especially at risk. The failure of the soils has the potential to cause widespread structural damage. The oscillation and failure of the soils may result in increased water flow and/or failure of wells as the subsurface flows are disrupted and sometimes permanently altered. Increased flows may be dramatic, resulting in geyser-like water spouts and/or flash floods. Similarly, septic systems may be damaged creating both inconvenience and health concerns.

Seiches: Seismic waves may rock an enclosed body of water (e.g., lake or reservoir), creating an oscillating wave referred to as a "seiche." Although not a common cause of damage in past Colorado earthquakes, there is a potential for large, forceful waves similar to a tsunami ("tidal waves") to be generated on the large reservoirs within and neighboring Weld County. Such a wave would be a hazard to shoreline development and pose a significant risk on dam-created reservoirs. A seiche could either overtop or damage a dam leading to downstream flash flooding.

The impact an earthquake event has on an area is typically measured in terms of earthquake intensity. Intensity is most commonly measured using the Modified Mercalli Intensity (MMI) Scale based on direct and indirect measurements of seismic effects.

Another way to express an earthquake's severity is to compare its acceleration to the normal acceleration due to gravity. Peak ground acceleration (PGA) measures the strength of ground movements in this manner. PGA represents the rate in change of motion of the earth's surface during

an earthquake as a percent of the established rate of acceleration due to gravity. PGA can be partly determined by what soils and bedrock characteristics exist in the region. Unlike the MMI, PGA is not a measure of the total energy released by an earthquake, but rather of how hard the earth shakes at a given geographic area (the intensity). PGA is measured by using instruments including accelerographs and correlates well with the Mercalli scale. A detailed description of the Modified Mercalli Intensity Scale is shown in the following table.

Table 38. 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

Studies indicate that there are about 100 potentially active fault lines in Colorado. Over 500 earthquake tremors of magnitude 2.5 or higher have been recorded across the state since 1870. It is likely that more earthquakes of similar magnitude occurred during that time, but were not recorded due to low population densities and limited coverage of sensors across most of the State. For comparison, over 20,500 similarly sized events have been recorded in the State of California since 1870.

Relative to other western states, Colorado's earthquake risk is higher than Kansas or Oklahoma, lower than Utah, and much lower than Nevada and California (Colorado OEM, 2003). Despite Colorado's lower earthquake risk, based on geologic observations and characteristics of faults located in the region, seismologists predict that Colorado will indeed experience a magnitude 6.5 earthquake at some point in the future.

Future earthquakes are assumed to be likely to occur where earthquakes have produced faults in the geologically recent past. Quaternary faults are faults that have slipped in the last 1.8 million years and it is widely accepted that they are the most likely source of future large earthquakes. For this reason, quaternary faults are used to make fault sources for future earthquake models.

5.10.2 Previous Occurrences

Earthquakes are relatively infrequent in Colorado and records of historical earthquakes in and around Weld County are limited. The following Table provides a list of Colorado's larger earthquakes recorded since 1870.

Table 39. Notable Earthquake Events in Colorado (1870 – 2020)

Date	Location	Magnitude	Intensity
1870	Pueblo/Ft. Reynolds		VI
1871	Lily Park, Moffat County		VI
1880	Aspen		VI
1882	North central Colorado	6.6*	VII
1891	Axial Basin (Maybell)		VI
1901	Buena Vista		VI
1913	Ridgeway Area		VI
1944	Montrose/Basalt		VI
1955	Lake City		VI
1960	Montrose/Ridgeway	5.5	V
1966	NE of Denver	5.0	V
1966	CO-NM border, near Dulce, NM	5.5	VII
1967	NE Denver	5.3	VII
1967	NE Denver	5.2	VI
2011	Southwest of Trinidad	5.3	VIII

**Estimated, based on historical felt reports*

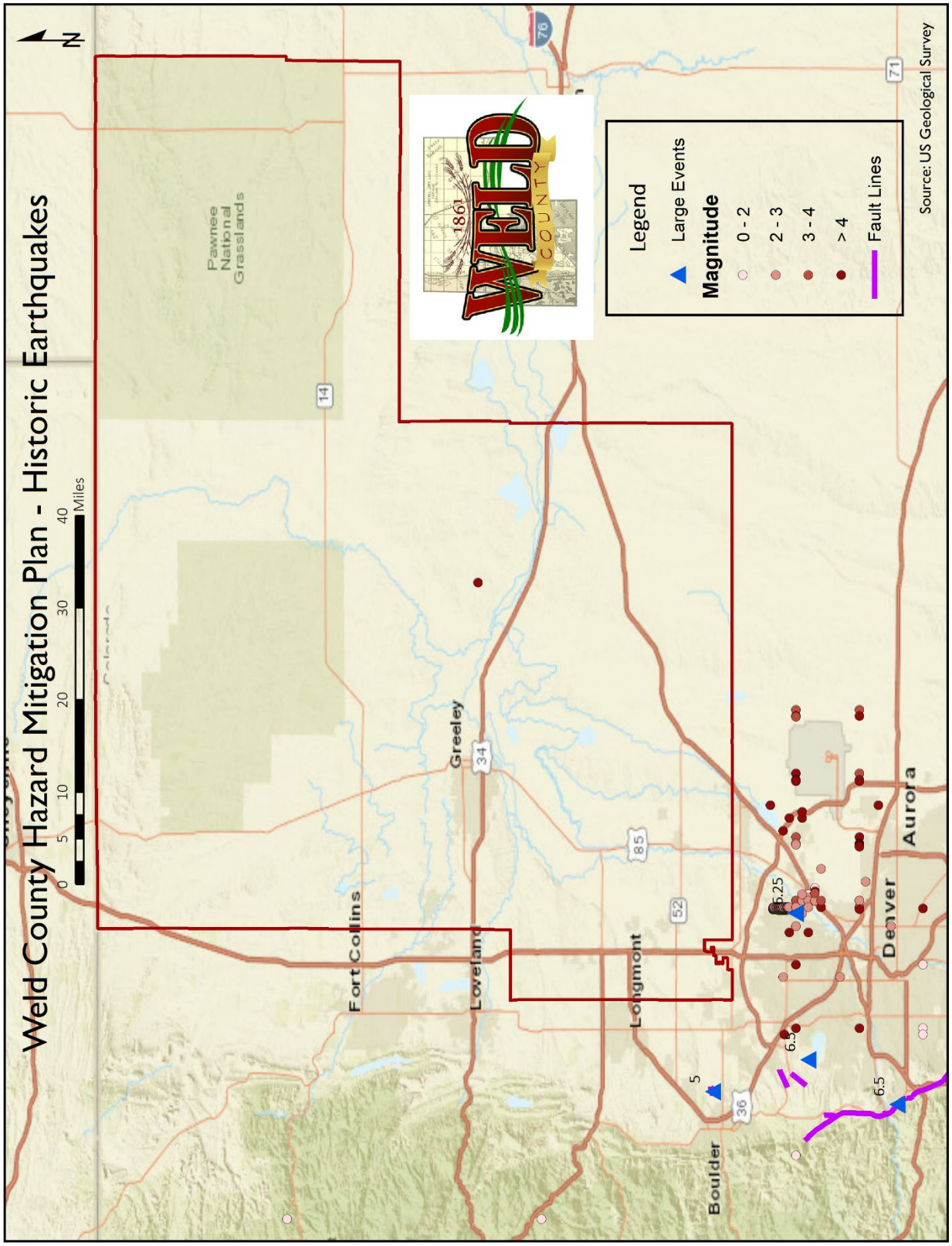
Source: Colorado Geological Survey

The most economically damaging earthquake in Colorado's history occurred on August 9th, 1967 in the Denver metro area. The 5.3 magnitude earthquake caused more than a million dollars of damage in Denver and the northern suburbs. That earthquake was followed by an earthquake of magnitude 5.2 three months later in November 1967. Although these two earthquake events cannot be classified as

"major earthquakes" they are significant because of their location along the Front Range Urban Corridor, an area where nearly 75 percent of Colorado residents and many Lifelines are located. Historically, earthquake risk in Colorado has been rated lower than most subject experts consider justified. It is critically important that local emergency managers in and around Weld County become fully aware of the size and consequences of an earthquake that could occur.

Figure 39 presents the locations of historical earthquakes around Weld County. Many of the larger events in the Region have occurred within miles of the County's Southern boundary.

Figure 39. Historical Earthquakes

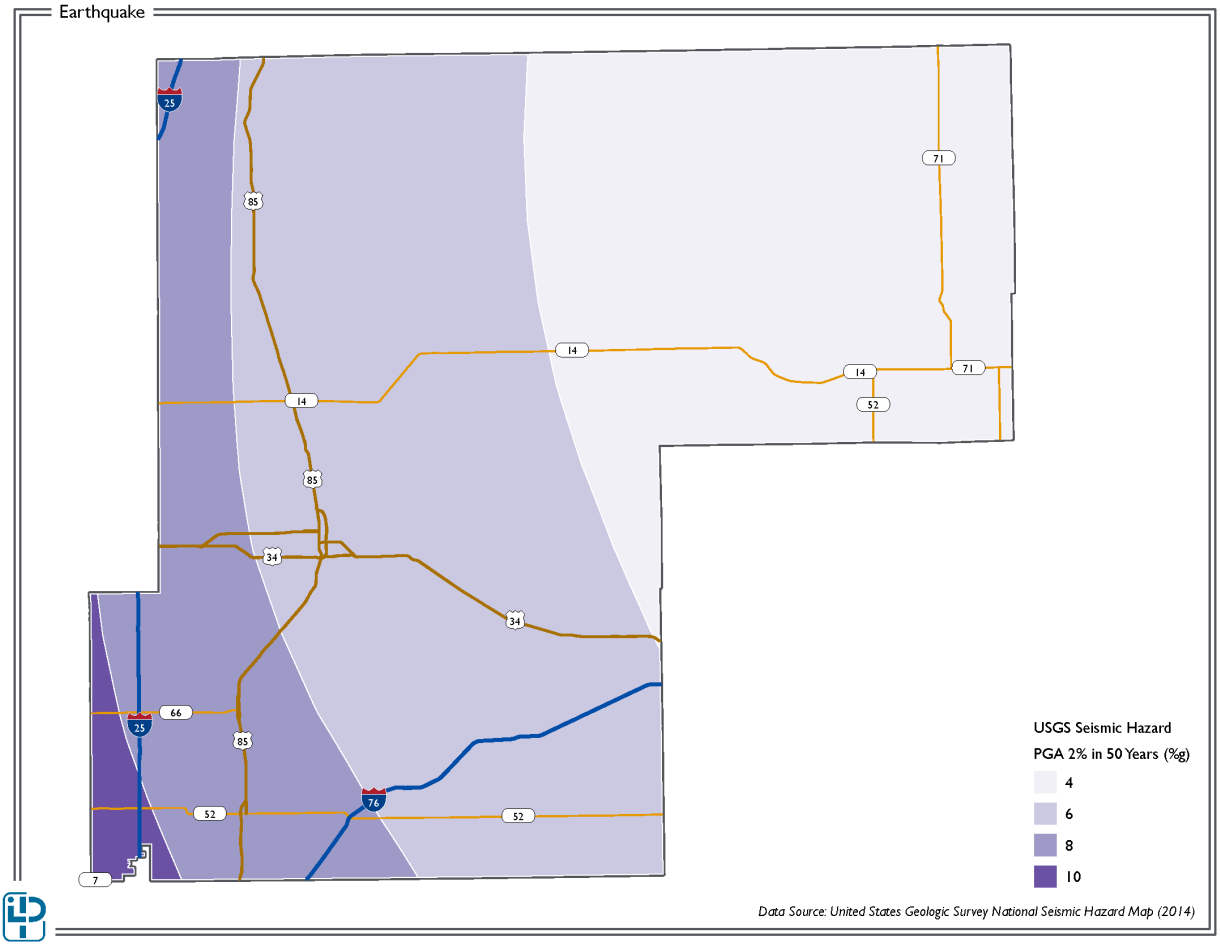


EMERGENCY MANAGEMENT

5.10.3 Data Analytics

The input into the composite risk layer developed with the data analytics suitability model for earthquake is shown in Figure 40.

Figure 40. Composite Risk Layer Earthquake Input



5.10.4 Inventory Exposed

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 4.2, an updated earthquake analyses was conducted for Weld County. The Hazus earthquake scenario modeled a magnitude 6.5 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 Weld County communities.

According to the Hazus inventory, there are an estimated 90,000 buildings in Weld County with a total building replacement value (excluding contents) of over $23 Billion. Approximately 92% of the buildings (and 82% of the building value) are associated with residential housing.

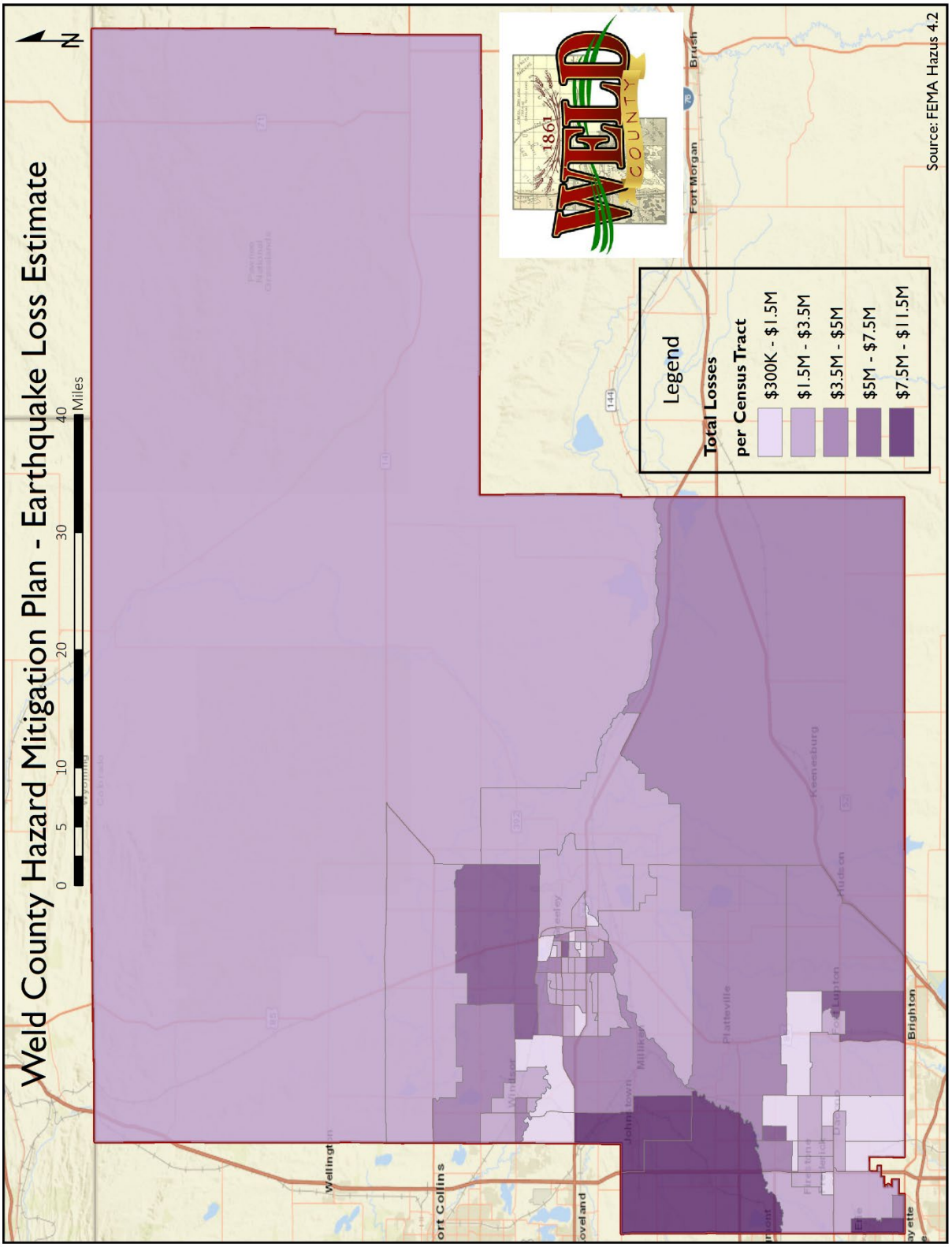
5.10.5 Potential Losses

In Colorado, earthquakes are considered low probability, high-consequence events. Although earthquakes may occur infrequently, they can have devastating impacts. Ground shaking can lead to the collapse of buildings and bridges and disruptions to other Lifelines. Deaths, injuries, and extensive property damage are possible vulnerabilities from this hazard. Some secondary hazards caused by earthquakes may include fire, hazardous material release, landslides, flash flooding, seiches, and dam failure. Moderate and even very large earthquakes are inevitable, although very infrequent, in areas of normally low seismic activity. Consequently, buildings in these regions are seldom designed to deal with an earthquake threat; therefore, they are extremely vulnerable.

Most property damage and earthquake-related injuries and deaths are caused by the failure and collapse of structures due to ground shaking. The level of damage depends upon the amplitude and duration of the shaking, which are directly related to the earthquake size, distance from the fault, site, and regional geology.

Figure 41 details the estimated total economic losses based upon the modeled 6.5 event. The Hazus tool performs its earthquake analysis at the Census Tract level. In Weld County, the largest losses are expected to occur in Greeley and the surrounding areas. This is caused by the higher population densities in these areas, coupled with the age and type of building stocks present across those communities. 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.

Figure 41. Hazus Earthquake Estimated Losses



EMERGENCY MANAGEMENT

Other loss estimates from the Hazus scenario to point out include:

- The vast majority of damages are expected to affect residential housing.
- Unreinforced masonry structures will experience ~70% of the collective 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.
- 61,000 tons of debris are expected to be generated from this type of event.
- Only 56 households are modeled as being displaced by this event.

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

5.10.6 Probability of Future Occurrences

Even though the seismic hazard risk in Weld County is low to moderate, it is likely that earthquakes will occur in the County in the future. It is reasonable to expect future earthquakes as large as magnitude 6.5, the largest event on record in Colorado. Calculations based on the historical earthquake records and geological evidence of recent fault activity suggest that an earthquake of magnitude 6 or greater may be expected somewhere in Colorado every several centuries.

Ultimately, the probability of an earthquake occurring in Weld County is low. Additionally, if an earthquake were to occur in the near future it is likely to be of a low magnitude, with expected damages to property and people to be minimal. History has shown, however, that Weld County and Colorado are at risk to a larger magnitude seismic event. Should that type of event occur, major damages and losses should be expected. This fact makes these low probability, high impact hazards a challenge to deal with when planning a mitigation strategy to combat all hazards faced by a community.

5.10.7 Land Use and Development

With the unpredictable nature of earthquake epicenter locations, it is not feasible to identify specific areas where development may exacerbate the risk to an earthquake. It should be assumed that all development increases the risk to the County from the threat of earthquakes. As population and development continue to expand in Weld County, continued enforcement of the unified construction code has great potential to mitigate increasing vulnerability and development pressure.

Due to the nature of earthquake hazards, areas in Weld County with high population densities and large numbers of structures and Lifelines are expected to experience greater damage and loss from an earthquake event. This includes jurisdictions located primarily in the central western and southwestern portion of the county, such as:

- Greeley
- Windsor
- Johnstown
- Evans
- Fort Lupton

Communities located in the eastern part of the County, may experience differential impacts from an earthquake event if transportation or utility infrastructure is damaged and prevents communities from responding or evacuating.

Standard building codes have the opportunity to provide Weld County with reasonable guidance for development throughout unincorporated and incorporated areas. Contractors and builders should be aware of applicable codes and regulations designed to reduce losses sustained by new and existing construction due to seismic hazards.

As development grows in the County and its municipalities, it will be important for citizens to consult with local building codes as modern building codes generally require seismic design elements for new construction.

5.11 Extreme Temperatures

MODERATE RISK HAZARD

5.11.1 Hazard Identification

Extreme temperatures pose a risk to all Weld County communities and include the ranges on the far ends of a thermometer, exceptionally cold or extraordinarily hot. These temperatures can lead to crop or property damage and in the worst cases injuries or death of community members. The impacts of extreme cold and extreme heat differ, but are immediate and can be long lasting.

Extreme Cold

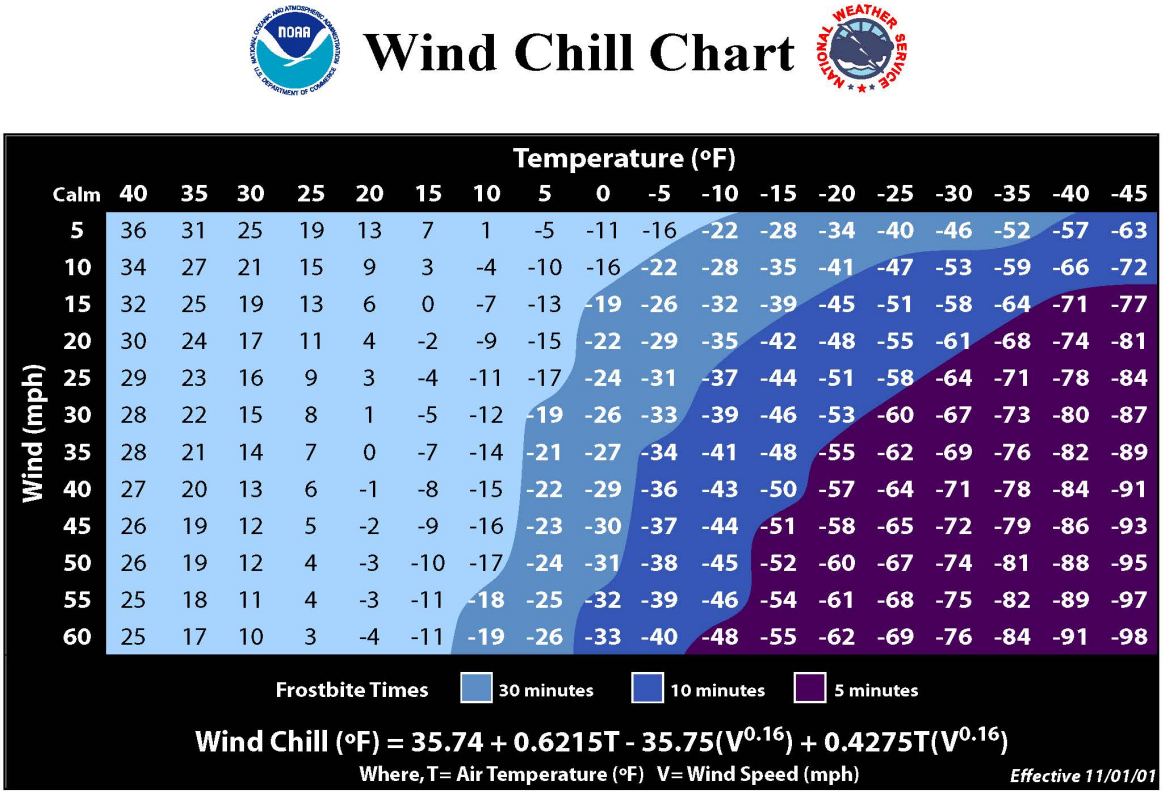
Weld County has relatively mild temperatures throughout the year, which do not vary much across the County geography. Winter temperature averages fall between 40-50°F highs and 15-25°F lows, between November and February. Winters on the eastern plains are typically dry, cold, and windy. Although snowfall is usually light, winter blizzards do affect Weld County residents.

Hazardous cold temperatures are those that drop well below what is considered normal for an area during the winter months. Windchill temperature is a critical factor in deciding the safety of the outside weather. Windchill is how cold people or animals feel outside and is based on the rate of heat loss from exposed skin to wind and cold. Windchill is calculated from wind speed and the outdoor temperature. As the wind increases, it draws heat from the body, driving down skin temperature and eventually the internal body temperature. These temperatures can be life threatening to people and animals exposed for extended periods of time.

The elderly, young children, people with mobility issues, those with independent living difficulty, low income families, and those experiencing homelessness are the most likely to suffer the negative effects of extreme cold.

The Wind Chill Chart (Figure 42) from the National Weather Service illustrates the effect of wind speeds on temperatures. The chart shows the actual air temperature and based on the effect of wind speed, what the perceived temperature is. The data also includes the amount of time until frostbite occurs.

Figure 42. Wild Chill Chart



The National Weather Service issues alerts when weather conditions may be dangerous. The following table explains the specific circumstances for an alert to be issued.

Table 40. National Weather Service Wind Chill Alert

Advisory	Description
Wind Chill Watch	There is a chance that wind chill temperatures will decrease to at least 24°F below zero during the next 24 to 48 hours.
Wind Chill Advisory	The wind chill conditions could be life threatening if action is not taken. The expected wind chill readings will be between 15°F to 24°F below zero.
Wind Chill Warning	Wind chill readings are life threatening. Expected readings of 25°F below zero or lower.

Source: National Weather Service

Table 41. Extreme Cold Illnesses

Condition	Description	Symptoms
Frost Bite	Frostbite is caused by freezing, resulting in a loss of feeling and color in the affected areas. It most often affects the nose, ears, cheeks, chin, fingers, or toes. Frostbite can permanently damage body tissues	Reduced blood flow to hands and feet Numbness, Tingling or stinging, Aching Bluish or pale, waxy skin
Hypothermia	Abnormally low body temperature which affects the brain, making the victim unable to think clearly or move well. Particularly dangerous because a person may not know it is happening and will not be able to do anything about it.	Shivering, Fatigue, Blue skin Loss of coordination Confusion and disorientation Dilated pupils Slowed pulse and breathing Loss of consciousness

Source: Centers for Disease Control

Extreme Heat

Weld County see its highest temperatures between June and August. Summer temperature averages fall between 80-90°F highs and 50-60°F lows. Extreme heat events are most common between June and August, when above average temperatures are sustained for an extended period, but events may occur in May or September, as well.

Extreme heat criteria vary based on the average high temperature for a region. A heat wave is described as extreme high temperatures for at least two days and prolonged exposure to the heat can lead to illness and possibly death. While rare in Weld County, high humidity during heat waves makes the effects of heat more harmful.

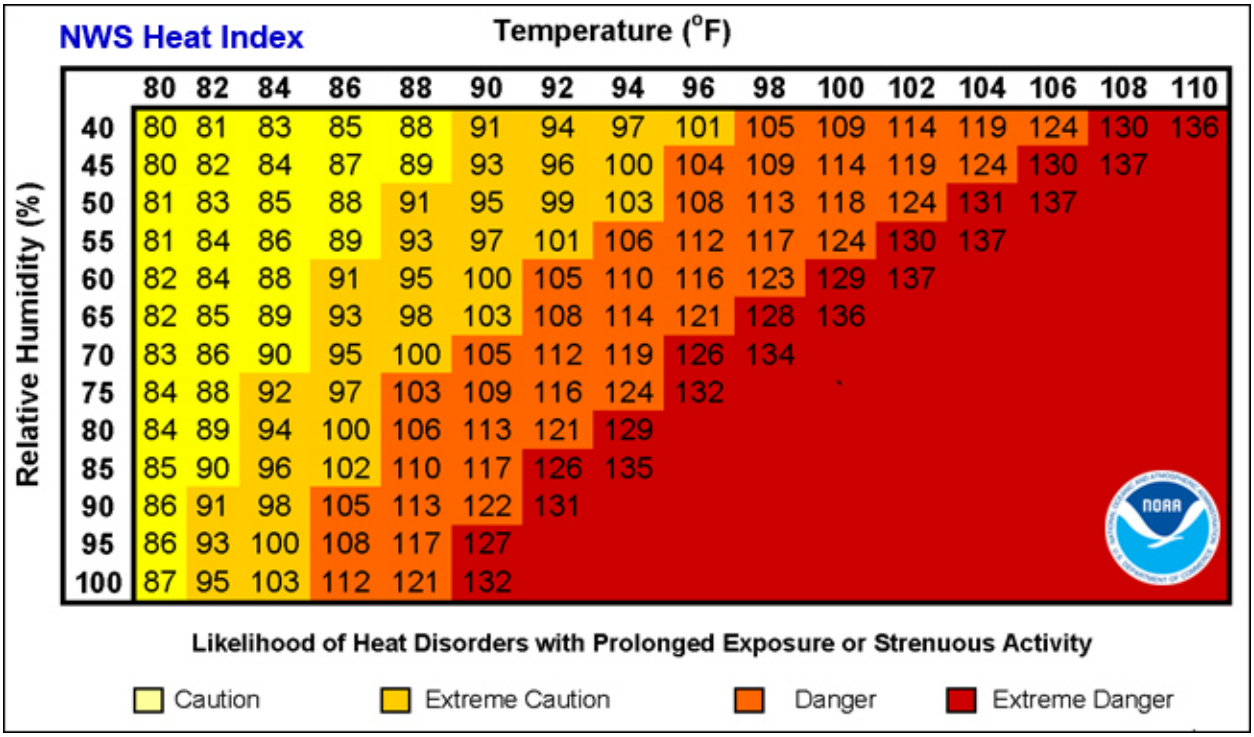
Extreme heat events are a considerable public health concern and heat is the primary weather-related cause of death in the United States. Especially susceptible are young children, the elderly, people with mobility issues, those with independent living difficulty, low income families, outdoor laborers and those experiencing homelessness.

During extreme heat events, individuals can suffer a variety of health problems, including heatstroke, heat exhaustion, heat syncope, and heat cramps. Heat-related illness and death can occur from exposure to intense heat in one afternoon, however, heat stress on the body has a cumulative effect.

The National Weather Service Heat Index (Figure 43) measures the severity of hot weather by estimating how hot it feels to humans. By combining air temperature and relative humidity, the Heat Index is directly related to skin temperature. The index includes classification of how dangerous exposure and strenuous activity can be based on the temperature range.

It is worth noting heat index values were devised for shady, light wind conditions and 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 43. National Weather Service Heat Index



Source: National Weather Service

The National Weather Service issues alerts when weather conditions may be dangerous. The following table explains the specific circumstances for an alert to be issued.

Table 42. National Weather Service Heat Alerts

Alert	Description
Excessive Heat Warning	Issued within 12 hours of onset of extremely dangerous conditions. Criteria vary across the country, but in general warning is issued when the maximum heat index temperature is expected to be 105°F or higher for at least 2 days and nighttime air temperatures will not drop below 75°F.
Excessive Heat Watch	Issued when conditions are favorable for an excessive heat event in the next 24 to 72 hours. Used when the risk of a heat wave has increased but its occurrence and timing is still uncertain.

Source: National Weather Service

Table 43 holds explanations of the most dangerous illnesses related to heat exposure. For the safety of community members, it is important to understand that not all heat-related illness occurs during extreme event conditions and it is critical to recognize the onset of a heat-related illness regardless of weather activity. Understanding the signs and symptoms can help to get medical care for a person as quickly as possible. Outside temperatures that may not seem dangerous can have negative effects on a variety of people, such as sports teams practicing outside and construction workers due to strenuous activity. Incredibly unfortunate incidents can happen when people and pets are left in cars or homes without air conditioning on what seems like a reasonable temperature day. Proper education about

heat illness and temperature fluctuations involves the understanding that extreme heat can come in a weather event, but illness and death can occur due to smaller scale temperature fluctuations.

Table 43. Heat Stress Illnesses

Condition	Description	Symptoms
Heat Exhaustion	Excessive loss of the body's water due to excessive sweating, typically. Most susceptible are the elderly, those with high blood pressure and those work in a hot environment.	Headache, Nausea, Dizziness, Weakness, Irritability, Thirst, Heavy sweating, Elevated body temperature
Heat Stroke	The most serious of heat-related illness, can be fatal if treatment is delayed. Body temperature can rise to 106°F or higher within 10 to 15 minutes.	Confusion, slurred speech, Loss of consciousness (coma). seizures Hot, dry skin or profuse sweating Very high body temperature

Source: Centers for Disease Control

5.11.2 Previous Occurrences

Extreme Cold

Winter weather alerts go out to the region at least once a year and most of these warn about large amounts of snow and expected road conditions. In some cases, they will warn specifically about extreme cold dangers and discourage people from being outside for extended periods. Two recent storms were large enough to impact Weld County considerably, with dangerous roadways and extreme cold conditions that put the community at significant risk.

In March 2019, a bomb cyclone impacted large parts of the state, disrupting power, causing numerous multi-car accidents and stranding 1,500 motorists across the state. A bomb cyclone is a storm characterized by a large, rapid drop in barometric pressure over 24 hours and wind gusts between 60-100 mph. The impacts of the bomb cyclone in Weld County began with beneficial steady rainfall and progressed to 54 mph wind gusts, whipping snow across roadways and crops. With a midday high temperature of only 29°F the event brought windchill temperatures of 10°F and below. While only 4.1 inches of snow fell in Greeley during the March event other towns got up to 9 inches. An April storm which was predicted to be similar to the bomb cyclone, brought 10 inches of snow to Greeley. The April storm was milder in winds with only 36mph wind gusts and less barometric pressure change, but had windchill temperatures of around 10°F.

In January 2017, an unforecasted storm surprised Weld County residents with 6 inches of snow overnight. The storm continued to snow with accumulation between 6-12 inches across the county. With hazardous conditions of low visibility and icy roads on the I-25 corridor, the temperatures presented even more of a threat to motorists and residents. Low temperatures of -2°F and wind chill temperatures of -25°F created a dangerous extreme cold event

NOAA's National Center for Environmental Information (NCEI) storm database tracks historical cold weather conditions, which are categorized as winter weather, winter storm, blizzard or cold/windchill events.

- Winter weather is an event in which there is freezing rain or when 2-4 inches of snow (alone or in combination with sleet and freezing rain) is expected to cause inconvenience for community members.
- Winter storm is a weather event which has more than one significant hazard (a combination of two or more of the following: snow, heavy or blowing snow, ice or sleet) and meets or exceeds 12 and/or 24 hour local warning criteria for at least one of the precipitation elements. Normally a winter storm would pose a threat to life or property.
- A blizzard is a life-threatening event produced by a combination of falling or blowing snow, and high winds, typically 35 mph or more for a prolonged period of time. There is no temperature requirement that must be met to achieve blizzard conditions. This combination can create potentially deadly travel conditions with impassable roads and zero visibilities.
- Cold/wind chill events have periods of extremely low temperatures or wind chill temperatures reaching or exceeding locally/regionally defined warning criteria.

The NCEI database began in 1950, however, data for Weld County is only available beginning in 1996. The NCEI explains that this is due to adaptations in data collection and processing procedures over time. It can be logically assumed that Weld County had significant weather and extreme cold events prior to 1996. Unfortunately, the lack of data interferes with the ability to track changes and patterns longitudinally. Table 44 lists the significant winter weather and cold/wind chill events for Weld County, separated by type and grouped by decade. Listing the specific events in each year does not lend itself to creating a holistic picture of the number of events seen in Weld County over time.

Table 44. Cold Weather Events in Weld County (1996 – June 2020)

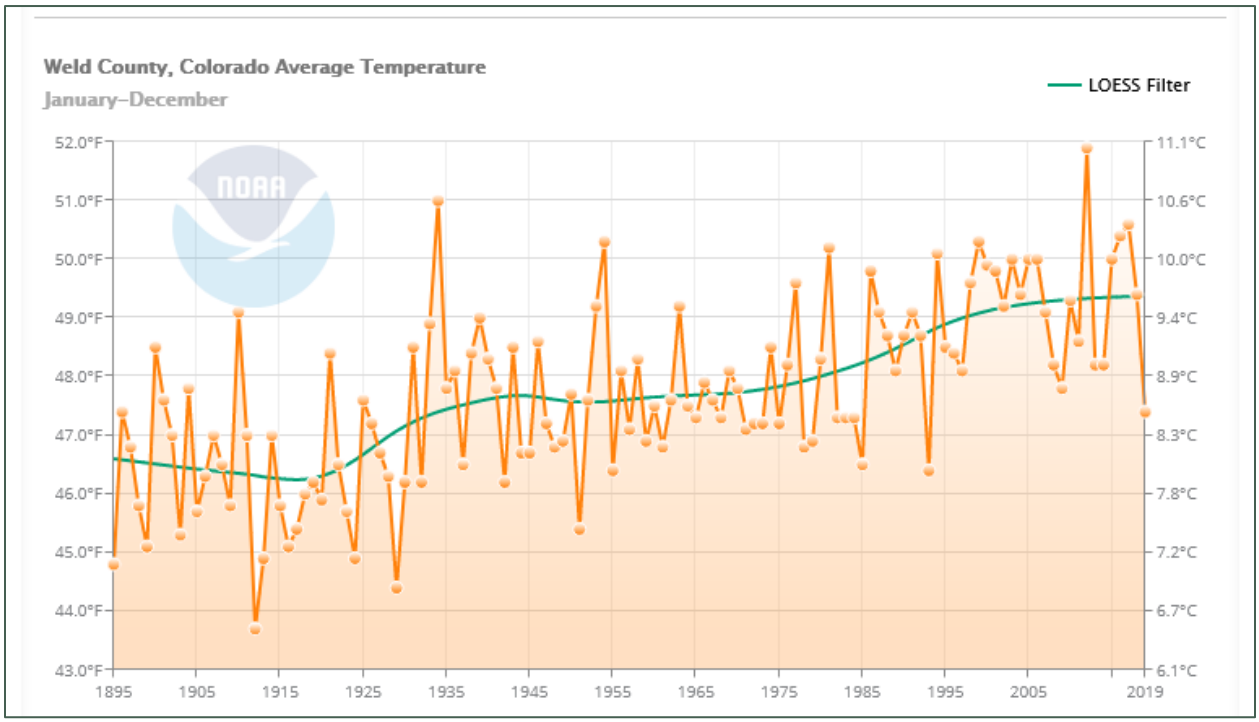
Period	Winter Weather	Winter Storm	Blizzard	Cold/ Wind Chill	Injuries	Deaths	Property Damage	Crop Damage
1996 - 2005	0	21	0	2	0	0	0	0
2006 - 2015	23	22	0	1	0	0	$102,000	0
2016- June 2020	18	12	7	0	0	1	0	0
Event Type Totals	**41**	**55**	**7**	**3**	**0**	**1**	**$102,000**	**0**
Total Events	**106**							

Source: NOAA, NCEI Storm Events Database; SHELDUS; Weld County

Extreme Heat

Data supports a shift towards a warmer climate with an increase in extreme high temperatures across the United States. Figure 44 below depicts the Colorado annual mean temperature history from 1895 to 2019. The probability of continued and more frequent extreme heat events across Colorado is supported by the clear upward trend in high temperatures since 1895.

Figure 44. Mean Colorado Temperature Trends (1895 – 2019)



Source: NOAA National Centers for Environmental information, Climate at a Glance

The Extreme Heat Events data available on CDC WONDER are county-level measures of the number of heat wave days in the months of May through September spanning the years 1981-2010. Heat events for daily maximum Heat Index were defined as any period of at least two consecutive days on which the county maximum Heat Index reached or exceeded the 95th percentile. When this condition was met, each of the consecutive days was identified as a "heat event day" for this definition. Table 45 presents this data by decade.

Table 45. Weld County Heat Wave Days (1981-2010)

Period	Heat Wave Days
1981- 1990	39
1991- 2000	41
2001-2010	94
Total Events	**174**

Source: CDC WONDER Database

5.11.3 Data Analytics

Extreme temperatures were not utilized as an input into the composite risk layer due to the hazard's lack of geographic variability.

5.11.4 Inventory Exposed

Damages in Weld County from extreme temperature events depend on a variety of factors and which end of the thermometer the event is defined by. All inventory and assets located in Weld County can be considered to be exposed to extreme temperatures.

The County's critical facilities should be able to provide adequate protection to community members in the event of an extreme temperature incident. Facilities with back-up generators are equipped to handle power outages during severe weather. Additionally, public buildings with heating and cooling systems are ideal shelters for both extreme cold or extreme heat occurrences.

Crops and livestock can be adversely affected by all extreme temperature events. Livestock are as sensitive as humans to low temperatures and even lower wind chill, so shelter is imperative for farmers during these events. If a low temperature event comes too early in the season, crops that may still be viable in the field could freeze and be lost before the chance to harvest them. During heat events, livestock may struggle without adequate water or shade, and crops may be irreversibly damaged due to the extended period of heat. Unfortunately, in most cases, there is little that can be done by farmers to mitigate the effects of extreme temperatures on their crops.

Extreme Cold

The most common building damage from extreme cold temperature exposure are freezing pipes that may burst and cause water damage. This is an issue for private homeowners and businesses, as well as Weld County properties.

Risks for buildings exposed to extreme cold changes are based on features such as the age and type of the building, construction material used, and condition of the structure. Specific construction elements can pose a greater likelihood of damage, such as large span roofs, which may leak or collapse under heavy snow loads.

Travel infrastructure can be affected during the winter months, as freezing temperatures and repeated freeze-thaw events can cause potholes, which may damage vehicles. Hazardous travel conditions, due to winter weather, may be more dangerous if potholes are not tended to promptly.

Damage and possible losses to critical infrastructure are a significant concern during an extreme cold event. Physical damage to essential parts of infrastructure due to ice build-up, burst pipes or high winds could result in disruption of vital services, including water, fuel and power supply systems, communications, and impassable roadways.

While people may stay indoors during an extreme cold event, without proper heating they are still susceptible to conditions such as frostbite and hypothermia. Extended power outages during a cold weather event can lead to dangerous situations for those trying to heat their homes with portable generators. If not vented properly, this can lead to carbon monoxide poisoning.

Motorists may be stranded due to poor winter road conditions, which requires the exposure of first responders who must go out and retrieve the motorists from their vehicles. Once retrieved, the logistical needs of shelter, feeding and medical care become another challenge.

Extreme Heat

The most significant impact of extreme heat on general building stock and critical facilities within Weld County is the resulting increased demand on air conditioning equipment. Surges in air conditioning demand may strain electrical systems and energy resources. Public utility infrastructure (including electrical generating and conveyance systems) may become damaged and break down causing localized and/or widespread power outages.

Transport and roadways could be impacted resulting in service disruptions and potentially hazardous travel conditions. Extreme heat may cause damage to the pavement of roads and bridges and could possibly cause railroad tracks to crack or buckle.

5.11.5 Potential Losses

Since 1996, there has only been one extreme cold event that caused property damage losses of $102,000. Currently, estimated property and crop losses associated with extreme temperature hazards are anticipated to be minimal across the planning area.

Despite the low likelihood of monetary losses, the human risk is considered great. Extreme heat and cold events present a significant life and safety threat to the population of Weld County, especially those with mobility issues, independent living difficulty, the elderly, low income families, outdoor laborers and those experiencing homelessness. Some of these people may be isolated, with no immediate family and/or limited mobility, which makes it more difficult for them to remove themselves from danger.

Casualties caused by extreme cold events can result from a lack of adequate heating and carbon monoxide poisoning from unsafe or unventilated heating systems, and hypothermia or frostbite from exposure to the elements. Individuals may not have access to a heat source or may be unable to afford to operate one on a regular basis, also increasing their risk for burst pipes. On the other end of the spectrum, those without adequate cooling can succumb to heat illnesses and struggle to find a way to cool down.

5.11.6 Probability of Future Occurrences

Based on data provided by the NWS and NCEI, it is likely that Weld County will continue to experience extreme temperature events in the future which will last for longer periods of time.

As more extreme temperature events are expected, limiting the effect of this hazard on the people and property in Weld County is crucial, as well as feasible. Ongoing mitigation activities should focus on protecting lives and preventing injuries during periods of extreme heat or cold. This includes actions such as community outreach campaigns to educate the public about risks and available support, establishing cooling and heating centers, reaching out to susceptible populations and educating the public on what advisories and warnings mean.

5.11.7 Land Use and Development

Increased development trends in and around Weld County will multiply the opportunities for exposure of growing areas to extreme temperatures. Enforcing and adhering to building codes for new development is imperative for community safety during future climate extremes. As the rural portions of the county continue to grow, consideration of reliable access to those rural residents should be prevalent in emergency management and mitigation planning.

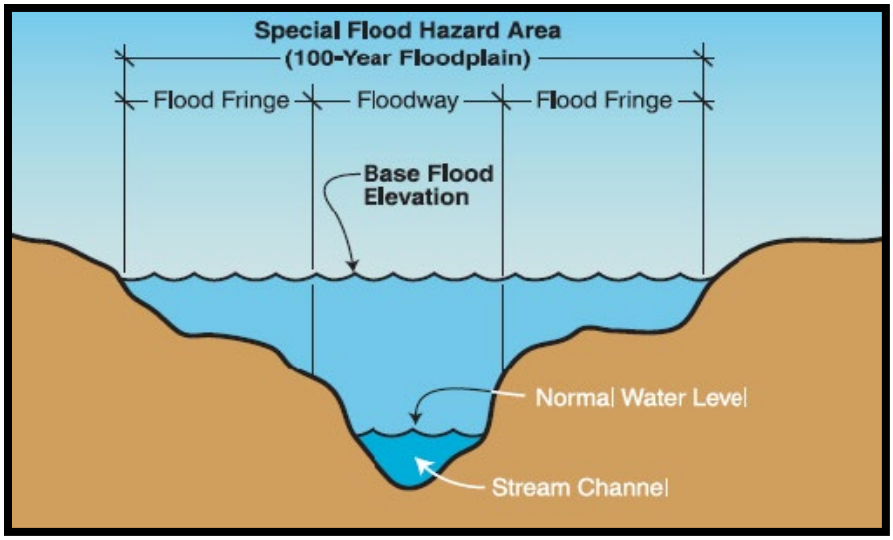
5.12 Flood (including Dam & Levee Failure)

HIGH RISK HAZARD

5.12.1 Hazard Identification

A flood is a naturally occurring event for rivers and streams and occurs when a normally dry area is inundated with water. Excess water from snowmelt or rainfall accumulates and overflows onto the stream banks and adjacent floodplains. As illustrated in Figure 45 below, floodplains are lowlands, adjacent to rivers, streams, and creeks that are subject to recurring floods. Flash floods, usually resulting from heavy rains or rapid snowmelt, can flood areas not typically subject to flooding, including urban areas. Additionally, extreme cold temperatures can cause streams and rivers to freeze, causing ice jams and creating flood conditions.

Figure 45. Floodplain Terminology



Floods are considered hazards when people and property are affected. Nationwide, hundreds of floods occur each year, making it one of the most common hazards in all 50 states and U.S. territories. Most injuries and deaths from flooding happen when people are swept away by flood currents and most property damage results from inundation by sediment-filled water. Fast-moving water can wash buildings off of their foundations and sweep vehicles away. Pipelines, bridges, and other infrastructure can be damaged when high water combines with flood debris. Basement flooding can also cause extensive damage. Flooding can cause extensive damage to crop lands and bring about the loss of livestock. Several factors determine the severity of floods including rainfall intensity and duration, topography, and ground cover.

Flood

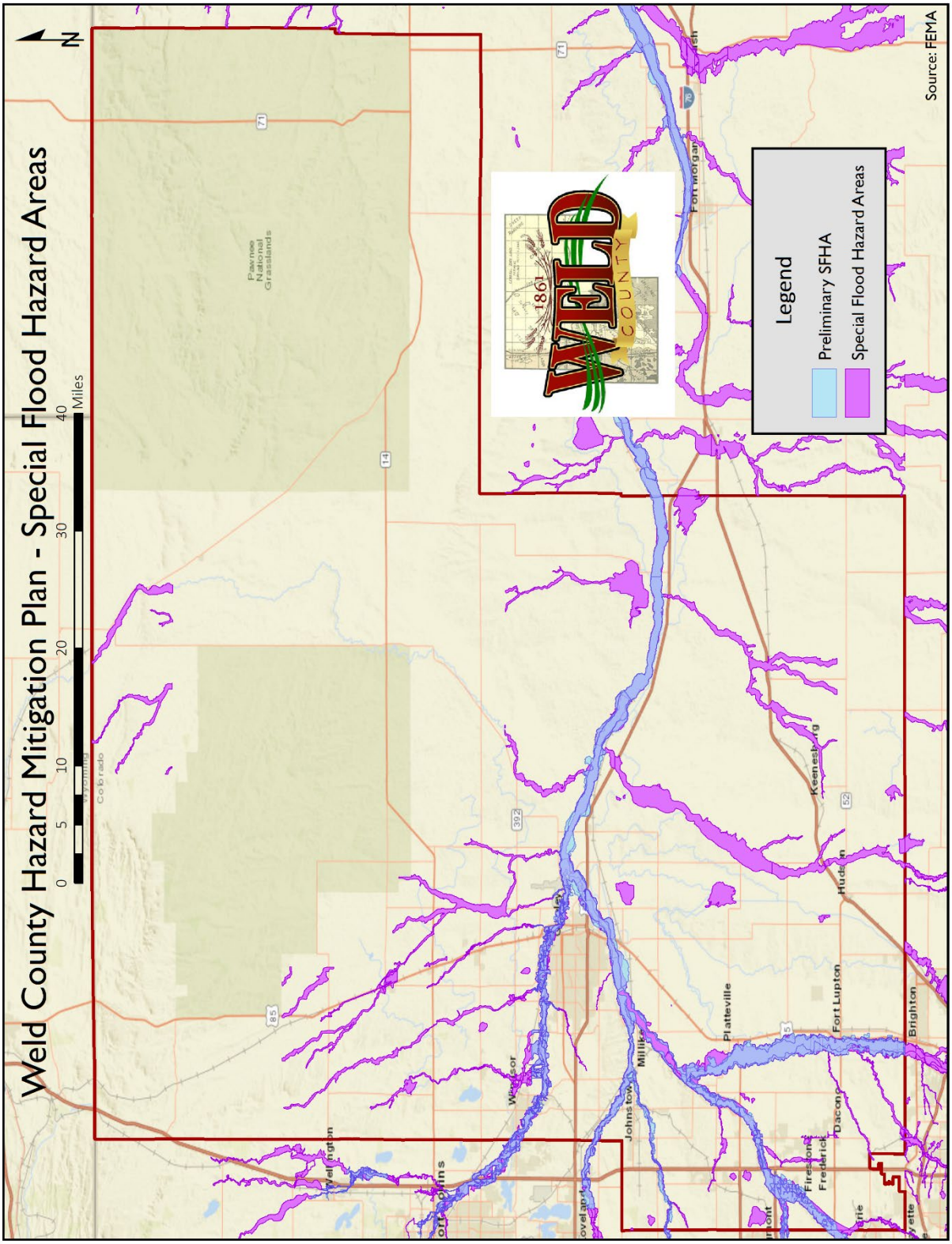
Riverine flooding originates from a body of water, typically a river, creek, or stream, as water levels rise onto normally dry land. Water from snowmelt, rainfall, freezing streams, ice flows, or a combination thereof, causes the river or stream to overflow its banks into adjacent floodplains. Winter flooding usually occurs when ice in the rivers creates dams or streams freeze from the bottom up during

extreme cold spells. Spring flooding is usually the direct result of melting winter snow packs, heavy spring rains, or a combination of the two.

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

Figure 46 shows the current Effective FEMA Special Flood Hazard Areas (SFHA) across Weld County, which correlate to the 1% annual chance flood event. In addition, the current updated Preliminary, and not yet regulatory, SFHAs are also presented. It is expected that these Preliminary floodplains will supersede the current Effective floodplains in the near future for those areas.

Figure 46. FEMA Special Flood Hazard Areas



EMERGENCY MANAGEMENT

Flash floods can occur anywhere when a large volume of water flows or melts over a short time period, usually from slow moving thunderstorms, rapid snowmelt, or a snow on rain event. Because of the localized nature of flash floods, clear definitions of hazard areas do not exist. These types of floods often occur rapidly with significant impacts. Quickly moving water, only a few inches deep, can lift people off their feet, and only a depth of a foot or two is needed to sweep cars away. Most flood deaths result from flash floods.

Urban flooding is the result of development and the ground's decreased ability to absorb excess water without adequate drainage systems in place. Typically, this type of flooding occurs when land uses change from fields or woodlands to roads and parking lots. Urbanization can increase runoff two to six times more than natural terrain. The flooding of developed areas may occur when the amount of water generated from rainfall and runoff exceeds a storm water system's capability to remove it.

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

Dam Failure

Floods from Dam Failure events are typically the result of either hydrologic or structural deficiencies. Dam failure by hydrologic deficiency is a result of inadequate spillway capacity, which can cause a dam to be overtopped during large flows into the reservoir. Failure usually occurs when excessive runoff happens after unusually heavy precipitation events. The sudden inflow from upstream dam failures is another potential cause of dam failure by overtopping.

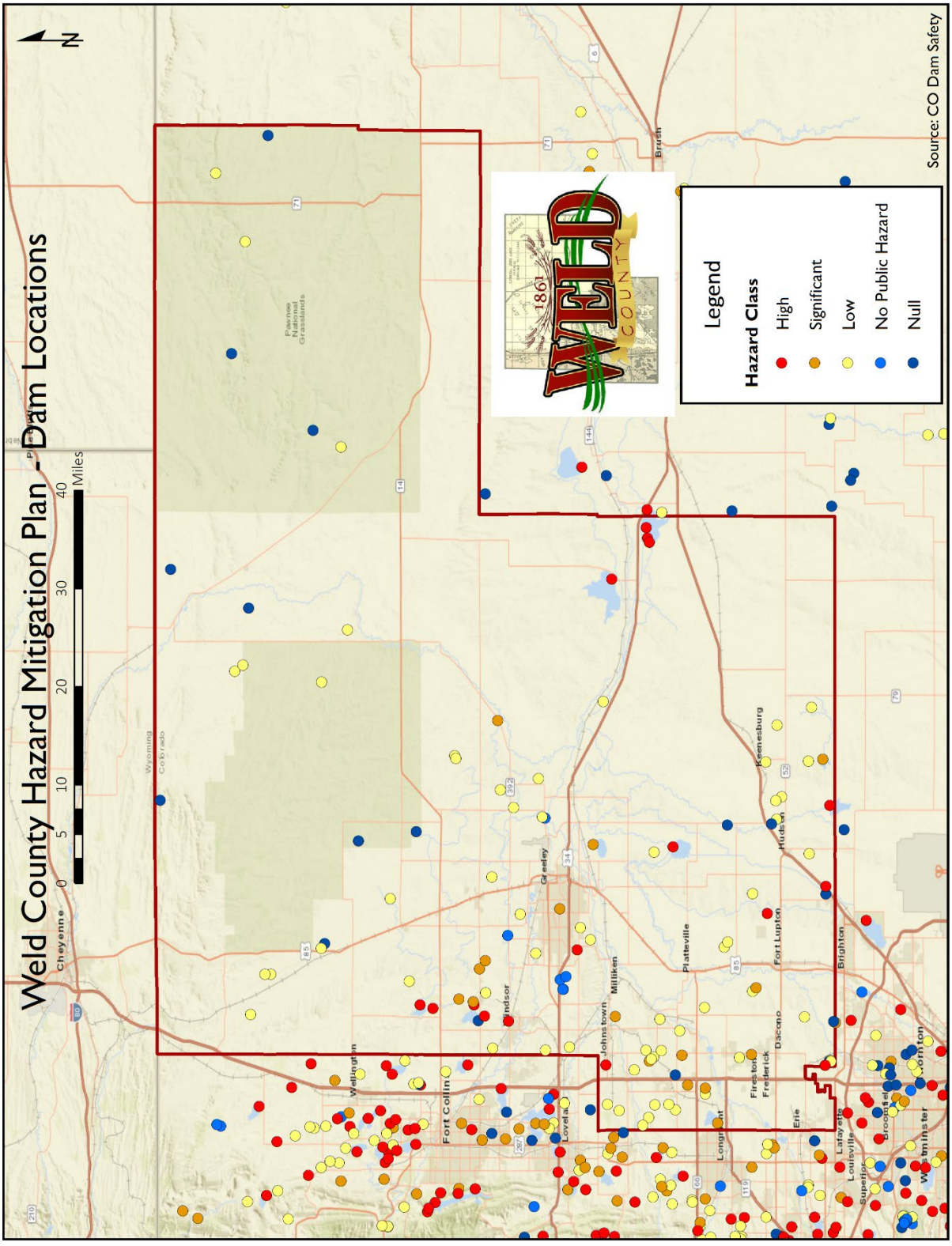
Colorado's Dam Safety Program rates the hazard classifications for dams on a three-tier system:

- High Hazard: A high-hazard rating does not imply or otherwise suggest that a dam suffers from an increased risk for failure. It simply means that if failure were to occur, the resulting consequences likely would be a direct loss of human life and extensive property damage.
- Significant Hazard: Significant hazard dams are those structures whose failure would result in significant damage to developed downstream property and infrastructure or that may result in an indirect loss of human life.
- Low Hazard: Low hazard dams typically are located in sparsely populated areas that would be largely unaffected by a breach of the dam. Although the dam and ancillary features may be totally destroyed, damages to downstream property would be restricted to undeveloped land with minimal impacts to existing infrastructure.

Figure 47 presents dams located throughout Weld County and the State. There are 117 located within the County, and many more across the Region that could impact Weld County communities. Of these within the County, sixteen are rated by the Colorado Dam Safety Program as being High Risk with another sixteen labeled a Significant Risk. Currently, there are eight dams with an Overall Condition ranking of Unsatisfactory.

Thirty-three Weld County dams are required to have Emergency Action Plans (EAP). Of these EAPs, twenty-four have been updated within the last five years. Twenty-five of the EAPs have inundation mapping identified. It should be noted that in many cases these inundation areas are larger than the SFHA.

Figure 47. Dam Locations & Hazard Class



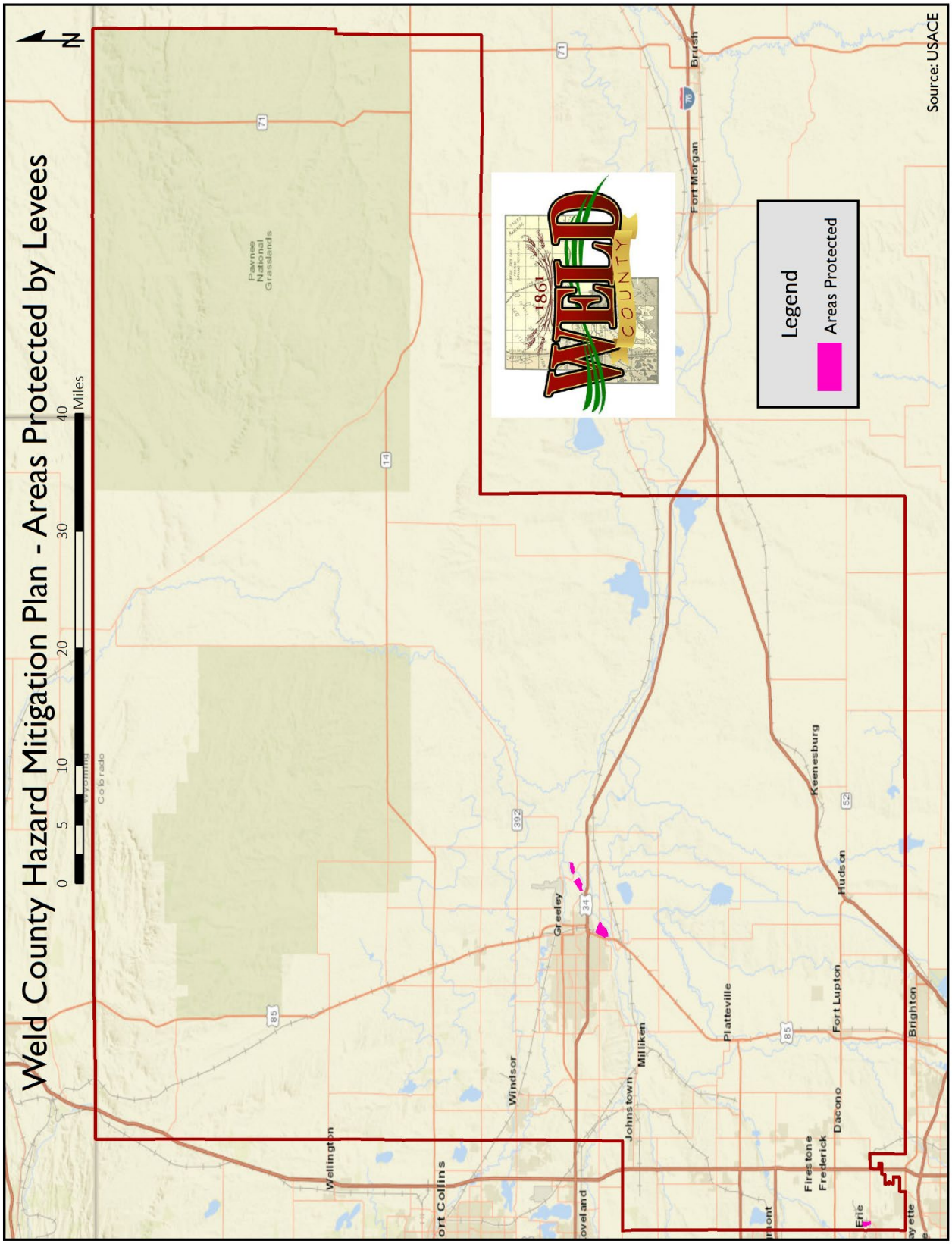
EMERGENCY MANAGEMENT

Levee Failure

Levees provide strong flood protection; however, they do not eliminate risk because they only reduce the risk to individuals and structures behind them. Levees are designed to protect against specific, pre-determined flood levels and are sometimes overtopped during severe weather events. As water passes over the top of a levee, it sometimes erodes the levee, worsening the flooding and potentially causing a breach. Levee Failure floods occur when a breach occurs, which may happen gradually or suddenly. The most dangerous breaches happen quickly. The resulting torrent can quickly inundate a large area behind the failed levee with little or no warning.

Figure 48 presents those areas identified by the U.S. Army Corps of Engineers (USACE) as being protected by levees. Note that there may be other areas protected by levee-like structures that are not officially tracked by the USACE.

Figure 48. Identified Areas Protected by Levee



EMERGENCY MANAGEMENT

5.12.2 Previous Occurrences

Documentation of flooding in Colorado collected by NOAA's National Center for Environmental Information (NCEI) goes back to 1950. The table below provides a history of major flood events that affected Weld County between 1950 and 2019. The earliest reported damaging event in Weld County didn't occur until 1996, but it is known that here were flooding events prior to then.

Table 46. Weld County Historical Flood Events (1950 – 2018)

Date	Hazard Type	Injuries	Deaths	Property Damage	Crop Damage
9/25/2020	Dam Failure	0	0	0	0
6/18/2018	Flash Flood	0	0	$10,000	0
5/8/2017	Flash Flood	0	0	$500,000	$50,000
7/17/2016	Flash Flood	0	0	$5,000	$10,000
6/13/2015	Flash Flood	0	0	$15,000	$10,000
6/2/2015	Flood	0	0	$25,000	$50,000
5/20/2015	Flood	0	0	$250,000	$100,000
5/9/2015	Flood	0	0	$15,000	$5,000
5/8/2015	Flood	0	0	$500,000	$100,000
8/25/2014	Flood	0	0	$25,000	$25,000
7/29/2014	Flash Flood	0	0	$10,000	$10,000
6/1/2014	Flood	0	0	$250,000	$50,000
5/30/2014	Flash Flood	0	0	$15,000	$10,000
5/25/2014	Flood	0	0	$15,000	$10,000
9/14/2013	Flash Flood	0	0	0	0
9/12/2013	Flood	0	0	$230,000,000	$3,750,000
8/3/2013	Flash Flood	0	0	$50,000	$50,000
9/26/2012	Flash Flood	0	0	$15,000	$10,000
6/7/2012	Flash Flood	0	0	$10,000	$5,000
7/12/2011	Flash Flood	0	0	$50,000	$100,000
6/12/2010	Flash Flood	0	0	$24,000	$50,000
6/11/2010	Flash Flood	0	0	$24,000	$50,000
5/26/2010	Flash Flood	0	0	$24,000	$250,000
5/25/2009	Flash Flood	0	0	$24,000	$50,000
8/6/2008	Flash Flood	0	0	$50,000	$25,000
8/22/2007	Flash Flood	0	0	$1,000	0
8/2/2007	Flash Flood	0	0	$1,000	0
6/9/2004	Flash Flood	0	0	0	0
7/26/2003	Flash Flood	0	0	0	0
7/13/2001	Flash Flood	0	0	$600,000	0
7/11/2001	Flash Flood	0	0	0	0
6/7/2001	Flash Flood	0	0	0	0
8/17/2000	Flash Flood	0	0	0	0
8/4/2000	Flood	0	0	0	0
7/19/2000	Flash Flood	0	0	0	0
7/10/1999	Flood	0	0	0	0
5/4/1999	Flood	0	0	0	0
5/1/1999	Flood	0	0	$200,000	0
4/28/1999	Flood	0	0	0	0
7/4/1998	Flood	0	0	0	0

Date	Hazard Type	Injuries	Deaths	Property Damage	Crop Damage
7/29/1997	Flash Flood	0	0	0	0
7/28/1997	Flash Flood	0	0	0	0
7/27/1997	Flash Flood	0	0	0	0
6/14/1997	Flood	0	0	0	0
6/3/1997	Flood	0	0	0	0
5/24/1997	Flash Flood	0	0	0	0
8/29/1996	Flash Flood	0	0	0	0
8/27/1996	Flood	0	0	0	0
Total		0	0	$232,708,000	$4,770,000

Source: SHELDUS; NOAA (NCEI)

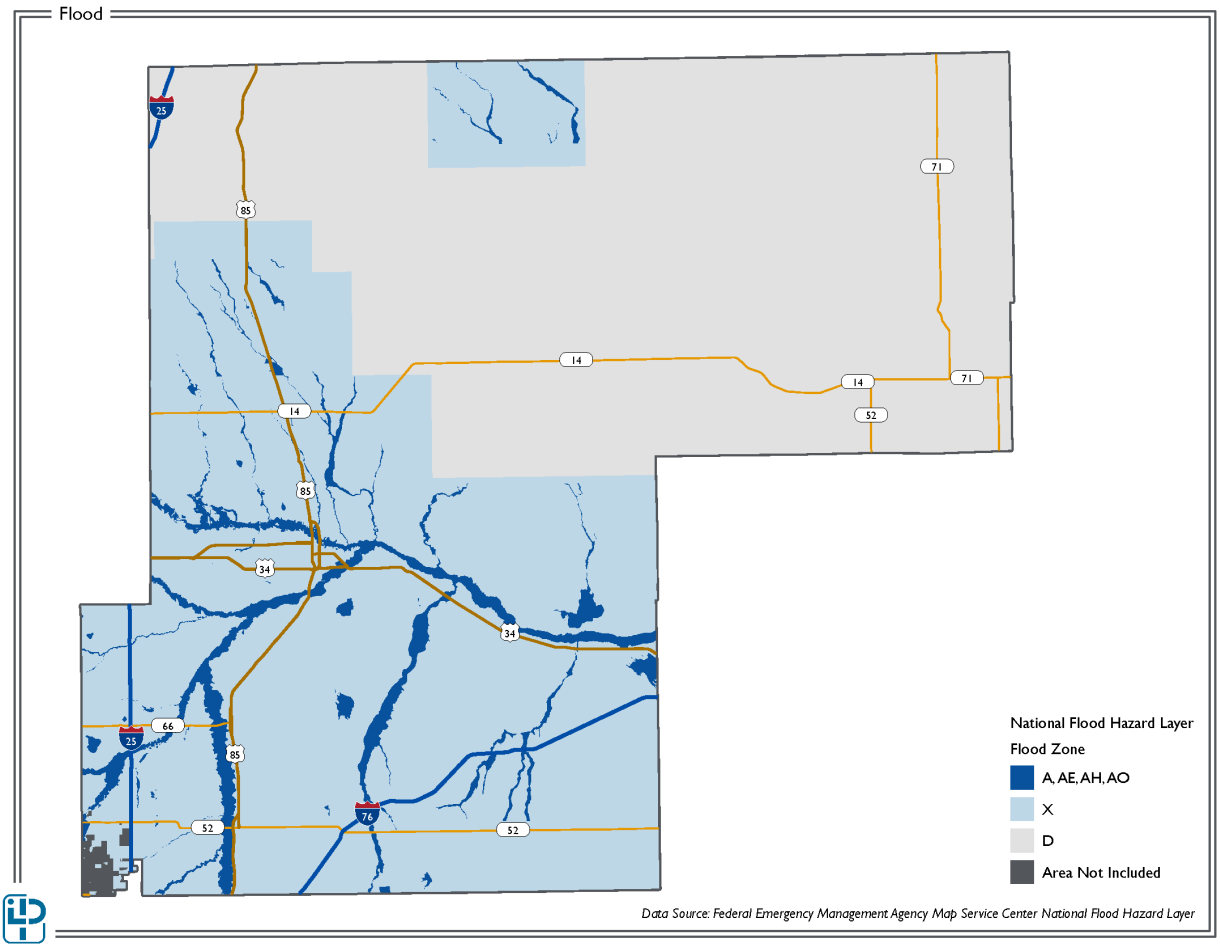
The most significant flooding event to collectively impact the State of Colorado occurred during September 2013. During the week beginning on September 9th, a slow moving cold front circulated over the state, clashing with warm, humid monsoonal air from the south. NOAA's NCEI estimates that Weld County sustained $231 million in property damage and another $4.5 million in crop damage. It should be noted, however, that the 2013 flooding was not a worst-case event for Weld County.

In September 2020, a dam failure did occur in Johnstown. No losses were reported, though repairs are anticipated to cost the Town $425 thousand. Additional details can be found in Table 25.

5.12.3 Data Analytics

The input into the composite risk layer developed with the data analytics suitability model for flood is shown in Figure 49.

Figure 49. Composite Risk Layer Flood Input



5.12.4 Inventory Exposed

Flood

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 4.2, an updated flood analysis was conducted for Weld County. The Hazus flood scenario modeled a countywide 1% annual chance flood event. According to the Hazus inventory, there are an estimated 90,000 buildings in Weld County with a total building replacement value (excluding contents) of over $23 Billion. Approximately 92% of the buildings (and 82% of the building value) are associated with residential housing.

Additional exposure analysis was also conducted outside of Hazus. There are 2,177 address points across Weld County that have elevated potential for flooding due to their location in the SFHA. This equates to 1.6% of all address points within the County.

Dam Failure

There are 28,411 address points across Weld County that have elevated potential for flooding due to their location in mapped dam failure inundation areas. This equates to 1.0% of all address points within the County. It is important to note that not all dams across the County currently have this mapping available. While this inundation data is unable to be mapped in this Plan, community leadership is able to access this data housed by the Colorado Dam Safety Program.

Levee Failure

There are 1,308 address points across Weld County that have elevated potential for flooding due to their location in mapped areas protected by known levees. This equates to 1.6% of all address points within the County.

5.12.5 Potential Losses

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

Flood events impact businesses by damaging property and by interrupting business. Flood events can cut off customer access to a business as well as close a business for repairs or permanently. A quick response to the needs of businesses affected by flood events can help a community maintain economic vitality in the face of flood damage. Responses to business damages can include funding to assist owners in elevating or relocating flood-prone business structures.

During flooding events, homes, businesses, and people face the threat of explosions and fires caused by leaking gas lines along with the possibility of being electrocuted. Domestic and wild animals forced out of their homes and brought into contact with humans by floodwaters can also pose a threat. In rural areas, property damage caused by flooding can be devastating to ranchers and farmers. When flooding occurs during the growing season, farmers can suffer widespread crop loss. Stock growers may lose livestock if they are unable to find safety from rising floodwaters. Flooding may also cause damage to pasture land, fences, barns, and out buildings.

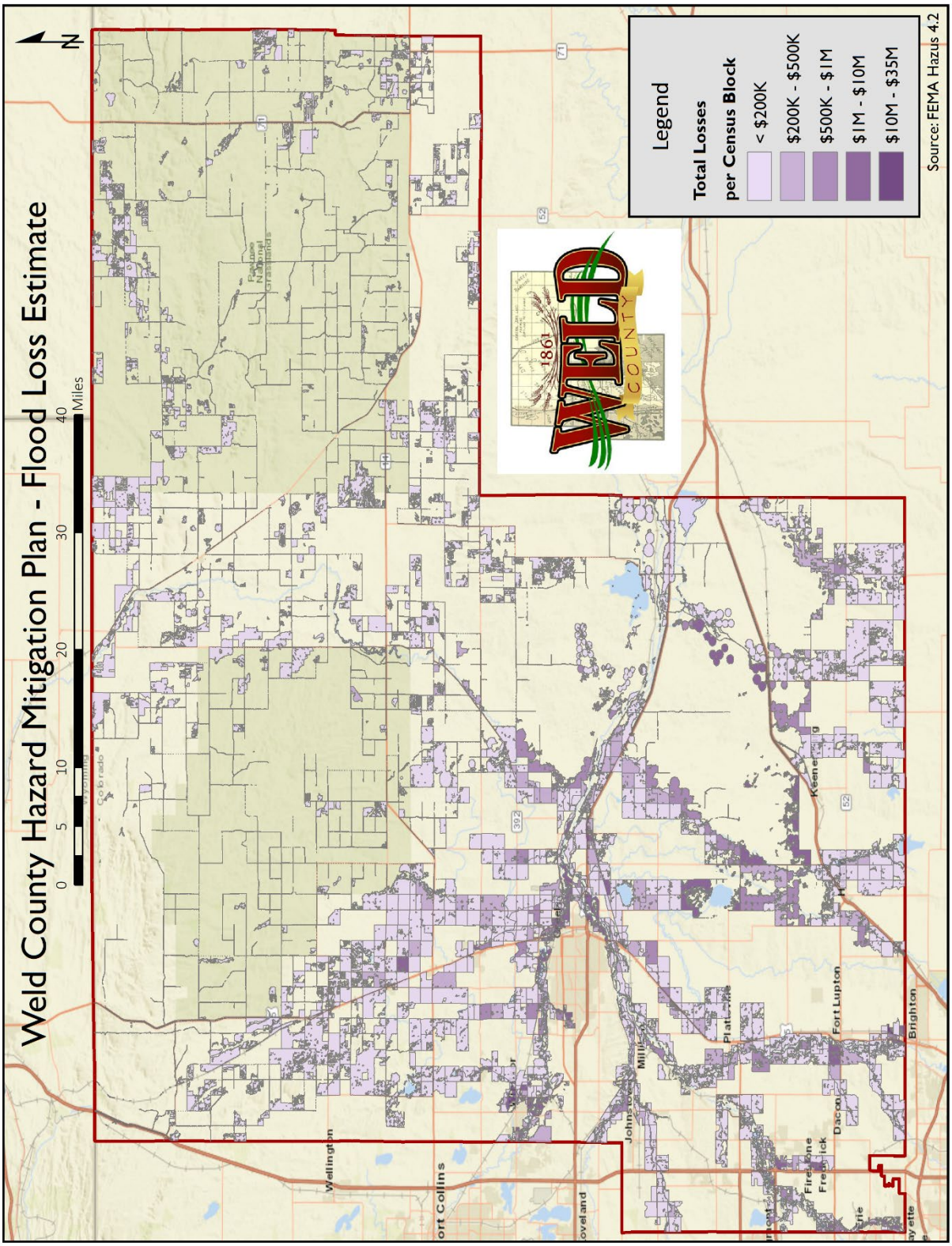
Publicly owned facilities are a key component of daily life for all citizens of the county. Public buildings are of particular importance during flood events because they house critical assets for government response and recovery activities. Damage to public water and sewer systems, transportation networks,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

Mitigation against flood events is accomplished through sensible floodplain management and regulations as well as identifying flood prone areas, tributary watersheds that experience instability or sediment loading problems, and channel instability hazards. This involves strategies to modify flooding and to modify infrastructure to decrease the likelihood of damage. To modify the impact of flooding, measures must be taken to decrease susceptibility to flood damage and disruptions. Natural and cultural resources must also be protected and managed. Coordination with mitigation plans by Floodplain managers will increase effectiveness of flood mitigation projects. City and County Planners will be valuable resources to incorporate flood mitigation plans into their respective plans.

The methodology used to determine potential losses to flooding was conducted using FEMA's Hazus loss estimation software. For this Plan, a 100-year flood scenario was modeled for the County. The results of the Hazus assessment are presented below.

Figure 50 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. While losses are estimate across most all of Weld County, it is clear some of the larger losses correlate to those floodprone areas with higher population and building densities. 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 50. Hazus Flood Estimated Losses



EMERGENCY MANAGEMENT

Other loss estimates from the Hazus scenario to point out include:

- The vast majority of damaged structures are expected to be residential housing.
- Damages are modeled for "Essential Facilities", which includes: hospitals, schools, fire & police stations, and EOCs. The analysis expects damages to a handful of fire & police stations, in addition to a few schools.
- The model estimates ~8,200 people will be displaced due to the flooding.
- Total building-related losses are estimated to be ~$250 Million. 45% of these losses related to expected business interruptions. Residential housing makes up ~41% of these losses.

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

5.12.6 Probability of Future Occurrences

Frequency of previously reported flood events in Weld County provide an acceptable framework for determining the probability of future flood occurrence in the area. The probability that the County and its municipalities will experience a flood event can be difficult to predict or quantify. However, based on historical records of forty-eight flood events since 1950, it can reasonably be assumed that this type of event has occurred once every 0.7 years from 1950 through 2020. It should be noted that the oldest historical record of flood is from 1996. Looking only since then, two flood events have occurred on average each year.

Severe flooding has the potential to inflict significant damage to people and property in Weld County. Mitigating flood damage requires that communities throughout the County remain diligent and notify local officials of potential flood (and flash flood) prone areas near infrastructure such as roads, bridges, and buildings. While the potential for flooding is always present, Weld County has existing land-use policies and regulations for development to help lessen potential damage due to floods.

5.12.7 Land Use and Development

As population continues to increase in Weld County, future development trajectories can be expected to put more people and property, both private and public, at risk of flooding. It is essential that zoning and land use plans take into account not only the dollar amount of damage that buildings near waterways could incur, but also the added risk of floodplain development activity that alters the natural flood plain of the area (for example, narrowing the floodplains by building new structures close to rivers

and streams). The county as a whole should plan for the likelihood of increased exposure of property and humans to flood events.

Existing floodplain management ordinances are intended to address methods and practices to minimize flood damage to new and substantial home improvement projects as well as to address zoning and subdivision ordinances and state regulations. Currently, Weld County is a National Flood Insurance Program (NFIP) participant and continues to support floodplain management activity at the county and local scale.

The greatest protection against flooding is afforded by quality construction and compliance with local ordinances which exceed NFIP requirements. Code adoption by local jurisdictions, compliance by builders, and local government inspection of new homes can greatly reduce the risk of flooding. Moving forward, Weld County will continue to support monitoring, analysis, modeling, and the development of decision-support systems and geographic information applications for floodplain management activities. Additionally, jurisdictions within the county should consider participating in the Community Rating System (CRS).

In addition to land-use planning, zoning, and codes applicable to new development, flood mitigation measures include structural and non-structural measures to address susceptibility of existing structures. Flood mitigation measures such as acquisition, relocation, elevation-in-place, wet/dry flood proofing, and enhanced storm drainage systems all have the potential to effectively reduce the impact of flooding in Weld County.

5.12.8 National Flood Insurance Program (NFIP)

Weld County and many of its municipalities have been mapped for flood hazards and participate in the National Flood Insurance Program (NFIP). Given the flood hazard and risk across the County, and recognizing the importance of the NFIP in mitigating flood losses, an emphasis will be placed on continued compliance with the NFIP by participating jurisdictions. As NFIP participants, many of these communities have and will continue to make every effort to remain in good standing with NFIP. This includes continuing to comply with the NFIP's standards for updating and adopting floodplain maps and maintaining and updating the floodplain zoning ordinance.

Details of local jurisdiction participation status are shown in Table 47. Currently, FEMA is in the process of updating a number of floodplain maps across the County and Preliminary maps are being reviewed by the local communities.

Table 47. NFIP Participation

CID	Community	FIRM Date
080266	Weld County	1/20/2016
080179	Town of Ault	1/20/2016
080236	City of Dacono	1/20/2016
080180	Town of Eaton	1/20/2016
080181	Town of Erie	8/15/2019
080182	City of Evans	1/20/2016
080241	Town of Firestone	1/20/2016
080183	City of Fort Lupton	1/20/2016
080244	Town of Frederick	1/20/2016
080123	Town of Gilcrest	1/20/2016
080184	City of Greeley	1/20/2016
080249	Town of Hudson	1/20/2016
080250	Town of Johnstown	12/19/2006
080251	Town of Keenesburg	1/20/2016
080186	Town of La Salle	1/20/2016
080182	Town of Mead	1/20/2016
080187	Town of Milliken	1/20/2016
080188	Town of Nunn	1/20/2016
080189	Town of Pierce	1/20/2016
080190	Town of Platteville	1/20/2016
080317	Town of Severance	1/20/2016
080264	Town of Windsor	1/20/2016

Source: FEMA 7/17/2020

Repetitive Loss properties (RL) are structures covered by a contract for flood insurance made available under the National Flood Insurance Program (NFIP) that: (a) have incurred flood-related damage on two occasions, in which the cost of repair, on the average, equaled or exceeded 25% of the market value of the structure at the time of each flood event; and (b) at the time of the second incidence of flood-related damage, the policy for flood insurance contained Increased Cost of Compliance Coverage.

Weld County has had a total of nineteen RL events, with two in Erie and the remainder in Unincorporated areas. These 19 events correlate to nine properties, all of which are single family residences.

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

There is one severe repetitive loss (SRL) structure located within Weld County. The single-family residence is located in the City of Greeley and is currently in a Zone A floodplain. The property has not undergone any mitigation projects.

Table 48. Severe Repetitive Loss Property - City of Greeley

Date of Loss	Building Payment	Contents Payment	Total
5/31/2014	$8,251.70	$3,047.70	$11,299.40
9/15/2014	$102,217	$102,217.42	$204,434
6/11/2011	$7,333.92	$18,055.11	$25,389.03
6/10/2010	$18,055.11	$1,786.72	$19,841.83
Total	**$135,857.73**	**$125,106.95**	**$260,964.68**

Source: Colorado Division of Homeland Security and Emergency Management

Table 49. SRL Structure - City of Greeley Loss Summary

Property Value	$374, 702
Cumulative Loss and LAE Paid	$219,328
Replacement Cost	$329,100
30 Year Savings to the Fund Value	$197,948
100 Year Savings to the Fund Value	$227,622

Source: Colorado Division of Homeland Security and Emergency Management

The City of Greeley has identified this property in their mitigation strategy and has developed a Mitigation Action Guide to reduce the risk (and cost) associated with flooding of the SRL structure.

Table 50 presents the current status of flood insurance policies and claims paid across the County. Weld County has a total of 459 NFIP policies (412 were documented in the 2016 Plan). Unincorporated areas of Weld County have by far the largest number of policies and historical claims paid.

Table 50. NFIP Flood Insurance Summary

CID	Community	Total Premiums	Policies in Effect	Total Coverage	Total Claims since 1978	Total Paid since 1978
080266	Weld County	$292,318	234	$62,305,900	125	$5,052,696
080179	Town of Ault	$1,865	2	$177,600	0	$0
080236	City of Dacono	$25,686	15	$3,341,500	4	$133,425
080180	Town of Eaton	$4,032	6	$1,820,000	1	$0
080181	Town of Erie	$26,934	55	$14,783,100	7	$78,68
080182	City of Evans	$22,796	35	$9,647,800	0	$0
080241	Town of Firestone	$10,125	17	$3,715,600	6	$38,123
080183	City of Fort Lupton	$2,751	5	$2,015,800	0	$0
080244	Town of Frederick	$10,221	25	$7,240,100	10	$40,592
080184	City of Greeley	$93,356	74	$25,210,500	13	$66,902
080249	Town of Hudson	$5,020	3	$670,200	0	$0
080250	Town of Johnstown	$5,756	15	$4,411,000	1	$9,971
080186	Town of LaSalle	$2,610	4	$1,280,000	4	$88,671
080187	Town of Milliken	$2,323	4	$1,720,900	3	$150,680
080188	Town of Nunn	$8,945	8	$1,327,000	0	$0
080189	Town of Pierce	$35,623	18	$3,557,300	1	$312
080190	Town of Platteville	$412	1	$280,000	0	$0
080317	Town of Severance	$2,471	8	$1,608,100	0	$0
080264	Town of Windsor	$28,683	64	$20,170,000	11	$6,932
Total*:		**$520,554**	**459**	**$125,918,700**	**167**	**$5,571,401**

Source: FEMA 7/17/2020, if a jurisdiction is not listed it does not currently have any policies

** Total does not include bi-county communities (Erie, Johnstown, Windsor)*

Weld County communities do not participate in FEMA's Community Rating System (CRS) program. CRS is a voluntary program for NFIP participating communities. The goals of the CRS is to reduce flood damages to insurable property, to strengthen and support the insurance aspects of the NFIP, and to encourage a comprehensive approach to floodplain management.

The CRS was developed to provide incentives in the form of insurance premium discounts to communities that go above and beyond the minimum floodplain management requirements and develop extra measures to reduce flood risk. There are 10 CRS classes and the classification determines the insurance premium discount for policy holders. The discounts range from 5% to a maximum of 45%. CRS activities are summarized into four main categories and include: public information, mapping & regulation, flood damage reduction, and flood preparedness.

5.13 Hazmat Release

HIGH RISK HAZARD

5.13.1 Hazard Identification

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.

Table 51. Hazardous Materials - Classes and Descriptions

Hazard Class	Description
Class 1: Explosives	1.1 mass explosion hazard 1.2 projectile hazard 1.3 minor blast/projectile/fire 1.4 minor blast 1.5 insensitive explosives 1.6 very insensitive explosives
Class 2: Compressed Gases	2.1 flammable gases 2.2 non-flammable compressed 2.3 poisonous
Class 3: Flammable Liquids	Flammable (flash point below 141°) Combustible (flash point 141°-200°
Class 4: Flammable Solids	4.1 flammable solids 4.2 spontaneously combustible 4.3 dangerous when wet
Class 5: Oxidizers and Organic Peroxides	5.1 Oxidizer 5.2 Organic Peroxide
Class 6: Toxic Materials	6.1 Material that is poisonous 6.2 Infectious Agents
Class 7: Radioactive Material	Radioactive I Radioactive II Radioactive III
Class 8: Corrosive Material	Destruction of the human skin Corrode steel at a rate of 0.25 inches per year
Class 9: Miscellaneous	A material that presents a hazard during shipment but does not meet the definition of the other classes

There are three common sources for Hazmat incidents within the County: delivery lines, fixed storage facilities/use locations, and transportation lines. Specific safety regulations apply when handling and storing hazardous materials at fixed facilities. Hazardous materials that are being transported must have specific packaging and labeling. If a Hazmat incident occurs, the area impacts will depend on the nature of the chemical and climate conditions. All areas should be considered at risk. Some areas may have greater impacts from a spill, such as those close to aquifers and other water supplies.

Weld County's 2035 Transportation Plan summarizes existing transportation conditions including current hazardous materials routes. "Weld County has significant oil well activity," states the 2035 Plan. "As a result, trucks carrying oil well production utilize nearly every road in the county."

In Weld County, transportation of hazardous materials is occurring throughout the day, every day, by rail and road. While roadway transport accounts for the largest amount of hazardous materials moving though the County, rail cars pose an increased risk due to the large quantities they can carry. With that said, there have been a limited number of Hazmat incidents involving rail cars in Weld County.

Routing of hazardous materials by motor vehicles on all public roads in the state is governed by Title 42, Article 20 of the Colorado Revised Statutes. CDOT Policy Directive 1903.0 (effective 5/20/2010), and CDOT Procedural Directive 1903.1 (effective 2/3/2011), govern CDOT's role in the designation of hazardous material routes. In order to designate a Colorado state highway as hazardous material route, CDOT staff members, local governments, or private entities must request the Mobility Section of the Division of Transportation Development to perform an analysis of the route. To perform this analysis, the Mobility Section convenes a "Hazmat Advisory Team" to determine if the proposed route meets the required criteria. If the required criteria are met and approved by the Transportation Commission, CDOT will file a petition with the Colorado State Patrol (CSP) for approval. If the petition is approved, the route is designated a hazmat route.

*Approved by the Board of Commissioners on July 8, 2019, the **Weld County Oil and Gas Energy Department** (OGED) was created to firmly establish the county's local control over mineral resources in unincorporated Weld County - a delegation included in Senate Bill 181 and accepted by the commissioners upon the bill being signed into law on April 16, 2019.*

With the goal of serving residents and the energy industry, the OGED is where to file and get more information about 1041 Weld County Oil and Gas Location Assessment (1041 WOGLA) permits, Location Assessment for Pipeline (LAP) permits and more. The OGED can also assist residents who have questions regarding oil and gas activity in Weld County. You can find many of the documents you need and the answers to many questions you may have throughout this website.

The OGED is responsible for permitting, regulating and enforcing surface regulations related to oil and gas operations for drilling sites located in unincorporated Weld County. The department is currently staffed with 12 employees who will enforce regulations to ensure the health, safety and welfare of the public and the environment.

Weld County is the number one producer of oil and gas in the State. 87% of all crude oil production and 43% of all natural gas production in Colorado comes from Weld County!

Currently Weld County has submitted a petition to CSP for an oil, crude, and gas exemption for CR 49, between Highway 34 and I-76.

The required criteria that the route must meet before it is brought before the Transportation Commission are as follows:

- The route(s) under consideration are feasible, practicable, and not unreasonably expensive for such transportation.
- The route(s) is continuous within a jurisdiction and from one jurisdiction to another.
- The route(s) does not unreasonably burden interstate or intrastate commerce.
- The route(s) designation is not arbitrary or intended by the petitioner merely to divert the transportation of hazardous materials to other communities.
- The route(s) designation will not interfere with the pickup or delivery of hazardous materials.
- The route(s) designation is consistent with all applicable state and federal laws and regulations; and
- The route(s) provides greater safety to the public than other feasible routes. Considerations include but are not limited to:
    - AADT, crash and fatality rates
    - Population within a one-mile swath of each side of the highway
    - Locations of schools, hospitals, sensitive environmental areas, rivers, lakes, etc.
    - Emergency response capabilities on the route
    - Condition of the route, i.e., vertical and horizontal alignment, pavement condition, level of access to the route, etc.

Colorado State Patrol
Hazardous Materials Unit

(303) 273-1900
http://csp.state.co.hazmat.html

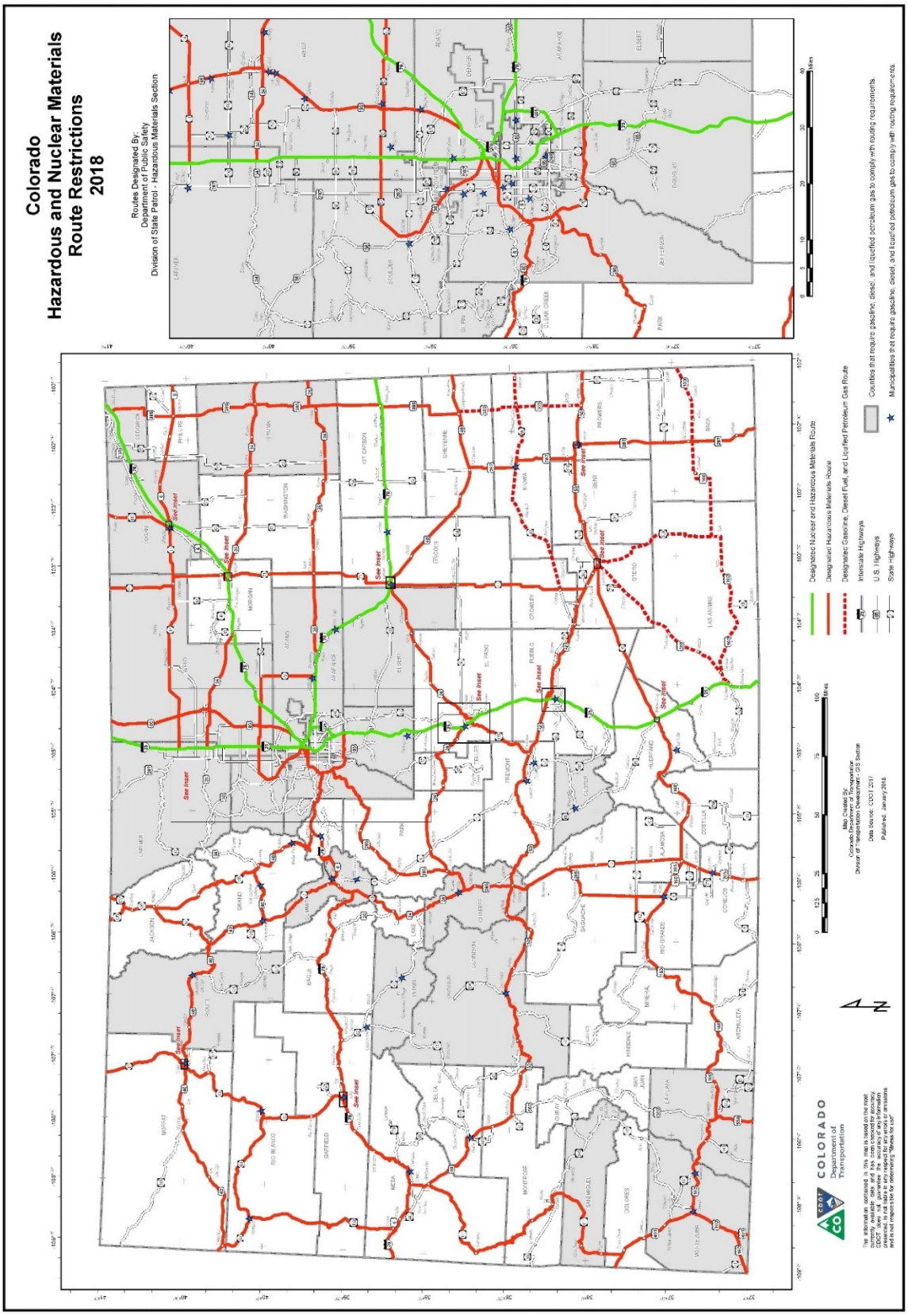
Troop 8-C is the Hazardous Materials Section of the Colorado State Patrol. Their mission is to contribute to the safety of hazardous materials transportation in order to protect citizens and the environment. Twenty-eight troopers trained as Hazardous Materials Technicians are deployed throughout the state.

Weld County's Office of Emergency Management is the Designated Emergency Response Authority (DERA) for all unincorporated areas of the County. Local municipalities are the DERA for their community unless they have delegated their role to local fire districts. State Patrol has jurisdiction for highways.

For security reasons, it is not within the scope of this plan to map the locations of all industrial and commercial fixed sites.

The following CDOT map shows the state's designated nuclear, hazardous materials, and gasoline, diesel fuel, and liquid petroleum gas routes, many of which pass through the western portion of Weld County.

Figure 51. Colorado Hazardous and Nuclear Materials Route Restrictions



5.13.2 Previous Occurrences

The Pipeline and Hazardous Materials Safety Administration's (PHMSA) Incident Reports Database, shows a total of 200 Hazmat incidents reported in Weld County between 1977 and 2019. The majority of these incidents occurred due to improper preparation for transport, product leakage due to loose or defective components, and overfilling of product. Roughly 10% were traffic accidents.

Table 52. PHMSA Causes of Hazardous Material Incidents (1977 – 2019)

Period	Total	Defective Component or Device	Improper Transport Preparation	Overfilled Capacity	Vehicle Accident	Other
1977-1988	2	2	-	-	-	-
1990-1999	62	8	11	14	4	25
2000-2009	46	16	10	4	2	14
2010-2019	90	34	10	2	14	30
Total	**200**	**60**	**31**	**20**	**20**	**69**

The Colorado Oil & Gas Conservation Commission (COGCC) also keeps a database of past spills and releases. Table 53 presents these documented incidents since 2010. The County averaged 292 spills and releases per year during this time. It should be pointed out the 12% drop from that average during 2020. This recent reduction in spills is attributed to on-going work between the county and industry.

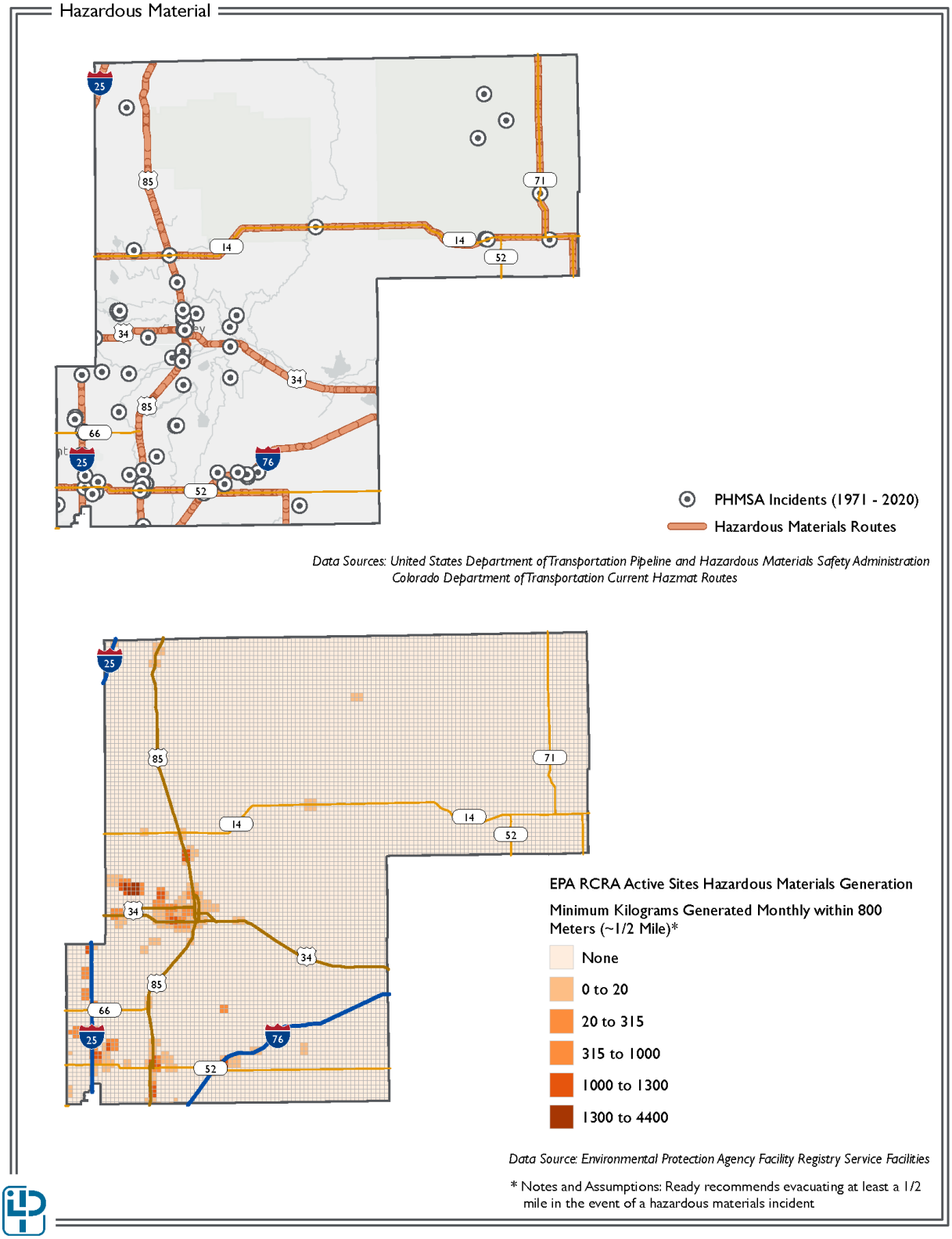
Table 53. COGCC Hazardous Material Incidents (2010 – 2020)

Year	Total
2010	159
2011	179
2012	199
2013	327
2014	418
2015	327
2016	262
2017	367
2018	364
2019	352
2020	258
Total	**3,212**

5.13.3 Data Analytics

The input into the composite risk layer developed with the data analytics suitability model for Hazmat release is shown in Figure 52.

Figure 52. Composite Risk Layer Hazmat Release Input



5.13.4 Inventory Exposed

Approved transportation routes crisscross the County geography, moving large amounts of hazardous materials each day, and significant quantities of chemicals are used in the agricultural regions. Therefore, the inventory and assets in the County, public and private, are exposed. Risks to people, property and crops may vary substantially at local levels and should be determined in mitigation planning accordingly.

As development continues closer to existing industrial areas and population density increases near hazardous materials transportation routes, the inventory exposed to future occurrences multiplies.

The effects of exposure may not only be near a direct spill or release of hazardous materials, as some chemical vapors can travel considerable distances based on wind conditions and the type of chemical. The inventory that is most often exposed to Hazmat risks are railways, roadways, and fixed facilities that contain hazardous materials, and all assets that lie within at least a mile of the potential release areas.

5.13.5 Potential Losses

Hazmat related events occur throughout Weld County every year. The potentials costs and damages are based on the intensity, magnitude and risk of these incidents. Hazardous material responses depend on various factors including:

- Type of material released
- Cause and process of release
- Weather conditions
- Location of the event
- Presence of population nearby
- Time until responders arrive

These events have the potential to threaten lives, disrupt services to the public and disrupt business activity due to possible evacuations and extended closure of roadways. Hazmat incidents can result in environmental contamination to non-renewable resources such as soil and water sources.

Human exposure to hazardous materials may have the most immediate and extreme consequences. The presence of a Hazmat response teams brings with it very specific dangers to first responders and the protective equipment they wear is typically discarded after the response, creating a need for this inventory to be replenished.

Potential losses should consider the costs of responses. The Colorado Department of Public Safety has a set of rules and regulations concerning claims for reimbursement of costs incurred for the handling of hazardous substance incidents. These direct costs include:

- Personnel overhead
- Supplies expended
- Vehicles and equipment
- Contracted services
- Laboratory testing
- Storage/disposal of the materials

Indirect costs such as administrative staff hours may also be included. If the incident response is not properly documented, submitted, and processed, it could result in only partial or no reimbursement to the local jurisdiction.

5.13.6 Probability of Future Occurrences

The probability of future occurrences of Hazmat events is likely. The COGCC incident data shows an average of 292 events occurred yearly since 2010. Trends from the last four years show that incidents are decreasing, most likely due to increased coordination between the county and industry.

As operations utilizing hazardous materials fluxtuate, such as oil production, so do handling and transport. This contributes to the probability and risks of future events.

5.13.7 Land Use and Development

As Weld County continues to experience population growth and development over time, considerations must be made concerning land use and regulations. Increasing development may cause residential and commercial investment closer to railways and identified hazardous and nuclear materials routes.

5.14 Land Subsidence

LOW RISK HAZARD

5.14.1 Hazard Identification

Land Subsidence describes any depressions, cracks, and/or sinkholes in the earth's surface which can threaten people and property. Causes of subsidence include, but are not limited to, the removal or reduction of sub-surface fluids (water, oil, gas, etc.), mine subsidence, and hydro compaction. Of these causes, hydro compaction and mine subsidence usually manifest as localized events, while fluid removal may occur either locally or regionally.

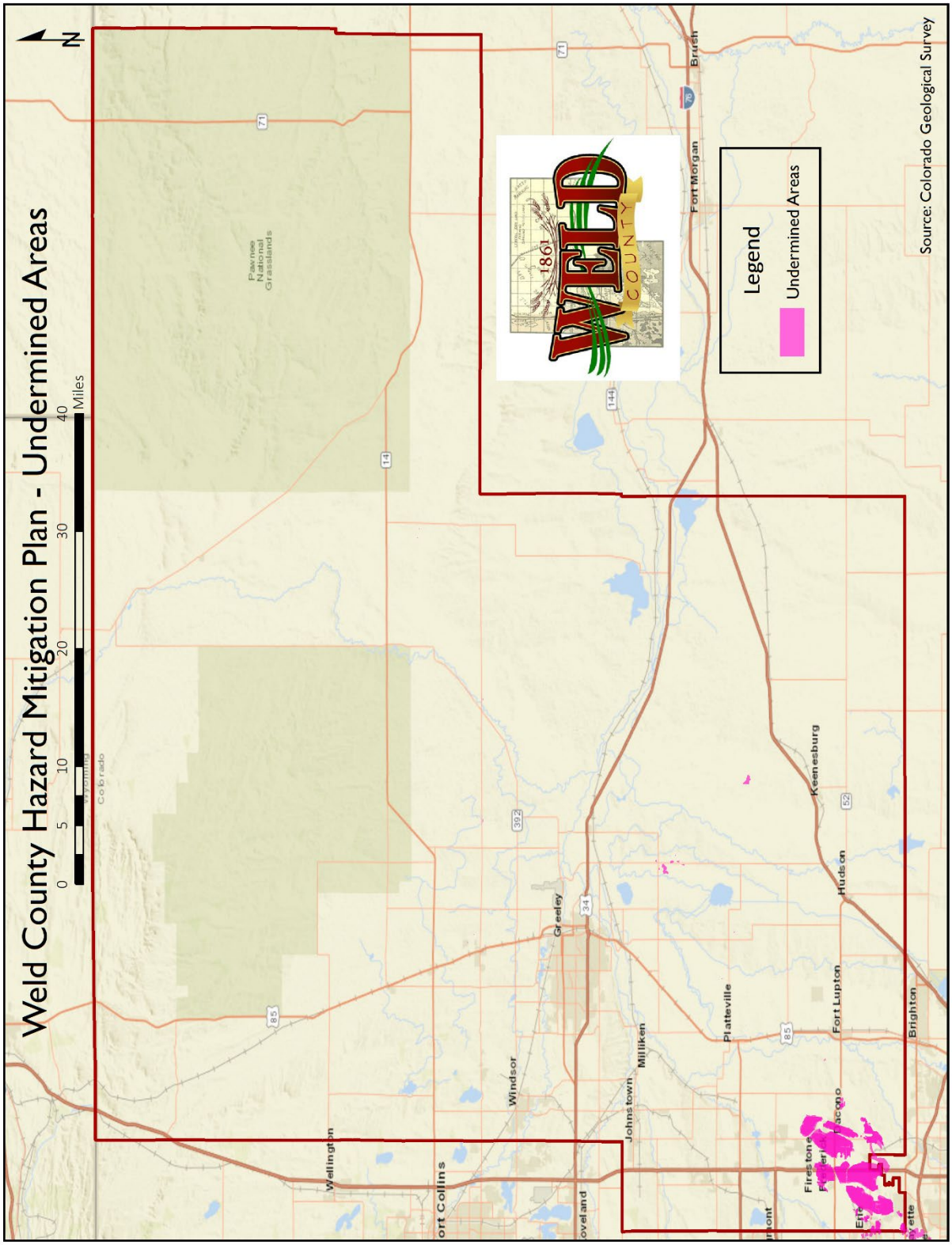
Land subsidence can occur rapidly due to a sinkhole or the collapse of an underground mine, or during major earthquakes. Subsidence can also take place slowly, becoming evident over the time span of many years. Soils that tend to collapse and settle are those characterized by low-density materials that shrink in volume when they become wet and/or are subjected to weight from development. Subsidence events, depending on their location, can pose significant risks to health, safety, and local agricultural economies and interruption to transportation, and other services.

There are hundreds of abandoned underground coal mines scattered throughout Colorado that present potential subsidence hazards to structures and surface improvements. The Colorado Geological Survey (CGS) operates the Colorado Mine Subsidence Information Center (MSIC) which is the repository for all of the known existing maps of inactive or abandoned coal mines in the state. Subsidence tends to be problematic along the Colorado Front Range, Western Slope, and in the central mountains near Eagle and Garfield Counties.[7]

Based on data provided by CGS, there are a number of known undermined areas within southwestern Weld County that are more vulnerable to subsidence, with additional small pockets scattered across the southern half of the County. Figure 53 presents a map identifying the locations within Weld County that have potential for subsidence due to historical mining activity. Note that this data is best available and is the same utilized during the 2016 Plan update.

[7] 2013 Colorado Natural Hazards Mitigation Plan

Figure 53. Undermined Areas



EMERGENCY MANAGEMENT

5.14.2 Previous Occurrences

Reliable, county-specific historical records of land subsidence events in the State of Colorado is sparse. That said, CGS has been researching land subsidence in Colorado for over two decades. In addition to publishing regional susceptibility maps and GIS datasets, the CGS has also compiled a series of case histories that describe select land subsidence events across the state.

Out of the five case histories highlighted on the CGS "Geologic Hazards" resource site, two are located in Weld County.

Table 54. CGS Land Subsidence Case Histories – Weld County

Location	Event Summary
Erie, CO	January 2009 - A large subsidence hole was reported at a residence near the corner of a horse barn. The property owners reported the hole opened up overnight and a fence and gate had been destroyed by the event. The hole measured roughly 25 feet by 25 feet by 15 feet deep and was filled with water. Because of the nature of the opening and the proximity to livestock and human activities, the event was considered a subsidence emergency and was backfilled by the Abandoned Mine Lands program
Erie, CO	December 2008 - A large subsidence hole in a field west of Erie was reported. The hole was about 50 feet in diameter and 35 feet deep before being filled with water. The field where the hole appeared was under consideration for annexation by the town for future residential development. A geophysical investigation conducted 3 months prior did not show any evidence of voids in the area. The hole was located outside of the mined area shown on the mine map indicating that the mine map was inaccurate. During the mitigation process, a secondary subsidence pit of smaller dimensions was found directly west of the original hole. Both holes were backfilled by the Abandoned Mine Lands program.

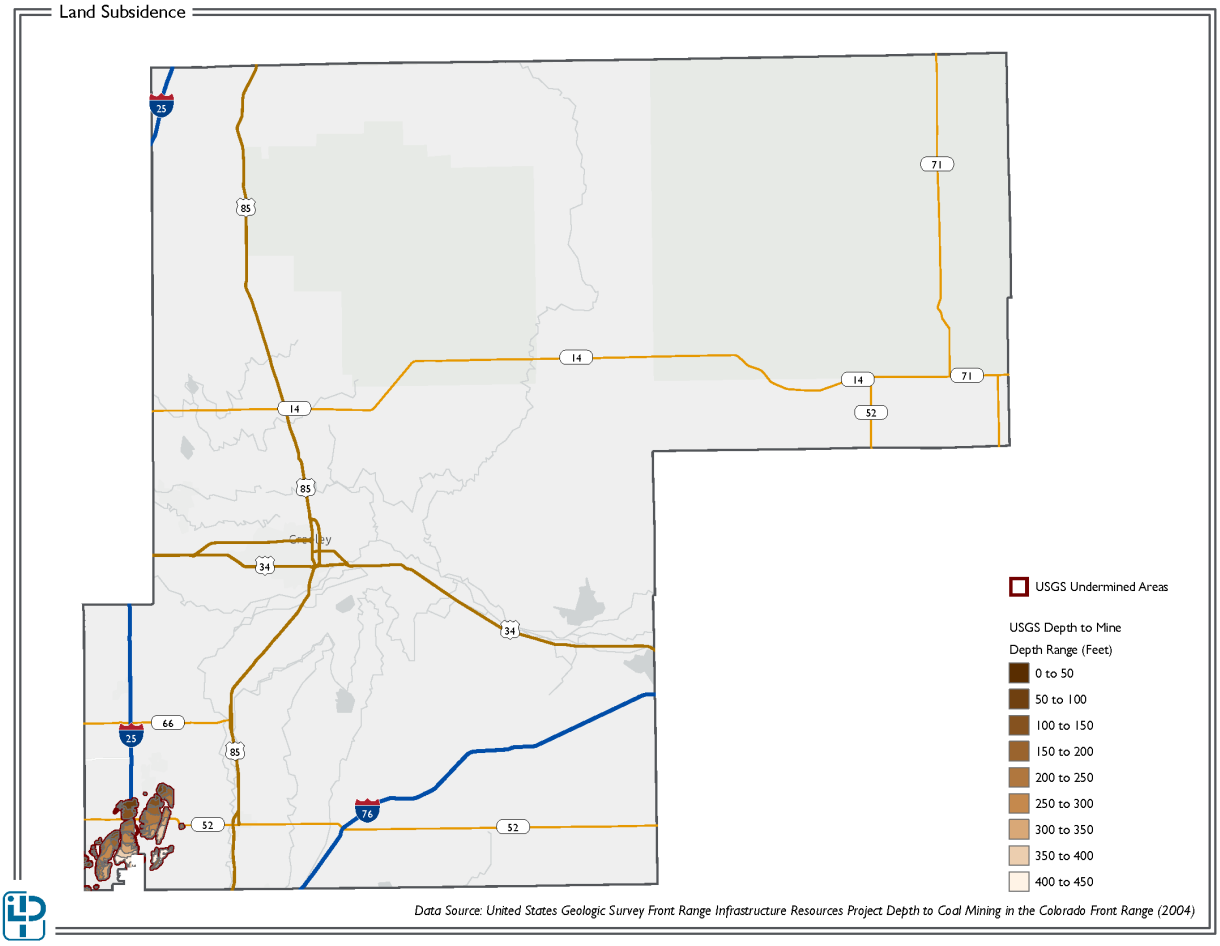
Source: CGS

As a general rule of thumb, land subsidence occurrence can be expected where it has occurred in the past. For this reason, the County may benefit from developing a reporting system and database for tracking land subsidence events.

5.14.3 Data Analytics

The input into the composite risk layer developed with the data analytics suitability model for land subsidence is shown in Figure 54.

Figure 54. Composite Risk Layer Land Subsidence Input



5.14.4 Inventory Exposed

A structure may be at risk to the impacts of land subsidence if it is located over or close to an undermined area. Therefore, an important first step in determining exposure at a specific location is to determine if the area is undermined or near an area where underground mining took place. There are 8,453 address points across Weld County that have elevated potential for subsidence due to historical mining activity and development activity. This equates to 6.2% of all address points within the County.

Most of the undermined areas within Weld County that are vulnerable to subsidence are located in the southwestern portion of the County. This is an area of the County where both development and population are growing rapidly. Impacted communities include Erie, Dacono, and Frederick. As population growth brings new development into available land in the southwestern portion of the County, more assets may become exposed to subsidence hazards.

5.14.5 Potential Losses

The risk analysis indicates that Weld County has relatively high exposure to land subsidence, primarily because of the location of historically undermined areas in relation to urban development and population growth. Not only have there been previous land subsidence events reported in the County, CGS data of at-risk areas shows a number of areas of historical undermining in the County, many of

which intersect with Lifelines, largely populated areas, and future development areas. A lack of historical losses makes it difficult to quantify potential losses from land subsidence events.

5.14.6 Probability of Future Occurrences

Due to the lack of identified subsidence occurrences and uncertainty associated with existing data, it is challenging to calculate any type of probability for future events. It can be assured however, that subsidence will continue to slowly alter the landscape of Weld County.

In areas where there is decreased precipitation in the summer months and reduced surface-water supplies, communities are often forced to pump more ground water to meet their needs. In Colorado, the major aquifers are composed primarily of compressed clay and silt, soil types that are prone to compact when groundwater is pumped. In the past, major land subsidence has occurred in agricultural settings where groundwater has been pumped for irrigation. It is important that Weld County considers future mitigation actions that will address this hazard, particularly in rapidly growing areas.

5.14.7 Land Use and Development

As the population of Weld County grows, there is a possibility that some development will encroach into identified subsidence hazard areas. These hazards include the potential for sagging ground, sinkholes, and the collapse of mine shafts that have not been adequately closed. Any of these hazards can cause damage to property, structures, transportation infrastructure, utility lines, and in some cases, can threaten human life. Only a few inches of differential settlement beneath a structure could cause many thousands of dollars of damage. It is important that subsidence risk data is considered in the designs and plans of future development proposals.

5.15 Prairie Fire

HIGH RISK HAZARD

5.15.1 Hazard Identification

Prairie Fires (also known as wildfires) are defined as unwanted or unplanned wildland fires. They include unauthorized human caused fires, escaped prescribed burn projects, and all other wildland fires where the objective is to put the fire out.

Prairie fires are fueled by natural ground cover, including native and non-native species of trees, brush and grasses, and crops along with weather conditions and topography. While available fuel, topography, and weather provide the conditions that allow fires to spread, most fires are caused by people through criminal or accidental misuse of fire.

Prairie fires pose serious threats to human safety and property in Weld County. They can destroy crops, timber resources, recreation areas, and critical wildlife habitat. Wildfires are commonly perceived as hazards in the western part of the state; however, they are a growing problem in the wildland-urban interfaces of eastern Colorado, including communities within Weld County.

Prairie Fire near Weld County

Prairie fire behavior is dictated in part by the quantity and quality of available fuels. Fuel quantity is the mass of material per unit area. Fuel quality is determined by a number of factors, including fuel density, chemistry, and arrangement. Arrangement influences the availability of oxygen surrounding the fuel source. Another important aspect of fuel quality is the total surface area of the material that is exposed to heat and air. Fuels with large area-to-volume ratios, such as grasses, leaves, bark and twigs, are easily ignited when dry.

Climatic and meteorological conditions that influence prairie fires include solar insulation, atmospheric humidity, and precipitation, all of which determine the moisture content of wood and leaf litter. Dry spells, heat, low humidity, and wind increase the susceptibility of vegetation to fire. Additional natural agents can be responsible for igniting fires, including lightning, sparks generated by rocks rolling down a slope, friction produced by branches rubbing together in the wind, and spontaneous combustion.

Arson and accidents, including sparks from equipment and vehicles, can also cause prairie fire. Human-caused fires are typically worse than those caused by natural agents. Arson and accidental fires usually start along roads, trails, streams, or at dwellings that are generally on lower slopes or bottoms of hills and valleys. Nurtured by updrafts, these fires can spread quickly uphill. Arson fires are often set

deliberately at times when factors such as wind, temperature, and dryness contribute to the spread of flames.

Local impacts from prairie fire events include the following:

- Loss of life (human, livestock, wildlife)
- Damage to municipal watersheds
- Loss of property
- Evacuations
- Transportation interruption (closing highways)
- Reductions in air quality and human health
- Injuries – burns, smoke inhalation, etc.
- Coal seam or other energy facility ignitions
- Loss of vegetation (erosion, loss of forage and habitat for livestock and wildlife)
- Expense of responding (equipment, personnel, supplies, etc.)
- Loss of revenue from destroyed recreation and tourism area

Predicting the intensity of a prairie fire, its rate of spread, and its duration are important for wildfire mitigation activity, response, and firefighter safety. Listed below are the three key factors affecting prairie fire behavior in the Wildland Urban Interface (WUI). Very often, however, the only factor that a community can have direct influence over is fuel.

1. **Fuels:** The type, density, and continuity of surrounding vegetation and, sometimes, flammable structures, that provide fuel to keep a wildfire burning. Fuels consist of combustible materials and vegetation (including grasses, leaves, ground litter, plants, shrubs, and trees) that feed a fire.
2. **Weather:** Relative humidity, wind, and temperatures all affect wildfire threat and behavior.
3. **Topography:** The steepness and aspect (direction) of slopes, as well as building-site locations, are features that affect fire behavior.

Wildfires are often rated based on their ability of their fuels to ignite. Descriptions for the commonly used "Fire Danger Rating" system are listed below:

- **Low:** Fuels do not ignite readily from small firebrands. However, an intense heat source, such as lightning, may start fires in duff or rotted wood. Fires in open grasslands may burn freely for a few hours after rain, but wood fires spread slowly by creeping or smoldering, and burn in irregular fingers. There is little danger of spotting.
- **Moderate:** Fires can start from most accidental causes, with the exception of lightning. Fires in open grasslands will burn briskly and rapidly on windy days. Timber fires spread slowly to moderately fast. The average fire is of moderate intensity, although heavy concentrations of fuel may burn hot. Short-distance spotting may occur. Fires are not likely to become serious and control is relatively easy.
- **High:** All fine dead fuels ignite readily and fires start easily from most causes. Unattended brush and campfires are likely to escape. Fires spread rapidly and short-distance spotting is common. High-intensity burning may develop on slopes or in concentrations of fine fuels. Fires may become serious and their control difficult unless they are attacked successfully while small.

- **Extreme/Very High:** Fires start easily from all causes and immediately after ignition, spread rapidly and increase quickly in intensity. Spot fires are a constant danger. Fires burning in light fuels may quickly develop intensity characteristics such as long-distance spotting and fire whirlwinds when they burn into heavier fuels.

For the purpose of prairie fire mitigation strategy development, this Plan divides the various land use types within Weld County into four categories: *cultivated agricultural land*, *forested land*, *grazing land*, and *miscellaneous*. Cultivated agricultural lands include both irrigated and non-irrigated crop land. Typically, this category of land has very dynamic burning characteristics and seasons. Crops and dormant stands located on Weld County's cultivated agricultural land can both serve as fuel for wildfires. What makes agricultural land unique is the dynamic nature of the fuel locations and seasons of availability. These factors add to the challenge of wildfire suppression and mitigation.

In the context of the Weld County landscape, forested land includes the riparian forest, windbreaks, shelterbelts, living snow fences, and urban forests. Much of the forested land in Weld County occurs along rivers, seasonal water courses, lakes, and ponds. Other forested lands include farmsteads and urban areas. Here, trees are often planted near homes and outbuildings, which contribute to elevated wildfire risk. In addition to the trees, forested lands include a surface cover of dry brush and grasses, which are primary fuel sources for rapidly moving fires.

Grazing lands are primarily made up of sandhill steppe and prairie landscapes. Sandhill steppe is a combination of mixed grasses and sage, and is widely used for livestock grazing. Fuel loads on grazing lands are moderate to heavy and large fires have occurred with this fuel type during springtime wind events. In some areas within Weld County livestock grazing maintains a rather sparse fuel load. Miscellaneous areas include transportation right of ways, fence lines, disturbed areas, and other locations that contain grasses, tumbleweeds, wild sunflowers, and other vegetation.

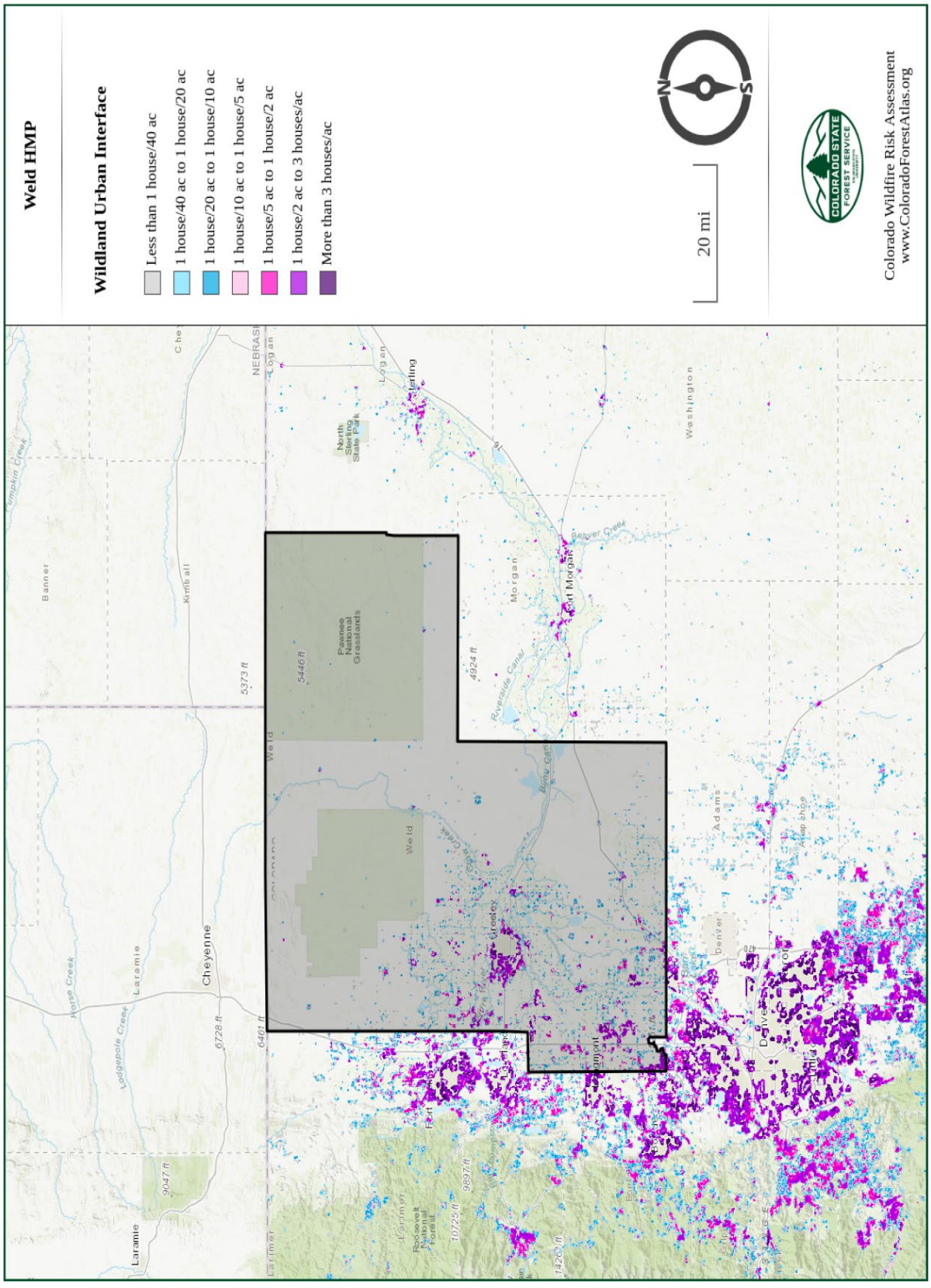
Long-term regional weather patterns in Colorado have followed a cyclical pattern of wet years (characterized by average to high precipitation levels for the region), followed by a series of drought years (characterized by below average precipitation levels). During wet years, the typical fire season is from March through November. During drought years, the fire season in Colorado has been as long as the full year.

Before discussing wildland fire risk in Weld County, a key wildfire management term must first be defined. The term "wildland-urban interface", or WUI, is widely used within the wildland fire management community to describe any area where manmade buildings are constructed close to or within a boundary of natural terrain and fuel, where high potential for wildland fires exist. Communities are able to establish the definition and boundary of their local WUI, and the boundaries often help in meeting local management needs.

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

Figure 55 provides an overview of Weld County's WUI. These areas have been identified mainly in the Southwestern quarter of the County.

Figure 55. Wildland-Urban Interface



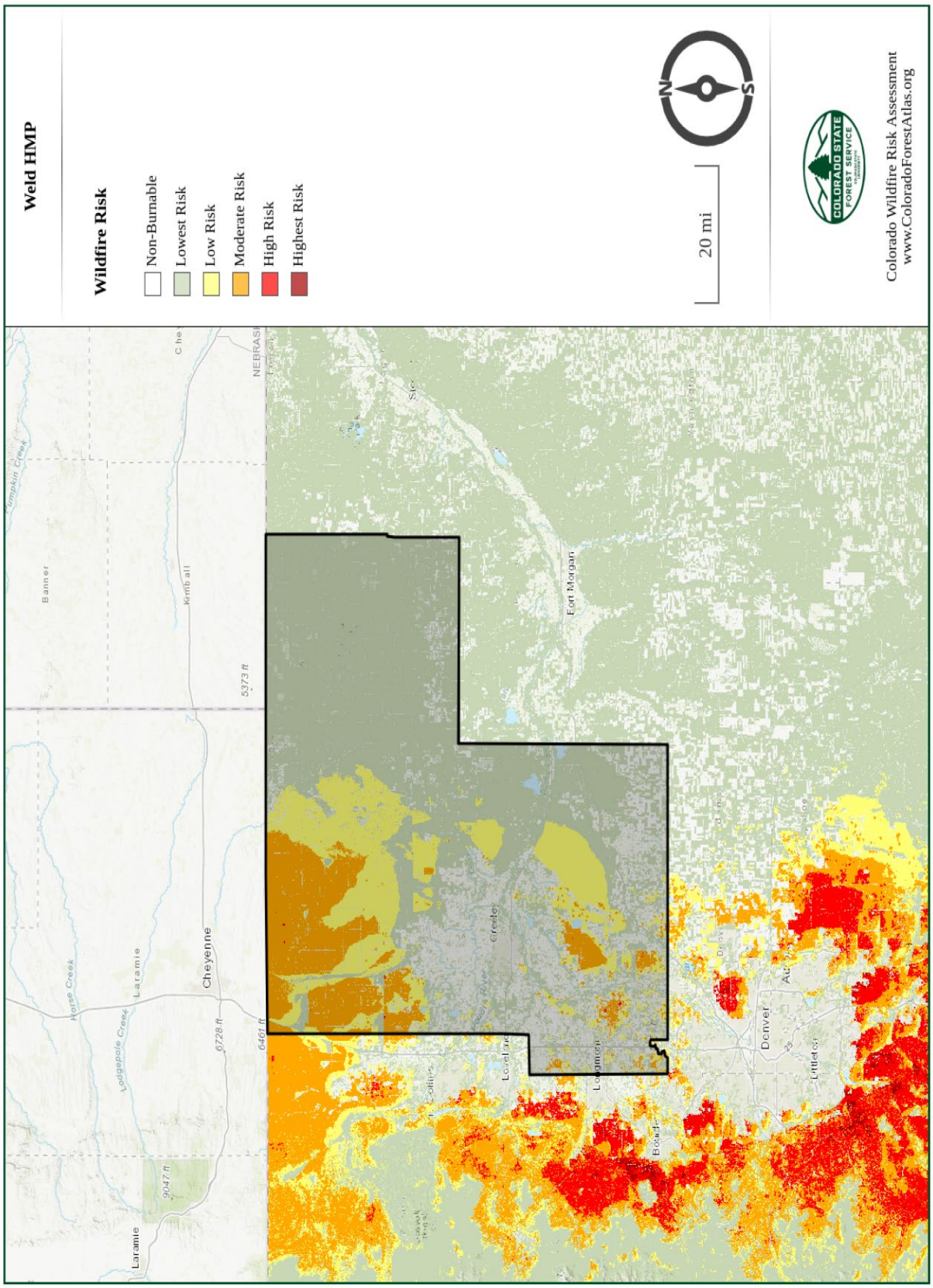
EMERGENCY MANAGEMENT

"Wildfire Risk" represents the possibility of loss or harm occurring from a wildfire. It identifies areas with the greatest potential impacts from a wildfire, considering both WUI Risk, Drinking Water Risk, Forest Assets Risk, and Riparian Areas Risk.

Figure 56 identifies areas with the greatest potential impacts from a prairie fire, in other words, those areas most at risk. The highest wildfire risk areas are located in the Northwest corner of the County in addition to some areas in Southcentral Weld County.

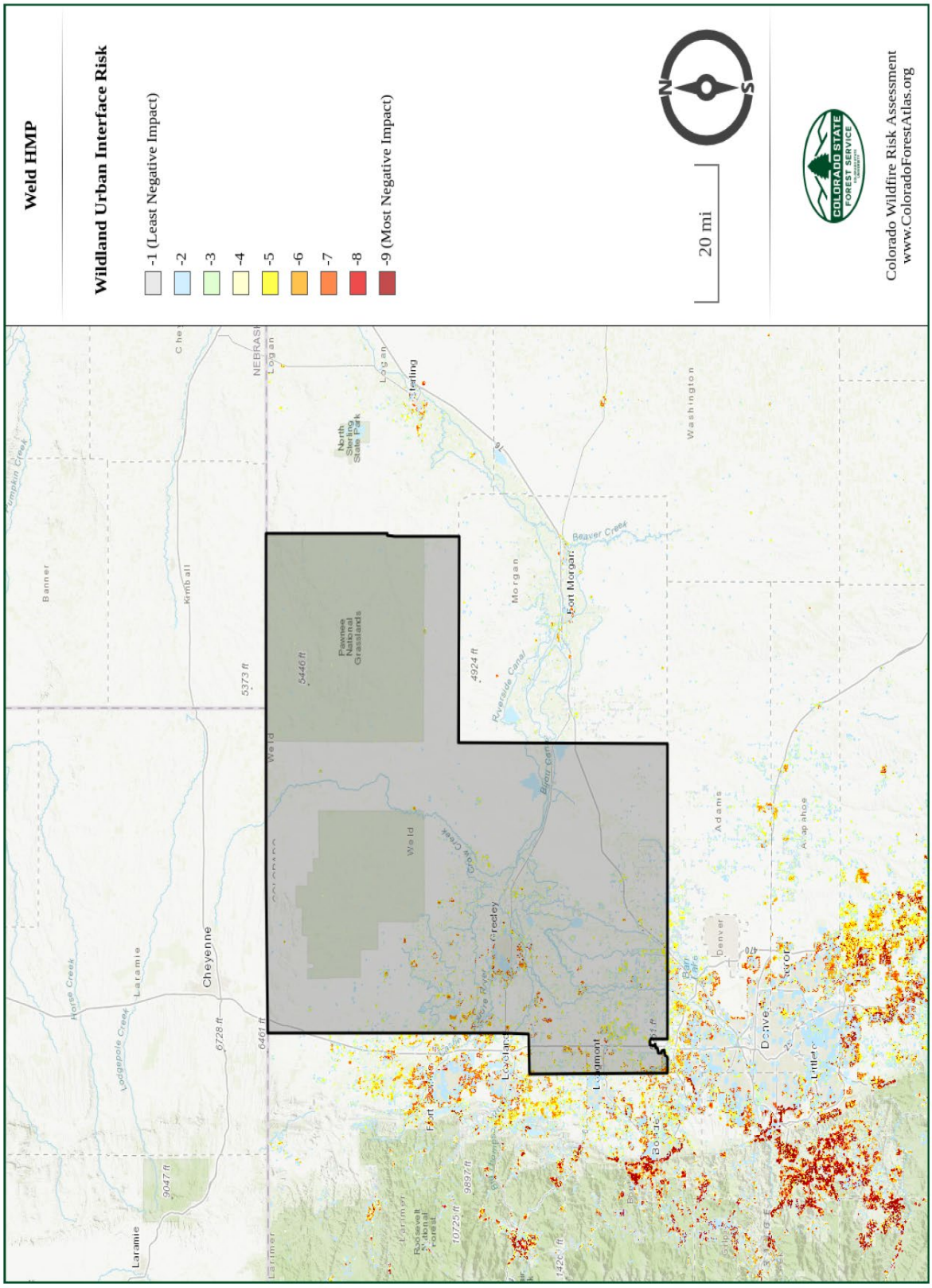
Specific to WUI Risk, Figure 57 presents the CSFS data that rates the potential impact of a wildfire on people and their homes. This data identifies those areas of the County at the most risk, which can be seen to vary across much of the Western portion of the County.

Figure 56. Wildfire Risk



EMERGENCY MANAGEMENT

Figure 57. Wildland-Urban Interface Risk



EMERGENCY MANAGEMENT

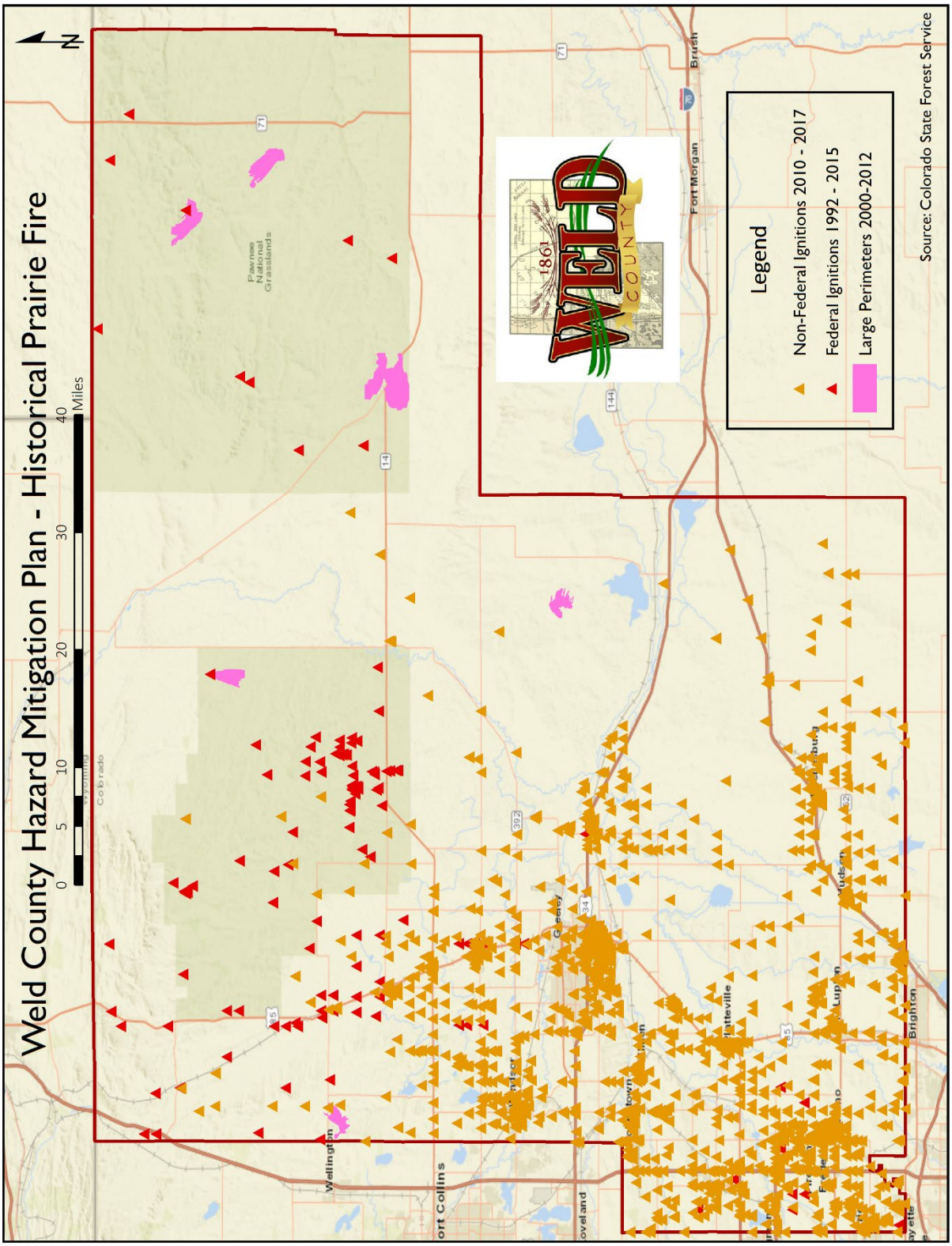
Wildfires can occur at any time of day and during any month of the year. Moreover, the length of a wildfire season and/or peak months may vary appreciably from year to year. As evidenced by the wildfire risk map, areas within Weld County that are characterized by dense development and single-family homes along the wildland-urban interface are most vulnerable to wildfire. The jurisdictions with the highest WUI Risk Index rating include areas of Erie, Hudson, Firestone, Frederick, Windsor, Greeley, and portions of unincorporated Weld County.

5.15.2 Previous Occurrences

Based on data provided by NOAA's NCEI Storm Events Database, there has been one prairie fire with reported damages in Weld County in recorded history. Damages were estimated to be $1.5M from this 9/12/2010 event in Northwestern Weld County.

Figure 58 presents historical wildfire ignitions, from both Federal and non-Federal lands. This data from the CSFS also included some of the largest perimeter fires to impact Weld County from 2000-2012. This shows that generally the largest fires occur on the eastern portion of the County, while the number of ignitions increase towards the more densely populated portions of Southwestern Weld County.

Figure 58. Historical Prairie Fires

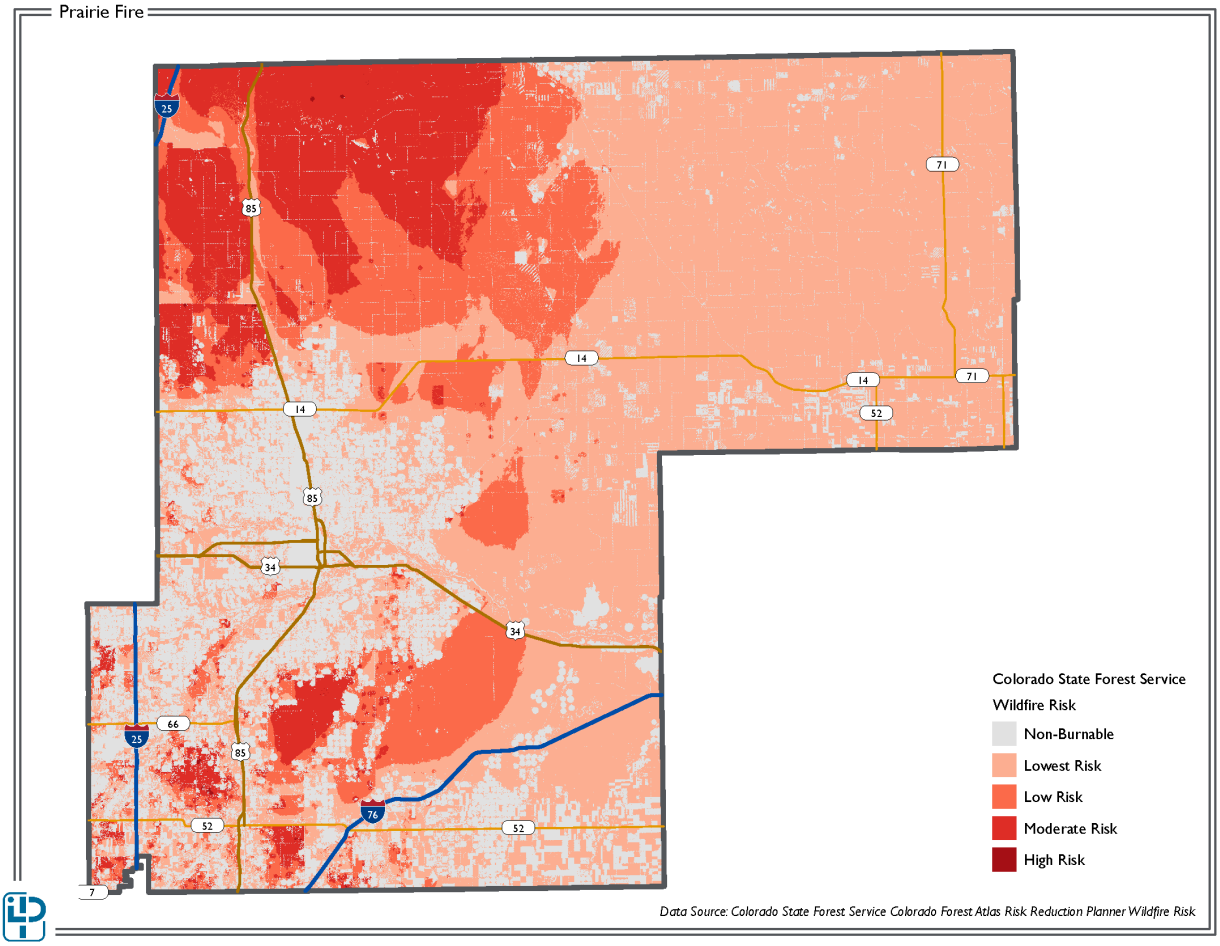


EMERGENCY MANAGEMENT

5.15.3 Data Analytics

The input into the composite risk layer developed with the data analytics suitability model for prairie fire is shown in Figure 59.

Figure 59. Composite Risk Layer Prairie Fire Input



5.15.4 Inventory Exposed

Fires can extensively impact the economy of an affected area, including the agricultural, recreation and tourism industries, water resources, and the critical facilities upon which Weld County depends. A structure may be at risk to the impacts of prairie fire if it is located within the wildland urban interface (WUI). There are 67,562 address points across Weld County that are located in the WUI. This equates to 49.6% of all address points within the County.

5.15.5 Potential Losses

It is clear there is potential for large losses resulting from a wildfire event, as nearly 50% of the Weld County housing stock resides in the WUI. This would be in addition to the other Lifelines that are situated in these hazard areas.

5.15.6 Probability of Future Occurrences

Recent wildfires and brush fires across Colorado have forced school closures, disrupted telephone services by burning fiber optic cables, damaged railroads and other infrastructure, and adversely affected

tourism, outdoor recreation, and hunting. The likelihood of one of those fires attaining significant size and intensity is unpredictable and highly dependent on environmental conditions and firefighting response. Weather conditions, particularly drought events, increase the likelihood of wildfires occurring. That said, it is important to note that 98% of wildfires are human-caused. Ultimately, the occurrence of future wildfire events will strongly depend on patterns of human activity and events are more likely to occur in wildfire-prone areas experiencing new or additional development.

Reported non-Federal land ignitions in Weld County over the recent past provide an acceptable framework for determining the future occurrence in terms of frequency for such events. Based on historical record of 3,890 ignitions from 2010 - 2017, it can be reasonably assumed that a wildfire event has a large chance to develop across the County in any given year. The probability of the County and its municipalities experiencing a wildfire associated with damages or loss is a different question to quantify.

5.15.7 Land Use and Development

Future development is an important factor to consider in the context of wildfire mitigation because development and population growth can contribute to increased exposure of people and property to wildfire. During the past few decades, population growth in the Weld County WUI has increased greatly. Subdivisions and other high-density developments have created a situation where wildland fires can involve more buildings than any amount of fire equipment can possibly protect. As development in Weld County expands into wildland areas, people and property are increasingly at risk.

By identifying areas with significant potential for population growth and/or future development in high-risk areas, communities can identify areas of mitigation interest and reduce hazard risks associated with increased exposure.

Wildfire mitigation in the wildland-urban interface has primarily been the responsibility of property owners who choose to build and live in vulnerable zones. In practice, successful wildfire mitigation strategies can be quite involved. The most important aspect of successful suppression is disruption of the continuity of fuels, achieved by creating breaks or defensible areas. For interface fires, where homes and other structures fill the space, fuel reduction is best accomplished before the fires begin.

Safety zones can be created around structures by reducing or eliminating brush, trees, and vegetation around a home or facility. FEMA recommends using a 30-foot safety zone; including keeping grass below 2 feet tall and clearing all fallen leaves and branches promptly. Additionally, only fire-resistant or non-combustible materials should be used on roofs and exterior surfaces. Firebreaks -- areas of inflammable materials that create a fuel break and reduce the ability for fires to spread over roads and pathways -- can be planned and designed to serve as wildfire mitigation.

5.16 Public Health Hazards

HIGH RISK HAZARD

5.16.1 Hazard Identification

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 storm, or hazardous materials 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, including epidemics and pandemics, have the potential to cause serious illness and death, especially among those who have compromised immune systems due to age or underlying medical conditions. Emergency Support Function 8 (ESF 8) of the Weld County Emergency Operations Plan provides an organizational framework for public health and medical service preparedness, response, and recovery efforts for various emergency epidemics.

A pandemic can be defined as a disease that attacks a large population across great geographic distances. Pandemics 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. Epidemics tend to occur seasonally, affect much smaller areas and fewer members of the community.

According to data from the Colorado Reportable Disease Statistics (CDPHE) database, Influenza viruses represent the most common cause of hospitalization due to disease in Weld County. Seasonal influenza (often referred to as the flu) is a common infection that affects large numbers of people in Colorado every year. Influenza is an acute respiratory disease caused by influenza type A or B viruses. The typical features of seasonal influenza include abrupt onset of fever and respiratory symptoms such as cough, sore throat, as well as headache, muscle ache, and fatigue. For seasonal influenza, the incubation period ranges from 1 to 4 days and the clinical severity of infection can range from asymptomatic infection to primary viral pneumonia and death. Most people experience influenza as a very uncomfortable, but ultimately benign illness. However, the influenza virus can mutate, causing it to be much more dangerous to humans. Yearly seasonal influenza remains a significant disease in the U.S. and Colorado, and seasonal epidemics can result in high morbidity and mortality, as well as create strains on the health care system and communities.

A new virus emerged in China in December 2019 and was named the 2019 Novel Coronavirus (COVID-19). In Weld County, the first COVID-19 case presented on March 13th, 2020. Weld County saw rapid spread of the virus. As of 12/10/2020 there have been 16,578 reported cases across Weld County, resulting in 145 deaths.

The incubation period for COVID-19 can be from 1 to 14 days. Risk of contraction has been tied to proximity to others and exposure to respiratory droplets. Initial common symptoms can include a dry cough, fever, fatigue, difficulty breathing or shortness of breath and loss of sense of taste and smell. People may be asymptomatic, which means a positive result for the virus, but having no recognizable symptoms, and still be active spreaders of the virus. In the case of contracting the virus, one is considered no longer contagious after 10 days since symptoms first appeared, 24 hours with no fever,

without the use of fever-reducing medications, such as acetaminophen or ibuprofen and other symptoms are improving. The disease can range from mild fatigue and discomfort to rapid deterioration of the person's health, resulting in hospitalization and often being put on a ventilator. While most cases resolve in a reasonable amount of time, many people have been sick for a duration of multiple months. Once cleared of the virus, many people are seeing long term negative impacts to their health and a very slow return to regular functioning in day to day life.

In 2009, the World Health Organization (WHO) updated their phase descriptions in the pandemic alert system plan. While this plan was written for an influenza pandemic, the phases also correlate to other zoonotic or emerging diseases and therefore apply to the COVID-19 pandemic. Zoonotic diseases are diseases that can be spread from animals to humans. These diseases can be caused by bacteria, viruses, parasites, and fungi that are carried by animals and insects.

These phases can be utilized for any emerging disease to gauge the awareness and response of public health organizations. The six-phase approach was designed for the easy incorporation of recommendations into existing national and local preparedness and response plans. Phases 1—3 correlate with preparedness in the pre-pandemic interval, including capacity development and response planning activities, while Phases 4—6 signal the need for response and mitigation efforts during the pandemic interval.

Pre-Pandemic Interval

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

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

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

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

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

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

Pandemic Interval

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

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

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

- **Phase 5** represents human-to-human transmission of the disease in more than one country of one WHO region

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

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

Additionally, there are two periods after the phases, which describe the decline of cases of disease. These include:

- **Post-Peak Period**, when levels of the pandemic disease in most countries with adequate surveillance have dropped below peak level.

- **Post-Pandemic Period**, levels of disease activity have returned to levels seen for seasonal influenza or illness in most countries with adequate surveillance.

5.16.2 Previous Occurrences

Public health hazard occurrences range from common to relatively rare. Diseases can greatly impact the public health and health care system, but the vast majority of these are known reportable diseases, which may have outbreaks but do not reach epidemic or pandemic levels. These case numbers are required to be submitted to the state to help track which diseases are impacting the population most in the County. Also commonly known are the hazards to public health that follow a disaster, such as flood or earthquake, which are well documented and prepared for.

Pandemics are the rarest disease occurrence and other than the current global health situation with COVID-19, there was only one other pandemic in the last 50 years. As we are still in the midst of the COVID-19 pandemic, additional details of this event will be added in future Plan updates.

The influenza virus, H1N1, came to the world's attention in March 2009. The symptoms of pandemic H1N1 2009 influenza were similar to those of seasonal influenza. Illness in most cases was mild, but there were cases of severe disease requiring hospitalization and a number of deaths. While no cases were reported in Weld County in 2009, a hospitalization, resulting in death, did occur in 2013. The H1N1 virus no longer presents a widespread threat due to an available vaccine.

The Colorado Department of Public Health and Environment (CDPHE) releases an annual reportable disease summary for each county. The events with the highest incidences in Weld County between 2014 and 2017 are summarized in Table 55.

Chronic Hepatitis C and influenza resulting in hospitalizations represent the largest disease incidence in Weld County between 2014 and 2017.

Table 55. Colorado Reportable Disease Statistics (CDPHE), Weld County

Disease	2014	2015	2016	2017	Total
Animal Bites	38	33	92	98	261
Campylobacter	56	83	108	117	364
Cryptosporidiosis	5	9	10	17	41
Giardiasis	11	9	11	15	46
Haemophilus Influenzae	2	4	6	7	19
Hepatitis B, Chronic	7	24	29	16	76
Hepatitis C, Chronic	100	116	163	214	593
Influenza- Hospitalized	200	80	90	204	574
Pertussis	183	57	34	14	288
Salmonellosis	33	40	42	48	163
Shigellosis	3	4	9	9	25
STEC (Shiga Toxin producing E.coli)	8	17	15	*	40*
Strep Pneumo Invasive	24	28	31	34	117
Varicella (Chicken Pox)	12	17	20	19	68
West Nile Virus	20	10	27	14	71
Total:	**702**	**531**	**687**	**826**	**2746**

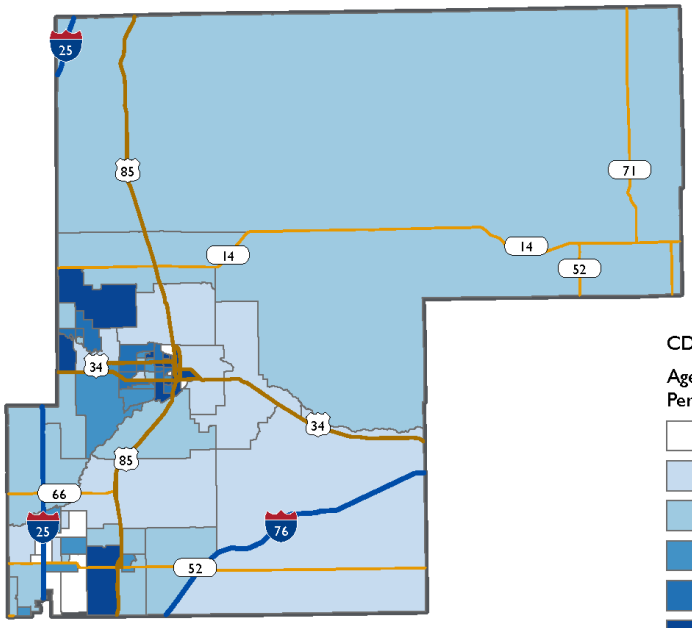
*Source: Division of Disease Control and Environmental Epidemiology, CDPHE Note: * indicates no data for this year*

5.16.3 Data Analytics

The input into the composite risk layer developed with the data analytics suitability model for public health hazards is shown in Figure 60.

Figure 60. Composite Risk Layer Public Health Hazards Input

Public Health

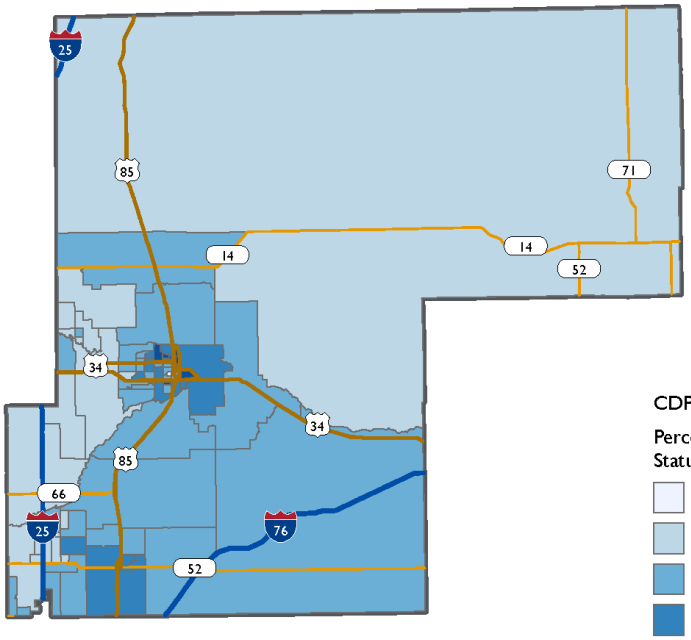


CDPHE Influenza Hospitalizations

Age-Adjusted Influenza Hospitalization Rate Per 100,000 Persons

- No Data
- 0 to 35
- 35 to 45
- 45 to 60
- 60 to 90
- 90 to 290

Data Source: Colorado Department of Public Health and Environment Influenza Hospitalizations



CDPHE Adult Health Status

Percent of Adults with Fair or Poor Perceived Health Status

- 0 to 12
- 12 to 14
- 14 to 16
- 16 to 18
- 18 to 23

Data Source: Colorado Department of Public Health and Environment Health Status in Adults

5.16.4 Inventory Exposed

Public health hazards by nature are a concern for all populations. However, when considering the entire population, hazards can have a greater effect on certain subgroups and it is important to understand the proportion these groups account for in the whole population. In the Weld County community, the most at-risk members are:

- The elderly (people over 65 years of age)
- Children (under 5 years old)
- Those with pre-existing and/or chronic conditions (i.e. asthma, diabetes and heart disease)

The following table highlights the demographic data for Weld County residents within these categories.

Table 56. At-Risk Population Data

Demographic	Unincorporated Weld County	Colorado	United States
Population	324,492	5,758,736	328,239,523
Age: 4 and Under (%)	7.1	5.8	6
Age: Under 18 (%)	25.9	21.9	22.3
Age: 65 and Over (%)	12.4	14.6	16.5
Persons in Poverty (%)	10.5	9.3	10.5
Persons with a Disability (%)	10.2	19.1	26
Persons Age 65+ with a Disability (%)	35.4	32.2	43.8
Adults who are Obese or Overweight (%)	64.47	57.4	71.3
Adults with Diabetes (%)	8.6	7.3	8.2
Adults with Asthma (%)	9.22	9.1	7.7
Adults with Coronary Heart Disease (%)	3.27	2.7	4.2

Source: American Community Survey, U.S. Census Bureau (2013-2019), Colorado Behavioral Risk Factor Surveillance System (2014-2019), Colorado Birth Dataset, Vital Records (2013-2017)

5.16.5 Potential Losses

COVID-19 has shown the sweeping impacts a pandemic can have on a community and the economy. These impacts result from people becoming ill and being unable to work, but also due to public health measures put in place to protect the rest of the population from becoming ill. With the public health COVID-19 response, communities were placed into lockdown to limit spread of the virus, businesses had to temporarily shut their doors to minimize community interaction.

The results of these actions are difficult to quantify at the time of this report, as the pandemic continues to spread in communities and there are some restrictions still in place at varying levels in different communities. However, many businesses, such as retail stores and restaurants do not have the capital to remain closed for extended periods of time or to function at lower capacities to ensure public health guidelines are followed. The number of businesses that will not be able to maintain long-term operations or reopen at all will likely grow.

As businesses have been either restricted in their operations or unable to reopen, many members of the community have become unemployed. Data from the US Bureau of Labor Statistics shows that the unemployment rate in Weld County in February 2020, prior to the first COVID-19 case in March, was 2.9% and reached a high of 10.1% in June 2020. Per the most recent available data at the time of this

report, the August 2020 rate has declined to 6.6%. Weld County lifted public health restrictions on businesses and restaurants in April 2020.

For an overall picture, in the 2020 annual report for the state, from the Colorado Business Economic Outlook Committee, the projected outlook was for a loss of 128,500 (-4.6%) jobs, spanning every major industry. It is difficult to pinpoint the accuracy of these projections down to the County or municipality level, especially as each jurisdiction made decisions about reopening and guidelines specific to their community.

Due to the closures there may be a resulting drop in revenue for businesses and the possible loss of sales taxes for municipalities may have a noticeable long-term impact. Weld County does not have a sales tax and the majority of tax revenue comes from property taxes on lands used for oil production. These taxes are based on a two-year cycle, so the County may not see impacts until 2022, at which point the expected drop in revenue due to the pandemic, which suppressed the global demand for fuel, may have severe effects.

5.16.6 Probability of Future Occurrences

Public health hazards will continue to occur with numerous impacts to communities. Of the various types of public health hazards, the scale and type of hazard should always be considered when determining risk to the population. While many public health hazards typically have small scopes, it is important to recognize the magnitude of impact to the community, including cascading effects to other communities and long-term consequences.

The increase in global transport, as well as urbanization, can introduce new diseases in and around Weld County, which makes epidemics likely to occur. While not every new disease turns into an epidemic or a pandemic, there is no way to predict which diseases will.

The spread of infectious diseases is likely to increase, as future conditions affect temperature, precipitation, and humidity levels which allow disease carrying vectors and pathogens to come into closer contact with humans. Human population growth and expansion of humans into previously uninhabited areas can increase the risk of exposure to animals and disease transmission.

The highest probability of increased occurrences is in existing reportable disease cases. For example, mosquitoes capable of transmitting West Nile virus are already present in Colorado. An impact specific to agricultural areas is irrigation for crops, which can be a breeding ground for mosquitoes which carry West Nile virus and increased irrigation could lead to higher population numbers.

5.16.7 Land Use and Development

Future development in and around Weld County has the potential to change how infectious diseases spread through the community and impact human health in both the short and long term. New development may increase the number of people and facilities exposed to public health hazards and greater population concentrations put more people at risk.

5.17 Severe Storm (Including Hail, Lightning & Winter Storm)

HIGH RISK HAZARD

5.17.1 Hazard Identification

Severe storms, including thunderstorms, hail, lightning, and winter storms, occur throughout the year in Weld County. While each hazard occurs typically during a particular part of the year, changes in climate are increasing the likelihood of more sporadic events.

Severe thunderstorms are categorized as such, by the National Weather Service, if hail at least 3/4 inch in diameter is produced, winds are 58 MPH or stronger, or a tornado is present. The typical thunderstorm is 15 miles in diameter and lasts an average of 30 minutes. Thunderstorms create the conditions for hail and lightning based on the types of precipitation present, the various air temperatures and the characteristics of the wind. While a severe thunderstorm carries excessive winds, there are many thunderstorms which can still produce hail at winds speeds that can cause significant damages and safety concerns.

Hail is a frequent and damaging weather event in the region for property, livestock, and crops, as well as the danger it poses to human safety. Hail is a precipitation that is formed when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere. The super cooled raindrops grow into balls of ice, which are a potential hazard when they fall back to the earth.

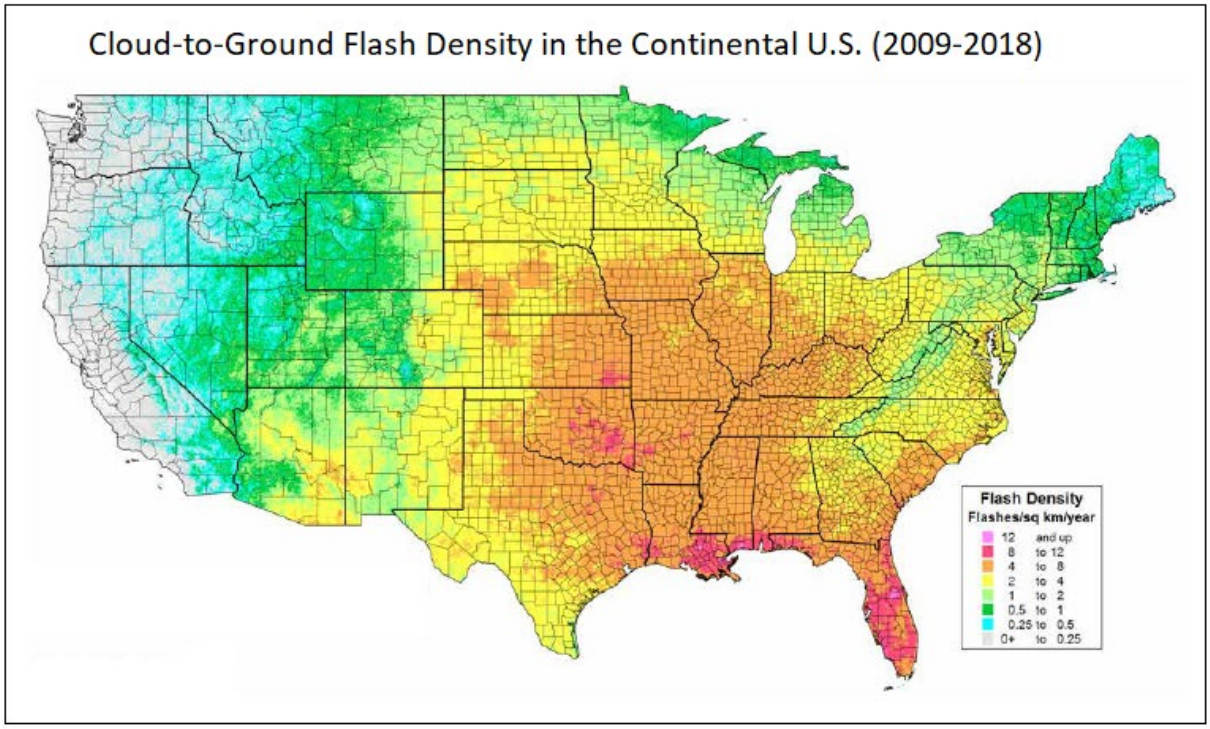
Hail season in Weld County is typically between March and October. The County sees hailstones from <1" up to 3" during a typical year. Hailstones can result in extreme damages, injuries and sometimes death. In 2019, the largest size hailstone record in Colorado was broken, when a hailstone weighing over half a pound and 4.83 inches in diameter was discovered.

Lightning may accompany hail and develops when ice particles in a cloud collide with other particles causing a separation of electrical charges. Positively charged ice particles rise to the top of the cloud and negatively charged ones fall to the middle and lower sections of the cloud. The negative charges at the base of the cloud attract positive charges at the surface of the Earth. Invisible to the human eye, the negatively charged area of the cloud sends a charge, called a stepped leader, toward the ground. Once it gets close enough, a channel develops between the cloud and the ground. Lightning is the electrical transfer through this channel. The channel rapidly heats to 50,000 degrees Fahrenheit and contains approximately 100 million electrical volts. The rapid expansion of the heated air causes thunder.

The state of Colorado ranks 32nd in terms of its cloud-to-ground lightning flash densities between 2009-2018. Unfortunately, the state ranks 4th in the country in terms of lightning death rate per million (0.81) people from 1959-2016. However, it is worth noting over that time period, there were 146 deaths total in Colorado. Lightning deaths are rare, but the risk increases due to the large amounts of outdoor recreation and outdoor workers. Since 1983, Weld County has had 11 injuries and 1 death due to lightning.

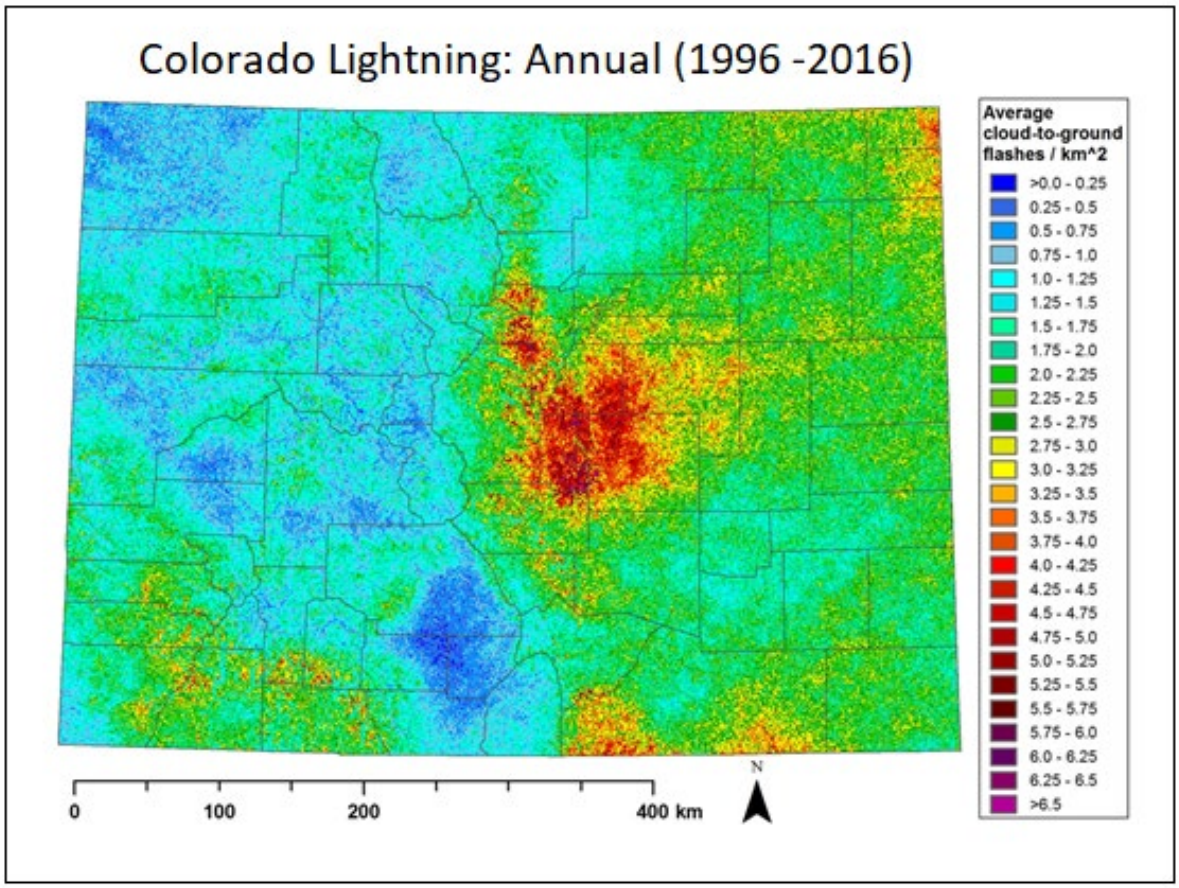
The U.S. National Lightning Detection Network (NLDN) tracks the average cloud-to-ground lightning flash densities in the US, also called lightning incidence. Figure 61 shows the US data for 2009-2018 and Figure 62 shows the data for Colorado between 1996-2016. These images are the result of contouring millions of cloud-to-ground lightning flashes and averaging annually.

Figure 61. Average Lightning Flash Density in the U.S.



Source: Vaisala National Lightning Detection Network

Figure 62. Colorado Lightning Flash Density Map



Source: Vaisala National Lightning Detection Network

The flash density maps show a wide range of values across the US and the state of Colorado. Weld County, which is 10,400 km², has roughly between 1.0 and 2.75 flashes/year/km² on average, depending on location.

Winter weather events encompass a number of types of weather occurrences. Winter weather in Colorado is typically relatively mild, however large weather events are known to impact safety, business continuity and the integrity of lifeline infrastructure, such as communications and electrical power supply. Each event carries its own specific characteristics, some posing more hazards than others and it is important to consider the impacts to your community for the entire spectrum of events.

The NCEI storm database tracks historical cold weather conditions and these are broken down based off the elements of the weather event.

Winter weather is an event in which there is freezing rain or when 2-4 inches of snow (alone or in combination with sleet and freezing rain) is expected to cause inconvenience for community members.

Winter storm is a weather event which has more than one significant hazard (a combination of two or more of the following: snow, heavy or blowing snow, ice or sleet) and meets or exceeds 12 and/or 24 hour local warning criteria for at least one of the precipitation elements. Normally a winter storm would pose a threat to life or property.

Blizzard is a life-threatening event produced by a combination of falling or blowing snow, and high winds, typically 35 mph or more, reducing visibility to 1/4 mile or less for at least 3 hours. These winds can contribute to dangerous wind chill temperatures, however there is not a temperature or snowfall requirement that must be met to achieve blizzard conditions. Ground blizzards can develop when strong winds lift snow off the ground and severely reduce visibilities. The combination of these elements can create potentially deadly travel conditions with impassable roads and zero visibilities.

Heavy snow, in large quantities, may fall during winter storms. Six inches or more in 12 hours or eight inches or more in 24 hours constitutes conditions that may significantly hamper travel or create hazardous conditions. The National Weather Service issues warnings for such events. Smaller amounts can also make travel hazardous, but in most cases, only results in minor inconveniences. Heavy wet snow before the leaves fall from the trees in the fall or after the trees have leafed out in the spring may cause problems with broken tree branches and power outages.

Ice storms are the result of significant accumulation of freezing rain, which lasts several hours. Freezing rain occurs when snowflakes descend into a warmer layer of air and melt completely. When these liquid water drops fall through another thin layer of freezing air just above the surface, they do not have enough time to refreeze before reaching the ground. Because they are "supercooled," they instantly refreeze upon contact with anything that that is at or below 32°F, creating a glaze of ice on the ground, trees, power lines, or other objects. Thick, heavy accumulations of ice can bring down trees and power lines, which makes already dangerous driving and walking more hazardous.

Extreme Cold, poses risks to people, property, livestock, and crops across Weld County. When temperatures become colder than is normal for an area, for an extended period of time, the dangers to the community may not be immediately apparent. Cold temperatures and wind combine to create dangerous wind chill temperatures, which are a critical factor in deciding the safety of the outside weather. These temperatures can be life threatening if exposed for extended periods of time. See the Extreme Temperatures section of the Plan for more specifics about the hazards to the County.

5.17.2 Previous Occurrences

Hail

Hail can be difficult to accurately quantify, as it relies on public reporting and monitoring by various weather organizations, Therefore, there is a high population bias with hail reports. A majority of reports align with cities and major roadways, while less reports come from rural areas but not necessarily less hail.

The eastern portion of Colorado is considered a "hot spot" for severe weather. For Weld County, this means that over 500 hail events were reported between January 1996 and August 2020, making it likely there will be more hailstorms in the future.

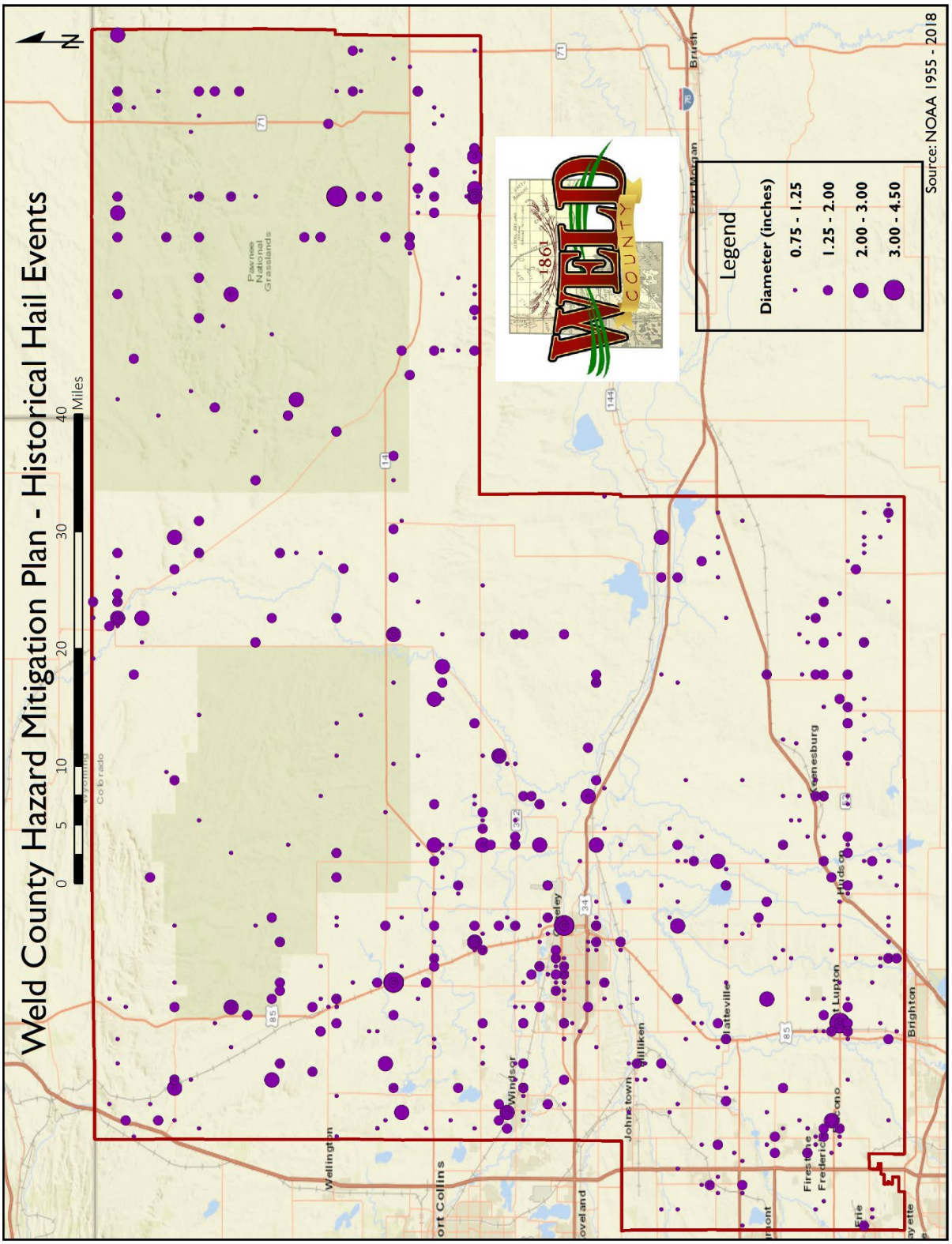
Table 57. Historic Hail Events Reporting Losses in Weld County

Date	Location	Hail Size Diameter (in)	Damage to Property
5/16/1991	Unincorporated Weld County	1.00	$4,000
5/31/1994	City of Greeley	0.75	$4,000
7/16/1994	Town of Windsor	1.25	$5,000
7/16/1994	Town of Eaton	2.50	$5,000

Date	Location	Hail Size Diameter (in)	Damage to Property
7/16/1994	Town of Eaton	2.00	$5,000
7/24/1994	Unincorporated Weld County	2.00	$3,000
7/24/1994	Unincorporated Weld County	1.75	$4,000
7/31/1996	Unincorporated Weld County	0.75	$200
6/23/1997	City of Greeley	1.50	$3,100
8/10/2004	Town of Eaton	2.00	$2,000
8/19/2016	City of Greeley	1.50	$15,000
Total			$50,300

Figure 63 presents the distribution and size of historical hail events across the County from 1955 - 2018. Although more likely to be reported if occurring in populated areas, the events on the map show that hail can impact every part of Weld County and its municipalities.

Figure 63. Historical Hail Events



EMERGENCY MANAGEMENT

Lightning

According to NCEI data, there were 27 lightning events between 1996 and 2019, in Weld County. These have resulted in 4 four injuries and 1 death. The resulting damages were $1,049,000 in property and $26,000 in damage to crops. The events which caused property and crop damage are summarized in Table *58*.

Table 58. Lightning Strikes Resulting Property or Crop Damages

Date	Location	Damage to Property	Damage to Crops
6/4/1996	Greeley	$50,000	$0
6/8/1996	La Salle	$1,000	$0
6/25/1996	Greeley	$0	$6,000
7/8/1997	Roggen	$100,000	$0
9/20/1998	Windsor	$500,000	$0
7/27/1999	Hudson	$100,000	$0
4/20/2000	Windsor	$200,000	$0
7/10/2001	Greeley	$40,000	$0
9/20/2010	Kersey	$0	$10,000
9/20/2010	Kersey	$0	$10,000
5/8/2017	Greeley	$5,000	$0
Total		**$9,000**	**$26,000**

Source: NOAA; NCEI Storm Events Database

Winter Storm

Historic winter weather data between January 1996 and June 2020, lists a total of 106 events in Weld County. Within those events, there were no reported injuries or deaths. As far as losses, there was no crop damage and $102,000 worth of property damage. Winter weather events, according to the NCEI Storm Events Database definitions include: winter storm, winter weather, blizzard and cold/wind chill. An event is recorded if there are more than one significant hazard (a combination of two or more of the following: snow, heavy or blowing snow, ice or sleet) and meets or exceeds local twelve or twenty-four hour warning criteria for at least one of the precipitation elements.

Table 59. Historic Winter Storms in the Weld County (1996 – 2020)

Period	Winter Weather	Winter Storm	Blizzard	Cold/ Wind Chill	Injuries	Deaths	Property Damage	Crop Damage
1996 - 2005	0	21	0	2	0	0	0	0
2006 - 2015	23	22	0	1	0	0	$102,000	0
2016- June 2020	18	12	7	0	0	0	0	0
Event Type Totals	**41**	**55**	**7**	**3**	**0**	**0**	**$102,000**	**0**
Total Events	**106**							

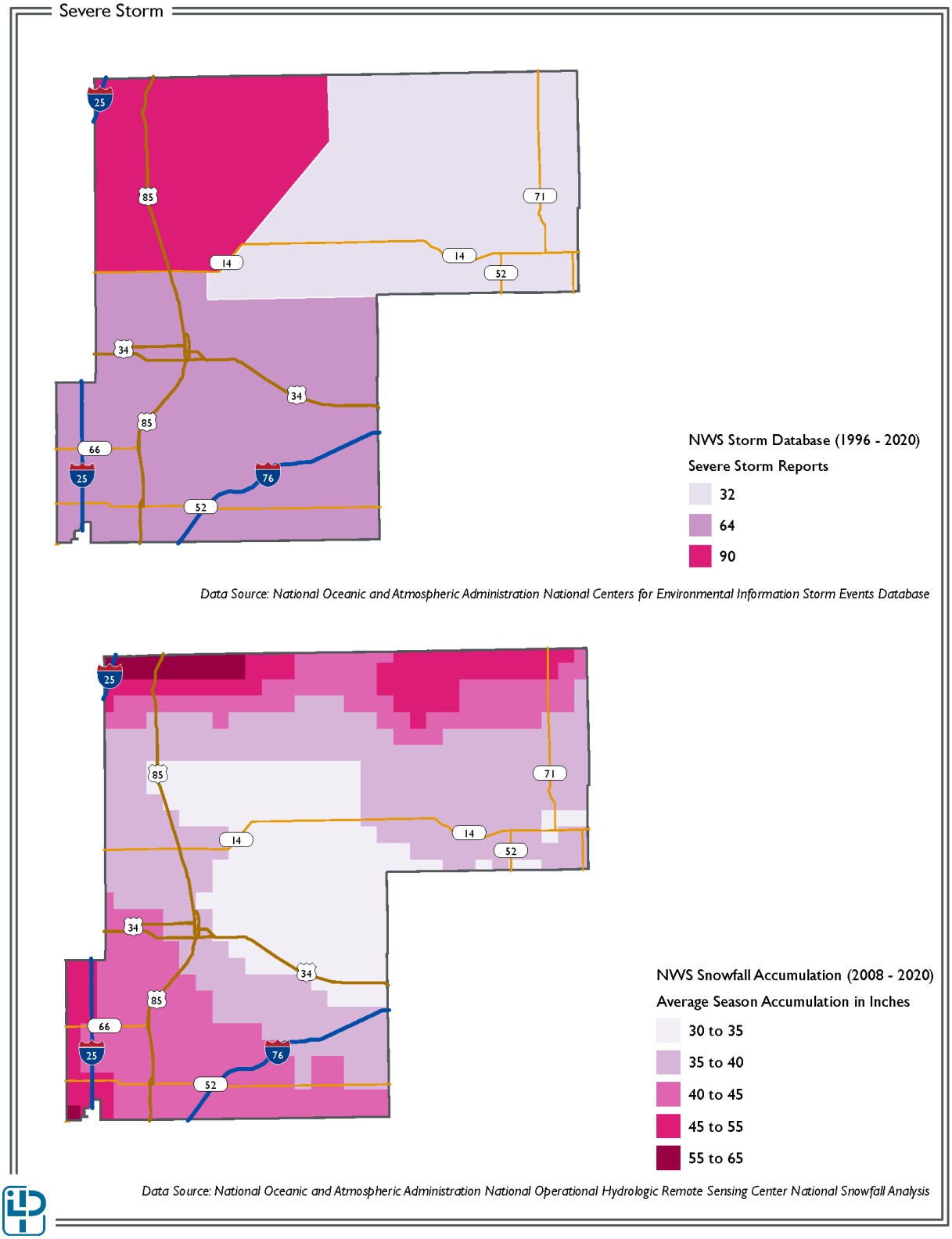
Source: NOAA; NCEI Storm Events Database

In March 2019, a bomb cyclone impacted large parts of the state, disrupting power, causing numerous multi-car accidents, and stranding 1,500 motorists across the state. A bomb cyclone is a storm characterized by a large, rapid drop in barometric pressure over 24 hours and wind gusts between 60-100 mph. The impacts of the bomb cyclone in Weld County began with beneficial steady rainfall and progressed to 54 mph wind gusts, whipping snow across roadways and crops. With a midday high temperature of only 29°F the event brought windchill temperatures of 10°F and below. While only 4.1 inches of snow fell in Greeley during the March event other towns got up to 9 inches. An April storm which was predicted to be similar to the bomb cyclone, brought 10 inches of snow to Greeley. The April storm was milder in winds with only 36mph wind gusts and less barometric pressure change, but had windchill temperatures of around 10°F.

5.17.3 Data Analytics

The inputs into the composite risk layer developed with the data analytics suitability model for severe storm are shown in the following Figures.

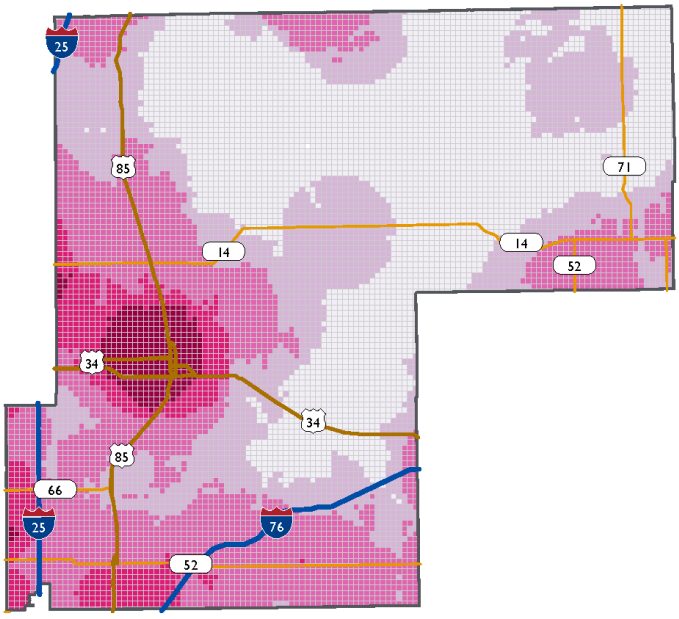
Figure 64. Composite Risk Layer Severe Storm Input 1



EMERGENCY MANAGEMENT

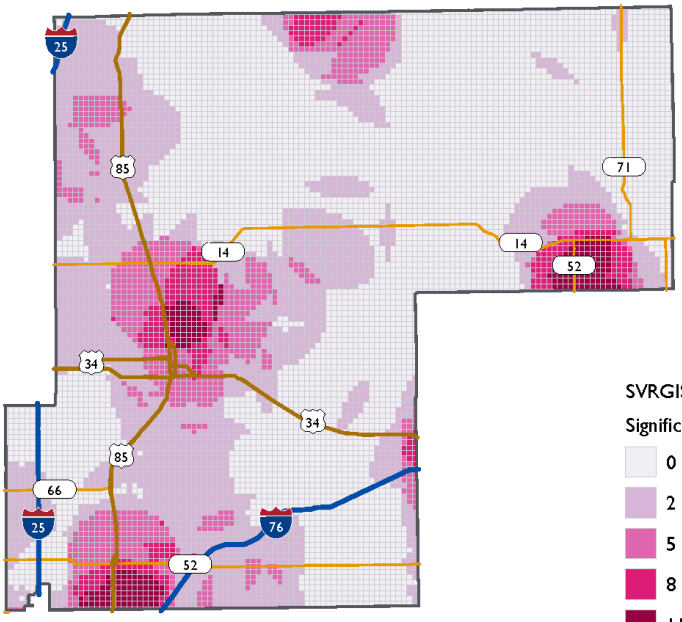
Figure 65. Composite Risk Layer Severe Storm Input 2

Severe Storm



SVRGIS Hail Events (1955 - 2018)
Severe Events Within 10 Kilometers (~6 Miles)*
0 to 14
14 to 28
28 to 57
57 to 94
94 to 162

Data Source: National Oceanic and Atmospheric Administration Storm Prediction Center Severe Weather GIS Hail



SVRGIS Hail Events (1955 - 2018)
Significant Severe Events Within 10 Kilometers (~6 Miles)*
0 to 2
2 to 5
5 to 8
8 to 11
11 to 17

Data Source: National Oceanic and Atmospheric Administration Storm Prediction Center Severe Weather GIS Hail

* Notes and Assumptions: Per NWS, the average hail swath is 6 miles long
NOAA defines severe hail events as storms that produce hail 1 inch in diameter or larger and significant severe hail events as storms that produce hail 2 inches in diameter or larger
Per NOAA, severe weather reports tend to cluster around population centers; the data generally matches the understanding of severe weather climatology, but may show a slight bias towards population centers

EMERGENCY MANAGEMENT

5.17.4 Inventory Exposed

The variety of severe storms that impact Weld County each year have diverse and sometimes harmful impacts on the community, property, crops, and livestock. While it is true that all inventory across the County could be impacted by these distinct weather events, generalizing these impacts can leave gaps in planning. When looking at each weather event, it is important to recognize the different risk levels of each hazard for specific inventory and assets. Damages may occur as a result of high winds, lightning strikes, hail, ice accumulation and other winter storm impacts. However, consequences to these elements differ greatly, for example the risk to power supply infrastructure from high winds and ice accumulation is much higher than from hail, while water supply would be most greatly affected by extreme cold.

5.17.5 Potential Losses

Potential losses greatly depend on the frequency, intensity, and type of weather event. It is difficult to quantify and previous losses are not a reliable indicator to determine future losses. Grouping by type of event can help to illustrate specific impacts on property or crop damage.

Hail poses threats to both property and crops. Small hail in large volumes or driven by a strong wind are most damaging to crops. Large hail is most damaging to physical structures and poses a threat to human and livestock safety. Hail often damages vehicles, windows, and roofs. If the hailstones are large enough they may go through windshields and roof. The buildup of weight on a roof can collapse structures.

Lightning poses a threat to human life, may damage buildings, if directly struck, and has the potential to ignite grassland fires. These fires may become a threat to crops or developed areas.

Winter weather events include various types and therefore have varied impacts. Winter storms may bring snow quickly but result in only a minor inconvenience to the community and typically little damage past vehicle accidents. Ice storms can greatly impact infrastructure due to the consequences of ice accumulations, creating dangerous conditions and straining infrastructure with the weight of the ice. Power lines may be downed which could result in a disruption of service until safely repaired and trees falling under the weight could cause property damage. Blizzards and/or heavy snow present dangers to snow removal equipment and crews, as road conditions are the most likely impact. Heavy snow may impact structural integrity due to the weight on roofs and may also bring down trees.

Losses to structures are typically minimal and covered by insurance, but uncovered losses may be personnel overhead, maintenance costs, and contents within structures. A timely forecast may not be able to mitigate the property loss, but could reduce the casualties and associated injuries.

5.17.6 Probability of Future Occurrences

Severe storms are likely in the future. While understanding the historical frequency, duration, and spatial extent of severe weather is critical to planning, it is important to recognize that with changing climate it may be more difficult to determine the likelihood and potential severity of future occurrences. The characteristics of historical events illustrate the impacts on the County, but will not foretell the impacts of future events due to the unpredictability of timing, location and intensity of weather events. The large growth of the County brings new considerations, as storm elements change and more people, property, livestock, and crops may be impacted.

In recent years, there is a trend toward a shorter yet more intense hail season, with increasing proportions of significant and very large hail. As population density grows there will be a noticeable difference in the magnitude of hail risk.

Lightning flash density is increasing across the US, making an increase likely in Weld County.

Winter weather events are likely in the future. While each type may have its own probability, it is fair to say an increase in events may happen in Weld County.

5.17.7 Land Use and Development

Increased development trends in and around Weld County will multiply the possible consequences of severe storms. Enforcing and adhering to building codes for new development is imperative for community safety during future climate extremes. As the rural portions of the County continue to grow, consideration of reliable access to those rural residents should be prevalent in emergency management and mitigation planning.

5.18 Tornado & Straight-Line Wind

MODERATE RISK HAZARD

5.18.1 Hazard Identification

Tornadoes typically occur during the spring and early summer months of March through June and are most likely to form in the late afternoon and early evening. According to the National Weather Service, tornado wind speeds can range between 30 to more than 300 miles per hour. Most tornadoes are a few dozen yards wide and touchdown briefly, but even small, short-lived tornadoes can inflict tremendous damage. The damage caused by a tornado is a result of high wind velocities and wind-blown debris, which ranges depending on the intensity, size, and duration of the storm. The majority of Colorado tornadoes occur in the eastern plains, including large areas of Weld County.

According to NOAA data from May 1952 to May 2020, Weld County has a total of 280 tornado segments, more than any other County in the U.S. A segment is the portion of a tornado's path within a single county. If a tornado stays in one county, then a "tornado" is the same as a "segment." The National Weather Service historically has verified tornado warnings by county, which is the reason for county-segment tornado recordkeeping.

Tornadoes are classified based on the damage inflicted once it has passed over a man-made structure, which allows experts to assess and estimate wind intensity. The Fujita Scale (Table 60) was used until 2007, classifying the intensity from the least to most intense, in seven categories (F0-F6). This scale was replaced by the Enhanced Fujita Scale (Table 62), which uses six intensity categories (EF0-EF5) to measure tornado strength and associated damages. The scale was revised to reflect better examinations of tornado damage surveys, to align wind speeds more closely with associated storm damage. The new scale takes into account how most structures are designed and is considered a more accurate representation of the surface wind speeds in the most violent tornadoes. Table 60 provides details on how the Enhanced Fujita Scale intensities can be derived from the previous Fujita Scale.

Table 60. 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
3	162-209	**3**	138-167
4	210-261	**4**	168-199
5	262-317	**5**	200-234

Source: https://www.spc.noaa.gov/efscale/ef-scale.html

Table 61. Fujita Tornado Damage Scale

F-Scale Number	Intensity Phrase	Wind Speed	Type of Damage
F0	Gale tornado	40-72 mph	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages signboards.
F1	Moderate tornado	73-112 mph	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
F2	Significant tornado	113-157 mph	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
F3	Severe tornado	158-206 mph	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted
F4	Devastating tornado	207-260 mph	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
F5	Incredible tornado	261-318 mph	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel reinforced concrete structures badly damaged.
F6	Inconceivable tornado	319-379 mph	These winds are very unlikely. The small area of damage they might produce would probably not be recognizable along with the mess produced by F4 and F5 wind that would surround the F6 winds. Missiles, such as cars and refrigerators would do serious secondary damage that could not be directly identified as F6 damage. If this level is ever achieved, evidence for it might only be found in some manner of ground swirl pattern, for it may never be identifiable through engineering studies

Source: http://www.spc.noaa.gov/faq/tornado/f-scale.html

Table 62. Enhanced Fujita (EF) Scale

Enhanced Fujita Category	Wind Speed (mph)	Potential Damage
EF0	65-85	Light damage: Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.
EF1	86-110	Moderate damage: Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	111-135	Considerable damage: Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF3	136-165	Severe damage: Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
EF4	166-200	Devastating damage: Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
EF5	>200	Incredible damage: Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 m (109 yds.); high-rise buildings have significant structural deformation; incredible phenomena will occur.

Source: http://www.spc.noaa.gov/faq/tornado/ef-scale.html

Straight line winds and other severe wind events, which can be more damaging than tornadoes, can cause injuries and death to people and animals, along with damages to property and crops. Straight-line

wind is a term used to define any thunderstorm wind that is not associated with rotation, and is used mainly to differentiate from tornadic winds.

Downburst is the general term for all localized strong wind events that are caused by a strong downdraft within a thunderstorm, and is used to broadly describe macro and microbursts.

A macroburst is an outward burst of strong winds that occurs when a strong downdraft reaches the ground, spreading over 2.5 miles. Macroburst winds may begin over a smaller area and then spread out over a wider area, sometimes producing damage similar to a tornado. Although usually associated with thunderstorms, macrobursts can occur with showers too weak to produce thunder.

A microburst is a small concentrated downburst that produces an outward burst of strong winds at or near the surface. Microbursts are small, less than 2.5 miles across and short-lived, lasting only five to 10 minutes, with maximum windspeeds sometimes exceeding 100 mph.

A derecho is a widespread, long-lived wind storm that is associated with a band of rapidly moving showers or thunderstorms. A typical derecho consists of numerous microbursts, downbursts, and downburst clusters. By definition, if the wind damage swath extends more than 240 miles and includes wind gusts of at least 58 mph or greater along most of its length, then the event may be classified as a derecho.

5.18.2 Previous Occurrences

NCEI's Storm Events Database estimates that 280 tornadoes have touched down in, or moved through, Weld County between 1950 and May 2020. A majority of these events have been classified as F0 or F1 events, with 15 F2 tornadoes, 1 F3 and 1 EF3. Table 63 illustrates the breakdown of occurrences, damages, injuries, and deaths over that time period.

Table 63. Tornado History in Weld County (1950 – 2020)

Period	Total	F1	F2	F3	EF 1	EF 2	EF 3	Injuries	Deaths	Property Damage	Crop Damage
1950-1961	21	3	5	1				6	0	$46,620	$0
1962-1971	10	5	1					1	0	$77,530	$0
1972-1981	44	22	1					3	0	$2,840,250	$0
1982-1991	63	41	7					3	0	$696,010	$0
1992-2001	63	7	1					0	0	$75,000	$0
2002-2011	41	3			2		1	79	1	$147,020,000	$5,000
2012-5/2020	38				1	1		1	0	$105,000	$5,000
Total: 280		**81**	**15**	**1**	**3**	**1**	**1**	**93**	**1**	**$150,860,410**	**$10,000**

Source: NOAA; NCEI Storm Events Database

Weld County saw its most destructive tornado event on May 22, 2008. The tornado, ranked an EF3 on the Enhanced Fujita Scale, swept north-northwestward across the County, carving a path of destruction,

nearly 39 miles in length. The storm, which was up to one mile wide at times, had a continuous at path of 24 miles and brought baseball sized hail. This tornado event caused 78 injuries and one death, along with millions of dollars in damages.

Nearly 300 homes were significantly damaged or destroyed and 1,259 individuals applied for federal disaster aid. At one point over 60,000 people were without power, as over 200 power poles were snapped or blown down, which cost Poudre Valley Rural Electric Association an estimated $1 million. A reported 85 tractor trailers and 15 railroad cars were overturned. The Town of Windsor saw much of the damages, including the leveling of the main feed lot and a destroyed dairy barn resulting in the death of almost 400 cattle.

The following Figure depicts the tornado touchdown locations that occurred on May 22, 2008.

Figure 66. Tornado Touchdowns in Weld County, May 22, 2008

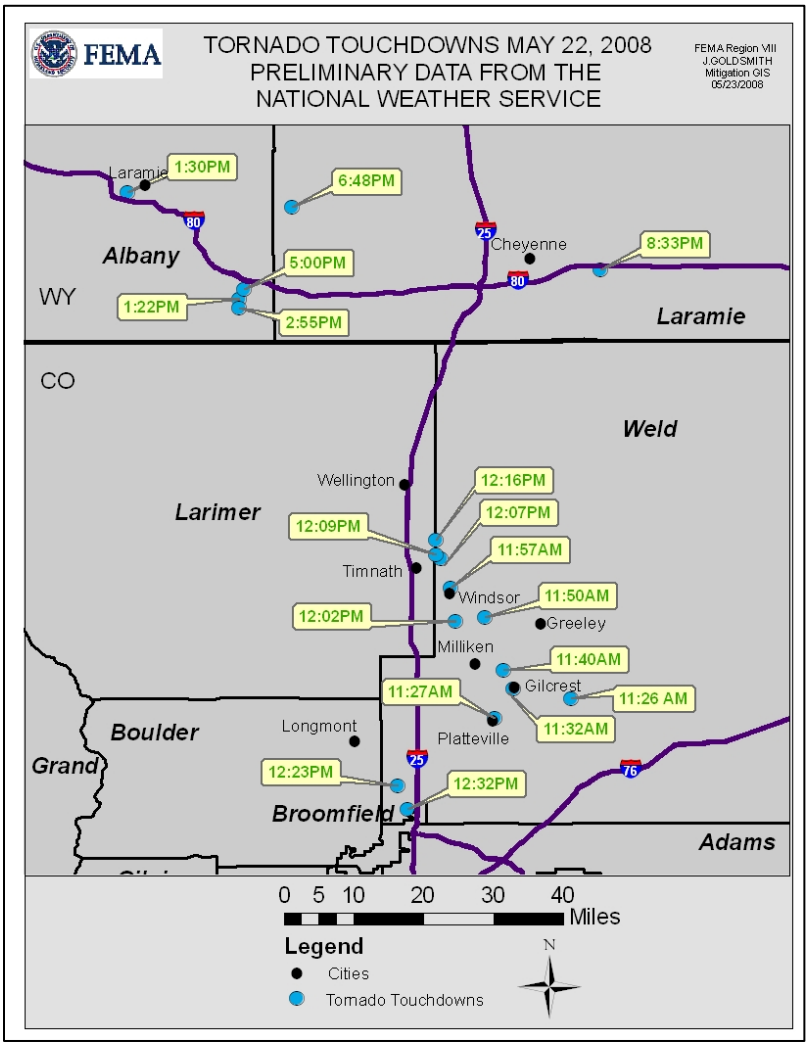
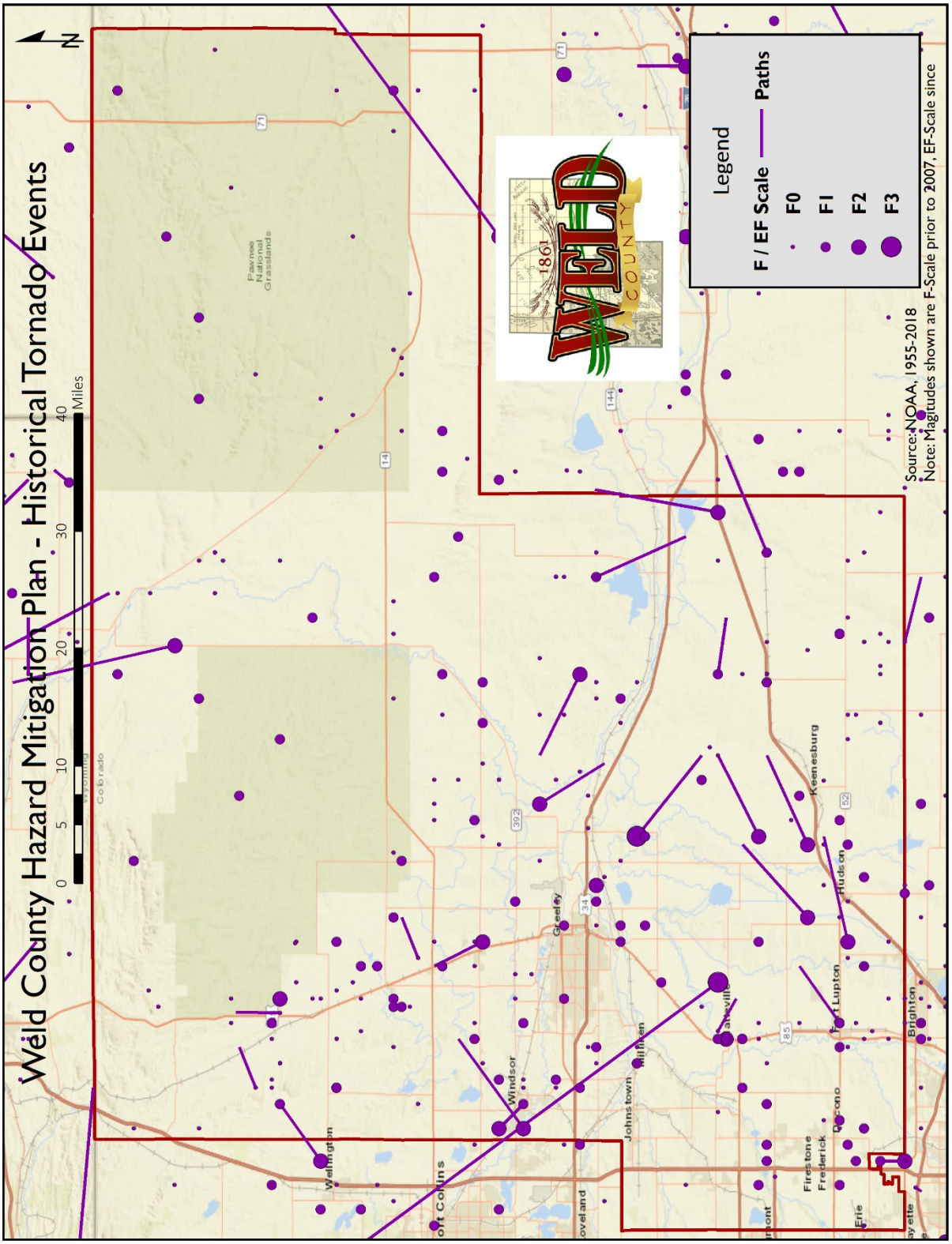


Figure 67 depicts historical tornado tracks and events in and around Weld County. The map illustrates where tornadoes have touched down (and traveled) between 1955 and 2018. It is important to note that all portions of the County are susceptible to tornado hazard, from the urban western portions to the rural eastern side.

Figure 67. Historical Tornado Events



EMERGENCY MANAGEMENT

Data from NOAA's NCEI Storm Events Database for straight-line wind events, in Weld County, was used for historical thunderstorm and high wind events. Thunderstorm winds and high winds differ in their characteristics, but both can be dangerous to public safety and cause significant damages to property and crops. Table 64 and Table 65 illustrate the breakdown of historical events, the difference in time periods is due to changes in the NCEI Event categorizations.

Thunderstorm Winds arise from convection, occurring within 30 minutes of lightning being observed or detected. Characterized by wind speeds of at least 58 mph, or thunderstorm related winds of any speed below 58 mph that produce a fatality, injury, or damage.

High Winds are sustained non-convective winds of 40 mph or greater lasting for 1 hour or longer, or gusts of 58 mph or greater for any duration.

Based on data provided by NCEI's Storm Events Database, 167 high wind events have occurred in Weld County between 1996 and August 2020. Between 1985 and August 2020, a total of 237 thunderstorm wind events have occurred across the County.

Table 64. Thunderstorm Winds Event History in Weld County (1985 – 2020)

Period	Total Events	Range of Magnitude (includes unknown magnitudes)	Injuries	Deaths	Property Damage	Crop Damage
1985-1994	59	47-71	0	0	$13,600	$0
1995-2004	63	50-70	1	1	$63,000	$0
2005-2014	62	50-76	0	0	$241,000	$10,000
2015-8/2020	53	50-71	0	0	$0	$0
TOTAL:	**237**		**1**	**1**	**$317,600**	**$10,000**

Source: NOAA; NCEI Storm Events Database

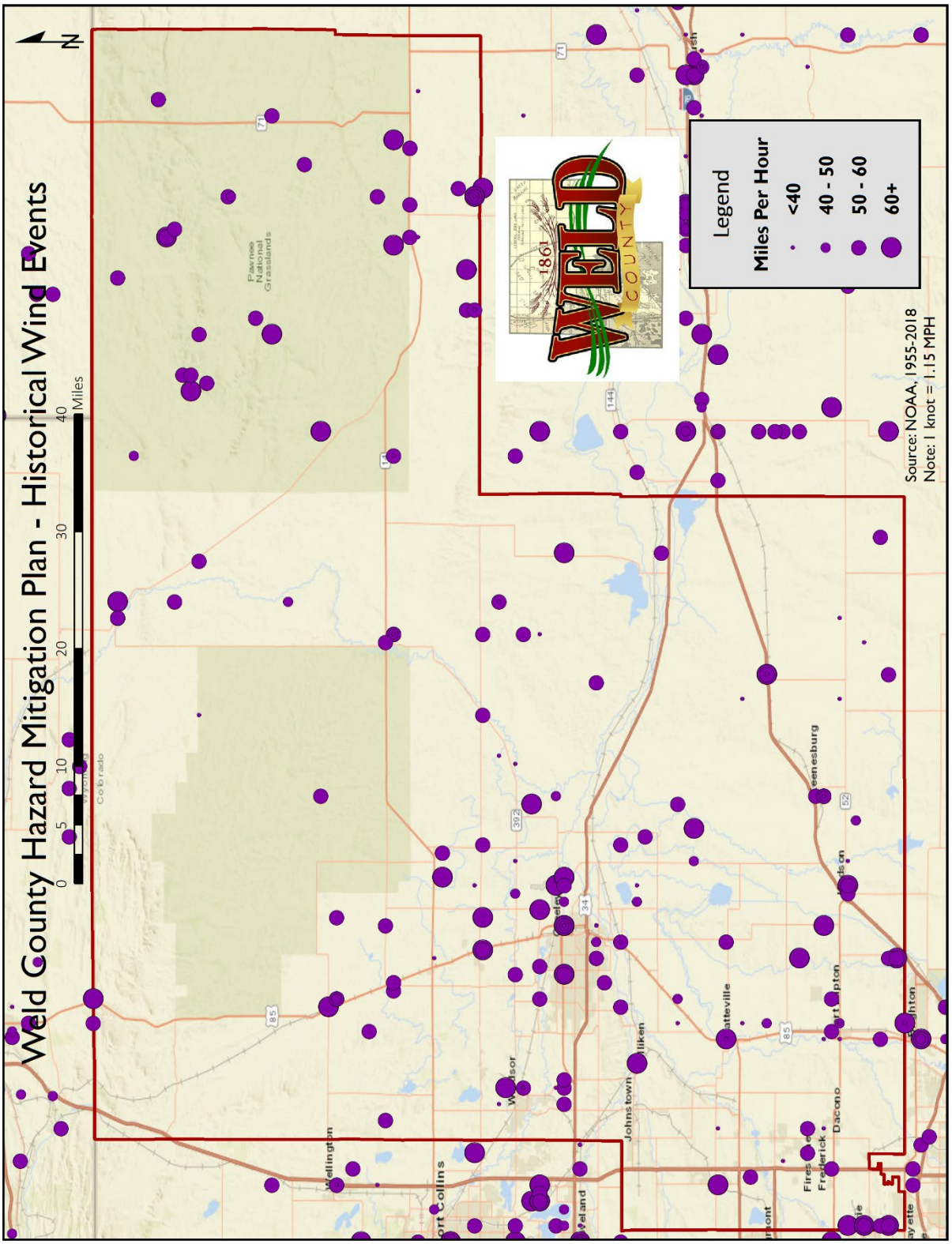
Table 65. High Winds and Strong Winds Event History in Weld County (1996 – 2020)

Period	Total Events	Range of Magnitude (includes unknown magnitudes)	Injuries	Deaths	Property Damage	Crop Damage
1996-2005	88	39-100	7	0	$1,436,000	$0
2006-2015	49	35-88	7	0	$235,000	$255,000
2016-8/2020	30	50-78	0	0	$300,000	$0
TOTAL:	**167**		**17**	**0**	**$1,971,000**	**$255,000**

Source: NOAA; NCEI Storm Events Database

The following Figure 68 provides a geospatial view of these historical severe wind events in Weld County between 1996 and 2018. As with tornadoes, it should be noted that severe winds affect all portions of the County.

Figure 68. Historical Severe Wind Events



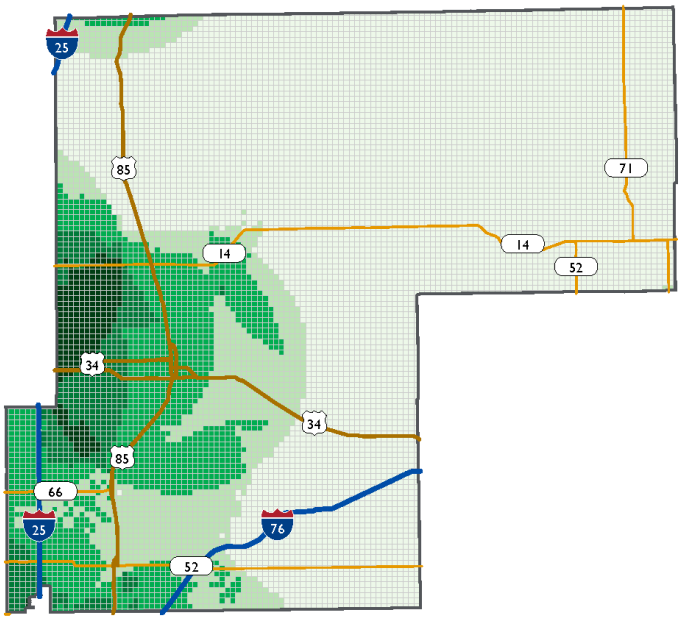
EMERGENCY MANAGEMENT

5.18.3 Data Analytics

The inputs into the composite risk layer developed with the data analytics suitability model for tornado & straight-line wind are shown in the following Figures.

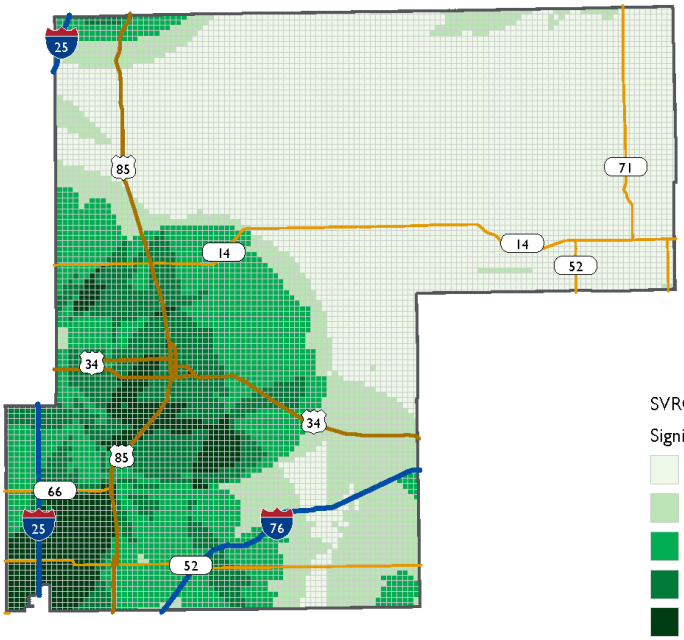
Figure 69. Composite Risk Layer Tornado & Straight-Line Wind Input 1

Straight-Line Wind/Tornado



SVRGIS Wind Events (1955 - 2018)
Severe Events Within 24 Kilometers (~15 Miles)*
7 to 46
46 to 71
71 to 91
91 to 117
117 to 157

Data Source: National Oceanic and Atmospheric Administration Storm Prediction Center Severe Weather GIS Wind



SVRGIS Wind Events (1955 - 2018)
Significant Severe Events Within 24 Kilometers (~15 Miles)*
0 to 4
4 to 7
7 to 10
10 to 12
12 to 18

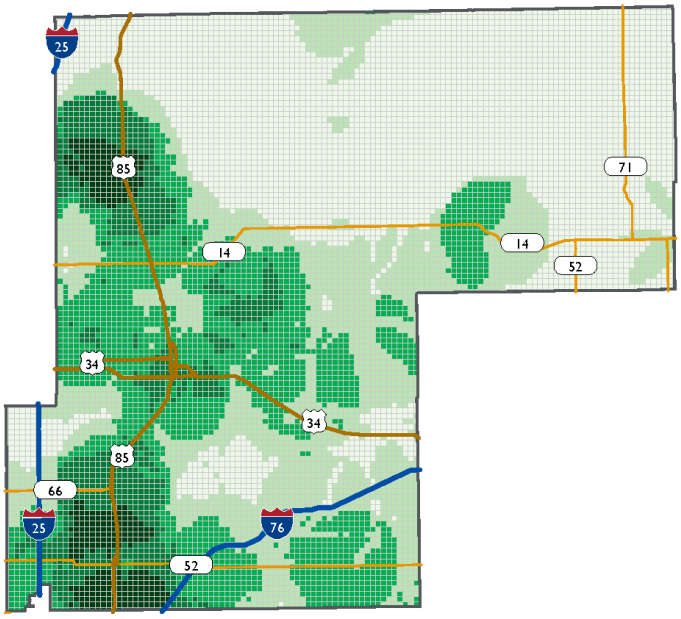
Data Source: National Oceanic and Atmospheric Administration Storm Prediction Center Severe Weather GIS Wind

* Notes and Assumptions: Per NWS, the average severe storm is 15 miles wide
NOAA defines severe wind events as storms that produce damaging winds or wind speeds of 58 miles per hour or greater and significant severe wind events as storms that produce wind speeds of 75 miles per hour or greater
Per NOAA, severe weather reports tend to cluster around population centers; the data generally matches the understanding of severe weather climatology, but may show a slight bias towards population centers

EMERGENCY MANAGEMENT

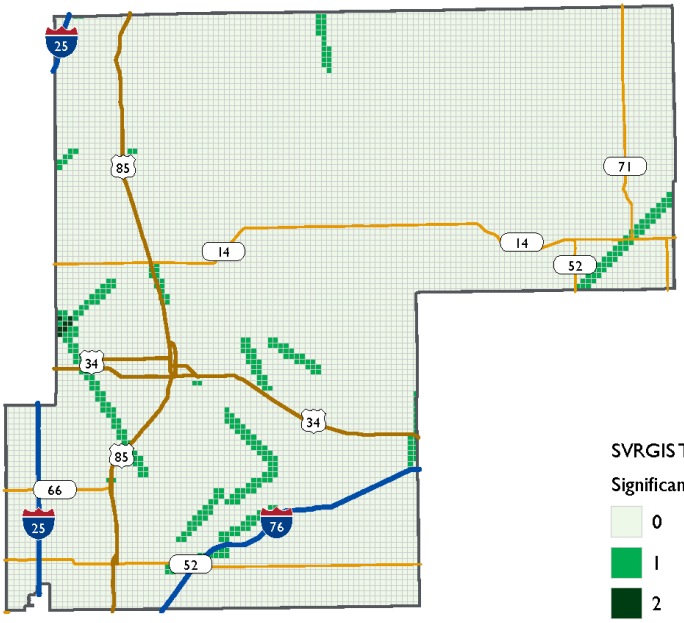
Figure 70. Composite Risk Layer Tornado & Straight-Line Wind Input 2

Straight-Line Wind/Tornado



SVRGIS Tornado Events (1955 - 2018)
Severe Events Within 10 Kilometers (~6 Miles)*
0 to 3
3 to 7
7 to 11
11 to 16
16 to 24

Data Source: National Oceanic and Atmospheric Administration Storm Prediction Center Severe Weather GIS Tornado



SVRGIS Tornado Events (1955 - 2018)
Significant Severe Events Within 0.2 Kilometers (~200 Yards)*
0
1
2

Data Source: National Oceanic and Atmospheric Administration Storm Prediction Center Severe Weather GIS Tornado

* Notes and Assumptions: Per NWS and National Geographic, the average tornado swath is 6 miles long and 100-300 yards wide
Severe tornado events were provided as initial points
Significant severe tornado events were provided as paths
NOAA defines severe tornado events as a tornado and significant severe tornado events as a tornado that produces EF2 or greater damage
Per NOAA, severe weather reports tend to cluster around population centers; the data generally matches the understanding of severe weather climatology, but may show a slight bias towards population centers

EMERGENCY MANAGEMENT

5.18.4 Inventory Exposed

All assets located in Weld County can be considered at risk from severe wind and tornadoes. Exposure to high winds is assumed to be as destructive, if not more so than tornadoes.

Due to the nature of these events, it is difficult to predict the intensity of the tornado, wind speed, and flying debris that may result. Therefore, it is also difficult to determine if any inventory or assets are more exposed than others. Overall, infrastructure, property, crops, livestock, and people could be impacted by wind events, even the events considered "small".

Structure type and material are important to consider, as those made of light materials, such as mobile homes, are most susceptible to damage.

5.18.5 Potential Losses

Tornadoes and straight-line wind events damage or destroy what is in their path and the lasting impacts depend upon wind speeds and duration of the event. Inventory and assets face potential losses primarily due to damages to property and structures, but losses may be incurred due to livestock or crop damage, as well. Due to the erratic nature of these events, it is difficult to quantify what may be realistically damaged or lost. Damages to roads, homes and infrastructure should be considered when looking at the potential losses at a local level. Additional costs may stem from the response to the event, debris removal, maintenance, and necessary repairs.

Accurate and current valuation of properties and assets is vital to understanding potential losses. The scale of damages to inventory may vary depending on the age and type of the building, construction materials used and the condition of the structure. Critical infrastructure may be impacted during an event, which may have cascading effects on services to the public. These disruptions or halting of services may result in losses. Electrical supply, communications, water and fuel supply are essential to maintain during and after a tornado or wind event.

Due to the nature of tornadoes and severe wind events, not all jurisdictions within Weld County are likely to be impacted equally. Over 7,700 homes or roughly 7% of the homes in Weld County are mobile homes, according to 2018 US Census Bureau data. The structural characteristics of these homes are a concern for property losses and life safety obstacles are critical to focus on when planning. The residents of mobile homes are more likely to have access and functional needs, such as those with low-income, the elderly and a larger population of immigrants. Deaths from tornadoes are significantly more likely in mobile homes than for those in fixed homes, NOAA research estimates that since 1975 over one-third of all tornado deaths in the country were of those in mobile homes. Between January and August of 2020, there were 78 deaths in the US from tornadoes, 36 of those people were located in mobile homes. As communities across Weld County continue to grow, it is important that local agencies monitor the inventory and locations of mobile homes. Communities or geographic locations with large numbers of mobile homes require specific discussion of mitigation actions for straight-line winds, tornadoes, and all hazards in general.

5.18.6 Probability of Future Occurrences

The probability of the County and its municipalities experiencing a tornado or straight-line wind event is high. The frequency and magnitude of these events historically is an indicator of the likelihood of events in the future. However, this data does not inform the characteristics of impending events, especially considering the unpredictability of tornadoes and the undiscriminating impacts of straight-line winds. Understanding previous events can help with informing planning efforts, but it is important to think long-term about the potential for these events to grow in frequency and intensity.

5.18.7 Land Use and Development

All future structures built in Weld County will likely be exposed to severe wind and tornado damage. Weld County and its jurisdictions should continue to adhere to building codes and to facilitate new development that is built to the highest design standards to account for heavy winds.

6 Appendix A: 2021 Mitigation Action Guides

Mitigation Action Guides: 2021-26 Weld County

Contents

Mitigation Action Guides: 2021-26 Weld County

Weld County (9 Projects)

1-Weld County: County Resiliency, Building of Lifelines and Subcomponents in all Jurisdictions	
PRIORITY: Medium	HAZARDS ADDRESSED: All hazards
LOCATION: County Wide	GOALS ADDRESSED: 1, 2, 3, 4
RECOMMENDATION DATE: 2021-2025	OBJECTIVES ADDRESSED: A, B, C, D, E
TARGET COMPLETION DATE: Annually	LIFELINE: All SUBCOMPONENT: All
ISSUE: Traditional educational programs have not been measured, Weld County is working with each jurisdiction individually in the "Whole Community Approach" to strengthen capabilities, build resilience, incorporate preplanning for all hazards, development of COOP, EOP, ERGs and community wide educational programs.	
RECOMMENDATION: The goal would be to better understand each community's resilience (social vulnerability, capabilities and social capital) and then build upon the existing preparedness education program to target the areas that will make communities more resilient. The program would include an evaluation tool for measuring results annually and evaluating the effectiveness of preparedness outreach. Meetings have been set up with Weld Communities to continue every other month for the next five years. Goals are to focus locally on building resiliency on the local level.	
ACTION: We will continue working "Whole Community" by letting the local communities lead the program, while OEM collaborates with Local EM's and Community Leaders to develop training, community education and overall resilience planning. Meetings have been scheduled with each community every two months, to engage, collaborate, strengthen capabilities, track mitigation projects, develop COOPS, EOP, COG, ERG and community programs.	
LEAD AGENCY: Weld OEM	EXPECTED COST: OEM Staff time
SUPPORT AGENCIES: Community EM's and Leaders, First Responder Agencies	POTENTIAL FUNDING SOURCES: CDBG, HMPG grants; Private grants or Weld County Government Special Project funding.
PROGRESS MILESTONES:	

2-Weld County: Lifeline Integration - Health and Medical Resiliency Study	
PRIORITY: Medium	HAZARDS ADDRESSED: All hazards
LOCATION: County Wide	GOALS ADDRESSED: 1, 2, 3, 4
RECOMMENDATION DATE: 2021	OBJECTIVES ADDRESSED: A, B, C, D, E

EMERGENCY MANAGEMENT

TARGET COMPLETION DATE: January 31, 2021 January 31, 2022	LIFELINE: Health and Medical SUBCOMPONENT: All
ISSUE: Lifeline Resiliency in Health & Medical have not been accurately measured, Weld County is working with each Health Care Facility using the "whole Community approach" to strengthen capabilities, build resilience, identify gaps and potential mitigation projects.	
RECOMMENDATION: The goal would be to better understand each Health Care Facilities' (vulnerability and capabilities) and then build upon the existing policies and programs to target the areas that will make facilities more resilient. The program would include utilize the CO PHRCA measuring results annually and evaluating the effectiveness of facility preparedness.	
ACTION: Engage the Health Care Facilities by using the Whole Community approach utilizing the CO PHRCA spreadsheet that gauges staffing needs, capabilities, and infrastructure requirements.	
LEAD AGENCY: Weld OEM, Whole Community Group, WCDPHE	EXPECTED COST: OEM and Public Health Staff time
SUPPORT AGENCIES: OEM, WCDPHE, Health Care Facilities and Providers	POTENTIAL FUNDING SOURCES: General Fund
PROGRESS MILESTONES: Engage the Whole Community Group to address the goals of the Survey questions and encourage participation to develop a measurable record of capabilities, preparedness goals and critical infrastructure resilience.	

3-Weld County: Floodplain Management	
PRIORITY: Medium	HAZARDS ADDRESSED: Flooding
LOCATION: County Wide	GOALS ADDRESSED: 1, 2, 3, 4
RECOMMENDATION DATE: Jan 2021	OBJECTIVES ADDRESSED: A, B, C, D, E
TARGET COMPLETION DATE: On going	LIFELINE: Food, Water, Shelter/ Safety &Security/ Transportation SUBCOMPONENT: Water, Rivers, Roads,
ISSUE: Weld County strives to comply with NFIP standards, and will adjust as needed with changes	
RECOMMENDATION: Continue to coordinate with the Planning Department on Floodplain management, Support community education on NFIP.	
ACTION: Annual review of NFIP standards and ordinances	
LEAD AGENCY: Weld County Planning Dept. Flood Plain Management	EXPECTED COST: Weld County Staff Time
SUPPORT AGENCIES: Weld OEM	POTENTIAL FUNDING SOURCES: General Fund

PROGRESS MILESTONES: Weld County is not participating in the CRS program. Weld is a member of NFIP and Weld County adopted the model ordinance in January of 2014, as required by the state. Weld County enforces floodplain regulations as outlined in Article XI of Chapter 23 of the Weld County Code, in accordance with FEMA's requirements.

4-Weld County: ALERT Flood Warning System	
PRIORITY: Medium	HAZARDS ADDRESSED: Flooding
LOCATION: County Wide	GOALS ADDRESSED: 1, 2, 3, 4
RECOMMENDATION DATE: June 2021	OBJECTIVES ADDRESSED: A, B, C, D, E
TARGET COMPLETION DATE: Ongoing	LIFELINE: Food, Water, Shelter/ Safety &Security/ Transportation SUBCOMPONENT: Water, Rivers, Roads,
ISSUE: Weld County has several rivers downstream from high elevations, where flooding can occur very quickly to heavily populated communities.	
RECOMMENDATION: Continue to install additional flood warning gauges and monitoring equipment as needed.	
ACTION: Identify and install additional flood level gauges at critical points on waterways	
LEAD AGENCY: Weld County OEM	EXPECTED COST: estimated equipment costs 8,000. Per site
SUPPORT AGENCIES: Weld County Public Works, CO Div of Water Resources	POTENTIAL FUNDING SOURCES: HMGP Grants
PROGRESS MILESTONES: Several ALERT river gauges have been installed throughout Weld County. Identify locations across Weld County with high flood risk, evaluate sites for additional warning equipment.	

5-Weld County: Improve Dam Safety	
PRIORITY: Medium	HAZARDS ADDRESSED: Flooding
LOCATION: County Wide	GOALS ADDRESSED: 1, 2, 3, 4
RECOMMENDATION DATE: June 2021	OBJECTIVES ADDRESSED: A, B, C, D, E
TARGET COMPLETION DATE: Ongoing	LIFELINE: Food, Water, Shelter, Safety &Security SUBCOMPONENT: Water, Rivers, Roads, Community Safety
ISSUE: Weld County has several rivers downstream from high elevations, where flooding can occur very quickly to heavily populated communities. Many dams have indicators of aging infrastructure, regular inspection and assessments on earthen dams throughout the county.	

RECOMMENDATION: Continue to maintain emergency response plans for the dams in Weld County, Work with the Division of Water Resources to update all documentation and coordinate with owners for planning and preparedness. Participate with the Division of Water Resources and the Bureau of Reclamation on Dan Safety Exercises and planning	
ACTION: Identify and install additional flood level gauges at critical points upstream of dams and rivers, in order to identify potential concerns and allow for prewarning of residents and staff.	
LEAD AGENCY: OEM	EXPECTED COST: Unknown, Staff time
SUPPORT AGENCIES: Division of Water Resources/ Dam Safety	POTENTIAL FUNDING SOURCES: General Fund
PROGRESS MILESTONES: Coordinate with the State Div. of Water Resources to make sure inspections are completed on high hazard dams and emergency plans are up to date.	

6-Weld County: Establish an ongoing or annual Public Education Campaign regarding Hazards and Emergency Management	
PRIORITY: High	HAZARDS ADDRESSED: All hazards
LOCATION: County Wide	GOALS ADDRESSED: 1, 2, 3
RECOMMENDATION DATE: Jan. 2021	OBJECTIVES ADDRESSED: A, B, E
TARGET COMPLETION DATE: Ongoing	LIFELINE: All SUBCOMPONENT: All
ISSUE: There are many Emergency Management issues that need to be reinforced with public education so that citizens know what risks they face, what protective actions they can take, and what government programs are in place to assist them.	
RECOMMENDATION: The potential for saving just one life and providing time for individuals and businesses to take effective protective actions, outweighs the potential cost of the public education program. Public Education may be the most effective and least-expensive way to reduce disaster losses by changing human behavior to promote appropriate actions. Weld OEM is working with each community separately to gauge and evaluate public education needs, based on current Risk Rankings and Capabilities that have been identified through the Hazard Mitigation planning process. Each community will have separate strengths and challenges and as these challenges are addressed, progress will be documented in both Capabilities and Lifeline Integration.	
ACTION: Establish an ongoing or annual Public Education campaign regarding Hazards and Emergency Management	
LEAD AGENCY: Weld County Emergency Management, in conjunction with appropriate County/Town Departments with municipalities	EXPECTED COST: $2,500 for printing and distribution costs
SUPPORT AGENCIES: State and Federal agencies	POTENTIAL FUNDING SOURCES: Monitor grants, seek private partners for cost sharing

PROGRESS MILESTONES: The planning team agreed that this should remain a high priority, ongoing project. Since 2009, Weld County OEM and many participating jurisdictions have continued to make public preparedness train-the-trainer curriculum and invites community members to participate in the course. These trainers are equipped to teach preparedness in their communities, healthcare facilities, assisted livings centers or wherever their sphere of influence might be. Weld County OEM also actively participates in the community Outreach Events, raising awareness about disaster preparedness. This action item will continue to be a priority 2021-2025. Weld County OEM will develop a new mitigation action focused on studying disaster resilience in communities throughout the Weld County in order to better understand how to develop the preparedness program. Weld OEM is working with each community separately to gauge and evaluate public education needs, based on current Risk Rankings and Capabilities that have been identified through the Hazard Mitigation planning process. Each community will have separate strengths and challenges and as these challenges are addressed, progress will be documented in both Capabilities and Lifeline Integration.

7-Weld County: Inventory Critical Facilities within the Floodplain to Determine if they should be Protected	
PRIORITY: Medium	HAZARDS ADDRESSED: Flooding
LOCATION: County Wide	GOALS ADDRESSED: 1, 2
RECOMMENDATION DATE: January 2021	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: Ongoing	LIFELINE: All SUBCOMPONENT: All
ISSUE: In floodplains there is a known risk. Not having critical facilities protected against such risks can severely handicap a community's ability to respond and recover from a flood. Potential losses should be estimated for the failure of each critical facility. Then a cost estimate should be calculated for the favored method of protection. A benefit-cost comparison will then indicate whether or not the facility is worth protecting.	
RECOMMENDATION: The potential for saving just one life and providing time for individuals and businesses to take effective protective actions, outweighs the potential cost of the public education program. Public Education may be the most effective and least-expensive way to reduce disaster losses by changing human behavior to promote appropriate actions. Collaborate with critical facility managers to mitigate and retrofit potentially vulnerable structures or assets.	
ACTION: Each incorporated community with a mapped floodplain should inventory critical facilities within the floodplain to determine if they should be protected. Facilities would include power substations, water sources such as wellheads, sewage treatment facilities, police and fire stations, hospitals, and nursing homes.	
LEAD AGENCY: County Emergency Manager in conjunction with appropriate County/Town Departments. Technical Assistance is available from state agencies if help in making these determinations is	EXPECTED COST: Staff time only for initial inventory and discussion of protection methods, and cost-benefit analysis
SUPPORT AGENCIES: Planning Department, Public Works	POTENTIAL FUNDING SOURCES: There is no cost for

	the initial inventory and decision-making. Protective measures should be taken where cost-effective.
PROGRESS MILESTONES:	

8-Weld County: Public Warning System- IPAWS Awareness and Training	
PRIORITY: Medium	HAZARDS ADDRESSED: All
LOCATION: County Wide	GOALS ADDRESSED: 1, 2, 3, 4
RECOMMENDATION DATE: Annually	OBJECTIVES ADDRESSED: A, B, C, D, E
TARGET COMPLETION DATE: 2025	LIFELINE: Communications, Safety & Security SUBCOMPONENT: Early Warning Systems, Community Safety
ISSUE: IPAWs system was integrated with CODE RED in 2020, continued training is needed to understand usage and when to request an alert. Weld County OEM is running a Test every week, however many jurisdictions are not aware of how the system works or how to request an alert.	
RECOMMENDATION: Continue working with the jurisdictions throughout Weld County to explain the IPAWS integration and identify hazards where it would be utilized.	
ACTION: Set up training in each jurisdiction and set up templated messaging	
LEAD AGENCY: Weld OEM	EXPECTED COST: Included with Outreach/Awareness
SUPPORT AGENCIES: Response Agencies	POTENTIAL FUNDING SOURCES:
PROGRESS MILESTONES:	

9-Weld County: StormReady / Weather Safety	
PRIORITY: High	HAZARDS ADDRESSED: Severe Storms
LOCATION: County Wide	GOALS ADDRESSED: 2, 3
RECOMMENDATION DATE: Annually	OBJECTIVES ADDRESSED: A, B
TARGET COMPLETION DATE: Classes held annually in the spring March-May	LIFELINE: Communications, Safety & Security SUBCOMPONENT: Early Warning Systems, Community Safety
ISSUE: One of the goals for the Northeast Region is to have all 11 counties participate in Storm Ready. Weld County has been a participant in the past, and the intent is to maintain Storm Ready status.	

Mitigation Action Guides: 2021-26 Weld County

Maintain our procedure for reporting storm damage to the National Weather Service Office in real time. EOC Activations Procedures, Spotter Activation Criteria and classes, maintain Local Warning System Activation Criteria	
ACTION: Maintain 'StormReady" status with NOAA	
LEAD AGENCY: Weld OEM in conjunction with appropriate County/Town Departments within municipalities	EXPECTED COST: Staff Time and funds for meeting for drinks and goodies. This will come from the OEM budget
SUPPORT AGENCIES: Sheriff's Office, Weld County Regional Communications, Public Works	POTENTIAL FUNDING SOURCES: OEM Budget and local business sponsor's
PROGRESS MILESTONES: 2019-2020 We held a Weather Spotter Class in Greeley and Virtually, we discuss storm weather preparedness in Whole Community Meetings. IPAWS was integrated into the CODE Red Emergency Alert System, staff was trained and have been doing a weekly IPAWS test. Weld OEM held Code Red sign up, EXPO, Project Connects, and Employee Fair in Windsor.	

Mitigation Action Guides: 2021-26 Weld County

Weld County -PW (7 Projects)

1-Weld County - PW: WCR 120, 110, 108 Low Water Crossings	
PRIORITY: High	HAZARD(S) MITIGATED: Flood, Erosion, and Subsidence.
LOCATION: Latitude: 40.446330 to 40.783420 Longitude: -104.701460 to -104.801590	LIFELINE(S) MITIGATED: Safety and Security, Health and Medical, and Transportation.
RECOMMENDATION DATE: 2013	GOAL(S) ADDRESSED: 1, 2
TARGET COMPLETION DATE: 2025	OBJECTIVE(S) ADDRESSED: E
ISSUE: The roads have to be closed during major storm events.	
RECOMMENDED ACTION: Reconstruct the roads and install large culverts to keep water from overtopping the road and washing it out. This project will achieve resiliency from severe storms and minimize the risk to the general public. It will also eliminate road closures due to washouts.	
LEAD AGENCY: Weld County	EXPECTED COST: $1,574,762.60
SUPPORT AGENCY(IES): N/A	POTENTIAL FUNDING SOURCE(S): DOLA
PROGRESS MILESTONES:	
STATUS UPDATE(S): The WCSO is constructing their new training facility off WCR 120 and Public Works will be mining gravel for county roads, so it makes this project a higher priority.	

2-Weld County – PW: Bridge 19/46.5A	
PRIORITY: High	HAZARD(S) MITIGATED: Flood and Erosion
LOCATION: WCR 19 between SH 60 and WCR 46.5	LIFELINE(S) MITIGATED: Safety and Security, Health and Medical, and Transportation.
RECOMMENDATION DATE: 2013	GOAL(S) ADDRESSED: 1, 2
TARGET COMPLETION DATE: 2021	OBJECTIVE(S) ADDRESSED: E
ISSUE: Constructing a new bridge to span the entire floodplain in accordance with the new FEMA DFIRM standards for this drainage basin.	
RECOMMENDED ACTION: Construct a new bridge to achieve resiliency from major flood events and allow the road to remain open to minimize the risk to the general public.	
LEAD AGENCY: Weld County	EXPECTED COST: $3,373,205
SUPPORT AGENCY(IES): Town of Johnstown	POTENTIAL FUNDING SOURCE(S): CDOT Bridge Grant
PROGRESS MILESTONES: The design will be completed in 2020. Construction will be completed in 2021.	
STATUS UPDATE(S): Weld County has contracted with JUB Engineers to design the new bridge.	

3-Weld County – PW: Bridge 54/13A	
PRIORITY: High	HAZARD(S) MITIGATED: Flood and Erosion
LOCATION: WCR 54 between WCR 15 and WCR 13	LIFELINE(S) MITIGATED: Safety and Security, Health and Medical, and Transportation.
RECOMMENDATION DATE: 2013	GOAL(S) ADDRESSED: 1, 2
TARGET COMPLETION DATE: 2023	OBJECTIVE(S) ADDRESSED: E
ISSUE: Constructing a new bridge to span the entire floodplain in accordance with the new FEMA DFIRM standards for this drainage basin.	
RECOMMENDED ACTION: Construct a new bridge that is wide enough to accommodate the future widening of this arterial roadway from two to four lanes. A new bridge will achieve resiliency from major flood events and allow the road to remain open to minimize the risk to the general public.	
LEAD AGENCY: Weld County	EXPECTED COST: $6,532,055
SUPPORT AGENCY(IES): N/A	POTENTIAL FUNDING SOURCE(S): DOLA
PROGRESS MILESTONES: The design will be completed in 2021. Construction will begin in 2022 and be completed in 2023.	
STATUS UPDATE(S): Weld County has contracted with JUB Engineers to design the new bridge.	

4-Weld County – PW: Bridge 60.5/49A	
PRIORITY: Medium	HAZARD(S) MITIGATED: Flood and Erosion
LOCATION: WCR 60.5 between WCR 49 and WCR 51	LIFELINE(S) MITIGATED: Safety and Security, Health and Medical, and Transportation.
RECOMMENDATION DATE: 2013	GOAL(S) ADDRESSED: 1, 2
TARGET COMPLETION DATE: 2025	OBJECTIVE(S) ADDRESSED: E
ISSUE: Constructing a new bridge to span the entire floodplain in accordance with the new FEMA D-FIRM standards for this drainage basin.	
RECOMMENDED ACTION: Construct a new bridge that is wide enough to accommodate the future widening of this arterial roadway from two to four lanes. A new bridge will achieve resiliency from major flood events and allow the road to remain open to minimize the risk to the general public.	
LEAD AGENCY: Weld County	EXPECTED COST: $4,117,575
SUPPORT AGENCY(IES): N/A	POTENTIAL FUNDING SOURCE(S): DOLA
PROGRESS MILESTONES: The design will start in 2022. Construction will begin in 2024 and be completed in 2025.	
STATUS UPDATE(S): Weld County has contracted with JUB Engineers to design the new bridge.	

5-Weld County – PW: Bridge 34/17A	
PRIORITY: High	HAZARD(S) MITIGATED: Flood and Erosion
LOCATION: WCR 34 between WCR 17 and WCR 19	LIFELINE(S) MITIGATED: Safety and Security, Health and Medical, and Transportation.
RECOMMENDATION DATE: 2013	GOAL(S) ADDRESSED: 1, 2
TARGET COMPLETION DATE: 2026	OBJECTIVE(S) ADDRESSED: E
ISSUE: Constructing a new bridge to span the entire floodplain in accordance with the new FEMA D-FIRM standards for this drainage basin.	
RECOMMENDED ACTION: Construct a new bridge that is wide enough to accommodate the future widening of this arterial roadway from two to four lanes. A new bridge will achieve resiliency from major flood events and allow the road to remain open to minimize the risk to the general public.	
LEAD AGENCY: Weld County	EXPECTED COST: $8,800,000
SUPPORT AGENCY(IES): N/A	POTENTIAL FUNDING SOURCE(S): DOLA
PROGRESS MILESTONES: The design will be in 2022. Construction will begin in 2023 and be completed in 2026.	
STATUS UPDATE(S): Weld County has contracted with JUB Engineers to design the new bridge.	

6-Weld County – PW: Galeton Drainage Project	
PRIORITY: High	HAZARD(S) MITIGATED: Flood, Erosion, and Subsidence.
LOCATION: WCR 49 between WCR 74 and WCR 76	LIFELINE(S) MITIGATED: Safety and Security, Health and Medical, and Transportation.
RECOMMENDATION DATE: 2020	GOAL(S) ADDRESSED: 1, 2
TARGET COMPLETION DATE: 2025	OBJECTIVE(S) ADDRESSED: E
ISSUE: The flooding has closed the road and impacted adjacent landowners.	
RECOMMENDED ACTION: Reconstruct of WCR 49 and include the installation of culvert(s) to keep water from overtopping the road and flooding properties. This project will achieve resiliency from severe storms and minimize the risk to the general public. It will also Eliminate road closures due to washouts and provide continuous access to the Galeton Fire Protection District.	
LEAD AGENCY: Weld County	EXPECTED COST: $1,000,000
SUPPORT AGENCY(IES): N/A	POTENTIAL FUNDING SOURCE(S): DOLA
PROGRESS MILESTONES:	

STATUS UPDATE(S): Public Works would like to add this drainage project into our Capital Improvement Plan to contract the work.

7-Weld County – PW: Gill Drainage Project	
PRIORITY: Low	HAZARD(S) MITIGATED: Flood, Erosion, and Subsidence.
LOCATION: Latitude: Gill Townsite off of WCR 55	LIFELINE(S) MITIGATED: Safety and Security, Health and Medical, and Transportation.
RECOMMENDATION DATE: 2020	GOAL(S) ADDRESSED:
TARGET COMPLETION DATE: 2026	OBJECTIVE(S) ADDRESSED:
ISSUE: The entire Gill Townsite sits in a bowl and has trouble draining during large storm events, which creates flooding.	
RECOMMENDED ACTION: Reconstruct the roads and install large culverts to keep water from overtopping the road and washing it out, thereby reduce flooding to homes within the Gill Townsite. It will also eliminate damage to additional public and private infrastructure.	
LEAD AGENCY: Weld County	EXPECTED COST: $3,000,000
SUPPORT AGENCY(IES): N/A	POTENTIAL FUNDING SOURCE(S): DOLA
PROGRESS MILESTONES:	
STATUS UPDATE(S): Need to include on the Public Works Capital Improvement Plan.	

Mitigation Action Guides: 2021-26 Weld County

Ault (2 Projects)

1-Ault: Community Impact Study -Vulnerable Populations-Shelter Capabilities Planning	
PRIORITY: High	HAZARDS ADDRESSED: All hazards
LOCATION: Town of Ault	GOALS ADDRESSED: 1-4
RECOMMENDATION DATE: 7/31/2021	OBJECTIVES ADDRESSED: A, B, C, D, E
TARGET COMPLETION DATE: 12/31/2021	Lifelines: Public Safety
ISSUE: Due to the potential impact of severe storms, long term power outages, tornados, proximity of hazmat routes and the lack of sheltering capabilities in the community; the impact by natural hazards and cascading events would require Ault to acquire outside assistance to shelter local residents.	
RECOMMENDATION: Conduct a Community Impact study to identify vulnerable areas and neighborhoods that be greatly impacted by identified high ranking natural hazards or the cascading effects of natural hazards. Identify shelter locations, that include generators, capability to sustain winds up to 200 mph, cots, blankets and maintain supplies for emergency provisions. Provide Train the Trainer course to include preparation for all hazards that could impact the community. Update Emergency planning to include early warning procedures and sheltering/shelter-in-place protocols. Harden infrastructure systems to prevent long term disruption of services and supplies. Identify and obtain grant funding for all components of above projects.	
ACTION: identifying shelters and designating them as critical facilities - providing backup power through fixed generators - mitigating the shelters against hazards (wind, flood, fire, etc.) - building safe rooms or shelters for identified vulnerable areas that need them	
LEAD AGENCY: Town of Ault	EXPECTED COST: Staff Time,
SUPPORT AGENCIES: Weld OEM,	POTENTIAL FUNDING SOURCES: TBD
PROGRESS MILESTONES:	

2-Ault: Hazardous Materials - Community Impact Study	
PRIORITY: High	HAZARDS ADDRESSED: Hazardous Material
LOCATION: Town of Ault	GOALS ADDRESSED: 1-4
RECOMMENDATION DATE: 7/31/2021	OBJECTIVES ADDRESSED: A, B, C, D, E
TARGET COMPLETION DATE: 12/31/2021	LIFELINES: Public Safety, Hazmat, Communications
ISSUE: Due to proximity of Hazmat Routes and Railroad through Ault, Hazmat is the highest-ranking risk to the community at a 2.5. The risks include Hwy 85, Hwy 14 and UP Railway that runs parallel	

to Hwy 85 on the East side of town. A Hazmat spill on either route would significantly impact the entire community of Ault, traffic on Hwy 85 and Hwy 14, the residential area, and the environment.	
RECOMMENDATION: Conduct a Community Impact study addressing the hazmat routes, UP railway commodity flow study, update the current commodity flow study using the recently developed Application (Zone Survey) develop a public awareness campaign and establish protocol and procedure for responding to most prevalent hazmat concerns based on the study. Conduct training for community, government and first responders to address Response, Mitigation, and shelter in place protocols. Identify options at the crossing guards to harden and/or lengthen the closure for a train. Identify funding opportunities for identified projects.	
ACTION: Schedule a meeting with government officials, first responders, Weld OEM, Union Pacific, and CDOT/CSP to conduct a community impact study, consulting with Subject Matter Experts from every agency.	
LEAD AGENCY: Town of Ault	EXPECTED COST: Staff Time
SUPPORT AGENCIES: Weld OEM, CSP,CDOT	POTENTIAL FUNDING SOURCES: TBD
PROGRESS MILESTONES:	

Mitigation Action Guides: 2021-26 Weld County

Carbon Valley - Dacono (2 Projects)

1-Dacono: Design and Construction of Colorado Blvd. Bridge	
PRIORITY: High (#1)	HAZARDS ADDRESSED: Flood
LOCATION: Colorado Blvd (WCR 13)	GOALS ADDRESSED: 1, 2, 4
RECOMMENDATION DATE: 10/19/2015	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: 12/31/2025	LIFELINES and SUBCOMPONENTS ADDRESSED: Safety and Security: Community Safety; Law, Fire, Government Services; Transportation: Highway/Roadway
ISSUE: Based on previous experience with flooding on Colorado Boulevard, the particular area of road that intersects with the Little Dry Creek water-way, a bridge needs to be constructed to mitigate the impact of water flowing over that section of Colorado Blvd often requiring the road be closed.	
RECOMMENDATION: Bridging Colorado Blvd at Little Dry Creek	
ACTION: Design and Construction of Colorado Blvd. Bridge	
LEAD AGENCY: City of Dacono Public Works	EXPECTED COST: $2 Million; Staffing would include city staff and administration throughout the entire process
SUPPORT AGENCIES: Weld County, Army Corps of Engineers	POTENTIAL FUNDING SOURCES: Dacono City Budget; Grants (State and Federal)
PROGRESS MILESTONES: Design Completion, Impact Reports, permitting, RFQ, RFP, bidding, construction, reclamation, and completion. Updated: To date, this project has undergone engineering review and design. Completion of this project will depend on available funding, and it has not yet been scheduled. This project should be continued as a 2021 mitigation action.	

2-Dacono: Grandview Street and York Street Flood Mitigation	
PRIORITY: High (#2)	HAZARDS ADDRESSED: Flood
LOCATION: Grandview (Weld County Road 12) at York Street (Weld County Road 11)	GOALS ADDRESSED: 2, 4
RECOMMENDATION DATE: 10/19/2015	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: 12/31/2025	LIFELINES and SUBCOMPONENTS ADDRESSED: Safety and Security: Community Safety; Law, Fire, Government Services; Transportation: Highway/Roadway

Mitigation Action Guides: 2021-26 Weld County

ISSUE: In the event of sustained moderate or heavy rain, this intersection experiences flooding.	
RECOMMENDATION: Installation of box culverts	
ACTION: Engineering design and construction	
LEAD AGENCY: City of Dacono Public Works	EXPECTED COST: Unknown
SUPPORT AGENCIES: Weld County	POTENTIAL FUNDING SOURCES: Dacono city budget; State and Federal grants
PROGRESS MILESTONES: Engineering design and construction, RFP, bidding, construction, reclamation, completion. To date, this project has undergone engineering review and design. Completion of this project will depend on available funding, and it has not yet been scheduled. This project should be continued as a 2021 mitigation action.	

Carbon Valley - Firestone (3 Projects)

1-Firestone: Installation of Infrastructure for Transmission Technologies	
PRIORITY: Medium	HAZARDS ADDRESSED: ALL
LOCATION: Town of Firestone	GOALS ADDRESSED: 1, 2, 4
RECOMMENDATION DATE: 1/2/2021	OBJECTIVES ADDRESSED: C, E
TARGET COMPLETION DATE: 12/31/2022	LIFELINES and SUBCOMPONENTS ADDRESSED: Safety and Security: Government Services; Community Safety Communications: Infrastructure; Alerts, Warnings, and Messages; Responder Communications
ISSUE: lack of stable and redundant communication services to households and businesses in Firestone. The population growth has been significant and communication systems are in need of update.	
RECOMMENDATION: Install stable and redundant communication system to ensure dependable communication to residents and businesses in Firestone during a disaster.	
ACTION: Install Fiber To The Premises (FTTP) network to all residents and businesses in Firestone.	
LEAD AGENCY: Town of Firestone	EXPECTED COST: $200,000.00
SUPPORT AGENCIES:	POTENTIAL FUNDING SOURCES: Town of Firestone, Grants, and Public-Private Partnership
PROGRESS MILESTONES: RFP completed in 2020. Next steps will be scope of work and system installation.	

2-Firestone: Godding Hollow Tri-Town Basin Outfall Improvements	
PRIORITY: Medium	HAZARDS ADDRESSED: Flood
LOCATION: Town of Firestone	GOALS ADDRESSED: 1, 2
RECOMMENDATION DATE: 6/21/2021	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: Interim improvements by December 2022; Final improvement by June 2031, as agreed upon with ditch company.	LIFELINES and SUBCOMPONENTS ADDRESSED: Interim improvements by December 2022; Final improvement by June 2031, as agreed upon with ditch company.
ISSUE: he Godding Hollow Drainage Basin and the Tri-Town Drainage Basin confluences at this location. A couple of hundred years of irrigation ditch construction, county road construction, and gravel mining have eliminated the natural drainage way so major storm events in the basins cause significant flooding where these two irrigation ditches and drainage basins all come together.	

RECOMMENDATION: Construct a concrete box culvert and related drainage channel improvements to convey stormwater under the Last Chance Irrigation Ditch and WCR 26. Install grouted riprap sloping rock drop structures, relocate conflicting utilities, realign two irrigation ditches and the associated irrigation laterals.	
ACTION: Perform interim improvements to minimize immediate impact, then bid out the entire project for final improvements, as recommended.	
LEAD AGENCY: Town of Firestone	EXPECTED COST: $5,000,000
SUPPORT AGENCIES: City of Dacono, Town of Frederick, and Weld County Government	POTENTIAL FUNDING SOURCES: Support agencies
PROGRESS MILESTONES: Plan, schedule, and perform interim improvements, determine needs for final improvements, secure funding, prepare RFP, bid out project, schedule and perform improvements.	

3-Firestone: Community Connect Program	
PRIORITY: Medium	HAZARDS ADDRESSED: All
LOCATION: Town of Firestone	GOALS ADDRESSED: 1, 2, 3, 4
RECOMMENDATION DATE: 11/1/2021	OBJECTIVES ADDRESSED: A, C, E
TARGET COMPLETION DATE: 12/31/2022	LIFELINES and SUBCOMPONENTS ADDRESSED: Safety and Security: Fire, LE, SAR, Gov. Services and Community Safety. Communications: alerts, warnings, and messages. Health and Medical: Medical Care.
ISSUE: First responders have limited information about specific critical issues at a residence or location. They typically discover these issues when they arrive on scene of an incident. It would be helpful to know ahead of time when critical issues are present, and to get to know our community residents better.	
RECOMMENDATION: Working with the Frederick-Firestone Fire Protection District, support the implementation of a program that allows residents to provide critical information on a voluntary basis to help first responders have critical knowledge about community members and locations prior to responding to the location. Critical issues could include property access, systems available (sprinklers), location details, people with disabilities who may need assistance or adaptive technology.	
ACTION: Support community education about potential hazards and public safety preparedness and the use of the Community Connect Program, when purchased and implemented by the Frederick-Firestone Fire Protection District.	
LEAD AGENCY: Frederick-Firestone Fire Protection District	EXPECTED COST: Unknown; will update as cost information is provided by vendor.

SUPPORT AGENCIES: Town of Firestone, Town of Frederick, and the Carbon Valley Emergency Management Agency	POTENTIAL FUNDING SOURCES: FFFPD Budget, potential grant sources to be researched.
PROGRESS MILESTONES: The Towns of Firestone and Frederick will help to develop implementation plan, communicate, and educate the community about hazards and emergencies, and how the technology can support public safety and resilience, and actively invite the community to utilize the Community Connect tool. The Frederick-Firestone Fire Protection District will Identify cost, seek budget approval and funding, acquire software, help develop public messaging about the use of the software, educate FFFPD responders on the use of the information provided by the community, monitor and update the use of tool annually.	

Mitigation Action Guides: 2021-26 Weld County

Carbon Valley - Frederick (4 Projects)

1-Frederick: Box Culvert at Bella Rosa Parkway	
PRIORITY: High	HAZARDS ADDRESSED: Flooding
LOCATION: Bella Rosa Parkway/No Name Creek	GOALS ADDRESSED: 1, 2, 3, 4
RECOMMENDATION DATE: 09/19/2015	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: 09/20/2023	LIFELINES and SUBCOMPONENTS ADDRESSED: Safety and Security: Community Safety; Law, Fire, and Government Services. Transportation: Highway/Roadway
ISSUE: Flood control and drainage improvements have been done subsequent to the 2013 flood. More improvements are needed in order to withstand a 100-year flood.	
RECOMMENDATION: Completion of the box culverts as designed but not yet funded.	
ACTION: Engineering and construction of box culverts	
LEAD AGENCY: Town of Frederick	EXPECTED COST: $3 million
SUPPORT AGENCIES: Weld County OEM, Carbon Valley EMA	POTENTIAL FUNDING SOURCES: Town capital budget, CDBG, DOLA, EIAF
PROGRESS MILESTONES:  This project has been partially completed - Damage was repaired but the lack of adequate box culverts to handle the 100-year flood will result in future damage. The Town of Frederick Stormwater Master Plan will identify this project as a priority.	

2-Frederick: Potable Water System Emergency Supply	
PRIORITY: Medium	HAZARDS ADDRESSED: Drought, Extreme Temperatures, Water Supply Suspension
LOCATION: SE4NE4 Section 32, Township 2, Range 67	GOALS ADDRESSED: 1, 2
RECOMMENDATION DATE: 2005, 2010	OBJECTIVES ADDRESSED: E

TARGET COMPLETION DATE: 2025	LIFELINES and SUBCOMPONENTS ADDRESSED: Potable Water, Fire Suppression Supply, Pressure Regulation
ISSUE: Loss of service by Central Weld County Water District	
RECOMMENDATION: The CWCWD contract states that CWCWD will provide some emergency water but the Town must have storage to meet emergency supply needs. There is an existing interconnect with LHWD to CWCWD within Town limits which can provide an alternative supply if there is an issue with CWCWD service. To provide additional supplies to meet immediate needs in the event of an emergency the Town should build an additional storage tank. The Town currently receives water through a 2.58MG tank and direct connections to the CWCWD transmission mains. The construction of an additional 1.5 MG tank on the existing tank site would provide additional emergency storage capacity to serve the Town as the area that can be served through the tank site has grown.	
ACTION: Installation of additional storage tank to serve Frederick	
LEAD AGENCY: Frederick	EXPECTED COST: $4.5M
SUPPORT AGENCIES: CWCWD, LHWD	POTENTIAL FUNDING SOURCES: State Revolving Fund – Drinking Water
PROGRESS MILESTONES: Location identified	

3-Frederick: Town Facilities - Expansion & Modification	
PRIORITY: Medium	HAZARDS ADDRESSED: All
LOCATION: Town of Frederick	GOALS ADDRESSED: 1, 2
RECOMMENDATION DATE: 12/8/2020	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: 12/31/2025	LIFELINES and SUBCOMPONENTS ADDRESSED: Safety & Security, Communications Components: Government Services, Law Enforcement and Security, Infrastructure, and Finance. (Continue to provide)
ISSUE: Limited space for employees to provide high levels of service to the community. Aging buildings are becoming costly for routine maintenance. Many key infrastructure items such as HVAC is past its life cycle. Workflow and ability to social distance during the 2020 COVID-19 pandemic is challenging with current building structures.	
RECOMMENDATION: Identify and construct a new Town Hall to meet the growing needs of the community for the next 30 years.	
ACTION: Obtain location and funding for larger Town Hall.	
LEAD AGENCY: Town of Frederick	EXPECTED COST: T.B.D.

SUPPORT AGENCIES: Weld County OEM	POTENTIAL FUNDING SOURCES: Capital Facility Fee, Sales Tax Increase, Mill Levy Increase.
PROGRESS MILESTONES:	

4-Frederick: Community Connect Program	
PRIORITY: Medium	HAZARDS ADDRESSED: All
LOCATION: Town of Frederick	GOALS ADDRESSED: 1, 2, 3, 4
RECOMMENDATION DATE: 11/1/2021	OBJECTIVES ADDRESSED: A, C, E
TARGET COMPLETION DATE: 12/31/2022	LIFELINES and SUBCOMPONENTS ADDRESSED: Safety and Security: Fire, LE, SAR, Gov. Services and Community Safety. Communications: alerts, warnings, and messages. Health and Medical: Medical Care.
ISSUE: First responders have limited information about specific critical issues at a residence or location. They typically discover these issues when they arrive on scene of an incident. It would be helpful to know ahead of time when critical issues are present, and to get to know our community residents better.	
RECOMMENDATION: Working with the Frederick-Firestone Fire Protection District, support the implementation of a program that allows residents to provide critical information on a voluntary basis to help first responders have critical knowledge about community members and locations prior to responding to the location. Critical issues could include property access, systems available (sprinklers), location details, people with disabilities who may need assistance or adaptive technology.	
ACTION: Support community education about potential hazards and public safety preparedness and the use of the Community Connect Program, when purchased and implemented by the Frederick-Firestone Fire Protection District.	
LEAD AGENCY: Frederick-Firestone Fire Protection District	EXPECTED COST: Unknown; will update as cost information is provided by vendor.
SUPPORT AGENCIES: Town of Frederick, Town of Firestone, and the Carbon Valley Emergency Management Agency	POTENTIAL FUNDING SOURCES: FFFPD Budget, potential grant sources to be researched.
PROGRESS MILESTONES: The Towns of Firestone and Frederick will help to develop implementation plan, communicate, and educate the community about hazards and emergencies, and how the technology can support public safety and resilience, and actively invite the community to utilize the Community Connect tool. The Frederick-Firestone Fire Protection District will Identify cost, seek budget approval and funding, acquire software, help develop public messaging about the use of the software, educate FFFPD responders on the use of the information provided by the community, monitor and update the use of tool annually.	

Eaton (3 Projects)

1-Eaton: Drought Plan Development	
PRIORITY: Medium	HAZARDS ADDRESSED: Drought
LOCATION: Eaton Community	GOALS ADDRESSED: 1, 2
RECOMMENDATION DATE:2021	OBJECTIVES ADDRESSED: C, E
TARGET COMPLETION DATE: 12/31/2021	LIFELINES: Food, Water, Shelter, Safety & Security SUBCOMPONENTS: Water supplies, Government Services
ISSUE: Eaton has been impacted previously by drought in the area. Much of the city water is piped in from Horsetooth Reservoir. Should the only water source for Eaton be impacted or disrupted the community would be left without water. Colorado's dry weather and drought conditions impact regional water reserves.	
RECOMMENDATION: Community to develop a drought plan to ensure better water usage and back up resources for city water supplies.	
ACTION: Conduct study, develop plan to develop redundant sources and retain needed water sources and supplies	
LEAD AGENCY: Town of Eaton	EXPECTED COST: TBD
SUPPORT AGENCIES: Weld OEM	POTENTIAL FUNDING SOURCES: Town budget, BRIC, additional grant funding
PROGRESS MILESTONES:	

2-Eaton: Roundabout Collins Rd & C R 35	
PRIORITY: Medium	HAZARDS ADDRESSED: All
LOCATION: Eaton Community	GOALS ADDRESSED: 2
RECOMMENDATION DATE:2021	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: 12/31/2021	LIFELINES: Transportation, Safety & Security SUBCOMPONENTS: City Streets, County Roads, Community Safety
ISSUE: Eaton is currently building a new High School on the NE section by Collins Rd and C R 35, due to a study of traffic in that area, it is recommended that a roundabout be built at that intersection.	
RECOMMENDATION: recommended to build at roundabout at the Collins/ CR 35 intersection, due the amount of traffic and pedestrian foot traffic in the area that will increase with the completion of the High School.	

ACTION: Roundabout construction	
LEAD AGENCY: Town of Eaton	EXPECTED COST: TBD
SUPPORT AGENCIES: Weld County, CDOT	POTENTIAL FUNDING SOURCES: Town budget, Weld County PW, additional grant funding
PROGRESS MILESTONES:	

3-Eaton: Pump Pit	
PRIORITY: Medium	HAZARDS ADDRESSED: Drought
LOCATION: Eaton Public Safety Training center: 320 4th St	GOALS ADDRESSED: 1,2
RECOMMENDATION DATE: Dec 2020	OBJECTIVES ADDRESSED: D, E
TARGET COMPLETION DATE: July 2021	LIFELINES: Food, Water, Shelter, Safety & Security SUBCOMPONENTS: Water supplies, Fire Services
ISSUE: Provisioning against future drought measures and in the interest of fire department essential training we are installing a "pump pit" that would be used for ongoing fire training but reuses a stored volume of water instead of direct hydrant use which often becomes run-off.	
RECOMMENDATION: A below ground pump pit with a capacity of 2500 gallons (minimum) to conserve water use during training under drought conditions for water conservation and to secure emergency water sources for public safety.	
ACTION: Budgeted and planned for installation summer 2021	
LEAD AGENCY: Eaton	EXPECTED COST: 90,000
SUPPORT AGENCIES: Town of Eaton under IGA approval for Training Center. Eaton Fire Protection District.	POTENTIAL FUNDING SOURCES: EFPD annual operating budget
PROGRESS MILESTONES:	

Mitigation Action Guides: 2021-26 Weld County

Erie (12 Projects)

1-Erie: County Line Road, Tellane to Cheeseman	
PRIORITY: Medium	HAZARDS ADDRESSED: Severe storm
LOCATION: County Line Road, Tellane to Cheeseman	GOALS ADDRESSED: 1 and 2
RECOMMENDATION DATE: Design 2021	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: 2023	LIFELINE: Transportation, Public Safety SUBCOMPONENT: Roadway
ISSUE: This section of County Line road has multiple connections and is between two schools and a day care center. There are no turn lanes or sidewalks. It is difficult for children to cross the roadway to get to school and cars back up waiting to make left turns. The Town has applied for a Safer Main Streets funding for this project. There have been multiple accidents in the stretch of County Line Road.	
RECOMMENDATION: Assuming the project will receive funding in early 2021, begin the design, and work with the power company to underground overhead lines. Construction is anticipated to begin in 2022. The project will include left turn lanes, rectangular rapid flashing beacons for pedestrian crossings, bike lanes and sidewalks on each side.	
ACTION: County Line Road, Telleen to Cheesman	
LEAD AGENCY: Todd Fessenden, 303-926-2895.	EXPECTED COST: $2,950,000
SUPPORT AGENCIES:	POTENTIAL FUNDING SOURCES: Transportation Impact Fund for 20%, DRCOG Safer Main Streets funding for 80%
PROGRESS MILESTONES:	

2-Erie: Coal Creek Improvements Reach 1	
PRIORITY: High	HAZARDS ADDRESSED: Flooding
LOCATION: Coal Creek from south of Cheeseman St to north of Briggs St	GOALS ADDRESSED: 1, 2, and 4
RECOMMENDATION DATE: Early 2021	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: Mid 2022	LIFELINE: Safety and Security SUBCOMPONENT: Community Safety
ISSUE: A Coal Creek Master Plan and a Flood Hazard Area Delineation (FHAD) study was completed for Coal Creek in 2016. The flows in Coal Creek increased from the FIS. Because of the increased	

flows, the Town worked with MHFD to study three reaches of Coal Creek from Cheesman St to Kenosha Rd. Reach 1 is just east of Old Town Erie. This section of Erie is protected from the 100-year flood with a levee. To ensure the Levee has adequate freeboard to continue to protect the Town, this section was designed. Currently the design and a CLOMR is being reviewed by FEMA.	
RECOMMENDATION: Once the CLOMR is approved by FEMA, the construction of the improvements will be completed, and a LOMR submitted to FEMA.	
ACTION: Coal Creek Improvements Reach 1	
LEAD AGENCY: Todd Fessenden, 303-926-2895.	EXPECTED COST: $2,000,000
SUPPORT AGENCIES:	POTENTIAL FUNDING SOURCES: Storm Drainage Fund
PROGRESS MILESTONES:	

3-Erie: Coal Creek Improvements Reach 2	
PRIORITY: High	HAZARDS ADDRESSED: Flooding
LOCATION: Coal Creek from Briggs Street to County Line Road.	GOALS ADDRESSED: 1, 2, and 4
RECOMMENDATION DATE: Begin design 2022	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: 2026	LIFELINE: Safety and Security, SUBCOMPONENT: Community Safety
ISSUE: A Coal Creek Master Plan and a Flood Hazard Area Delineation (FHAD) study was completed for Coal Creek in 2016. The flows in Coal Creek increased from the FIS. Because of the increased flows, the Town worked with MHFD to study three reaches of Coal Creek from Cheesman St to Kenosha Rd. Reach 2 is between Briggs Street and County Line Road. Currently there is a conceptual design for this section. Property for the Coal Creek improvements needs to be acquired and a final design and permitting is needed before construction can occur. The improvements in this reach along with Reach 1 and 3 and a Bridge Replacement for County Line Road, has the potential to remove Weld County properties from the Flood Hazard Zone.	
RECOMMENDATION: Prepare a preliminary design and apply for funding for final design and construction.	
ACTION: Coal Creek Improvements Reach 3	
LEAD AGENCY: Todd Fessenden, 303-926-2895.	EXPECTED COST: $12,000,000
SUPPORT AGENCIES:	POTENTIAL FUNDING SOURCES: Storm Drainage Fund Grant funding from multiple sources such as CWCB, GoCO, FEMA and DRCOG.

PROGRESS MILESTONES:

4-Erie: Coal Creek Improvements Reach 3	
PRIORITY: High	HAZARDS ADDRESSED: Flooding
LOCATION: Coal Creek from County Line Road to Kenosha Road	GOALS ADDRESSED: 1, 2, and 4
RECOMMENDATION DATE: Early 2021	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: Mid 2022	LIFELINE: Safety and Security SUBCOMPONENT: Community Safety
ISSUE: A Coal Creek Master Plan and a Flood Hazard Area Delineation (FHAD) study was completed for Coal Creek in 2016. The flows in Coal Creek increased from the FIS. Because of the increased flows, the Town worked with MHFD to study three reaches of Coal Creek from Cheesman St to Kenosha Rd. Reach 3 is between County Line Road and Kenosha Road. Currently the design and a CLOMR is being reviewed by FEMA.	
RECOMMENDATION: Once the CLOMR is approved by FEMA, the construction of the improvements will be completed, and a LOMR submitted to FEMA.	
ACTION: Coal Creek Improvements Reach 3	
LEAD AGENCY: Todd Fessenden, 303-926-2895.	EXPECTED COST: $5,000,000
SUPPORT AGENCIES:	POTENTIAL FUNDING SOURCES: Storm Drainage Fund and Mile High Flood District
PROGRESS MILESTONES:	

5-Erie: Old Town Drainage Improvements	
PRIORITY: High	HAZARDS ADDRESSED: Flooding
LOCATION: Old Town Erie to Coal Creek	GOALS ADDRESSED: 1, 2, and 4
RECOMMENDATION DATE: Begin design 2021, begin implementation of improvements in 2023	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: 2024 for near term improvements	LIFELINE: Safety and Security SUBCOMPONENT: Community Safety
ISSUE: Old Town Erie's storm drainage system does not handle a minor storm. A conceptual plan has been developed to add detention and additional storm sewer systems. With redevelopment of	

Old Town Erie, storm drainage improvements are needed to improve the exiting conditions and not make it worse.	
RECOMMENDATION: Begin the design for implementation of the Old Town Infrastructure Improvements for drainage. Need to review conceptual recommendations and implement a plan to complete improvements. Conceptual plan recommends 2.5 mill in next 5-years and 9.3 mill for mid to long term implementation.	
ACTION: Old Town Drainage Improvements	
LEAD AGENCY: Todd Fessenden, 303-926-2895.	EXPECTED COST: $3,500,000 for near term and 9,500,000 for long term.
SUPPORT AGENCIES:	POTENTIAL FUNDING SOURCES: Storm Drainage Fund Grant funding from multiple sources such as CWCB and DRCOG.
PROGRESS MILESTONES:	

6-Erie: Zone 3 Storage Tank	
PRIORITY: Medium	HAZARDS ADDRESSED: Severe storm, Drought
LOCATION: North of SH 52	GOALS ADDRESSED: 1 and 2
RECOMMENDATION DATE: Design 2021	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: 2024	LIFELINE: Food Water Shelter SUBCOMPONENT: Water
ISSUE: The Town is developing new water supplies that will be locating on the north side of Erie. By constructing a new water treatment facility close to the water supplies the infrastructure needed to transport water for treatment will be reduced. A second water treatment facility will provide redundancy in the event of a natural disaster.	
RECOMMENDATION: Begin the design and permitting in 2021. Begin construction in 2022.	
ACTION: Zone 3 Water Storage Tank	
LEAD AGENCY: Todd Fessenden, 303-926-2895.	EXPECTED COST: $7,000,000
SUPPORT AGENCIES:	POTENTIAL FUNDING SOURCES: Water Fund
PROGRESS MILESTONES:	

7-Erie: Well Project	
PRIORITY: Medium	HAZARDS ADDRESSED: Severe storm, Drought

LOCATION: North of SH 52	GOALS ADDRESSED: 1 and 2
RECOMMENDATION DATE: Design 2020	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: 2024	LIFELINE: Food Water Shelter SUBCOMPONENT: Water
ISSUE: The Town is developing new water supplies that the well system is part of. Having diversified water supplies will provide redundancy in the event of a natural disaster.	
RECOMMENDATION: The design of a well system for water supply is underway. The installation and distribution system for the well system will begin construction in 2021. The water from the well system will be treated from a new water treatment facility.	
ACTION: Well project	
LEAD AGENCY: Todd Fessenden, 303-926-2895.	EXPECTED COST: $4,000,000
SUPPORT AGENCIES:	POTENTIAL FUNDING SOURCES: Water Fund
PROGRESS MILESTONES:	

8-Erie: Zone 2 Water System Improvements	
PRIORITY: High	HAZARDS ADDRESSED: Severe storm, Drought
LOCATION: Linear project between WCR 3, WCR 7, SH 52 and Erie Parkway	GOALS ADDRESSED: 1 and 2
RECOMMENDATION DATE: Design 2021	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: 2024	LIFELINE: Food Water Shelter SUBCOMPONENT: Water
ISSUE: The Zone 2 Waterline Improvement project will provide the first phase in a needed Zone 2 transmission waterline and new Zone 2 water storage tank. This transmission line and storage tank will provide reliability to the Zone 2 water system. It is also needed to get water out to the Zone 2 distribution system.	
RECOMMENDATION: Begin the design and property acquisition for the storage tank and easements where the waterline is outside of right-of-way.	
ACTION: Zone 2 Water System Improvements	
LEAD AGENCY: Todd Fessenden, 303-926-2895.	EXPECTED COST: $12,000,000
SUPPORT AGENCIES:	POTENTIAL FUNDING SOURCES: Water Fund
PROGRESS MILESTONES:	

9-Erie: Zone 3 Storage Tank	
PRIORITY: Medium	HAZARDS ADDRESSED: Severe storm, Drought
LOCATION: SW corner of Erie	GOALS ADDRESSED: 1 and 2
RECOMMENDATION DATE: Design 2021	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: 2024	LIFELINE: Food Water Shelter SUBCOMPONENT: Water
ISSUE: The Zone 3 storage tank is needed for reliability. The existing tanks are on the east side of Erie, by placing a new storage tank on the west side it provides reliability and a balance to the water distribution system.	
RECOMMENDATION: Begin the design and property acquisition for the storage tank and easements for waterlines needed to connect to the tank waterline is outside of right-of-way.	
ACTION: Zone 3 Water Storage Tank	
LEAD AGENCY: Todd Fessenden, 303-926-2895.	EXPECTED COST: $7,000,000
SUPPORT AGENCIES:	POTENTIAL FUNDING SOURCES: Water Fund
PROGRESS MILESTONES:	

10-Erie: Zone 3 Waterline Improvements	
PRIORITY: High	HAZARDS ADDRESSED: Severe storm, Drought
LOCATION: from the existing water treatment facility west of 119th street to the existing water storage tank west of WCR 7.	GOALS ADDRESSED: 1 and 2
RECOMMENDATION DATE: Construction 2021	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: 2021	LIFELINE: Food Water Shelter SUBCOMPONENT: Water
ISSUE: The Zone 3 Waterline Improvement project will provide an additional transmission waterline connecting the water treatment facility to the water storage tank site. It is not only needed to provide a back-up transmission line to the storage tank, but it is needed to get water out to the distribution system.	
RECOMMENDATION: This project is 95% designed and will be ready to bid and begin construction in 2021.	
ACTION: Zone 3 Waterline Improvements	

LEAD AGENCY: Todd Fessenden, 303-926-2895.	EXPECTED COST: $5,200,000
SUPPORT AGENCIES:	POTENTIAL FUNDING SOURCES: Water Fund
PROGRESS MILESTONES:	

11-Erie: Erie Parkway & WCR 7 Intersection Improvements	
PRIORITY: High	HAZARDS ADDRESSED: Severe storms, Flooding
LOCATION: Erie Parkway & WCR 7	GOALS ADDRESSED: 1 and 2
RECOMMENDATION DATE: Design 2020	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: 2021	LIFELINE: Transportation SUBCOMPONENT: Roadway
ISSUE: The Town has designed the intersection improvements and is actively acquiring the additional ROW and easement needed for construction. The project includes adding turn lanes and a traffic signal. This intersection has experienced multiple accidents, exacerbated by severe weather. The first phase is to improve the roadway and the second is to install a traffic signal.	
RECOMMENDATION: Complete the right of way acquisition needed for the roadway improvements, then bid and construct the roadway improvements, then install the traffic signal.	
ACTION: Erie Parkway & WCR 7 Intersection Improvements	
LEAD AGENCY: Todd Fessenden, 303-926-2895.	EXPECTED COST: $4,000,000
SUPPORT AGENCIES:	POTENTIAL FUNDING SOURCES: Transportation Impact Fund for roadway improvements, FHWA funding for Traffic Signal
PROGRESS MILESTONES:	

12-Erie: Signal Communication Project	
PRIORITY: High	HAZARDS ADDRESSED: Severe storm
LOCATION: Town wide	GOALS ADDRESSED: 1 and 2
RECOMMENDATION DATE: Design 2021	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: 2022	LIFELINE: Transportation SUBCOMPONENT: Roadway
ISSUE: The Town began looking into a signal communications project in 2018. Without adequate funding the project was put on hold. The Town was successful in acquiring funding in late 2020 for	

the design and implementation of the project. This project will allow Town Staff to monitor and control the traffic signals. It will assist during storm events to monitor the roadway conditions. By having signals communicating traffic flow will be safer.	
RECOMMENDATION: Complete the funding agreement, start the design and implement the communications project.	
ACTION: Signal Communication Project	
LEAD AGENCY: Todd Fessenden, 303-926-2895.	EXPECTED COST: $910,000
SUPPORT AGENCIES:	POTENTIAL FUNDING SOURCES: General Fund, DRCOG funding qualified intersections
PROGRESS MILESTONES:	

Evans (3 Projects)

1-Evans: 31st Street Stormwater Outfall	
PRIORITY: High	HAZARDS ADDRESSED: Flooding
LOCATION: 31st Street from HWY 85 east to the railroad track.	GOALS ADDRESSED: 1, 2
RECOMMENDATION DATE: 2016	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: 7/2021	LIFELINE: Stormwater & Transportation SUBCOMPONENT: Rivers & City Streets
ISSUE: This project will reduce localized flooding problems and reduce transportation problems during high water/storm events.	
RECOMMENDATION: Enlarging pipeline and increase conveyance capacity.	
ACTION: Additional pipeline crossing US Highway 85 and Union Pacific Railroad and installation of east Side stormwater piping and inlets. Mitigate stormwater interfering with transportation routes, general public safety/protection from flooding.	
LEAD AGENCY: City of Evans	EXPECTED COST: <$10,000,000.00
SUPPORT AGENCIES: Colorado Water Resources and Power Development Authority	POTENTIAL FUNDING SOURCES: State Revolving Fund
PROGRESS MILESTONES: 60% plans received 12/4/20. Anticipated construction date March/April 2021.	

2-Evans: Bay at the Landings Inlet Flood Mitigation	
PRIORITY: Medium	HAZARDS ADDRESSED: Flooding
LOCATION: Boardwalk/Anchor	GOALS ADDRESSED: Mitigating flooding to residences from insufficient inlet capacity.
RECOMMENDATION DATE: 2016	OBJECTIVES ADDRESSED: Residences on Boardwalk were getting flooded due to stormwater, traffic was impacted on local collector due to stormwater.
TARGET COMPLETION DATE: 12/31/2020	LIFELINE: Stormwater & Transportation SUBCOMPONENT: Rivers & City Streets
ISSUE: Flooding prevention and traffic improvement.	
RECOMMENDATION: Enlarge storm drainage inlets.	
ACTION: Construction per recommendation above.	
LEAD AGENCY: City of Evans	EXPECTED COST: $80,000.00

SUPPORT AGENCIES: N/A	POTENTIAL FUNDING SOURCES: Local
PROGRESS MILESTONES: Completion of construction 12/31/2020.	

3-Evans: Community Impact Study -Vulnerable Populations-Shelter Capabilities Planning	
PRIORITY: High	HAZARDS ADDRESSED: All Hazards
LOCATION: Evans	GOALS ADDRESSED: 1-4
RECOMMENDATION DATE: 07.31.2021	OBJECTIVES ADDRESSED: A, B, C, D, E
TARGET COMPLETION DATE: 12.31.2021	LIFELINE: Public Safety SUBCOMPONENT: All
ISSUE: Due to the potential impact of severe storms, long term power outages, tornados, proximity of hazmat routes and the lack of sheltering capabilities in the community; the impact by natural hazards and cascading events would require Evans to acquire outside assistance to shelter local residents.	
RECOMMENDATION: Conduct a Community Impact study to identify vulnerable areas and neighborhoods that be greatly impacted by identified high ranking natural hazards or the cascading effects of natural hazards. Identify shelter locations, that include generators, capability to sustain winds up to 200 mph, cots, blankets and maintain supplies for emergency provisions. Provide Train the Trainer course to include preparation for all hazards that could impact the community. Update Emergency planning to include early warning procedures and sheltering/shelter-in-place protocols. Harden infrastructure systems to prevent long term disruption of services and supplies. Identify and obtain grant funding for all components of above projects.	
ACTION: identifying shelters and designating them as critical facilities - providing backup power through fixed generators - mitigating the shelters against hazards (wind, flood, fire, etc.) - building safe rooms or shelters for identified vulnerable areas that need them	
LEAD AGENCY: City of Evans	EXPECTED COST: Staff Time
SUPPORT AGENCIES: Weld OEM	POTENTIAL FUNDING SOURCES: TBD
PROGRESS MILESTONES:	

Mitigation Action Guides: 2021-26 Weld County

Fort Lupton (6 Projects)

1-Fort Lupton: Warning Sirens	
PRIORITY: High	HAZARDS ADDRESSED: Severe Storms
LOCATION: City of Fort Lupton	GOALS ADDRESSED: 1, 2
RECOMMENDATION DATE: 11-16-2020	OBJECTIVES ADDRESSED: A, E
TARGET COMPLETION DATE: December 2023	LIFELINE: Safety and Security; Communications SUBCOMPONENT: Community Safety; Infrastructure; Alerts
ISSUE: As the community grows additional outdoor warning sirens will be needed to help cover areas outside the current range of the sirens already functioning. A lot of growth including a new fire station has occurred in the southern region of our community. Expansion of Fort Lupton's outdoor warning system within our growing community is essential to efforts to minimize loss of life during severe weather events. The development is also underway to the west which if positioned correctly could also help warn neighboring communities.	
RECOMMENDATION: Install an early warning system to minimize loss of life and increase public safety.	
ACTION: Install Outdoor Warning Sirens.	
LEAD AGENCY: City of Fort Lupton	EXPECTED COST: $60,000 x 2 = $120,000
SUPPORT AGENCIES: Fort Lupton Fire	POTENTIAL FUNDING SOURCES: Grants, City Capital Improvements Budget, Private Funding
PROGRESS MILESTONES: Work with Fire to ensure proper placement. Obtain funding to install. Ensure they are functional under the dispatch alert system.	

2-Fort Lupton: Emergency Notification Signs	
PRIORITY: Medium	HAZARDS ADDRESSED: Severe Storms, Hazmat, Flooding, Tornado's
LOCATION: City of Fort Lupton	GOALS ADDRESSED: 1, 2,
RECOMMENDATION DATE: 11-16-2020	OBJECTIVES ADDRESSED: A, D, E
TARGET COMPLETION DATE: December 2025	LIFELINE: Transportation; Safety and Security SUBCOMPONENT: Alerts; Search and Rescue; Community Safety
ISSUE: There are several instances during severe weather that a void of information about conditions in the area is lacking. This information signage and weather camera service would help local and regional services to have a better understanding of the conditions on the ground.	

RECOMMENDATION: Work with CDOT to get additional information for the traveling public, service agencies, and emergency response on both Highway 85 and Highway 52.	
ACTION: Install Emergency Notification Sign and Weather Station with CDOT	
LEAD AGENCY: City of Fort Lupton	EXPECTED COST: $ unknown at this time
SUPPORT AGENCIES: CDOT, State Patrol, Traffic Management Team	POTENTIAL FUNDING SOURCES: Grants, CDOT, City Capital Improvements Budget
PROGRESS MILESTONES: Get a planning meeting together with CDOT to help guide pathways. Obtain funding. Install and get functional on CDOT system.	

3-Fort Lupton: Water Storage	
PRIORITY: Medium	HAZARDS ADDRESSED: Drought, Severe Storms
LOCATION: City of Fort Lupton	GOALS ADDRESSED: 1, 2
RECOMMENDATION DATE: 11-16-2020	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: December 2025	LIFELINE: Food Water Shelter SUBCOMPONENT: Water
ISSUE: The City requires water storage for augmentation planning of well use. Additional storage capacity will provide redundancy in the event severe drought.	
RECOMMENDATION: Multiple opportunities are available due to gravel mining operations within City limits.	
ACTION: Well Project	
LEAD AGENCY: City of Fort Lupton	EXPECTED COST: $750,000
SUPPORT AGENCIES: Colorado Water Board	POTENTIAL FUNDING SOURCES: City Capital Improvements Budget, Utility Fund, Water Sales Tax
PROGRESS MILESTONES: Obtain right of first refusal from current mine operations. Obtain funding to purchase mining properties for water storage (post mining operations).	

4-Fort Lupton: Well Inclusions	
PRIORITY: Medium	HAZARDS ADDRESSED: Drought, Severe Storms
LOCATION: City of Fort Lupton	GOALS ADDRESSED: 1, 2
RECOMMENDATION DATE: 11-16-2020	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: December 2025	LIFELINE: Food Water Shelter SUBCOMPONENT: Water
ISSUE: The City is expanding new water supplies that the well system is part of. Having diversified water supplies will provide redundancy in the event of a natural disaster.	
RECOMMENDATION: A non-potable well system for water supply is operating in the city. The installation and distribution system for the well system continues to grow to help offset potable water demands. The system continues to provide a source that if needed could integrate to a mixed system to produce treated water. The addition of key wells will help to insure functionality of the pressurized system.	
ACTION: Well Project	
LEAD AGENCY: City of Fort Lupton	EXPECTED COST: $500,000
SUPPORT AGENCIES:	POTENTIAL FUNDING SOURCES: City Capital Improvements Budget, Utility Fund, Water Sales Tax
PROGRESS MILESTONES: Have wells included into augmentation plan. Obtain funding to have connections made and well in operation. Master plan for non-potable water system.	

5-Fort Lupton: Localized Flooding	
PRIORITY: High	HAZARDS ADDRESSED: Flood
LOCATION: City of Fort Lupton	GOALS ADDRESSED: 1, 2, 4
RECOMMENDATION DATE: 01/01/2019	OBJECTIVES ADDRESSED: D, E
TARGET COMPLETION DATE: Annually portions through 2025	LIFELINE: Safety and Security; Transportation SUBCOMPONENT: Community Safety; Highway/Roadway
ISSUE: Existing storm drainage infrastructure is undersized and aging. Many CMP require replacement with larger RCP. Multiple major drainage basins have no viable outfall to the west.	
RECOMMENDATION: Storm Sewer systems to direct flows west to be designed and constructed. Kahil Street from S Denver Ave to detention provided in Lone Pine Park. Storm sewer / channeled outfall along future 14th Street extension to discharge to existing Golden Pond detention facility. Identify and map storm sewer network, prioritize replacement.	

ACTION: Coordinate with new developments and program projects into CIP..	
LEAD AGENCY: City of Fort Lupton	EXPECTED COST: $2,500,000
SUPPORT AGENCIES:	POTENTIAL FUNDING SOURCES: Storm Drainage Fund (Revision of fee basis on % pervious surface per lot/parcel)
PROGRESS MILESTONES: GIS mapping and camera inspection summer 2021 CR 31/14th St outfall - Coordination begun / Develop design and participation method. Kahil outfall is currently under Construction as of 11/15/2020. Anticipated completion early 2021 Update Master Drainage Plan	

6-Fort Lupton: Emergency Shelter Generator	
PRIORITY: High	HAZARDS ADDRESSED: All
LOCATION: Fort Lupton Recreation and Community Center (203 S. Harrison Ave, Fort Lupton, CO 80621)	GOALS ADDRESSED: 1, 2
RECOMMENDATION DATE: 11-16-2020	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: December 2022	LIFELINE: Safety and Security; Food, Water, Shelter; SUBCOMPONENT: Search and Rescue; Shelter; water; food
ISSUE: Currently there is no back-up power to this location to support emergency coordination functions.	
RECOMMENDATION: The wiring and installation of a generator and a transfer switch would allow for a reliable back up power source at a single critical city facility. This generator would support city staff and services at this location and would allow for the relocation of staff and continuity of critical services. It is identified as an emergency shelter location. In addition, emergency support related services and functions could be coordinated from this location. Critical emergency support functions-operation of the Emergency Operations Center (EOC), location of the Policy Group meeting area and information center, the Joint Information Center (JIC) and local law enforcement operations could also function at this location if need be.	
ACTION: Install a generator and associated wiring at the Fort Lupton Recreation Center in an effort to support emergency functions during a short or long term power outage.	
LEAD AGENCY: City of Fort Lupton	EXPECTED COST: $250,000 to $300,000
SUPPORT AGENCIES:	POTENTIAL FUNDING SOURCES: Grants, City Capital Improvements Budget

PROGRESS MILESTONES:

Develop and publish an RFP

Construction to wire the building (in coordination with PD and United Power) to include locating, digging, accessing and splitting existing cabling

Install transfer switch and complete wiring

Complete installation of generator and initiate testing

Mitigation Action Guides: 2021-26 Weld County

Greeley (2 Projects)

1-Greeley- Extreme Heat / Drought Resiliency Program Development	
PRIORITY: Medium	HAZARDS ADDRESSED: Drought/ Extreme Heat
LOCATION: City of Greeley	GOALS ADDRESSED: 1, 2
RECOMMENDATION DATE: 2020	OBJECTIVES ADDRESSED: A, B, C, D
TARGET COMPLETION DATE: TBD	LIFELINE: Safety & Security, Water, Food, Shelter, Health & Medical SUBCOMPONENT: Community Safety, Food, Water, Agriculture, Public Health
ISSUE: Projected increases in frequency and intensity of extreme heat events and drought	
RECOMMENDATION: Collaborate between various City departments and programs to mitigate extreme heat events and droughts with various mitigation measures including tree plantings (Share the Shade), bluegrass conversion to native lawns (Water Conservation), backyard xeric habitats (Natural Areas & Trails), restored native ecosystems (Natural Areas & Trails).	
ACTION: Extreme Heat and Drought Resiliency	
LEAD AGENCY: City of Greeley Culture, Parks and Recreation Department	EXPECTED COST: Multi-million and multi-year projects
SUPPORT AGENCIES: City of Greeley Public Works Department and Community Development Department	POTENTIAL FUNDING SOURCES: City of Greeley and grant opportunities
PROGRESS MILESTONES: • locating and adding shade structures where appropriate (picnic shelters, shade umbrellas/sails) in park areas • Forestry's "Share the Shade" program to encourage private property owners to plant trees to increase shade canopy and reduce heat islands in the community • Bluegrass turf conversion to native lawns (Water Conservation) • Backyard xeric habitats (Natural Areas & Trails, Water Conservation) • Restored native ecosystems in City Natural Areas • Reduction of turf areas in City Parks (Parks)	

2-Greeley: Prairie Fire Mitigation Program Development / CWPP	
PRIORITY: High	HAZARDS ADDRESSED: Prairie Fires
LOCATION: City of Greeley	GOALS ADDRESSED: 1, 2
RECOMMENDATION DATE: 2020	OBJECTIVES ADDRESSED: A, B, C, D
TARGET COMPLETION DATE: TBD	Lifeline: Safety & Security Subcomponent: Fire Services, Community Safety,

Mitigation Action Guides: 2021-26 Weld County

ISSUE: Non-native vegetation dominates much of the undeveloped land with Greeley's LREGA, including within the City's Natural Areas properties. Encroachment of development adjacent to Natural Areas and other Open Lands provides a plains version of a Wildland-Urban Interface strategy.	
RECOMMENDATION: Coordinate between Greeley Fire Dept., Natural Areas & Trails, Stormwater, and Water & Sewer to develop grassland management plans, SOPs for mowing/grazing/haying and other methods of vegetation management, develop and maintain wildland fire resources including equipment and staff with sufficient certifications to support prescribed fire program.	
ACTION: Fire Mitigation in the City-limits (Community Wildfire Protection Plan)	
LEAD AGENCY: Greeley Fire Department	EXPECTED COST: Undetermined
SUPPORT AGENCIES: State of Colorado Division of Fire Protection and Control (DFPC), City of Greeley Culture, Parks and Recreation Department, National Wildfire Coordinating Group (NWCG)	POTENTIAL FUNDING SOURCES: City of Greeley and State of Colorado
PROGRESS MILESTONES: • 2018 -2019 Draft Outline for Fire Chief • City Department collaboration	

Mitigation Action Guides: 2021-26 Weld County

Greeley PW (7 Projects)

1-Greeley - PW: City-Initiated Floodway Rezone	
PRIORITY: Medium	HAZARDS ADDRESSED: Flooding
LOCATION: City of Greeley	GOALS ADDRESSED: 2
RECOMMENDATION DATE: 2015	OBJECTIVES ADDRESSED: C
TARGET COMPLETION DATE: 2024 – Following adoption of state Risk Map updated flood study	LIFELINE: Water, Food, Shelter, SUBCOMPONENT: Waterways, Residential Areas,
ISSUE: Following adoption of the State of Colorado updated flood study, the City of Greeley will initiate a floodway rezone of all properties impacted by the revised floodway boundary. Properties within the revised floodway will be rezoned Conservation District (C-D) to restrict development within this area and preserve natural open space.	
RECOMMENDATION: Restricted development within the regulated floodway and preservation of natural open space	
ACTION: City-Initiated Floodway Rezone	
LEAD AGENCY: City of Greeley	EXPECTED COST: Under development
SUPPORT AGENCIES:	POTENTIAL FUNDING SOURCES: Under development, likely largely in house
PROGRESS MILESTONES: This has been identified by the city as a future zoning map change. This mitigation action item will be continued as a mitigation action item for the 2016 plan update.	

2-Greeley - PW: Mitigate Risk to Severe Repetitive Loss Property	
PRIORITY: Medium	HAZARDS ADDRESSED: Flooding
LOCATION: 760 71st Ave, Greeley, CO 80631. Property not within city limits	GOALS ADDRESSED: 1
RECOMMENDATION DATE: 2015	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: 2025	LIFELINE: Food, Water, Shelter, Safety & Security SUBCOMPONENT: Waterways, Residential homes, Community Safety
ISSUE: This residence has severe repetitive loss history due to flooding on the Cache la Poudre River. The City of Greeley provides resources (man power, sand bags) to this property during flooding events as it is directly abuts city limits and city crews are typically mitigating road closures next to this property. The city attempted to purchase/acquire this property through the HMGP process in 2014 but was unsuccessful due to valuation discrepancies.	
RECOMMENDATION: Reduce or eliminate severe repetitive flood losses on this property.	
ACTION: Continue to work with property owner on flood mitigation efforts and consider acquisition if conditions allow and are favorable to all parties.	

LEAD AGENCY: City of Greeley	EXPECTED COST: $400,000
SUPPORT AGENCIES: City of Greeley Office of Emergency Management	POTENTIAL FUNDING SOURCES: CDBG, HMGP
PROGRESS MILESTONES: Program not funded; no current timeline established	

3-Greeley - PW: Cache la Poudre, West Greeley Project (Corps of Engineers)	
PRIORITY: High	HAZARDS ADDRESSED: Flooding
LOCATION: Poudre River Corridor between 83rd Avenue and 47th Avenue	GOALS ADDRESSED: 1
RECOMMENDATION DATE: Begin first phase construction 2016	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: 2025	LIFELINES: Food, Water, Shelter, Transportation SUBCOMPONENT: Waterways, City Streets
ISSUE: As a nationally significant ecosystem, portions of the Cache la Poudre River that flow through Greeley and areas adjacent to Greeley, years of channelization of the river and neglect and invasion of non-native weeds and vegetation have significantly reduced habitat loss. Restoration of wetland and riparian habitats can provide critical floodplain and river corridor connections, habitat for state-listed threatened and endangered species, and international bird habitat. The COE has identified a total of nine (9) parcels to rehabilitate, of which five (5) are identified as a first phase for improvements. Out of these 5 parcels, 1 or 2 may be addressed in the first year of a multi-year project. Although the Project doesn't specifically address flood control, a desired outcome is addressing the river channel itself and preserving/planning for the inevitable future flooding of the corridor and water flows.	
RECOMMENDATION: Phase 1 construction is complete. Additional funding to complete other phases is being considered.	
ACTION: Environmental restoration and controlled recreational access	
LEAD AGENCY: City of Greeley	EXPECTED COST: $12,967,000 (Phase II)
SUPPORT AGENCIES: All COG, Parks and Rec	POTENTIAL FUNDING SOURCES: Great Outdoors Colorado (Colorado Lottery), City of Greeley Water/Sewer Dept., US Department of Defense/Corps of Engineers, Conservation Trust Fund
PROGRESS MILESTONES: Design – 2015/2016, Construction in phases starting in 2016	

4-Greeley - PW: Poudre River Cleaning	
PRIORITY: Low	HAZARDS ADDRESSED: Flooding
LOCATION: City of Greeley	GOALS ADDRESSED: 1
RECOMMENDATION DATE: 2015	OBJECTIVES ADDRESSED: E

TARGET COMPLETION DATE: 2023	LIFELINE: Food, Water, Shelter SUBCOMPONENT: Waterways
ISSUE: The Cache la Poudre River is known from several studies including a 1999 Army Corps of Engineers study, to have sediment building up in it and therefore over time has been silting in and losing capacity. A program to clean the river of its sandbars, sediment and remove some vegetation is necessary to help convey flood flows through the City of Greeley. This will help especially mountain snow melt events that happen annually and fill the main channel most years and tend to cause minor to moderate flooding in many areas.	
RECOMMENDATION: To develop a program to annually evaluate maintaining the Poudre River by removing any sand bars and any unwanted vegetation that are restricting main channel flows. The program likely would take several years to work through the City limits, and then would cycle back to the beginning and evaluate the corridor continuously as needed. Bridges also need to be evaluated, but need to be done annually to ensure they are clear.	
ACTION: Clean sediment and vegetation from the Cache la Poudre main channel to restore main channel flow capacity.	
LEAD AGENCY: City of Greeley	EXPECTED COST: $1,500,000
SUPPORT AGENCIES: US Army Corps of Engineers, Public Works Department	POTENTIAL FUNDING SOURCES: FEMA grant and Stormwater Utility
PROGRESS MILESTONES: Removal of all sandbars, restrictions and unwanted vegetation.	

5-Greeley - PW: Highway 85 Bridge Replacement	
PRIORITY: High	HAZARDS ADDRESSED: Flooding
LOCATION: City of Greeley	GOALS ADDRESSED: 1
RECOMMENDATION DATE: 2015	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: 2027	LIFELINE: Transportation, Water, Food, Shelter SUBCOMPONENT: Bridges, City Streets, Water Treatment Facility
ISSUE: The Cache la Poudre River floodplain model shows that the river overtops the Highway 85 bridge near the Greeley Water Pollution Control Facility. Past flooding events of less than 100 year events have also demonstrated that this bridge is easily overtopped at less than a 25 year storm event. When this bridge is overtopped all other roads except 59th Avenue that run north and south are underwater. With Highway 85 flooded greatly impedes the ability for people, commerce, and emergency vehicles to navigate the city and reach citizens on the northern area of the city. River flood events typically last for many weeks so impacts to the community can be very impactful and devastating.	
RECOMMENDATION: Replace the Highway 85 Bypass bridge over the Cache la Poudre River.	
ACTION: Replace the bridge with a higher capacity bride including some channel improvements to improve capacity of the river at this location.	

LEAD AGENCY: Colorado Department of Transportation & the City of Greeley	EXPECTED COST: $8,000,000
SUPPORT AGENCIES: Colorado Department of Transportation, Army Corps of Engineers, FEMA, Public Works Department, 970-350-9795	POTENTIAL FUNDING SOURCES: FEMA grant, CDOT FASTER Funds
PROGRESS MILESTONES: Completion of bridge replacement and channel improvements.	

6-Greeley - PW: River Bypass Channel	
PRIORITY: Medium	HAZARDS ADDRESSED: Flooding
LOCATION: City of Greeley	GOALS ADDRESSED: 1
RECOMMENDATION DATE: 2015	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: 2021	LIFELINE: Food, Water, Shelter. Transportation SUBCOMPONENT: Rivers, Water Treatment Facility, City Streets, State Highways
ISSUE: The Cache la Poudre River floodplain model shows that the river splits around the Greeley Water Pollution Control Facility. This isolates and floods some of the property limiting access to the plant. Additionally many businesses along east 8th Street east of Highway 85 are flooded.	
RECOMMENDATION: Channel improvements and/or a by-pass channel are needed to guide water safely around the Water Pollution Control Facility and many businesses along 8th Street east of Highway 85. This would safely control flows and route them back to the river on the eastern side of Greeley.	
ACTION: Purchase property and build a by-pass channel to route flows from the Poudre River west of Highway 85 and route them north of East 8th Street and then back into the river in eastern Greeley.	
LEAD AGENCY: City of Greeley	EXPECTED COST: $18,000,000
SUPPORT AGENCIES: US Army Corps of Engineers, FEMA, Public Works Department	POTENTIAL FUNDING SOURCES: FEMA grant, Federal Block Grant Funds, Stormwater Utility
PROGRESS MILESTONES: Completion of by-pass channel improvements.	

7-Greeley - PW: Poudre River Flood Mitigation Master Planning Project – Ash Ave to 21st Ave	
PRIORITY: High	HAZARDS ADDRESSED: Flooding
LOCATION: City of Greeley	GOALS ADDRESSED: 1
RECOMMENDATION DATE: 2019	OBJECTIVES ADDRESSED: E

Mitigation Action Guides: 2021-26 Weld County

TARGET COMPLETION DATE: Fall 2030	LIFELINE: Food, Water, Shelter, Transportation SUBCOMPONENT: Waterways, City Streets,

ISSUE:

Over the past 150-years the Poudre River has been significantly modified by human activity, particularly along the reach from Fern Avenue to 47th Avenue. These modifications include channelization, encroachment, soil berms along the river banks, gravel mining, floodplain disconnection, and river relocation. As a result of these modifications, the city experiences significant flooding from small to medium sized hydrologic events, on the order of 15-30 year recurrence frequency. Most notably the floods of 1983, 1999, and 2014 have caused significant property damage to the city.

The city's largest exposure to riverine flooding is along the reach from Ash Avenue to 11th Avenue, or approximately 2.3 miles. In the spring of 2014, a large spring runoff event overtopped the 6th Avenue river berm and inundated approximately 46-acres of commercial-industrial area.

Development restrictions associated with the FEMA Special Flood Hazard Area (SFHA) encumber a significant amount of developed property between 11th Avenue and Ash Avenue. This includes residential neighborhoods, commercial businesses, and industrial businesses. It is estimated that every road along the river in this area would be flooded in a 100-year event, including the US Highway 85 Bypass. Further, there is a large flow split at the US-85 Bypass that proceeds to the east along E. 8th Street (also known as SH-263) and does not have a defined return flow-path to the river.

RECOMMENDATION:

This project produced a comprehensive Poudre River flood mitigation master plan document for the following river reaches:

- Greeley Urban Reach: Specifically from the Ogilvy Ditch head structure (1,400-feet downstream from Ash Avenue) and proceeding upstream to 21st Avenue; approximately 17,600-feet along the Poudre River.
- East 8th Street Flow Split: Specifically from the flow split off the main channel at US Highway 85 then proceeding east (downstream) along 8th Street until the flow split returns to the main river channel, approximately 7,000 – 8,000-feet along E. 8th Street.

This project should produce a Master Plan along the Poudre River to guide river maintenance, reduce flood losses, and potentially remove properties from the FEMA 100-yr floodplain. The Master Plan document will be used by the City to guide a river channel maintenance program, identify and prioritize flood mitigation projects, provide scientific basis for granting opportunities (Federal, State, and Other) to fund capital projects, and facilitate the refinement of the effective FEMA river model along the study reach. This plan shall be feasible, implementable, and provide a foundation for pursuing grant funding opportunities.

ACTION: City-Initiated Flood Mitigation Master Planning Project	
LEAD AGENCY: City of Greeley	EXPECTED COST: $60,000,000
SUPPORT AGENCIES: City of Greeley Office of Emergency Management, Public Works Department	POTENTIAL FUNDING SOURCES: City of Greeley

PROGRESS MILESTONES:

- Implementation of the masterplan and the identified projects.

EMERGENCY MANAGEMENT

Hudson (3 Projects)

1-Hudson: Community Impact Study -Vulnerable Populations-Shelter Capabilities Planning	
PRIORITY: High	HAZARDS ADDRESSED: All hazards
LOCATION: Town of Hudson	GOALS ADDRESSED: 1-4
RECOMMENDATION DATE: 7/31/2021	OBJECTIVES ADDRESSED: A, B, C, D, E
TARGET COMPLETION DATE: 12/31/2021	Lifelines: Public Safety
ISSUE: ISSUE: Due to the potential impact of severe storms, long term power outages, tornados, proximity of hazmat routes and the lack of sheltering capabilities in the community; the impact by natural hazards and cascading events would require Hudson to acquire outside assistance to shelter local residents.	
RECOMMENDATION: Conduct a Community Impact study to identify vulnerable areas and neighborhoods that be greatly impacted by identified high ranking natural hazards or the cascading effects of natural hazards. Identify shelter locations, that include generators, capability to sustain winds up to 200 mph, cots, blankets and maintain supplies for emergency provisions. Provide Train the Trainer course to include preparation for all hazards that could impact the community. Update Emergency planning to include early warning procedures and sheltering/shelter-in-place protocols. Harden infrastructure systems to prevent long term disruption of services and supplies. Identify and obtain grant funding for all components of above projects.	
ACTION: identifying shelters and designating them as critical facilities - providing backup power through fixed generators - mitigating the shelters against hazards (wind, flood, fire, etc.) - building safe rooms or shelters for identified vulnerable areas that need them	
LEAD AGENCY: Town of Hudson	EXPECTED COST: Staff Time,
SUPPORT AGENCIES: Weld OEM,	POTENTIAL FUNDING SOURCES: TBD
PROGRESS MILESTONES:	

2-Hudson: Repeater System	
PRIORITY: Medium	HAZARDS ADDRESSED: All Hazards
LOCATION: Town of Hudson	GOALS ADDRESSED: 1, 2
RECOMMENDATION DATE: 2021	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: 2021	LIFELINES: Safety & Security, Transportation, Communications SUBCOMPONENTS: Government Services, Roadways, PW Communications

ISSUE: The Public Works Department does not have a reliable means to communicate efficiently and safely when operating heavy machinery on a blue sky day and is more dangerous and life threatening during severe storms when working in different parts of the Town. Use of cellphones is illegal while operating heavy equipment.	
RECOMMENDATION: Integrate a repeater system to strengthen and harden the communication systems for Public Safety and Communications to include communications with essential workers to clear arterial roadways for first responders during a disaster/storm. enable the Public Works Department to communicate effectively and quickly across the community.	
ACTION: Integrate repeater into communications systems, receive training in use of system, test out and operate new system.	
LEAD AGENCY: Town of Hudson	EXPECTED COST: $16,000
SUPPORT AGENCIES: Town of Hudson Admin Department Public Works Department,	POTENTIAL FUNDING SOURCES: Hudson 2021 FY Budget
PROGRESS MILESTONES: Integration of repeater system; all essential staff trained; full implementation of system into daily operations.	

3-Hudson: Updates Comprehensive Plan / Identify Mitigation actions	
PRIORITY: High	HAZARDS ADDRESSED: All Hazards
LOCATION: Hudson	GOALS ADDRESSED: 1, 2, 4
RECOMMENDATION DATE: Immediately	OBJECTIVES ADDRESSED: C, D, E
TARGET COMPLETION DATE: 2021	LIFELINE: All SUBCOMPONENT: All
ISSUE: Creation of a Comprehensive Plan that will address all potential hazards from blizzards, to active shooter, to pandemics. Upon finalization, this will include a separate list of mitigation items for the Town to work on as well as be tested in semiannual tabletop exercises.	
RECOMMENDATION: Due to the current COVID-19 situation, the majority of the writing will be done by Town of Hudson staff, a full draft provided to regional partners to review and offer revisions before final adoption. Afterwards, additional mitigation items and semiannual tabletops can lead to improvements and corrections of the Comprehensive Plan.	
ACTION: Regional support for the project, potential to be used as a template for other smaller communities in Weld County.	
LEAD AGENCY: Town of Hudson	EXPECTED COST: None (Staff time)
SUPPORT AGENCIES: Several Regional Partners including Weld County OEM, Hudson Fire Protection District, BNSF,	POTENTIAL FUNDING SOURCES: N/A

United Power, Northern Water, RE-3J School District, Best Western, Weld County Dispatch, CDOT, among other private businesses.	
PROGRESS MILESTONES: First draft of Comprehensive Plan; review by regional partners and other stakeholder groups; adoption; semiannual tabletop training exercise; additional mitigation items discovered through development of Comprehensive Plan.	

Mitigation Action Guides: 2021-26 Weld County

Johnstown (5 Projects)

1-Johnstown: Resiliency Study	
PRIORITY: Medium	HAZARDS ADDRESSED: Drought, Land Subsidence, Extreme Temperatures, Flood, Public Health, prairie fire
LOCATION: Town Wide	GOALS ADDRESSED: 3, 4
RECOMMENDATION DATE:	OBJECTIVES ADDRESSED: A, C, D, E
TARGET COMPLETION DATE: 10/31/2021	LIFELINE: All SUBCOMPONENT: All
ISSUE: Traditional preparedness education has not been measured, and as a result, we don't have a good understanding of their effectiveness. Johnstown wants to better understand the vulnerability and capability of the people in our communities, and work toward building resilience to preparedness outreach and education.	
RECOMMENDATION: Johnstown has in the works a resiliency study being done with an outside firm. The goal would be to compare ours to other communities and continue adding to the study to create a better understanding of needs as the Town grows.	
ACTION: Conduct/Finish a resiliency study	
LEAD AGENCY: Johnstown	EXPECTED COST: OEM staff time, contractor costs $75,000.
SUPPORT AGENCIES: Community Emergency Managers and First Responder Agencies	POTENTIAL FUNDING SOURCES: grants; private grant or Johnstown government special project funding (if available).
PROGRESS MILESTONES: An actual study is being conduct with a private firm	

2-Johnstown: Drainage Improvements Old Town	
PRIORITY: High	HAZARDS ADDRESSED: Flooding
LOCATION: Old Town Basin	GOALS ADDRESSED: 1, 2
RECOMMENDATION DATE: 10.12.2008	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: 10.12.2021	LIFELINE: Transportation, Food, Water, Shelter SUBCOMPONENT: Town roads, waterways
ISSUE: The old town basin was constructed during a time when urban drainage design was not used. This area is 90% surface run water from events and creates flooding in the old Town community. The Town has hired a consultant to study and design a new drainage in the area and produce a project list for improvements that would help protect people and property in the area from future floods and ensure the road stays open to travel.	

RECOMMENDATION: It will be implemented as funding becomes available in 2021 or 2022 at the latest	
ACTION: Install inlets and underground piping to remove surface flow and carry water safely to drain ways	
LEAD AGENCY: Johnstown	EXPECTED COST: Implementation costs are 2.7 million
SUPPORT AGENCIES:	POTENTIAL FUNDING SOURCES: annual budget, possible grant funding
PROGRESS MILESTONES: The study is expected to be completed in June, 2021 or 2022	

3-Johnstown: Install Emergency Generator	
PRIORITY: High	HAZARDS ADDRESSED: Severe Storms
LOCATION: Johnstown	GOALS ADDRESSED: 1, 2
RECOMMENDATION DATE: 2010	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: 2021	LIFELINE: Energy SUBCOMPONENT: Utilities
ISSUE: Johnstown raw water source is located in Berthoud Colorado. The building was constructed from brick and block with an underground pump station. the building lacks a sufficient emergency generator to supply electrical power to be able to pump raw water to our water treatment plant to produce potable water during power outages/floods	
RECOMMENDATION: Provide water for treatment continuity of operations.	
ACTION: Install emergency generator	
LEAD AGENCY: Johnstown	EXPECTED COST: $375,000
SUPPORT AGENCIES:	POTENTIAL FUNDING SOURCES: Annual budgets
PROGRESS MILESTONES:	

4-Johnstown: Community Preparedness Education	
PRIORITY: Medium	HAZARDS ADDRESSED: Drought, Earthquake, Land Subsidence, Extreme Temperatures, Flood, Severe Storm, Wind & Tornado, Fire, Public Health, Hazmat
LOCATION: Johnstown	GOALS ADDRESSED: 1, 3
RECOMMENDATION DATE: 06.2019	OBJECTIVES ADDRESSED: A

TARGET COMPLETION DATE: 10.06.2022	LIFELINE: All SUBCOMPONENT: All
ISSUE: There are many emergency management issues that need to be reinforced with public education so that citizens know what risks they face, what protective actions they can take, and what government programs are in place to assist them.	
RECOMMENDATION: The potential for saving just one life, and providing time for individuals and businesses to take effective protective actions, outweighs the potential cost of the public education program. Public Education may be the most effective and least-expensive way to reduce disaster losses by changing human behavior to promote appropriate actions	
ACTION: Establish an ongoing or annual Public Education campaign regarding Hazards and Emergency Management	
LEAD AGENCY: Johnstown	EXPECTED COST: $4,500 for printing and distribution costs
SUPPORT AGENCIES: County Emergency Management, First Responder Agencies, FEMA	POTENTIAL FUNDING SOURCES Local budgets
PROGRESS MILESTONES: Since 2009, Weld County OEM and many participating jurisdictions have continued to make public preparedness outreach and education a priority. The Town of Johnstown will continue to work with Weld County OEM on community preparedness education and hazard identification.	

5-Johnstown: Community Impact Study -Vulnerable Populations-Shelter Capabilities Planning	
PRIORITY: High	HAZARDS ADDRESSED: All Hazards
LOCATION: Johnstown	GOALS ADDRESSED: 1-4
RECOMMENDATION DATE: 07.31.2021	OBJECTIVES ADDRESSED: A, B, C, D, E
TARGET COMPLETION DATE: 12.31.2021	LIFELINE: Public Safety SUBCOMPONENT: All
ISSUE: Due to the potential impact of severe storms, long term power outages, tornados, proximity of hazmat routes and the lack of sheltering capabilities in the community; the impact by natural hazards and cascading events would require Johnstown to acquire outside assistance to shelter local residents.	
RECOMMENDATION: Conduct a Community Impact study to identify vulnerable areas and neighborhoods that be greatly impacted by identified high ranking natural hazards or the cascading effects of natural hazards. Identify shelter locations, that include generators, capability to sustain winds up to 200 mph, cots, blankets and maintain supplies for emergency provisions. Provide Train the Trainer course to include preparation for all hazards that could impact the community. Update Emergency planning to include early warning procedures and sheltering/shelter-in-place protocols. Harden infrastructure systems to prevent long term disruption of services and supplies. Identify and obtain grant funding for all components of above projects.	
ACTION: identifying shelters and designating them as critical facilities	

- providing backup power through fixed generators - mitigating the shelters against hazards (wind, flood, fire, etc.) - building safe rooms or shelters for identified vulnerable areas that need them	
LEAD AGENCY: Johnstown	EXPECTED COST: Staff Time
SUPPORT AGENCIES: Weld OEM	POTENTIAL FUNDING SOURCES: TBD
PROGRESS MILESTONES:	

Mitigation Action Guides: 2021-26 Weld County

Keenesburg (4 Projects)

1-Keenesburg: Floodplain Training	
PRIORITY: Low	HAZARDS ADDRESSED: Flood
LOCATION: Town of Keenesburg	GOALS ADDRESSED: 1-4
RECOMMENDATION DATE: Annually	OBJECTIVES ADDRESSED: A, B, D, E
TARGET COMPLETION DATE: Ongoing with annual review	LIFELINE: Safety & Security, Water SUBCOMPONENTS: Warning Systems, Outreach, Waterways
ISSUE: Staff is small with many varied responsibilities and no experience with reading FIRM's	
RECOMMENDATION: Staff training of flood plain rules and regulation in general, as well as direction and instruction in reading maps and determining elevation requirements. Careful review of any annexations in conjunction with the FIRM's for determination of the any existing flood plain zone.	
ACTION: Careful review of building permit applications, and location of project to determine if within a possible flood plain, as the Town of Keenesburg has not been mapped, importance placed on annexations and determining if any annexations lie within a flood zone. The Town of Keenesburg is not participating in the CRS program, however we are member of the NFIP. The Town of Keenesburg has adopted the model ordinance in October of 2013 as required by the State of Colorado. The Town of Keenesburg will enforce flood plain regulation in accordance with FEMA's requirements for any annexed property that lies within a mapped flood zone. Have a different staff member attend flood plain training on an annual basis	
LEAD AGENCY: Town of Keenesburg	EXPECTED COST: Staff Time
SUPPORT AGENCIES: Colorado Water Conservation Board	POTENTIAL FUNDING SOURCES: N/A
PROGRESS MILESTONES: Assistant Town Manager attended a Floodplain Management training course on September 9, 2015. Ongoing project. 2020-2025	

2-Keenesburg: Notify Traveling Public about Shelter Locations	
PRIORITY: High	HAZARDS ADDRESSED: Severe Weather
LOCATION: Community-wide	GOALS ADDRESSED: 1, 4
RECOMMENDATION DATE: Annually	OBJECTIVES ADDRESSED: A, D
TARGET COMPLETION DATE: Annually	LIFELINES: Safety & Security, Shelter SUBCOMPONENTS: Shelters, Outreach
ISSUE: Traveling public not aware of help available if stranded due to severe weather and or the closure of the I-76	
RECOMMENDATION: Place a notice at entry to town (existing kiosk) providing contact information	

ACTION: Create signage to be located at kiosk, motel, and gas station all located on Market Street just off of I-76 containing contact information for anyone seeking shelter due to severe weather and or closure of I-76.	
LEAD AGENCY: Town of Keenesburg	EXPECTED COST: Staff Time
SUPPORT AGENCIES: Southeast Weld Fire Protection District	POTENTIAL FUNDING SOURCES: N/A
PROGRESS MILESTONES: Complete once signage is in place. Update: This was not completed and will continue to address	

3-Keenesburg: Tornado Warning System Education for Residents	
PRIORITY: Medium	HAZARDS ADDRESSED: Tornado
LOCATION: Town of Keenesburg	GOALS ADDRESSED: 1, 2, and 3
RECOMMENDATION DATE: Annually	OBJECTIVES ADDRESSED: A, B, and E
TARGET COMPLETION DATE: Ongoing	LIFELINES: Safety & Security SUBCOMPONENT: Early Warning Systems, Outreach
ISSUE: As new residents move into town many do not know what to do when the siren sounds.	
RECOMMENDATION: Outreach and education of the public to identify the action that should be taken when the siren sounds	
ACTION: We will post educational information about what to do in the event of a tornado and specifically what it means when the siren sounds on the town's facebook page, and website, as well as place different articles in the local newspaper every month during tornado season	
LEAD AGENCY: Town of Keenesburg	EXPECTED COST: Staff time
SUPPORT AGENCIES: N/A	POTENTIAL FUNDING SOURCES: N/A
PROGRESS MILESTONES: Education outreach consists of an article in the newspaper, on our website, as well as on the town's Facebook page. Project is ongoing	

4-Keenesburg: Community Impact Study -Vulnerable Populations-Shelter Capabilities Planning	
PRIORITY: High	HAZARDS ADDRESSED: All hazards
LOCATION: Town of Keenesburg	GOALS ADDRESSED: 1-4
RECOMMENDATION DATE: 6/17/2021	OBJECTIVES ADDRESSED: A, B, C, D, E
TARGET COMPLETION DATE: 12/31/2021	Lifelines: Public Safety

Mitigation Action Guides: 2021-26 Weld County

ISSUE: Due to the potential impact of severe storms, long term power outages, tornados, proximity of hazmat routes and the lack of sheltering capabilities in the community; the impact by natural hazards and cascading events would require Keenesburg to acquire outside assistance to shelter local residents.	
RECOMMENDATION: Conduct a Community Impact study to identify vulnerable areas and neighborhoods that be greatly impacted by identified high ranking natural hazards or the cascading effects of natural hazards. Identify shelter locations, that include generators, capability to sustain winds up to 200 mph, cots, blankets and maintain supplies for emergency provisions. Provide Train the Trainer course to include preparation for all hazards that could impact the community. Update Emergency planning to include early warning procedures and sheltering/shelter-in-place protocols. Harden infrastructure systems to prevent long term disruption of services and supplies. Identify and obtain grant funding for all components of above projects.	
ACTION: identifying shelters and designating them as critical facilities - providing backup power through fixed generators - mitigating the shelters against hazards (wind, flood, fire, etc.) - building safe rooms or shelters for identified vulnerable areas that need them	
LEAD AGENCY: Town of Keenesburg	EXPECTED COST: Staff Time
SUPPORT AGENCIES: Weld OEM	POTENTIAL FUNDING SOURCES: TBD
PROGRESS MILESTONES:	

LaSalle (3 Projects)

1-LaSalle: Community Preparedness Education	
PRIORITY: High	HAZARDS ADDRESSED: Drought, Earthquake, Land Subsidence, Extreme Temperatures, Flood, Severe Storm, Wind & Tornado, Fire, Public Health, Hazmat
LOCATION: Town of LaSalle	GOALS ADDRESSED: 1,3
RECOMMENDATION DATE: 10.06.20	OBJECTIVES ADDRESSED: A, B
TARGET COMPLETION DATE: 2020-2025	LIFELINES: Safety & Security SUBCOMPONENTS: Community Safety, Education Programs
ISSUE: There are many emergency management issues that need to be reinforced with public education so that citizens know what risks they face, what protective actions they can take, and what government programs are in place to assist them.	
RECOMMENDATION: The potential for saving just one life, and providing time for individuals and businesses to take effective protective actions, outweighs the potential cost of the public education program. Public Education may be the most effective and least-expensive way to reduce disaster losses by changing human behavior to promote appropriate actions	
ACTION: Establish an ongoing or annual Public Education campaign regarding Hazards and Emergency Management	
LEAD AGENCY: Town of LaSalle	EXPECTED COST: $2,500 for printing and distribution costs
SUPPORT AGENCIES: County Emergency Management, First Responder Agencies, State DHSEM, FEMA	POTENTIAL FUNDING SOURCES HMPG, SHSG, Local budgets and private partner cost share.
PROGRESS MILESTONES: Since 2009, Weld County OEM and many participating jurisdictions have continued to make public preparedness outreach and education a priority. The Town of LaSalle will continue to work with Weld County OEM on community preparedness education and hazard identification.	

2-LaSalle: Develop Upkeep Schedule for Emergency Power Systems	
PRIORITY: Medium	HAZARDS ADDRESSED: Earthquake, Land Subsidence, Extreme Temperatures, Flood, Severe Storm, Wind & Tornado
LOCATION: Project location LaSalle	GOALS ADDRESSED: 1, 2
RECOMMENDATION DATE: 10.06.15	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: Ongoing	LIFELINES: Safety & Security, Energy SUBCOMPONENTS: Government Buildings, Power
ISSUE: In Colorado, there are a number severe weather events that could cause a power outage to the Town Offices and facilities. In case of an emergency, there are several town employees who need	

to stay connected to town networks and communication systems. Town offices are also used for command posts, damage assessment data collection points and information points for citizens	
RECOMMENDATION: The Town has a generator for backup power, continued maintenance to keep the generator operation will allow the town to stay operational during emergencies.	
ACTION: Town staff will test and maintain the operational condition of the generator.	
LEAD AGENCY: LaSalle Town Staff	EXPECTED COST: Annual budget will meet this need.
SUPPORT AGENCIES:	POTENTIAL FUNDING SOURCES annual budget
PROGRESS MILESTONES: funding will be included in annual budgets.	

3-LaSalle: Community Impact Study -Vulnerable Populations-Shelter Capabilities Planning	
PRIORITY: High	HAZARDS ADDRESSED: All hazards
LOCATION: Town of LaSalle	GOALS ADDRESSED: 1-4
RECOMMENDATION DATE: 6/17/2021	OBJECTIVES ADDRESSED: A, B, C, D, E
TARGET COMPLETION DATE: 12/31/2021	Lifelines: Public Safety
ISSUE: Due to the potential impact of severe storms, long term power outages, tornados, proximity of hazmat routes and the lack of sheltering capabilities in the community; the impact by natural hazards and cascading events would require LaSalle to acquire outside assistance to shelter local residents.	
RECOMMENDATION: Conduct a Community Impact study to identify vulnerable areas and neighborhoods that be greatly impacted by identified high ranking natural hazards or the cascading effects of natural hazards. Identify shelter locations, that include generators, capability to sustain winds up to 200 mph, cots, blankets and maintain supplies for emergency provisions. Provide Train the Trainer course to include preparation for all hazards that could impact the community. Update Emergency planning to include early warning procedures and sheltering/shelter-in-place protocols. Harden infrastructure systems to prevent long term disruption of services and supplies. Identify and obtain grant funding for all components of above projects.	
ACTION: identifying shelters and designating them as critical facilities - providing backup power through fixed generators - mitigating the shelters against hazards (wind, flood, fire, etc.) - building safe rooms or shelters for identified vulnerable areas that need them	
LEAD AGENCY: Town of LaSalle	EXPECTED COST: Staff Time
SUPPORT AGENCIES: Weld OEM	POTENTIAL FUNDING SOURCES: TBD
PROGRESS MILESTONES:	

Mitigation Action Guides: 2021-26 Weld County

Mead (5 Projects)

1-Mead: Policy Group Training for Elected Officials	
PRIORITY: High	HAZARDS ADDRESSED: All
LOCATION: Mead or Weld County	GOALS ADDRESSED: 1, 2, 4
RECOMMENDATION DATE: 2020	OBJECTIVES ADDRESSE: B, C
TARGET COMPLETION DATE: 2021, 2022,2024	LIFELINES: Safety & Security SUBCOMPONENTS: Local Government Services, Community Safety
ISSUE: While many of the tactical and strategic decisions will be handled by partner agencies, such as Mountain View Fire Protection District, Weld County OEM, and Weld County Sheriff's Office, the Town of Mead Board of Trustees must be prepared to make policy decisions and must undergo training to understand what a Policy Group is and what its roles are and are not in an emergency.	
RECOMMENDATION: Offer Policy Group training to the Town of Mead Board of Trustees.	
ACTION:	
LEAD AGENCY: Town of Mead	EXPECTED COST: Food, travel expenses, < $350
SUPPORT AGENCIES: Weld County OEM, Colorado Municipal League	POTENTIAL FUNDING SOURCES: Existing training budget
PROGRESS MILESTONES:	

2-Mead: Update Policies and Plans with Mitigation Principles - North Creek Flood Plain Analysis	
PRIORITY: High	HAZARDS ADDRESSED: Flooding
LOCATION: Mead	GOALS ADDRESSED: 1, 2, 4
RECOMMENDATION DATE: 2021	OBJECTIVES ADDRESSED: C, E
TARGET COMPLETION DATE: 12/31/2021	LIFELINES: Safety and Security, Transportation, SUBCOMPONENTS: Waterways, Roads, Residential Housing
ISSUE: The North Creek Flood Plain Analysis is needed to accurately identify the flood plain and its impact on the community. The anticipated cost is $85,000. Completion in 2021.	
RECOMMENDATION: Perform floodplain mapping study	
ACTION: Mapping is needed to accurately identify the flood plain and its impact on the community.	
LEAD AGENCY: Town of Mead	EXPECTED COST: North Creek Flood Plain Analysis $85,000

SUPPORT AGENCIES: Weld OEM	POTENTIAL FUNDING SOURCES: Town of Mead General Fund and Drainage Fund.
PROGRESS MILESTONES:	

3-Mead: Update Policies and Plans with Mitigation Principles - Emergency Operations Plan	
PRIORITY: High	HAZARDS ADDRESSED: All
LOCATION: Mead	GOALS ADDRESSED: 1, 2, 4
RECOMMENDATION DATE: 2021	OBJECTIVES ADDRESSED: C, E
TARGET COMPLETION DATE: 2021	LIFELINES: All SUBCOMPONENTS: All
ISSUE: Emergency Operations Plan – Mead's Emergency Ops Plan is out of date. It is currently being updated by staff. Support may be sought from Weld County OEM, anticipated completion in 2021.	
RECOMMENDATION: Incorporate mitigation principles into policy documents and plans.	
ACTION: Emergency Operations Plan for planning and reference.	
LEAD AGENCY: Town of Mead	EXPECTED COST:
SUPPORT AGENCIES: Weld OEM	POTENTIAL FUNDING SOURCES: Town of Mead General Fund, Drainage Fund, and Sewer Enterprise Fund. In addition, grant funding may be available through Department of Local Affairs Grant and/or SIPA
PROGRESS MILESTONES:	

4-Mead: Update Facilities- Public Works Facility - Design & Construction	
PRIORITY: High	HAZARDS ADDRESSED: All
LOCATION: Mead	GOALS ADDRESSED: 2
RECOMMENDATION DATE: 2021	OBJECTIVES ADDRESSED: C, E
TARGET COMPLETION DATE: 2021	LIFELINES: Safety and Security, SUBCOMPONENTS: Government Services, Law Enforcement
ISSUE: A Public Works facility is under design with anticipated construction in 2021. This will provide more space for both our PW staff and PD staff as they currently share a temporary facility. The primary PW impact will be to consolidate town resources to one location which allows better access	

and improved responsiveness. This will also allow Mead PD dedicated space in the temporary modular which provides more security, confidentiality and additional facility space.	
RECOMMENDATION: Build a facility that allows the affective and efficient provisions of government services.	
ACTION: Complete design and construction of facility to consolidate resources.	
LEAD AGENCY: Town of Mead	EXPECTED COST: $5,000,000
SUPPORT AGENCIES: Weld OEM	POTENTIAL FUNDING SOURCES: DOLA
PROGRESS MILESTONES: Complete design in 2020. Begin construction 2021.	

5-Mead: Community Impact Study -Vulnerable Populations-Shelter Capabilities Planning	
PRIORITY: High	HAZARDS ADDRESSED: All Hazards
LOCATION: Mead	GOALS ADDRESSED: 1-4
RECOMMENDATION DATE: 07.31.2021	OBJECTIVES ADDRESSED: A, B, C, D, E
TARGET COMPLETION DATE: 12.31.2021	LIFELINE: Public Safety SUBCOMPONENT: All
ISSUE: Due to the potential impact of severe storms, long term power outages, tornados, proximity of hazmat routes and the lack of sheltering capabilities in the community; the impact by natural hazards and cascading events would require Mead to acquire outside assistance to shelter local residents.	
RECOMMENDATION: Conduct a Community Impact study to identify vulnerable areas and neighborhoods that be greatly impacted by identified high ranking natural hazards or the cascading effects of natural hazards. Identify shelter locations, that include generators, capability to sustain winds up to 200 mph, cots, blankets and maintain supplies for emergency provisions. Provide Train the Trainer course to include preparation for all hazards that could impact the community. Update Emergency planning to include early warning procedures and sheltering/shelter-in-place protocols. Harden infrastructure systems to prevent long term disruption of services and supplies. Identify and obtain grant funding for all components of above projects.	
ACTION: identifying shelters and designating them as critical facilities - providing backup power through fixed generators - mitigating the shelters against hazards (wind, flood, fire, etc.) - building safe rooms or shelters for identified vulnerable areas that need them	
LEAD AGENCY: Town of Mead	EXPECTED COST: Staff Time
SUPPORT AGENCIES: Weld OEM	POTENTIAL FUNDING SOURCES: TBD

PROGRESS MILESTONES:

Mitigation Action Guides: 2021-26 Weld County

Milliken (4 Projects)

1-Milliken: Convert acquired land and property in the floodplain to Open Space	
PRIORITY: High (#1)	HAZARDS ADDRESSED: Flood Hazard and Other Hazards
LOCATION: Land previously Martin Home Mobile Park-current Open Space Projects	GOALS ADDRESSED: 2
RECOMMENDATION DATE: 2021	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: 12/31/2023	LIFELINES: Health & Medical SUBCOMPONENTS: Public Health
ISSUE: Identify Open Space features for the previously acquired mobile home space. We are working with FEMA and our Town GOMill (Great Outdoors Milliken) Committee on options for that area with keeping the intent of the acquisition.	
RECOMMENDATION: Committee to research ideas for open space area	
ACTION:	
LEAD AGENCY: Town of Milliken Administration Dept.	EXPECTED COST: $2,500,000
SUPPORT AGENCIES: FEMA HMGP, CDHSEM	POTENTIAL FUNDING SOURCES: FEMA HMGP 75%, CDHSEM 12.5%
PROGRESS MILESTONES;	

2-Milliken: Procurement and Installation of Tornado Sirens	
PRIORITY: High (#2)	HAZARDS ADDRESSED: Tornado/Wind Hazard
LOCATION: Town of Milliken	GOALS ADDRESSED: 1
RECOMMENDATION DATE: 2021	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: 12/31/2022	LIFELINES: Safety & Security; Food, Water & Shelter; Health & Medical SUBCOMPONENTS: Community Safety, Shelter, Public Health
ISSUE: Warn public regarding pending tornadoes and high wind events	
RECOMMENDATION: The Town has installed a Tornado Siren at the back for the Police Station. However, looking into other sites around Town would be beneficial as well.	
ACTION: Install additional tornado sirens throughout Milliken	
LEAD AGENCY: Town of Milliken Police and Fire Department	EXPECTED COST: $60,000 -$100,000

SUPPORT AGENCIES: FEMA, Colorado Division of Homeland Security and Emergency Management	POTENTIAL FUNDING SOURCES: FEMA HMGP 75%, CDHSEM HMGP 12.5%.
PROGRESS MILESTONES:	

3-Milliken: Storm Water Improvements Throughout Milliken	
PRIORITY: Medium (#3)	HAZARDS ADDRESSED: Flood Hazard
LOCATION: Town of Milliken	GOALS ADDRESSED: 2
RECOMMENDATION DATE: 9/1/2021	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: 12/29/2021	LIFELINES: Safety and Security SUBCOMPONENTS: Community Safety
ISSUE: Identify storm drainage problem areas throughout the Town of Milliken	
RECOMMENDATION: Cherry Street Stormwater and Road Rebuild project. We are currently budgeting for the construction phase hopefully to start in early 2021 after the design is complete. Est completion for this project is Fall of 2021.	
ACTION: Construct storm drainage improvements throughout Milliken	
LEAD AGENCY: Town of Milliken Public Works	EXPECTED COST: $20,000,000
SUPPORT AGENCIES: FEMA, Colorado Division of Homeland Security and Emergency Management, Colorado Water Board	POTENTIAL FUNDING SOURCES: FEMA HMGP, CDHSEM HMGP 12.5%.

PROGRESS MILESTONES:	

4-Milliken: Community Impact Study -Vulnerable Populations-Shelter Capabilities Planning	
PRIORITY: High	HAZARDS ADDRESSED: All Hazards
LOCATION: Milliken	GOALS ADDRESSED: 1-4
RECOMMENDATION DATE: 07.31.2021	OBJECTIVES ADDRESSED: A, B, C, D, E
TARGET COMPLETION DATE: 12.31.2021	LIFELINE: Public Safety SUBCOMPONENT: All
ISSUE: Due to the potential impact of severe storms, long term power outages, tornados, proximity of hazmat routes and the lack of sheltering capabilities in the community; the impact by natural hazards and cascading events would require Milliken to acquire outside assistance to shelter local residents.	
RECOMMENDATION: Conduct a Community Impact study to identify vulnerable areas and neighborhoods that be greatly impacted by identified high ranking natural hazards or the cascading effects of natural hazards. Identify shelter locations, that include generators, capability to sustain winds up to 200 mph, cots, blankets and maintain supplies for emergency provisions. Provide Train the Trainer course to include preparation for all hazards that could impact the community. Update Emergency planning to include early warning procedures and sheltering/shelter-in-place protocols. Harden infrastructure systems to prevent long term disruption of services and supplies. Identify and obtain grant funding for all components of above projects.	
ACTION: identifying shelters and designating them as critical facilities - providing backup power through fixed generators - mitigating the shelters against hazards (wind, flood, fire, etc.) - building safe rooms or shelters for identified vulnerable areas that need them	
LEAD AGENCY: Town of Milliken	EXPECTED COST: Staff Time
SUPPORT AGENCIES: Weld OEM	POTENTIAL FUNDING SOURCES: TBD

PROGRESS MILESTONES:

Nunn (3 Projects)

1-Nunn: Master Drainage Plan	
PRIORITY: Moderate	HAZARDS ADDRESSED: Flooding
LOCATION: Town of Nunn city limits	GOALS ADDRESSED: 1, 2
RECOMMENDATION DATE: 2022	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: 2022	LIFELINE: Transportation, Water SUBCOMPONENT: Town streets, waterways
ISSUE: Improper and insufficient stormwater drainage throughout town	
RECOMMENDATION: Drainage plan needed. Reduce the number of closed or damaged roads in town due to flooding or water damage.	
ACTION: Prevent flooding in community streets, provide better stormwater runoff. Review existing flood study information and Map from FEMA, utilize existing contours of topography, measure existing culverts and drainage structures at street crossings, identify 100-year stormwater runoff that enters town limits, identify current drainage improvements for the future, outline drainage design criteria to be utilized as development occurs in the future.	
LEAD AGENCY: Town of Nunn	EXPECTED COST: $28,000, including time and labor
SUPPORT AGENCIES: Weld County	POTENTIAL FUNDING SOURCES: BRIC, General Funds, looking for others
PROGRESS MILESTONES: Nunn has the estimate from KBN Engineers: Review of existing information, Field reconnaissance of existing culverts, conceptual stormwater runoff flows, identify drainage areas of concern, prepare a Town Drainage design exhibit, prepare recommendation for major improvements, prepare an outline for drainage design criteria: 3 months to complete.	

2- Nunn: Tornado Shelter to be ADA Compliant	
PRIORITY: High	HAZARDS ADDRESSED: Tornados
LOCATION: Town Hall	GOALS ADDRESSED: 1
RECOMMENDATION DATE: 2021	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: 2021	LIFELINE: Safety & Security SUBCOMPONENT: Community Safety, Government Buildings
ISSUE: Tornado shelter is in the basement and is not ADA Compliant. This will help to reduce the risk of injury or death of AFN citizens during a tornado	
RECOMMENDATION: Nunn would like to get a chair lift, and include a compost toilet in the event of an active shelter situation.	
ACTION: Install Chairlift for AFN citizens and install compost toilet for emergency shelter	

LEAD AGENCY: Town of Nunn	EXPECTED COST: $28,000
SUPPORT AGENCIES: Weld County	POTENTIAL FUNDING SOURCES: BRIC, General Funds, looking for others
PROGRESS MILESTONES: Nunn would like to have this completed in 2021. They are currently getting estimate for a chairlift, cost to install, and purchasing and installing a compost toilet. Projected completion date Spring 2021	

3-Nunn: Community Impact Study -Vulnerable Populations-Shelter Capabilities Planning	
PRIORITY: High	HAZARDS ADDRESSED: All Hazards
LOCATION: Nunn	GOALS ADDRESSED: 1-4
RECOMMENDATION DATE: 07.31.2021	OBJECTIVES ADDRESSED: A, B, C, D, E
TARGET COMPLETION DATE: 12.31.2021	LIFELINE: Public Safety SUBCOMPONENT: All
ISSUE: Due to the potential impact of severe storms, long term power outages, tornados, proximity of hazmat routes and the lack of sheltering capabilities in the community; the impact by natural hazards and cascading events would require Nunn to acquire outside assistance to shelter local residents.	
RECOMMENDATION: Conduct a Community Impact study to identify vulnerable areas and neighborhoods that be greatly impacted by identified high ranking natural hazards or the cascading effects of natural hazards. Identify shelter locations, that include generators, capability to sustain winds up to 200 mph, cots, blankets and maintain supplies for emergency provisions. Provide Train the Trainer course to include preparation for all hazards that could impact the community. Update Emergency planning to include early warning procedures and sheltering/shelter-in-place protocols. Harden infrastructure systems to prevent long term disruption of services and supplies. Identify and obtain grant funding for all components of above projects.	
ACTION: identifying shelters and designating them as critical facilities - providing backup power through fixed generators - mitigating the shelters against hazards (wind, flood, fire, etc.) - building safe rooms or shelters for identified vulnerable areas that need them	
LEAD AGENCY: Town of Nunn	EXPECTED COST: Staff Time
SUPPORT AGENCIES: Weld OEM	POTENTIAL FUNDING SOURCES: TBD
PROGRESS MILESTONES:	

Mitigation Action Guides: 2021-26 Weld County

Pierce (4 Projects)

1-Pierce: Community Impact Study -Vulnerable Populations-Shelter Capabilities Planning	
PRIORITY: High	HAZARDS ADDRESSED: All hazards
LOCATION: Town of Pierce	GOALS ADDRESSED: 1-4
RECOMMENDATION DATE: 7/31/2021	OBJECTIVES ADDRESSED: A, B, C, D, E
TARGET COMPLETION DATE: 12/31/2021	Lifelines: Public Safety
ISSUE: Due to the potential impact of severe storms, long term power outages, tornados, proximity of hazmat routes and the lack of sheltering capabilities in the community; the impact by natural hazards and cascading events would require Pierce to acquire outside assistance to shelter local residents.	
RECOMMENDATION: Conduct a Community Impact study to identify vulnerable areas and neighborhoods that be greatly impacted by identified high ranking natural hazards or the cascading effects of natural hazards. Identify shelter locations, that include generators, capability to sustain winds up to 200 mph, cots, blankets and maintain supplies for emergency provisions. Provide Train the Trainer course to include preparation for all hazards that could impact the community. Update Emergency planning to include early warning procedures and sheltering/shelter-in-place protocols. Harden infrastructure systems to prevent long term disruption of services and supplies. Identify and obtain grant funding for all components of above projects.	
ACTION: identifying shelters and designating them as critical facilities - providing backup power through fixed generators - mitigating the shelters against hazards (wind, flood, fire, etc.) - building safe rooms or shelters for identified vulnerable areas that need them	
LEAD AGENCY: Town of Pierce	EXPECTED COST: Staff Time,
SUPPORT AGENCIES: Weld OEM,	POTENTIAL FUNDING SOURCES: TBD
PROGRESS MILESTONES:	

2-Pierce: County Road 90 Improvements	
PRIORITY: Medium	HAZARDS ADDRESSED: Hazmat evacuations/severe storms/ flooding
LOCATION: CR 90/hwy85- CR 29	GOALS ADDRESSED: 1, 2
RECOMMENDATION DATE: 2021-22	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: 2022	LIFELINES: Transportation SUBCOMPONENTS: County Roads, State Highways

ISSUE: Past and potential future flooding in the lower drainage areas and ditches that the roadway crosses, along with the age/deterioration of the roadway poses a threat to using this road as an exit route from the town in an emergency. Hazmat route traffic exacerbates road conditions during storms and flooding. The road is also an evacuation route for the school directly to the south of the intersection. Now that CR 29 is a paved through road between Hwy 14 and CR 100 , CR 90 is becoming an increasingly important exit route for residents from Pierce. Planned Road maintenance- increased truck traffic, degraded road condition	
RECOMMENDATION: Repair the roadway	
ACTION: Maintain and improve condition of Hazmat and Evacuation Route for community	
LEAD AGENCY: Town of Pierce	EXPECTED COST: $1m + awaiting estimate
SUPPORT AGENCIES: FEMA	POTENTIAL FUNDING SOURCES: FEMA, BRIC, Revenues, WC IGA
PROGRESS MILESTONES: Get an estimate for road repair, awaiting property tax revenues that will go towards funding the project. Grant funding submission start project 2021, projected project timeframe 6 months to 1 year.	

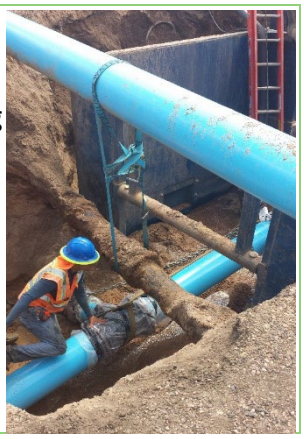
3-Pierce: Community Preparedness Education	
PRIORITY: High	HAZARDS ADDRESSED: Drought, Earthquake, Land Subsidence, Extreme Temperatures, Flood, Severe Storm, Wind & Tornado, Fire, Public Health, Hazmat
LOCATION: Town of Pierce	GOALS ADDRESSED: 1,3
RECOMMENDATION DATE: 10.06.2015	OBJECTIVES ADDRESSED: A, B
TARGET COMPLETION DATE: Annually	LIFELINES: All SUBCOMPONENTS: All
ISSUE: There are many emergency managements issues that need to be reinforced with public education so that citizens know what risks they face, what protective actions they can take, and what government programs are in place to assist them.	
RECOMMENDATION: The potential for saving just one life, and providing time for individuals and businesses to take effective protective actions, outweighs the potential cost of the public education program. Public Education may be the most effective and least-expensive way to reduce disaster losses by changing human behavior to promote appropriate actions	
ACTION: Establish an ongoing or annual Public Education campaign regarding Hazards and Emergency Management	
LEAD AGENCY: Town of Pierce	EXPECTED COST: $2,500 for printing and distribution costs

SUPPORT AGENCIES: County Emergency Management, First Responder Agencies, State DHSEM, FEMA	POTENTIAL FUNDING SOURCES HMPG, SHSG, Local budgets and private partner cost share.
PROGRESS MILESTONES: Since 2009, Weld County OEM and many participating jurisdictions have continued to make public preparedness outreach and education a priority. The Town of Pierce will continue to work with Weld County OEM on community preparedness education and hazard identification. Updated: Ongoing project	

4-Pierce Drainage County Road 88 / Hwy 85	
PRIORITY: High	HAZARDS ADDRESSED: Flood, Storm water
LOCATION: Pierce	GOALS ADDRESSED: 1, 2, 3, 4
RECOMMENDATION DATE: 1/1/2016	OBJECTIVES ADDRESSED: D, E
TARGET COMPLETION DATE: 2025	LIFELINE: Transportation SUBCOMPONENT: Roads
ISSUE: The Town of Pierce has a Comprehensive Plan identifying storm drainage issues and goals. The primary goal is to preserve flood plains and natural drainage ways in the Pierce planning area. Drainage at County Road 88 and Highway 85 requires a larger engineered culvert to prevent standing water on the street and nearby properties.	
RECOMMENDATION: The Town of Pierce is working jointly with Weld County to engineer a larger culvert to drain storm water under County Road 88 and allow it to flow down the natural drainage area. Agreements with the State of Colorado, City of Thornton and Fort Collins Lateral may be necessary to help direct the drainage to the proper natural areas.	
ACTION: This is a high priority currently being planned in conjunction with Weld County to engineer a culvert large enough to drain storm water and direct it to a ditch system approximately ¾ mile away.	
LEAD AGENCY: Town of Pierce	EXPECTED COST: Storm drainage improvements in the vicinity of US85 and County Road 88. Installation, agreements, and engineered design directing the flow to a ditch system approximately ¾ mile. $500,000
SUPPORT AGENCIES: Weld County	POTENTIAL FUNDING SOURCES: Pierce charges drainage fees.

PROGRESS MILESTONES

Update: There is no current progress on this project. Project will be ongoing Through 2020-2025, with collaboration of county and state and City of Thornton for adjoining property.



Mitigation Action Guides: 2021-26 Weld County

Platteville (6 Projects)

1-Platteville: Comprehensive Plan Update and Training	
PRIORITY: High	HAZARDS ADDRESSED: Severe Storms (Tornadoes, Blizzards, Floods & other severe weather events)
LOCATION: Town of Platteville	GOALS ADDRESSED: 1, 2, 3, 4
RECOMMENDATION DATE: March 2021	OBJECTIVES ADDRESSED: C, E, D
TARGET COMPLETION DATE: May 2021	LIFELINES: Safety & Security SUBCOMPONENT: Government Services
ISSUE: Update Comprehensive Plan to include an Annex for Continuity of Government (COG) Plan	
RECOMMENDATION: Conduct annual elected officials and staff training on the COG Plan.	
ACTION: Update and review the Comprehensive Plan each year with Elected Officials and Town staff.	
LEAD AGENCY: Town of Platteville	EXPECTED COST: TBD
SUPPORT AGENCIES: Legislative, Administration, Police & Public Works	POTENTIAL FUNDING SOURCES: General Fund
PROGRESS MILESTONES: The Continuity of Government Plan was adopted in 2019 and will be integrated into the Comprehensive Pan and submitted as an Annex by elected officials and staff. Scenario training will also be implemented in 2021.	

2-Platteville: Community Education of updated Early Warning System, Training and Utilization	
PRIORITY: Medium	HAZARDS ADDRESSED: Severe Storms (Tornadoes, Blizzards, Floods & other severe weather events)
LOCATION: Town of Platteville	GOALS ADDRESSED: 1,2,3,4
RECOMMENDATION DATE: Ongoing	OBJECTIVES ADDRESSED: A,B, E
TARGET COMPLETION DATE: Ongoing	LIFELINES: Safety & Security, Communications SUBCOMPONENTS: Government Services, Early Warning System
ISSUE: Emergency Communication Systems (Everbridge) was purchased, but underutilized	
RECOMMENDATION: Continue the utilization of the Town's Emergency Communication System to provide emergency notifications and warnings to the community during severe storms and similar events.	
ACTION: Utilize the Town's Emergency Notification System during severe weather events as needed. Promote the system in the community to increase use of the system.	
LEAD AGENCY: Town of Platteville	EXPECTED COST: $6,000 Annual Renewal

SUPPORT AGENCIES: Police & Public Works	POTENTIAL FUNDING SOURCES: General Fund
PROGRESS MILESTONES: The Town's Emergency Communication System (Everbridge) was purchased and implemented in 2014 and has been used regularly since that time to provide regular (weekly) community information and emergency notifications as needed. Since implementation there are approximately 600 users who receive notifications.	

3-Platteville: Tornado Sirens - Maintenance and Testing	
PRIORITY: High	HAZARDS ADDRESSED: Severe Storms & Tornadoes
LOCATION: Town of Platteville	GOALS ADDRESSED: 1,2,4
RECOMMENDATION DATE: April 2021	OBJECTIVES ADDRESSED: B,C,E
TARGET COMPLETION DATE: Sept 2021	LIFELINES: Communications, Safety & Security SUBCOMPONENT: Early Warning System, Community Safety
ISSUE: Annual Testing of Tornado Sirens in Platteville & Gilcrest	
RECOMMENDATION: Continuation of annual emergency warning / tornado siren testing.	
ACTION: Conduct monthly Tornado Siren testing the first Saturday of each month from April – September at 10:00am each date in coordination with the Platteville/Gilcrest Fire Protection District (PGFPD) and Platteville Police Department.	
LEAD AGENCY: Town of Platteville	EXPECTED COST: TBD
SUPPORT AGENCIES: PGFPD	POTENTIAL FUNDING SOURCES: General Fund
PROGRESS MILESTONES: Five Tornado Sirens (3 Platteville, 1 Gilcrest, 1 US85 & SH60) were initially acquired and installed in 2009. One additional Tornado Siren acquired and installed in 2019 to provide better emergency warning coverage to the north portion of Platteville. Backup batteries were also replaced in 2018 for all Tornado Sirens.	

4-Platteville: Comprehensive Plan - Update and training	
PRIORITY: High	HAZARDS ADDRESSED: Severe Storms (Tornadoes, Blizzards, Floods & other severe weather events)
LOCATION: Town	GOALS ADDRESSED: 1, 2, 3, 4
RECOMMENDATION DATE: February 2021	OBJECTIVES ADDRESSED: A, B, C, D, E

TARGET COMPLETION DATE: April 2021	LIFELINE: All SUBCOMPONENT: All
ISSUE: Comprehensive Plan needs updated and continued training and exercise	
RECOMMENDATION: Update the Comprehensive Plan annually and provide bi-annual training each spring and fall to all Town employees. Promote the plan to the community annually.	
ACTION: Update and review the EMP by April of each year with Elected Officials and Town staff.	
LEAD AGENCY: Town of Platteville	EXPECTED COST: TBD
SUPPORT AGENCIES: Administration, Police & Public Works	POTENTIAL FUNDING SOURCES: General Fund
PROGRESS MILESTONES: The Comprehensive Plan was adopted in 2009 and updated again in 2019. Update and review the plan annually each spring and fall with Elected Officials, Town staff and community members.	

5-Platteville: Community Impact Study -Vulnerable Populations-Shelter Capabilities Planning	
PRIORITY: High	HAZARDS ADDRESSED: All Hazards
LOCATION: Platteville	GOALS ADDRESSED: 1-4
RECOMMENDATION DATE: 07.31.2021	OBJECTIVES ADDRESSED: A, B, C, D, E
TARGET COMPLETION DATE: 12.31.2021	LIFELINE: Public Safety SUBCOMPONENT: All
ISSUE: Due to the potential impact of severe storms, long term power outages, tornados, proximity of hazmat routes and the lack of sheltering capabilities in the community; the impact by natural hazards and cascading events would require Platteville to acquire outside assistance to shelter local residents.	
RECOMMENDATION: Conduct a Community Impact study to identify vulnerable areas and neighborhoods that be greatly impacted by identified high ranking natural hazards or the cascading effects of natural hazards. Identify shelter locations, that include generators, capability to sustain winds up to 200 mph, cots, blankets and maintain supplies for emergency provisions. Provide Train the Trainer course to include preparation for all hazards that could impact the community. Update Emergency planning to include early warning procedures and sheltering/shelter-in-place protocols. Harden infrastructure systems to prevent long term disruption of services and supplies. Identify and obtain grant funding for all components of above projects.	
ACTION: identifying shelters and designating them as critical facilities - providing backup power through fixed generators - mitigating the shelters against hazards (wind, flood, fire, etc.) - building safe rooms or shelters for identified vulnerable areas that need them	
LEAD AGENCY: Town of Platteville	EXPECTED COST: Staff Time

SUPPORT AGENCIES: Weld OEM	POTENTIAL FUNDING SOURCES: TBD
PROGRESS MILESTONES:	

6-Platteville: Master Storm Drainage Plan	
PRIORITY: High	HAZARDS ADDRESSED: All Hazards
LOCATION: Platteville	GOALS ADDRESSED: 1, 2
RECOMMENDATION DATE: 12.01.2019	OBJECTIVES ADDRESSED: C, E
TARGET COMPLETION DATE: 12.01.2021	LIFELINE: Transportation, Public Safety SUBCOMPONENT: Roadways
ISSUE: The Town of Platteville applied and received DOLA funding to assist in completing a Master Storm Drainage Study. The Plan is currently being written by the Town's Engineer and Public Works Director to mitigation current flooding and storm drainage concerns as well as develop long-term mitigation plans for future development and growth in areas identified in the 2010 Comprehensive Plan Update.	
RECOMMENDATION: Task PW Director and Engineers to draft the plan and identify long term mitigation projects for future development and growth.	
ACTION: Complete master storm drainage plan	
LEAD AGENCY: Town Administration	EXPECTED COST: Staff Time
SUPPORT AGENCIES: State Planning, Engineering, Public Works	POTENTIAL FUNDING SOURCES: Capital Improvement Fund, General Fund, State and Federal Funding Sources.
PROGRESS MILESTONES:	

Severance (3 Projects)

1-Severance: Downtown Drainage and Street Improvements (Phase 2)	
PRIORITY: High	HAZARDS ADDRESSED: Flooding, Drainage
LOCATION: Severance	GOALS ADDRESSED: 1
RECOMMENDATION DATE: 2019	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: December 31, 2021	LIFELINES: Safety & Security, Transportation SUBCOMPONENTS: Town Roads, Community Safety
ISSUE: Localized flooding and drainage issues in the older part of Town.	
RECOMMENDATION: The benefits are to decrease impacts created by localized flooding and drainage in the old part of Town by installing curb, gutter, sidewalk and storm drainage facilities to alleviate the problem	
ACTION: Construct curb, gutter, sidewalk, street and drainage improvements, along with replacing dilapidated water and sewer infrastructure.	
LEAD AGENCY: Town of Severance	EXPECTED COST: $4,000,000
SUPPORT AGENCIES:	POTENTIAL FUNDING SOURCES: General Fund
PROGRESS MILESTONES: Phase 1 Completed in Summer 2016	

2-Severance: Hidden Valley Parkway Crossing	
PRIORITY: High	HAZARDS ADDRESSED: Access, Flooding
LOCATION: Severance	GOALS ADDRESSED: 1, 2
RECOMMENDATION DATE: 2019	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: December 31, 2021	LIFELINES: Safety & Security, Transportation SUBCOMPONENTS: Town Roads, Community Safety
ISSUE: Lack of an access to cross over the Floodplain/Floodplain.	
RECOMMENDATION: This crossing structure will also for better connectivity west and east through Town, provide quicker emergency access from the Middle School to the High School, and provide an elevated crossing during a potential flooding situation.	
ACTION: Construct a box culvert "bridge" structure with curb, gutter, sidewalk, street and drainage improvements that will provide vehicle and pedestrian access across the floodplain.	
LEAD AGENCY: Town of Severance	EXPECTED COST: $1,800,000
SUPPORT AGENCIES:	POTENTIAL FUNDING SOURCES: General Fund/Storm Water Fund/Development Reimbursement

PROGRESS MILESTONES: Design Completed 2019

3-Severance: Harmony Regional Drainage Project	
PRIORITY: Medium	HAZARDS ADDRESSED: Flooding, Drainage
LOCATION: Severance	GOALS ADDRESSED: 1, 2
RECOMMENDATION DATE: 2020	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: December 31, 2021	LIFELINES: Safety & Security, Transportation SUBCOMPONENTS: Town Roads, Community Safety
ISSUE: Localized flooding and drainage issues along E. Harmony Road between WCR 21 and Timber Ridge Parkway.	
RECOMMENDATION: The benefits are to decrease impacts created by localized flooding and drainage along Harmony by significantly decreasing the over toping of this roadway during a flooding situation and addressing capacity issues downstream in the Storm water system.	
ACTION: Construct an underground storm drainage system and retention pond.	
LEAD AGENCY: Town of Severance	EXPECTED COST: $1,500,000
SUPPORT AGENCIES:	POTENTIAL FUNDING SOURCES: General Fund/Storm Water Fund
PROGRESS MILESTONES: Design Completed 2020	

Windsor (3 Projects)

1-Windsor: Eastman Park Riverwalk Project	
PRIORITY: High	HAZARDS ADDRESSED: Flooding
LOCATION: Eastman Park Riverwalk/7th St Windsor	GOALS ADDRESSED: 1, 2
RECOMMENDATION DATE: 2021-22	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: 2023	LIFELINE: Water & Transportation SUBCOMPONENT: Rivers & City Streets
ISSUE: This project will improve the river channel, remove banks and increase wetlands. Overall it should improve flow of river channel and prevent flooding of city streets in the area along and adjacent to 7th St	
RECOMMENDATION:	
ACTION: Remove banks, improve river channel, increase wetlands.	
LEAD AGENCY: Town of Windsor	EXPECTED COST: $1.5 million
SUPPORT AGENCIES: NISP	POTENTIAL FUNDING SOURCES:
PROGRESS MILESTONES:	

2-Windsor: Acquire Emergency Power System Transfer Switches - Public Safety Complex	
PRIORITY: Medium	HAZARDS ADDRESSED: All Hazards
LOCATION: Windsor	GOALS ADDRESSED: 1
RECOMMENDATION DATE:	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: 2022	LIFELINE: Public Safety, Energy SUBCOMPONENT: Government Buildings, Backup Power
ISSUE: Generator project was completed in 2019, Now Transfer switches need to be completed in the Public Safety Complex	
RECOMMENDATION:	
ACTION:	
LEAD AGENCY: Town of Windsor	EXPECTED COST: $49k
SUPPORT AGENCIES:	POTENTIAL FUNDING SOURCES: general budget, BRIC

PROGRESS MILESTONES:

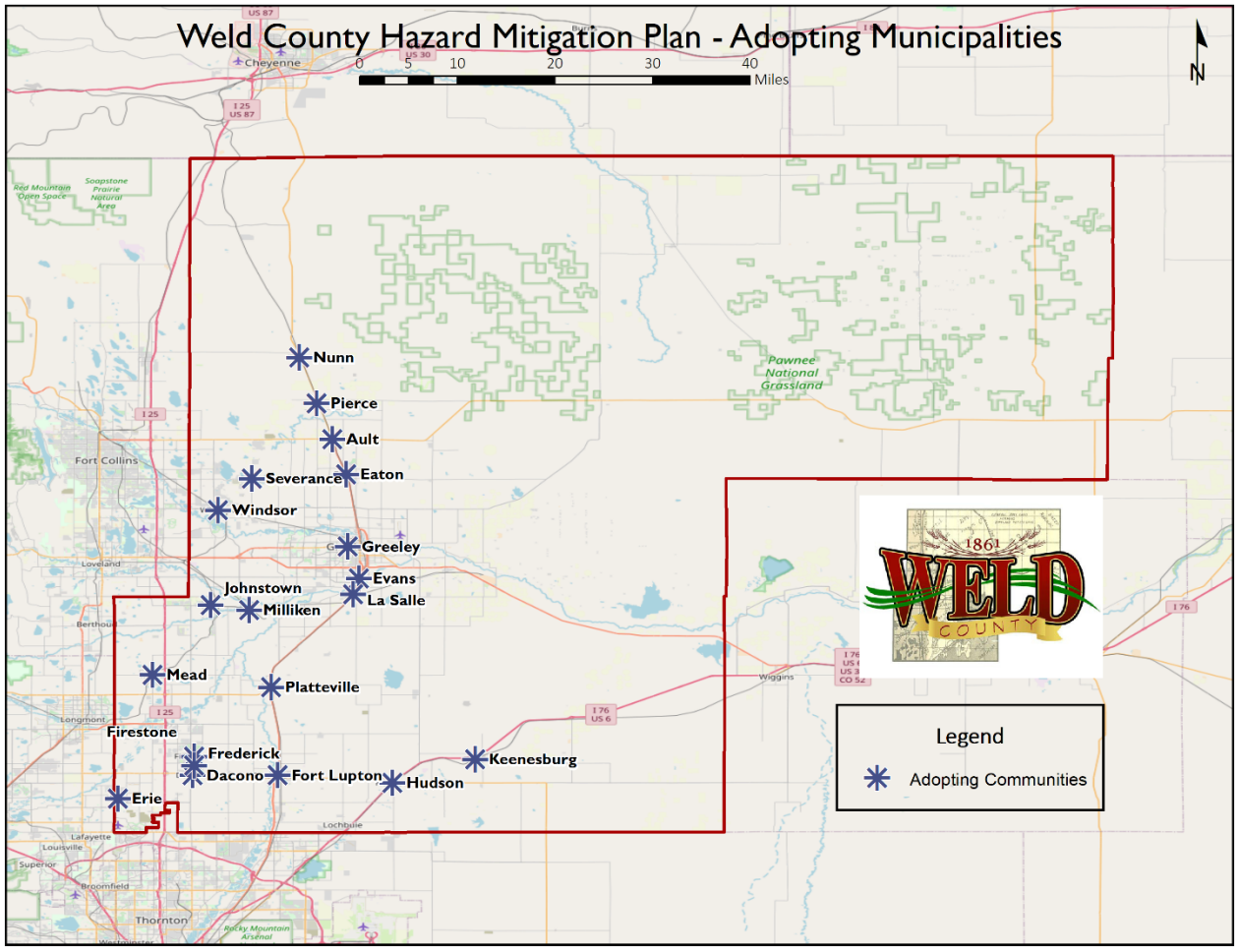
3-Windsor: Flood Mitigation on CR 13	
PRIORITY: Medium	HAZARDS ADDRESSED: Flooding
LOCATION: Windsor	GOALS ADDRESSED: 1
RECOMMENDATION DATE: 2021-22	OBJECTIVES ADDRESSED: E
TARGET COMPLETION DATE: 2022	LIFELINE: Water & Transportation SUBCOMPONENT: Rivers & County Roads
ISSUE: CR 13 is vulnerable to flooding each year, Windsor removed gravel and sediment deposits from the cache La Poudre River near CR 13 Bridge crossing. Budgeted annually for routine maintenance along river.	
RECOMMENDATION: Maintain project yearly	
ACTION:	
LEAD AGENCY: Town of Windsor	EXPECTED COST: $50k/ yearly
SUPPORT AGENCIES:	POTENTIAL FUNDING SOURCES: general budget, BRIC
PROGRESS MILESTONES:	

7 Appendix B: Municipal Annexes

The following municipal annexes provide additional, specific information that is unique to each participating jurisdiction (see Figure 71) included in this Hazard Mitigation Plan. Individual municipal risk assessments are included for each municipality's High Risk hazards. It should be noted that for many hazards, community exposure and risk are the same across the entire County. When possible, community scale risk assessments are presented as data allows.

Additionally, communities are encouraged to leverage available web map viewers to access the most recent hazard data as they reference this Plan. This will ensure municipalities 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.

Figure 71. Map of Adopting Communities



EMERGENCY MANAGEMENT

7.1 Town of Ault

The Town of Ault Comprehensive Plan shares the vision and guiding principles of the community.

"Ault will be a vibrant, safe, friendly, attractive small town with thriving businesses, well-tended neighborhoods, excellent parks, good schools and opportunities for everyone. It will be a model for social, economic and environmental sustainability."

Guiding Principles:

- Maintain and Enhance Ault's Small-Town Appeal
- Cultivate Sustainable Community
- Grow Responsibly
- Foster an Open, Inclusive Town Culture
- Continue to Enable Citizens to Travel Safely and Efficiently by Car, Bike and Foot

7.1.1 Community Profile

Ault is located on the intersection of Hwy 85 and Hwy 14 and is known as the "Gateway to the Pawnee Grasslands." The Town is an important crossroads for transporting goods and services and is not heavily reliant on its agricultural roots. In recent years, Ault has transformed into a bedroom community for residents working in Cheyenne, Fort Collins and Greeley, all of which are within 45 minutes.

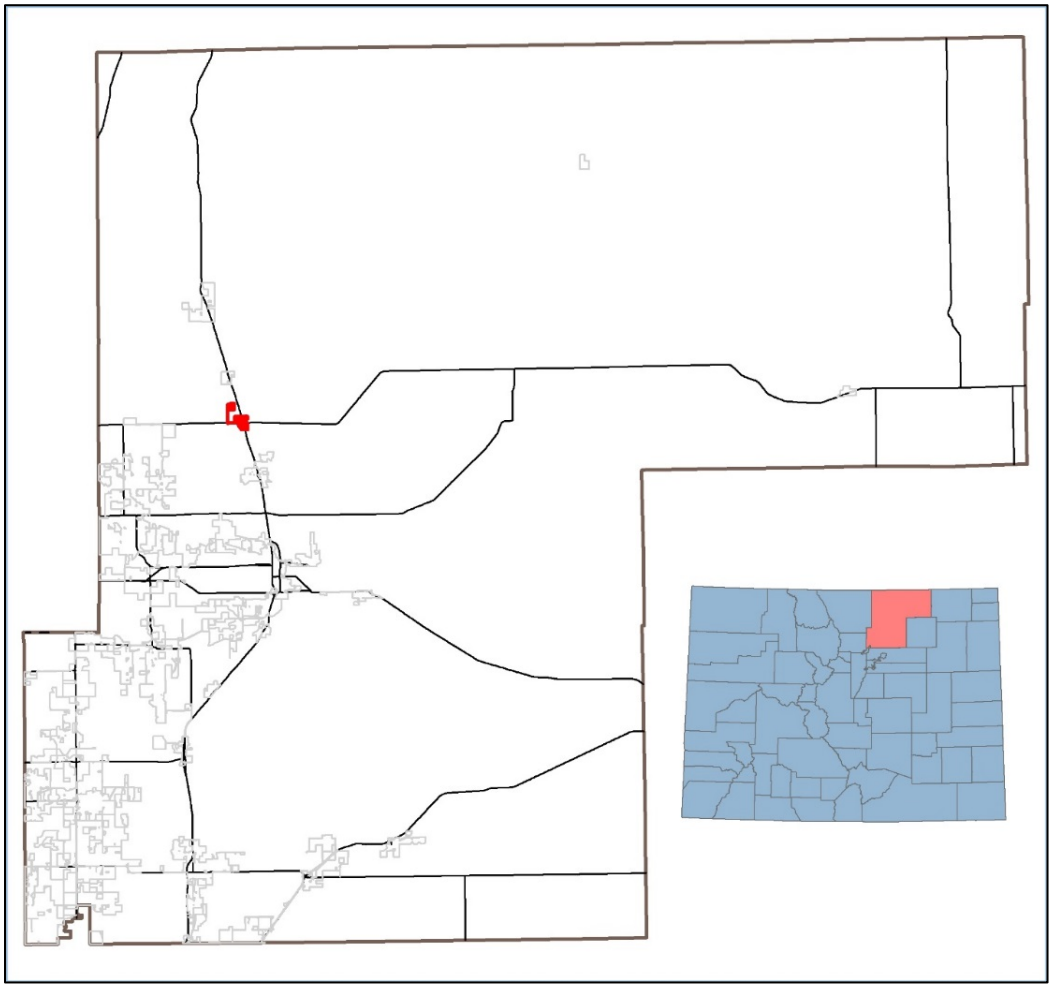


Table 66 shows some development information for the Town of Ault. Current information for specific characteristics of the population is only available from the US Census Bureau for municipalities with populations over 5,000 people.

Table 66. Town of Ault Demographics

Ault	Colorado	
1,843	5,758,736	Population, 2019
21.0%	14.5%	Population, % change April 1, 2010 to July 1, 2019
2.62	2.56	Persons Per Household, 2019

Note: Recent data is unavailable from the US Census Bureau for some categories, based on the size of the municipality. Source: US Census Bureau

Growth in Ault has been substantial over the last decade and when the 2020 Census data is available the characteristics of the population should be reviewed to help with inclusive preparedness, mitigation, and response planning. See Chapter 4 of this Plan for information on Community Inclusion within the County.

7.1.2 Risk and Vulnerability Assessment

Table 67 summarizes the results of the RF ranking exercise performed by the Town of Ault. The results represent the relative risk of different hazards across the municipality from the perspective of local stakeholders and subject matter experts. Note the final RF Ranking values in this table include the weighting factors detailed in the Risk Assessment chapter of this Plan.

Table 67. Risk Factor Results for Ault

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	RF Ranking
Agricultural Hazards	1	1	1	1	4	1.3
Cyber Hazards	1	1	1	4	4	1.6
Drought	2	1	3	1	4	2.0
Earthquake	1	2	1	4	1	1.6
Extreme Temps.	3	1	1	3	3	2.0
Flood	1	1	2	4	4	1.8
Hazmat Release	2	2	4	4	1	2.5
Land Subsidence	1	1	1	4	1	1.3
Prairie Fire	3	1	1	4	2	2.0
Public Health Hazards	3	2	2	1	4	2.4
Severe Storms	3	2	2	2	1	2.2
Tornado & Wind	2	2	1	4	1	1.9

The conclusions drawn from the qualitative assessment are organized into three categories shown in the following table and provide a summary of hazard risk for Ault as a whole - based on High, Moderate, or Low risk designations. This process helped frame ongoing planning discussions around local and regional hazard risks and assisted with the development of the Plan's updated mitigation strategy.

Table 68. Hazard Risk Conclusions for Ault

HIGH RISK (2.5 or higher)	**Hazmat Release**
MODERATE RISK (2.0 – 2.4)	**Drought, Extreme Temperatures, Prairie Fire, Public Health Hazards, Severe Storms**
LOW RISK (1.9 or lower)	**Agricultural Hazards, Cyber Hazards, Earthquake, Flood, Land Subsidence, Tornado & Straight-Line Wind**

Since the 2016 Plan, the Town has decreased the assessed risk from prairie fire and straight-line winds & tornadoes to Moderate Risk (both formerly High). It has also elevated drought and public health hazards from Low Risk to Moderate. Besides the newly added hazards of agricultural hazards and cyber hazards, all other risk rankings remain the same.

The following sections highlight the Town of Ault's High Risk hazards and include any specific content relevant to the Town. They are intended to supplement information included in each hazard profile in the main body of this Plan.

7.1.2.1 Hazmat Release

Vulnerability to hazmat release is increased for the Town of Ault, mainly due to the location of a CDOT hazardous materials route through the community. Additionally, railroads span across Ault, which present their own increased risk for hazmat release. As is true for the entire County, the presence of any businesses that store hazardous materials also increases the risk for these types of events.

Based on data supplied by the Pipeline and Hazardous Materials Safety Administration's (PHMSA) Incident Reports Database there have been three events that have occurred within Ault between 1991 and 2019. One of these events was a rollover accident. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.1.3 Capabilities Assessment

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

Planning and regulatory capabilities are powerful tools for implementing hazard mitigation. The Town currently utilizes some of these capabilities shown in Table 69. It is important for all municipalities to regularly review each of these tools, to identify opportunities for further risk reduction efforts.

Table 69. Planning & Regulatory Capabilities

Mitigation Capability	Utilized?	Comments
Comprehensive, Master, or General Plan	Yes	
Capital Improvement Program or Plan (CIP)	No	
Floodplain Management Plan	No	
Stormwater Program / Plan	No	

Mitigation Capability	Utilized?	Comments
Community Wildfire Protection Plan (CWPP)	No	
Erosion / Sediment Control Program	No	
Economic Development Plan	No	
Other:		
Building Codes (Year)	Yes	2018 IBC
Site Plan Review Requirements	Yes	Planning Committee / Town Board
Other:	Yes	Consultant
Zoning Ordinance (Land Use)	Yes	Planning Committee / Town Board
Subdivision Ordinance	Yes	Planning Committee / Town Board
National Flood Insurance Program (NFIP) Participant	Yes	
Flood Insurance Study / Flood Insurance Rate Map / DFIRM	Yes	
Floodplain Ordinance	Yes	
Elevation Certificates for Floodplain Development	Yes	Consultant
Community Rating System (CRS) Participant	No	
Open Space / Conservation Program	No	
Growth Management Ordinance	No	
Stormwater Ordinance	No	
Other Hazard Ordinance (steep slope, wildfire, snow loads, etc.)	No	
Other:	No	

Available resources including staff, municipal groups, and technology are all vital for a community to be able to implement hazard mitigation. Ault is fortunate to have a number of these capabilities identified in Table 134.

Table 70. Administrative & Technical Capabilities

Mitigation Capability	Utilized?	Comments
Planning Commission	Yes	
Mitigation Planning Committee	No	
Maintenance Programs (tree trimming, clearing drainage, etc.)	No	
Emergency Manager	Yes	Tom Nissen
Building Official	Yes	Consultant
Floodplain Administrator	Yes	Consultant
Community Planner	Yes	Development review team
Transportation Planner	No	
Civil Engineer	Yes	Consultant
GIS Capability	Yes	Limited

Mitigation Capability	Utilized?	Comments
Resiliency Planner	No	
Other:	No	
Warning Systems / Services (flood)	Yes	Sirens
Warning Systems / Services (other / multi hazard)	Yes	Code Red / IPAWS through Country
Grant Writing / Management	Yes	FPD
Other:	No	

The ability of a community to implement a comprehensive mitigation strategy is largely dependent on available funding. These related municipal capabilities are outlined in Table 135 and show that Ault could leverage a number of tools in the future to implement mitigation activities.

Table 71. Financial Capabilities

Mitigation Capability	Utilized?	Comments
Levy for Specific Purposes with Voter Approval	No	
Utilities Fees	Yes	
System Development / Impact Development Fee	Yes	For police, infrastructure, drainage, streets and parks
General Obligation Bonds to Incur Debt	No	
Special Tax Bonds to Incur Debt	No	
Open Space / Conservation Fund	No	
Stormwater Utility Fees	No	
Capital Improvement Project Funding	No	
Community Development Block Grants (CDBG)	Yes	Partner with County
Withheld spending in hazard-prone areas	No	
Other:		

Education and outreach are important capabilities that allow a community to continue the conversation with their public regarding hazard risk and opportunities to mitigate. Table 136 shows that Ault does leverage a public outreach program for wildfire.

Table 72. Education & Outreach Capabilities

Mitigation Capability	Utilized?	Comments
Public Hazard Education / Outreach Program	Yes	Wildfire
Local Citizen Groups That Communicate Hazard Risks	No	
Firewise	No	
NOAA StormReady Program	No	

Mitigation Capability	Utilized?	Comments
Other:	No	

7.1.4 Mitigation Actions

The new mitigation actions identified by the Town during the Plan update are included in Table 73.

Table 73. 2021 Mitigation Action

ID	Organization	Action
2021-17	1-Ault	Community Impact Study -Vulnerable Populations-Shelter Capabilities Planning
2021-18	2-Ault	Hazardous Materials – Community Impact Study

7.2 City of Dacono

The Comprehensive Plan for the City of Dacono, Dacono Forward, was updated in 2017. The expansion upon the original plan from 2005 reflects the economic changes in the community and the renewed perspective on growth and development.

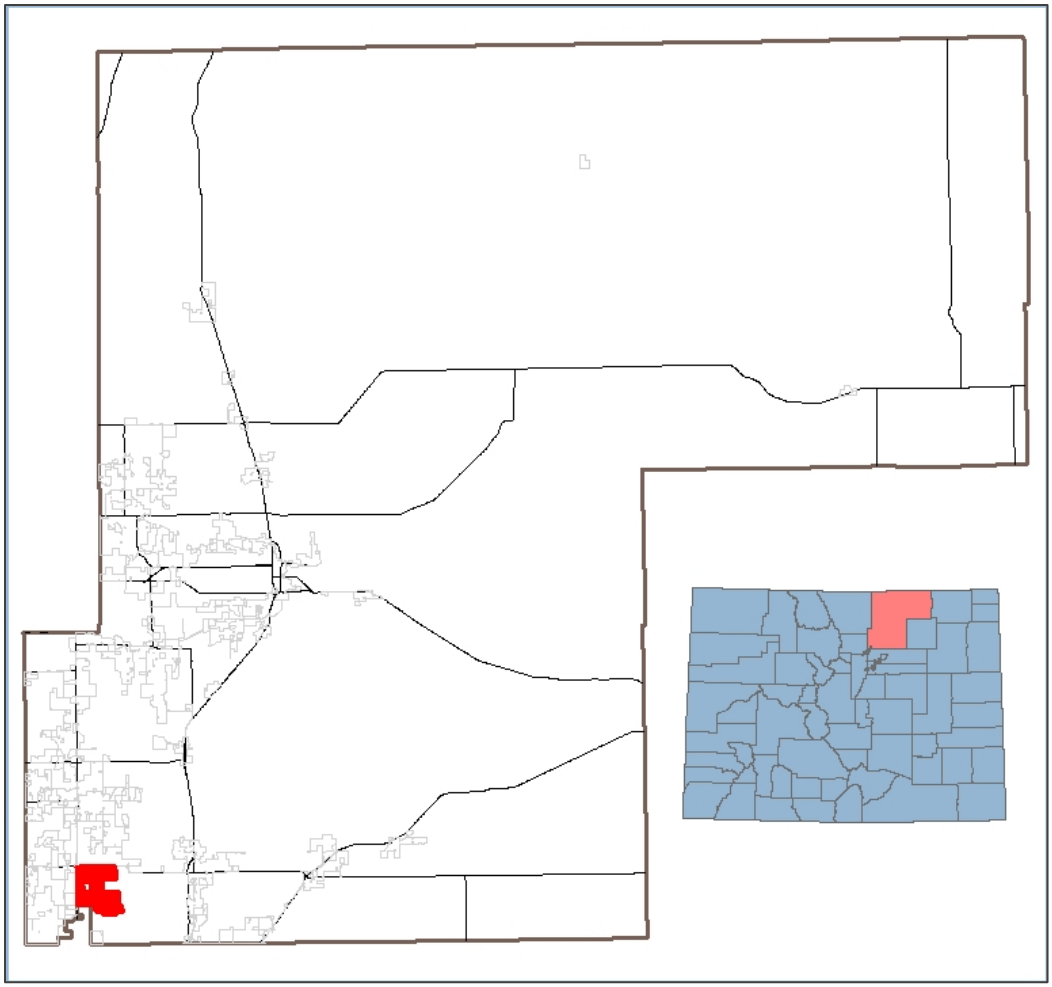
"*The Guiding Principles which informed this Dacono Forward plan are intended to provide direction for future land use and resource investment decisions. To this end, they should be considered in matters related to rezoning, subdivision and site design requests; as well as, the selection of priority initiatives, capital expenditures, and investment incentives. As they relate to this Dacono Forward Plan, they served as the foundation for its Goals (desired outcomes) and Strategic Public Initiatives (recommendations and actions).*"

The Guiding Principles are:

- Grow the City's economy through diversification of job and business opportunities, and balance growth through efficient development patterns.
- New development and redevelopment will meet Dacono's expectations for excellence in design and the creation of places consistent with long-term economic viability.
- Today's neighborhoods remain vital and desirable places that meet the needs of existing residents and also appeal to future residents.
- Housing choices available in Dacono are accessible and affordable to people at all stages of their lives.
- City leaders and decision-makers will focus sufficient attention and investment on distinctive areas throughout the City so that each can achieve the vision described in this plan.

7.2.1 Community Profile

The City of Dacono is located in southwestern Weld County, about 10 miles north of the Denver metropolitan area. Dacono is located east of I-25 and south of Highway 52. The city encompasses nearly 8.2 square miles, with a future growth boundary of 22 square miles.



Dacono is part of the Carbon Valley area which also includes the Towns of Frederick and Firestone. The three municipalities share a Chamber of Commerce and a Park and Recreation District. They are represented in the Carbon Valley Emergency Management Agency, which also includes the Frederick Fire Protection District and Mountain View Fire Rescue. The municipalities work with their specific stakeholders in determining risks and vulnerabilities, however the unique agreement between them is important to planning efforts.

The table below summarizes key demographic and development related characteristics of the City of Dacono.

Table 74. City of Dacono Demographics

Dacono	Colorado	
6,034	5,758,736	Population, 2019
45.2%	14.5%	Population, % change April 1, 2010 to July 1, 2019
10.6%	5.8%	% Population under 5 years, 2019
28.0%	21.9%	% Population under 19 years, 2019
7.6%	14.6%	% Population 65 years and over, 2019

Dacono	Colorado	
69.9%	64.9%	Homeownership Rate, 2019
2.84	2.56	Persons Per Household, 2019
$67,524	$68,811	Median Household Income, 2014- 2018
5.9%	9.3%	Persons below poverty level, %, 2014- 2018
10.5%	7.3%	% Population under 65 years, with a disability 2014-2018
19.9%	17%	Language other than English spoken at home, % age 5+, 2014- 2018

Source: US Census Bureau

The City's current population is estimated at 6,034 people, according to the US Census Bureau. Population forecasts are unavailable for municipalities in Colorado, however the population growth rate for Dacono was 5.9% from 2015 to 2018. This is almost double that of Weld County and around four times that of the state for the same period.

7.2.2 Risk and Vulnerability Assessment

Table 75 summarizes the results of the RF ranking exercise performed by the City of Dacono. The results represent the relative risk of different hazards across the municipality from the perspective of local stakeholders and subject matter experts. Note the final RF Ranking values in this table include the weighting factors detailed in the Risk Assessment chapter of this Plan.

Table 75. Risk Factor Results for Dacono

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	RF Ranking
Agricultural Hazards	3	3	4	1	4	3.1
Cyber Hazards	3	4	4	4	4	3.7
Drought	3	2	4	1	4	2.8
Earthquake	1	2	4	1	1	1.9
Extreme Temps.	2	2	2	1	3	2.0
Flood	3	3	4	2	4	3.2
Hazmat	3	2	2	3	2	2.4
Land Subsidence	1	1	1	2	1	1.1
Prairie Fire	3	2	1	4	3	2.4
Public Health Hazards	4	2	4	1	3	3.0
Severe Storms	4	3	4	3	2	3.4
Tornado & Wind	3	4	2	4	4	3.3

The conclusions drawn from the qualitative assessment are organized into three categories shown in the following table and provide a summary of hazard risk for Dacono as a whole - based on High, Moderate, or Low risk designations. This process helped frame ongoing planning discussions around local and regional hazard risks and assisted with the development of the Plan's updated mitigation strategy.

Table 76. Hazard Risk Conclusions for Dacono

HIGH RISK (2.5 or higher)	**Agricultural Hazards, Cyber Hazards, Drought, Flood, Public Health Hazards, Severe Storms, Tornado & Straight-Line Wind**
MODERATE RISK (2.0 – 2.4)	**Extreme Temperatures, Hazmat, Prairie Fire**
LOW RISK (1.9 or lower)	**Earthquake, Land Subsidence**

Since the 2016 Plan, the City has decreased the assessed risk from extreme temperatures to Moderate Risk (formerly High) and land subsidence to Low (formerly Moderate). It has also elevated prairie fire from Low Risk to Moderate. Besides the newly added hazards of agricultural hazards and cyber hazards, all other risk rankings remain the same.

The following sections highlight the City of Dacono's High Risk hazards and include any specific content relevant to the City. They are intended to supplement information included in each hazard profile in the main body of this Plan.

7.2.2.1 Agricultural Hazards (including Disease & Pests)

Vulnerability to agricultural hazards is not noticeably different from the rest of the County. Those communities whose economies are more dependent on the agriculture industry do experience higher risk to these hazards. There are no previous events to document specific to Dacono. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.2.2.2 Cyber Hazards

For any municipality, vulnerability to cyber hazards does not vary from that of the County as a whole. While there are no documented cyber events impacting Dacono, the threat of this hazard is continually increasing. There are no previous events to document specific to Dacono. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.2.2.3 Drought

The community vulnerability to drought is not noticeably different from the rest of the County. Those communities whose economies are more dependent on the agriculture industry do experience higher risk to this hazard. There are no previous events to document specific to Dacono. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.2.2.4 Flood (including Dam & Levee Failure)

Flood is a very localized hazard and vulnerability is unique for each municipality. There are no previous events to document specific to Dacono.

Overall vulnerability to flood is increased for the City of Dacono, where 2.2% of address points (58) are located within the Special Flood Hazard Area (SFHA). This is a larger percentage of structures at risk, as compared to 1.6% of Countywide addresses located in the SFHA.

Flood events can also occur as a result of dam or levee failure. In these cases, flood waters may not follow the typical floodplains mapped as the SFHA.

The City of Dacono's overall vulnerability to flooding in dam inundation areas is significantly different from the rest of the County, as Dacono has no address points located in these dam inundation areas. This is compared to 1.0% of Countywide addresses located in these areas.

The City is not the first jurisdiction downstream of any dams. Additional information pertaining to dams can be referenced at the State's Dam Safety website: https://dwr.state.co.us/Tools/DamSafety/Dams .

The City's overall vulnerability to flooding in areas protected by known levees is substantially different from the rest of the County, as Dacono has no address points located in within levee protected areas. This is compared to 1.6% of Countywide addresses located in these areas.

It is important to note that this analysis is only as good as best available data allows. Current floodplains, dam inundation areas, and areas protected by levees may not currently map all hazard areas. Additionally, mapped hazard areas may be dated and in need of updated mapping and analysis.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.2.2.5 Public Health Hazards

Vulnerability to public health hazards is not expected to be noticeably different from the rest of the County. Individuals at a higher risk to this hazard include the aging adult population, those with a chronic illness, such as diabetes, asthma, coronary heart disease, and those who are obese or overweight. Other populations at risk include children, those in poverty and those with a disability. This data is collected at census tract level by the Centers for Disease Control (CDC) and is unavailable at a municipality level. The data by census tract can be found in the Colorado Department of Health and Environment Open Data database here.

Future occurrences are expected to mirror that of the County. There are no previous events to document specific to Dacono. Refer to Chapter 5 – Risk Assessment of this Plan for additional details, including a summary of the higher risk population demographics for Weld County and the State.

7.2.2.6 Severe Storm (including Hail, Lightning, & Winter Storm)

Vulnerability to severe storm, which includes hail, lightning, and winter storm, is not noticeably different from the rest of the County. Dacono's more densely developed areas experience the greatest risk. Any structures not constructed to meet recent building codes experience the greatest risk from structural damages.

According to the NOAA's Storm Events Database, between 2015 and 2020, the City of Dacono has had seven severe thunderstorms which resulted in reports of hail. There was no reported damage to property or crops and no injuries or deaths. The hail in these storms ranged in size from 1 inch to 1.75 inches.

No other events for severe storm, specific to Dacono, were recorded over this time period.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.2.2.7 Tornado & Straight-Line Wind

Vulnerability to tornado & straight-line wind is not noticeably different from the rest of the County. Dacono's more densely developed areas experience the greatest risk, in addition to any structures not constructed to meet recent building codes.

Between 2015 and 2020, there were no reports of occurrences specific to Dacono. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.2.3 Capabilities Assessment

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

Planning and regulatory capabilities are powerful tools for implementing hazard mitigation. The Town currently utilizes or has implemented many of these capabilities shown in Table 77. It is important for all municipalities to regularly review each of these tools, to identify opportunities for further risk reduction efforts.

Table 77. Planning & Regulatory Capabilities

Mitigation Capability	Utilized?	Comments
Comprehensive, Master, or General Plan	Yes	Dacono Forward adopted 2017
Capital Improvement Program or Plan (CIP)	No	
Floodplain Management Plan	No	
Stormwater Program / Plan	No	
Community Wildfire Protection Plan (CWPP)	No	
Erosion / Sediment Control Program	No	
Economic Development Plan	No	
Other:	No	
Building Codes (Year)	Yes	2018 Edition
Site Plan Review Requirements	Yes	
Other:	No	
Zoning Ordinance (Land Use)	Yes	
Subdivision Ordinance	Yes	
National Flood Insurance Program (NFIP) Participant	Yes	
Flood Insurance Study / Flood Insurance Rate Map / DFIRM	Yes	
Floodplain Ordinance	Yes	

Mitigation Capability	Utilized?	Comments
Elevation Certificates for Floodplain Development	Yes	
Community Rating System (CRS) Participant	No	
Open Space / Conservation Program	No	
Growth Management Ordinance	No	
Stormwater Ordinance	Yes	
Other Hazard Ordinance (steep slope, wildfire, snow loads, etc.)	No	
Other:	No	

Available resources including staff, municipal groups, and technology are all vital for a community to be able to implement hazard mitigation. Dacono is fortunate to have most all of these capabilities identified in Table 78.

Table 78. Administrative & Technical Capabilities

Mitigation Capability	Utilized?	Comments
Planning Commission	Yes	
Mitigation Planning Committee	No	
Maintenance Programs (tree trimming, clearing drainage, etc.)	Yes	
Emergency Manager	Yes	Carbon Valley Emergency Management Agency (CVEMA)
Building Official	Yes	
Floodplain Administrator	Yes	
Community Planner	Yes	
Transportation Planner	No	
Civil Engineer	Yes	
GIS Capability	Yes	
Resiliency Planner	No	
Other:	No	
Warning Systems / Services (flood)	No	
Warning Systems / Services (other / multi hazard)	Yes	
Grant Writing / Management	No	
Other:	No	

The ability of a community to implement a comprehensive mitigation strategy is largely dependent on available funding. These related municipal capabilities are outlined in Table 79 and show that Dacono utilizes a broad range of financial tools that can support mitigation activities.

Table 79. Financial Capabilities

Mitigation Capability	Utilized?	Comments
Levy for Specific Purposes with Voter Approval	Yes	
Utilities Fees	Yes	
System Development / Impact Development Fee	Yes	
General Obligation Bonds to Incur Debt	Yes	
Special Tax Bonds to Incur Debt	No	
Open Space / Conservation Fund	Yes	
Stormwater Utility Fees	No	
Capital Improvement Project Funding	Yes	
Community Development Block Grants (CDBG)	Yes	
Withheld spending in hazard-prone areas	No	
Other:	No	

Education and outreach are important capabilities that allow a community to continue the conversation with their public regarding hazard risk and opportunities to mitigate. Table 80 shows that Dacono could benefit by expanding upon these capabilities.

Table 80. Education & Outreach Capabilities

Mitigation Capability	Utilized?	Comments
Public Hazard Education / Outreach Program	Yes	CVEMA Hazard and Preparedness Education and Outreach
Local Citizen Groups That Communicate Hazard Risks	No	
Firewise	No	
NOAA StormReady Program	No	
Other:	No	

7.2.4 Plan Maintenance and Implementation

The City of Dacono has developed a Plan Maintenance and Implementation Strategy outlining their method and schedule for keeping the plan current. The Implementation Strategy below also includes a discussion of how the City will continue public participation in the plan maintenance process.

- The Carbon Valley Emergency Manager will facilitate an annual review of hazard mitigation plan and actions with City staff and leadership. In addition, The City of Dacono and CVEMA will periodically engage the public in the process of identifying hazards, risks, and prioritizing mitigation actions.

7.2.5 Integrating Hazard Mitigation into Local Planning

The City also identified ways to integrate hazard mitigation into their local planning mechanisms and policies. Following are the specific integration strategies identified by the City of Dacono.

- To consider implementing hazard mitigation actions into the City's capital improvement projects and building codes.

7.2.6 Mitigation Actions

The mitigation actions identified by the City during the Plan update are included in Table 81. Both of these actions from the 2016 Plan have been carried over into the City's updated mitigation strategy.

Table 81. 2021 Mitigation Actions

ID	Organization	Action
2021-19	1-Dacono	Design and Construction of CO Blvd Bridge
2021-20	2-Dacono	Grandview Street and York Street Flood Mitigation

7.3 Town of Eaton

"The Comprehensive Plan for the Town of Eaton is intended to be a statement of the collective vision for Eaton's future. The goals and policies within the plan define the values that are important to the community. …These overall goals set forth our intent and describe our mission." - 2018

Overall Community Goals:

- Preserve a sense of community, high quality schools, a sense of safety, and a sense of history.
- Allow planned growth, high quality and affordable housing, and sustainable growth.
- Encourage the maintenance and improvement of existing commercial and industrial businesses.
- Encourage a balance of new commercial and industrial development that will serve the community's needs.
- Encourage new jobs to keep the economy balanced and provide opportunities for those who wish to live and work in the community.
- Enhance the provision of local services, including those provided by local government or the private sector.
- Enhance the existing community programs that make the Eaton community strong and assure that this sense of community remains strong.
- Promote affordable and comfortable housing for senior citizens and maintain the related programs that support them.
- Avoid land uses and development activities that damage Eaton's environment and its community resources.
- Eliminate any environmental contamination of abandoned buildings and related land uses.
- Manage the growth that is likely to occur in the Eaton community and develop and maintain the new and the existing infrastructure that will serve that growth.
- Work with other community agencies and organizations to solve issues, plan for future growth, and build the best possible Town.

7.3.1 Community Profile

The Town of Eaton is located 7 miles north of Greeley, along US Route 85. It is located on the Denver, Colorado-Cheyenne, Wyoming mainline of the Union Pacific Railroad.

The local economy's foundation has a long history rooted in agriculture. Eaton takes pride in that foundation and considers itself the Town of "Beef, Beets and Beans" Retail businesses, professional services and industrial development have helped to diversify the economy and with continued growth are expected to strengthen the tax base for the Town.

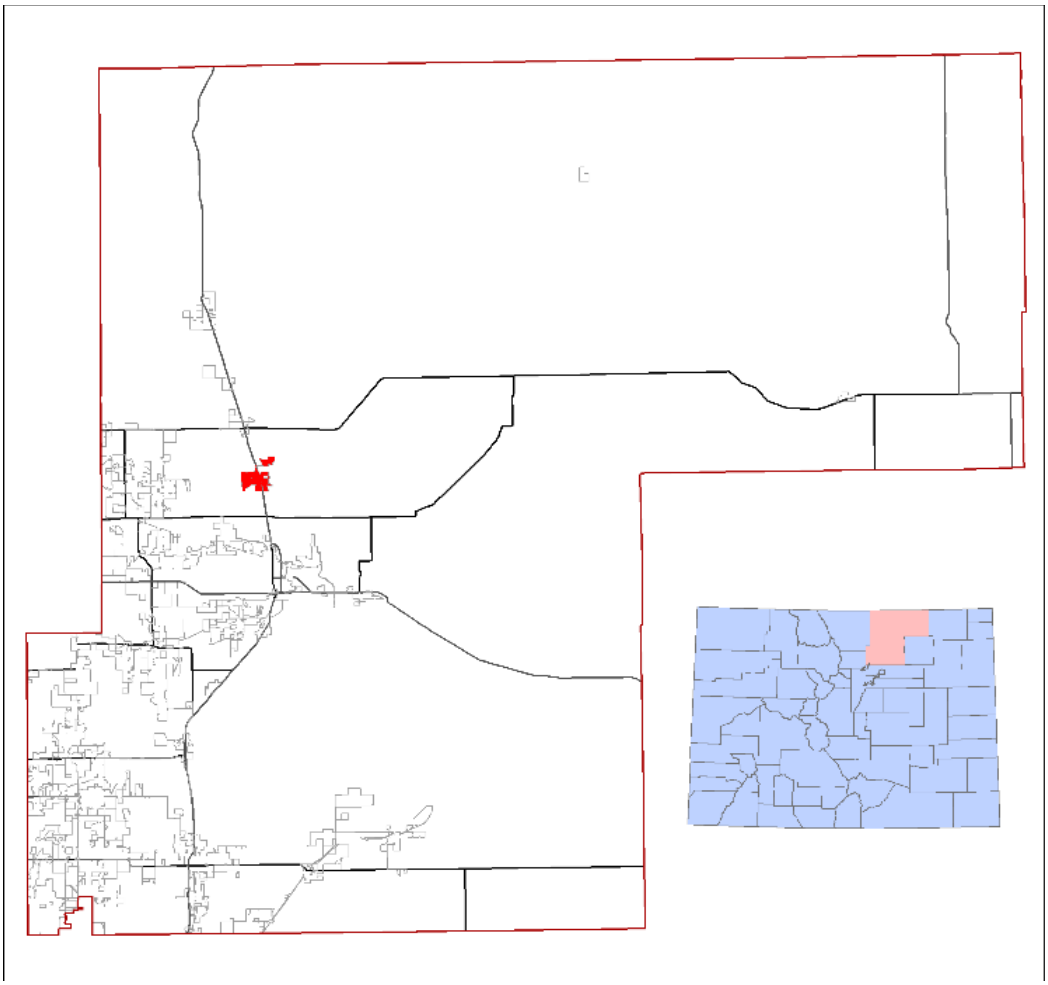


Table 82 shows some development information for the Town of Eaton. Current information for specific characteristics of the population is only available from the US Census Bureau for municipalities with populations over 5,000 people, until each decennial census.

Table 82. Town of Eaton Demographics

Eaton	Colorado	
5,707	5,758,736	Population, 2019
30.3%	14.5%	Population, % change April 1, 2010 to July 1, 2019
2.77	2.56	Persons Per Household, 2019

Note: Recent data is unavailable from the US Census Bureau for some categories, based on the size of the municipality. Source: US Census Bureau

7.3.2 Risk and Vulnerability Assessment

Table 83 summarizes the results of the RF ranking exercise performed by the Town of Eaton. The results represent the relative risk of different hazards across the municipality from the perspective of local stakeholders and subject matter experts. Note the final RF Ranking values in this table include the weighting factors detailed in the Risk Assessment chapter of this Plan.

Table 83. Risk Factor Results for Eaton

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	RF Ranking
Agricultural Hazards	2	3	3	4	4	2.9
Cyber Hazards	3	2	3	4	3	2.8
Drought	3	1	4	1	4	2.5
Earthquake	1	3	3	4	1	2.3
Extreme Temps.	3	1	4	3	1	2.4
Flood	1	1	2	4	2	1.6
Hazmat Release	2	2	4	4	3	2.7
Land Subsidence	1	1	2	4	4	1.8
Prairie Fire	3	2	2	4	1	2.4
Public Health Hazards	4	2	3	1	4	2.9
Severe Storms	4	3	4	2	3	3.4
Tornado & Wind	3	3	3	2	1	2.7

The conclusions drawn from the qualitative assessment are organized into three categories shown in the following table and provide a summary of hazard risk for Eaton as a whole - based on High, Moderate, or Low risk designations. This process helped frame ongoing planning discussions around local and regional hazard risks and assisted with the development of the Plan's updated mitigation strategy.

Table 84. Hazard Risk Conclusions for Eaton

HIGH RISK (2.5 or higher)	**Agricultural Hazards, Cyber Hazards, Drought, Hazmat Release, Public Health Hazards, Severe Storms, Tornado & Straight-Line Wind**
MODERATE RISK (2.0 – 2.4)	**Earthquake, Extreme Temperatures, Prairie Fire**
LOW RISK (1.9 or lower)	**Flood, Land Subsidence**

The following sections highlight the Town of Eaton's High Risk hazards and include any specific content relevant to the Town. They are intended to supplement information included in each hazard profile in the main body of this Plan.

7.3.2.1 Agricultural Hazards (including Disease & Pests)

Vulnerability to agricultural hazards is not noticeably different from the rest of the County. Those communities whose economies are more dependent on the agriculture industry do experience higher risk to these hazards. There are no previous events to document specific to Eaton. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.3.2.2 Cyber Hazards

For any municipality, vulnerability to cyber hazards does not vary from that of the County as a whole. While there are no documented cyber events impacting Eaton, the threat of this hazard is continually increasing. There are no previous events to document specific to Eaton. Future occurrences are

expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.3.2.3 Drought

The community vulnerability to drought is not noticeably different from the rest of the County. Those communities whose economies are more dependent on the agriculture industry do experience higher risk to this hazard. There are no previous events to document specific to Eaton. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.3.2.4 Hazmat Release

Vulnerability to hazmat release is increased for the Town of Eaton, mainly due to the location of a CDOT hazardous materials route through the community. Additionally, railroads span across Eaton which present their own increased risk for hazmat release. As is true for the entire County, the presence of any businesses that store hazardous materials also increases the risk for these types of events.

Based on data supplied by the Pipeline and Hazardous Materials Safety Administration's (PHMSA) Incident Reports Database there have been two events that have occurred within Eaton between 1991 and 2019. These were due to improper preparation for transport and mishandling.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.3.2.5 Public Health Hazards

Vulnerability to public health hazards is not expected to be noticeably different from the rest of the County. Individuals at a higher risk to this hazard include the aging adult population, those with a chronic illness, such as diabetes, asthma, coronary heart disease, and those who are obese or overweight. Other populations at risk include children, those in poverty and those with a disability. This data is collected at census tract level by the Centers for Disease Control (CDC) and is unavailable at a municipality level. The data by census tract can be found in the Colorado Department of Health and Environment Open Data database here.

Future occurrences are expected to mirror that of the County. There are no previous events to document specific to Eaton. Refer to Chapter 5 – Risk Assessment of this Plan for additional details, including a summary of the higher risk population demographics for Weld County and the State.

7.3.2.6 Severe Storms (including Hail, Lightning, & Winter Storm)

Vulnerability to severe storm, which includes hail, lightning, and winter storm, is not noticeably different from the rest of the County. Eaton's more densely developed areas experience the greatest risk, in addition to potential greater losses to the agriculture sector. Any structures not constructed to meet recent building codes experience the greatest risk from structural damages.

According to the NOAA's Storm Events Database, between 2015 and 2020, the Town of Eaton has had eleven severe storm which resulted in reports of hail. The hail in these storms ranged in size from 0.75 inches to 1.75 inches. There was no reported damage to property or crops and no injuries or deaths.

No other events for severe storm, specific to Eaton, were recorded over this time period.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.3.2.7 Tornado & Straight-Line Wind

Vulnerability to tornado & straight-line wind is not noticeably different from the rest of the County. Eaton's more densely developed areas experience the greatest risk, in addition to any structures not constructed to meet recent building codes.

According to the NOAA's Storm Events Database, between 2015 and 2020, one event, an EF0 tornado, was reported. A brief landspout caused minor damage to a farmstead, although no claims for property damage were reported. There were no injuries and no deaths.

No other events for severe storm, specific to Eaton, were recorded over this time period.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.3.3 Capabilities Assessment

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

Planning and regulatory capabilities are powerful tools for implementing hazard mitigation. The Town currently utilizes or has implemented a number of these capabilities shown in Table 85. It is important for all municipalities to regularly review each of these tools, to identify opportunities for further risk reduction efforts.

Table 85. Planning & Regulatory Capabilities

Mitigation Capability	Utilized?	Comments
Comprehensive, Master, or General Plan	Yes	Eaton Comprehensive Plan- last update 10/2020
Capital Improvement Program or Plan (CIP)	No	Future project
Floodplain Management Plan	No	Eaton Draw
Stormwater Program / Plan	No	Water restrictions, Drought Plan next year
Community Wildfire Protection Plan (CWPP)	No	
Erosion / Sediment Control Program	Yes	City of Greeley -standards
Economic Development Plan	No	
Other:	No	
Building Codes (Year)	Yes	2018 Updated building codes- (Procode) 3rd party contractor for inspections
Site Plan Review Requirements	No	Baseline Engineering
Other:	No	
Zoning Ordinance (Land Use)	Yes	
Subdivision Ordinance	Yes	
National Flood Insurance Program (NFIP) Participant	Yes	

Mitigation Capability	Utilized?	Comments
Flood Insurance Study / Flood Insurance Rate Map / DFIRM	Yes	
Floodplain Ordinance	Yes	
Elevation Certificates for Floodplain Development	No	Eaton Draw
Community Rating System (CRS) Participant	No	
Open Space / Conservation Program	No	Tension, retention, no formal program
Growth Management Ordinance	Yes	
Stormwater Ordinance	Yes	
Other Hazard Ordinance (steep slope, wildfire, snow loads, etc.)	No	Building Code- snow load for houses
Other:	No	

Available resources including staff, municipal groups, and technology are all vital for a community to be able to implement hazard mitigation. Eaton is fortunate to have most all of these capabilities identified in Table 86.

Table 86. Administrative & Technical Capabilities

Mitigation Capability	Utilized?	Comments
Planning Commission	Yes	Eaton Planning Commission
Mitigation Planning Committee	No	May be a possibility going forward
Maintenance Programs (tree trimming, clearing drainage, etc.)	Yes	Eaton Public Works, Maintenance
Emergency Manager	Yes	Jeff Schreier
Building Official	Yes	John Gesick
Floodplain Administrator	Yes	Jeff Schreier
Community Planner	Yes	Vince Harris
Transportation Planner	Yes	Vince Harris
Civil Engineer	Yes	Greeley- Brad Curtis
GIS Capability	Yes	Started 2019
Resiliency Planner	No	
Other:	No	
Warning Systems / Services (flood)	No	
Warning Systems / Services (other / multi hazard)	Yes	Code Red, IPAWS
Grant Writing / Management	Yes	Jeff Schreier
Other:	No	

The ability of a community to implement a comprehensive mitigation strategy is largely dependent on available funding. These related municipal capabilities are outlined in Table 87 and show that Eaton utilizes some financial tools that can support mitigation activities.

Table 87. Financial Capabilities

Mitigation Capability	Utilized?	Comments
Levy for Specific Purposes with Voter Approval	No	
Utilities Fees	Yes	Town of Eaton, Water/Sewer/Irrigation/Trash Enterprise funds
System Development / Impact Development Fee	Yes	Impact Fees
General Obligation Bonds to Incur Debt	No	
Special Tax Bonds to Incur Debt	No	
Open Space / Conservation Fund	No	
Stormwater Utility Fees	No	
Capital Improvement Project Funding	No	
Community Development Block Grants (CDBG)	No	future East Eaton, Jeff Schreier on the committee
Withheld spending in hazard-prone areas	No	
Other:	No	

Education and outreach are important capabilities that allow a community to continue the conversation with their public regarding hazard risk and opportunities to mitigate. Table 88 shows that Eaton could benefit by expanding upon these capabilities.

Table 88. Education & Outreach Capabilities

Mitigation Capability	Utilized?	Comments
Public Hazard Education / Outreach Program	No	
Local Citizen Groups That Communicate Hazard Risks	No	
Firewise	No	
NOAA StormReady Program	In Progress	Storm Spotter classes, shelter (board chambers)
Other:	No	

7.3.4 Mitigation Actions

The mitigation actions identified by the Town during the Plan update are included in Table 89.

Table 89. 2021 Mitigation Actions

ID	Organization	Action
2021-21	1-Eaton	Drought Plan Development
2021-22	2-Eaton	Roundabout Collins Rd & CR35
2021-23	3-Eaton	Pump Pit

7.4 Town of Erie

In the 2015 update of the Town of Erie Comprehensive Plan, key principles were created based on the community's aspirations and the ideals for the Town within the planning area.

These key principles are:

- A Coordinated and Efficient Pattern of Growth
- Quality Design and Development
- Provide Infrastructure and Public Services Efficiently and Equitably
- Stable, Cohesive Neighborhoods Offering a Variety of Housing Types
- A Comprehensive, Integrated Transportation System
- Stewardship of the Natural Environment
- Trails, Parks and Recreation Opportunities
- Protected Lands Program
- Balanced Land Use Mix
- Overall Economic Vitality
- Downtown Vitality

7.4.1 Community Profile

The Town of Erie is situated at the center of Colorado's major economic and population hubs. Located in both Boulder and Weld Counties, Erie lies just west of I-25 and spans 48 square miles, extending from the north side of State Highway 52 and south to State Highway 7.

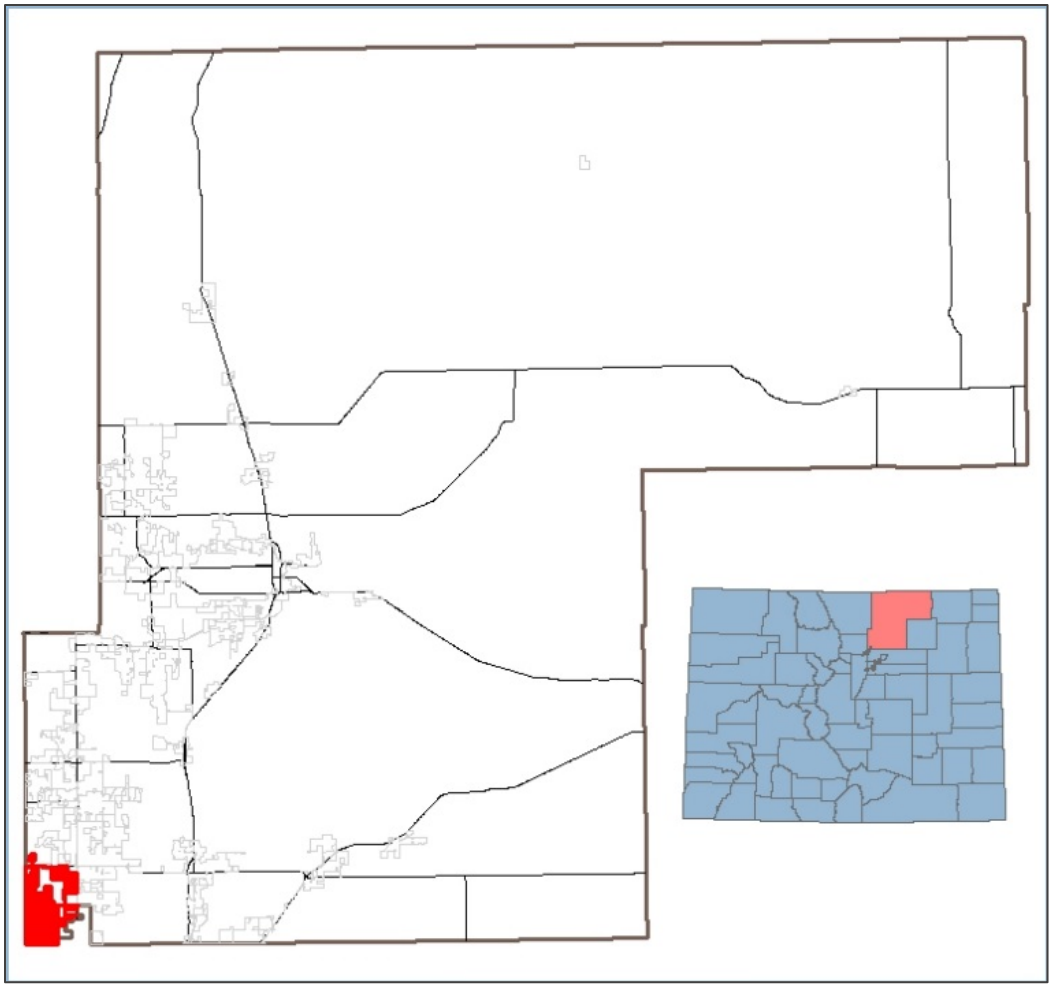


Table 90 summarizes key demographic and development related characteristics of the Town of Erie.

Table 90. Town of Erie Demographics

Erie	Colorado	
27,003	5,758,736	Population, 2019
48.5%	14.5%	Population, % change April 1, 2010 to July 1, 2019
8.4%	5.8%	% Population under 5 years, 2019
30.3%	21.9%	% Population under 19 years, 2019
9.3%	14.6%	% Population 65 years and over, 2019
86.9%	64.9%	Homeownership Rate, 2019
2.95	2.56	Persons Per Household, 2019
$119,973	$68,811	Median Household Income, 2014- 2018
4.5%	9.3%	Persons below poverty level, %, 2014- 2018
2.2%	7.3%	% Population under 65 years, with a disability 2014-2018
11.0%	17%	Language other than English spoken at home, % age 5+, 2014- 2018

Source: US Census Bureau

The Town of Erie has a projected population growth of 4.6% by 2023, estimating the future population to be 31,035. The population growth in Erie has created an economy primarily driven by housing construction and the community is working on diversifying the economy and strengthening the tax base.

7.4.2 Risk and Vulnerability Assessment

The Town of Erie is situated in both Boulder and Weld Counties. For the purpose of this plan, spatially analyzed hazard risks have been only assessed for the areas of Erie that lie specifically within Weld County.

Table 91 summarizes the results of the RF ranking exercise performed by the Town of Erie. The results represent the relative risk of different hazards across the municipality from the perspective of local stakeholders and subject matter experts. Note the final RF Ranking values in this table include the weighting factors detailed in the Risk Assessment chapter of this Plan.

Table 91. Risk Factor Results for Erie

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	RF Ranking
Agricultural Hazards	3	2	3	1	4	2.6
Cyber Hazards	4	2	4	4	4	3.4
Drought	3	3	4	1	4	3.1
Earthquake	1	2	3	4	1	2.0
Extreme Temps.	3	2	3	2	3	2.6
Flood	3	3	3	3	3	3.0
Hazmat Release	3	1	2	4	1	2.1
Land Subsidence	2	1	1	4	1	1.6
Prairie Fire	3	1	1	4	1	1.9
Public Health Hazards	4	3	3	2	4	3.3
Severe Storms	4	3	3	2	1	3.0
Tornado & Wind	2	2	2	4	1	2.1

The conclusions drawn from the qualitative assessment are organized into three categories shown in the following table and provide a summary of hazard risk for Erie as a whole - based on High, Moderate, or Low risk designations. This process helped frame ongoing planning discussions around local and regional hazard risks and assisted with the development of the Plan's updated mitigation strategy.

Table 92. Hazard Risk Conclusions for Erie

HIGH RISK (2.5 or higher)	**Agricultural Hazards, Cyber Hazards, Drought, Extreme Temperatures, Flood, Public Health Hazards, Severe Storms**
MODERATE RISK (2.0 – 2.4)	**Earthquake, Hazmat Release, Tornado & Straight-Line Wind**
LOW RISK (1.9 or lower)	**Land Subsidence, Prairie Fire**

Since the 2016 Plan, the Town has decreased the assessed risk from earthquake, hazmat release, and tornado & straight-line wind to Moderate Risk (all were formerly High). It also decreased the assessed

risk from land subsidence and prairie fire from High to Low. Besides the newly added hazards of agricultural hazards and cyber hazards, all other risk rankings remain the same.

The following sections highlight the Town of Erie's High Risk hazards and include any specific content relevant to the Town. They are intended to supplement information included in each hazard profile in the main body of this Plan.

7.4.2.1 Agricultural Hazards (including Disease & Pests)

Vulnerability to agricultural hazards is not noticeably different from the rest of the County. Those communities whose economies are more dependent on the agriculture industry do experience higher risk to these hazards. There are no previous events to document specific to Erie. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.4.2.2 Cyber Hazards

For any municipality, vulnerability to cyber hazards does not vary from that of the County as a whole. While there are no documented cyber events impacting Erie, the threat of this hazard is continually increasing. There are no previous events to document specific to Erie. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.4.2.3 Drought

The community vulnerability to drought is not noticeably different from the rest of the County. Those communities whose economies are more dependent on the agriculture industry do experience higher risk to this hazard. There are no previous events to document specific to Erie. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.4.2.4 Extreme Temperatures

The Town of Erie's vulnerability to extreme temperatures is not noticeably different from the rest of the County. Those communities whose economies are more dependent on the agriculture industry do experience higher risk to these hazards due to potential crop and livestock losses. Additionally, individuals at a higher risk to extreme temperatures include those with mobility issues, independent living difficulty, the elderly, low-income families, outdoor laborers, and those experiencing homelessness. Data for these demographics is collected at census tract level, however snapshot data for populations that can fluctuate drastically, such as the number of outdoor laborers and those experiencing homelessness is not included. These are still considerable populations in the County and the Town of Erie and local efforts to quantify these populations periodically can help with mitigation planning.

The data for high risk populations has been analyzed by Colorado Department of Public Health and Environment (CDPHE) and has been used to create Community Inclusions maps. These maps can be zoomed into specific census tracts for municipalities and communities, illustrating the population variances. Refer to Chapter 4 for examples of these maps for Weld County.

There are no previous events to document specific to the Town of Erie. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.4.2.5 Flood (including Dam & Levee Failure)

Flood is a very localized hazard and vulnerability is unique for each municipality. According to the NOAA's Storm Events Database, a flood caused by heavy rain, on 5/8/2015, impacted Erie. The flood caused $500,000 in property damages and $100,000 in crop damages. There were no injuries or deaths.

The Town of Erie's overall vulnerability to flood is noticeably lower than the rest of the County. Erie spans both Boulder and Weld Counties and the information for vulnerability includes only those address points within Weld County. Erie has 37 address points located in the Special Flood Hazard Area (SFHA). This equates to 0.5% of all address points for the Town, as compared to 1.6% of Countywide addresses located in the SFHA.

Flood events can also occur as a result of dam or levee failure. In these cases, flood waters may not follow the typical floodplains mapped as the SFHA.

Overall vulnerability to flooding in dam inundation areas is increased for the Town of Erie, where 1.6% of address points (112) are located within these dam inundation areas. This is a larger percentage of structures at risk, as compared to 1.0% of Countywide addresses located in these areas.

Additionally, the Town is the first jurisdiction downstream from four dams. Two of these have a hazard classification of Significant or High, both of which have Emergency Action Plans (EAPs). Additional information pertaining to dams can be referenced at the State's Dam Safety website: https://dwr.state.co.us/Tools/DamSafety/Dams .

Overall vulnerability to flooding in areas protected by known levees is increased for the Town of Erie, where 5.6% of address points (400) are located within levee protected areas. This is a larger percentage of structures at risk, as compared to 1.6% of Countywide addresses located in protected areas.

It is important to note that this analysis is only as good as best available data allows. Current floodplains, dam inundation areas, and areas protected by levees may not currently map all hazard areas. Additionally, mapped hazard areas may be dated and in need of updated mapping and analysis.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

There are currently two Repetitive Loss (SRL) structures in Erie. Additional details pertaining to this and FEMA's National Flood Insurance Program (NFIP) can be found in this Plan's flood chapter.

7.4.2.6 Public Health Hazards

Vulnerability to public health hazards is not expected to be noticeably different from the rest of the County. Individuals at a higher risk to this hazard include the aging adult population, those with a chronic illness, such as diabetes, asthma, coronary heart disease, and those who are obese or overweight. Other populations at risk include children, those in poverty and those with a disability. This data is collected at census tract level by the Centers for Disease Control (CDC) and is unavailable at a municipality level. The data by census tract can be found in the Colorado Department of Health and Environment Open Data database here.

Future occurrences are expected to mirror that of the County. There are no previous events to document specific to Erie. Refer to Chapter 5 – Risk Assessment of this Plan for additional details, including a summary of the higher risk population demographics for Weld County and the State.

7.4.2.7 Severe Storm (including Hail, Lightning, & Winter Storm)

Vulnerability to severe storm, which includes hail, lightning, and winter storm, is not noticeably different from the rest of the County. Erie's more densely developed areas experience the greatest risk, in addition to potential greater losses to the agriculture sector. Any structures not constructed to meet recent building codes experience the greatest risk from structural damages.

According to the NOAA's Storm Events Database, between 2015 and 2020, the Town of Erie has had eight severe storm events. Seven of these events resulted in reports of hail, which ranged in size from 0.75 inches to 1.5 inches. None of these events resulted in damage to property or crops and no injuries or deaths.

One event, on 7/25/2018, was reported as thunderstorm winds with magnitudes of 61mph and 70 mph. This storm produced large hail, damaging winds and heavy rain. The storm knocked out power, dented cars and damaged trees. Near Jasper Road east of U.S. 287, the storm picked up a 40-foot grain trailer and pushed it almost 200 yards.

No other events for severe storm, specific to Erie, were recorded over this time period.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.4.3 Capabilities Assessment

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

Planning and regulatory capabilities are powerful tools for implementing hazard mitigation. The Town currently utilizes or has implemented most of these capabilities shown in Table 93. It is important for all municipalities to regularly review each of these tools, to identify opportunities for further risk reduction efforts.

Table 93. Planning & Regulatory Capabilities

Mitigation Capability	Utilized?	Comments
Comprehensive, Master, or General Plan	Yes	Master Plan
Capital Improvement Program or Plan (CIP)	Yes	5-Year CIP Plan
Floodplain Management Plan	Yes	
Stormwater Program / Plan	Yes	
Community Wildfire Protection Plan (CWPP)	No	
Erosion / Sediment Control Program	Yes	
Economic Development Plan	Yes	
Other:	No	
Building Codes (Year)	Yes	2015
Site Plan Review Requirements	Yes	
Other:	No	

Mitigation Capability	Utilized?	Comments
Zoning Ordinance (Land Use)	Yes	
Subdivision Ordinance	Yes	
National Flood Insurance Program (NFIP) Participant	Yes	
Flood Insurance Study / Flood Insurance Rate Map / DFIRM	Yes	
Floodplain Ordinance	Yes	
Elevation Certificates for Floodplain Development	No	
Community Rating System (CRS) Participant	No	
Open Space / Conservation Program	Yes	
Growth Management Ordinance	No	
Stormwater Ordinance	Yes	
Other Hazard Ordinance (steep slope, wildfire, snow loads, etc.)	Yes	
Other:	No	

Available resources including staff, municipal groups, and technology are all vital for a community to be able to implement hazard mitigation. Erie is fortunate to have many of these capabilities identified in Table 94.

Table 94. Administrative & Technical Capabilities

Mitigation Capability	Utilized?	Comments
Planning Commission	Yes	
Mitigation Planning Committee	No	
Maintenance Programs (tree trimming, clearing drainage, etc.)	Yes	
Emergency Manager	Yes	
Building Official	Yes	
Floodplain Administrator	Yes	
Community Planner	Yes	
Transportation Planner	No	
Civil Engineer	Yes	
GIS Capability	Yes	
Resiliency Planner	No	
Other:	No	
Warning Systems / Services (flood)	No	
Warning Systems / Services (other / multi hazard)	No	
Grant Writing / Management	No	
Other:	No	

The ability of a community to implement a comprehensive mitigation strategy is largely dependent on available funding. These related municipal capabilities are outlined in Table 95 and show that Erie utilizes a broad range of financial tools that can support mitigation activities.

Table 95. Financial Capabilities

Mitigation Capability	Utilized?	Comments
Levy for Specific Purposes with Voter Approval	No	
Utilities Fees	Yes	
System Development / Impact Development Fee	Yes	
General Obligation Bonds to Incur Debt	Yes	
Special Tax Bonds to Incur Debt	No	
Open Space / Conservation Fund	Yes	
Stormwater Utility Fees	No	
Capital Improvement Project Funding	Yes	
Community Development Block Grants (CDBG)	No	
Withheld spending in hazard-prone areas	No	
Other:	No	

Education and outreach are important capabilities that allow a community to continue the conversation with their public regarding hazard risk and opportunities to mitigate. Table 96 shows that Erie could benefit by expanding upon these capabilities.

Table 96. Education & Outreach Capabilities

Mitigation Capability	Utilized?	Comments
Public Hazard Education / Outreach Program	No	
Local Citizen Groups That Communicate Hazard Risks	No	
Firewise	No	
NOAA StormReady Program	No	
Other:		

7.4.4 Plan Maintenance and Implementation

The Town of Erie has developed a Plan Maintenance and Implementation Strategy outlining their method and schedule for keeping the plan current. The Implementation Strategy below also includes a discussion of how the Town will continue public participation in the plan maintenance process.

- The Town of Erie will follow Boulder County's schedule for plan monitoring, revision, and maintenance. Mitigation Actions will be monitored and administered by appropriate Town Departments (i.e. - Administration, Police and Public Works).
- The Town is participating in Hazard Mitigation Plans with both Boulder and Weld County. Plans will be made public (online) when they are brought forward for Board approval. Any changes to these plans requiring Board approval would also be made public.

7.4.5 Integrating Hazard Mitigation into Local Planning

The Town also identified ways to integrate hazard mitigation into their local planning mechanisms and policies. Following are the specific integration strategies identified by the Town of Erie.

- The Town will update our Capital Improvement Plans to integrate our mitigation actions.

7.4.6 Mitigation Actions

The new mitigation actions identified by the Town during the Plan update are included in Table 97Table 73. Three actions from the 2016 Plan have been carried over into the Town's updated mitigation strategy.

Table 97. 2021 Mitigation Actions

ID	Organization	Action
2021-24	1-Erie	County Line Rd, Tellane to Cheeseman
2021-25	2- Erie	Coal Creek Improvements Reach 1
2021-26	3-Erie	Coal Creek Improvements reach 2
2021-27	4-Erie	Coal Creek Improvements reach 3
2021-28	5-Erie	Old Town Drainage Improvements
2021-29	6-Erie	Zone 3 Storage Tank
2021-30	7-Erie	Well Project
2021-31	8-Erie	Zone 2 Water System Improvements
2021-32	9-Erie	Zone 3 Storage Tank
2021-33	10-Erie	Zone 3 Waterline Improvements
2021-34	11-Erie	Erie Parkway & WCR 7 Intersection Improvements
2021-35	12-Erie	Signal Communications Project

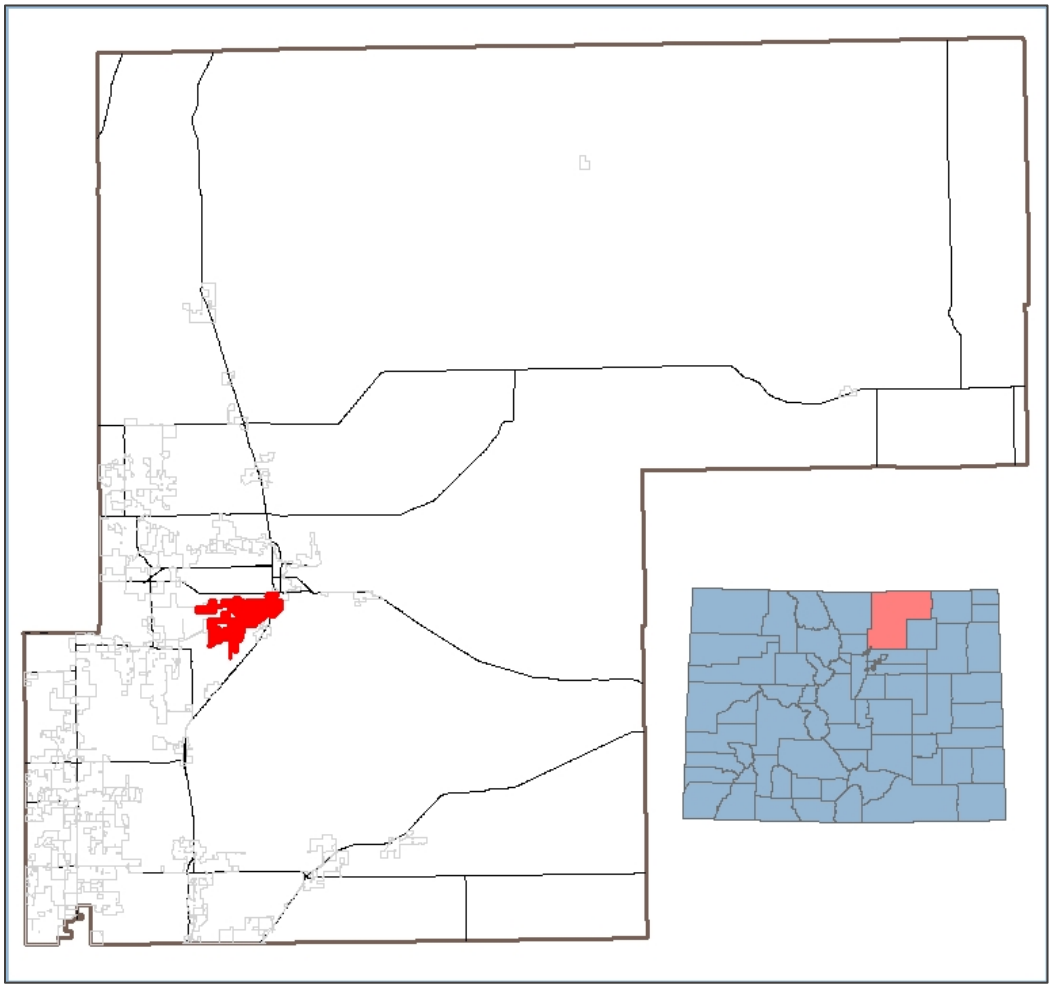
7.5 City of Evans

In the current City of Evans Comprehensive Plan, the City adopted a set of Strategic Priorities which encompasses their principles, informs their goals and guides their actions. These priorities are:

- Economic Development
- Infrastructure Development
- Regional Leadership
- Public Safety

7.5.1 Community Profile

The City of Evans is located in northern Colorado at the crossroads of US Highway 85 and US Highway 34. Evans is located just south of Greeley and was once the County seat of Weld County. Evans is the second most populated municipality in the County with a population of 21,205 according to the US Census Bureau (2019).



The table below summarizes key demographic and development related characteristics of the City of Evans.

Table 98. City of Evans Demographics

Evans	Colorado	
21,205	5,758,736	Population, 2019
14.6%	14.5%	Population, % change April 1, 2010 to July 1, 2019
8.9%	5.8%	% Population under 5 years, 2019
29.8%	21.9%	% Population under 19 years, 2019
6.6%	14.6%	% Population 65 years and over, 2019
62.0%	64.9%	Homeownership Rate, 2019
3.04	2.56	Persons Per Household, 2019
$58,405	$68,811	Median Household Income, 2014- 2018
12.7%	9.3%	Persons below poverty level, %, 2014- 2018
6.6%	7.3%	% Population under 65 years, with a disability 2014-2018
30.7%	17%	Language other than English spoken at home, % age 5+, 2014- 2018

Source: US Census Bureau

The City of Evans has a diverse economy, which is primarily driven by construction, retail trade and personal & professional services. The City has focused its infrastructure projects on upgrading outdated infrastructure and redeveloping roads to accommodate for the growth and increased traffic.

7.5.2 Risk and Vulnerability Assessment

Table 99 summarizes the results of the RF ranking exercise performed by the City of Evans. The results represent the relative risk of different hazards across the municipality from the perspective of local stakeholders and subject matter experts. Note the final RF Ranking values in this table include the weighting factors detailed in the Risk Assessment chapter of this Plan.

Table 99. Risk Factor Results for Evans

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	RF Ranking
Agricultural Hazards	1	0.5	2	1	4	1.4
Cyber Hazards	3	4	2	4	4	3.3
Drought	3	3	4	1	4	3.1
Earthquake	1	1	3	2	1	1.5
Extreme Temps.	3	1	1	1	2	1.7
Flood	2	4	2	1	4	2.7
Hazmat Release	3	2	2	4	3	2.6
Land Subsidence	1	1	1	1	1	1.0
Prairie Fire	2	1	2	1	1	1.5
Public Health Hazards	4	4	3	1	4	3.5
Severe Storms	3	3	3	4	1	2.9
Tornado & Wind	3	3	3	4	1	2.9

The conclusions drawn from the qualitative assessment are organized into three categories shown in the following table and provide a summary of hazard risk for Evans as a whole - based on High, Moderate, or

Low risk designations. This process helped frame ongoing planning discussions around local and regional hazard risks and assisted with the development of the Plan's updated mitigation strategy.

Table 100. Hazard Risk Conclusions for Evans

HIGH RISK (2.5 or higher)	**Cyber Hazards, Drought, Flood, Hazmat Release, Public Health Hazards, Severe Storms, Tornado & Straight-Line Wind**
MODERATE RISK (2.0 – 2.4)	
LOW RISK (1.9 or lower)	**Agricultural Hazards, Earthquake, Extreme Temperatures, Land Subsidence, Prairie Fire**

Since the 2016 Plan, the City has decreased the assessed risk from earthquake, extreme temperatures, land subsidence, and prairie fire to Low Risk (all formerly High). Besides the newly added hazards of agricultural hazards and cyber hazards, all other risk rankings remain the same.

The following sections highlight the City of Evan's High Risk hazards and include any specific content relevant to the City. They are intended to supplement information included in each hazard profile in the main body of this Plan.

7.5.2.1 Cyber Hazards

For any municipality, vulnerability to cyber hazards does not vary from that of the County as a whole. While there are no documented cyber events impacting Evans, the threat of this hazard is continually increasing. There are no previous events to document specific to the City of Evans. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.5.2.2 Drought

The community vulnerability to drought is not noticeably different from the rest of the County. Those communities whose economies are more dependent on the agriculture industry do experience higher risk to this hazard. There are no previous events to document specific to the City of Evans. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.5.2.3 Flood (including Dam & Levee Failure)

Flood is a very localized hazard and vulnerability is unique for each municipality. There are no previous events to document specific to Evans.

The City of Evans' overall vulnerability to flood is not noticeably different from the rest of the County. Evans has 159 address points located in the Special Flood Hazard Area (SFHA). This equates to 1.7% of all address points for the City, as compared to 1.6% of Countywide addresses located in the SFHA.

Flood events can also occur as a result of dam or levee failure. In these cases, flood waters may not follow the typical floodplains mapped as the SFHA.

Overall vulnerability to flooding in dam inundation areas is increased for the City of Evans, where 14.0% of address points (1,332) are located within these dam inundation areas. This is a larger percentage of structures at risk, as compared to 1.0% of Countywide addresses located in these areas.

Additionally, the City is the first jurisdiction downstream from eight dams. Two of these have a hazard classification of Significant or High, both of which have Emergency Action Plans (EAPs). Additional information pertaining to dams can be referenced at the State's Dam Safety website: https://dwr.state.co.us/Tools/DamSafety/Dams .

Overall vulnerability to flooding in areas protected by known levees is increased for the City of Evans, where 9.5% of address points (904) are located within levee protected areas. This is a larger percentage of structures at risk, as compared to 1.6% of Countywide addresses located in protected areas.

It is important to note that this analysis is only as good as best available data allows. Current floodplains, dam inundation areas, and areas protected by levees may not currently map all hazard areas. Additionally, mapped hazard areas may be dated and in need of updated mapping and analysis.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.5.2.4 Hazmat Release

Vulnerability to hazmat release is increased for the City of Evans, mainly due to the location of a CDOT hazardous materials route through the community. Additionally, railroads which span across Evans present their own increased risk for hazmat release. As is true for the entire County, the presence of any businesses that store hazardous materials also increases the risk for these types of events.

Based on data supplied by the Pipeline and Hazardous Materials Safety Administration's (PHMSA) Incident Reports Database there have been 35 events that have occurred within Evans between 1991 and 2019. All events involved leakage, spillage or damage due to improper transportation preparation or handling.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.5.2.5 Public Health Hazards

Vulnerability to public health hazards is not expected to be noticeably different from the rest of the County. Individuals at a higher risk to this hazard include the aging adult population, those with a chronic illness, such as diabetes, asthma, coronary heart disease, and those who are obese or overweight. Other populations at risk include children, those in poverty and those with a disability. This data is collected at census tract level by the Centers for Disease Control (CDC) and is unavailable at a municipality level. The data by census tract can be found in the Colorado Department of Health and Environment Open Data database here.

Future occurrences are expected to mirror that of the County. There are no previous events to document specific to the City of Evans. Refer to Chapter 5 – Risk Assessment of this Plan for additional details, including a summary of the higher risk population demographics for Weld County and the State.

7.5.2.6 Severe Storm (including Hail, Lightning, & Winter Storm)

Vulnerability to severe storm, which includes hail, lightning, and winter storm, is not noticeably different from the rest of the County. The City of Evan's more densely developed areas experience the greatest risk, in addition to potential greater losses to the agriculture sector. Any structures not constructed to meet recent building codes experience the greatest risk from structural damages.

According to the NOAA's Storm Events Database, between 2015 and 2020, the City of Evans has had five severe storm events. These events were reports of hail, which ranged in size from 0.88 inches to

1.5 inches. None of these events resulted in reported damage to property or crops and no injuries or deaths.

No other events for severe storm, specific to Evans, were recorded over this time period.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.5.2.7 Tornado & Straight-Line Wind

Vulnerability to tornado & straight-line wind is not noticeably different from the rest of the County. Evans' more densely developed areas experience the greatest risk, in addition to any structures not constructed to meet recent building codes.

Between 2015 and 2020, there were no reports of occurrences specific to Evans. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.5.3 Capabilities Assessment

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

Planning and regulatory capabilities are powerful tools for implementing hazard mitigation. The City currently utilizes or has implemented most of these capabilities shown in Table 101. It is important for all municipalities to regularly review each of these tools, to identify opportunities for further risk reduction efforts.

Table 101. Planning & Regulatory Capabilities

Mitigation Capability	Utilized?	Comments
Comprehensive, Master, or General Plan	Yes	Currently being updated, completion 2021
Capital Improvement Program or Plan (CIP)	Yes	Updated 2020/Annually
Floodplain Management Plan	Yes	Enforced by ordinance, Todd Hepworth
Stormwater Program / Plan	Yes	Updated 2020
Community Wildfire Protection Plan (CWPP)	No	Under jurisdiction of Evans Fire District
Erosion / Sediment Control Program	Yes	Part of MS4 updated in 2020
Economic Development Plan	Yes	Included in master planning effort
Other:	Yes	THIRA/HIRA included in master plan
Building Codes (Year)	Yes	Current IBC 2018
Site Plan Review Requirements	Yes	Part of land development code/design requirements
Other:	No	
Zoning Ordinance (Land Use)	Yes	Part of code and comprehensive plan
Subdivision Ordinance	Yes	Part of code and comprehensive plan

Mitigation Capability	Utilized?	Comments
National Flood Insurance Program (NFIP) Participant	Yes	Part of comprehensive plan/land use regulations
Flood Insurance Study / Flood Insurance Rate Map / DFIRM	Yes	2021 Update in process
Floodplain Ordinance	Yes	Current with FEMA requirements
Elevation Certificates for Floodplain Development	Yes	
Community Rating System (CRS) Participant	No	Under consideration
Open Space / Conservation Program	Yes	Part of development - % of open space preservation
Growth Management Ordinance	Yes	CPA with Weld County, IGA with Evans, Greeley, Kersey
Stormwater Ordinance	Yes	Ties to MS4 Program
Other Hazard Ordinance (steep slope, wildfire, snow loads, etc.)	Yes	Included in Master Plan
Other:	Yes	Weight limit posting on bridges

Available resources including staff, municipal groups, and technology are all vital for a community to be able to implement hazard mitigation. Evans is fortunate to have most all of these capabilities identified in Table 102.

Table 102. Administrative & Technical Capabilities

Mitigation Capability	Utilized?	Comments
Planning Commission	Yes	Meets monthly
Mitigation Planning Committee	Yes	Informal group of partners
Maintenance Programs (tree trimming, clearing drainage, etc.)	Yes	Normal daily activities
Emergency Manager	Yes	Part time/temporary
Building Official	Yes	Contract
Floodplain Administrator	Yes	Todd Hepworth
Community Planner	Yes	Lauren Richardson
Transportation Planner	No	
Civil Engineer	Yes	City Engineer with two Civil Engineer Reports
GIS Capability	Yes	ARCGIS - Anna Jereb
Resiliency Planner	No	
Other:	Yes	Economic Development Manager/Community Development Director/Neighborhood Services/Compliance
Warning Systems / Services (flood)	No	
Warning Systems / Services (other / multi hazard)	Yes	Code Red, IPAWS, Reverse 911
Grant Writing / Management	Yes	Finance/Comm. Dev./Engineering/Operations
Other:	Yes	City Attorney, Staffed EOC

The ability of a community to implement a comprehensive mitigation strategy is largely dependent on available funding. These related municipal capabilities are outlined in Table 103 and show that Evans utilizes a broad range of financial tools that can support mitigation activities.

Table 103. Financial Capabilities

Mitigation Capability	Utilized?	Comments
Levy for Specific Purposes with Voter Approval	Yes	Submitted as a ballot measure as needed
Utilities Fees	Yes	Enterprise funds
System Development / Impact Development Fee	Yes	Part of City fee schedule
General Obligation Bonds to Incur Debt	Yes	City does not currently have any. In order to obtain voter approval required.
Special Tax Bonds to Incur Debt	Yes	City does not currently have any. In order to obtain voter approval required.
Open Space / Conservation Fund	Yes	Conservation trust fund in place
Stormwater Utility Fees	Yes	Updated 2019
Capital Improvement Project Funding	Yes	CIP funds included annually in budget
Community Development Block Grants (CDBG)	Yes	Through Weld County/State
Withheld spending in hazard-prone areas	No	
Other:	Yes	CDOT/GOCO/State Parks/Safe Routes to School etc.

Education and outreach are important capabilities that allow a community to continue the conversation with their public regarding hazard risk and opportunities to mitigate. Table 104 shows that Evans does leverage some of these capabilities and is currently working on expanding these efforts.

Table 104. Education & Outreach Capabilities

Mitigation Capability	Utilized?	Comments
Public Hazard Education / Outreach Program	Yes	Various community outreach programs
Local Citizen Groups That Communicate Hazard Risks	No	
Firewise	No	
NOAA StormReady Program	Yes	Storm Spotter Training/NWS Spotters
Other:	No	

7.5.4 Mitigation Actions

The new mitigation actions identified by the City during the Plan update are included in Table 105Table 73. One action from the 2016 Plan have been carried over into the City's updated mitigation strategy.

Table 105. 2021 Mitigation Actions

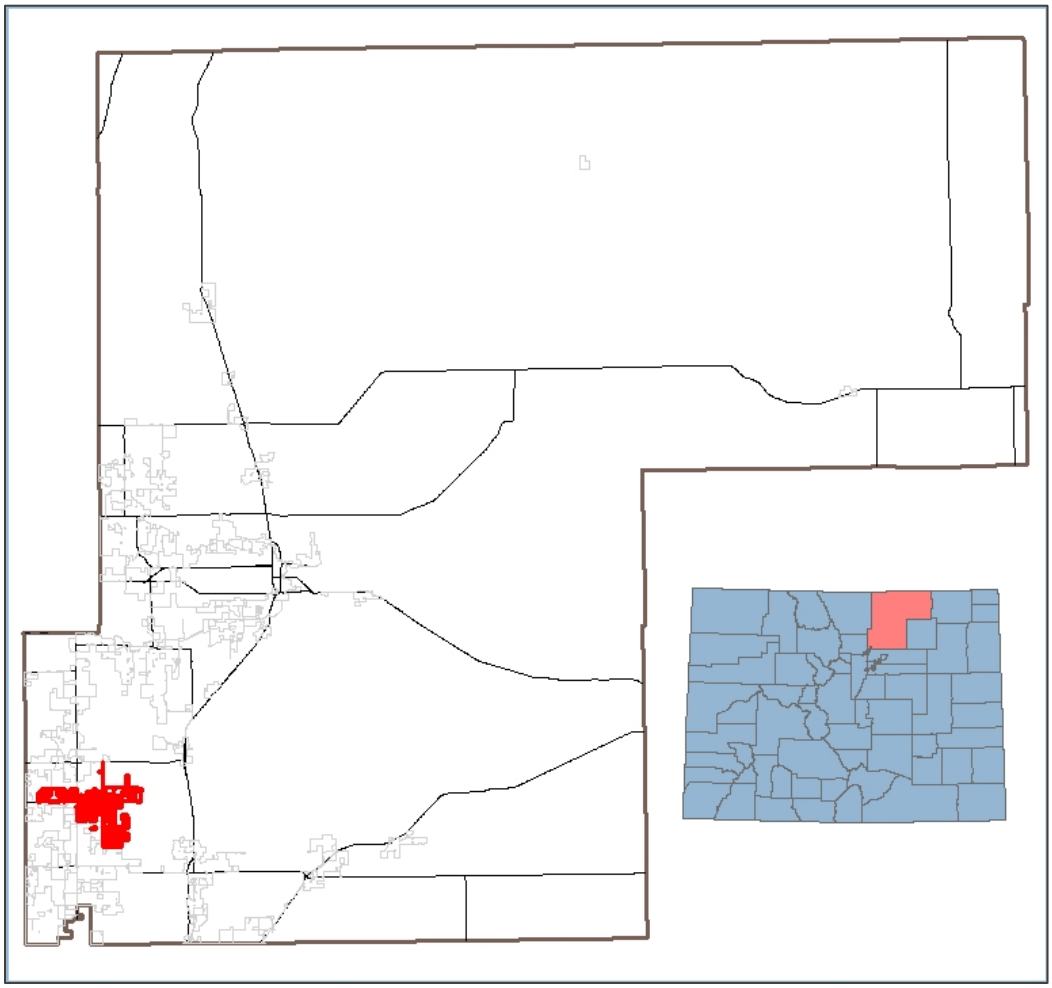
ID	Organization	Action
2021-36	1-Evans	31st St Stormwater Outfall
2021-37	2-Evans	Bay at the Landings Inlet Flood Mitigation
2021-38	3-Evans	Community Impact Study -Vulnerable Populations-Shelter Capabilities Planning

7.6 Town of Firestone

"The Town of Firestone is a unique community of citizens, businesses, and governments that are united in creating a stable, safe, prosperous, and healthful environment in which to live, work, worship, learn, recreate and exercise the rights and freedoms provided by the United States Constitution."
– Firestone Master Plan 2013

7.6.1 Community Profile

The Town of Firestone is located on the northern edge of the Denver-Boulder metropolitan area along Interstate 25, midway between Denver and Fort Collins, just east of Longmont. Firestone's boundary is approximately 7,774 acres with a planning area of about 56 square miles. The Town of Firestone offers residents the charm of a small town along with easy access to the Rocky Mountains, front range communities, parks, trails, schools, community events, and more.



Firestone is part of the Carbon Valley area which also includes the Towns of Frederick and the City of Dacono. The three municipalities share a Chamber of Commerce and a Park and Recreation District. They are represented in the Carbon Valley Emergency Management Agency, which also includes the Frederick Fire Protection District and Mountain View Fire Rescue. The municipalities work with their specific stakeholders in determining risks and vulnerabilities, however the unique agreement between them is important to planning efforts.

Table 106 summarizes key demographic and development related characteristics of the Town of Firestone.

Table 106. Town of Firestone Demographics

Firestone	Colorado	
16,177	5,758,736	Population, 2019
58.6%	14.5%	Population, % change April 1, 2010 to July 1, 2019
7.9%	5.8%	% Population under 5 years, 2019
30.0%	21.9%	% Population under 19 years, 2019
9.2%	14.6%	% Population 65 years and over, 2019
88.6%	64.9%	Homeownership Rate, 2019
3.09	2.56	Persons Per Household, 2019
$97,102	$68,811	Median Household Income, 2014- 2018
3.6%	9.3%	Persons below poverty level, %, 2014- 2018
6.7%	7.3%	% Population under 65 years, with a disability 2014-2018
10.4%	17%	Language other than English spoken at home, % age 5+, 2014- 2018

Source: US Census Bureau

7.6.2 Risk and Vulnerability Assessment

Table 107 summarizes the results of the RF ranking exercise performed by the Town of Firestone. The results represent the relative risk of different hazards across the municipality from the perspective of local stakeholders and subject matter experts. Note the final RF Ranking values in this table include the weighting factors detailed in the Risk Assessment chapter of this Plan.

Table 107. Risk Factor Results for Firestone

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	RF Ranking
Agricultural Hazards	3	3	4	1	4	3.1
Cyber Hazards	3	4	4	4	4	3.7
Drought	3	2	4	1	4	2.8
Earthquake	1	2	4	1	1	1.9
Extreme Temps.	2	2	2	1	3	2.0
Flood	3	3	4	2	4	3.2
Hazmat Release	3	2	2	3	2	2.4
Land Subsidence	1	1	1	2	1	1.1
Prairie Fire	3	2	1	4	3	2.4
Public Health Hazards	4	2	4	1	3	3.0
Severe Storms	4	3	4	3	2	3.4
Tornado & Wind	3	4	2	4	4	3.3

The conclusions drawn from the qualitative assessment are organized into three categories shown in the following table and provide a summary of hazard risk for Firestone as a whole - based on High, Moderate, or Low risk designations. This process helped frame ongoing planning discussions around

local and regional hazard risks and assisted with the development of the Plan's updated mitigation strategy.

Table 108. Hazard Risk Conclusions for Firestone

HIGH RISK (2.5 or higher)	**Agricultural Hazards, Cyber Hazards, Drought, Flood, Public Health Hazards, Severe Storms, Tornado & Straight-Line Wind**
MODERATE RISK (2.0 – 2.4)	**Extreme Temperatures, Hazmat Release, Prairie Fire**
LOW RISK (1.9 or lower)	**Earthquake, Land Subsidence**

Since the 2016 Plan, the Town has increased the assessed risk from drought and public health hazards to High Risk (both formerly Low). Severe storms and tornado & straight-line wind also elevated from Moderate to High Risk. Besides the newly added hazards of agricultural hazards and cyber hazards, all other risk rankings remain the same.

The following sections highlight the Town of Firestone's High Risk hazards and include any specific content relevant to the Town. They are intended to supplement information included in each hazard profile in the main body of this Plan.

7.6.2.1 Agricultural Hazards (including Disease & Pests)

Vulnerability to agricultural hazards is not noticeably different from the rest of the County. Those communities whose economies are more dependent on the agriculture industry do experience higher risk to these hazards. There are no previous events to document specific to the Town of Firestone. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.6.2.2 Cyber Hazards

For any municipality, vulnerability to cyber hazards does not vary from that of the County as a whole. While there are no documented cyber events impacting the Town of Firestone, the threat of this hazard is continually increasing. There are no previous events to document specific to Firestone. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.6.2.3 Drought

The community vulnerability to drought is not noticeably different from the rest of the County. Those communities whose economies are more dependent on the agriculture industry do experience higher risk to this hazard. There are no previous events to document specific to the Town of Firestone. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.6.2.4 Flood (including Dam & Levee Failure)

Flood is a very localized hazard and vulnerability is unique for each municipality. There are no previous events to document specific to the Town of Firestone.

The Town of Firestone's overall vulnerability to flood is noticeably different from the rest of the County. Firestone has 51 address points located in the Special Flood Hazard Area (SFHA). This

equates to 0.8% of all address points for the Town, as compared to 1.6% of Countywide addresses located in the SFHA.

Flood events can also occur as a result of dam or levee failure. In these cases, flood waters may not follow the typical floodplains mapped as the SFHA.

Overall vulnerability to flooding in dam inundation areas is increased for Firestone, where 6.8% of address points (434) are located within these dam inundation areas. This is a larger percentage of structures at risk, as compared to 1.0% of Countywide addresses located in these areas.

Additionally, the Town is the first jurisdiction downstream from one dam. It has a hazard classification of Significant and does have an Emergency Action Plan (EAP). Additional information pertaining to dams can be referenced at the State's Dam Safety website: https://dwr.state.co.us/Tools/DamSafety/Dams .

The Town of Firestone's overall vulnerability to flooding in areas protected by known levees is significantly different from the rest of the County. Firestone has no address points located within levee protected areas, compared to 1.6% of Countywide addresses located in these areas.

It is important to note that this analysis is only as good as best available data allows. Current floodplains, dam inundation areas, and areas protected by levees may not currently map all hazard areas. Additionally, mapped hazard areas may be dated and in need of updated mapping and analysis.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.6.2.5 Public Health Hazards

Vulnerability to public health hazards is not expected to be noticeably different from the rest of the County. Individuals at a higher risk to this hazard include the aging adult population, those with a chronic illness, such as diabetes, asthma, coronary heart disease, and those who are obese or overweight. Other populations at risk include children, those in poverty and those with a disability. This data is collected at census tract level by the Centers for Disease Control (CDC) and is unavailable at a municipality level. The data by census tract can be found in the Colorado Department of Health and Environment Open Data database here.

Future occurrences are expected to mirror that of the County. There are no previous events to document specific to Firestone. Refer to Chapter 5 – Risk Assessment of this Plan for additional details, including a summary of the higher risk population demographics for Weld County and the State.

7.6.2.6 Severe Storm (including Hail, Lightning, & Winter Storm)

Vulnerability to severe storm, which includes hail, lightning, and winter storm, is not noticeably different from the rest of the County. Firestone's more densely developed areas experience the greatest risk, in addition to potential greater losses to the agriculture sector. Any structures not constructed to meet recent building codes experience the greatest risk from structural damages.

According to the NOAA's Storm Events Database, between 2015 and 2020, the Town of Firestone has had fourteen severe storm events. Twelve of these events resulted in reports of hail, which ranged in size from 0.75 inches to 1.75 inches. None of these events resulted in reported damage to property or crops and no injuries or deaths.

Two events were reported as thunderstorm winds with magnitudes of 52 mph and 70 mph. One storm uprooted trees, but for both events there was no damage to property or crops and no injuries or deaths in Firestone.

No other events for severe storm, specific to Firestone, were recorded over this time period.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.6.2.7 Tornado & Straight-Line Wind

Vulnerability to tornado & straight-line wind is not noticeably different from the rest of the County. Firestone's more densely developed areas experience the greatest risk, in addition to any structures not constructed to meet recent building codes.

Between 2015 and 2020, there were no reports of occurrences specific to Firestone. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.6.3 Capabilities Assessment

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

Planning and regulatory capabilities are powerful tools for implementing hazard mitigation. The Town currently utilizes or has implemented many of these capabilities shown in Table 109. It is important for all municipalities to regularly review each of these tools, to identify opportunities for further risk reduction efforts.

Table 109. Planning & Regulatory Capabilities

Mitigation Capability	Utilized?	Comments
Comprehensive, Master, or General Plan	Yes	
Capital Improvement Program or Plan (CIP)	Yes	
Floodplain Management Plan	No	
Stormwater Program / Plan	Yes	Stormwater Coordinator on staff overseeing the MS4 Program Pollution Prevention Strategy, along with SOP's for departments
Community Wildfire Protection Plan (CWPP)	No	
Erosion / Sediment Control Program	Yes	MS4 Program for all municipal construction activities, landscaped areas, street maintenance and utility and storm sewer replacement and construction
Economic Development Plan	No	
Other:	No	
Building Codes (Year)	Yes	Currently 2012
Site Plan Review Requirements	Yes	Firestone Development Code

Mitigation Capability	Utilized?	Comments
Other:	No	
Zoning Ordinance (Land Use)	No	No Ordinance, but covered in the Firestone Developoment Code
Subdivision Ordinance	No	No Ordinance, but covered in the Firestone Developoment Code
National Flood Insurance Program (NFIP) Participant	Yes	
Flood Insurance Study / Flood Insurance Rate Map / DFIRM	Yes	
Floodplain Ordinance	Yes	No Ordinance, but covered in the Firestone Developoment Code
Elevation Certificates for Floodplain Development	Yes	Firestone Developoment Code
Community Rating System (CRS) Participant	No	
Open Space / Conservation Program	Yes	Future adoption of Parks Master Plan. Firestone Developoment Code addresses also
Growth Management Ordinance	No	No Ordinance, but regulated through Master Plan and Firestone Developoment Code
Stormwater Ordinance	Yes	Adopted February 2020
Other Hazard Ordinance (steep slope, wildfire, snow loads, etc.)	No	No Ordinance, but covered in the Firestone Developoment Code
Other:	No	

Available resources including staff, municipal groups, and technology are all vital for a community to be able to implement hazard mitigation. Firestone is fortunate to have most all of these capabilities identified in Table 110.

Table 110. Administrative & Technical Capabilities

Mitigation Capability	Utilized?	Comments
Planning Commission	Yes	Firestone Planning & Zoning Commission is a seven-member commission that recommends various development matters to the BOT for consideration
Mitigation Planning Committee	No	
Maintenance Programs (tree trimming, clearing drainage, etc.)	Yes	Parks and Stormwater Maintenance Staff
Emergency Manager	Yes	IGA with Carbon Valley Emergency Management Agency, FTE EM Coordinator
Building Official	Yes	Currently contract with SAFEbuilt and bringing building official in house within next 2 years.
Floodplain Administrator	Yes	Matt Wiederspahn
Community Planner	No	The Town of Firestone has a Planning Department (Sr. Planners, Planning Manager and Director)
Transportation Planner	No	Town Engineer on staff overseeing transportation and upcoming Transportation Master Plan

Mitigation Capability	Utilized?	Comments
Civil Engineer	Yes	Civil engineer on staff
GIS Capability	Yes	GIS coordinator on staff
Resiliency Planner	No	
Other:	No	
Warning Systems / Services (flood)	No	
Warning Systems / Services (other / multi hazard)	Yes	CodeRed Emergency Notification Service and Blackboard Connect for updates and emergency alerts
Grant Writing / Management	No	
Other:	No	

The ability of a community to implement a comprehensive mitigation strategy is largely dependent on available funding. These related municipal capabilities are outlined in Table 111and show that Firestone utilizes a broad range of financial tools that can support mitigation activities.

Table 111. Financial Capabilities

Mitigation Capability	Utilized?	Comments
Levy for Specific Purposes with Voter Approval	Yes	Occupation/Lodging Tax
Utilities Fees	Yes	Water/Street lights based on rate studies
System Development / Impact Development Fee	Yes	Impact Fees charged by Planning on permit process
General Obligation Bonds to Incur Debt	No	
Special Tax Bonds to Incur Debt	Yes	2014 Revenue Bonds
Open Space / Conservation Fund	Yes	Conservation Trust from State
Stormwater Utility Fees	Yes	Stormwater fees based on rate studies
Capital Improvement Project Funding	Yes	1% Sales tax limited to parks and streets
Community Development Block Grants (CDBG)	No	
Withheld spending in hazard-prone areas	No	
Other:	No	

Education and outreach are important capabilities that allow a community to continue the conversation with their public regarding hazard risk and opportunities to mitigate. Table 112 shows that Firestone could benefit by expanding upon these capabilities.

Table 112. Education & Outreach Capabilities

Mitigation Capability	Utilized?	Comments
Public Hazard Education / Outreach Program	Yes	Hazard and Preparedness Education and Outreach in partnership with CVEMA

Mitigation Capability	Utilized?	Comments
Local Citizen Groups That Communicate Hazard Risks	No	
Firewise	Yes	Through Frederick-Firestone Fire Protection District Community Outreach
NOAA StormReady Program	No	
Other:		

7.6.4 Plan Maintenance and Implementation

The Town of Firestone has developed a Plan Maintenance and Implementation Strategy outlining their method and schedule for keeping the plan current. The Implementation Strategy below also includes a discussion of how the Town will continue public participation in the plan maintenance process.

- The Carbon Valley Emergency Manager will facilitate an annual review of the hazard mitigation plan and actions with Town of Firestone police department, departmental staff, leadership, and the Town Board.
- Hazard mitigation will be evaluated by the Town annually in conjunction with project planning and the annual budget.

7.6.5 Integrating Hazard Mitigation into Local Planning

The Town also identified ways to integrate hazard mitigation into their local planning mechanisms and policies. Following are the specific integration strategies identified by the Town of Firestone.

- The Town will integrate hazard mitigation actions into our Capital Improvements Plan by emphasizing projects that mitigate the impacts of our highest risk hazards.

7.6.6 Mitigation Actions

The new mitigation actions identified by the Town during the Plan update are included in Table 113.

Table 113. 2021 Mitigation Actions

ID	Organization	Action
2021-39	1-Firestone	Installation of Infrastructure Transmission Technologies
2021-100	2-Firestone	Godding Hollow Tri-Town Basin Outfall Improvements
2021-101	3-Firestone	Community Connect Program

7.7 City of Fort Lupton

"The City of Fort Lupton will be a premier destination of the Front Range. Well positioned to capture growth and investment on the periphery of the Denver area, Fort Lupton will have numerous opportunities to shape its future. Combining quality living with a variety of services and amenities, the City will become a prominent community within Colorado."

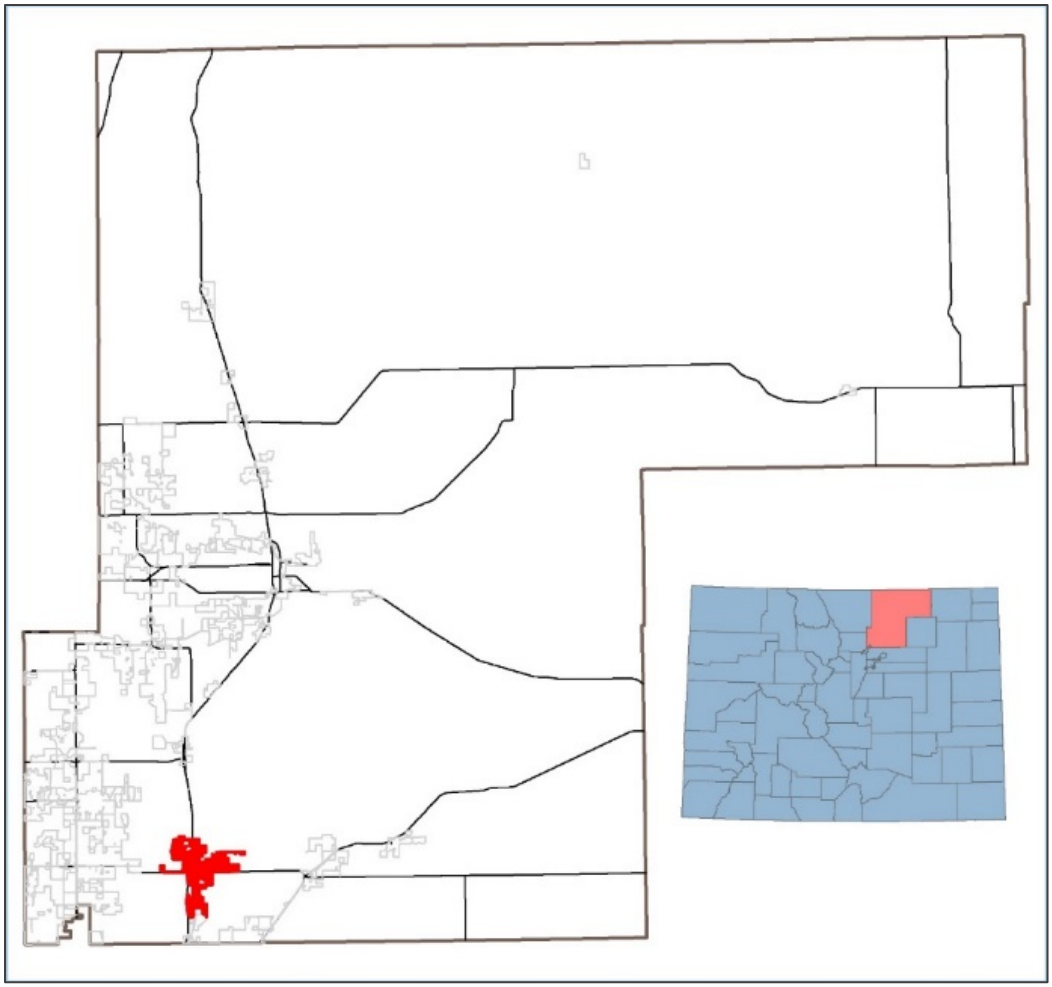
– City of Fort Lupton Comprehensive Plan 2018

One of the primary goals of Fort Lupton is to become a sustainable city that provides ample opportunities for residents to live, learn, work and play. The Comprehensive Plan addresses the following areas in the work toward achieving that goal:

- Growth and Development
- Subarea Plans
- Regional Presence
- Transportation and Mobility
- Parks, Open Space & Environmental Features
- Public Facilities and Services
- Implementation

7.7.1 Community Profile

The City of Fort Lupton is located along the South Platte River, approximately 26 miles north of Denver, 23 miles south of Greeley, and 24 miles east of Boulder. Fort Lupton is positioned at the intersection of US Highway 85 and Colorado Route 52, providing access to Interstate 25 to the west and Interstate 76 to the east as well as the greater Denver and Front Range regions.



The table below summarizes key demographic and development related characteristics of the City of Fort Lupton.

Table 114. City of Fort Lupton Demographics

Fort Lupton	Colorado	
8,317	5,758,736	Population, 2019
12.2%	14.5%	Population, % change April 1, 2010 to July 1, 2019
8.1%	5.8%	% Population under 5 years, 2019
28.9%	21.9%	% Population under 19 years, 2019
10.2%	14.6%	% Population 65 years and over, 2019
72.0%	64.9%	Homeownership Rate, 2019
3.09	2.56	Persons Per Household, 2019
$63,548	$68,811	Median Household Income, 2014- 2018
7.7%	9.3%	Persons below poverty level, %, 2014- 2018
11.2%	7.3%	% Population under 65 years, with a disability 2014-2018
34.2%	17%	Language other than English spoken at home, % age 5+, 2014- 2018

Source: US Census Bureau

7.7.2 Risk and Vulnerability Assessment

Table 115 summarizes the results of the RF ranking exercise performed by the City of Fort Lupton. The results represent the relative risk of different hazards across the municipality from the perspective of local stakeholders and subject matter experts. Note the final RF Ranking values in this table include the weighting factors detailed in the Risk Assessment chapter of this Plan.

Table 115. Risk Factor Results for Fort Lupton

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	RF Ranking
Agricultural Hazards	1	1	2	1	4	1.5
Cyber Hazards	3	2	1	4	4	2.5
Drought	3	2	4	1	4	2.8
Earthquake	1	3	4	4	2	2.6
Extreme Temps.	2	2	4	1	4	2.5
Flood	2	2	2	3	3	2.2
Hazmat Release	3	2	1	4	2	2.3
Land Subsidence	1	1	1	4	3	1.5
Prairie Fire	2	2	2	4	2	2.2
Public Health Hazards	2	3	4	1	4	2.8
Severe Storms	3	3	3	4	1	2.9
Tornado & Wind	3	3	4	4	1	3.1

The conclusions drawn from the qualitative assessment are organized into three categories shown in the following table and provide a summary of hazard risk for Fort Lupton as a whole - based on High, Moderate, or Low risk designations. This process helped frame ongoing planning discussions around local and regional hazard risks and assisted with the development of the Plan's updated mitigation strategy.

Table 116. Hazard Risk Conclusions for Fort Lupton

HIGH RISK (2.5 or higher)	**Cyber Hazards, Drought, Earthquake, Extreme Temperatures, Public Health Hazards, Severe Storms, Tornado & Straight-Line Wind**
MODERATE RISK (2.0 – 2.4)	**Flood, Hazmat Release, Prairie Fire**
LOW RISK (1.9 or lower)	**Agricultural Hazards, Land Subsidence**

Since the 2016 Plan, the City has increased the assessed risk from earthquake and tornado & straight-line winds to High Risk (both formerly Moderate). The City has also increased the assessed risk from extreme temperatures and severe storm to High Risk (both formerly Low). Besides the newly added hazards of agricultural hazards and cyber hazards, all other risk rankings remain the same.

The following sections highlight the City of Fort Lupton's High Risk hazards and include any specific content relevant to the City. They are intended to supplement information included in each hazard profile in the main body of this Plan.

7.7.2.1 Cyber Hazards

For any municipality, vulnerability to cyber hazards does not vary from that of the County as a whole. While there are no documented cyber events impacting City of Fort Lupton, the threat of this hazard is continually increasing. There are no previous events to document specific to Fort Lupton. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.7.2.2 Drought

The community vulnerability to drought is not noticeably different from the rest of the County. Those communities whose economies are more dependent on the agriculture industry do experience higher risk to this hazard. There are no previous events to document specific to City of Fort Lupton. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.7.2.3 Earthquake

Vulnerability to earthquake is not noticeably different from the rest of the County. The City of Fort Lupton's more densely developed areas experience the greatest risk, in addition to any structures not constructed to meet recent building codes. There are no previous events to document specific to Fort Lupton. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.7.2.4 Extreme Temperatures

Vulnerability to extreme temperatures is not noticeably different from the rest of the County. Those communities whose economies are more dependent on the agriculture industry do experience higher risk to these hazards due to potential crop and livestock losses. Additionally, individuals at a higher risk to extreme temperatures include those with mobility issues, independent living difficulty, the elderly, low-income families, outdoor laborers, and those experiencing homelessness. Data for these demographics is collected at census tract level, however snapshot data for populations that can fluctuate drastically, such as the number of outdoor laborers and those experiencing homelessness is not included. These are still considerable populations in the County and City of Fort Lupton and local efforts to quantify these populations periodically can help with mitigation planning.

The data for high risk populations has been analyzed by Colorado Department of Public Health and Environment (CDPHE) and has been used to create Community Inclusions maps. These maps can be zoomed into specific census tracts for municipalities and communities, illustrating the population variances. Refer to Chapter 4 for examples of these maps for Weld County.

There are no previous events to document specific to the City of Fort Lupton. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.7.2.5 Public Health Hazards

Vulnerability to public health hazards is not expected to be noticeably different from the rest of the County. Individuals at a higher risk to this hazard include the aging adult population, those with a chronic illness, such as diabetes, asthma, coronary heart disease, and those who are obese or overweight. Other populations at risk include children, those in poverty and those with a disability. This data is collected at census tract level by the Centers for Disease Control (CDC) and is unavailable at a municipality level. The data by census tract can be found in the Colorado Department of Health and Environment Open Data database here.

Future occurrences are expected to mirror that of the County. There are no previous events to document specific to Fort Lupton. Refer to Chapter 5 – Risk Assessment of this Plan for additional details, including a summary of the higher risk population demographics for Weld County and the State.

7.7.2.6 Severe Storm (including Hail, Lightning, & Winter Storm)

Vulnerability to severe storm, which includes hail, lightning, and winter storm, is not noticeably different from the rest of the County. Fort Lupton's more densely developed areas experience the greatest risk, in addition to potential greater losses to the agriculture sector. Any structures not constructed to meet recent building codes experience the greatest risk from structural damages.

According to the NOAA's Storm Events Database, between 2015 and 2020, the City of Fort Lupton has had ten severe storm events. All of these events resulted in reports of hail, which ranged in size from 0.88 inches to 2 inches. None of these events resulted in reported damage to property or crops and no injuries or deaths.

No other events for severe storm, specific to Fort Lupton, were recorded over this time period.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.7.2.7 Tornado & Straight-Line Wind

Vulnerability to tornado & straight-line wind is not noticeably different from the rest of the County. Fort Lupton's more densely developed areas experience the greatest risk, in addition to any structures not constructed to meet recent building codes.

According to the NOAA's Storm Events Database, between 2015 and 2020, there was one (1) report of an EF0 tornado in Fort Lupton. The event did not cause damage to property or crops and no injuries or deaths.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.7.3 Capabilities Assessment

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

Planning and regulatory capabilities are powerful tools for implementing hazard mitigation. The City currently utilizes or has implemented some of these capabilities shown in Table 117. It is important for all municipalities to regularly review each of these tools, to identify opportunities for further risk reduction efforts.

Table 117. Planning & Regulatory Capabilities

Mitigation Capability	Utilized?	Comments
Comprehensive, Master, or General Plan	Yes	
Capital Improvement Program or Plan (CIP)	Yes	
Floodplain Management Plan	No	

Mitigation Capability	Utilized?	Comments
Stormwater Program / Plan	No	
Community Wildfire Protection Plan (CWPP)	Yes	
Erosion / Sediment Control Program	No	
Economic Development Plan	No	
Other:	No	
Building Codes (Year)	Yes	ICC FIRE CODE 2012
Site Plan Review Requirements	Yes	
Other:	No	
Zoning Ordinance (Land Use)	No	
Subdivision Ordinance	No	
National Flood Insurance Program (NFIP) Participant	Yes	
Flood Insurance Study / Flood Insurance Rate Map / DFIRM	Yes	
Floodplain Ordinance	Yes	
Elevation Certificates for Floodplain Development	No	
Community Rating System (CRS) Participant	No	
Open Space / Conservation Program	No	
Growth Management Ordinance	No	
Stormwater Ordinance	No	
Other Hazard Ordinance (steep slope, wildfire, snow loads, etc.)	No	
Other:	No	

Available resources including staff, municipal groups, and technology are all vital for a community to be able to implement hazard mitigation. Fort Lupton could benefit by developing the capabilities identified in Table 118.

Table 118. Administrative & Technical Capabilities

Mitigation Capability	Utilized?	Comments
Planning Commission	No	
Mitigation Planning Committee	No	
Maintenance Programs (tree trimming, clearing drainage, etc.)	No	
Emergency Manager	No	
Building Official	No	
Floodplain Administrator	Yes	
Community Planner	No	
Transportation Planner	No	
Civil Engineer	No	

Mitigation Capability	Utilized?	Comments
GIS Capability	No	
Resiliency Planner	No	
Other:	No	
Warning Systems / Services (flood)	Yes	CodeRed
Warning Systems / Services (other / multi hazard)	Yes	Local Sirens
Grant Writing / Management	Yes	Internal
Other:	No	

The ability of a community to implement a comprehensive mitigation strategy is largely dependent on available funding. These related municipal capabilities are outlined in Table 119 and show that Fort Lupton utilizes a range of financial tools that can support mitigation activities.

Table 119. Financial Capabilities

Mitigation Capability	Utilized?	Comments
Levy for Specific Purposes with Voter Approval	Yes	Until 2022 for Station 2
Utilities Fees	No	
System Development / Impact Development Fee	No	
General Obligation Bonds to Incur Debt	Yes	Station 2
Special Tax Bonds to Incur Debt	No	
Open Space / Conservation Fund	No	
Stormwater Utility Fees	No	
Capital Improvement Project Funding	Yes	
Community Development Block Grants (CDBG)	No	
Withheld spending in hazard-prone areas	No	
Other:	No	

Education and outreach are important capabilities that allow a community to continue the conversation with their public regarding hazard risk and opportunities to mitigate. Table 120 shows that Fort Lupton could benefit by expanding upon these capabilities.

Table 120. Education & Outreach Capabilities

Mitigation Capability	Utilized?	Comments
Public Hazard Education / Outreach Program	No	
Local Citizen Groups That Communicate Hazard Risks	No	

Mitigation Capability	Utilized?	Comments
Firewise	No	
NOAA StormReady Program	No	
Other:	Yes	Fire Safety

7.7.4 Mitigation Actions

The new mitigation actions identified by the City during the Plan update are included in Table 121. One action from the 2016 Plan has been carried over into the City's updated mitigation strategy.

Table 121. 2021 Mitigation Actions

ID	Organization	Action
2021-41	1-Fort Lupton	Warning Sirens
2021-42	2-Fort Lupton	Emergency Notification Signs
2021-43	3-Fort Lupton	Water Storage
2021-44	4-Fort Lupton	Well Inclusions
2021-45	5-Fort Lupton	Localized Flooding
2021-46	6-Fort Lupton	Emergency Shelter Generator

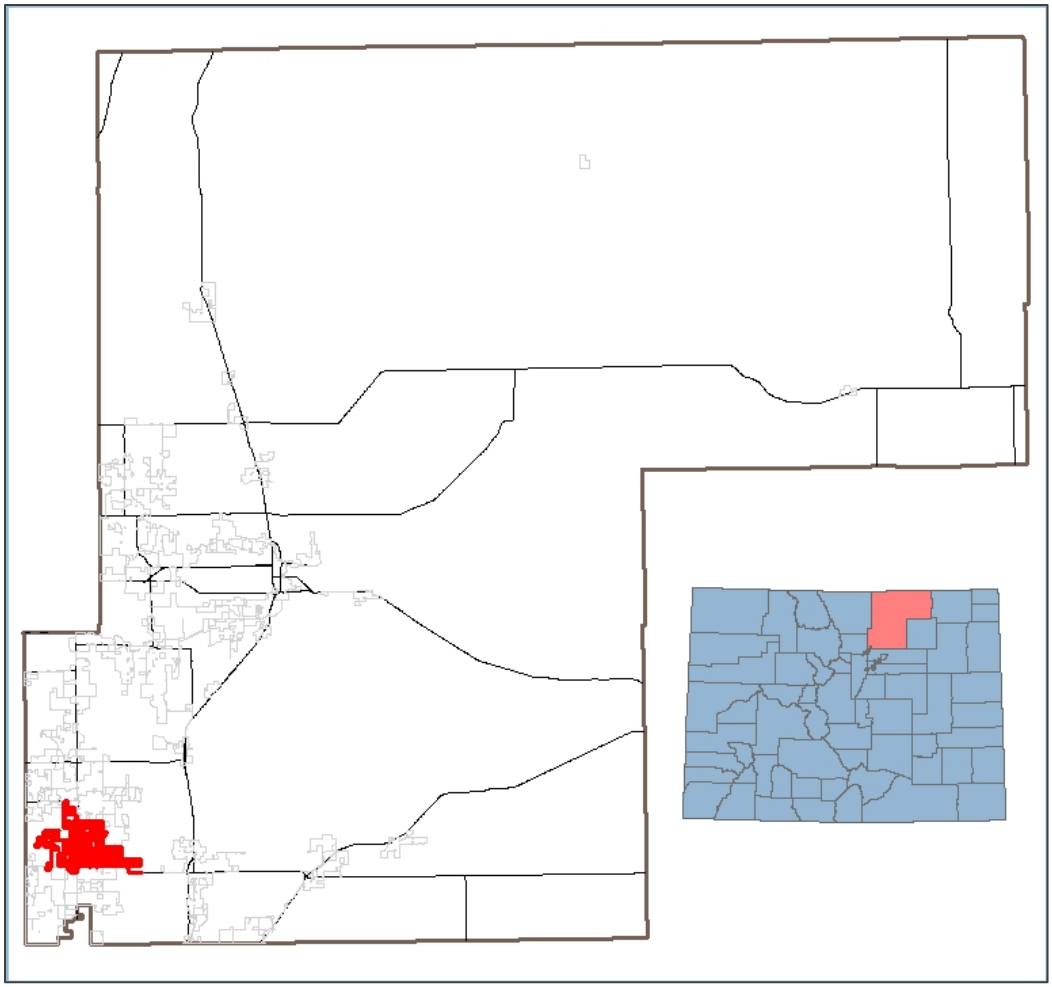
7.8 Town of Frederick

The 2016 Town of Frederick Comprehensive Plan includes statements of goals and objectives, which provide the framework for planning recommendations, policies and future projects and actions. These goals are:

- Growth & Development - Manage growth to accommodate future population expansion while supporting the preservation of the Town's rural and natural areas.
- Residential Neighborhoods - Promote a diverse housing inventory to accommodate Frederick's growing population while maintaining its existing rural character.
- Commercial & Industrial Areas - Leverage Frederick's strategic location and developable areas to promote employment growth and achieve a jobs-housing balance.
- Transportation & Mobility - Support a transportation system that accommodates the Town's growing population while ensuring safety and mobility for all modes of travel.
- Parks, Recreation & Open Space - Support a park and open space system that accommodates a range of recreational activities and meets the needs of the Frederick population.
- Community Facilities & Infrastructure - Provide infrastructure and services to maintain and support a high quality of life for residents and businesses through collaborative efforts and partnerships.
- Urban Design, Beautification & Tourism - Establish a coordinated program of urban design initiatives, infrastructure improvements, community services, and development standards that celebrate and promote the agricultural and mining heritage of Frederick, distinguishing it from other communities within the region.

7.8.1 Community Profile

The Town of Frederick is located 20 miles north of Denver and 20 miles east of Boulder. It encompasses more than 14 square miles and is bisected by I-25. Frederick is south of State Highway 119 and stretches for nearly six miles along State Highway 52.



The Town of Frederick is part of the Carbon Valley area which also includes the Town of Firestone and the City of Dacono. The three municipalities share a Chamber of Commerce and a Park and Recreation District. They are represented in the Carbon Valley Emergency Management Agency, which also includes the Frederick Fire Protection District and Mountain View Fire Rescue. The municipalities work with their specific stakeholders in determining risks and vulnerabilities, however the unique agreement between them is important to planning efforts.

The table below summarizes key demographic and development related characteristics of the Town of Frederick.

Table 122. Town of Frederick Demographics

Frederick	Colorado	
13,960	5,758,736	Population, 2019
61.1%	14.5%	Population, % change April 1, 2010 to July 1, 2019
8.3%	5.8%	% Population under 5 years, 2019
28.8%	21.9%	% Population under 19 years, 2019
9.1%	14.6%	% Population 65 years and over, 2019
91.6%	64.9%	Homeownership Rate, 2019
3.05	2.56	Persons Per Household, 2019

Frederick	Colorado	
$100,057	$68,811	Median Household Income, 2014- 2018
1.7%	9.3%	Persons below poverty level, %, 2014- 2018
4.5%	7.3%	% Population under 65 years, with a disability 2014-2018
8.4%	17%	Language other than English spoken at home, % age 5+, 2014- 2018

Source: US Census Bureau

7.8.2 Risk and Vulnerability Assessment

Table 123 summarizes the results of the RF ranking exercise performed by the Town of Frederick. The results represent the relative risk of different hazards across the municipality from the perspective of local stakeholders and subject matter experts. Note the final RF Ranking values in this table include the weighting factors detailed in the Risk Assessment chapter of this Plan.

Table 123. Risk Factor Results for Frederick

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	RF Ranking
Agricultural Hazards	3	3	4	1	4	3.1
Cyber Hazards	3	4	4	4	4	3.7
Drought	3	2	4	1	4	2.8
Earthquake	1	2	4	1	1	1.9
Extreme Temps.	2	2	2	1	3	2.0
Flood	3	3	4	2	4	3.2
Hazmat Release	3	2	2	3	2	2.4
Land Subsidence	1	1	1	2	1	1.1
Prairie Fire	3	2	1	4	3	2.4
Public Health Hazards	4	2	4	1	3	3.0
Severe Storms	4	3	4	3	2	3.4
Tornado & Wind	3	4	2	4	4	3.3

The conclusions drawn from the qualitative assessment are organized into three categories shown in the following table and provide a summary of hazard risk for Frederick as a whole - based on High, Moderate, or Low risk designations. This process helped frame ongoing planning discussions around local and regional hazard risks and assisted with the development of the Plan's updated mitigation strategy.

Table 124. Hazard Risk Conclusions for Frederick

HIGH RISK (2.5 or higher)	**Agricultural Hazards, Cyber Hazards, Drought, Flood, Public Health Hazards, Severe Storms, Tornado & Straight-Line Wind**
MODERATE RISK (2.0 – 2.4)	**Extreme Temperatures, Hazmat Release, Prairie Fire**
LOW RISK (1.9 or lower)	**Earthquake, Land Subsidence**

Since the 2016 Plan, the Town has increased the assessed risk from extreme temperatures and hazmat release from Low to Moderate. Public health hazards, formerly Low Risk, is now considered as High. The Town has reduced its assessed risk from prairie fire from High to Moderate. Besides the newly added hazards of agricultural hazards and cyber hazards, all other risk rankings remain the same.

The following sections highlight the Town of Frederick's High Risk hazards and include any specific content relevant to the Town. They are intended to supplement information included in each hazard profile in the main body of this Plan.

7.8.2.1 Agricultural Hazards (including Disease & Pests)

Vulnerability to agricultural hazards is not noticeably different from the rest of the County. Those communities whose economies are more dependent on the agriculture industry do experience higher risk to these hazards. There are no previous events to document specific to the Town of Frederick. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.8.2.2 Cyber Hazards

For any municipality, vulnerability to cyber hazards does not vary from that of the County as a whole. While there are no documented cyber events impacting the Town of Frederick, the threat of this hazard is continually increasing. There are no previous events to document specific to Frederick. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.8.2.3 Drought

The community vulnerability to drought is not noticeably different from the rest of the County. Those communities whose economies are more dependent on the agriculture industry do experience higher risk to this hazard. There are no previous events to document specific to the Town of Frederick. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.8.2.4 Flood (including Dam & Levee Failure)

Flood is a very localized hazard and vulnerability is unique for each municipality. There are no previous events to document specific to Frederick.

The Town of Frederick's overall vulnerability to flood is not noticeably different from the rest of the County. Frederick has 72 address points located in the Special Flood Hazard Area (SFHA). This equates to 0.9% of all address points for the Town, as compared to 1.6% of Countywide addresses located in the SFHA.

Flood events can also occur as a result of dam or levee failure. In these cases, flood waters may not follow the typical floodplains mapped as the SFHA.

Overall vulnerability to flooding in dam inundation areas is increased for the Town of Frederick, where 3.5% of address points (283) are located within these dam inundation areas. This is a larger percentage of structures at risk, as compared to 1.0% of Countywide addresses located in these areas.

Additionally, the Town is the first jurisdiction downstream from two dams. Both have a hazard classification of Significant and associated Emergency Action Plans (EAPs). Additional information pertaining to dams can be referenced at the State's Dam Safety website: https://dwr.state.co.us/Tools/DamSafety/Dams .

The Town's overall vulnerability to flooding in areas protected by known levees is significantly different from the rest of the County. Frederick has no address points located in these within levee protected areas, compared to 1.6% of Countywide addresses located in these areas.

It is important to note that this analysis is only as good as best available data allows. Current floodplains, dam inundation areas, and areas protected by levees may not currently map all hazard areas. Additionally, mapped hazard areas may be dated and in need of updated mapping and analysis.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.8.2.5 Public Health Hazards

Vulnerability to public health hazards is not expected to be noticeably different from the rest of the County. Individuals at a higher risk to this hazard include the aging adult population, those with a chronic illness, such as diabetes, asthma, coronary heart disease, and those who are obese or overweight. Other populations at risk include children, those in poverty and those with a disability. This data is collected at census tract level by the Centers for Disease Control (CDC) and is unavailable at a municipality level. The data by census tract can be found in the Colorado Department of Health and Environment Open Data database here.

Future occurrences are expected to mirror that of the County. There are no previous events to document specific to Frederick. Refer to Chapter 5 – Risk Assessment of this Plan for additional details, including a summary of the higher risk population demographics for Weld County and the State.

7.8.2.6 Severe Storm (including Hail, Lightning, & Winter Storm)

Vulnerability to severe storm, which includes hail, lightning, and winter storm, is not noticeably different from the rest of the County. Frederick's more densely developed areas experience the greatest risk, in addition to potential greater losses to the agriculture sector. Any structures not constructed to meet recent building codes experience the greatest risk from structural damages.

According to the NOAA's Storm Events Database, between 2015 and 2020, the Town of Frederick has had four severe storm events. All of these events resulted in reports of hail, which ranged in size from 1 inch to 2.5 inches. None of these events resulted in reported damage to property or crops and no injuries or deaths.

No other events for severe storm, specific to Frederick, were recorded over this time period.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.8.2.7 Tornado & Straight-Line Wind

Vulnerability to tornado & straight-line wind is not noticeably different from the rest of the County. Frederick's more densely developed areas experience the greatest risk, in addition to any structures not constructed to meet recent building codes.

Between 2015 and 2020, there were no reports of occurrences specific to Frederick. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.8.3 Capabilities Assessment

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

Planning and regulatory capabilities are powerful tools for implementing hazard mitigation. The Town currently utilizes or has implemented most of these capabilities shown in Table 125. It is important for all municipalities to regularly review each of these tools, to identify opportunities for further risk reduction efforts.

Table 125. Planning & Regulatory Capabilities

Mitigation Capability	Utilized?	Comments
Comprehensive, Master, or General Plan	Yes	Multiple master plans
Capital Improvement Program or Plan (CIP)	Yes	Annual Updates
Floodplain Management Plan	Yes	
Stormwater Program / Plan	Yes	Master Plan underway - complete 12/21
Community Wildfire Protection Plan (CWPP)	No	
Erosion / Sediment Control Program	No	
Economic Development Plan	No	In process
Other:	No	
Building Codes (Year)	Yes	2012
Site Plan Review Requirements	Yes	Town Code/Website
Other:	No	
Zoning Ordinance (Land Use)	Yes	
Subdivision Ordinance	Yes	
National Flood Insurance Program (NFIP) Participant	Yes	
Flood Insurance Study / Flood Insurance Rate Map / DFIRM	Yes	
Floodplain Ordinance	Yes	Town Code
Elevation Certificates for Floodplain Development	Yes	
Community Rating System (CRS) Participant	No	
Open Space / Conservation Program	Yes	
Growth Management Ordinance	No	
Stormwater Ordinance	Yes	Town Code
Other Hazard Ordinance (steep slope, wildfire, snow loads, etc.)	No	
Other:	No	

Available resources including staff, municipal groups, and technology are all vital for a community to be able to implement hazard mitigation. Frederick is fortunate to have many of these capabilities identified in Table 126.

Table 126. Administrative & Technical Capabilities

Mitigation Capability	Utilized?	Comments
Planning Commission	Yes	
Mitigation Planning Committee	No	
Maintenance Programs (tree trimming, clearing drainage, etc.)	Yes	Through Public Works
Emergency Manager	Yes	Emergency Management Coordinator through IGA for Carbon Valley Emergency Management Agency
Building Official	Yes	Staff CBO
Floodplain Administrator	Yes	Engineering Director
Community Planner	Yes	Planning Director
Transportation Planner	No	Administered by Engineering Dept
Civil Engineer	Yes	2 Engineers plus Engineering Director
GIS Capability	Yes	GIS Staff
Resiliency Planner	No	
Other:	No	
Warning Systems / Services (flood)	No	
Warning Systems / Services (other / multi hazard)	No	
Grant Writing / Management	No	
Other:	No	

The ability of a community to implement a comprehensive mitigation strategy is largely dependent on available funding. These related municipal capabilities are outlined in Table 127 and show that Frederick utilizes a broad range of financial tools that can support mitigation activities.

Table 127. Financial Capabilities

Mitigation Capability	Utilized?	Comments
Levy for Specific Purposes with Voter Approval	Yes	
Utilities Fees	Yes	
System Development / Impact Development Fee	Yes	
General Obligation Bonds to Incur Debt	No	
Special Tax Bonds to Incur Debt	Yes	
Open Space / Conservation Fund	Yes	
Stormwater Utility Fees	Yes	

Mitigation Capability	Utilized?	Comments
Capital Improvement Project Funding	Yes	
Community Development Block Grants (CDBG)	Yes	
Withheld spending in hazard-prone areas	No	
Other:	No	

Education and outreach are important capabilities that allow a community to continue the conversation with their public regarding hazard risk and opportunities to mitigate. Table 128 shows that Frederick could benefit by expanding upon these capabilities.

Table 128. Education & Outreach Capabilities

Mitigation Capability	Utilized?	Comments
Public Hazard Education / Outreach Program	Yes	Hazard and Preparedness Education and Outreach in partnership with CVEMA
Local Citizen Groups That Communicate Hazard Risks	No	
Firewise	Yes	Through Frederick-Firestone Fire Protection District Community Outreach
NOAA StormReady Program	No	
Other:	No	

7.8.4 Plan Maintenance and Implementation

The Town of Frederick has developed a Plan Maintenance and Implementation Strategy outlining their method and schedule for keeping the plan current. The Implementation Strategy below also includes a discussion of how the Town will continue public participation in the plan maintenance process.

- The Carbon Valley Emergency Manager will facilitate an annual review of hazard mitigation plan and actions with Town of Frederick's leadership team, in cooperation with partner agencies, such as the fire district and the Weld County Office of Emergency Management. In addition, the Town of Frederick and CVEMA will periodically engage the public in the process of identifying hazards, risks, and prioritizing mitigation actions. To do so, mitigation actions and priorities will be posted on the Town's website for public review and comment.

7.8.5 Integrating Hazard Mitigation into Local Planning

The Town also identified ways to integrate hazard mitigation into their local planning mechanisms and policies. Following are the specific integration strategies identified by the Town of Frederick.

- Current Land Use Code includes environmental constraints related to hazard mitigation. The Town's CIP includes priority mitigation projects related to Storm Water Management.

7.8.6 Mitigation Actions

The new mitigation actions identified by the Town during the Plan update are included in Table 129. One action from the 2016 Plan has been carried over into the Town's updated mitigation strategy.

Table 129. 2021 Mitigation Actions

ID	Organization	Action
2021-47	1-Frederick	Box Culvert at Bella Rosa Parkway
2021-48	2-Frederick	Potable Water System, Emergency Supply
2021-49	3- Frederick	Town Facilities- Expansion & Modification
2021-102	4-Frederick	Community Connect Program

7.9 City of Greeley

"Greeley promotes a healthy, diverse economy and high quality of life responsive to all its residents and neighborhoods, thoughtfully managing its human and natural resources in a manner that creates and sustains a safe, unique, vibrant and rewarding community in which to live, work and play."
– City of Greeley 2060 Comprehensive Plan

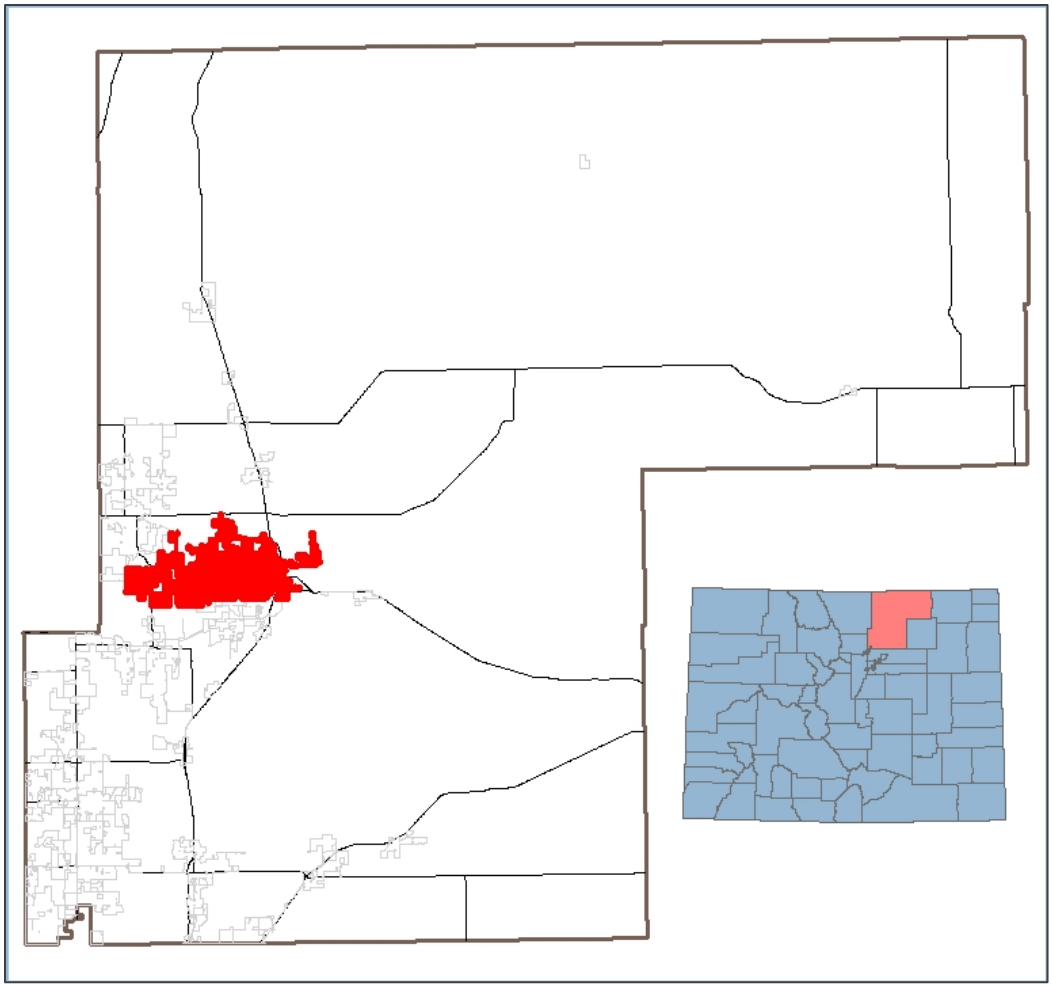
Greeley's Core Values & Guiding Principles are outlined in their comprehensive plan, *City of Greeley 2060,* and serve as a guide for future development and policy decisions within the City's boundaries. They are as follows:

- Excellence in actions, attitude, leadership and focus
- Progressive and Appealing Industrial Development
- A Safe, Prepared, Secure and Harmonious community environment
- Sustainable Community Development through healthy behaviors, sensitive environmental stewardship, varied and compact community design and a complete, effective & forward-thinking transportation system
- A Community Rich in Diversity of People, Customs, and Ideas
- Every Neighborhood Thrives reflecting the spirit of community
- Center of a comprehensive Premier Educational System
- 'Better Together' leadership mode of intergovernmental & public/private cooperation to achieve exceptional community benefits
- A Regional Leader and Northern Colorado destination

These core values and guiding principles are interwoven throughout the City's Comprehensive Plan and form the basis for daily decision making, project/policy prioritization, and implementation strategies.

7.9.1 Community Profile

According to the City of Greeley's Department of Economic Development "Greeley is the business center for Weld County." The second largest community in northern Colorado, Greeley serves as a major retail trade center for agricultural communities in northeastern Colorado, southeastern Wyoming, and southwestern Nebraska.



The City of Greeley is characterized by expansive prairie to the east and the towering Rocky Mountains to the west. Greeley is located in a semi-arid climate. The summers are hot and the winters are mild. Precipitation occurs mostly in the form of rain or snow from October to April: snowfalls are often light and usually melt within a few days.

The table below summarizes key demographic characteristics of the City of Greeley.

Table 130. City of Greeley Demographics

Greeley	Colorado	
108,649	5,758,736	Population, 2019
16.9%	14.5%	Population, % change April 1, 2010 to July 1, 2019
7.0%	5.8%	% Population under 5 years, 2019
25.3%	21.9%	% Population under 19 years, 2019
11.8%	14.6%	% Population 65 years and over, 2019
59.7%	64.9%	Homeownership Rate, 2019
2.71	2.56	Persons Per Household, 2019
$55,007	$68,811	Median Household Income, 2014- 2018
17.1%	9.3%	Persons below poverty level, %, 2014- 2018

Greeley	Colorado	
8.0%	7.3%	% Population under 65 years, with a disability 2014-2018
26.1%	17%	Language other than English spoken at home, % age 5+, 2014- 2018

Source: US Census Bureau

7.9.2 Risk and Vulnerability Assessment

Table 131 summarizes the results of the RF ranking exercise performed by the City of Greeley. The results represent the relative risk of different hazards across the municipality from the perspective of local stakeholders and subject matter experts. Note the final RF Ranking values in this table include the weighting factors detailed in the Risk Assessment chapter of this Plan.

Table 131. Risk Factor Results for Greeley

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	RF Ranking
Agricultural Hazards	4	2	3	1	4	2.9
Cyber Hazards	3	3	3	4	4	3.2
Drought	3	2	4	1	4	2.8
Earthquake	1	2	2	4	1	1.8
Extreme Temps.	3	2	4	1	4	2.8
Flood	3	2	2	1	4	2.4
Hazmat Release	2	4	4	4	4	3.4
Land Subsidence	1	1	1	3	2	1.3
Prairie Fire	3	2	2	4	2	2.5
Public Health Hazards	2	3	3	2	4	2.7
Severe Storms	3	3	2	2	2	2.6
Tornado & Wind	2	2	2	4	1	2.1

The conclusions drawn from the qualitative assessment are organized into three categories shown in the following table and provide a summary of hazard risk for Greeley as a whole - based on High, Moderate, or Low risk designations. This process helped frame ongoing planning discussions around local and regional hazard risks and assisted with the development of the Plan's updated mitigation strategy.

Table 132. Hazard Risk Conclusions for Greeley

HIGH RISK (2.5 or higher)	**Agricultural Hazards, Cyber Hazards, Drought, Extreme Temperatures, Hazmat Release, Prairie Fire, Public Health Hazards, Severe Storms**
MODERATE RISK (2.0 – 2.4)	**Flood, Tornado & Straight-Line Wind**
LOW RISK (1.9 or lower)	**Earthquake, Land Subsidence**

Since the 2016 Plan, the City has increased the assessed risk from prairie fire to High Risk (formerly Moderate). Besides the newly added hazards of agricultural hazards and cyber hazards, all other risk rankings remain the same.

The following sections highlight the City of Greeley's High Risk hazards and include any specific content relevant to the City. They are intended to supplement information included in each hazard profile in the main body of this Plan.

7.9.2.1 Agricultural Hazards (including Disease & Pests)

Greeley does not see a noticeably different vulnerability to agricultural hazards from the rest of the County. Those communities whose economies are more dependent on the agriculture industry do experience higher risk to these hazards. There are no previous events to document specific to Greeley. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.9.2.2 Cyber Hazards

Vulnerability to cyber hazards for any municipality does not vary from that of the County as a whole. While there are no documented cyber events impacting Greeley, the threat of this hazard is continually increasing. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.9.2.3 Drought

Vulnerability to drought is not noticeably different from the rest of the County. Those communities whose economies are more dependent on the agriculture industry do experience higher risk to this hazard. There are no previous events to document specific to Greeley. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.9.2.4 Extreme Temperatures

Vulnerability to extreme temperatures is not noticeably different from the rest of the County. Those communities whose economies are more dependent on the agriculture industry do experience higher risk to these hazards, due to potential crop and livestock losses. Additionally, individuals at a higher risk to extreme temperatures include those with mobility issues, independent living difficulty, the elderly, low-income families, outdoor laborers, and those experiencing homelessness. Data for these demographics is collected at census tract level, however snapshot data for populations that can fluctuate drastically, such as the number of outdoor laborers and those experiencing homelessness is not included. These are still considerable populations in the County and the City of Greeley and local efforts to quantify these populations periodically can help with mitigation planning.

The data for high risk populations has been analyzed by Colorado Department of Public Health and Environment (CDPHE) and has been used to create Community Inclusions maps. These maps can be zoomed into specific census tracts for municipalities and communities, illustrating the population variances. Refer to Chapter 4 for examples of these maps for Weld County.

There are no previous events to document specific to Greeley. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.9.2.5 Flood (including Dam & Levee Failure)

Flood hazard is not ranked as a High Risk for the City. However, there is currently one Severe Repetitive Loss (SRL) structure in Greeley. Additional details pertaining to this property and FEMA's National Flood Insurance Program (NFIP) can be found in the flood section of Chapter 5 – Risk Assessment.

An event of note occurred in 2015, which caused $250,000 in property damage and $100,000 in crop damage. As of the writing of this plan, there were no other recent events.

7.9.2.6 Hazmat Release

Vulnerability to hazmat release is increased for Greeley, mainly due to the location of CDOT hazardous materials routes through the community. Additionally, railroads span across the City which present their own increased risk for hazmat release. As is true for the entire County, the presence of any businesses that store hazardous materials also increases the risk for these types of events.

Based on data supplied by the Pipeline and Hazardous Materials Safety Administration's (PHMSA) Incident Reports Database, 26 events have occurred within Greeley between 1990 and 2019. The majority of these events were spillage and overfilling, however four of them were vehicular or rollover accidents. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.9.2.7 Prairie Fire

Vulnerability to prairie fire is not noticeably different from the rest of the County. Greeley has 15,730 address points located in the wildland urban interface (WUI). This equates to 42.8% of all address points for the City, as compared to 49.6 percent of Countywide addresses located in the WUI. Future occurrences are expected to mirror that of the County. There are no previous events to document specific to Greeley. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.9.2.8 Public Health Hazards

Vulnerability to public health hazards is not expected to be noticeably different from the rest of the County. Individuals at a higher risk to this hazard include the aging adult population, those with a chronic illness, such as diabetes, asthma, coronary heart disease, and those who are obese or overweight. Other populations at risk include children, those in poverty and those with a disability. This data is collected at census tract level by the Centers for Disease Control (CDC) and is unavailable at a municipality level. The data by census tract can be found in the Colorado Department of Health and Environment Open Data database here.

Future occurrences are expected to mirror that of the County. There are no previous events to document specific to Greeley. Refer to Chapter 5 – Risk Assessment of this Plan for additional details, including a summary of the higher risk population demographics for Weld County and the State.

7.9.2.9 Severe Storm (including Hail, Lightning, & Winter Storm)

Vulnerability to severe storm, which includes hail, lightning, and winter storm, is not noticeably different from the rest of the County. Greeley's more densely developed areas experience the greatest risk. Any structures not constructed to meet recent building codes experience the greatest risk from structural damages.

According to the NOAA's Storm Events Database, between 2015 and 2020, the City of Greeley has had twenty-seven severe storm events. Twenty-four of these events resulted in reports of hail, which ranged in size from 0.88 inches to 2.5 inches. One of these events resulted in $15,000 of damage to property. There was no reported damage to crops and no injuries or deaths.

Two events were reported as thunderstorm winds with magnitudes of 60 mph and 70 mph. There was no reported damage to property or crops and no injuries or deaths. One event was a lightning strike which cause $5,000 in property damage. There were no injuries or deaths.

No other events for severe storm, specific to Greeley, were recorded over this time period.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.9.3 Capabilities Assessment

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

Planning and regulatory capabilities are powerful tools for implementing hazard mitigation. The City currently utilizes or has implemented most of these capabilities shown in Table 133. It is important for all municipalities to regularly review each of these tools, to identify opportunities for further risk reduction efforts.

Table 133. Planning & Regulatory Capabilities

Mitigation Capability	Utilized?	Comments
Comprehensive, Master, or General Plan	Yes	
Capital Improvement Program or Plan (CIP)	Yes	5-year plan
Floodplain Management Plan	Yes	
Stormwater Program / Plan	Yes	
Community Wildfire Protection Plan (CWPP)	In Progress	
Erosion / Sediment Control Program	Yes	
Economic Development Plan	Yes	
Other:	No	
Building Codes (Year)	Yes	2018
Site Plan Review Requirements	Yes	
Other:	No	
Zoning Ordinance (Land Use)	Yes	
Subdivision Ordinance	Yes	
National Flood Insurance Program (NFIP) Participant	Yes	
Flood Insurance Study / Flood Insurance Rate Map / DFIRM	Yes	
Floodplain Ordinance	Yes	
Elevation Certificates for Floodplain Development	Yes	
Community Rating System (CRS) Participant	No	
Open Space / Conservation Program	Yes	
Growth Management Ordinance	No	
Stormwater Ordinance	Yes	

Mitigation Capability	Utilized?	Comments
Other Hazard Ordinance (steep slope, wildfire, snow loads, etc.)	No	
Other:	No	

Available resources including staff, municipal groups, and technology are all vital for a community to be able to implement hazard mitigation. Greeley is fortunate to have most all of these capabilities identified in Table 134.

Table 134. Administrative & Technical Capabilities

Mitigation Capability	Utilized?	Comments
Planning Commission	Yes	
Mitigation Planning Committee	No	
Maintenance Programs (tree trimming, clearing drainage, etc.)	Yes	
Emergency Manager	Yes	
Building Official	Yes	
Floodplain Administrator	Yes	Position is in the Stormwater Division of Public Works
Community Planner	Yes	
Transportation Planner	Yes	Position is in Public Works Traffic Division
Civil Engineer	Yes	
GIS Capability	Yes	
Resiliency Planner	Yes	
Other:	No	
Warning Systems / Services (flood)	Yes	Poudre River and 3 rain gauges give alerts
Warning Systems / Services (other / multi hazard)	Yes	Weld County CodeRed
Grant Writing / Management	Yes	
Other:	No	

The ability of a community to implement a comprehensive mitigation strategy is largely dependent on available funding. These related municipal capabilities are outlined in Table 135 and show that Greeley utilizes a broad range of financial tools that can support mitigation activities.

Table 135. Financial Capabilities

Mitigation Capability	Utilized?	Comments
Levy for Specific Purposes with Voter Approval	No	No Mill Levy
Utilities Fees	Yes	
System Development / Impact Development Fee	Yes	
General Obligation Bonds to Incur Debt	Yes	Available, but not currently using this tool for debt

Mitigation Capability	Utilized?	Comments
Special Tax Bonds to Incur Debt	Yes	
Open Space / Conservation Fund	Yes	Colorado Lottery Conservation Trust
Stormwater Utility Fees	Yes	Utility since 2002
Capital Improvement Project Funding	Yes	
Community Development Block Grants (CDBG)	Yes	
Withheld spending in hazard-prone areas	No	
Other:	No	

Education and outreach are important capabilities that allow a community to continue the conversation with their public regarding hazard risk and opportunities to mitigate. Table 136 shows that Greeley does leverage some of these capabilities and is currently working on expanding these efforts.

Table 136. Education & Outreach Capabilities

Mitigation Capability	Utilized?	Comments
Public Hazard Education / Outreach Program	No	City OEM developing
Local Citizen Groups That Communicate Hazard Risks	Yes	
Firewise	No	
NOAA StormReady Program	Yes	County
Other:	No	

7.9.4 Mitigation Actions

The new mitigation actions identified by the City during the Plan update are included in Table 137. Seven actions from the 2016 Plan have been carried over into the City's updated mitigation strategy.

Table 137. 2021 Mitigation Actions

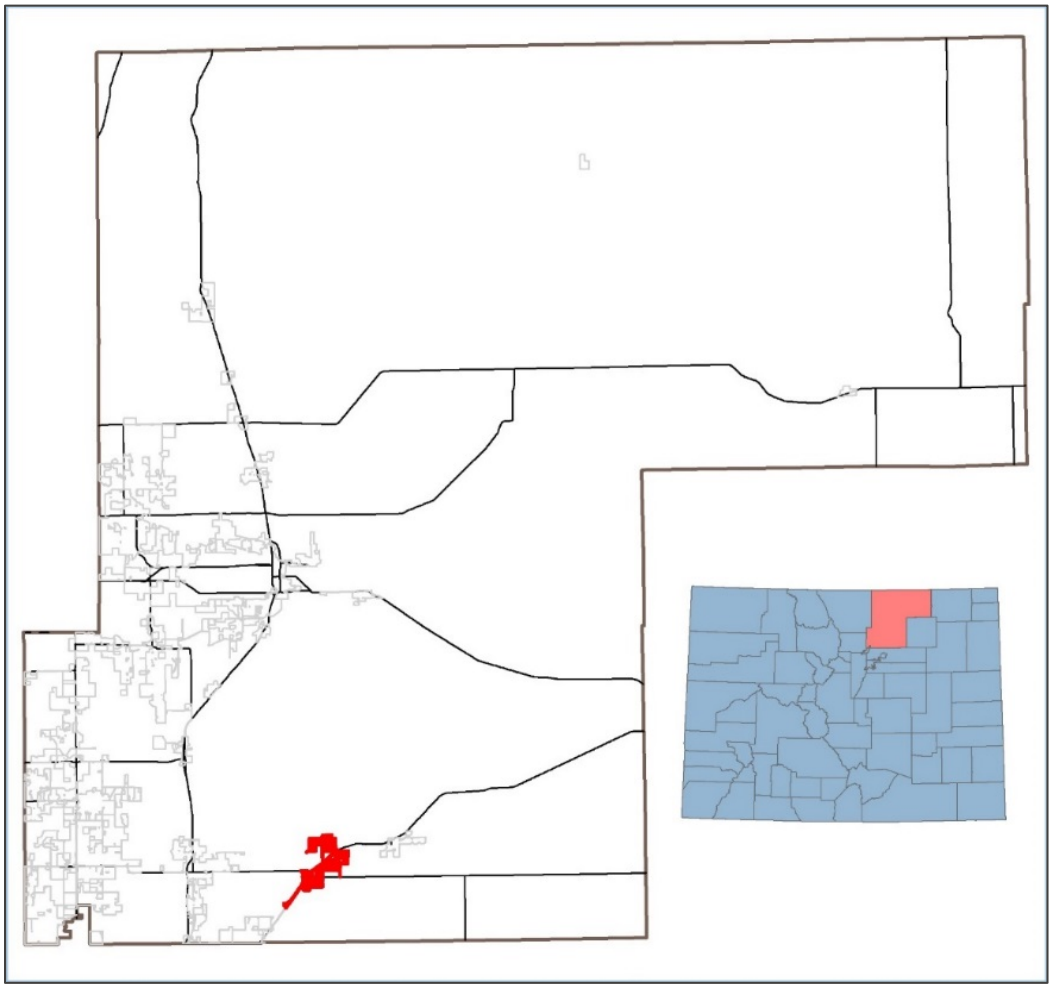
ID	Organization	Action
2021-50	1-City of Greeley	Extreme Heat/Drought Resiliency Program Development
2021-51	2-City of Greeley	Prairie Fire Mitigation Program Development/CWPP
2021-52	1-Greeley- PW	City-Initiated Floodway Rezone
2021-53	2-Greeley -PW	Mitigate Risk to Severe Repetitive Loss Property
2021-54	3-Greeley-PW	Cache la Poudre, West Greeley USACE Project
2021-55	4-Greeley-PW	Poudre River Cleaning
2021-56	5-Greeley -PW	Hwy 85 Bridge Replacement
2021-57	6-Greeley -PW	River Bypass Channel
2021-58	7-Greeley-PW	Poudre River Flood Mitigation Master Planning Project – Ash Ave to 21st Ave

7.10 Town of Hudson

"The Hudson Comprehensive Use Plan establishes the type of town residents want Hudson to become by presenting a comprehensive view of the community, defining the visions of the Town's future, and establishing general methods by which to realize those visions. Its purpose is to articulate the collective desires of the community. It establishes a policy framework for the Town to use in evaluating key issues facing the Town, amendments to the Hudson Comprehensive Plan and to the Town's Land Development Code, and development proposals. Our mission is to enhance the quality of life for those who live in, work in, or visit our community" – 2018

7.10.1 Community Profile

The Town of Hudson is located in south-central Weld County approximately 30 miles northeast of downtown Denver. Located at the intersection of Interstate 76 and State Highway 52, Hudson is surrounded by farms and other agricultural and energy-related industries. The Burlington Northern Santa Fe railway is nearby and a recently operational BNSF Logistics Center is located in northern Hudson, occupying 436 acres.



The table below summarizes development information of the Town of Hudson. Current information for specific characteristics of the population is only available from the US Census Bureau for municipalities with populations over 5,000 people.

Table 138. Town of Hudson Demographics

Hudson	Colorado	
1,891	5,758,736	Population, 2019
-20.1%	14.5%	Population, % change April 1, 2010 to July 1, 2019
2.9	2.56	Persons Per Household, 2019

Note: Recent data is unavailable from the US Census Bureau for some categories, based on the size of the municipality. Source: US Census Bureau

7.10.2 Risk and Vulnerability Assessment

Table 139 summarizes the results of the RF ranking exercise performed by the Town of Hudson. The results represent the relative risk of different hazards across the municipality from the perspective of local stakeholders and subject matter experts. Note the final RF Ranking values in this table include the weighting factors detailed in the Risk Assessment chapter of this Plan.

Table 139. Risk Factor Results for Hudson

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	RF Ranking
Agricultural Hazards	2	1	2	1	4	1.8
Cyber Hazards	3	3	1	4	2	2.6
Drought	3	1	3	1	4	2.3
Earthquake	2	2	4	4	1	2.5
Extreme Temps.	3	1	4	1	4	2.5
Flood	1	1	2	2	3	1.5
Hazmat Release	3	3	3	4	2	3.0
Land Subsidence	2	1	1	1	4	1.6
Prairie Fire	2	3	3	3	3	2.7
Public Health Hazards	3	2	3	1	3	2.5
Severe Storms	4	2	4	1	3	3.0
Tornado & Wind	2	3	3	4	2	2.7

The conclusions drawn from the qualitative assessment are organized into three categories shown in the following table and provide a summary of hazard risk for Hudson as a whole - based on High, Moderate, or Low risk designations. This process helped frame ongoing planning discussions around local and regional hazard risks and assisted with the development of the Plan's updated mitigation strategy.

Table 140. Hazard Risk Conclusions for Hudson

HIGH RISK (2.5 or higher)	**Cyber Hazards, Earthquake, Extreme Temperatures, Hazmat Release, Prairie Fire, Public Health Hazards, Severe Storms, Tornado & Straight-Line Wind**
MODERATE RISK (2.0 – 2.4)	**Drought**
LOW RISK (1.9 or lower)	**Agricultural Hazards, Flood, Land Subsidence**

Since the 2016 Plan, the Town has increased the assessed risk from drought from Low to Moderate.

The Town has also increased the assessed risk from earthquake from Low to High. Risk from extreme temperature, public health hazards, and prairie fire are all now considered High (previously Moderate). Besides the newly added hazards of agricultural hazards and cyber hazards, all other risk rankings remain the same.

The following sections highlight the Town of Hudson's High Risk hazards and include any specific content relevant to the Town. They are intended to supplement information included in each hazard profile in the main body of this Plan.

7.10.2.1 Cyber Hazards

For any municipality, vulnerability to cyber hazards does not vary from that of the County as a whole. While there are no documented cyber events impacting Hudson, the threat of this hazard is continually increasing. There are no previous events to document specific to the Town of Hudson. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.10.2.2 Earthquake

Vulnerability to earthquake is not noticeably different from the rest of the County. The Town of Hudson's more densely developed areas experience the greatest risk, in addition to any structures not constructed to meet recent building codes. There are no previous events to document specific to Hudson. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.10.2.3 Extreme Temperatures

Vulnerability to extreme temperatures is not noticeably different from the rest of the County. Those communities whose economies are more dependent on the agriculture industry do experience higher risk to these hazards due to potential crop and livestock losses. Additionally, individuals at a higher risk to extreme temperatures include those with mobility issues, independent living difficulty, the elderly, low-income families, outdoor laborers, and those experiencing homelessness. Data for these demographics is collected at census tract level, however snapshot data for populations that can fluctuate drastically, such as the number of outdoor laborers and those experiencing homelessness is not included. These are still considerable populations in the County and the Town of Hudson and local efforts to quantify these populations periodically can help with mitigation planning.

The data for high risk populations has been analyzed by Colorado Department of Public Health and Environment (CDPHE) and has been used to create Community Inclusions maps. These maps can be zoomed into specific census tracts for municipalities and communities, illustrating the population variances. Refer to Chapter 4 for examples of these maps for Weld County.

There are no previous events to document specific to the Town of Hudson. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.10.2.4 Hazmat Release

Vulnerability to hazmat release is increased for the Town of Hudson, mainly due to the location of a CDOT hazardous materials route through the community. Additionally, railroads span across Hudson which present their own increased risk for hazmat release. As is true for the entire County, the presence of any businesses that store hazardous materials also increases the risk for these types of events.

Based on data supplied by the Pipeline and Hazardous Materials Safety Administration's (PHMSA) Incident Reports Database there has been one event within Hudson between 1991 and 2019. This was a railway transport event and was caused by a loose closure or component.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.10.2.5 Prairie Fire

Vulnerability to prairie fire is increased for Hudson, where 54.8% of address points (362) are located within the wildland urban interface (WUI). This is a larger percentage of structures at risk, as compared to 49.6 percent of Countywide addresses located in the WUI. Future occurrences are expected to mirror that of the County. There are no previous events to document specific to Hudson. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.10.2.6 Public Health Hazards

Vulnerability to public health hazards is not expected to be noticeably different from the rest of the County. Individuals at a higher risk to this hazard include the aging adult population, those with a chronic illness, such as diabetes, asthma, coronary heart disease, and those who are obese or overweight. Other populations at risk include children, those in poverty and those with a disability. This data is collected at census tract level by the Centers for Disease Control (CDC) and is unavailable at a municipality level. The data by census tract can be found in the Colorado Department of Health and Environment Open Data database here.

Future occurrences are expected to mirror that of the County. There are no previous events to document specific to Hudson. Refer to Chapter 5 – Risk Assessment of this Plan for additional details, including a summary of the higher risk population demographics for Weld County and the State.

7.10.2.7 Severe Storm (including Hail, Lightning, & Winter Storm)

Vulnerability to severe storm, which includes hail, lightning, and winter storm, is not noticeably different from the rest of the County. The Town of Hudson 's more densely developed areas experience the greatest risk, in addition to potential greater losses to the agriculture sector. Any structures not constructed to meet recent building codes experience the greatest risk from structural damages.

According to the NOAA's Storm Events Database, between 2015 and 2020, the Town of Hudson has had six severe storm events. Four of these events resulted in reports of hail, which ranged in size from 1 inch to 2 inches. None of these events resulted in reported damage to property or crops and no injuries or deaths.

Two events were reported as thunderstorm winds with magnitudes of 60 mph and 63 mph. There was no reported damage to property or crops and no injuries or deaths. No other events for severe storm, specific to Hudson, were recorded over this time period.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.10.2.8 Tornado & Straight-Line Wind

Vulnerability to tornado & straight-line wind is not noticeably different from the rest of the County. Hudson's more densely developed areas experience the greatest risk, in addition to any structures not constructed to meet recent building codes.

According to the NOAA's Storm Events Database, between 2015 and 2020, there was one (1) report of an EF0 tornado in Hudson. The event did not cause damage to property or crops and no injuries or deaths.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.10.3 Capabilities Assessment

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

Planning and regulatory capabilities are powerful tools for implementing hazard mitigation. The Town currently utilizes or has implemented many of these capabilities shown in Table 141. It is important for all municipalities to regularly review each of these tools, to identify opportunities for further risk reduction efforts.

Table 141. Planning & Regulatory Capabilities

Mitigation Capability	Utilized?	Comments
Comprehensive, Master, or General Plan	Yes	2035 Comprehensive Plan, passed March 2018
Capital Improvement Program or Plan (CIP)	No	Currently in progress
Floodplain Management Plan	No	
Stormwater Program / Plan	No	
Community Wildfire Protection Plan (CWPP)	No	
Erosion / Sediment Control Program	Yes	Adopted by reference in engineering standards
Economic Development Plan	No	
Other:	Yes	Passed January 2020
Building Codes (Year)	Yes	IBC, IRC 2018
Site Plan Review Requirements	Yes	All except single-family residential
Other:	No	
Zoning Ordinance (Land Use)	Yes	
Subdivision Ordinance	Yes	
National Flood Insurance Program (NFIP) Participant	Yes	Adopted by reference in engineering standards
Flood Insurance Study / Flood Insurance Rate Map / DFIRM	Yes	Adopted by reference in engineering standards
Floodplain Ordinance	Yes	Regulated through engineering standards
Elevation Certificates for Floodplain Development	Yes	
Community Rating System (CRS) Participant	No	
Open Space / Conservation Program	No	

Mitigation Capability	Utilized?	Comments
Growth Management Ordinance	Yes	
Stormwater Ordinance	Yes	Regulated through engineering standards
Other Hazard Ordinance (steep slope, wildfire, snow loads, etc.)	No	
Other:	No	

Available resources including staff, municipal groups, and technology are all vital for a community to be able to implement hazard mitigation. Hudson is fortunate to have most all of these capabilities identified in Table 142.

Table 142. Administrative & Technical Capabilities

Mitigation Capability	Utilized?	Comments
Planning Commission	Yes	
Mitigation Planning Committee	No	
Maintenance Programs (tree trimming, clearing drainage, etc.)	Yes	As needed
Emergency Manager	Yes	Assistant to the Town Manager
Building Official	Yes	Contract with SAFEbuilt
Floodplain Administrator	Yes	Guy Patterson
Community Planner	Yes	
Transportation Planner	Yes	Same as Community Planner
Civil Engineer	Yes	Contract with Northern Engineering
GIS Capability	Yes	
Resiliency Planner	No	
Other:	No	
Warning Systems / Services (flood)	No	Minimal floodplain issues
Warning Systems / Services (other / multi hazard)	Yes	Tornado sirens (Weld County)
Grant Writing / Management	Yes	Multiple Staff
Other:	No	

The ability of a community to implement a comprehensive mitigation strategy is largely dependent on available funding. These related municipal capabilities are outlined in Table 143 and show that Hudson utilizes a broad range of financial tools that can support mitigation activities.

Table 143. Financial Capabilities

Mitigation Capability	Utilized?	Comments
Levy for Specific Purposes with Voter Approval	Yes	"Property Tax Special Revenue Fund"
Utilities Fees	Yes	
System Development / Impact Development Fee	Yes	Park, Facilities, Street Impact Funds (low $ amount)
General Obligation Bonds to Incur Debt	Yes	

Mitigation Capability	Utilized?	Comments
Special Tax Bonds to Incur Debt	Yes	
Open Space / Conservation Fund	Yes	
Stormwater Utility Fees	No	
Capital Improvement Project Funding	Yes	
Community Development Block Grants (CDBG)	Yes	
Withheld spending in hazard-prone areas	No	
Other:	No	

Education and outreach are important capabilities that allow a community to continue the conversation with their public regarding hazard risk and opportunities to mitigate. Table 144 shows that Hudson could benefit by expanding upon these capabilities.

Table 144. Education & Outreach Capabilities

Mitigation Capability	Utilized?	Comments
Public Hazard Education / Outreach Program	No	
Local Citizen Groups That Communicate Hazard Risks	No	
Firewise	No	
NOAA StormReady Program	No	
Other:	No	

7.10.4 Mitigation Actions

The new mitigation actions identified by the Town during the Plan update are included in Table 145Table 73. Two actions from the 2016 Plan have been carried over into the Town's updated mitigation strategy.

Table 145. 2021 Mitigation Actions

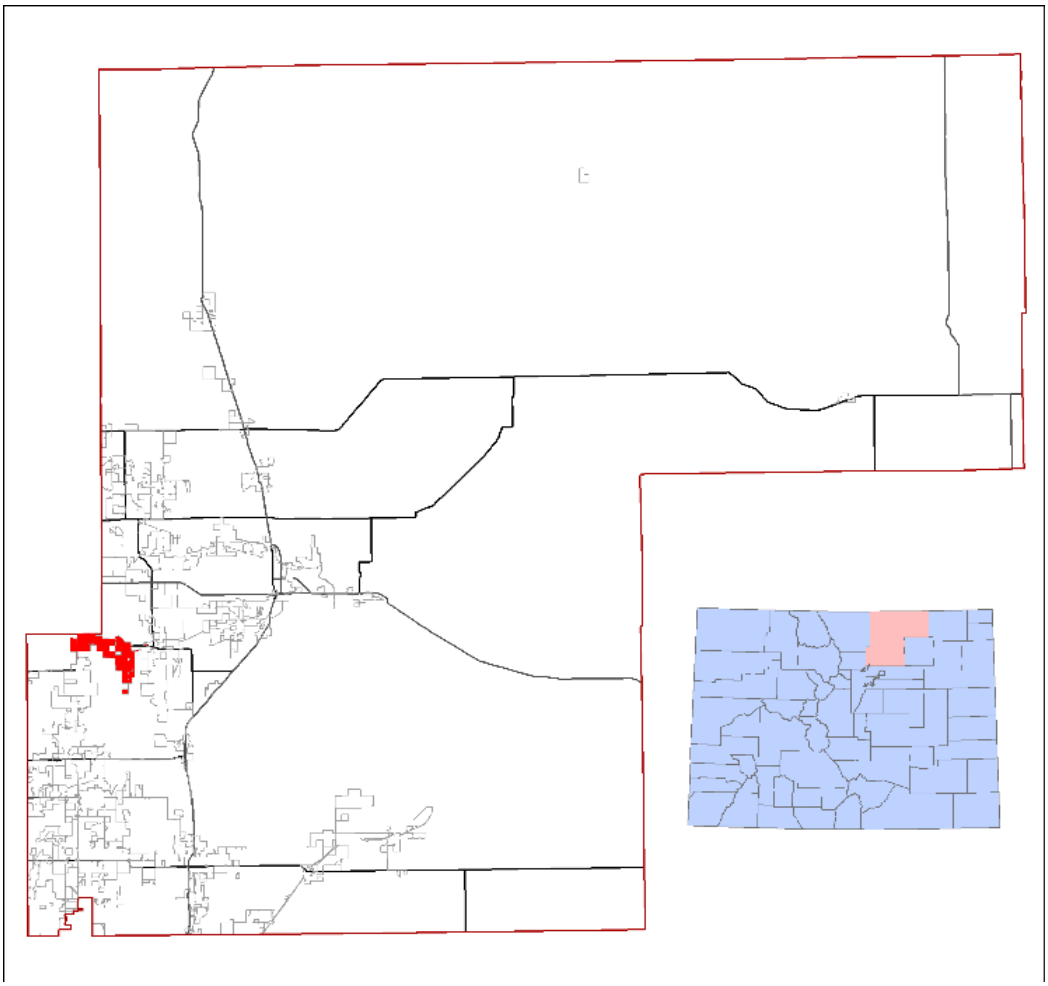
ID	Organization	Action
2021-59	1-Hudson	Community Impact Study -Vulnerable Populations-Shelter Capabilities Planning
2021-60	2-Hudson	Repeater System
2021-61	3-Hudson	Updates Comprehensive Plan / Identify Mitigation actions

7.11 Town of Johnstown

The 2020 Town of Johnstown Comprehensive Plan states the community mission as *"enhancing the quality of life of our residents, businesses, and visitors through community-focused leadership."* Along with this mission the vision statement of "*connecting community with opportunity*" shows the commitment to community-driven growth and development.

7.11.1 Community Profile

The Town of Johnstown falls in both Larimer and Weld Counties. Greeley is approximately ten miles to the east-northeast and Loveland is approximately nine miles to the northwest. With a location adjacent to Interstate 25 and a Great Western Railroad interchange, the Town has a unique advantage for transporting goods and services across the region.



The table below summarizes key demographic characteristics of Johnstown.

Table 146. Town of Johnstown Demographics

Johnstown	Colorado	
18,198	5,758,736	Population, 2019
54.1%	14.5%	Population, % change April 1, 2010 to July 1, 2019
9.2%	5.8%	% Population under 5 years, 2019

Johnstown	Colorado	
25.7%	21.9%	% Population under 19 years, 2019
12.9%	14.6%	% Population 65 years and over, 2019
88.5%	64.9%	Homeownership Rate, 2019
2.87	2.56	Persons Per Household, 2019
$90,240	$68,811	Median Household Income, 2014- 2018
2.9%	9.3%	Persons below poverty level, %, 2014- 2018
4.7%	7.3%	% Population under 65 years, with a disability 2014-2018
13.7%	17%	Language other than English spoken at home, % age 5+, 2014- 2018

Source: US Census Bureau

7.11.2 Risk and Vulnerability Assessment

The Town of Johnstown is situated in both Larimer and Weld Counties. For the purpose of this plan, spatially analyzed hazard risks have been assessed for the areas of the city that lie specifically within Weld County.

Table 147 summarizes the results of the RF ranking exercise performed by the Town of Johnstown. The results represent the relative risk of different hazards across the municipality from the perspective of local stakeholders and subject matter experts. Note the final RF Ranking values in this table include the weighting factors detailed in the Risk Assessment chapter of this Plan.

Table 147. Risk Factor Results for Johnstown

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	RF Ranking
Agricultural Hazards	3	1	2	1	4	2.1
Cyber Hazards	3	1	2	4	4	2.4
Drought	2	1	4	1	4	2.2
Earthquake	1	1	3	4	1	1.7
Extreme Temps.	2	1	4	1	4	2.2
Flood	3	2	1	2	3	2.2
Hazmat Release	3	1	1	4	1	1.9
Land Subsidence	4	1	1	4	4	2.5
Prairie Fire	3	1	1	4	2	2.0
Public Health Hazards	2	3	4	1	4	2.8
Severe Storms	3	1	4	2	2	2.4
Tornado & Wind	4	1	2	4	1	2.4

The conclusions drawn from the qualitative assessment are organized into three categories shown in the following table and provide a summary of hazard risk for Johnstown as a whole - based on High, Moderate, or Low risk designations. This process helped frame ongoing planning discussions around local and regional hazard risks and assisted with the development of the Plan's updated mitigation strategy.

Table 148. Hazard Risk Conclusions for Johnstown

HIGH RISK (2.5 or higher)	**Land Subsidence, Public Health Hazards**
MODERATE RISK (2.0 – 2.4)	**Agricultural Hazards, Cyber Hazards, Drought, Extreme Temperatures, Flood, Prairie Fire, Severe Storms, Tornado & Straight-Line Wind**
LOW RISK (1.9 or lower)	**Earthquake, Hazmat Release**

The following sections highlight the Town of Johnstown's High Risk hazards and include any specific content relevant to the Town. They are intended to supplement information included in each hazard profile in the main body of this Plan.

7.11.2.1 Land Subsidence

Johnstown's vulnerability to land subsidence is not noticeably different from the rest of the County. Although undermined areas have not been identified within the Town's borders, there are multiple identified areas within ten miles of Johnstown that had historic mining activities. There are no previous events to document specific to Johnstown. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.11.2.2 Public Health Hazards

Vulnerability to public health hazards is not expected to be noticeably different from the rest of the County. Individuals at a higher risk to this hazard include the aging adult population, those with a chronic illness, such as diabetes, asthma, coronary heart disease, and those who are obese or overweight. Other populations at risk include children, those in poverty and those with a disability. This data is collected at census tract level by the Centers for Disease Control (CDC) and is unavailable at a municipality level. The data by census tract can be found in the Colorado Department of Health and Environment Open Data database here.

Future occurrences are expected to mirror that of the County. There are no previous events to document specific to Johnstown. Refer to Chapter 5 – Risk Assessment of this Plan for additional details, including a summary of the higher risk population demographics for Weld County and the State.

7.11.3 Capabilities Assessment

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

Planning and regulatory capabilities are powerful tools for implementing hazard mitigation. The Town currently utilizes or has implemented many of these capabilities shown in Table 149. It is important for all municipalities to regularly review each of these tools, to identify opportunities for further risk reduction efforts.

Table 149. Planning & Regulatory Capabilities

Mitigation Capability	Utilized?	Comments
Comprehensive, Master, or General Plan	Yes	

Mitigation Capability	Utilized?	Comments
Capital Improvement Program or Plan (CIP)	Yes	
Floodplain Management Plan	No	
Stormwater Program / Plan	No	
Community Wildfire Protection Plan (CWPP)	No	
Erosion / Sediment Control Program	Yes	Require grading and ECP prior to site work
Economic Development Plan	Yes	
Other:	No	
Building Codes (Year)	Yes	2018
Site Plan Review Requirements	Yes	
Other:	No	
Zoning Ordinance (Land Use)	Yes	
Subdivision Ordinance	Yes	
National Flood Insurance Program (NFIP) Participant	Yes	
Flood Insurance Study / Flood Insurance Rate Map / DFIRM	Yes	
Floodplain Ordinance	Yes	
Elevation Certificates for Floodplain Development	Yes	Not in FEMA certificate
Community Rating System (CRS) Participant	No	Under consideration for 2021
Open Space / Conservation Program	No	
Growth Management Ordinance	Yes	
Stormwater Ordinance	Yes	
Other Hazard Ordinance (steep slope, wildfire, snow loads, etc.)	Yes	
Other:	No	

Available resources including staff, municipal groups, and technology are all vital for a community to be able to implement hazard mitigation. Johnstown is fortunate to have most all of these capabilities identified in Table 150.

Table 150. Administrative & Technical Capabilities

Mitigation Capability	Utilized?	Comments
Planning Commission	Yes	
Mitigation Planning Committee	No	
Maintenance Programs (tree trimming, clearing drainage, etc.)	Yes	
Emergency Manager	Yes	
Building Official	Yes	
Floodplain Administrator	Yes	

Mitigation Capability	Utilized?	Comments
Community Planner	Yes	
Transportation Planner	Yes	
Civil Engineer	Yes	
GIS Capability	Yes	
Resiliency Planner	No	
Other:	No	
Warning Systems / Services (flood)	No	
Warning Systems / Services (other / multi hazard)	Yes	
Grant Writing / Management	Yes	
Other:	No	

The ability of a community to implement a comprehensive mitigation strategy is largely dependent on available funding. These related municipal capabilities are outlined in Table 151 and show that Johnstown utilizes a range of financial tools that can support mitigation activities.

Table 151. Financial Capabilities

Mitigation Capability	Utilized?	Comments
Levy for Specific Purposes with Voter Approval	No	
Utilities Fees	Yes	
System Development / Impact Development Fee	Yes	
General Obligation Bonds to Incur Debt	No	
Special Tax Bonds to Incur Debt	No	
Open Space / Conservation Fund	No	
Stormwater Utility Fees	Yes	
Capital Improvement Project Funding	Yes	
Community Development Block Grants (CDBG)	No	
Withheld spending in hazard-prone areas	No	
Other:	No	

Education and outreach are important capabilities that allow a community to continue the conversation with their public regarding hazard risk and opportunities to mitigate. Table 152 shows that Johnstown could benefit by expanding upon these capabilities.

Table 152. Education & Outreach Capabilities

Mitigation Capability	Utilized?	Comments
Public Hazard Education / Outreach Program	No	
Local Citizen Groups That Communicate Hazard Risks	No	
Firewise	No	
NOAA StormReady Program	No	
Other:	No	

7.11.4 Mitigation Actions

The mitigation actions identified by the Town during the Plan update are included in Table 153.

Table 153. 2021 Mitigation Actions

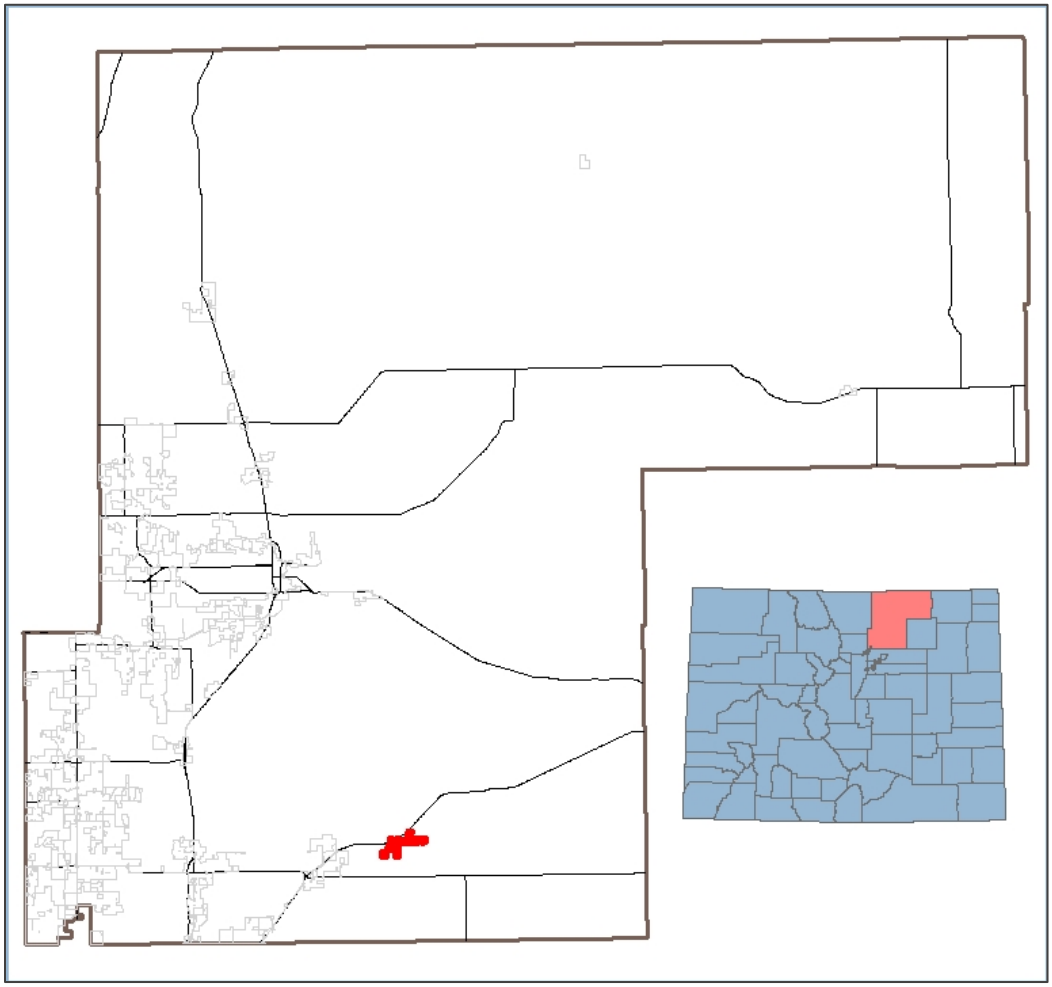
ID	Organization	Action
2021-62	1-Johnstown	Resiliency Study
2021-63	2-Johnstown	Drainage Improvements Old Town
2021-64	3-Johnstown	Install Emergency Generator
2021-65	4-Johnstown	Community Preparedness Education
2021-66	5-Johnstown	Community Impact Study -Vulnerable Populations-Shelter Capabilities Planning

7.12 Town of Keenesburg

The motto of Keenesburg is "Home of 500 Happy People and a Few Soreheads." While the Town has grown to a population of over 1,200, the importance of positive progression of the community is at the forefront of the Town's character. Pride in the community's involvement and roots in agriculture have guided the development of this municipality.

7.12.1 Community Profile

The Town of Keenesburg is located in Southeast Weld County, approximately 25 miles southeast of the County Seat of Greeley. Keenesburg is located along the I-76 corridor and approximately 35 miles northeast of Denver. The Town has a total area of 0.6 square miles and is part of the agricultural community.



The table below summarizes development information of the Town of Keenesburg. Current information for specific characteristics of the population is only available from the US Census Bureau for municipalities with populations over 5,000 people.

Table 154. Town of Keenesburg Demographics

Keenesburg	Colorado	
1,237	5,758,736	Population, 2019

Keenesburg	Colorado	
8.7%	14.5%	Population, % change April 1, 2010 to July 1, 2019
2.56	2.56	Persons Per Household, 2019

Note: Recent data is unavailable from the US Census Bureau for some categories, based on the size of the municipality. Source: US Census Bureau

7.12.2 Risk and Vulnerability Assessment

Table 155 summarizes the results of the RF ranking exercise performed by the Town of Keenesburg. The results represent the relative risk of different hazards across the municipality from the perspective of local stakeholders and subject matter experts. Note the final RF Ranking values in this table include the weighting factors detailed in the Risk Assessment chapter of this Plan.

Table 155. Risk Factor Results for Keenesburg

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	RF Ranking
Agricultural Hazards	3	2	3	1	4	2.6
Cyber Hazards	3	2	2	4	2	2.5
Drought	4	3	3	1	4	3.2
Earthquake	1	3	3	4	1	2.3
Extreme Temps.	3	3	3	2	3	2.9
Flood	2	3	3	3	2	2.6
Hazmat Release	3	4	3	4	3	3.4
Land Subsidence	1	1	1	4	1	1.3
Prairie Fire	2	2	2	4	1	2.1
Public Health Hazards	4	4	4	1	4	3.7
Severe Storms	4	3	4	2	1	3.2
Tornado & Wind	3	3	3	4	1	2.9

The conclusions drawn from the qualitative assessment are organized into three categories shown in the following table and provide a summary of hazard risk for Keenesburg as a whole - based on High, Moderate, or Low risk designations. This process helped frame ongoing planning discussions around local and regional hazard risks and assisted with the development of the Plan's updated mitigation strategy.

Table 156. Hazard Risk Conclusions for Keenesburg

HIGH RISK (2.5 or higher)	**Agricultural Hazards, Cyber Hazards, Drought, Extreme Temperatures, Flood, Hazmat Release, Public Health Hazards, Severe Storms, Tornado & Straight-Line Wind**
MODERATE RISK (2.0 – 2.4)	**Earthquake, Prairie Fire**
LOW RISK (1.9 or lower)	**Land Subsidence**

Since the 2016 Plan, the Town has increased the assessed risk from drought and flood to High Risk (both formerly Moderate). The Town has also increased the assessed risk from extreme temperatures,

hazmat release, public health hazards, and prairie fire to High Risk (all formerly Low). Besides the newly added hazards of agricultural hazards and cyber hazards, all other risk rankings remain the same.

The following sections highlight the Town of Keenesburg's High Risk hazards and include any specific content relevant to the Town. They are intended to supplement information included in each hazard profile in the main body of this Plan.

7.12.2.1 Agricultural Hazards (including Disease & Pests)

Vulnerability to agricultural hazards is not noticeably different from the rest of the County. Those communities whose economies are more dependent on the agriculture industry do experience higher risk to these hazards. There are no previous events to document specific to the Town of Keenesburg. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.12.2.2 Cyber Hazards

For any municipality, vulnerability to cyber hazards does not vary from that of the County as a whole. While there are no documented cyber events impacting the Town of Keenesburg, the threat of this hazard is continually increasing. There are no previous events to document specific to Keenesburg. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.12.2.3 Drought

The community vulnerability to drought is not noticeably different from the rest of the County. Those communities whose economies are more dependent on the agriculture industry do experience higher risk to this hazard. There are no previous events to document specific to the Town of Keenesburg. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.12.2.4 Extreme Temperatures

The Town of Keenesburg's vulnerability to extreme temperatures is not noticeably different from the rest of the County. Those communities whose economies are more dependent on the agriculture industry do experience higher risk to these hazards due to potential crop and livestock losses. Additionally, individuals at a higher risk to extreme temperatures include those with mobility issues, independent living difficulty, the elderly, low-income families, outdoor laborers, and those experiencing homelessness. Data for these demographics is collected at census tract level, however snapshot data for populations that can fluctuate drastically, such as the number of outdoor laborers and those experiencing homelessness is not included. These are still considerable populations in the County and the Town of Keenesburg and local efforts to quantify these populations periodically can help with mitigation planning.

The data for high risk populations has been analyzed by Colorado Department of Public Health and Environment (CDPHE) and has been used to create Community Inclusions maps. These maps can be zoomed into specific census tracts for municipalities and communities, illustrating the population variances. Refer to Chapter 4 for examples of these maps for Weld County.

There are no previous events to document specific to the Town of Keenesburg. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.12.2.5 Flood (including Dam & Levee Failure)

Flood is a very localized hazard and vulnerability is unique for each municipality. On 6/16/2018 a flash flood impacted Keenesburg, resulting in $10,000 in property damages. Numerous roads were closed and damaged due to the heavy rain.

The Town of Keenesburg's overall vulnerability to flood is not noticeably different from the rest of the County. Keenesburg has 1 address point located in the Special Flood Hazard Area (SFHA). This equates to 1.7% of all address points for the Town, as compared to 1.6% of Countywide addresses located in the SFHA.

Flood events can also occur as a result of dam or levee failure. In these cases, flood waters may not follow the typical floodplains mapped as the SFHA.

The Town of Keenesburg's overall vulnerability to flooding in dam inundation areas is significantly different from the rest of the County, as Keenesburg has no address points located in these dam inundation areas. This is compared to 1.0% of Countywide addresses located in these areas.

Additionally, the Town is the first jurisdiction downstream from two dams. Both have a hazard classification of Low. Additional information pertaining to dams can be referenced at the State's Dam Safety website: https://dwr.state.co.us/Tools/DamSafety/Dams .

The Town's overall vulnerability to flooding in areas protected by known levees is substantially different from the rest of the County. Keenesburg has no address points located in these within levee protected areas, compared to 1.6% of Countywide addresses located in these areas.

It is important to note that this analysis is only as good as best available data allows. Current floodplains, dam inundation areas, and areas protected by levees may not currently map all hazard areas. Additionally, mapped hazard areas may be dated and in need of updated mapping and analysis.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.12.2.6 Hazmat Release

Vulnerability to hazmat release is increased for the Town of Keenesburg, mainly due to the location of a CDOT hazardous materials route through the community. Additionally, railroads span across Keenesburg which present their own increased risk for hazmat release. As is true for the entire County, the presence of any businesses that store hazardous materials also increases the risk for these types of events.

Based on data supplied by the Pipeline and Hazardous Materials Safety Administration's (PHMSA) Incident Reports Database, eight events occurred within Keenesburg between 1991 and 2019. One was a rollover accident, while the rest were due to improper transport preparation and loose or defective components.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.12.2.7 Public Health Hazards

Vulnerability to public health hazards is not expected to be noticeably different from the rest of the County. Individuals at a higher risk to this hazard include the aging adult population, those with a chronic illness, such as diabetes, asthma, coronary heart disease, and those who are obese or

overweight. Other populations at risk include children, those in poverty and those with a disability. This data is collected at census tract level by the Centers for Disease Control (CDC) and is unavailable at a municipality level. The data by census tract can be found in the Colorado Department of Health and Environment Open Data database here.

Future occurrences are expected to mirror that of the County. There are no previous events to document specific to Keenesburg. Refer to Chapter 5 – Risk Assessment of this Plan for additional details, including a summary of the higher risk population demographics for Weld County and the State.

7.12.2.8 Severe Storm (including Hail, Lightning, & Winter Storm)

Vulnerability to severe storm, which includes hail, lightning, and winter storm, is not noticeably different from the rest of the County. The Town of Keenesburg's more densely developed areas experience the greatest risk, in addition to potential greater losses to the agriculture sector. Any structures not constructed to meet recent building codes experience the greatest risk from structural damages.

According to the NOAA's Storm Events Database, between 2015 and 2020, the Town of Keenesburg has had 8 severe storm events. Four (4) of these events resulted in reports of hail, which ranged in size from 1 inch to 1.5 inches. None of these events resulted in reported damage to property or crops and no injuries or deaths.

Four (4) events were reported as thunderstorm winds with magnitudes of 50 mph and 61 mph. There was no reported damage to property or crops and no injuries or deaths. No other events for severe storm, specific to Keenesburg, were recorded over this time period.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.12.2.9 Tornado & Straight-Line Wind

Vulnerability to tornado & straight-line wind is not noticeably different from the rest of the County. The Town of Keenesburg's more densely developed areas experience the greatest risk, in addition to any structures not constructed to meet recent building codes.

According to the NOAA's Storm Events Database, between 2015 and 2020, there was one (1) report of an EF0 tornado in Keenesburg. The event did not cause damage to property or crops and no injuries or deaths.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.12.3 Capabilities Assessment

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

Planning and regulatory capabilities are powerful tools for implementing hazard mitigation. The Town currently utilizes or has implemented many of these capabilities shown in Table 157. It is important for all municipalities to regularly review each of these tools, to identify opportunities for further risk reduction efforts.

Table 157. Planning & Regulatory Capabilities

Mitigation Capability	Utilized?	Comments
Comprehensive, Master, or General Plan	Yes	Comprehensive Plan, update in 2021
Capital Improvement Program or Plan (CIP)	Yes	
Floodplain Management Plan	No	
Stormwater Program / Plan	In Progress	In development- planning stages
Community Wildfire Protection Plan (CWPP)	No	
Erosion / Sediment Control Program	No	Erosion control, Construction permits
Economic Development Plan	No	City Council informal group
Other:		
Building Codes	Yes	Updated 2018- New update in process
Site Plan Review Requirements	Yes	Municipal Code
Other:		
Zoning Ordinance (Land Use)	Yes	Municipal Code / Adopted Standards
Subdivision Ordinance	Yes	Municipal Code
National Flood Insurance Program (NFIP) Participant	Yes	
Flood Insurance Study / Flood Insurance Rate Map / DFIRM	Yes	
Floodplain Ordinance	Yes	
Elevation Certificates for Floodplain Development	No	
Community Rating System (CRS) Participant	No	
Open Space / Conservation Program	No	
Growth Management Ordinance	No	
Stormwater Ordinance	No	
Other Hazard Ordinance (steep slope, wildfire, snow loads, etc.)	No	
Other:	No	

Available resources including staff, municipal groups, and technology are all vital for a community to be able to implement hazard mitigation. Keenesburg is fortunate to have many of these capabilities identified in Table 158 and are currently increasing these abilities.

Table 158. Administrative & Technical Capabilities

Mitigation Capability	Utilized?	Comments
Planning Commission	Yes	
Mitigation Planning Committee	No	

Mitigation Capability	Utilized?	Comments
Maintenance Programs (tree trimming, clearing drainage, etc.)	Yes	Easement, cleaned and cleared, tree trimming in progress, Tree USA town in future
Emergency Manager	Yes	Fire Chief SE Weld FPD
Building Official	Yes	Contract Charles Abbott & Assoc, Troy Dicker
Floodplain Administrator	Yes	Mark Grey
Community Planner	Yes	Contract, Todd Hodges
Transportation Planner	In progress	2021- transportation plan-hiring position
Civil Engineer	Yes	Kent Bruxvoort
GIS Capability	In progress	goal for 2021
Resiliency Planner	No	
Other:	No	
Warning Systems / Services (flood)	Yes	Emergency Siren-All Hazards
Warning Systems / Services (other / multi hazard)	Yes	Emergency Siren, CodeRed, IPAWS
Grant Writing / Management	Yes	Debra Chumley
Other:	No	

The ability of a community to implement a comprehensive mitigation strategy is largely dependent on available funding. These related municipal capabilities are outlined in Table 159 and show that Keenesburg utilizes a broad range of financial tools that can support mitigation activities.

Table 159. Financial Capabilities

Mitigation Capability	Utilized?	Comments
Levy for Specific Purposes with Voter Approval	No	
Utilities Fees	Yes	Water, Sewer
System Development / Impact Development Fee	Yes	
General Obligation Bonds to Incur Debt	Yes	Sales Tax Revenue Bond
Special Tax Bonds to Incur Debt	No	
Open Space / Conservation Fund	Yes	
Stormwater Utility Fees	No	
Capital Improvement Project Funding	Yes	Capital Improvement Fund
Community Development Block Grants (CDBG)	Yes	Participating with Weld County
Withheld spending in hazard-prone areas	No	
Other:	No	

Education and outreach are important capabilities that allow a community to continue the conversation with their public regarding hazard risk and opportunities to mitigate. Table 160 shows that Keenesburg does leverage some of these capabilities and would benefit by expanding upon these efforts.

Table 160. Education & Outreach Capabilities

Mitigation Capability	Utilized?	Comments
Public Hazard Education / Outreach Program	No	
Local Citizen Groups That Communicate Hazard Risks	No	
Firewise	No	
NOAA StormReady Program	Yes	SE Weld Fire Protection District
Other:	No	

7.12.4 Mitigation Actions

The mitigation actions identified by the Town during the Plan update are included in Table 161Table 73. Three actions from the 2016 Plan have been carried over into the Town's updated mitigation strategy.

Table 161. 2021 Mitigation Actions

ID	Organization	Action
2021-67	1-Keenesburg	Floodplain Training
2021-68	2-Keenesburg	Notify Travelling Public about Shelter Locations
2021-69	3-Keenesburg	Tornado Warning System Public Education
2021-103	4-Keenesburg	Community Impact Study -Vulnerable Populations-Shelter Capabilities Planning

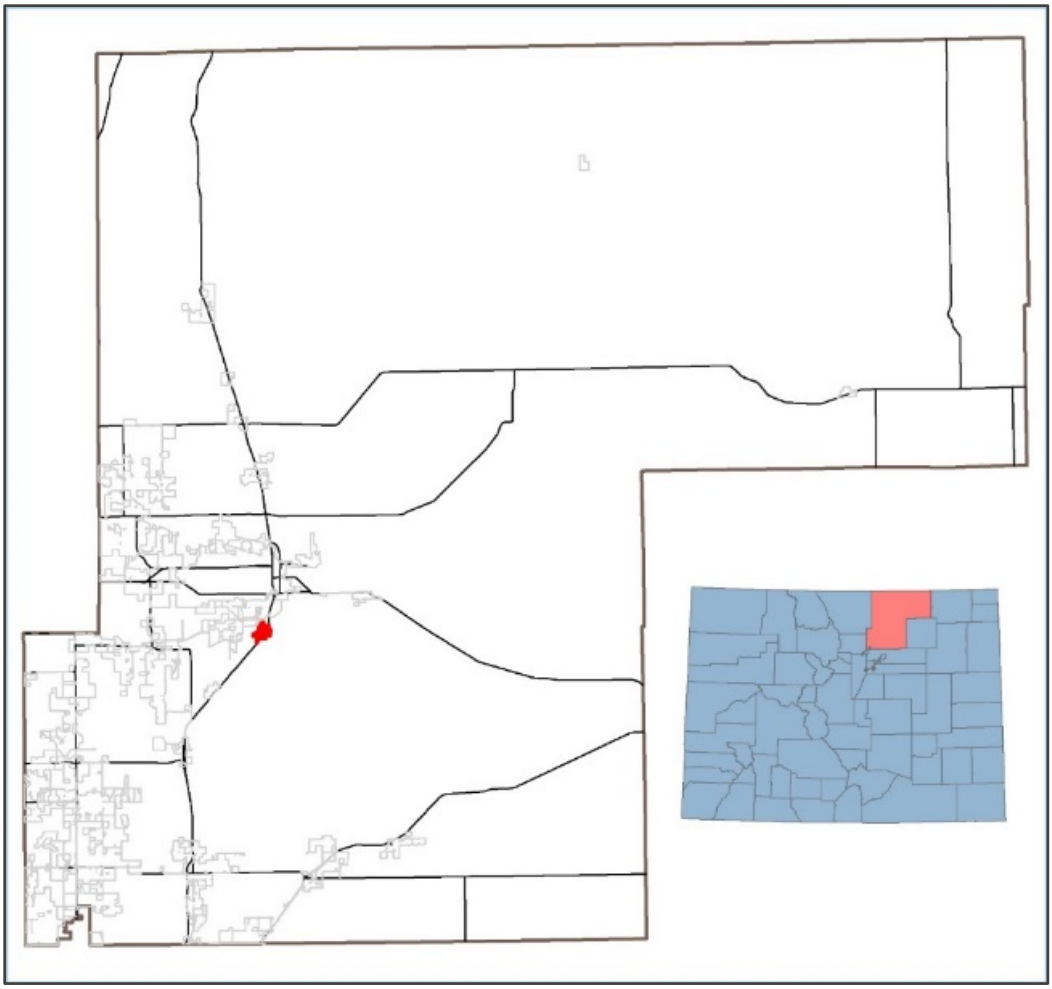
7.13 Town of LaSalle

The LaSalle 2018 Comprehensive Plan identified guiding principles to inform decisions for the present and future of the community. These are based on the community's core values and are used to guide decisions, prioritize allocation of resources and preserve the unique qualities that define LaSalle. These Guiding Principles are:

- Preserve LaSalle's Small-Town Character.
- Ensure growth pays its own way and contributes to the community as a whole.
- Continue to maintain and upgrade infrastructure and community facilities.
- Foster economic vitality and resilience by supporting existing local businesses and attracting new businesses.
- Approach decisions in the spirit of cooperation and work together to find solutions that are beneficial to the community.
- Form and nurture partnerships with other communities and agencies to help strengthen LaSalle and enhance community services.
- Respect and protect the environment.
- Preserve and enhance opportunities and services to support and attract families.
- Be resilient economically and environmentally.
- Continue to acknowledge and support the local agricultural community and responsible development of mineral resources within the LaSalle Planning Area.

7.13.1 Community Profile

LaSalle is located approximately 7 miles south of Greeley. The Town is bisected by U.S Highway 85 and houses a switchyard for Union Pacific Railway. The Town has a total area of 0.7 square miles and is an agricultural community, although recent growth has started to diversify the economy.



The table below summarizes development information of the Town of LaSalle. Current information for specific characteristics of the population is only available from the US Census Bureau for municipalities with populations over 5,000 people.

Table 162. Town of LaSalle Demographics

LaSalle	Colorado	
2,337	5,758,736	Population, 2019
18.9%	14.5%	Population, % change April 1, 2010 to July 1, 2019
2.8	2.56	Persons Per Household, 2019

Note: Recent data is unavailable from the US Census Bureau for some categories, based on the size of the municipality. Source: US Census Bureau

7.13.2 Risk and Vulnerability Assessment

Table 163 summarizes the results of the RF ranking exercise performed by the Town of LaSalle. The results represent the relative risk of different hazards across the municipality from the perspective of local stakeholders and subject matter experts. Note the final RF Ranking values in this table include the weighting factors detailed in the Risk Assessment chapter of this Plan.

Table 163. Risk Factor Results for LaSalle

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	RF Ranking
Agricultural Hazards	2	2	2	1	2	1.9
Cyber Hazards	2	1	4	4	2	2.3
Drought	4	3	4	1	4	3.4
Earthquake	1	1	1	1	1	1.0
Extreme Temps.	2	2	3	1	2	2.1
Flood	3	3	3	4	4	3.2
Hazmat Release	3	3	4	4	2	3.2
Land Subsidence	1	1	1	1	1	1.0
Prairie Fire	2	1	1	4	1	1.6
Public Health Hazards	4	4	4	2	4	3.8
Severe Storms	4	3	4	2	3	3.4
Tornado & Wind	3	3	3	4	1	2.9

The conclusions drawn from the qualitative assessment are organized into three categories shown in the following table and provide a summary of hazard risk for LaSalle as a whole - based on High, Moderate, or Low risk designations. This process helped frame ongoing planning discussions around local and regional hazard risks and assisted with the development of the Plan's updated mitigation strategy.

Table 164. Hazard Risk Conclusions for LaSalle

HIGH RISK (2.5 or higher)	**Drought, Flood, Hazmat Release, Public Health Hazards, Severe Storms, Tornado & Straight-Line Wind**
MODERATE RISK (2.0 – 2.4)	**Cyber Hazards, Extreme Temperatures**
LOW RISK (1.9 or lower)	**Agricultural Hazards, Earthquake, Land Subsidence, Prairie Fire**

Since the 2016 Plan, the Town has decreased the assessed risk from earthquake to Low Risk (formerly Moderate) and from extreme temperatures to Moderate Risk (formerly High). LaSalle increased its risk assessment for flood to be High Risk (formerly Moderate). Besides the newly added hazards of agricultural hazards and cyber hazards, all other risk rankings remain the same.

The following sections highlight the Town of LaSalle's High Risk hazards and include any specific content relevant to the Town. They are intended to supplement information included in each hazard profile in the main body of this Plan.

7.13.2.1 Drought

The community vulnerability to drought is not noticeably different from the rest of the County. Those communities whose economies are more dependent on the agriculture industry do experience higher risk to this hazard. There are no previous events to document specific to LaSalle. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.13.2.2 Flood (including Dam & Levee Failure)

Flood is a very localized hazard and vulnerability is unique for each municipality. There are no previous events to document specific to LaSalle.

The Town of LaSalle's overall vulnerability to flood is considerably less than that of the rest of the County. LaSalle has no address points located in the Special Flood Hazard Area (SFHA), compared to the 1.6% of Countywide addresses that are located in the SFHA.

However, flood events can occur as a result of dam or levee failure. In these cases, flood waters may not follow the typical floodplains mapped as the SFHA.

Overall vulnerability to flooding in dam inundation areas is increased considerably for the Town of LaSalle, where 81.4% of address points (751) are located within these dam inundation areas. This is a significantly larger percentage of structures at risk, as compared to 1.0% of Countywide addresses located in these areas.

Additionally, the Town is the first jurisdiction downstream from eight dams. One has a hazard classification of Significant and currently has an Emergency Action Plan (EAP). None are classified as High. Additional information pertaining to dams can be referenced at the State's Dam Safety website: https://dwr.state.co.us/Tools/DamSafety/Dams .

The Town's overall vulnerability to flooding in areas protected by known levees is substantially different from the rest of the County. LaSalle has no address points located within levee protected areas. This is compared to 1.6% of Countywide addresses located in these areas.

It is important to note that this analysis is only as good as best available data allows. Current floodplains, dam inundation areas, and areas protected by levees may not currently map all hazard areas. Additionally, mapped hazard areas may be dated and in need of updated mapping and analysis.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.13.2.3 Hazmat Release

Vulnerability to hazmat release is increased for the Town of LaSalle, mainly due to the location of a CDOT hazardous materials route through the community. Additionally, railroads span across LaSalle which present their own increased risk for hazmat release. As is true for the entire County, the presence of any businesses that store hazardous materials also increases the risk for these types of events.

Based on data supplied by the Pipeline and Hazardous Materials Safety Administration's (PHMSA) Incident Reports Database there have been six events that have occurred within the Town of LaSalle between 1991 and 2019. One of these was the derailment and rollover of a train car. The rest were due to overfilling and improper preparation for transport. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.13.2.4 Public Health Hazards

Vulnerability to public health hazards is not expected to be noticeably different from the rest of the County. Individuals at a higher risk to this hazard include the aging adult population, those with a chronic illness, such as diabetes, asthma, coronary heart disease, and those who are obese or overweight. Other populations at risk include children, those in poverty and those with a disability. This data is collected at census tract level by the Centers for Disease Control (CDC) and is unavailable at a

municipality level. The data by census tract can be found in the Colorado Department of Health and Environment Open Data database here.

Future occurrences are expected to mirror that of the County. There are no previous events to document specific to the Town of LaSalle. Refer to Chapter 5 – Risk Assessment of this Plan for additional details, including a summary of the higher risk population demographics for Weld County and the State.

7.13.2.5 Severe Storm (including Hail, Lightning, & Winter Storm)

Vulnerability to severe storm, which includes hail, lightning, and winter storm, is not noticeably different from the rest of the County. LaSalle's more densely developed areas experience the greatest risk, in addition to potential greater losses to the agriculture sector. Any structures not constructed to meet recent building codes experience the greatest risk from structural damages.

According to the NOAA's Storm Events Database, between 2015 and 2020, the Town of LaSalle has had four severe storm events. All of these events resulted in reports of hail, which ranged in size from .75 inch to 1 inch. None of these events resulted in reported damage to property or crops and no injuries or deaths.

No other events for severe storm, specific to LaSalle, were recorded over this time period.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.13.2.6 Tornado & Straight-Line Wind

Vulnerability to tornado & straight-line wind is not noticeably different from the rest of the County. LaSalle's more densely developed areas experience the greatest risk, in addition to any structures not constructed to meet recent building codes.

Between 2015 and 2020, there were no reports of occurrences specific to LaSalle. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.13.3 Capabilities Assessment

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

Planning and regulatory capabilities are powerful tools for implementing hazard mitigation. The Town currently utilizes or has implemented most of these capabilities shown in Table 165. It is important for all municipalities to regularly review each of these tools, to identify opportunities for further risk reduction efforts.

Table 165. Planning & Regulatory Capabilities

Mitigation Capability	Utilized?	Comments
Comprehensive, Master, or General Plan	Yes	
Capital Improvement Program or Plan (CIP)	Yes	Reviewed annually

Mitigation Capability	Utilized?	Comments
Floodplain Management Plan		County Plan
Stormwater Program / Plan	Yes	MS4-
Community Wildfire Protection Plan (CWPP)	No	
Erosion / Sediment Control Program	Yes	
Economic Development Plan	Yes	
Other:		
Building Codes (Year)	Yes	2003 IBC
Site Plan Review Requirements	Yes	
Other:	No	
Zoning Ordinance (Land Use)	Yes	
Subdivision Ordinance	Yes	
National Flood Insurance Program (NFIP) Participant	Yes	
Flood Insurance Study / Flood Insurance Rate Map / DFIRM	Yes	
Floodplain Ordinance	Yes	
Elevation Certificates for Floodplain Development	Yes	FEMA
Community Rating System (CRS) Participant	No	
Open Space / Conservation Program	Yes	
Growth Management Ordinance	No	
Stormwater Ordinance	Yes	
Other Hazard Ordinance (steep slope, wildfire, snow loads, etc.)	Yes	Building Code
Other:	No	

Available resources including staff, municipal groups, and technology are all vital for a community to be able to implement hazard mitigation. LaSalle is fortunate to have most all of these capabilities identified in Table 166.

Table 166. Administrative & Technical Capabilities

Mitigation Capability	Utilized?	Comments
Planning Commission	Yes	
Mitigation Planning Committee	Yes	Staff
Maintenance Programs (tree trimming, clearing drainage, etc.)	Yes	
Emergency Manager	Yes	Carl Harvey
Building Official	Yes	Procode
Floodplain Administrator	Yes	Carl Harvey
Community Planner	Yes	
Transportation Planner	Yes	Staff

Mitigation Capability	Utilized?	Comments
Civil Engineer	Yes	Contracted
GIS Capability	Yes	County
Resiliency Planner	No	
Other:	No	
Warning Systems / Services (flood)	Yes	CodeRed, IPAWS
Warning Systems / Services (other / multi hazard)	Yes	CodeRed, IPAWS
Grant Writing / Management	Yes	
Other:	No	

The ability of a community to implement a comprehensive mitigation strategy is largely dependent on available funding. These related municipal capabilities are outlined in Table 167 and show that LaSalle utilizes a broad range of financial tools that can support mitigation activities.

Table 167. Financial Capabilities

Mitigation Capability	Utilized?	Comments
Levy for Specific Purposes with Voter Approval	No	Clerk
Utilities Fees	Yes	Water, Sewer, Trash, Stormwater
System Development / Impact Development Fee	Yes	
General Obligation Bonds to Incur Debt	No	
Special Tax Bonds to Incur Debt	No	
Open Space / Conservation Fund	No	
Stormwater Utility Fees	Yes	
Capital Improvement Project Funding	Yes	Annual Budgeted
Community Development Block Grants (CDBG)	Yes	County
Withheld spending in hazard-prone areas	No	
Other:	Yes	DOLA

Education and outreach are important capabilities that allow a community to continue the conversation with their public regarding hazard risk and opportunities to mitigate. Table 168 shows that LaSalle could benefit by expanding upon these capabilities.

Table 168. Education & Outreach Capabilities

Mitigation Capability	Utilized?	Comments
Public Hazard Education / Outreach Program	No	Occasional events, no formal program
Local Citizen Groups That Communicate Hazard Risks	No	

Mitigation Capability	Utilized?	Comments
Firewise	No	
NOAA StormReady Program	No	
Other:	No	

7.13.4 Mitigation Actions

The new mitigation action identified by the Town during the Plan update is included in Table 169. Two actions from the 2016 Plan have been carried over into the Town's updated mitigation strategy.

Table 169. 2021 Mitigation Actions

ID	Organization	Action
2021-70	1-LaSalle	Community Preparedness Education
2021-71	2-LaSalle	Develop Upkeep Schedule for Emergency Power Systems
2021-104	3-LaSalle	Community Impact Study -Vulnerable Populations-Shelter Capabilities Planning

7.14 Town of Mead

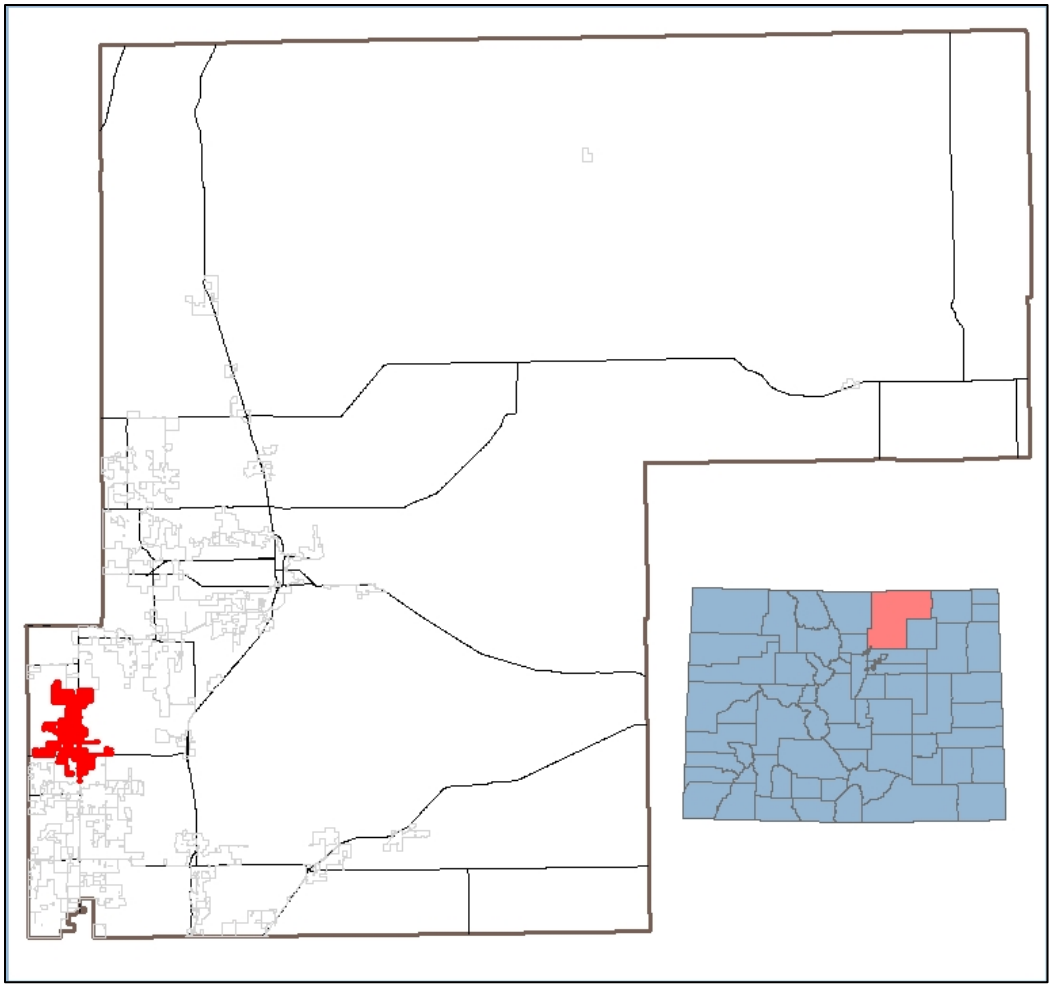
In the 2018 Comprehensive Plan for the Town of Mead, a shared community plan was developed through stakeholder input. The major themes of this plan guide the direction and decisions of community development.

The major themes are:

- A small-town community character
- Diverse economy
- Friendly neighborhoods
- Strong connectivity
- Dynamic parks, recreation and open space
- An expansive natural and agrarian setting
- Thoughtful community planning, facilities and services

7.14.1 Community Profile

The Town of Mead is located on the western edge of Weld County. The town's total area is 4.4 square miles, although the Town is included in the larger planning area spanning almost 50 square miles. Mead is bisected by both Interstate 25 and Highway 66. Highway 66 corridor is the southern scenic gateway into Rocky Mountain National Park and more than 80,000 people drive through the Town limits each day.



The table below summarizes development information of the Town of Mead. Current information for specific characteristics of the population is only available from the US Census Bureau for municipalities with populations over 5,000 people.

Table 170. Town of Mead Demographics

Mead	Colorado	
4,677	5,758,736	Population, 2019
36.1%	14.5%	Population, % change April 1, 2010 to July 1, 2019
3.03	2.56	Persons Per Household, 2019

Note: Recent data is unavailable from the US Census Bureau for some categories, based on the size of the municipality. Source: US Census Bureau

7.14.2 Risk and Vulnerability Assessment

Table 171 summarizes the results of the RF ranking exercise performed by the Town of Mead. The results represent the relative risk of different hazards across the municipality from the perspective of local stakeholders and subject matter experts. Note the final RF Ranking values in this table include the weighting factors detailed in the Risk Assessment chapter of this Plan.

Table 171. Risk Factor Results for Mead

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	RF Ranking
Agricultural Hazards	3	2	3	1	4	2.6
Cyber Hazards	3	3	3	4	4	3.2
Drought	3	2	3	1	4	2.6
Earthquake	1	3	3	4	2	2.4
Extreme Temps.	3	3	3	2	3	2.9
Flood	3	3	3	4	4	3.2
Hazmat Release	3	3	3	4	2	3.0
Land Subsidence	1	1	1	4	1	1.3
Prairie Fire	3	1	2	4	1	2.1
Public Health Hazards	4	4	4	1	4	3.7
Severe Storms	4	3	4	2	3	3.4
Tornado & Wind	3	3	3	4	1	2.9

The conclusions drawn from the qualitative assessment are organized into three categories shown in the following table and provide a summary of hazard risk for Mead as a whole - based on High, Moderate, or Low risk designations. This process helped frame ongoing planning discussions around local and regional hazard risks and assisted with the development of the Plan's updated mitigation strategy.

Table 172. Hazard Risk Conclusions for Mead

HIGH RISK (2.5 or higher)	**Agricultural Hazards, Cyber Hazards, Drought, Extreme Temperatures, Flood, Hazmat Release, Public Health Hazards, Severe Storms, Tornado & Straight-Line Wind**
MODERATE RISK (2.0 – 2.4)	**Earthquake, Prairie Fire**
LOW RISK (1.9 or lower)	**Land Subsidence**

Since the 2016 Plan, the Town has increased the assessed risk from drought to High Risk (formerly Low) and from earthquake and prairie fire to Moderate Risk (formerly Low). Mead increased its risk assessment for extreme temperatures, flood, and hazmat release to be High Risk (all formerly Moderate). Public health hazards, previously a Low Risk, are now considered High. Besides the newly added hazards of agricultural hazards and cyber hazards, all other risk rankings remain the same.

The following sections highlight the Town of Mead's High Risk hazards and include any specific content relevant to the Town. They are intended to supplement information included in each hazard profile in the main body of this Plan.

7.14.2.1 Agricultural Hazards (including Disease & Pests)

Vulnerability to agricultural hazards is not noticeably different from the rest of the County. Those communities whose economies are more dependent on the agriculture industry do experience higher risk to these hazards. There are no previous events to document specific to the Town of Mead. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.14.2.2 Cyber Hazards

For any municipality, vulnerability to cyber hazards does not vary from that of the County as a whole. While there are no documented cyber events impacting Mead, the threat of this hazard is continually increasing. There are no previous events to document specific to the Town of Mead. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.14.2.3 Drought

The community vulnerability to drought is not noticeably different from the rest of the County. Those communities whose economies are more dependent on the agriculture industry do experience higher risk to this hazard. There are no previous events to document specific to the Town of Mead. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.14.2.4 Extreme Temperatures

The Town of Mead's vulnerability to extreme temperatures is not noticeably different from the rest of the County. Those communities whose economies are more dependent on the agriculture industry do experience higher risk to these hazards due to potential crop and livestock losses. Additionally, individuals at a higher risk to extreme temperatures include those with mobility issues, independent living difficulty, the elderly, low-income families, outdoor laborers, and those experiencing homelessness. Data for these demographics is collected at census tract level, however snapshot data for populations that can fluctuate drastically, such as the number of outdoor laborers and those experiencing homelessness is not included. These are still considerable populations in the County and the Town of Mead and local efforts to quantify these populations periodically can help with mitigation planning.

The data for high risk populations has been analyzed by Colorado Department of Public Health and Environment (CDPHE) and has been used to create Community Inclusions maps. These maps can be zoomed into specific census tracts for municipalities and communities, illustrating the population variances. Refer to Chapter 4 for examples of these maps for Weld County.

There are no previous events to document specific to the Town of Mead. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.14.2.5 Flood (including Dam & Levee Failure)

Flood is a very localized hazard and vulnerability is unique for each municipality. There are no previous events to document specific to Mead.

The Town of Mead's overall vulnerability to flood is noticeably different from the rest of the County. Mead has 12 address points located in the Special Flood Hazard Area (SFHA). This equates to 0.5% of all address points for the Town, as compared to 1.6% of Countywide addresses located in the SFHA.

Flood events can also occur as a result of dam or levee failure. In these cases, flood waters may not follow the typical floodplains mapped as the SFHA.

The Town of Mead's overall vulnerability to flooding in dam inundation areas is significantly lower than the rest of the County. Mead has one address point located in these dam inundation areas. This equates to 0.04% of all address points for the Town, as compared to 1.0% of Countywide addresses located in these areas.

Additionally, the Town is the first jurisdiction downstream from two dams. Both have a hazard classification of Low. Additional information pertaining to dams can be referenced at the State's Dam Safety website: https://dwr.state.co.us/Tools/DamSafety/Dams .

The Town's overall vulnerability to flooding in areas protected by known levees is substantially different from the rest of the County. Mead has no address points located in these levee protected areas. This is compared to 1.6% of Countywide addresses located in these areas.

It is important to note that this analysis is only as good as best available data allows. Current floodplains, dam inundation areas, and areas protected by levees may not currently map all hazard areas. Additionally, mapped hazard areas may be dated and in need of updated mapping and analysis.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.14.2.6 Hazmat Release

Vulnerability to hazmat release is increased for the Town of Mead, mainly due to the location of a CDOT hazardous materials route through the community. Additionally, railroads span across Mead which present their own increased risk for hazmat release. As is true for the entire County, the presence of any businesses that store hazardous materials also increases the risk for these types of events.

Based on data supplied by the Pipeline and Hazardous Materials Safety Administration's (PHMSA) Incident Reports Database there have been six events within Mead between 1991 and 2019. These events were due to overfilling and improper preparation for transport. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.14.2.7 Public Health Hazards

Vulnerability to public health hazards is not expected to be noticeably different from the rest of the County. Individuals at a higher risk to this hazard include the aging adult population, those with a chronic illness, such as diabetes, asthma, coronary heart disease, and those who are obese or overweight. Other populations at risk include children, those in poverty and those with a disability. This data is collected at census tract level by the Centers for Disease Control (CDC) and is unavailable at a municipality level. The data by census tract can be found in the Colorado Department of Health and Environment Open Data database here.

Future occurrences are expected to mirror that of the County. There are no previous events to document specific to Mead. Refer to Chapter 5 – Risk Assessment of this Plan for additional details, including a summary of the higher risk population demographics for Weld County and the State.

7.14.2.8 Severe Storms (including Hail, Lightning, & Winter Storm)

Vulnerability to severe storm, which includes hail, lightning, and winter storm, is not noticeably different from the rest of the County. The Town of Mead's more densely developed areas experience the greatest risk, in addition to potential greater losses to the agriculture sector. Any structures not constructed to meet recent building codes experience the greatest risk from structural damages.

According to the NOAA's Storm Events Database, between 2015 and 2020, the Town of Mead has had seven severe storm events. All of these events resulted in reports of hail, which ranged in size from .88 inch to 1.25 inches. None of these events resulted in reported damage to property or crops and no injuries or deaths.

No other events for severe storm, specific to Mead, were recorded over this time period.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.14.2.9 Tornado & Straight-Line Wind

Vulnerability to tornado & straight-line wind is not noticeably different from the rest of the County. Mead's more densely developed areas experience the greatest risk, in addition to any structures not constructed to meet recent building codes.

Between 2015 and 2020, there were no reports of occurrences specific to Mead. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.14.3 Capabilities Assessment

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

Planning and regulatory capabilities are powerful tools for implementing hazard mitigation. The Town currently utilizes or has implemented most of these capabilities shown in Table 173. It is important for all municipalities to regularly review each of these tools, to identify opportunities for further risk reduction efforts.

Table 173. Planning & Regulatory Capabilities

Mitigation Capability	Utilized?	Comments
Comprehensive, Master, or General Plan	Yes	
Capital Improvement Program or Plan (CIP)	No	Informal
Floodplain Management Plan	No	
Stormwater Program / Plan	Yes	
Community Wildfire Protection Plan (CWPP)	No	
Erosion / Sediment Control Program	Yes	
Economic Development Plan	No	
Other:	No	
Building Codes (Year)	Yes	2018
Site Plan Review Requirements	Yes	
Other:	No	
Zoning Ordinance (Land Use)	Yes	
Subdivision Ordinance	Yes	
National Flood Insurance Program (NFIP) Participant	Yes	
Flood Insurance Study / Flood Insurance Rate Map / DFIRM	Yes	
Floodplain Ordinance	Yes	

Mitigation Capability	Utilized?	Comments
Elevation Certificates for Floodplain Development	Yes	
Community Rating System (CRS) Participant	No	
Open Space / Conservation Program	Yes	
Growth Management Ordinance	Yes	
Stormwater Ordinance	Yes	Master Plan
Other Hazard Ordinance (steep slope, wildfire, snow loads, etc.)	No	
Other:	No	

Available resources including staff, municipal groups, and technology are all vital for a community to be able to implement hazard mitigation. Mead is fortunate to have most all of these capabilities identified in Table 174.

Table 174. Administrative & Technical Capabilities

Mitigation Capability	Utilized?	Comments
Planning Commission	Yes	
Mitigation Planning Committee	No	
Maintenance Programs (tree trimming, clearing drainage, etc.)	Yes	
Emergency Manager	No	
Building Official	Yes	
Floodplain Administrator	Yes	Town Engineer
Community Planner	Yes	In-house Staff
Transportation Planner	Yes	Contract Staff
Civil Engineer	Yes	In-house/Contract Staff
GIS Capability	Yes	In-house/Contract Staff
Resiliency Planner	No	
Other:	No	
Warning Systems / Services (flood)	Yes	Currently identified systems: Weld County dispatch; CodeRed; social media
Warning Systems / Services (other / multi hazard)	Yes	Currently identified systems: Weld County dispatch; CodeRed; social media
Grant Writing / Management	Yes	In-house Staff
Other:	No	

The ability of a community to implement a comprehensive mitigation strategy is largely dependent on available funding. These related municipal capabilities are outlined in Table 175 and show that Mead utilizes a broad range of financial tools that can support mitigation activities.

Table 175. Financial Capabilities

Mitigation Capability	Utilized?	Comments
Levy for Specific Purposes with Voter Approval	No	General Mill Levy 11.522, but no specific purpose mill levy
Utilities Fees	Yes	Sewer PIF
System Development / Impact Development Fee	Yes	
General Obligation Bonds to Incur Debt	No	
Special Tax Bonds to Incur Debt	No	
Open Space / Conservation Fund	Yes	Impact Fees
Stormwater Utility Fees	Yes	Impact Fees
Capital Improvement Project Funding	Yes	Impact Fees
Community Development Block Grants (CDBG)	Yes	IGA with Weld County for CDBG
Withheld spending in hazard-prone areas	No	
Other:	No	

Education and outreach are important capabilities that allow a community to continue the conversation with their public regarding hazard risk and opportunities to mitigate. Table 176 shows that Mead could benefit by expanding upon these capabilities.

Table 176. Education & Outreach Capabilities

Mitigation Capability	Utilized?	Comments
Public Hazard Education / Outreach Program	No	
Local Citizen Groups That Communicate Hazard Risks	No	
Firewise	No	
NOAA StormReady Program	No	
Other:	No	

7.14.4 Mitigation Actions

The new mitigation actions identified by the Town during the Plan update are included in Table 177. Two actions from the 2016 Plan have been carried over into the Town's updated mitigation strategy.

Table 177. 2021 Mitigation Actions

ID	Organization	Action
2021-72	1-Mead	Policy Group Training for Elected Officials
2021-73	2-Mead	Update Policies and Plans with Mitigation Principles -North Creek Flood Plain Analysis

ID	Organization	Action
2021-74	3-Mead	Update Policies and Plans with Mitigation Principles - Emergency Operations Plan
2021-75	4-Mead	Update Facilities- Public Works facility – Design & Construction
2021-76	5-Mead	Community Impact Study -Vulnerable Populations-Shelter Capabilities Planning

7.15 Town of Milliken

Based on the Town of Milliken 2015 Comprehensive Plan update, the Town's vision is *"founded on the premise that the vitality and future growth of the Town and the quality of life of its residents are dependent upon the balancing of multiple contributing factors."*

These contributing factors were used to create guiding principles, which serve as a framework for organizing planning and recommended actions for implementation in the community.

The Town's guiding principles are as follows:

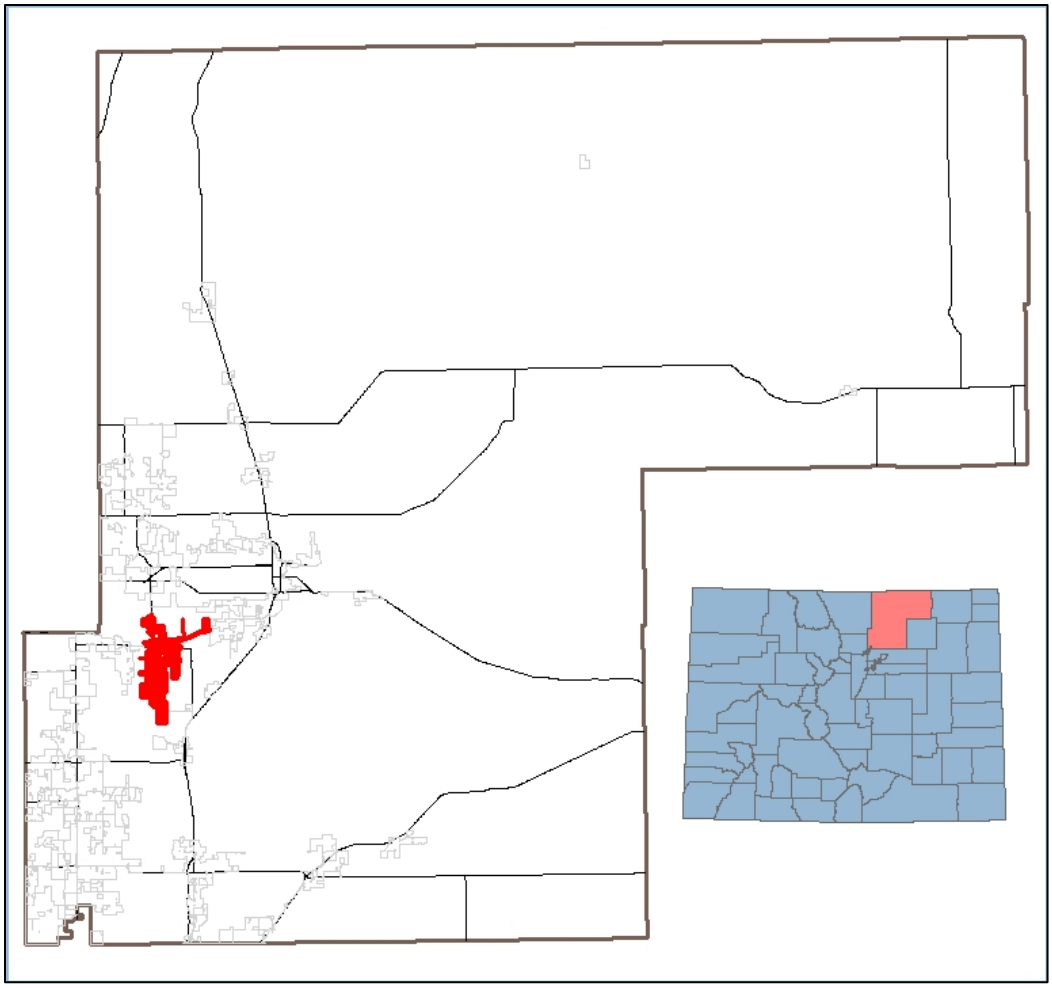
- A strong, diversified economic base
- A vibrant downtown that functions as the heart of the community
- A complete and highly accessible system of parks, open space, trails, and recreational opportunities
- A distinct community identity that reflects Milliken's cultural, archaeological, historical, and agricultural resources
- A fiscally sustainable pattern of development
- A diverse mix of housing types to meet the needs of residents of all ages, incomes, and abilities
- A safe and disaster resilient community

The Town recently conducted its own *Town of Milliken Risk Assessment – Planning for Hazards Implementation Project (November 2018)*. Readers are encouraged to reference this document in addition to the content contained in this updated HMP.

7.15.1 Community Profile

Milliken is approximately 5.7 square miles with no large bodies of water. The Town is primarily a farming community and sits six miles east of Interstate 25 in the western part of Weld County between the Town of Mead and the City of Greeley.

Agricultural uses make up a large portion of the overall land use mix in the Town. Much of Milliken's planning area is part of a single Planned Unit Development (PUD)—the Centennial Master Plan—that is being developed incrementally over time. Some portions of the original PUD have been rezoned from industrial to multifamily residential use.



The table below summarizes key demographic and development related characteristics of the Town of Milliken.

Table 178. Town of Milliken Demographics

Milliken	Colorado	
8,164	5,758,736	Population, 2019
45.4%	14.5%	Population, % change April 1, 2010 to July 1, 2019
4.9%	5.8%	% Population under 5 years, 2019
28.6%	21.9%	% Population under 19 years, 2019
8.3%	14.6%	% Population 65 years and over, 2019
87.8%	64.9%	Homeownership Rate, 2019
2.79	2.56	Persons Per Household, 2019
$72,101	$68,811	Median Household Income, 2014- 2018
5.6%	9.3%	Persons below poverty level, %, 2014- 2018
5.2%	7.3%	% Population under 65 years, with a disability 2014-2018
11.7%	17%	Language other than English spoken at home, % age 5+, 2014- 2018

Source: US Census Bureau

7.15.2 Risk and Vulnerability Assessment

Table 179 summarizes the results of the RF ranking exercise performed by the Town of Milliken. The results represent the relative risk of different hazards across the municipality from the perspective of local stakeholders and subject matter experts. Note the final RF Ranking values in this table include the weighting factors detailed in the Risk Assessment chapter of this Plan.

Table 179. Risk Factor Results for Milliken

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	RF Ranking
Agricultural Hazards	2	2	2	1	2	1.9
Cyber Hazards	1	2	4	4	3	2.4
Drought	4	3	4	1	4	3.4
Earthquake	1	1	1	1	1	1.0
Extreme Temps.	2	2	3	1	2	2.1
Flood	4	4	2	4	4	3.6
Hazmat Release	3	3	2	4	2	2.8
Land Subsidence	1	1	1	1	1	1.0
Prairie Fire	3	1	2	4	1	2.1
Public Health Hazards	2	1	2	1	4	1.8
Severe Storms	3	2	2	4	1	2.4
Tornado & Wind	2	2	2	4	4	2.4

The conclusions drawn from the qualitative assessment are organized into three categories shown in the following table and provide a summary of hazard risk for Milliken as a whole - based on High, Moderate, or Low risk designations. This process helped frame ongoing planning discussions around local and regional hazard risks and assisted with the development of the Plan's updated mitigation strategy.

Table 180. Hazard Risk Conclusions for Milliken

HIGH RISK (2.5 or higher)	**Drought, Flood, Hazmat Release**
MODERATE RISK (2.0 – 2.4)	**Cyber Hazards, Extreme Temperatures, Prairie Fire, Severe Storms, Tornado & Straight-Line Wind**
LOW RISK (1.9 or lower)	**Agricultural Hazards, Earthquake, Land Subsidence, Public Health Hazards**

Since the 2016 Plan, the Town has increased the assessed risk from drought and hazmat release to High Risk (both formerly Moderate). Milliken decreased its risk assessment for land subsidence to be Low Risk (formerly Moderate). The Town also reduced assessed risk for prairie fire, severe storm, and tornado & straight-line wind to be Moderate (all previously High). Public health hazards, previously a Low Risk, are now considered High. Besides the newly added hazards of agricultural hazards and cyber hazards, all other risk rankings remain the same.

The following sections highlight the Town of Milliken's High Risk hazards and include any specific content relevant to the Town. They are intended to supplement information included in each hazard profile in the main body of this Plan.

7.15.2.1 Drought

The community vulnerability to drought is not noticeably different from the rest of the County. Those communities whose economies are more dependent on the agriculture industry do experience higher risk to this hazard. There are no previous events to document specific to the Town of Milliken. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.15.2.2 Flood (including Dam & Levee Failure)

Flood is a very localized hazard and vulnerability is unique for each municipality. There are no previous events to document specific to Milliken.

The Town of Milliken's overall vulnerability to flood is significantly different from the rest of the County. Milliken has 1 address points located in the Special Flood Hazard Area (SFHA). This equates to 0.03% of all address points for the Town, as compared to 1.6% of Countywide addresses located in the SFHA.

Flood events can also occur as a result of dam or levee failure. In these cases, flood waters may not follow the typical floodplains mapped as the SFHA.

The Town of Milliken's overall vulnerability to flooding in dam inundation areas is not noticeably different from the rest of the County. Milliken has 22 address points located in these dam inundation areas. This equates to 0.6% of all address points for the Town, as compared to 1.0% of Countywide addresses located in these areas.

Additionally, the Town is the first jurisdiction downstream from six dams. Three of these have a hazard classification of Significant or High, but only two currently have Emergency Action Plans (EAPs). Additional information pertaining to dams can be referenced at the State's Dam Safety website: https://dwr.state.co.us/Tools/DamSafety/Dams .

The Town's overall vulnerability to flooding in areas protected by known levees is substantially different from the rest of the County. Milliken has no address points located in these levee protected areas. This is compared to 1.6% of Countywide addresses located in these areas.

It is important to note that this analysis is only as good as best available data allows. Current floodplains, dam inundation areas, and areas protected by levees may not currently map all hazard areas. Additionally, mapped hazard areas may be dated and in need of updated mapping and analysis.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.15.2.3 Hazmat Release

Vulnerability to hazmat release is increased, mainly due to railroads spanning across the Town of Milliken which present their own increased risk for hazmat release. As is true for the entire County, the presence of any businesses that store hazardous materials also increases the risk for these types of events.

Based on data supplied by the Pipeline and Hazardous Materials Safety Administration's (PHMSA) Incident Reports Database, seven events that have occurred within Milliken between 1991 and 2019. These events were due to overfilling and spillage caused by improper transport preparation. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.15.3 Capabilities Assessment

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

Planning and regulatory capabilities are powerful tools for implementing hazard mitigation. The Town currently utilizes or has implemented many of these capabilities shown in Table 181. It is important for all municipalities to regularly review each of these tools, to identify opportunities for further risk reduction efforts.

Table 181. Planning & Regulatory Capabilities

Mitigation Capability	Utilized?	Comments
Comprehensive, Master, or General Plan	Yes	
Capital Improvement Program or Plan (CIP)	Yes	
Floodplain Management Plan	Yes	
Stormwater Program / Plan	Yes	
Community Wildfire Protection Plan (CWPP)	No	
Erosion / Sediment Control Program	No	
Economic Development Plan	No	
Other:	No	
Building Codes (Year)	Yes	2018
Site Plan Review Requirements	Yes	
Other:	No	
Zoning Ordinance (Land Use)	Yes	
Subdivision Ordinance	Yes	
National Flood Insurance Program (NFIP) Participant	Yes	
Flood Insurance Study / Flood Insurance Rate Map / DFIRM	Yes	
Floodplain Ordinance	Yes	
Elevation Certificates for Floodplain Development	Yes	
Community Rating System (CRS) Participant	No	
Open Space / Conservation Program	Yes	
Growth Management Ordinance	No	
Stormwater Ordinance	No	
Other Hazard Ordinance (steep slope, wildfire, snow loads, etc.)	No	
Other:	No	

Available resources including staff, municipal groups, and technology are all vital for a community to be able to implement hazard mitigation. Milliken is fortunate to have most all of these capabilities identified in Table 182.

Table 182. Administrative & Technical Capabilities

Mitigation Capability	Utilized?	Comments
Planning Commission	Yes	
Mitigation Planning Committee	No	
Maintenance Programs (tree trimming, clearing drainage, etc.)	Yes	
Emergency Manager	Yes	
Building Official	Yes	3rd Party BO - ProCode
Floodplain Administrator	Yes	
Community Planner	Yes	
Transportation Planner	No	
Civil Engineer	Yes	3rd Party Engineer
GIS Capability	No	Priority for the 2021 Budget
Resiliency Planner	No	
Other:	No	
Warning Systems / Services (flood)	No	
Warning Systems / Services (other / multi hazard)	Yes	Tornado Sirens
Grant Writing / Management	Yes	Existing Staff
Other:	No	

The ability of a community to implement a comprehensive mitigation strategy is largely dependent on available funding. These related municipal capabilities are outlined in Table 183 and show that Milliken utilizes a broad range of financial tools that can support mitigation activities.

Table 183. Financial Capabilities

Mitigation Capability	Utilized?	Comments
Levy for Specific Purposes with Voter Approval	Yes	
Utilities Fees	Yes	
System Development / Impact Development Fee	Yes	
General Obligation Bonds to Incur Debt	Yes	
Special Tax Bonds to Incur Debt	Yes	
Open Space / Conservation Fund	Yes	
Stormwater Utility Fees	Yes	
Capital Improvement Project Funding	Yes	

Mitigation Capability	Utilized?	Comments
Community Development Block Grants (CDBG)	Yes	
Withheld spending in hazard-prone areas	No	
Other:	No	

Education and outreach are important capabilities that allow a community to continue the conversation with their public regarding hazard risk and opportunities to mitigate. Table 184 shows that Milliken could benefit by expanding upon these capabilities.

Table 184. Education & Outreach Capabilities

Mitigation Capability	Utilized?	Comments
Public Hazard Education / Outreach Program	No	
Local Citizen Groups That Communicate Hazard Risks	No	
Firewise	No	
NOAA StormReady Program	No	
Other:	No	

7.15.4 Mitigation Actions

The new mitigation action identified by the Town during the Plan update is included in Table 185. Three actions from the 2016 Plan have been carried over into the Town's updated mitigation strategy.

Table 185. 2021 Mitigation Actions

ID	Organization	Action
2021-77	1-Milliken	Convert acquired land and property in the floodplain to Open Space
2021-78	2-Milliken	Procurement and Installation of Tornado Sirens
2021-79	3-Milliken	Storm Water Improvements Throughout Milliken
2021-80	4-Milliken	Community Impact Study -Vulnerable Populations-Shelter Capabilities Planning

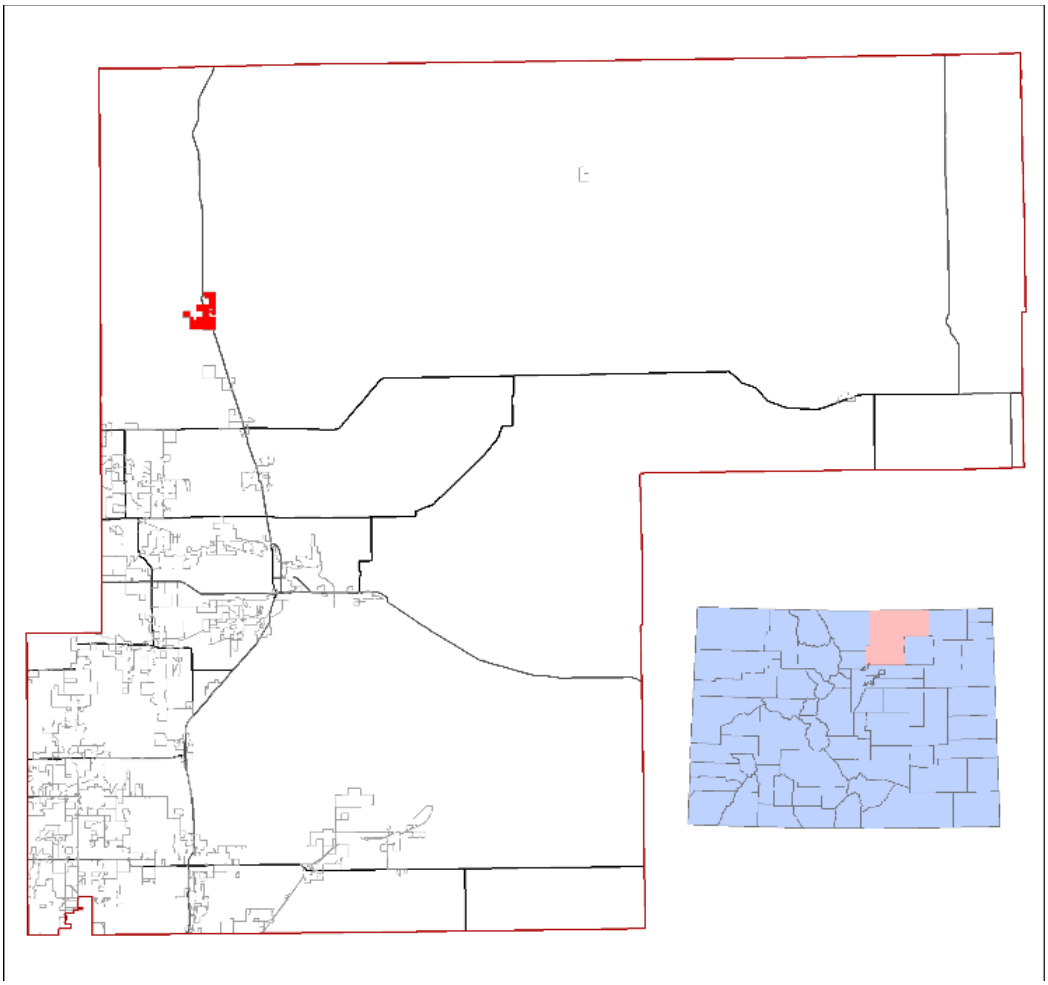
7.16 Town of Nunn

"Nunn will be a community where people and the environment come first; a place where our small-town charm and community spirit are celebrated and our history and peaceful quality of life are treasured. Our community will strive to provide exceptional services and housing, jobs, shopping and recreational opportunities for everyone."

-Town of Nunn Comprehensive Plan 2009

7.16.1 Community Profile

The Town of Nunn has a total area of 1.8 square miles, all of which is land, according to the United States Census Bureau. The growth and development of Nunn is driven by community members, especially their priorities and goals for the Town. The Town has utilized surveys, community events and workshops for important input from residents. One community event was a "Planning Fiesta" where feedback and discussion were critical to evaluating plans. An important workshop was with the local high school to ask students about their vision for a more dynamic Town of Nunn. The pride of community members in the Town is evident in their careful consideration of the future progress of Nunn.



The table below summarizes development information of the Town of Nunn. Current information for specific characteristics of the population is only available from the US Census Bureau for municipalities with populations over 5,000 people.

Table 186. Town of Nunn Demographics

Nunn	Colorado	
468	5,758,736	Population, 2019
12.2%	14.5%	Population, % change April 1, 2010 to July 1, 2019
2.5	2.56	Persons Per Household, 2019

Note: Recent data is unavailable from the US Census Bureau for some categories, based on the size of the municipality. Source: US Census Bureau

7.16.2 Risk and Vulnerability Assessment

Table 187 summarizes the results of the RF ranking exercise performed by the Town of Nunn. The results represent the relative risk of different hazards across the municipality from the perspective of local stakeholders and subject matter experts. Note the final RF Ranking values in this table include the weighting factors detailed in the Risk Assessment chapter of this Plan.

Table 187. Risk Factor Results for Nunn

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	RF Ranking
Agricultural Hazards	1.5	2	2	2.5	4	2.1
Cyber Hazards	2	1.5	2	4	3.5	2.2
Drought	3	1	3	1	4	2.3
Earthquake	1	2.5	2	4	1	2.0
Extreme Temps.	3	1	2.5	3	2	2.2
Flood	1	1	2	4	3	1.7
Hazmat Release	1.5	2	4	4	2	2.5
Land Subsidence	1	1	1.5	4	2.5	1.6
Prairie Fire	2.5	1.5	1.5	4	1.5	2.1
Public Health Hazards	3.5	2	2.5	1	4	2.7
Severe Storms	3.5	2.5	3	1.5	2	2.8
Tornado & Wind	2.5	2.5	2	3	1	2.3

The conclusions drawn from the qualitative assessment are organized into three categories shown in the following table and provide a summary of hazard risk for Nunn as a whole - based on High, Moderate, or Low risk designations. This process helped frame ongoing planning discussions around local and regional hazard risks and assisted with the development of the Plan's updated mitigation strategy.

Table 188. Hazard Risk Conclusions for Nunn

HIGH RISK (2.5 or higher)	**Hazmat Release, Public Health Hazards, Severe Storms**
MODERATE RISK (2.0 – 2.4)	**Agricultural Hazards, Cyber Hazards, Drought, Earthquake, Extreme Temperatures, Prairie Fire, Tornado & Straight-Line Wind**
LOW RISK (1.9 or lower)	**Flood, Land Subsidence**

The following sections highlight the Town of Nunn's High Risk hazards and include any specific content relevant to the Town. They are intended to supplement information included in each hazard profile in the main body of this Plan.

7.16.2.1 Hazmat Release

Vulnerability to hazmat release is increased for the Town of Nunn, mainly due to the location of a CDOT hazardous materials route through the community. Additionally, railroads span across Nunn which present their own increased risk for hazmat release. As is true for the entire County, the presence of any businesses that store hazardous materials also increases the risk for these types of events.

There have been no events in the Town of Nunn, between 1991 and 2019, based on data supplied by the Pipeline and Hazardous Materials Safety Administration's (PHMSA) Incident Reports Database.

Future occurrences can be expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.16.2.2 Public Health Hazards

Vulnerability to public health hazards is not expected to be noticeably different from the rest of the County. Individuals at a higher risk to this hazard include the aging adult population, those with a chronic illness, such as diabetes, asthma, coronary heart disease, and those who are obese or overweight. Other populations at risk include children, those in poverty and those with a disability. This data is collected at census tract level by the Centers for Disease Control (CDC) and is unavailable at a municipality level. The data by census tract can be found in the Colorado Department of Health and Environment Open Data database here.

Future occurrences are expected to mirror that of the County. There are no previous events to document specific to Nunn. Refer to Chapter 5 – Risk Assessment of this Plan for additional details, including a summary of the higher risk population demographics for Weld County and the State.

7.16.2.3 Severe Storms (including Hail, Lightning, & Winter Storm)

Vulnerability to severe storm, which includes hail, lightning, and winter storm, is not noticeably different from the rest of the County. The Town of Nunn's more densely developed areas experience the greatest risk, in addition to potential greater losses to the agriculture sector. Any structures not constructed to meet recent building codes experience the greatest risk from structural damages.

According to the NOAA's Storm Events Database, between 2015 and 2020, the Town of Nunn has had nine severe storm events. Seven of these events resulted in reports of hail, which ranged in size from 1.25 inches to 1.75 inches. None of these events resulted in reported damage to property or crops and no injuries or deaths.

Two events were reported as thunderstorm winds with magnitudes of 56 mph and 58 mph. There was no reported damage to property or crops and no injuries or deaths. No other events for severe storm, specific to Nunn, were recorded over this time period.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.16.3 Capabilities Assessment

The capability assessment examines the ability of the Town of Nunn to implement and manage the comprehensive mitigation strategy laid out in this Plan. The strengths, weaknesses, and resources of the

community are identified here as a means for evaluating and maintaining effective and appropriate management of the Town's hazard mitigation program.

Planning and regulatory capabilities are powerful tools for implementing hazard mitigation. The Town currently utilizes or has implemented many of these capabilities shown in Table 189. It is important for all municipalities to regularly review each of these tools, to identify opportunities for further risk reduction efforts.

Table 189. Planning & Regulatory Capabilities

Mitigation Capability	Utilized?	Comments
Comprehensive, Master, or General Plan	Yes	
Capital Improvement Program or Plan (CIP)	Yes	Annually by department
Floodplain Management Plan	No	Participating in statewide planning
Stormwater Program / Plan	Yes	FEMA Floodplain plan
Community Wildfire Protection Plan (CWPP)	No	
Erosion / Sediment Control Program	No	Permitted through the state, 1 acre per min
Economic Development Plan	No	Refer to Upstate Colorado
Other:	No	
Building Codes (Year)	Yes	SAFEbuilt, adopted by Ord. IRC 2018
Site Plan Review Requirements	Yes	Website-fliers for building
Other:	No	
Zoning Ordinance (Land Use)	Yes	
Subdivision Ordinance	Yes	
National Flood Insurance Program (NFIP) Participant	Yes	
Flood Insurance Study / Flood Insurance Rate Map / DFIRM	Yes	4-5 years
Floodplain Ordinance	Yes	
Elevation Certificates for Floodplain Development	Yes	SAFEbuilt, adopted by Ord. IRC 2018
Community Rating System (CRS) Participant	No	
Open Space / Conservation Program	Yes	Part of conservation/CO lottery/Open Space
Growth Management Ordinance	No	
Stormwater Ordinance	No	
Other Hazard Ordinance (steep slope, wildfire, snow loads, etc.)	Yes	Snow loads, included in building codes
Other:	No	

Available resources including staff, municipal groups, and technology are all vital for a community to be able to implement hazard mitigation. Nunn is fortunate to have many of these capabilities identified in Table 190.

Table 190. Administrative & Technical Capabilities

Mitigation Capability	Utilized?	Comments
Planning Commission	No	Town Board
Mitigation Planning Committee	No	Informal Town Board
Maintenance Programs (tree trimming, clearing drainage, etc.)	Yes	
Emergency Manager	Yes	Sue Frederickson
Building Official	Yes	SAFEbuilt
Floodplain Administrator	Yes	
Community Planner	No	Town Board
Transportation Planner	Yes	Refer to CDOT/Town Board
Civil Engineer	Yes	Contract Northern engineering
GIS Capability	No	Weld County
Resiliency Planner	No	Town Board
Other:	No	
Warning Systems / Services (flood)	Yes	Siren, FD initiated or county
Warning Systems / Services (other / multi hazard)	Yes	Code Red, IPAWS
Grant Writing / Management	Yes	Contracted per grant/grant writer
Other:	No	

The ability of a community to implement a comprehensive mitigation strategy is largely dependent on available funding. These related municipal capabilities are outlined in Table 191 and show that Nunn utilizes a broad range of financial tools that can support mitigation activities.

Table 191. Financial Capabilities

Mitigation Capability	Utilized?	Comments
Levy for Specific Purposes with Voter Approval	Yes	Yes, Mill Levy
Utilities Fees	Yes	Water, trash
System Development / Impact Development Fee	Yes	
General Obligation Bonds to Incur Debt	No	
Special Tax Bonds to Incur Debt	No	
Open Space / Conservation Fund	Yes	Conservation Funds
Stormwater Utility Fees	No	Possible in the future
Capital Improvement Project Funding	Yes	Annual budgeting
Community Development Block Grants (CDBG)	No	Possible in the future
Withheld spending in hazard-prone areas	No	

Mitigation Capability	Utilized?	Comments
Other:	No	

Education and outreach are important capabilities that allow a community to continue the conversation with their public regarding hazard risk and opportunities to mitigate. Table 192 shows that Nunn does leverage some of these capabilities and is currently working on expanding these efforts.

Table 192. Education & Outreach Capabilities

Mitigation Capability	Utilized?	Comments
Public Hazard Education / Outreach Program	Yes	Town board, Fire Dept, Police Dept
Local Citizen Groups That Communicate Hazard Risks	No	Nunn Facebook page
Firewise	Yes	Fire department
NOAA StormReady Program	Yes	Town board, Fire Dept, Police Dept
Other:	No	

7.16.4 Mitigation Actions

The mitigation actions identified by the Town during the Plan update are included in Table 193.

Table 193. 2021 Mitigation Actions

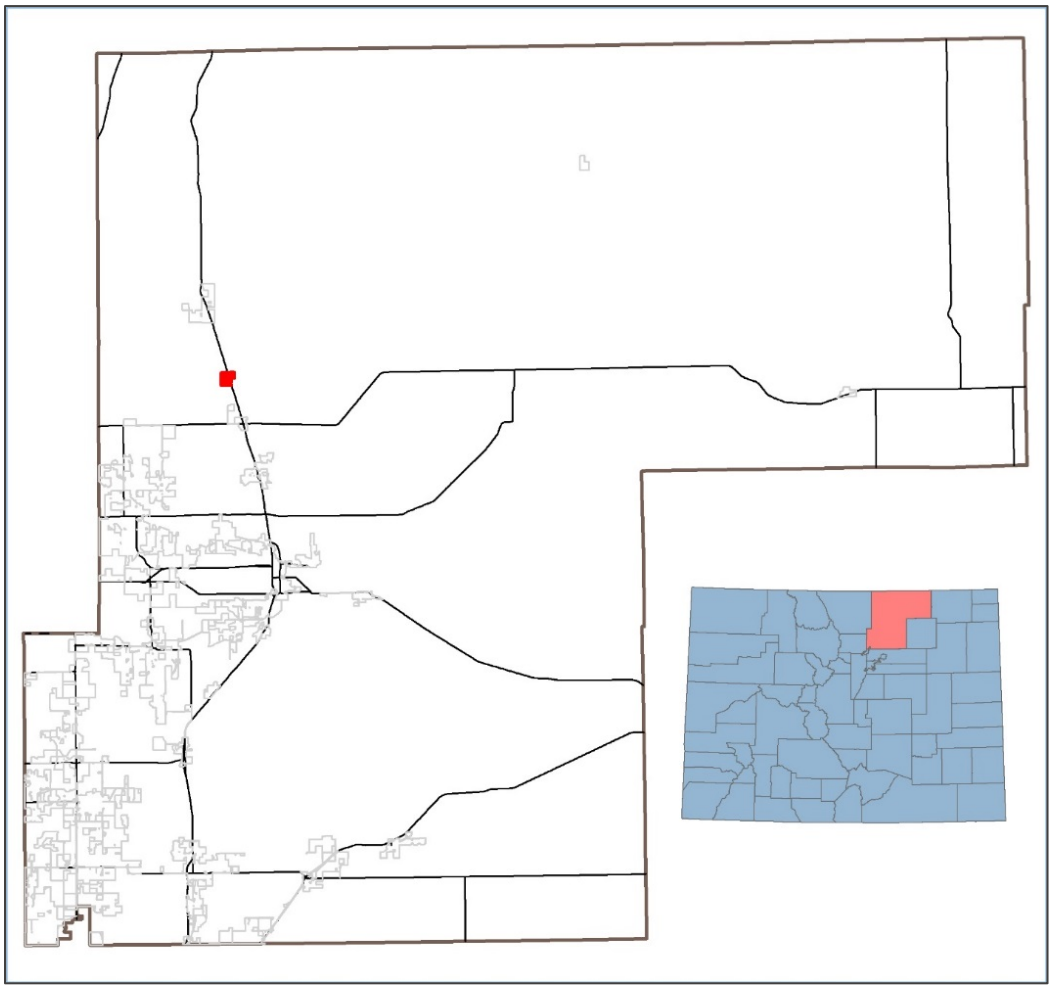
ID	Organization	Action
2021-81	1-Nunn	Master Drainage Plan
2021-82	2-Nunn	Tornado Shelter to be ADA Compliant
2021-83	3-Nunn	Community Impact Study -Vulnerable Populations-Shelter Capabilities Planning

7.17 Town of Pierce

The Town is a rural agricultural community located on the Colorado Eastern Plains along U.S. Highway 85, north of Greeley. The Town has a total area of 0.7 square miles, including 1.0 sq. mi. annexed in 2018 where a natural gas processing facility has been constructed. The Town shares a police and fire department with the Town of Ault.

7.17.1 Community Profile

The Town of Pierce was a key railroad stop at the time of founding and became a local shipping point for cattle, sheep, potatoes, beans, and sugar beets. The Town has grown more rapidly than much of the region, however it is still one of the smallest municipalities adopting this plan.



The table below summarizes development information of the Town of Pierce. Current information for specific characteristics of the population is only available from the US Census Bureau for municipalities with populations over 5,000 people.

Table 194. Town of Pierce Demographics

Pierce	Colorado	
1,153	5,758,736	Population, 2019
37.9%	14.5%	Population, % change April 1, 2010 to July 1, 2019

Pierce	Colorado	
2.68	2.56	Persons Per Household, 2019

Note: Recent data is unavailable from the US Census Bureau for some categories, based on the size of the municipality. Source: US Census Bureau

7.17.2 Risk and Vulnerability Assessment

Table 195 summarizes the results of the RF ranking exercise performed by the Town of Pierce. The results represent the relative risk of different hazards across the municipality from the perspective of local stakeholders and subject matter experts. Note the final RF Ranking values in this table include the weighting factors detailed in the Risk Assessment chapter of this Plan.

Table 195. Risk Factor Results for Pierce

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	RF Ranking
Agricultural Hazards	2	1	2	1	4	1.8
Cyber Hazards	2	1	3	4	3	2.2
Drought	3	2	4	1	4	2.8
Earthquake	2	1	3	4	1	2.0
Extreme Temps.	4	2	4	2	3	3.1
Flood	2	2	3	2	2	2.2
Hazmat Release	3	2	4	4	3	3.0
Land Subsidence	1	1	2	1	3	1.4
Prairie Fire	1	1	1	4	1	1.3
Public Health Hazards	2	2	1	3	4	2.1
Severe Storms	4	2	4	2	2	3.0
Tornado & Wind	4	2	4	1	2	2.9

The conclusions drawn from the qualitative assessment are organized into three categories shown in the following table and provide a summary of hazard risk for Pierce as a whole - based on High, Moderate, or Low risk designations. This process helped frame ongoing planning discussions around local and regional hazard risks and assisted with the development of the Plan's updated mitigation strategy.

Table 196. Hazard Risk Conclusions for Pierce

HIGH RISK (2.5 or higher)	**Drought, Extreme Temperatures, Hazmat Release, Severe Storms, Tornado & Straight-Line Wind**
MODERATE RISK (2.0 – 2.4)	**Cyber Hazards, Earthquake, Flood, Public Health Hazards**
LOW RISK (1.9 or lower)	**Agricultural Hazards, Land Subsidence, Prairie Fire**

Since the 2016 Plan, the Town has increased the assessed risk from drought, extreme temperatures, and hazmat release to High Risk (all were formerly Low). It also increased the risk from severe storm and tornado & straight-line wind to High (both were previously moderate). Pierce increased its risk assessment for earthquake, flood, and public health hazards to be Moderate Risk (all were formerly Low). Besides the newly added hazards of agricultural hazards and cyber hazards, all other risk rankings remain the same.

The following sections highlight the Town of Pierce's High Risk hazards and include any specific content relevant to the Town. They are intended to supplement information included in each hazard profile in the main body of this Plan.

7.17.2.1 Drought

The community vulnerability to drought is not noticeably different from the rest of the County. Those communities whose economies are more dependent on the agriculture industry do experience higher risk to this hazard. There are no previous events to document specific to the Town of Pierce. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.17.2.2 Extreme Temperatures

Vulnerability to extreme temperatures is not noticeably different from the rest of the County. Those communities whose economies are more dependent on the agriculture industry do experience higher risk to these hazards due to potential crop and livestock losses. Additionally, individuals at a higher risk to extreme temperatures include those with mobility issues, independent living difficulty, the elderly, low-income families, outdoor laborers, and those experiencing homelessness. Data for these demographics is collected at census tract level, however snapshot data for populations that can fluctuate drastically, such as the number of outdoor laborers and those experiencing homelessness is not included. These are still considerable populations in the County and the Town of Pierce and local efforts to quantify these populations periodically can help with mitigation planning.

The data for high risk populations has been analyzed by Colorado Department of Public Health and Environment (CDPHE) and has been used to create Community Inclusions maps. These maps can be zoomed into specific census tracts for municipalities and communities, illustrating the population variances. Refer to Chapter 4 for examples of these maps for Weld County.

There are no previous events to document specific to the Town of Pierce. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.17.2.3 Hazmat Release

Vulnerability to hazmat release is increased for the Town of Pierce, mainly due to the location of a CDOT hazardous materials route through the community. Additionally, railroads span across Pierce which present their own increased risk for hazmat release. As is true for the entire County, the presence of any businesses that store hazardous materials also increases the risk for these types of events.

There have been no events in the Town of Pierce, between 1991 and 2019, based on data supplied by the Pipeline and Hazardous Materials Safety Administration's (PHMSA) Incident Reports Database.

Future occurrences can be expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.17.2.4 Severe Storms (including Hail, Lightning, & Winter Storm)

Vulnerability to severe storm, which includes hail, lightning, and winter storm, is not noticeably different from the rest of the County. The Town of Pierce's more densely developed areas experience the greatest risk, in addition to potential greater losses to the agriculture sector. Any structures not constructed to meet recent building codes experience the greatest risk from structural damages.

According to the NOAA's Storm Events Database, between 2015 and 2020, the Town of Pierce has had four severe storm events.

Three of these events resulted in reports of hail, which ranged in size from 1.5 inches to 2.5 inches. These events resulted in damages to property and crops, but no injuries or deaths.

One event was reported as thunderstorm winds with magnitudes of 52 mph. There was no reported damage to property or crops and no injuries or deaths. No other events for severe storm, specific to Pierce, were recorded over this time period.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.17.2.5 Tornado & Straight-Line Wind

Vulnerability to tornado & straight-line wind is not noticeably different from the rest of the County. Pierce's more densely developed areas experience the greatest risk, in addition to any structures not constructed to meet recent building codes.

Between 2015 and 2020, there were no reports of occurrences specific to Pierce. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.17.3 Capabilities Assessment

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

Planning and regulatory capabilities are powerful tools for implementing hazard mitigation. The Town currently utilizes or has implemented some of these capabilities shown in Table 197. It is important for all municipalities to regularly review each of these tools, to identify opportunities for further risk reduction efforts.

Table 197. Planning & Regulatory Capabilities

Mitigation Capability	Utilized?	Comments
Comprehensive, Master, or General Plan	Yes	Master Plan
Capital Improvement Program or Plan (CIP)	No	
Floodplain Management Plan	Yes	Contract Northern CO Engineering
Stormwater Program / Plan	No	
Community Wildfire Protection Plan (CWPP)	No	Fire Protection District-Adam Ferrel
Erosion / Sediment Control Program	No	
Economic Development Plan	No	
Other:	No	
Building Codes (Year)	Yes	2018 updates
Site Plan Review Requirements	Yes	
Other:	No	

Mitigation Capability	Utilized?	Comments
Zoning Ordinance (Land Use)	Yes	
Subdivision Ordinance	Yes	
National Flood Insurance Program (NFIP) Participant	Yes	
Flood Insurance Study / Flood Insurance Rate Map / DFIRM	Yes	On the rated map
Floodplain Ordinance	Yes	
Elevation Certificates for Floodplain Development	Yes	
Community Rating System (CRS) Participant	No	
Open Space / Conservation Program	Yes	
Growth Management Ordinance	No	
Stormwater Ordinance	No	
Other Hazard Ordinance (steep slope, wildfire, snow loads, etc.)	No	
Other:	No	

Available resources including staff, municipal groups, and technology are all vital for a community to be able to implement hazard mitigation. Pierce has some of these capabilities identified in Table 198.

Table 198. Administrative & Technical Capabilities

Mitigation Capability	Utilized?	Comments
Planning Commission	Yes	Citizen appointed committee
Mitigation Planning Committee	No	
Maintenance Programs (tree trimming, clearing drainage, etc.)	Yes	For municipal properties
Emergency Manager	No	
Building Official	Yes	Contract SAFEbuilt/Planning Commissioner
Floodplain Administrator	Yes	Contract Northern CO Engineering
Community Planner	No	Contract as needed
Transportation Planner	No	
Civil Engineer	Yes	Contract Northern CO Engineering
GIS Capability	No	
Resiliency Planner	No	
Other:	No	
Warning Systems / Services (flood)	Yes	Audible Siren System, Ault/Pierce FD
Warning Systems / Services (other / multi hazard)	Yes	CodeRed, IPAWS
Grant Writing / Management	No	
Other:	No	

The ability of a community to implement a comprehensive mitigation strategy is largely dependent on available funding. These related municipal capabilities are outlined in Table 199 and show that Pierce utilizes a broad range of financial tools that can support mitigation activities.

Table 199. Financial Capabilities

Mitigation Capability	Utilized?	Comments
Levy for Specific Purposes with Voter Approval	No	
Utilities Fees	Yes	Water, Sewer
System Development / Impact Development Fee	Yes	
General Obligation Bonds to Incur Debt	No	
Special Tax Bonds to Incur Debt	No	
Open Space / Conservation Fund	Yes	1 currently
Stormwater Utility Fees	No	
Capital Improvement Project Funding	No	
Community Development Block Grants (CDBG)	No	
Withheld spending in hazard-prone areas	No	
Other:	No	

Education and outreach are important capabilities that allow a community to continue the conversation with their public regarding hazard risk and opportunities to mitigate. Table 200 shows that Pierce does leverage some of these capabilities and is currently working on expanding these efforts.

Table 200. Education & Outreach Capabilities

Mitigation Capability	Utilized?	Comments
Public Hazard Education / Outreach Program	No	
Local Citizen Groups That Communicate Hazard Risks	Yes	Informal Facebook page -residents of Pierce
Firewise	No	
NOAA StormReady Program	No	Possibly in the future.
Other:	Yes	School Education-Community Risk Reduction

7.17.4 Mitigation Actions

The new mitigation actions identified by the Town during the Plan update are included in Table 201. Two actions from the 2016 Plan have been carried over into the Town's updated mitigation strategy.

Table 201. 2021 Mitigation Actions

ID	Organization	Action
2021-84	1-Pierce	Community Impact Study -Vulnerable Populations-Shelter Capabilities Planning
2021-85	2-Pierce	County Road 90 Improvements
2021-86	3-Pierce	Community Preparedness Education
2021-87	4-Pierce	Drainage County Rd 88 / Hwy 85

7.18 Town of Platteville

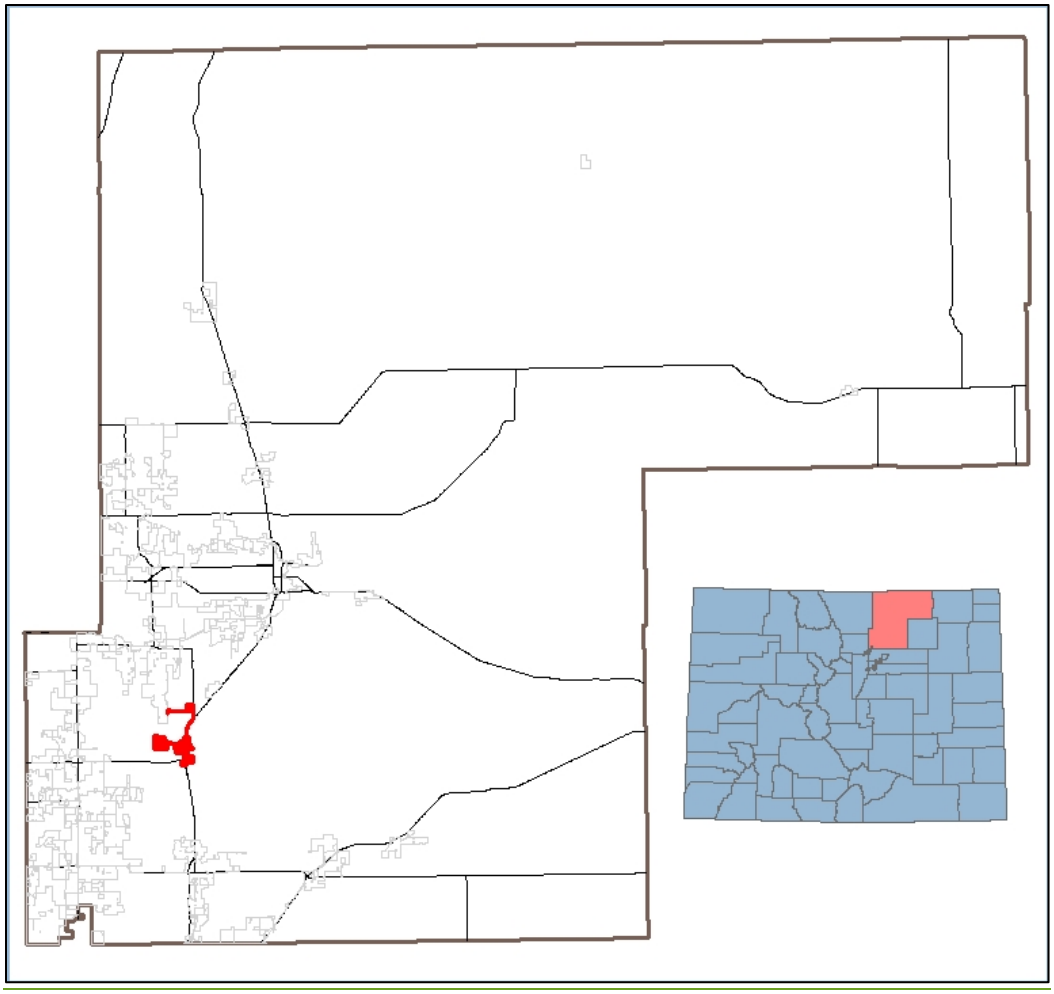
"*We are committed to growing and being innovative, collaborative and creative with a full appreciation of our location and heritage which include agriculture and energy production support services.*"
— Town of Platteville Comprehensive Plan (2017)

The Plan Guiding Principles include:

- Environment- Protect and enhance Platteville's natural environment and scenic beauty of the town and surrounding area, with particular emphasis on the South Platte River Corridor.
- Economic Development- Attract and retain a broad range of commercial and industrial businesses that provide local employment opportunities and meet the needs of residents.
- Growth Management- Retain the small town, rural character by guiding growth and new development, maintaining distinct community edges with abundant open lands.
- Transportation- Provide an efficient, safe and connected transportation system.
- Community Vision- Committed to growing and being innovative, collaborative and creative.
- Services and Infrastructure- Provide public services and infrastructure in a cost-effective manner that accommodates new growth while enhancing Platteville's quality of life.
- Community Character- Foster community pride and establish a strong sense of place by preserving cultural resources, enhancing Platteville's image and revitalizing its downtown core.
- Parks and Recreation- Provide a coordinated and continuous system of parks, trails, and recreation that serves the present and future needs of Platteville residents.

7.18.1 Community Profile

Platteville is one of the oldest communities in Weld County. It is located along the east bank of the South Platte River, at the intersection of US Highway 85 and Colorado Highway 66. Platteville is approximately 1.48 square miles in size and has an economy driven by agriculture and energy production.



The table below summarizes development information of the Town of Platteville. Current information for specific characteristics of the population is only available from the US Census Bureau for municipalities with populations over 5,000 people.

Table 202. Town of Platteville Demographics

Platteville	Colorado	
3,010	5,758,736	Population, 2019
20.7%	14.5%	Population, % change April 1, 2010 to July 1, 2019
2.88	2.56	Persons Per Household, 2019

Note: Recent data is unavailable from the US Census Bureau for some categories, based on the size of the municipality. Source: US Census Bureau

7.18.2 Risk and Vulnerability Assessment

Table 203 summarizes the results of the RF ranking exercise performed by the Town of Platteville. The results represent the relative risk of different hazards across the municipality from the perspective of local stakeholders and subject matter experts. Note the final RF Ranking values in this table include the weighting factors detailed in the Risk Assessment chapter of this Plan.

Table 203. Risk Factor Results for Platteville

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	RF Ranking
Agricultural Hazards	2	1	2	1	4	1.8
Cyber Hazards	2	1	2	4	3	2.0
Drought	3	1	1	1	4	1.9
Earthquake	1	2	4	4	1	2.2
Extreme Temps.	3	1	4	1	4	2.5
Flood	3	1	2	1	3	2.0
Hazmat Release	2	3	2	4	3	2.8
Land Subsidence	1	1	1	1	1	1.0
Prairie Fire	2	2	2	2	2	2.0
Public Health Hazards	2	1	2	1	3	1.8
Severe Storms	3	3	3	4	2	3.0
Tornado & Wind	3	3	3	4	2	3.0

The conclusions drawn from the qualitative assessment are organized into three categories shown in the following table and provide a summary of hazard risk for Platteville as a whole - based on High, Moderate, or Low risk designations. This process helped frame ongoing planning discussions around local and regional hazard risks and assisted with the development of the Plan's updated mitigation strategy.

Table 204. Hazard Risk Conclusions for Platteville

HIGH RISK (2.5 or higher)	**Extreme Temperatures, Hazmat Release, Severe Storms, Tornado & Straight-Line Wind**
MODERATE RISK (2.0 – 2.4)	**Cyber Hazards, Earthquake, Flood, Prairie Fire**
LOW RISK (1.9 or lower)	**Agricultural Hazards, Drought, Land Subsidence, Public Health Hazards**

Since the 2016 Plan, the Town has increased the assessed risk from earthquake to Moderate Risk (previously Low) and for extreme temperatures and hazmat to High Risk (formerly Moderate). Flood also increased from a Low to Moderate risk ranking. The risk to Public health hazards was modified to Low Risk (formerly Moderate). Besides the newly added hazards of agricultural hazards and cyber hazards, all other risk rankings remain the same.

The following sections highlight the Town of Platteville's High Risk hazards and include any specific content relevant to the Town. They are intended to supplement information included in each hazard profile in the main body of this Plan.

7.18.2.1 Extreme Temperatures

Vulnerability to extreme temperatures is not noticeably different from the rest of the County. Those communities whose economies are more dependent on the agriculture industry do experience higher risk to these hazards due to potential crop and livestock losses. Additionally, individuals at a higher risk to extreme temperatures include those with mobility issues, independent living difficulty, the elderly, low-income families, outdoor laborers, and those experiencing homelessness. Data for these demographics is collected at census tract level, however snapshot data for populations that can fluctuate

drastically, such as the number of outdoor laborers and those experiencing homelessness is not included. These are still considerable populations in the County and the Town of Platteville and local efforts to quantify these populations periodically can help with mitigation planning.

The data for high risk populations has been analyzed by Colorado Department of Public Health and Environment (CDPHE) and has been used to create Community Inclusions maps. These maps can be zoomed into specific census tracts for municipalities and communities, illustrating the population variances. Refer to Chapter 4 for examples of these maps for Weld County.

There are no previous events to document specific to the Town of Platteville. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.18.2.2 Hazmat Release

Vulnerability to hazmat release is increased for the Town of Platteville, mainly due to the location of a CDOT hazardous materials route through the community. As is true for the entire County, the presence of any businesses that store hazardous materials also increases the risk for these types of events.

Based on data supplied by the Pipeline and Hazardous Materials Safety Administration's (PHMSA) Incident Reports Database there have been seven events within Platteville between 1991 and 2019. Two of these events were vehicular accidents. The rest were due to overfilling and spillage.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.18.2.3 Severe Storms (including Hail, Lightning, & Winter Storm)

Vulnerability to severe storm, which includes hail, lightning, and winter storm, is not noticeably different from the rest of the County. Platteville's more densely developed areas experience the greatest risk, in addition to potential greater losses to the agriculture sector. Any structures not constructed to meet recent building codes experience the greatest risk from structural damages.

According to the NOAA's Storm Events Database, between 2015 and 2020, the Town of Platteville has had five severe storm events. All of these events resulted in reports of hail, which ranged in size from 1 inch to 1.5 inches. None of these events resulted in reported damage to property or crops and no injuries or deaths.

No other events for severe storm, specific to Platteville, were recorded over this time period.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.18.2.4 Tornado & Straight-Line Wind

Vulnerability to tornado & straight-line wind is not noticeably different from the rest of the County. Platteville's more densely developed areas experience the greatest risk, in addition to any structures not constructed to meet recent building codes.

Between 2015 and 2020, there were no reports of occurrences specific to Platteville. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.18.3 Capabilities Assessment

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

Planning and regulatory capabilities are powerful tools for implementing hazard mitigation. The Town currently utilizes or has implemented some of these capabilities shown in Table 205. It is important for all municipalities to regularly review each of these tools, to identify opportunities for further risk reduction efforts.

Table 205. Planning & Regulatory Capabilities

Mitigation Capability	Utilized?	Comments
Comprehensive, Master, or General Plan	Yes	Comp Plan updated in 2016
Capital Improvement Program or Plan (CIP)	Yes	
Floodplain Management Plan	No	
Stormwater Program / Plan	Yes	Adopted 2016
Community Wildfire Protection Plan (CWPP)	No	
Erosion / Sediment Control Program	No	
Economic Development Plan	Yes	Adopted 2020
Other:	No	
Building Codes (Year)	Yes	2018 IBC Adopted
Site Plan Review Requirements	Yes	
Other:	No	
Zoning Ordinance (Land Use)	Yes	
Subdivision Ordinance	Yes	
National Flood Insurance Program (NFIP) Participant	Yes	
Flood Insurance Study / Flood Insurance Rate Map / DFIRM	Yes	
Floodplain Ordinance	Yes	
Elevation Certificates for Floodplain Development	Yes	
Community Rating System (CRS) Participant	No	
Open Space / Conservation Program	No	
Growth Management Ordinance	No	
Stormwater Ordinance	No	
Other Hazard Ordinance (steep slope, wildfire, snow loads, etc.)	No	
Other:	No	

Available resources including staff, municipal groups, and technology are all vital for a community to be able to implement hazard mitigation. Platteville is fortunate to have many of these capabilities identified in Table 206.

Table 206. Administrative & Technical Capabilities

Mitigation Capability	Utilized?	Comments
Planning Commission	Yes	
Mitigation Planning Committee	No	
Maintenance Programs (tree trimming, clearing drainage, etc.)	Yes	
Emergency Manager	Yes	
Building Official	Yes	
Floodplain Administrator	Yes	
Community Planner	Yes	
Transportation Planner	No	Use Town Engineer for transportation planning
Civil Engineer	Yes	
GIS Capability	Yes	
Resiliency Planner	No	
Other:	No	
Warning Systems / Services (flood)	Yes	Warning sirens and emergency phone system
Warning Systems / Services (other / multi hazard)	Yes	Warning sirens and emergency phone system
Grant Writing / Management	Yes	
Other:	No	

The ability of a community to implement a comprehensive mitigation strategy is largely dependent on available funding. These related municipal capabilities are outlined in Table 207 and show that Platteville utilizes a number of financial tools that can support mitigation activities.

Table 207. Financial Capabilities

Mitigation Capability	Utilized?	Comments
Levy for Specific Purposes with Voter Approval	No	
Utilities Fees	Yes	Water & Sewer Enterprise Funds
System Development / Impact Development Fee	Yes	Update 2015
General Obligation Bonds to Incur Debt	No	
Special Tax Bonds to Incur Debt	No	
Open Space / Conservation Fund	Yes	Conservation Fund
Stormwater Utility Fees	No	Storm Drainage Impact Fees for new development
Capital Improvement Project Funding	Yes	

Mitigation Capability	Utilized?	Comments
Community Development Block Grants (CDBG)	Yes	
Withheld spending in hazard-prone areas	No	
Other:	No	

Education and outreach are important capabilities that allow a community to continue the conversation with their public regarding hazard risk and opportunities to mitigate. Table 208 shows that Platteville could benefit by expanding upon these capabilities.

Table 208. Education & Outreach Capabilities

Mitigation Capability	Utilized?	Comments
Public Hazard Education / Outreach Program	No	
Local Citizen Groups That Communicate Hazard Risks	No	
Firewise	No	
NOAA StormReady Program	No	
Other:	No	

7.18.4 Mitigation Actions

The new mitigation actions identified by the Town during the Plan update are included in Table 209. One action from the 2016 Plan has been carried over into the Town's updated mitigation strategy.

Table 209. 2021 Mitigation Actions

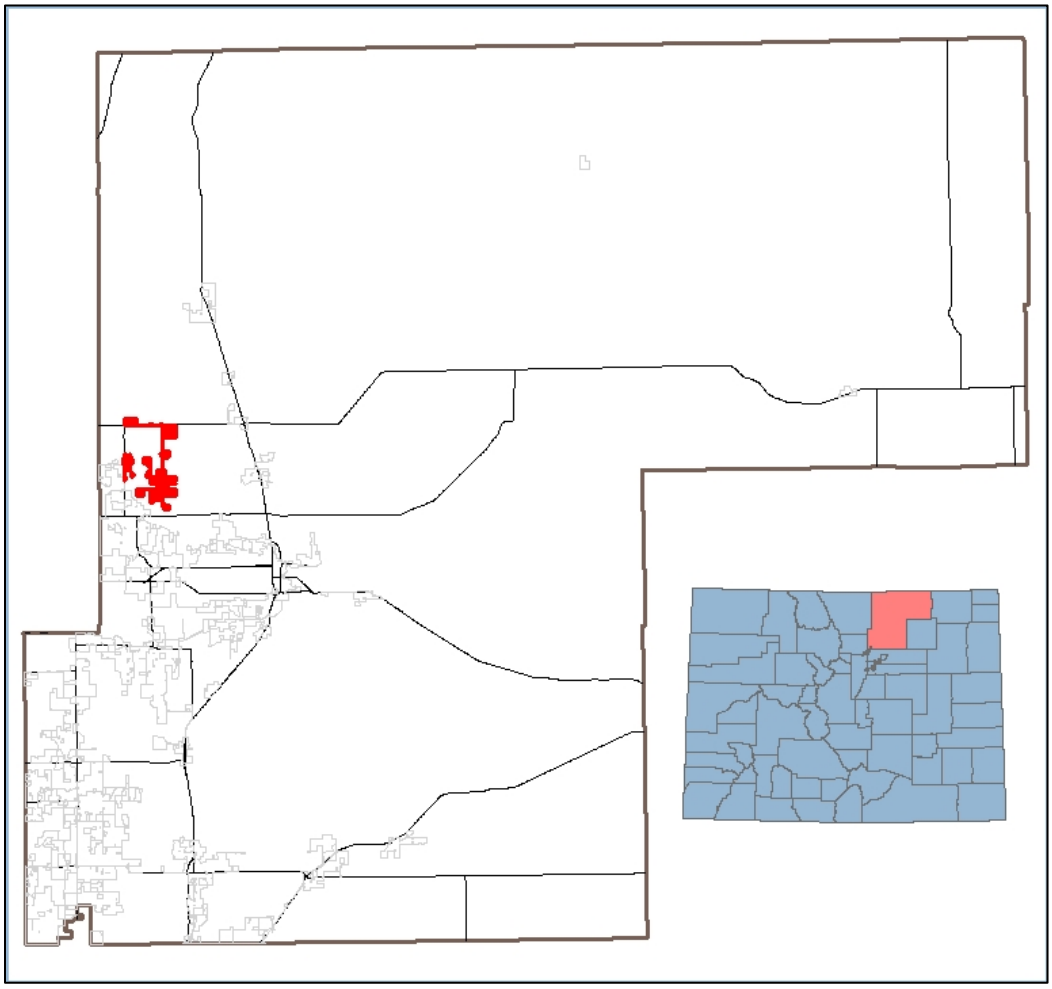
ID	Organization	Action
2021-88	1-Platteville	Comprehensive Plan Update and Training
2021-89	2-Platteville	Community Education of updated Early Warning System, Training and Utilization
2021-90	3-Platteville	Tornado Sirens - Maintenance and testing
2021-91	4-Platteville	Comprehensive EM Plan - Update and training
2021-92	5-Platteville	Community Impact Study -Vulnerable Populations-Shelter Capabilities Planning
2021-93	6-Platteville	Master Storm Drainage Plan

7.19 Town of Severance

The 2020 Severance Comprehensive Plan "*recognizes and respects private property rights while acknowledging the appropriate balance between these rights, the impact on health, safety, and welfare, for both existing and future residents of the Town, and the infrastructure requirements to adequately serve future development.*"

7.19.1 Community Profile

The Town of Severance is located approximately 10 miles east of Fort Collins, 7 miles north of Windsor and 10 miles northwest of Greeley. Severance has a total area of 2.1 square miles and was historically a rural farming community, which has evolved into a bedroom community. The construction of new residential communities, due to a doubling of the population in the last 10 years, has left the original agricultural community surrounded by modern construction.



The Windsor-Severance Fire Rescue (WSFR) provides fire, rescue, and hazmat services to the Towns of Windsor and Severance, as well as the rural areas surrounding them.

The table below summarizes key demographic and development related characteristics of the Town of Severance.

Table 210. Town of Severance Demographics

Severance	Colorado	
6,949	5,758,736	Population, 2019
104.3%	14.5%	Population, % change April 1, 2010 to July 1, 2019
10.8%	5.8%	% Population under 5 years, 2019
29.8%	21.9%	% Population under 19 years, 2019
9.5%	14.6%	% Population 65 years and over, 2019
95.2%	64.9%	Homeownership Rate, 2019
2.94	2.56	Persons Per Household, 2019
$99,375	$68,811	Median Household Income, 2014- 2018
2.4%	9.3%	Persons below poverty level, %, 2014- 2018
2.8%	7.3%	% Population under 65 years, with a disability 2014-2018
3.5%	17%	Language other than English spoken at home, % age 5+, 2014- 2018

Source: US Census Bureau

7.19.2 Risk and Vulnerability Assessment

Table 211 summarizes the results of the RF ranking exercise performed by the Town of Severance. The results represent the relative risk of different hazards across the municipality from the perspective of local stakeholders and subject matter experts. Note the final RF Ranking values in this table include the weighting factors detailed in the Risk Assessment chapter of this Plan.

Table 211. Risk Factor Results for Severance

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	RF Ranking
Agricultural Hazards	2	2	3	1	4	2.3
Cyber Hazards	3	3	3	2	3	2.9
Drought	3	2	3	1	4	2.6
Earthquake	2	1	2	3	1	1.7
Extreme Temps.	3	2	3	1	4	2.6
Flood	3	3	3	3	3	3.0
Hazmat Release	4	2	2	4	1	2.7
Land Subsidence	2	1	2	3	4	2.0
Prairie Fire	3	1	2	4	1	2.1
Public Health Hazards	4	3	3	1	4	3.2
Severe Storms	4	1	3	2	1	2.4
Tornado & Wind	2	3	2.5	3	1	2.4

The conclusions drawn from the qualitative assessment are organized into three categories shown in the following table and provide a summary of hazard risk for Severance as a whole - based on High, Moderate, or Low risk designations. This process helped frame ongoing planning discussions around local and regional hazard risks and assisted with the development of the Plan's updated mitigation strategy.

Table 212. Hazard Risk Conclusions for Severance

HIGH RISK (2.5 or higher)	**Cyber Hazards, Drought, Extreme Temperatures, Flood, Hazmat Release, Public Health Hazards**
MODERATE RISK (2.0 – 2.4)	**Agricultural Hazards, Land Subsidence, Prairie Fire, Severe Storms, Tornado & Straight-Line Wind**
LOW RISK (1.9 or lower)	**Earthquake**

Since the 2016 Plan, the Town has increased the assessed risk from flood, hazmat release, and public health hazards to High Risk (all were previously Low). The risk from land subsidence also was increased from Low to Moderate. Severance has decreased the assessed risk for both severe storms and tordano & straight-line winds, from High to Moderate. Besides the newly added hazards of agricultural hazards and cyber hazards, all other risk rankings remain the same.

The following sections highlight the Town of Severance's High Risk hazards and include any specific content relevant to the Town. They are intended to supplement information included in each hazard profile in the main body of this Plan.

7.19.2.1 Cyber Hazards

For any municipality, vulnerability to cyber hazards does not vary from that of the County as a whole. While there are no documented cyber events impacting the Town of Severance, the threat of this hazard is continually increasing. There are no previous events to document specific to Severance. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.19.2.2 Drought

The community vulnerability to drought is not noticeably different from the rest of the County. Those communities whose economies are more dependent on the agriculture industry do experience higher risk to this hazard. There are no previous events to document specific to the Town of Severance. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.19.2.3 Extreme Temperatures

Vulnerability to extreme temperatures is not noticeably different from the rest of the County. Those communities whose economies are more dependent on the agriculture industry do experience higher risk to these hazards due to potential crop and livestock losses. Additionally, individuals at a higher risk to extreme temperatures include those with mobility issues, independent living difficulty, the elderly, low-income families, outdoor laborers, and those experiencing homelessness. Data for these demographics is collected at census tract level, however snapshot data for populations that can fluctuate drastically, such as the number of outdoor laborers and those experiencing homelessness is not included. These are still considerable populations in the County and the Town of Severance and local efforts to quantify these populations periodically can help with mitigation planning.

The data for high risk populations has been analyzed by Colorado Department of Public Health and Environment (CDPHE) and has been used to create Community Inclusions maps. These maps can be zoomed into specific census tracts for municipalities and communities, illustrating the population variances. Refer to Chapter 4 for examples of these maps for Weld County.

There are no previous events to document specific to the Town of Severance. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.19.2.4 Flood (including Dam & Levee Failure)

Flood is a very localized hazard and vulnerability is unique for each municipality. According to the NOAA's Storm Events Database, there has been one flood event in Severance between 2015 and 2020. On 5/9/2015, a flood affected Severance when heavy rain produced flooding along already swollen creeks and streams in southwestern Weld County. This flood caused $15,000 in property damages and $5,000 in crop damages. There were no injuries or deaths.

The Town of Severance's overall vulnerability to flood is not noticeably different from the rest of the County. Severance has 47 address points located in the Special Flood Hazard Area (SFHA). This equates to 1.2% of all address points for the Town, as compared to 1.6% of Countywide addresses located in the SFHA.

Flood events can also occur as a result of dam or levee failure. In these cases, flood waters may not follow the typical floodplains mapped as the SFHA.

The Town of Severance's overall vulnerability to flooding in dam inundation areas considerably different from the rest of the County, as Severance has no address points located in these dam inundation areas. This is compared to 1.0% of Countywide addresses located in these areas.

Additionally, the Town is the first jurisdiction downstream from two dams. Both have a hazard classification of Significant or High and associated Emergency Action Plans (EAPs). Additional information pertaining to dams can be referenced at the State's Dam Safety website: https://dwr.state.co.us/Tools/DamSafety/Dams .

The Town's overall vulnerability to flooding in areas protected by known levees is significantly different from the rest of the County. Severance has no address points located within levee protected areas, compared to 1.6% of Countywide addresses located in these areas.

It is important to note that this analysis is only as good as best available data allows. Current floodplains, dam inundation areas, and areas protected by levees may not currently map all hazard areas. Additionally, mapped hazard areas may be dated and in need of updated mapping and analysis.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.19.2.5 Hazmat Release

Vulnerability to hazmat release is noticeably different from the rest of the County. There have been no events in the Town of Severance, between 1991 and 2019, based on data supplied by the Pipeline and Hazardous Materials Safety Administration's (PHMSA) Incident Reports Database.

The presence of any businesses that transport and store hazardous materials will increase the risk for these types of events.

Future occurrences can be expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.19.2.6 Public Health Hazards

Vulnerability to public health hazards is not expected to be noticeably different from the rest of the County. Individuals at a higher risk to this hazard include the aging adult population, those with a chronic illness, such as diabetes, asthma, coronary heart disease, and those who are obese or overweight. Other populations at risk include children, those in poverty and those with a disability. This data is collected at census tract level by the Centers for Disease Control (CDC) and is unavailable at a municipality level. The data by census tract can be found in the Colorado Department of Health and Environment Open Data database here.

Future occurrences are expected to mirror that of the County. There are no previous events to document specific to Severance. Refer to Chapter 5 – Risk Assessment of this Plan for additional details, including a summary of the higher risk population demographics for Weld County and the State.

7.19.3 Capabilities Assessment

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

Planning and regulatory capabilities are powerful tools for implementing hazard mitigation. The Town currently utilizes or has implemented a portion of these capabilities shown in Table 213. It is important for all municipalities to regularly review each of these tools, to identify opportunities for further risk reduction efforts.

Table 213. Planning & Regulatory Capabilities

Mitigation Capability	Utilized?	Comments
Comprehensive, Master, or General Plan	Yes	
Capital Improvement Program or Plan (CIP)	Yes	New for 2021 Budget
Floodplain Management Plan	No	
Stormwater Program / Plan	No	
Community Wildfire Protection Plan (CWPP)	No	
Erosion / Sediment Control Program	No	
Economic Development Plan	No	
Other:	No	
Building Codes (Year)	Yes	2018
Site Plan Review Requirements	Yes	
Other:	No	
Zoning Ordinance (Land Use)	Yes	
Subdivision Ordinance	Yes	
National Flood Insurance Program (NFIP) Participant	Yes	
Flood Insurance Study / Flood Insurance Rate Map / DFIRM	Yes	
Floodplain Ordinance	Yes	

Mitigation Capability	Utilized?	Comments
Elevation Certificates for Floodplain Development	Yes	
Community Rating System (CRS) Participant	No	
Open Space / Conservation Program	Yes	New Plan for 2021
Growth Management Ordinance	Yes	
Stormwater Ordinance	No	
Other Hazard Ordinance (steep slope, wildfire, snow loads, etc.)	No	
Other:	No	

Available resources including staff, municipal groups, and technology are all vital for a community to be able to implement hazard mitigation. Severance is fortunate to have many of these capabilities identified in Table 214.

Table 214. Administrative & Technical Capabilities

Mitigation Capability	Utilized?	Comments
Planning Commission	Yes	https://www.townofseverance.org/planning-commission
Mitigation Planning Committee	No	
Maintenance Programs (tree trimming, clearing drainage, etc.)	Yes	
Emergency Manager	Yes	Chief James Gerdeman
Building Official	Yes	Russ Weber, SAFEbuilt
Floodplain Administrator	Yes	Mike Ketterling, Northern Engineering
Community Planner	Yes	Mitch Nelson, Community Development Director
Transportation Planner	No	
Civil Engineer	Yes	Colorado Civil Group
GIS Capability	Yes	Mitch Nelson, Community Development Director
Resiliency Planner	No	
Other:	No	
Warning Systems / Services (flood)	No	
Warning Systems / Services (other / multi hazard)	Yes	Tornado Sirens
Grant Writing / Management	Yes	Mitch Nelson, Community Development Director
Other:	No	

The ability of a community to implement a comprehensive mitigation strategy is largely dependent on available funding. These related municipal capabilities are outlined in Table 215 and show that Severance utilizes a few financial tools that can support mitigation activities.

Table 215. Financial Capabilities

Mitigation Capability	Utilized?	Comments
Levy for Specific Purposes with Voter Approval	No	
Utilities Fees	Yes	
System Development / Impact Development Fee	Yes	
General Obligation Bonds to Incur Debt	No	
Special Tax Bonds to Incur Debt	No	
Open Space / Conservation Fund	Yes	
Stormwater Utility Fees	No	
Capital Improvement Project Funding	No	
Community Development Block Grants (CDBG)	No	
Withheld spending in hazard-prone areas	No	
Other:	No	

Education and outreach are important capabilities that allow a community to continue the conversation with their public regarding hazard risk and opportunities to mitigate. Table 216 shows that Severance could benefit by expanding upon these capabilities.

Table 216. Education & Outreach Capabilities

Mitigation Capability	Utilized?	Comments
Public Hazard Education / Outreach Program	No	
Local Citizen Groups That Communicate Hazard Risks	No	
Firewise	No	
NOAA StormReady Program	No	
Other:	No	

7.19.4 Mitigation Actions

The new mitigation actions identified by the Town during the Plan update are included in Table 217.

Table 217. 2021 Mitigation Actions

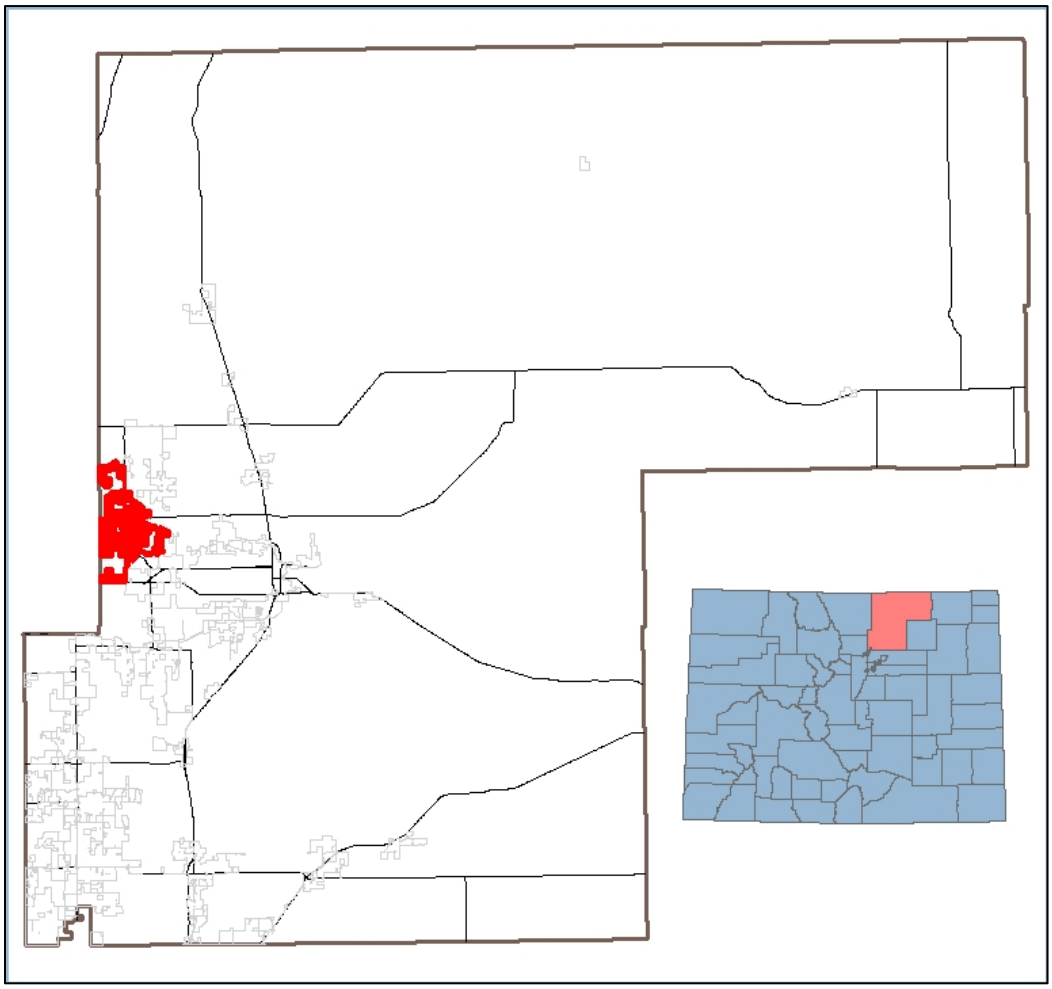
ID	Organization	Action
2021-94	1-Severence	Downtown Drainage and Street Improvements (Phase 2)
2021-95	2-Severence	Hidden Valley Parkway Crossing
2021-96	3-Severence	Harmony Regional Drainage Project

7.20 Town of Windsor

The 2016 Windsor Comprehensive Plan "*serves as a foundation for decision-making and a reference for Town officials, residents, and stakeholders as they consider development proposals, capital improvements, infrastructure investments, policy changes, and other actions in the decades to come.*"

7.20.1 Community Profile

The Town has a total area of 25.6 square miles of which 1.27 square miles of it is water. The Cache la Poudre River runs through the west and south sides of Town. It on the BNSF Railway and east of Interstate 25. It is approximately halfway between Fort Collins and Greeley and 15 miles northeast of Loveland.



The Windsor-Severance Fire Rescue (WSFR) provides fire, rescue, and hazmat services to the Towns of Windsor and Severance, as well as the rural areas surrounding them.

The table below summarizes key demographic and development related characteristics of the Town of Windsor.

Table 218. Town of Windsor Demographics

Windsor	Colorado	
30,477	5,758,736	Population, 2019

Windsor	Colorado	
63.4%	14.5%	Population, % change April 1, 2010 to July 1, 2019
7%	5.8%	% Population under 5 years, 2019
29.2%	21.9%	% Population under 19 years, 2019
14%	14.6%	% Population 65 years and over, 2019
82.4%	64.9%	Homeownership Rate, 2019
2.81	2.56	Persons Per Household, 2019
$96,710	$68,811	Median Household Income, 2014- 2018
4.3%	9.3%	Persons below poverty level, %, 2014- 2018
4.6%	7.3%	% Population under 65 years, with a disability 2014-2018
6.4%	17%	Language other than English spoken at home, % age 5+, 2014- 2018

Source: US Census Bureau

7.20.2 Risk and Vulnerability Assessment

The Town of Windsor is situated in both Larimer and Weld Counties. For the purpose of this plan, spatially analyzed hazard risks have been assessed for the areas of the city that lie specifically within Weld County.

Table 219 summarizes the results of the RF ranking exercise performed by the Town of Windsor. The results represent the relative risk of different hazards across the municipality from the perspective of local stakeholders and subject matter experts. Note the final RF Ranking values in this table include the weighting factors detailed in the Risk Assessment chapter of this Plan.

Table 219. Risk Factor Results for Windsor

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	RF Ranking
Agricultural Hazards	1	1	1	2	3	1.3
Cyber Hazards	2	4	4	4	4	3.4
Drought	4	3	4	1	3	3.3
Earthquake	1	2	2	4	2	1.9
Extreme Temps.	2	3	2	2	3	2.4
Flood	3	3	3	3	4	3.1
Hazmat Release	4	3	3	1	3	3.1
Land Subsidence	1	2	2	1	2	1.6
Prairie Fire	1	1	1	1	1	1.0
Public Health Hazards	4	4	4	3	4	3.9
Severe Storms	4	3	3	2	4	3.3
Tornado & Wind	2	2	2	2	4	2.2

The conclusions drawn from the qualitative assessment are organized into three categories shown in the following table and provide a summary of hazard risk for Windsor as a whole – based on High, Moderate, or Low risk designations. This process helped frame ongoing planning discussions around local and regional hazard risks and assisted with the development of the Plan's updated mitigation strategy.

Table 220. Hazard Risk Conclusions for Windsor

HIGH RISK (2.5 or higher)	**Cyber Hazards, Drought, Flood, Hazmat Release, Public Health Hazards, Severe Storms**
MODERATE RISK (2.0 – 2.4)	**Extreme Temperatures, Tornado & Straight-Line Wind**
LOW RISK (1.9 or lower)	**Agricultural Hazards, Earthquake, Land Subsidence, Prairie Fire**

Since the 2016 Plan, the Town has increased the assessed risk from drought to High Risk (previously Moderate). The Town also increased the assessed risk from flood, hazmat release, and public health hazards to High Risk (previously all were Low). Windsor has decreased the assessed risk for extreme temperatures, from High to Moderate and prairie fire from Moderate to Low. Besides the newly added hazards of agricultural hazards and cyber hazards, all other risk rankings remain the same.

The following sections highlight the Town of Severance's High Risk hazards and include any specific content relevant to the Town. They are intended to supplement information included in each hazard profile in the main body of this Plan.

7.20.2.1 Cyber Hazards

For any municipality, vulnerability to cyber hazards does not vary from that of the County as a whole. While there are no documented cyber events impacting the Town of Windsor, the threat of this hazard is continually increasing. There are no previous events to document specific to Windsor. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.20.2.2 Drought

The community vulnerability to drought is not noticeably different from the rest of the County. Those communities whose economies are more dependent on the agriculture industry do experience higher risk to this hazard. There are no previous events to document specific to Windsor. Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.20.2.3 Flood (including Dam & Levee Failure)

Flood is a very localized hazard and vulnerability is unique for each municipality. According to the NOAA's Storm Events Database, there have been two flood events in Windsor between 2015 and 2020. On 5/20/2015, a flood affected Windsor when the Cache La Poudre and South Platte River rose above flood stage producing a prolonged period of minor to moderate lowland flooding. Numerous county roads along the rivers were closed due to floodwaters. This flood caused $250,000 in property damages and $100,000 in crop damages. There were no injuries or deaths.

Another event on 6/2/2015, both the Cache La Poudre and South Platte Rivers crested over a foot above flood stage due to rainfall and snowmelt. This flood caused $25,000 in property damages and $50,000 in crop damages. There were no injuries or deaths.

The Town of Windsor spans both Larimer and Weld Counties and the information for vulnerability includes only those address points within Weld County.

Overall vulnerability to flood is increased for the Town of Windsor, where 2.2% of address points (287) are located within the Special Flood Hazard Area (SFHA). This is a larger percentage of structures at risk, as compared to 1.6% of Countywide addresses located in the SFHA.

Flood events can also occur as a result of dam or levee failure. In these cases, flood waters may not follow the typical floodplains mapped as the SFHA.

Overall vulnerability to flooding in dam inundation areas is increased for the Town of Windsor, where 68.0% of address points (8,818) are located within these dam inundation areas. This is a larger percentage of structures at risk, as compared to 1.0% of Countywide addresses located in these areas.

Additionally, the Town is the first jurisdiction downstream from fifteen dams. Six of these have a hazard classification of Significant or High and associated Emergency Action Plans (EAPs). Additional information pertaining to dams can be referenced at the State's Dam Safety website: https://dwr.state.co.us/Tools/DamSafety/Dams .

The Town's overall vulnerability to flooding in areas protected by known levees is significantly different from the rest of the County. Windsor has no address points located in these levee protected areas, compared to 1.6% of Countywide addresses located in these areas.

It is important to note that this analysis is only as good as best available data allows. Current floodplains, dam inundation areas, and areas protected by levees may not currently map all hazard areas. Additionally, mapped hazard areas may be dated and in need of updated mapping and analysis.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.20.2.4 Hazmat Release

Vulnerability to hazmat release is increased, mainly due to railroads spanning across the Town of Windsor which present their own increased risk for hazmat release. As is true for the entire County, the presence of any businesses that store hazardous materials also increases the risk for these types of events.

Based on data supplied by the Pipeline and Hazardous Materials Safety Administration's (PHMSA) Incident Reports Database there have been seven events that have occurred within Windsor between 1991 and 2019. These events were due to improper handling and preparation for transport.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.20.2.5 Public Health Hazards

Vulnerability to public health hazards is not expected to be noticeably different from the rest of the County. Individuals at a higher risk to this hazard include the aging adult population, those with a chronic illness, such as diabetes, asthma, coronary heart disease, and those who are obese or overweight. Other populations at risk include children, those in poverty and those with a disability. This data is collected at census tract level by the Centers for Disease Control (CDC) and is unavailable at a municipality level. The data by census tract can be found in the Colorado Department of Health and Environment Open Data database here.

Future occurrences are expected to mirror that of the County. There are no previous events to document specific to Windsor. Refer to Chapter 5 – Risk Assessment of this Plan for additional details, including a summary of the higher risk population demographics for Weld County and the State.

7.20.2.6 Severe Storms (including Hail, Lightning, & Winter Storm)

Vulnerability to severe storm, which includes hail, lightning, and winter storm, is not noticeably different from the rest of the County. The Town of Windsor's more densely developed areas experience the greatest risk. Any structures not constructed to meet recent building codes experience the greatest risk from structural damages.

According to the NOAA's Storm Events Database, between 2015 and 2020, the Town of Windsor has had ten severe storm events. All of these events resulted in reports of hail, which ranged in size from .88 inch to 2inches. None of these events resulted in damage to property or crops and no injuries or deaths.

No other events for severe storm, specific to Windsor, were recorded over this time period.

Future occurrences are expected to mirror that of the County. Refer to Chapter 5 – Risk Assessment of this Plan for additional details.

7.20.3 Capabilities Assessment

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

Planning and regulatory capabilities are powerful tools for implementing hazard mitigation. The Town currently utilizes or has implemented many of these capabilities shown in Table 221. It is important for all municipalities to regularly review each of these tools, to identify opportunities for further risk reduction efforts.

Table 221. Planning & Regulatory Capabilities

Mitigation Capability	Utilized?	Comments
Comprehensive, Master, or General Plan	Yes	
Capital Improvement Program or Plan (CIP)	Yes	
Floodplain Management Plan	Yes	
Stormwater Program / Plan	Yes	
Community Wildfire Protection Plan (CWPP)	No	
Erosion / Sediment Control Program	No	
Economic Development Plan	Yes	
Other:	No	
Building Codes (Year)	Yes	2018
Site Plan Review Requirements	Yes	
Other:		
Zoning Ordinance (Land Use)	Yes	

Mitigation Capability	Utilized?	Comments
Subdivision Ordinance	Yes	
National Flood Insurance Program (NFIP) Participant	Yes	
Flood Insurance Study / Flood Insurance Rate Map / DFIRM	Yes	
Floodplain Ordinance	Yes	
Elevation Certificates for Floodplain Development	No	
Community Rating System (CRS) Participant	No	
Open Space / Conservation Program	No	
Growth Management Ordinance	Yes	
Stormwater Ordinance	Yes	
Other Hazard Ordinance (steep slope, wildfire, snow loads, etc.)	No	
Other:	No	

Available resources including staff, municipal groups, and technology are all vital for a community to be able to implement hazard mitigation. Windsor is fortunate to have a number of these capabilities identified in Table 222.

Table 222. Administrative & Technical Capabilities

Mitigation Capability	Utilized?	Comments
Planning Commission	Yes	
Mitigation Planning Committee	No	
Maintenance Programs (tree trimming, clearing drainage, etc.)	Yes	
Emergency Manager	Yes	Shared in house
Building Official	Yes	Contract with SAFEbuilt
Floodplain Administrator	Yes	Omar Herrera
Community Planner	Yes	Planning Department
Transportation Planner	Yes	Contract as needed
Civil Engineer	Yes	
GIS Capability	Yes	
Resiliency Planner	No	
Other:	No	
Warning Systems / Services (flood)	No	
Warning Systems / Services (other / multi hazard)	No	
Grant Writing / Management	No	Handled by department
Other:	No	

The ability of a community to implement a comprehensive mitigation strategy is largely dependent on available funding. These related municipal capabilities are outlined in Table 223 and show that Windsor utilizes a broad range of financial tools that can support mitigation activities.

Table 223. Financial Capabilities

Mitigation Capability	Utilized?	Comments
Levy for Specific Purposes with Voter Approval	Yes	
Utilities Fees	Yes	
System Development / Impact Development Fee	Yes	
General Obligation Bonds to Incur Debt	Yes	
Special Tax Bonds to Incur Debt	Yes	
Open Space / Conservation Fund	No	
Stormwater Utility Fees	Yes	
Capital Improvement Project Funding	Yes	
Community Development Block Grants (CDBG)	No	
Withheld spending in hazard-prone areas	No	
Other:	No	

Education and outreach are important capabilities that allow a community to continue the conversation with their public regarding hazard risk and opportunities to mitigate. Table 224 shows that Windsor could benefit by expanding upon these capabilities.

Table 224. Education & Outreach Capabilities

Mitigation Capability	Utilized?	Comments
Public Hazard Education / Outreach Program	No	
Local Citizen Groups That Communicate Hazard Risks	No	
Firewise	No	
NOAA StormReady Program	No	
Other:	No	

7.20.4 Mitigation Actions

The new mitigation actions identified by the Town during the Plan update are included in Table 225. Two actions from the 2016 Plan have been carried over into the Town's updated mitigation strategy.

Table 225. 2021 Mitigation Actions

ID	Organization	Action
2021-97	1-Windsor	Eastman Park Riverwalk Project

ID	Organization	Action
2021-98	2-Windsor	Acquire Emergency Power System Transfer Switches - Public Safety Complex
2021-99	3-Windsor	Flood Mitigation on CR 13

8 Appendix C: Earthquake Hazus Risk Report

Hazus: Earthquake Global Risk Report

Region Name	WeldCO_Eq
Earthquake Scenario:	Weld EQ 2,500yr Probabalistic 6.5
Print Date:	July 17, 2020

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 4,015.73 square miles and contains 77 census tracts. There are over 89 thousand households in the region which has a total population of 252,825 people (2010 Census Bureau data). The distribution of population by Total Region and County is provided in Appendix B.

There are an estimated 90 thousand buildings in the region with a total building replacement value (excluding contents) of 23,758 (millions of dollars). Approximately 92.00 % of the buildings (and 82.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 6,078 and 14,834 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 90 thousand buildings in the region which have an aggregate total replacement value of 23,758 (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 2 hospitals in the region with a total bed capacity of 300 beds. There are 111 schools, 45 fire stations, 22 police stations and 4 emergency operation facilities. With respect to high potential loss facilities (HPL), there are no dams identified within the inventory. The inventory also includes 60 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 20,912.00 (millions of dollars). This inventory includes over 507.04 miles of highways, 600 bridges, 17,796.69 miles of pipes.

Table 1: Transportation System Lifeline Inventory

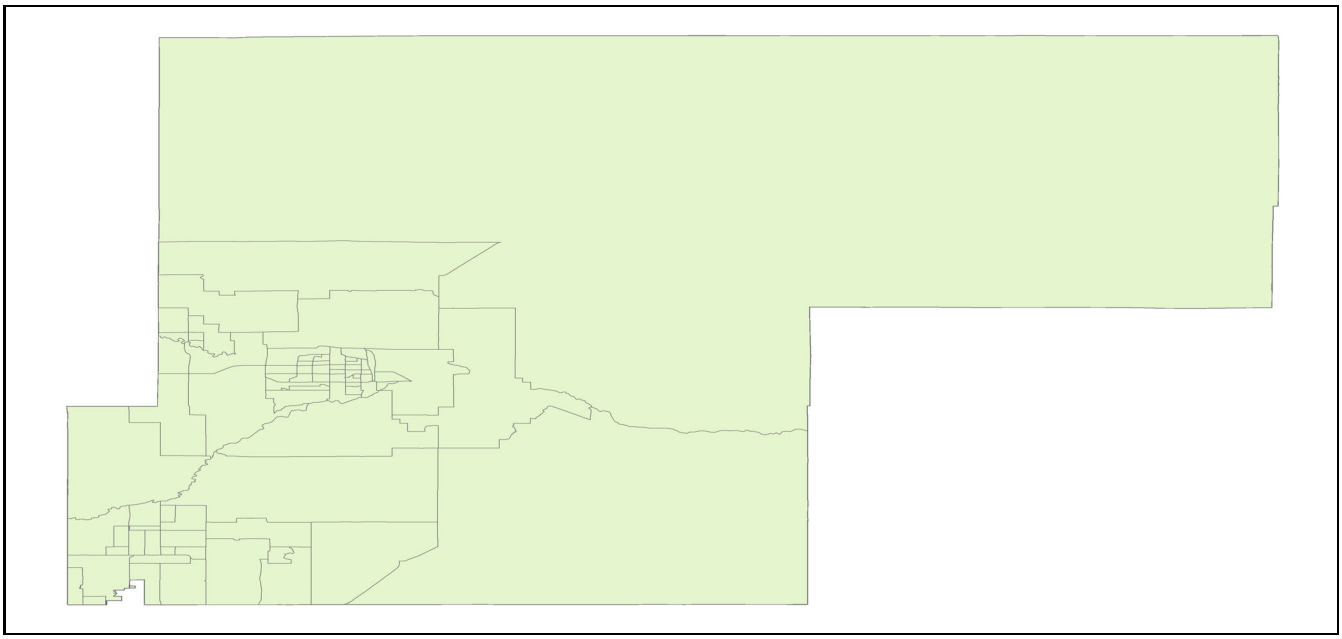
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	600	753.3787
	Segments	131	4185.4655
	Tunnels	0	0.0000
		Subtotal	**4938.8442**
Railways	Bridges	95	418.9648
	Facilities	0	0.0000
	Segments	285	493.9823
	Tunnels	0	0.0000
		Subtotal	**912.9471**
Light Rail	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	0	0.0000
	Tunnels	0	0.0000
		Subtotal	**0.0000**
Bus	Facilities	2	2.8225
		Subtotal	**2.8225**
Ferry	Facilities	0	0.0000
		Subtotal	**0.0000**
Port	Facilities	0	0.0000
		Subtotal	**0.0000**
Airport	Facilities	3	26.6373
	Runways	6	197.0052
		Subtotal	**223.6425**
		Total	**6,078.30**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	347.1444
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**347.1444**
Waste Water	Distribution Lines	NA	208.2866
	Facilities	60	7567.8281
	Pipelines	0	0.0000
		Subtotal	**7776.1147**
Natural Gas	Distribution Lines	NA	138.8577
	Facilities	20	30.8710
	Pipelines	43	524.0924
		Subtotal	**693.8211**
Oil Systems	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**0.0000**
Electrical Power	Facilities	11	6016.3351
		Subtotal	**6016.3351**
Communication	Facilities	16	1.5520
		Subtotal	**1.5520**
		Total	**14,835.00**

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	Weld EQ 2,500yr Probabalistic 6.5
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	6.50
Depth (km)	NA
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	NA

Direct Earthquake Damage

Building Damage

Hazus estimates that about 2,867 buildings will be at least moderately damaged. This is over 3.00 % of the buildings in the region. There are an estimated 13 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

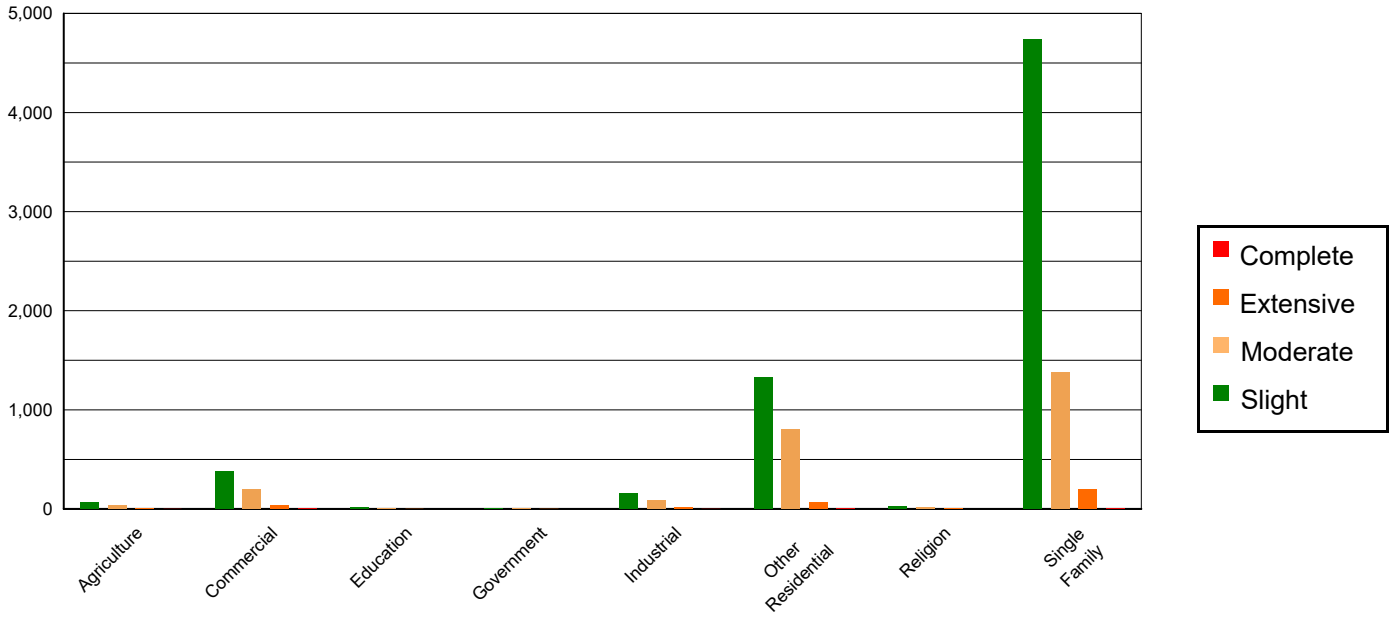


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	687.87	0.85	64.96	0.97	34.59	1.37	6.32	1.93	0.26	1.93
Commercial	3416.41	4.23	378.25	5.64	200.67	7.94	37.86	11.55	1.80	13.27
Education	129.41	0.16	11.73	0.17	5.90	0.23	0.92	0.28	0.04	0.33
Government	86.71	0.11	8.52	0.13	4.16	0.16	0.58	0.18	0.03	0.22
Industrial	1270.92	1.57	153.85	2.29	88.72	3.51	16.88	5.15	0.64	4.69
Other Residential	7702.04	9.54	1324.80	19.75	805.64	31.89	63.38	19.34	2.14	15.77
Religion	283.64	0.35	25.99	0.39	12.45	0.49	1.82	0.56	0.10	0.72
Single Family	67164.74	83.18	4739.68	70.66	1374.04	54.39	199.98	61.02	8.55	63.07
Total	**80,742**		**6,708**		**2,526**		**328**		**14**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	55227.73	68.40	3689.00	55.00	533.29	21.11	31.27	9.54	0.02	0.12
Steel	1260.54	1.56	143.82	2.14	92.43	3.66	14.69	4.48	0.78	5.72
Concrete	1030.28	1.28	116.24	1.73	52.08	2.06	5.56	1.70	0.14	1.06
Precast	1058.55	1.31	120.34	1.79	102.08	4.04	26.60	8.12	0.48	3.55
RM	14815.71	18.35	1052.24	15.69	735.24	29.10	131.80	40.21	0.63	4.65
URM	2060.26	2.55	414.49	6.18	245.59	9.72	60.58	18.48	9.62	70.94
MH	5288.65	6.55	1171.67	17.47	765.45	30.30	57.25	17.47	1.89	13.95
Total	**80,742**		**6,708**		**2,526**		**328**		**14**	

*Note:
RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 300 hospital beds available for use. On the day of the earthquake, the model estimates that only 246 hospital beds (82.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 93.00% of the beds will be back in service. By 30 days, 99.00% will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	2	0	0	2
Schools	111	0	0	111
EOCs	4	0	0	4
PoliceStations	22	0	0	22
FireStations	45	0	0	45

Transportation Lifeline Damage

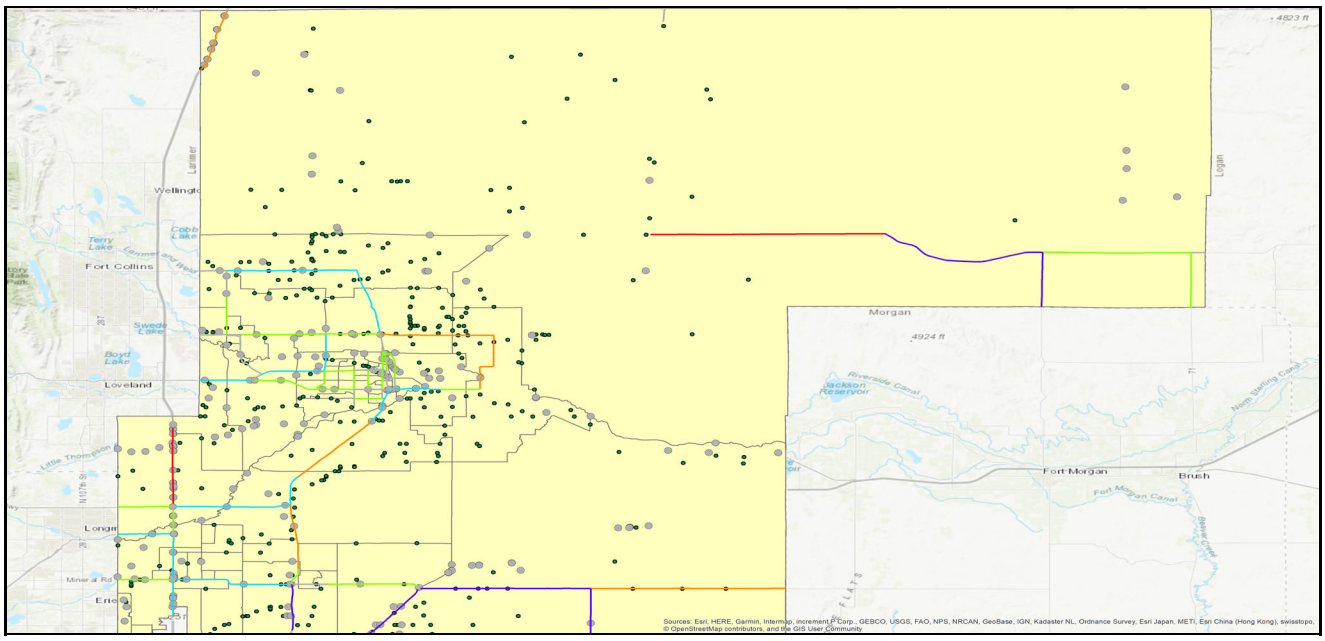


Table 6: Expected Damage to the Transportation Systems

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	131	0	0	131	131
	Bridges	600	0	0	600	600
	Tunnels	0	0	0	0	0
Railways	Segments	285	0	0	285	285
	Bridges	95	0	0	95	95
	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	2	0	0	2	2
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	3	0	0	3	3
	Runways	6	0	0	6	6

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	60	0	0	60	60
Natural Gas	20	0	0	20	20
Oil Systems	0	0	0	0	0
Electrical Power	11	0	0	11	11
Communication	16	0	0	16	16

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	10,785	111	28
Waste Water	6,471	56	14
Natural Gas	541	0	0
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	89,349	0	0	0	0	0
Electric Power		0	0	0	0	0

Induced Earthquake Damage

Fire Following Earthquake

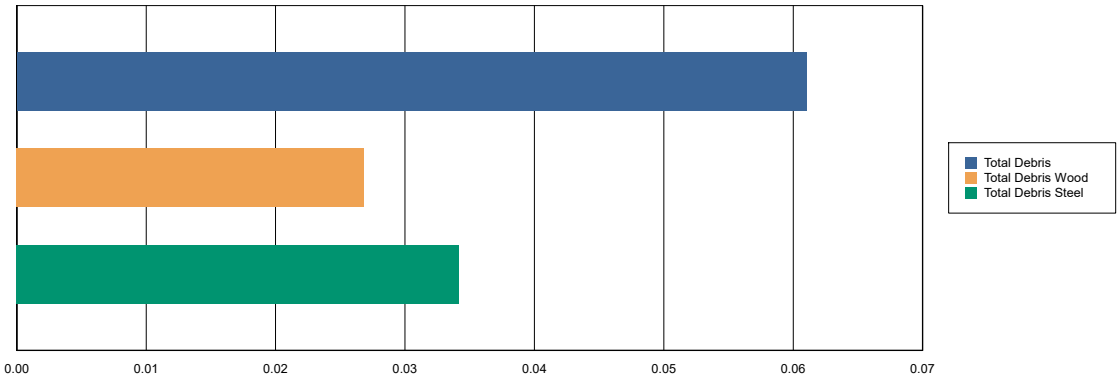
Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there 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 11 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 61,000 tons of debris will be generated. Of the total amount, Brick/Wood comprises 44.00% 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 2,440 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)



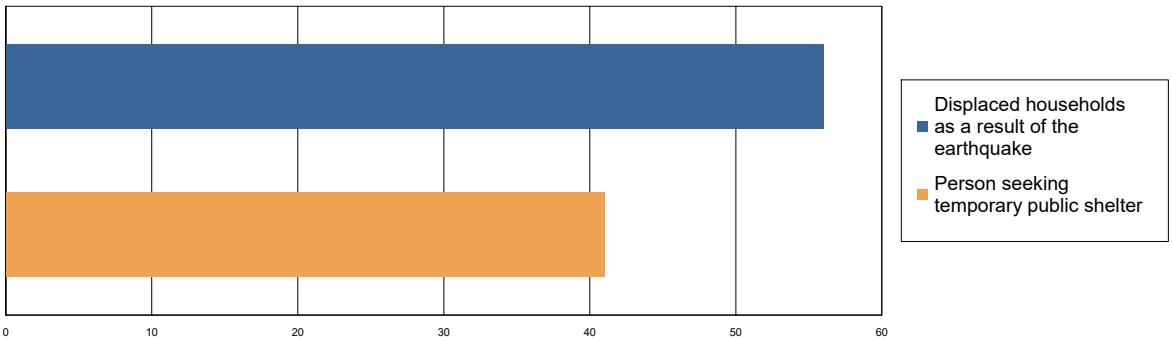
Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
0.03	0.03	0.06	2,440 (@25 tons/truck)

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 56 households to be displaced due to the earthquake. Of these, 41 people (out of a total population of 252,825) 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
56	41

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	0.65	0.08	0.01	0.01
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.96	0.12	0.01	0.01
	Other-Residential	9.80	1.00	0.03	0.05
	Single Family	25.13	2.80	0.19	0.36
	Total	**37**	**4**	**0**	**0**
2 PM	Commercial	36.97	4.82	0.35	0.67
	Commuting	0.00	0.00	0.00	0.00
	Educational	8.16	1.04	0.07	0.14
	Hotels	0.00	0.00	0.00	0.00
	Industrial	7.05	0.86	0.05	0.10
	Other-Residential	1.71	0.18	0.01	0.01
	Single Family	4.45	0.51	0.04	0.07
	Total	**58**	**7**	**1**	**1**
5 PM	Commercial	26.82	3.52	0.26	0.49
	Commuting	0.01	0.01	0.03	0.00
	Educational	0.69	0.08	0.01	0.01
	Hotels	0.00	0.00	0.00	0.00
	Industrial	4.41	0.54	0.03	0.06
	Other-Residential	3.56	0.37	0.01	0.02
	Single Family	9.68	1.12	0.08	0.15
	Total	**45**	**6**	**0**	**1**

Economic Loss

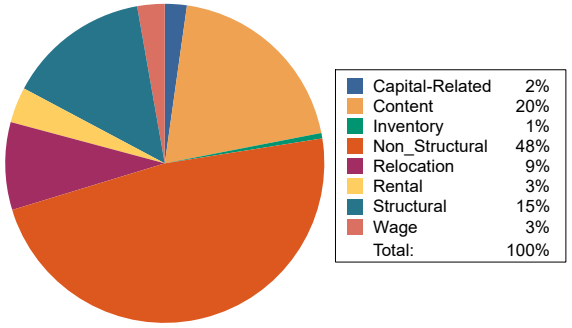
The total economic loss estimated for the earthquake is 591.16 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

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 225.36 (millions of dollars); 17 % 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 67 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

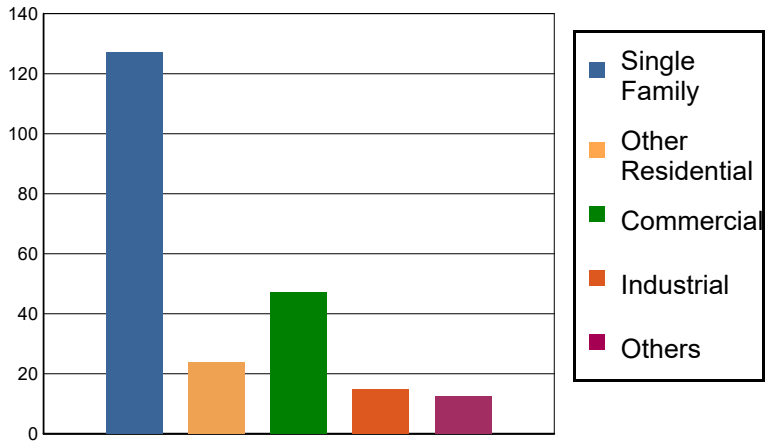


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	0.2607	5.2852	0.3232	0.3174	6.1865
	Capital-Related	0.0000	0.1108	4.4391	0.1968	0.0954	4.8421
	Rental	3.1903	1.1996	3.0274	0.1487	0.1182	7.6842
	Relocation	11.2207	1.8800	4.7551	0.8236	1.2949	19.9743
	Subtotal	**14.4110**	**3.4511**	**17.5068**	**1.4923**	**1.8259**	**38.6871**
Capital Stock Losses							
	Structural	18.7196	3.5174	5.9484	1.9111	2.7996	32.8961
	Non_Structural	68.5934	13.4523	14.6696	6.4049	4.5516	107.6718
	Content	25.4993	3.2462	8.8047	4.2255	3.0627	44.8384
	Inventory	0.0000	0.0000	0.2671	0.7912	0.2063	1.2646
	Subtotal	**112.8123**	**20.2159**	**29.6898**	**13.3327**	**10.6202**	**186.6709**
	Total	**127.22**	**23.67**	**47.20**	**14.83**	**12.45**	**225.36**

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	4185.4655	0.0000	0.00
	Bridges	753.3787	0.4211	0.06
	Tunnels	0.0000	0.0000	0.00
	Subtotal	**4938.8442**	**0.4211**	
Railways	Segments	493.9823	0.0000	0.00
	Bridges	418.9648	0.0031	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**912.9471**	**0.0031**	
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	2.8225	0.1657	5.87
	Subtotal	**2.8225**	**0.1657**	
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	26.6373	1.9710	7.40
	Runways	197.0052	0.0000	0.00
	Subtotal	**223.6425**	**1.9710**	
	Total	**6,078.26**	**2.56**	

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	347.1444	0.4994	0.14
	Subtotal	**347.1444**	**0.4994**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	7567.8281	219.4115	2.90
	Distribution Line	208.2866	0.2508	0.12
	Subtotal	**7776.1147**	**219.6623**	
Natural Gas	Pipelines	524.0924	0.0000	0.00
	Facilities	30.8710	0.5886	1.91
	Distribution Line	138.8577	0.0859	0.06
	Subtotal	**693.8211**	**0.6745**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Electrical Power	Facilities	6016.3351	142.3586	2.37
	Subtotal	**6016.3351**	**142.3586**	
Communication	Facilities	1.5520	0.0415	2.67
	Subtotal	**1.5520**	**0.0415**	
	Total	**14,834.97**	**363.24**	

Appendix A: County Listing for the Region

Weld,CO

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Colorado					
	Weld	252,825	19,447	4,310	23,758
Total Region		**252,825**	**19,447**	**4,310**	**23,758**

9 Appendix D: Flood Hazus Risk Report

Hazus: Flood Global Risk Report

Region Name: WeldFL100

Flood Scenario: 100yr

Print Date: Thursday, July 30, 2020

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
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FEMA

RiskMAP
Increasing Resilience Together

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The geographical size of the region is approximately 4,017 square miles and contains 9,901 census blocks. The region contains over 89 thousand households and has a total population of 252,825 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 90,317 buildings in the region with a total building replacement value (excluding contents) of 23,758 million dollars. Approximately 92.32% of the buildings (and 81.86% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 90,317 buildings in the region which have an aggregate total replacement value of 23,758 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	19,447,624	81.9%
Commercial	2,574,702	10.8%
Industrial	791,666	3.3%
Agricultural	378,289	1.6%
Religion	235,458	1.0%
Government	72,385	0.3%
Education	257,935	1.1%
Total	**23,758,059**	**100%**

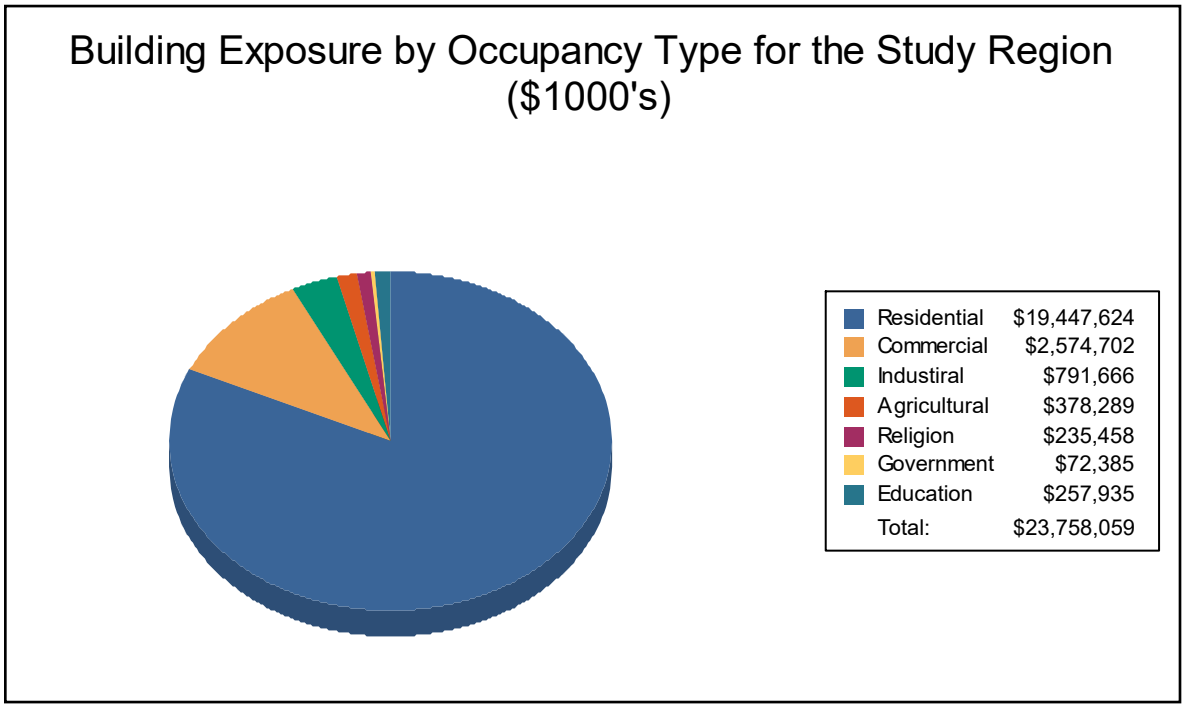
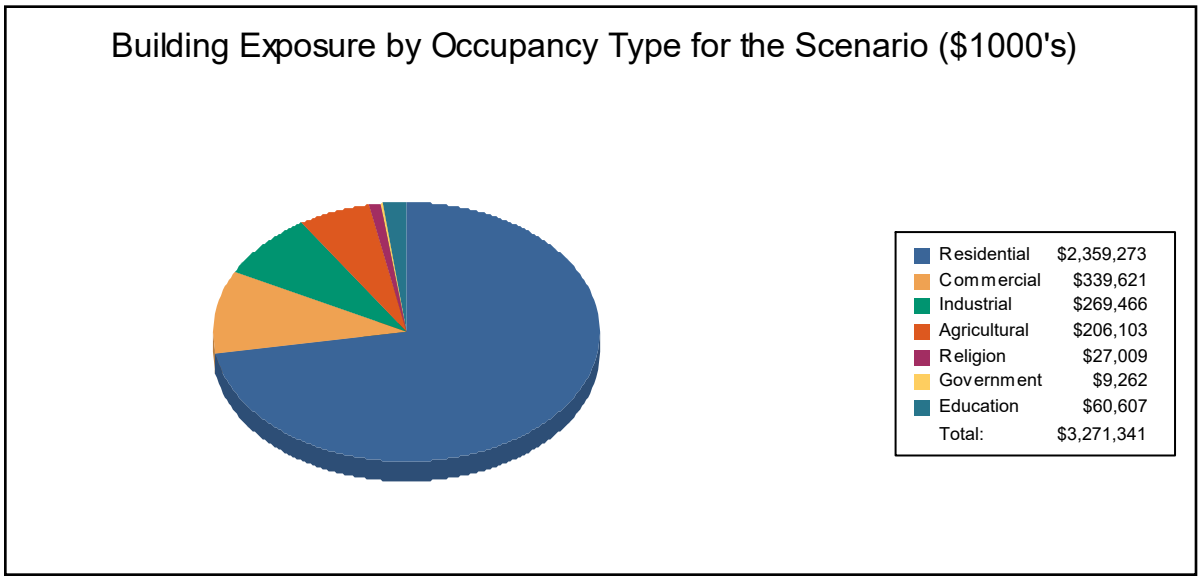


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	2,359,273	72.1%
Commercial	339,621	10.4%
Industrial	269,466	8.2%
Agricultural	206,103	6.3%
Religion	27,009	0.8%
Government	9,262	0.3%
Education	60,607	1.9%
Total	**3,271,341**	**100%**



Essential Facility Inventory

For essential facilities, there are 2 hospitals in the region with a total bed capacity of 300 beds.
There are 111 schools, 45 fire stations, 22 police stations and 4 emergency operation centers.

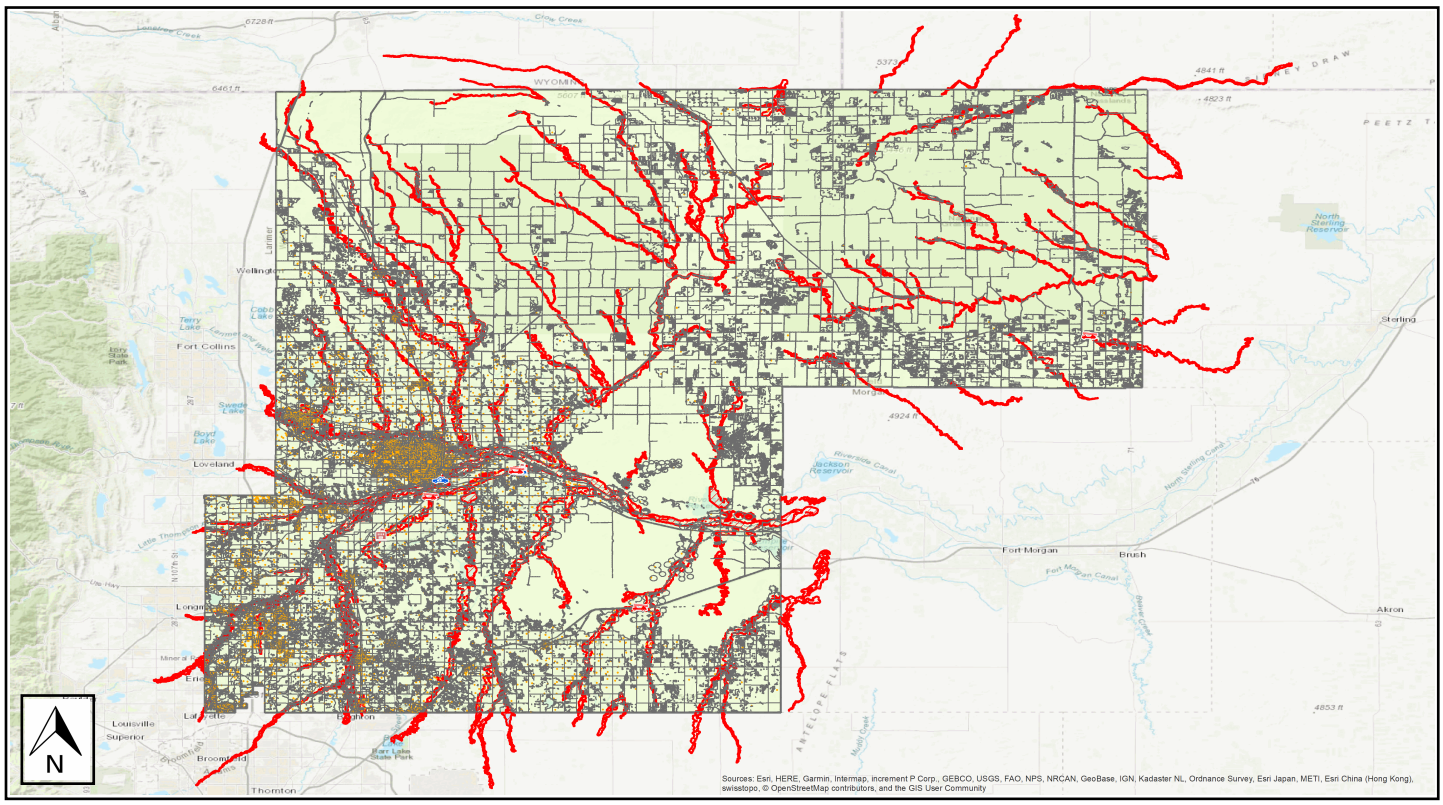
Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	WeldFL100
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 725 buildings will be at least moderately damaged. This is over 71% of the total number of buildings in the scenario. There are an estimated 11 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

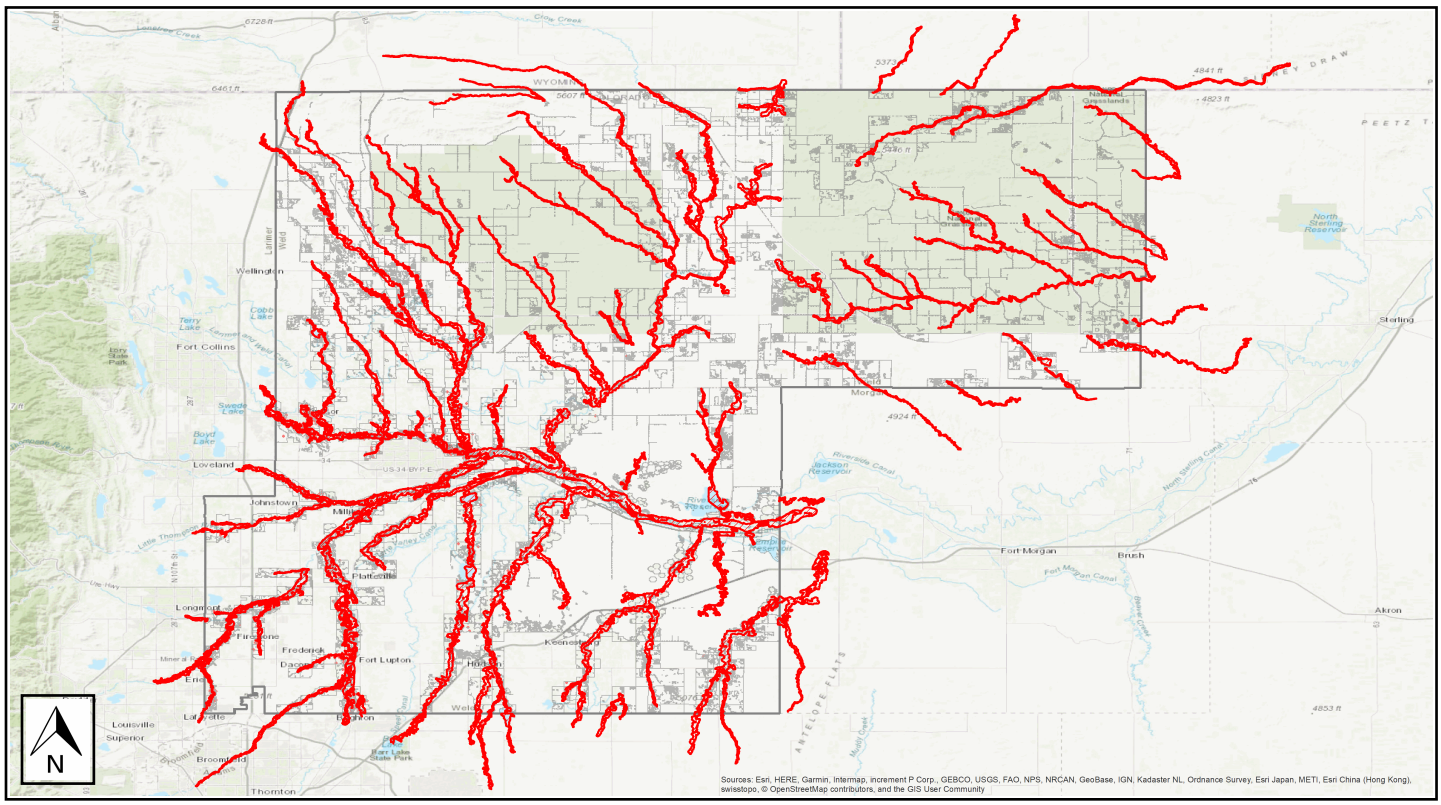


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		>50	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	6	86	1	14	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	1	100	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	324	31	476	45	137	13	77	7	23	2	11	1
Total	**331**		**477**		**137**		**77**		**23**		**11**	

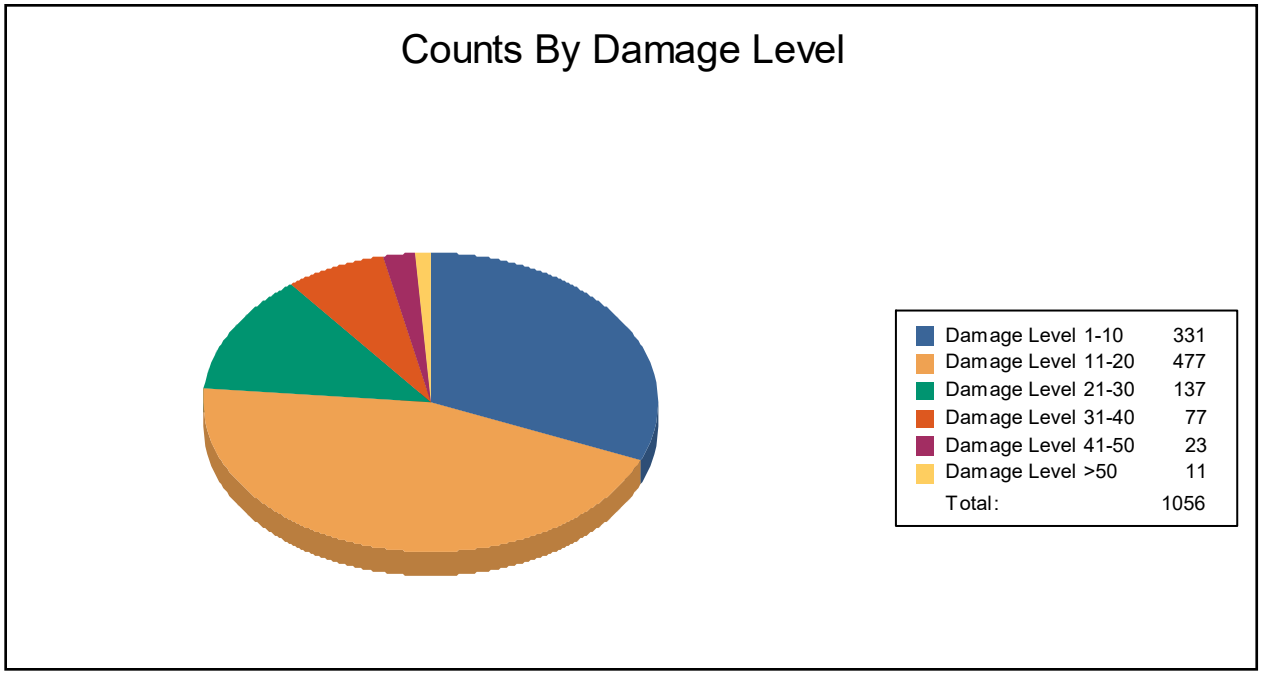


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		>50	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	1	100	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	1	100
Masonry	48	31	79	50	18	11	9	6	2	1	1	1
Steel	2	100	0	0	0	0	0	0	0	0	0	0
Wood	281	31	397	44	119	13	68	8	21	2	9	1

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 300 hospital beds available for use. On the day of the scenario flood event, the model estimates that 300 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	4	0	0	0
Fire Stations	45	4	0	4
Hospitals	2	0	0	0
Police Stations	22	2	0	2
Schools	111	4	0	4

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

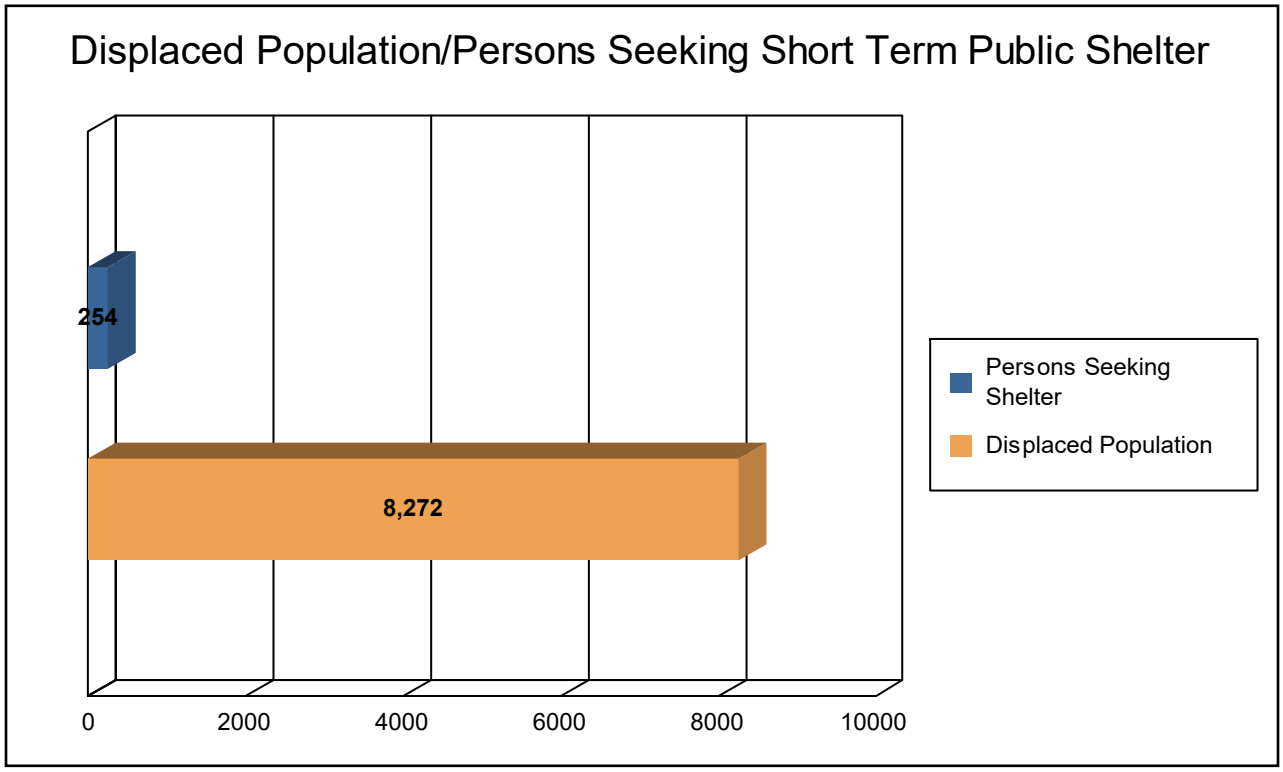
Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

Analysis has not been performed for this Scenario.

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 2,757 households (or 8,272 of people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 254 people (out of a total population of 252,825) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 456.78 million dollars, which represents 13.96 % of the total replacement value of the scenario buildings.

Building-Related Losses

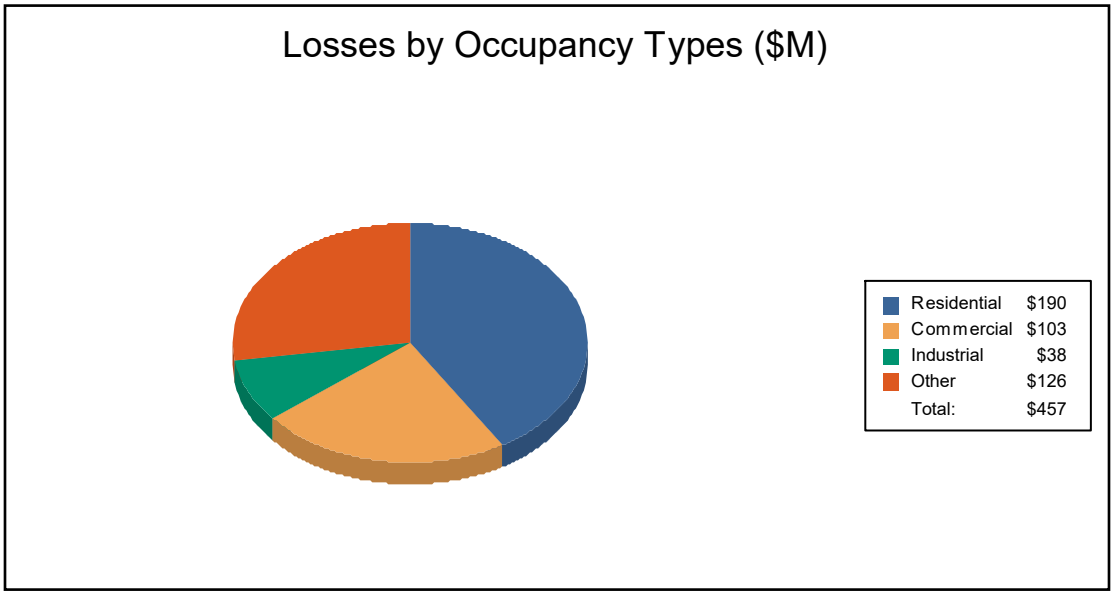
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability 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 250.79 million dollars. 45% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 41.51% 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	90.60	9.12	8.99	8.36	117.08
	Content	47.83	27.22	21.81	30.37	127.23
	Inventory	0.00	0.93	3.65	1.91	6.49
	Subtotal	**138.44**	**37.27**	**34.44**	**40.64**	**250.79**
Business Interruption						
	Income	0.24	26.12	1.08	18.15	45.58
	Relocation	38.74	6.87	0.99	8.74	55.34
	Rental Income	11.65	5.05	0.24	0.59	17.53
	Wage	0.57	27.54	1.73	57.71	87.54
	Subtotal	**51.19**	**65.58**	**4.03**	**85.19**	**205.99**
ALL	**Total**	**189.63**	**102.85**	**38.48**	**125.82**	**456.78**



Appendix A: County Listing for the Region

Colorado

- Weld

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Colorado				
Weld	252,825	19,447,624	4,310,435	23,758,059
Total	**252,825**	**19,447,624**	**4,310,435**	**23,758,059**
Total Study Region	**252,825**	**19,447,624**	**4,310,435**	**23,758,059**

10 Appendix E: Wildfire Risk Assessment Summary Report

2017 Colorado Wildfire Risk Assessment Summary Report

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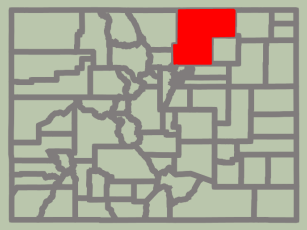
Weld HMP



Report was generated using

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Report version: 1.1.0

Report generated: 2020-10-13

Table of Contents

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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 **Weld HMP** project area, it is estimated that **174,680** people or **59.2 %** percent of the total project area population (294,924) live within the WUI.

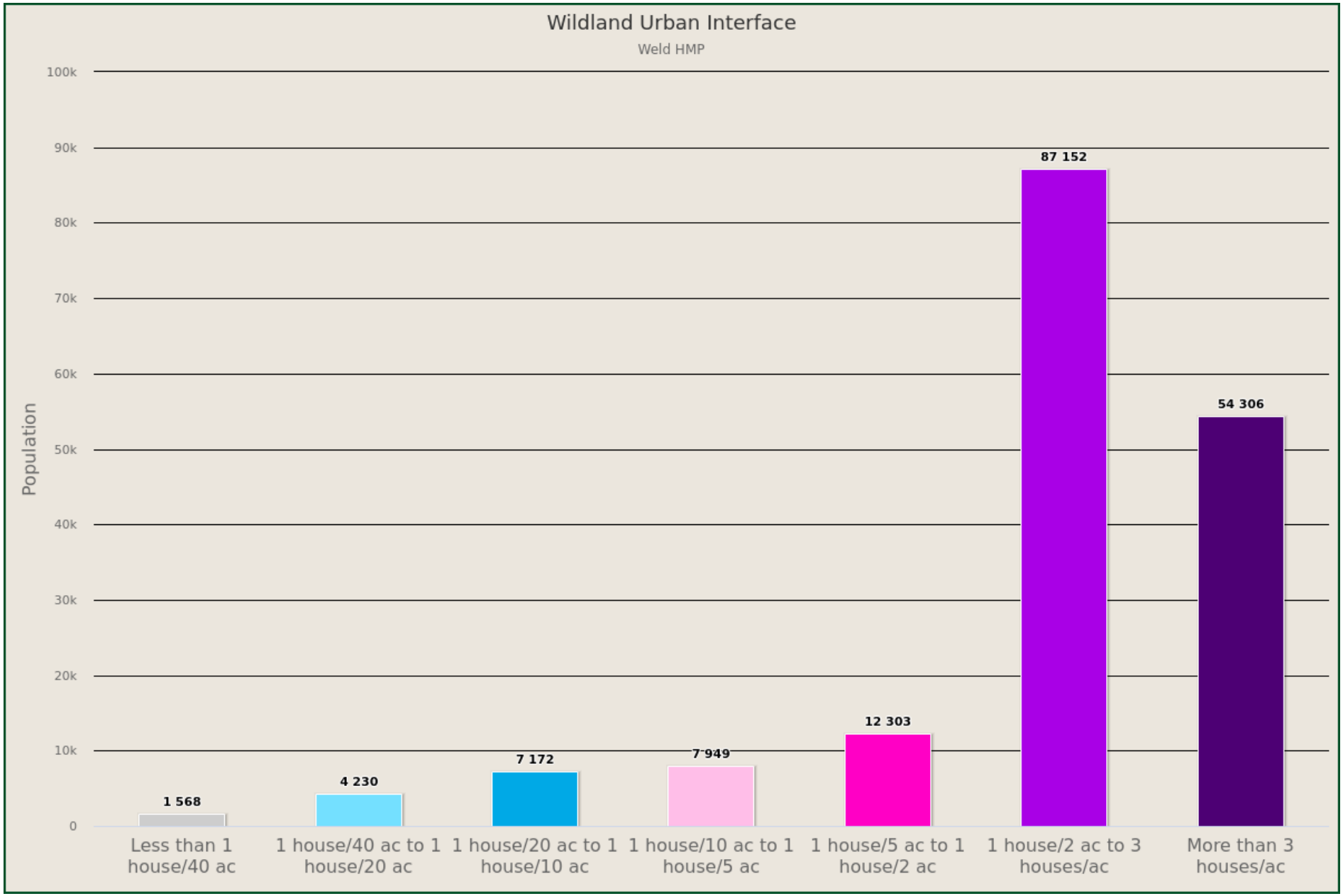
The Wildland Urban Interface (WUI) layer reflects housing density depicting where humans and their structures meet or intermix with wildland fuels. In the past, conventional wildland-urban interface datasets, such as USFS SILVIS, have been used to reflect these concerns. However, USFS SILVIS and other 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.

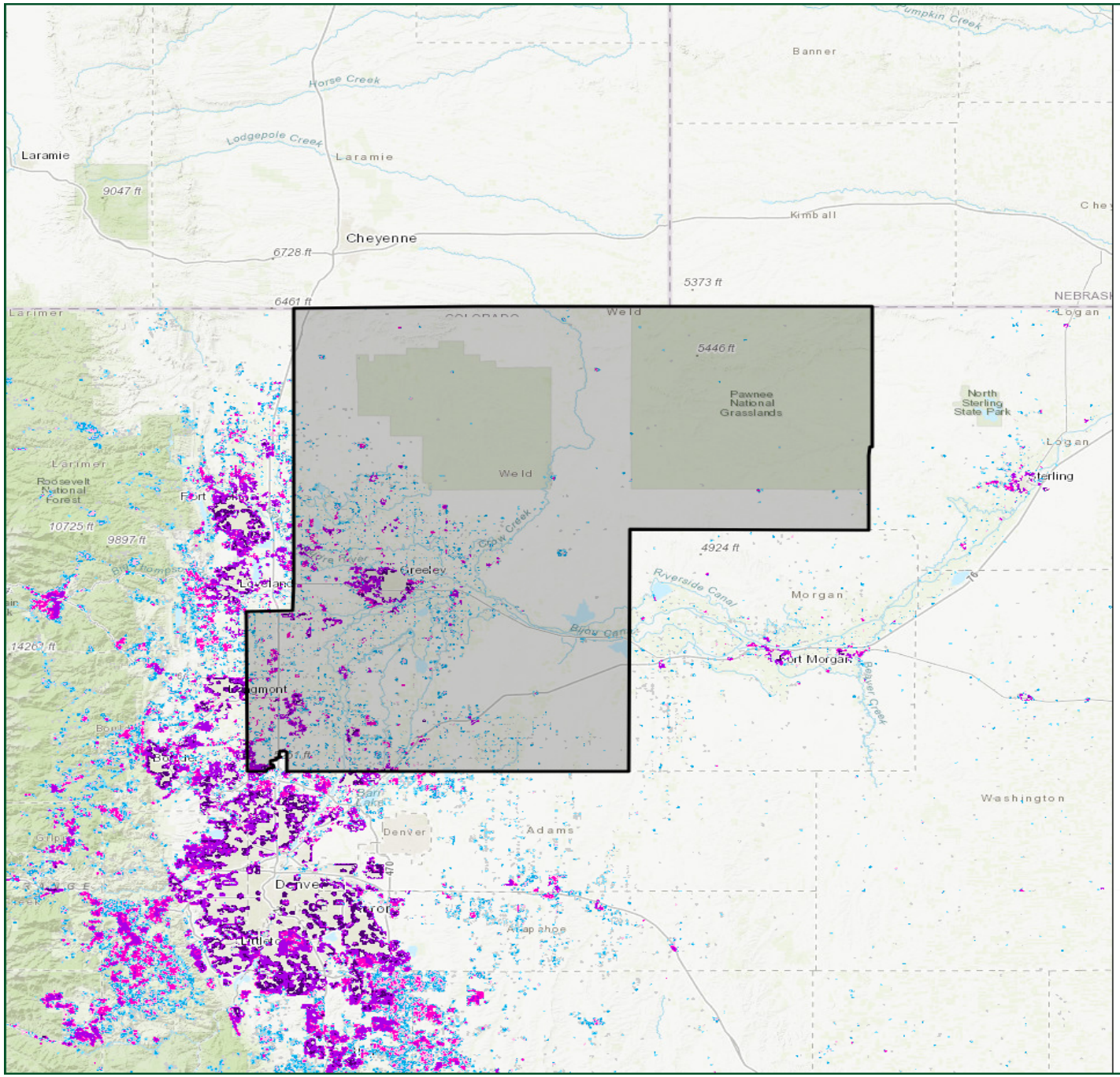
A more detailed description of the risk assessment algorithms is provided in the Colorado Wildfire Risk Assessment (Colorado WRA) Final Report, which can be downloaded from www.ColoradoForestAtlas.org.

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	1,568	0.9 %	36,099	24.6 %
1 house/40 ac to 1 house/20 ac	4,230	2.4 %	30,511	20.8 %
1 house/20 ac to 1 house/10 ac	7,172	4.1 %	25,016	17.0 %
1 house/10 ac to 1 house/5 ac	7,949	4.6 %	15,642	10.6 %
1 house/5 ac to 1 house/2 ac	12,303	7.0 %	13,836	9.4 %
1 house/2 ac to 3 houses/ac	87,152	49.9 %	21,974	14.9 %
More than 3 houses/ac	54,306	31.1 %	3,928	2.7 %
Total	**174,680**	**100.0 %**	**147,007**	**100.0 %**


Wildland Urban Interface
Weld HMP
Population
100k
90k
80k
70k
60k
50k
40k
30k
20k
10k
0
1 568
4 230
7 172
7 949
12 303
87 152
54 306
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


Weld HMP
Wildland Urban Interface
Acres
40k
35k
30k
25k
20k
15k
10k
5k
0
36 099
30 511
25 016
15 642
13 836
21 974
3 928
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



Weld HMP

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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Colorado Wildfire Risk Assessment
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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.

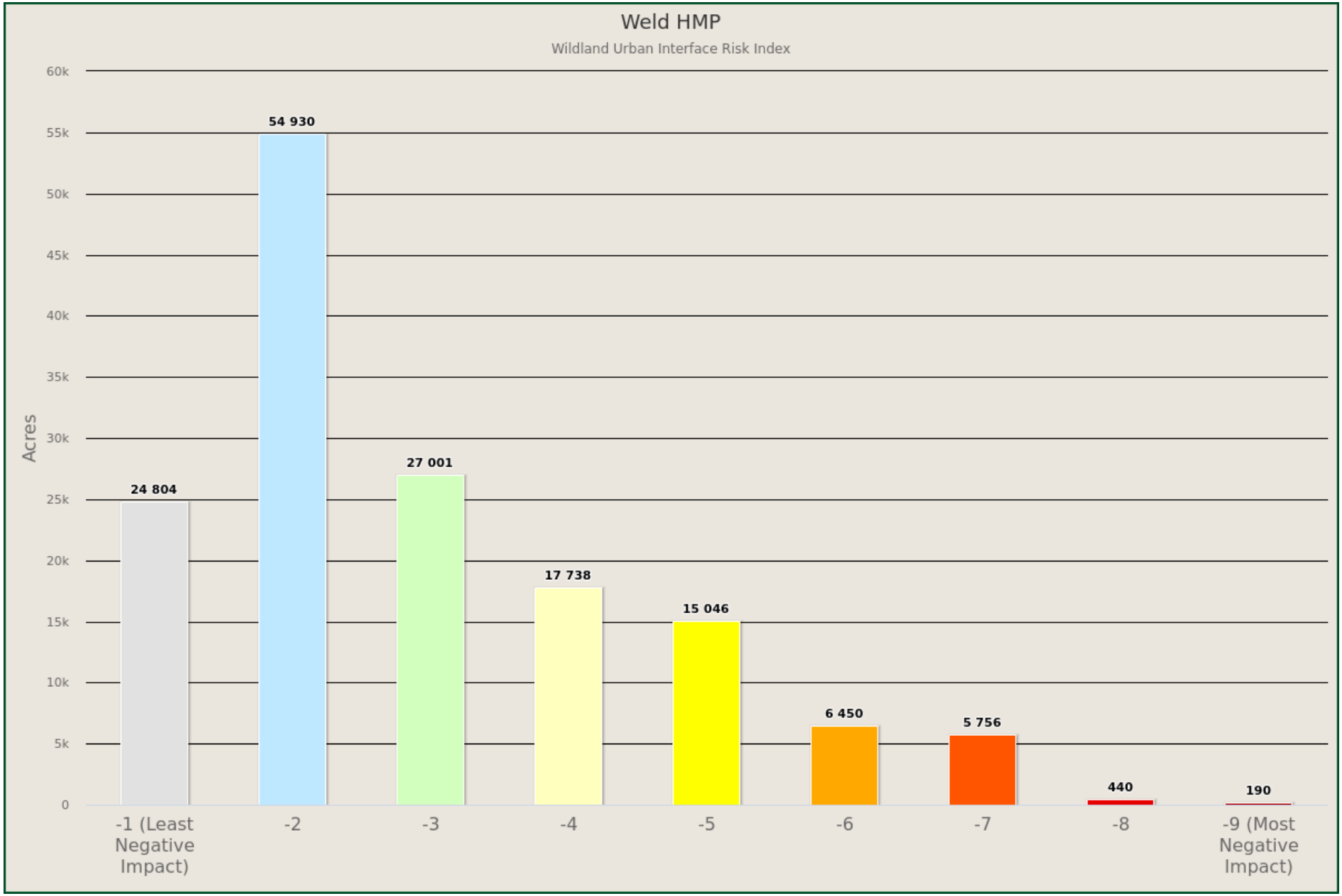
To calculate the WUI Risk Index, the WUI housing density data were combined with flame length data and response functions were defined to represent potential impacts. The response functions were defined by a team of experts led by Colorado State Forest

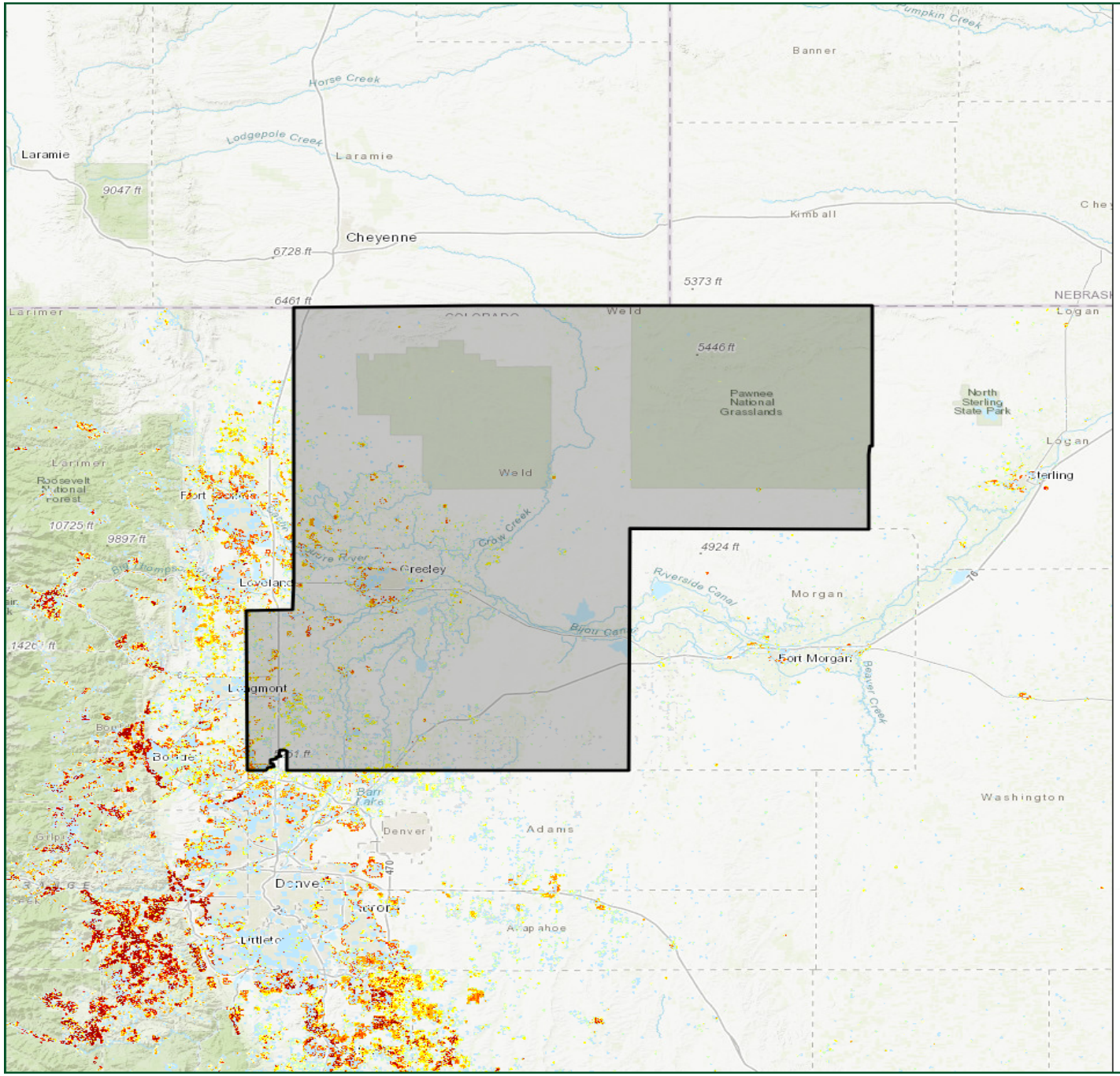
Service mitigation planning staff. By combining flame length with the WUI housing density data, it is possible to determine where the greatest potential impact to homes and people is likely to occur.

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)	24,804	16.3 %
-2	54,930	36.1 %
-3	27,001	17.7 %
-4	17,738	11.6 %
-5	15,046	9.9 %
-6	6,450	4.2 %
-7	5,756	3.8 %
-8	440	0.3 %
-9 (Most Negative Impact)	190	0.1 %
Total	**152,356**	**100 %**


Weld HMP
Wildland Urban Interface Risk Index
Acres
60k
55k
50k
45k
40k
35k
30k
25k
20k
15k
10k
5k
0
24 804
54 930
27 001
17 738
15 046
6 450
5 756
440
190
-1 (Least Negative Impact)
-2
-3
-4
-5
-6
-7
-8
-9 (Most Negative Impact)



Weld HMP

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:

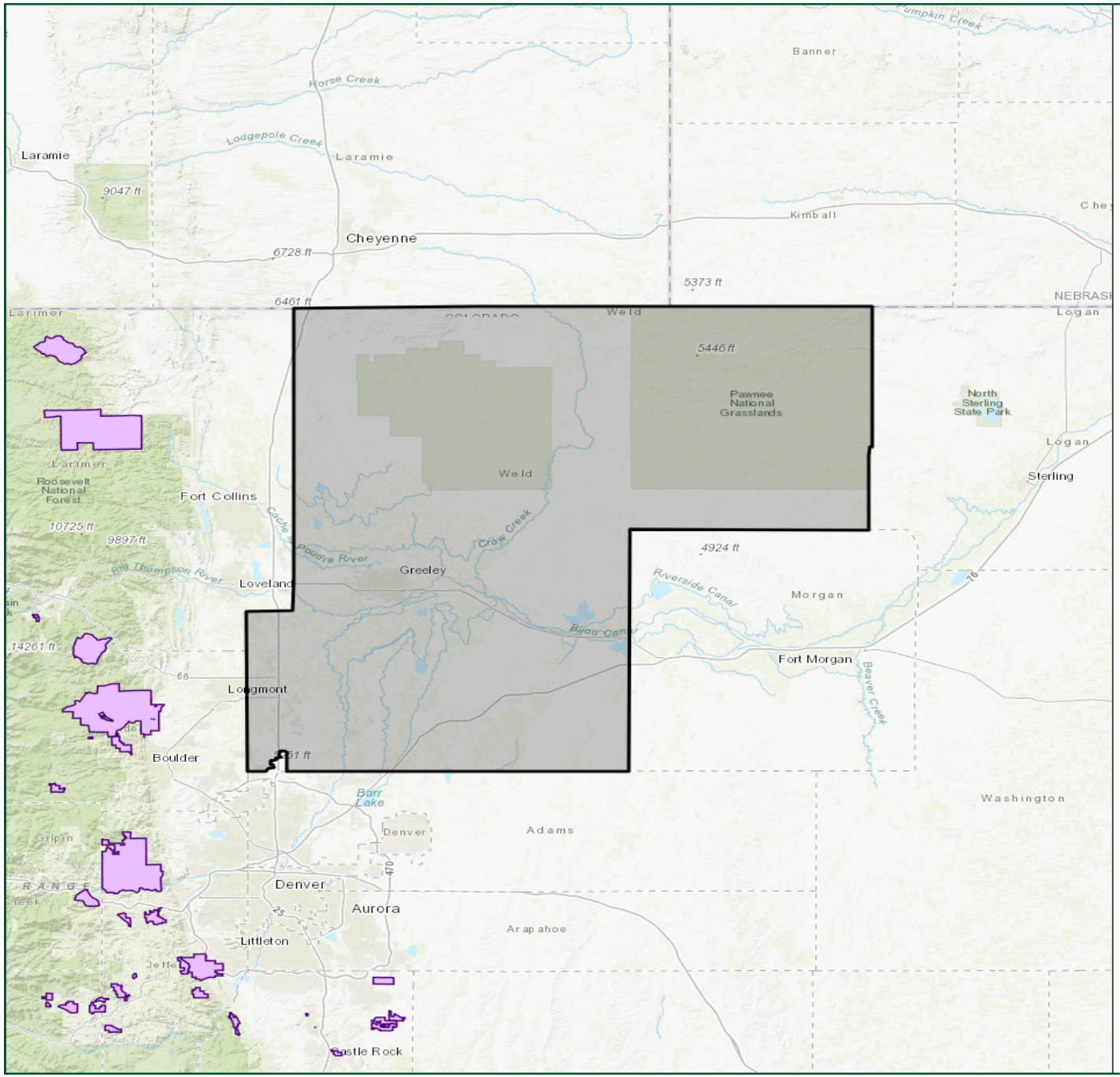
1. Form a Firewise board or committee
2. Obtain a wildfire risk assessment from the CSFS or local fire department, and create an action plan
3. Hold a Firewise event once per year
4. Invest a minimum of $24.14 per dwelling unit in local Firewise actions annually
5. Create a National Fire Prevention Association (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.



Weld HMP

Fire Wise Communities

Fire Wise Communities 2018

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Colorado Wildfire Risk Assessment
www.ColoradoForestAtlas.org

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

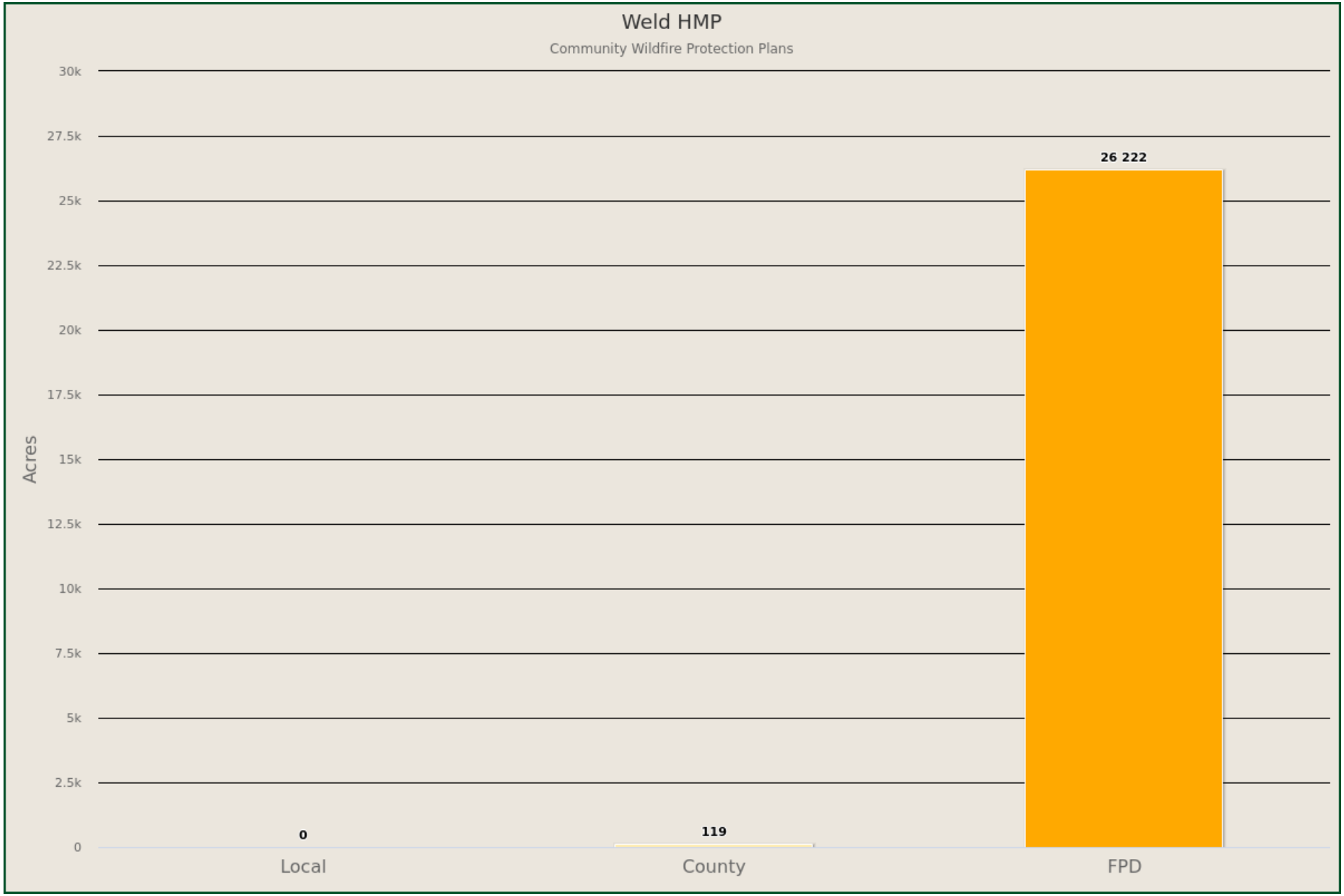
CWPPs are not shelf documents and should be reviewed, tracked and updated. A plan stays alive when it is periodically updated to address the accomplishments of the community. Community review of progress in meeting plan objectives and determining areas of new concern where actions must be taken to reduce wildfire risk helps the community stay current with changing environment and wildfire mitigation priorities.

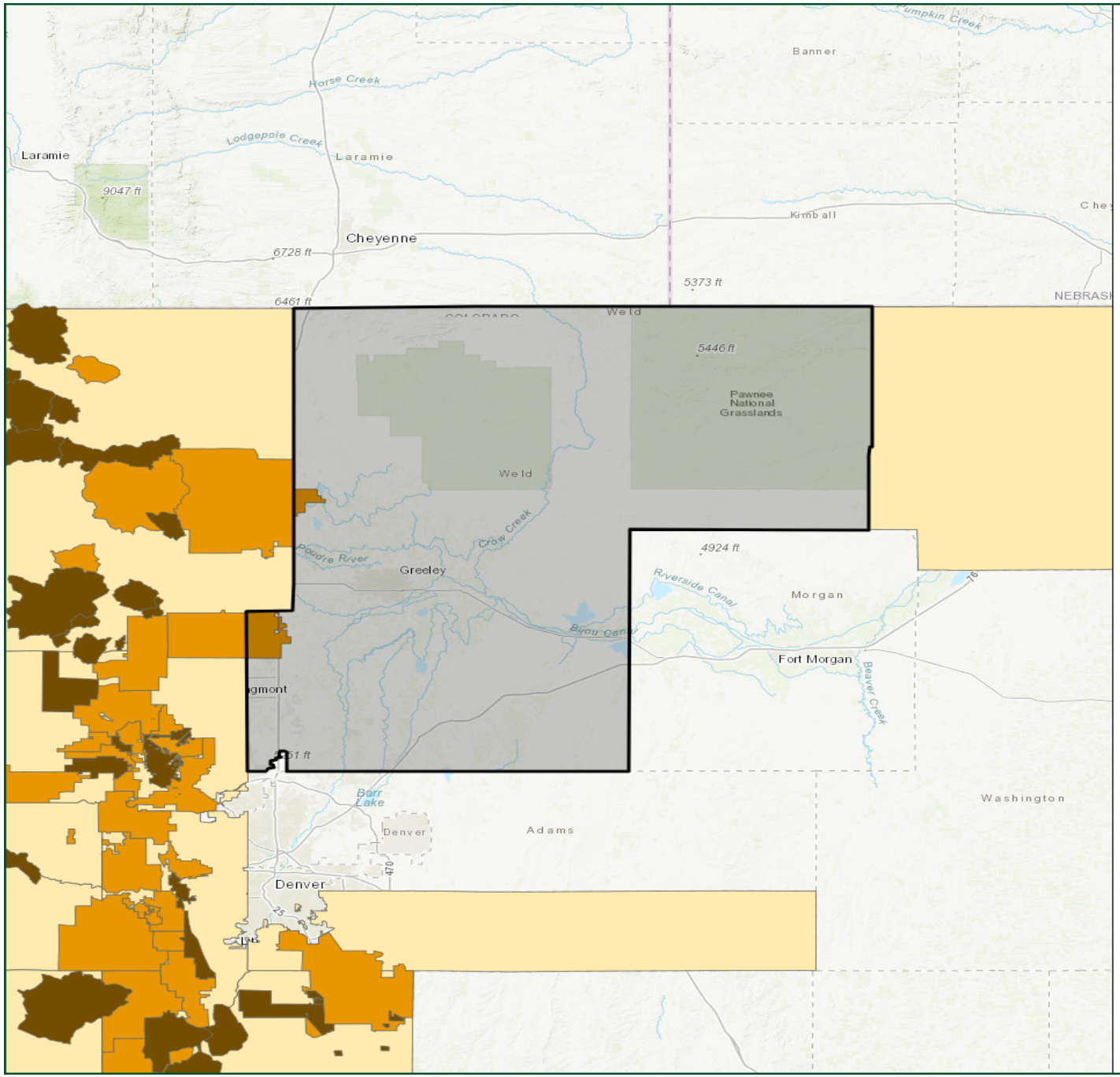
Community input is the foundation of a Community Wildfire Protection Plan that identfies community needs and garners community support.

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 Weld HMP test project area, there are 5 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
Larimer County	County	Fort Collins	51	1,684,188
Logan County	County	Fort Morgan	62	1,180,521
Boulder County CWPP	County	Boulder	6	473,517
Berthoud FPD	FPD	Fort Collins	20,540	63,105
Poudre Fire Authority	FPD	Fort Collins	5,682	150,739
Total Acres			**26,341**	**3,552,071**


Weld HMP
Community Wildfire Protection Plans
30k
27.5k
25k
22.5k
20k
17.5k
15k
12.5k
10k
7.5k
5k
2.5k
0
Acres
0
119
26 222
Local
County
FPD



Weld HMP

CWPP

- Community
- FPD
- County

20 mi

N

S

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Wildfire Risk

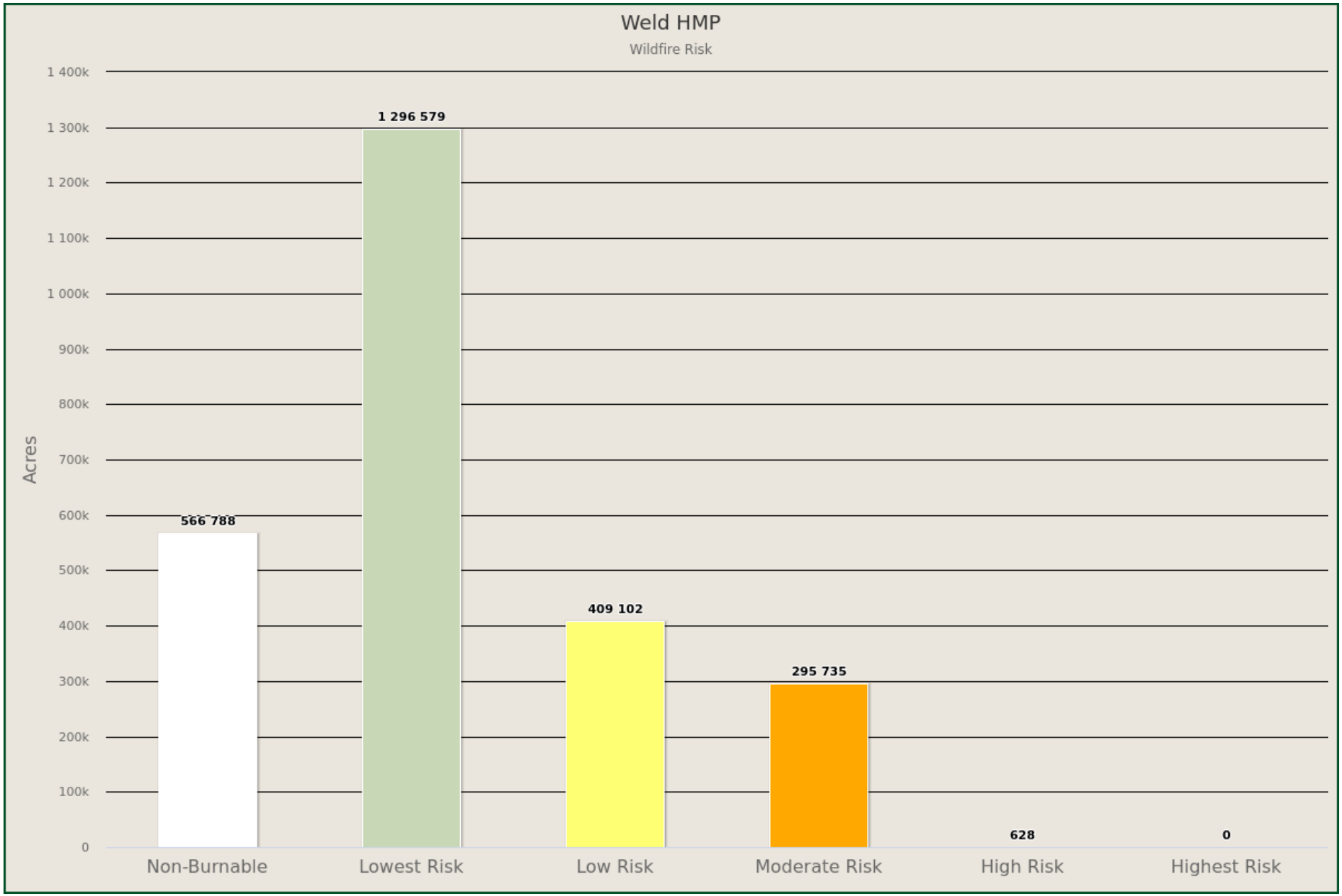
Description

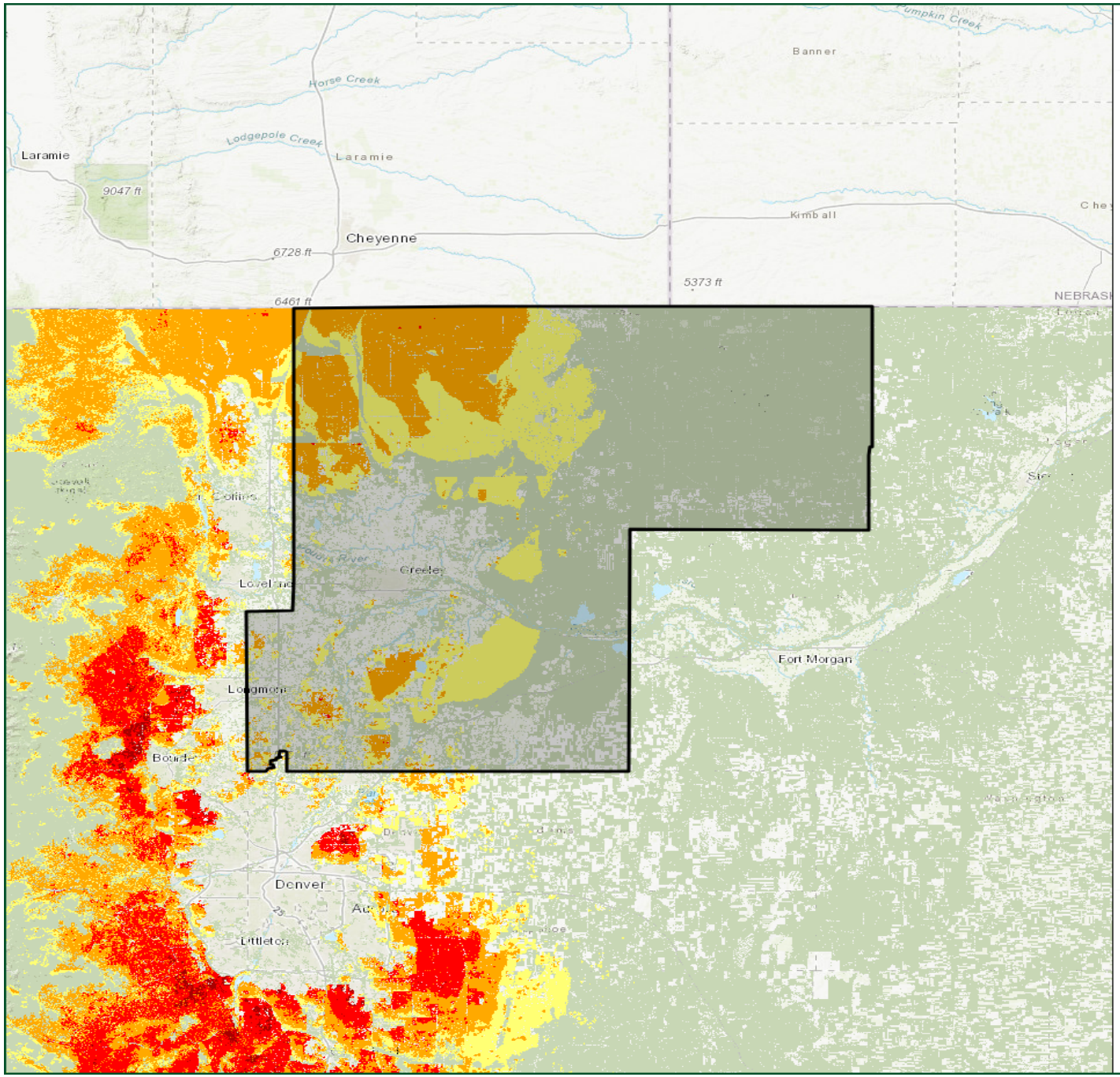
Wildfire Risk is a composite risk rating obtained by combining the probability of a fire occurring with the individual values at risk layers. Risk is defined as the possibility of loss or harm occurring from a wildfire. It identifies areas with the greatest potential impacts from a wildfire – i.e. those 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	566,788	22.1 %
	Lowest Risk	1,296,579	50.5 %
	Low Risk	409,102	15.9 %
	Moderate Risk	295,735	11.5 %
	High Risk	628	0.0 %
	Highest Risk	0	0 %
Total		**2,568,832**	**100 %**


Weld HMP
Wildfire Risk
Acres
1 400k
1 300k
1 200k
1 100k
1 000k
900k
800k
700k
600k
500k
400k
300k
200k
100k
0
566 788
1 296 579
409 102
295 735
628
0
Non-Burnable
Lowest Risk
Low Risk
Moderate Risk
High Risk
Highest Risk



Weld HMP

Wildfire Risk

- Non-Burnable
- Lowest Risk
- Low Risk
- Moderate Risk
- High Risk
- Highest Risk

20 mi

N

S

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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.

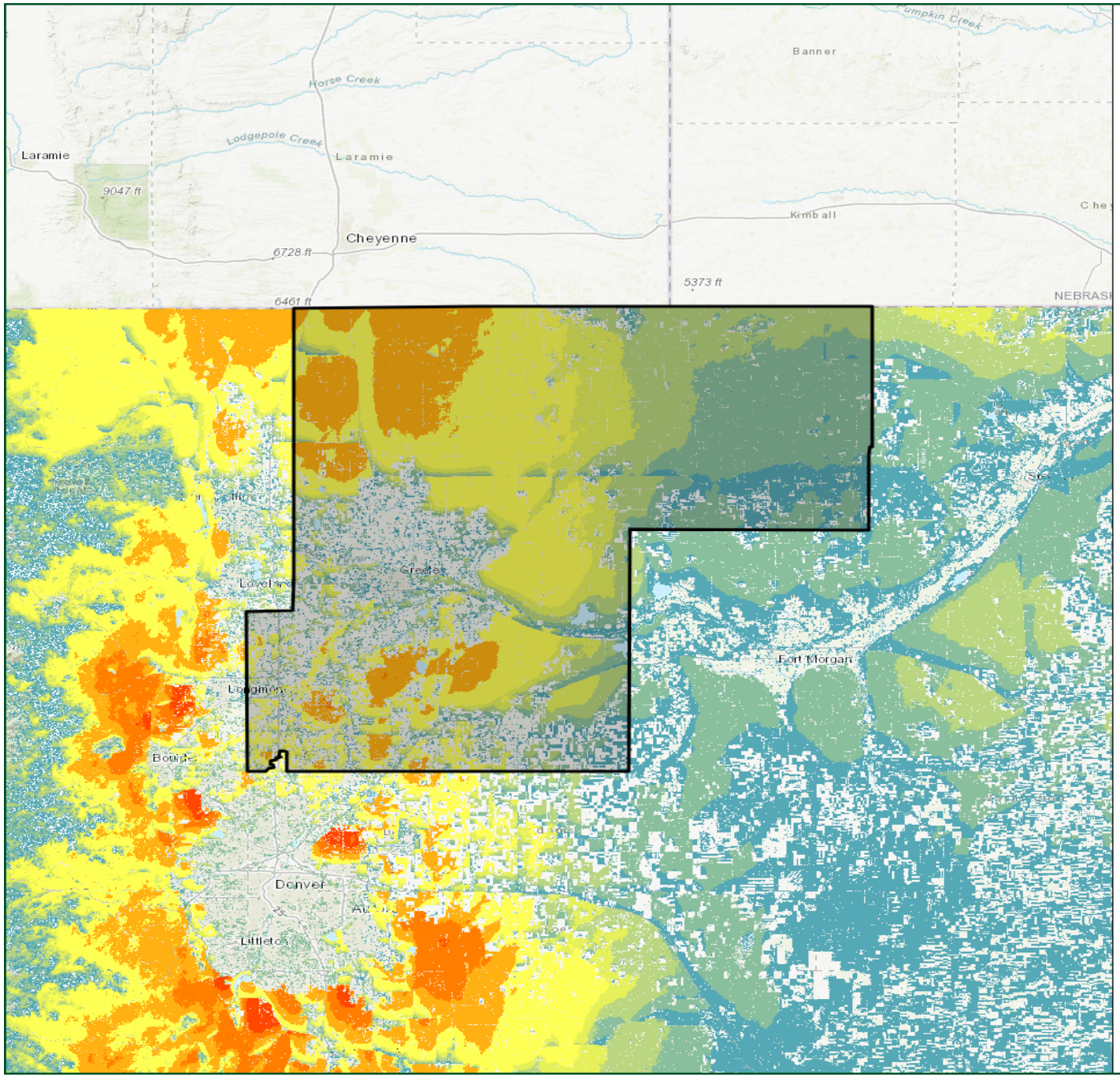
The probability map is derived at a 30-meter resolution. This scale of data was chosen to be consistent with the accuracy of the primary surface fuels dataset used in the assessment. While not appropriate for site specific analysis, it is appropriate for regional, county or local protection mitigation 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	1,949	0.1 %
Very Low	169,929	8.5 %
Very Low-Low	425,856	21.2 %
Low	337,235	16.8 %
Low-Moderate	233,392	11.6 %
Moderate	562,828	28.1 %
Moderate-High	273,235	13.6 %
High	859	0.0 %
High-Very High	0	0 %
Very High	0	0 %
Total	**2,005,283**	**100 %**


Weld HMP
Burn Probability
Acres
600k
550k
500k
450k
400k
350k
300k
250k
200k
150k
100k
50k
0
1 949
169 929
425 856
337 235
233 392
562 828
273 235
859
0
0
Non-Burnable
Very Low
Very Low-Low
Low
Low-Moderate
Moderate
Moderate-High
High
High-Very High
Very High



Weld HMP

Burn Probability

- Non-Burnable
- Very Low
- Very Low-Low
- Low
- Low-Moderate
- Moderate
- Moderate-High
- High
- High-Very High
- Very High

20 mi

N

S

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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.

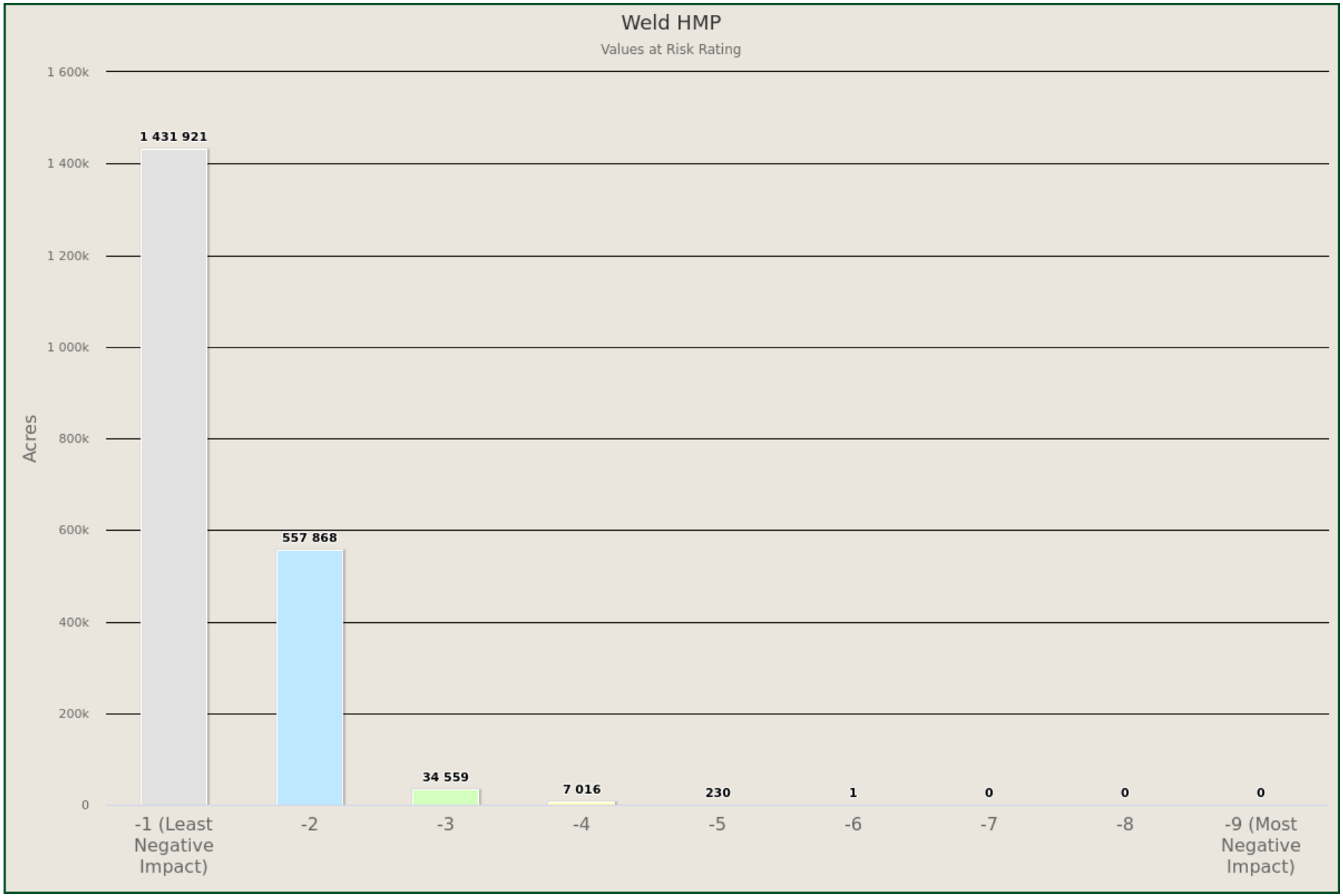
Response functions are a method of assigning a net change in the value to a resource or asset based on susceptibility to fire at different intensity levels. A resource or asset is any of the Fire Effects input layers, such as WUI, Forest Assets, etc. These net changes can be adverse (negative) or positive (beneficial).

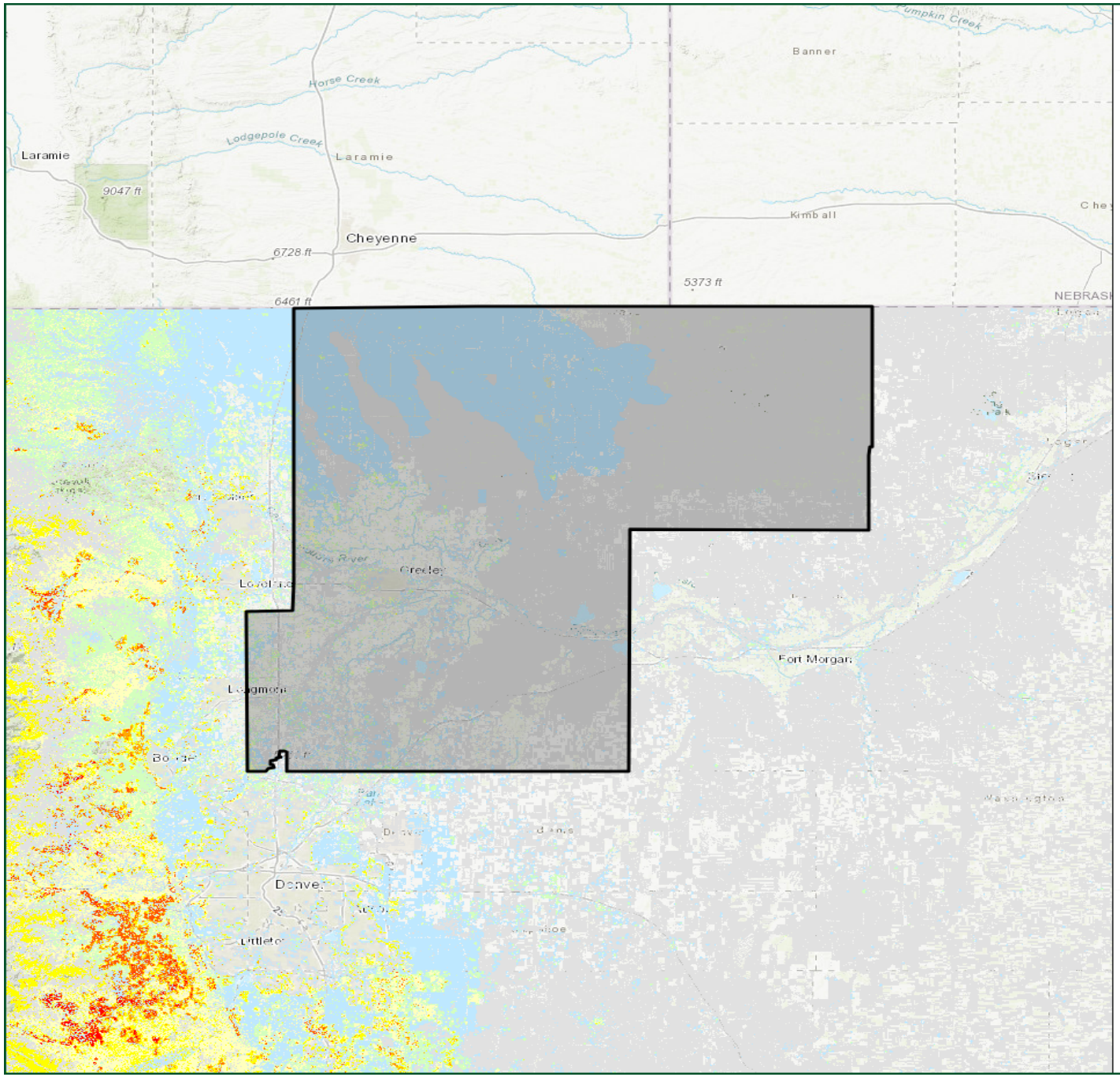
Calculating the Values at Risk Rating at a given location requires spatially defined estimates of the intensity of fire integrated with the identified resource value. This interaction is quantified through the use of response functions that estimate expected impacts to resources or assets at the specified 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)	1,431,921	70.5 %
-2	557,868	27.5 %
-3	34,559	1.7 %
-4	7,016	0.3 %
-5	230	0.0 %
-6	1	0.0 %
-7	0	0 %
-8	0	0 %
-9 (Most Negative Impact)	0	0 %
Total	**2,031,596**	**100 %**


Weld HMP
Values at Risk Rating
Acres
1 600k
1 400k
1 200k
1 000k
800k
600k
400k
200k
0
1 431 921
557 868
34 559
7 016
230
1
0
0
0
-1 (Least Negative Impact)
-2
-3
-4
-5
-6
-7
-8
-9 (Most Negative Impact)



Weld HMP

Values at Risk Rating

- Non-Categorized
- -1 (Least Negative Impact)
- -2
- -3
- -4
- -5
- -6
- -7
- -8
- -9 (Most Negative Impact)

20 mi

N

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Suppression Difficulty Rating

Description

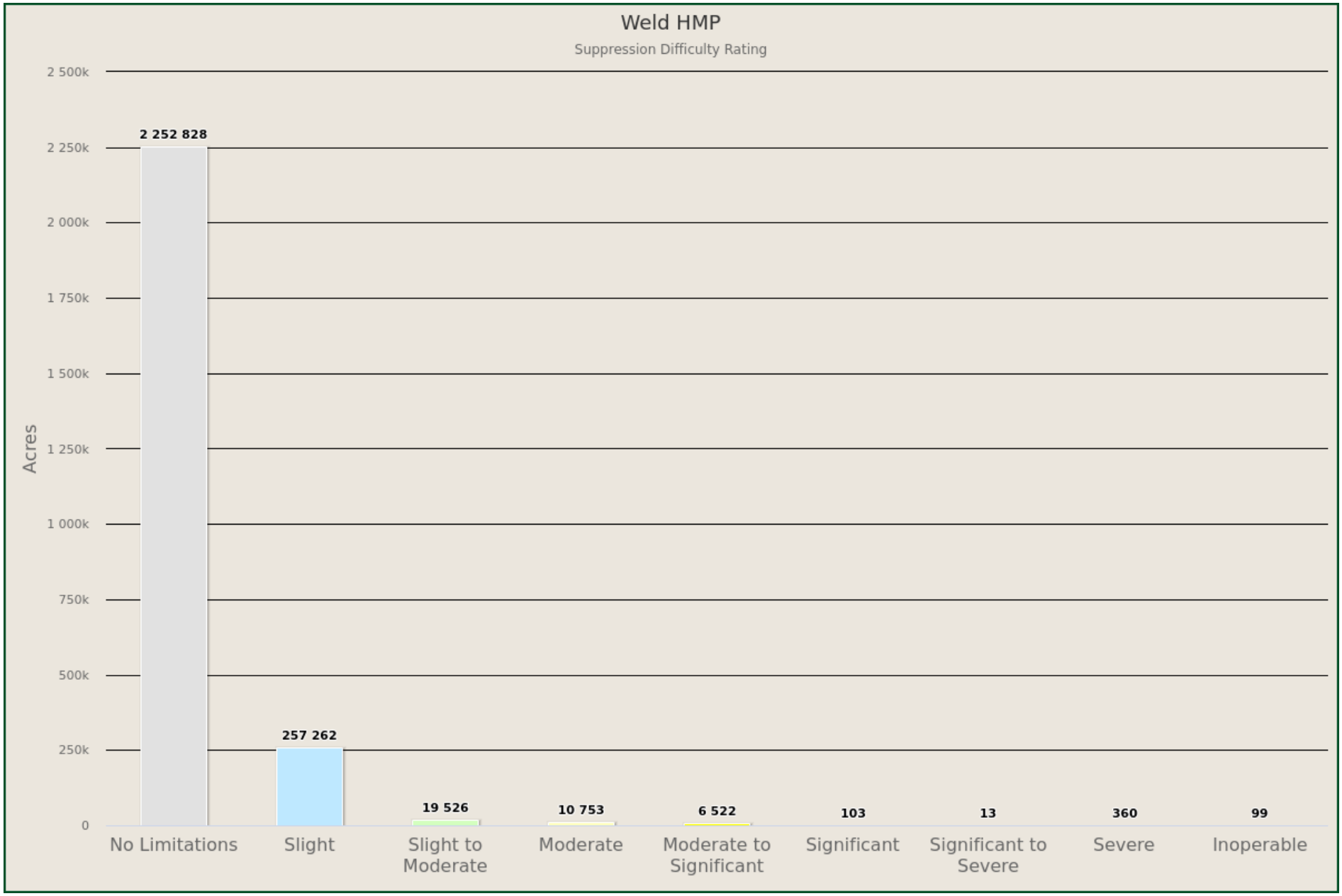
Reflects the difficulty or relative cost to suppress a fire given the terrain and vegetation conditions that may impact machine operability. This layer is an overall index that combines the slope steepness and the vegetation/fuel type characterization to identify areas where it would be difficult or costly to suppress a fire due to the underlying terrain and vegetation conditions that would impact machine operability (in particular Type II dozer).

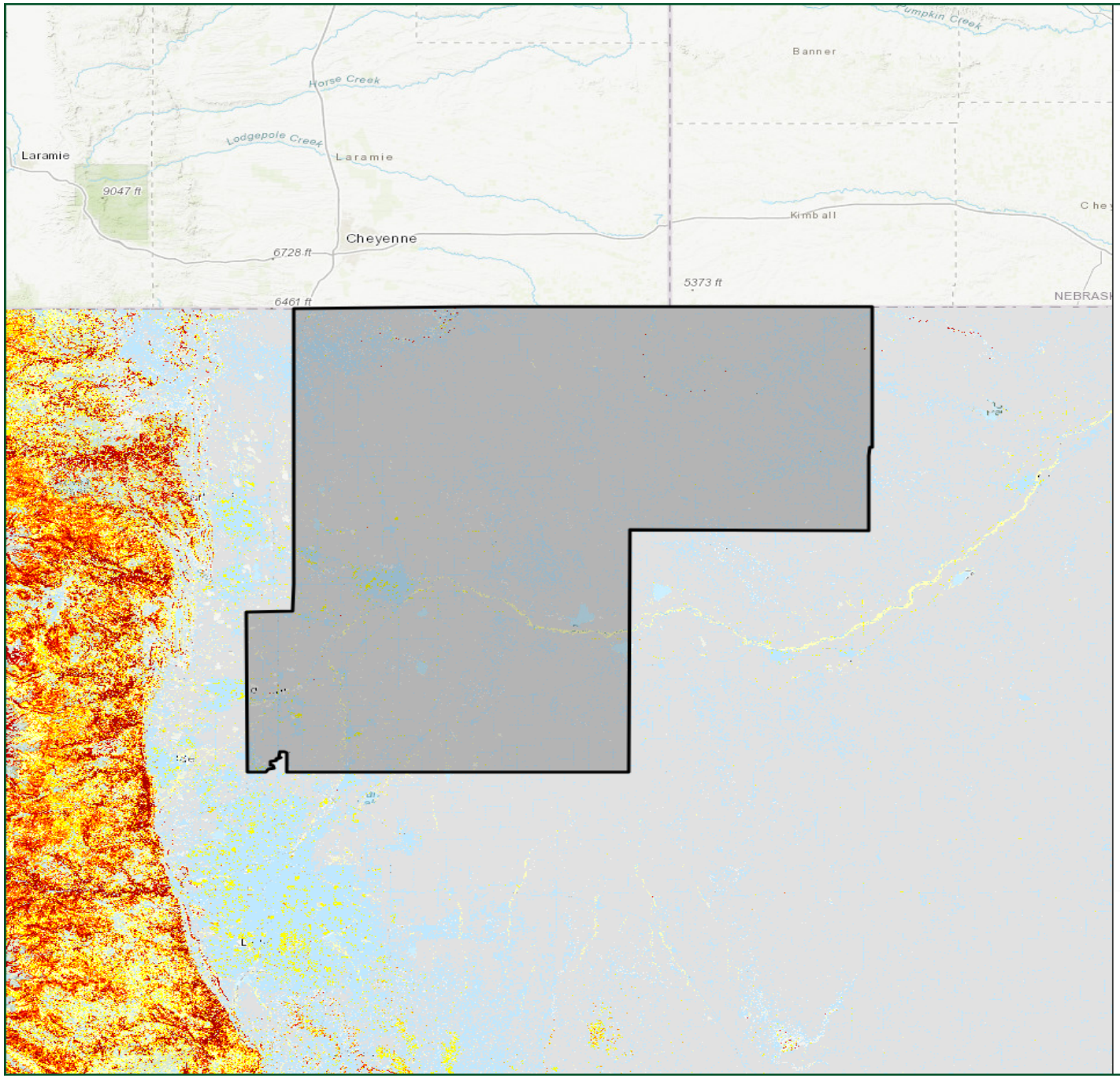
The rating was calculated based on the fireline production rates for hand crews and engines with modifications for slope, as documented in the NWCG Fireline Handbook 3, PMS 401-1.

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	2,252,828	88.4 %
Slight	257,262	10.1 %
Slight to Moderate	19,526	0.8 %
Moderate	10,753	0.4 %
Moderate to Significant	6,522	0.3 %
Significant	103	0.0 %
Significant to Severe	13	0.0 %
Severe	360	0.0 %
Inoperable	99	0.0 %
Total	**2,547,465**	**100 %**


Weld HMP
Suppression Difficulty Rating
Acres
2 500k
2 250k
2 000k
1 750k
1 500k
1 250k
1 000k
750k
500k
250k
0
2 252 828
257 262
19 526
10 753
6 522
103
13
360
99
No Limitations
Slight
Slight to Moderate
Moderate
Moderate to Significant
Significant
Significant to Severe
Severe
Inoperable



Weld HMP

Suppression Difficulty

- No Limitations
- Slight
- Slight to Moderate
- Moderate
- Moderate to Significant
- Significant
- Significant to Severe
- Severe
- Inoperable

20 mi

N

S

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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.

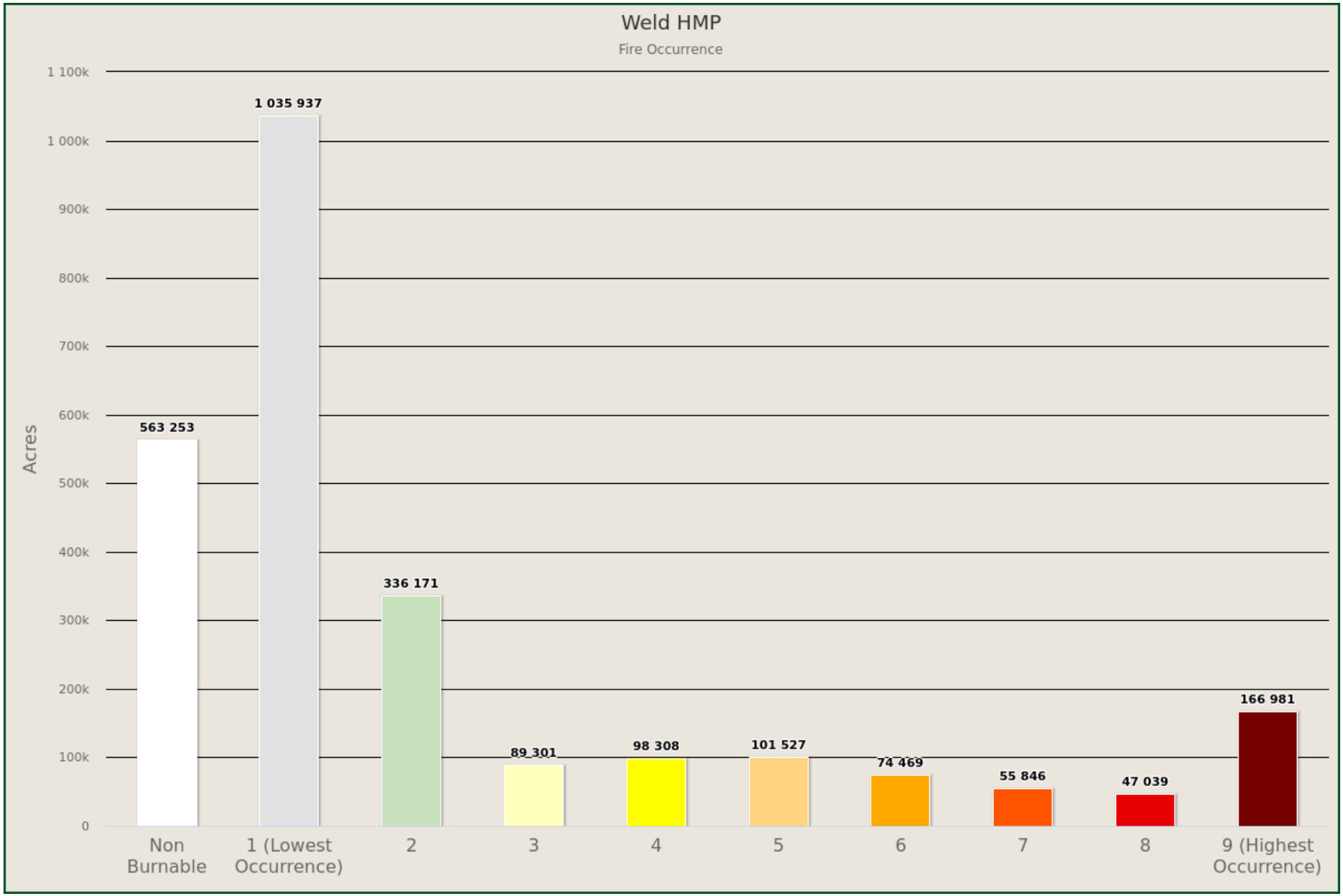
Historic fire report data were used to create the ignition points for all Colorado fires. This included both federal and non-federal fire ignition locations.

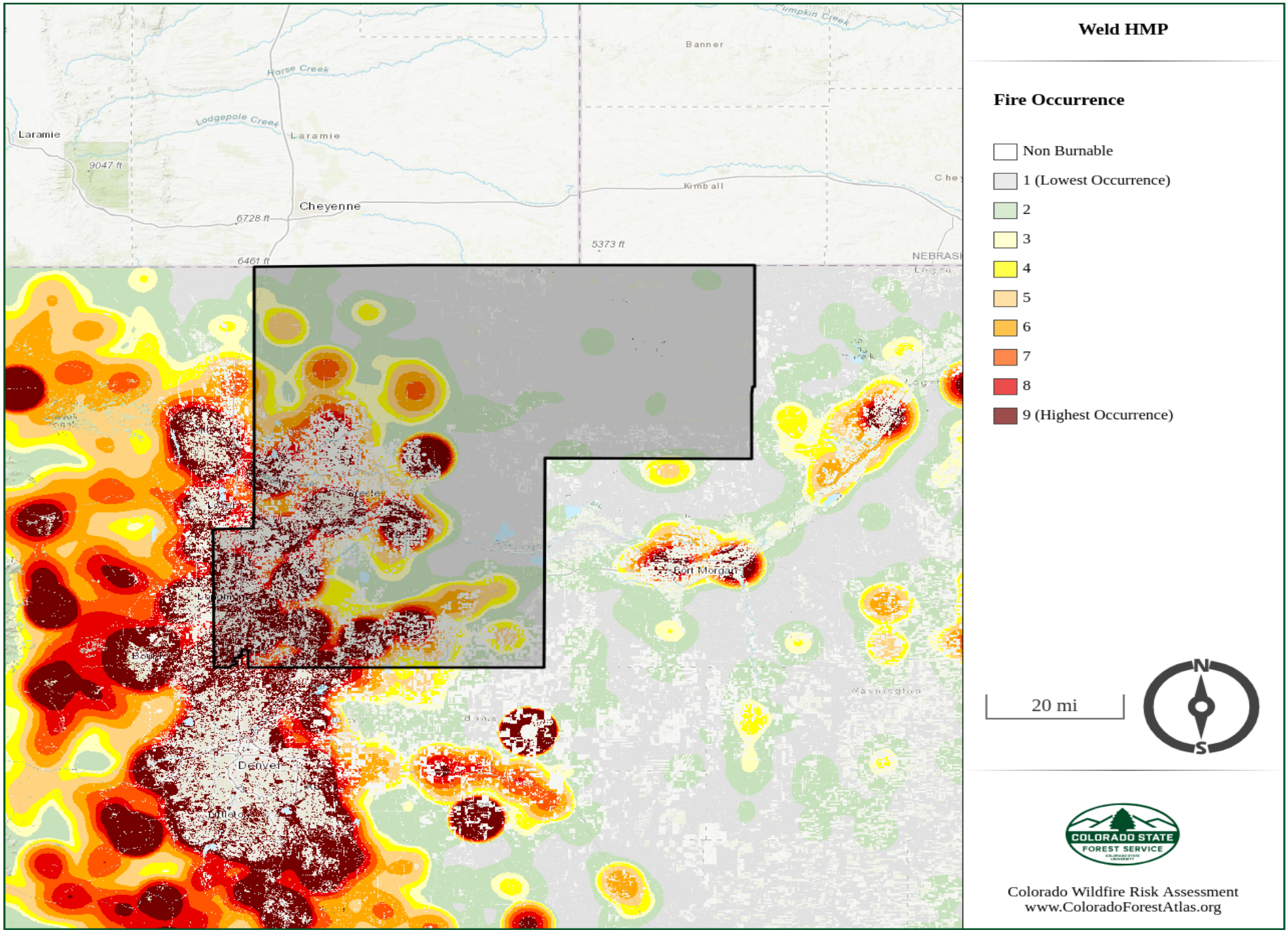
The class breaks are determined by analyzing the Fire Occurrence output values for the entire state and determining cumulative percent of acres (i.e. Class 9 has the top 1.5% of acres with the highest occurrence rate). Refer to the Colorado WRA Final Report for a more detailed description of the mapping 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	563,253	21.9 %
1 (Lowest Occurrence)	1,035,937	40.3 %
2	336,171	13.1 %
3	89,301	3.5 %
4	98,308	3.8 %
5	101,527	4.0 %
6	74,469	2.9 %
7	55,846	2.2 %
8	47,039	1.8 %
9 (Highest Occurrence)	166,981	6.5 %
Total	**2,568,832**	**100 %**


Weld HMP
Fire Occurrence
Acres
1 100k
1 000k
900k
800k
700k
600k
500k
400k
300k
200k
100k
0
563 253
1 035 937
336 171
89 301
98 308
101 527
74 469
55 846
47 039
166 981
Non Burnable
1 (Lowest Occurrence)
2
3
4
5
6
7
8
9 (Highest Occurrence)


Weld HMP
Fire Occurrence
Non Burnable
1 (Lowest Occurrence)
2
3
4
5
6
7
8
9 (Highest Occurrence)
20 mi
N
S
Laramie
Cheyenne
Banner
Kimball
Fort Morgan
Denver
Horse Creek
Lodgepole Creek
Pumpkin Creek
9047 ft
6728 ft
6461 ft
5373 ft
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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.

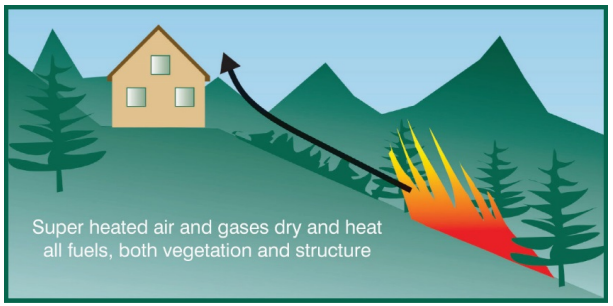
FIRE BEHAVIOR CHARACTERISTICS

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

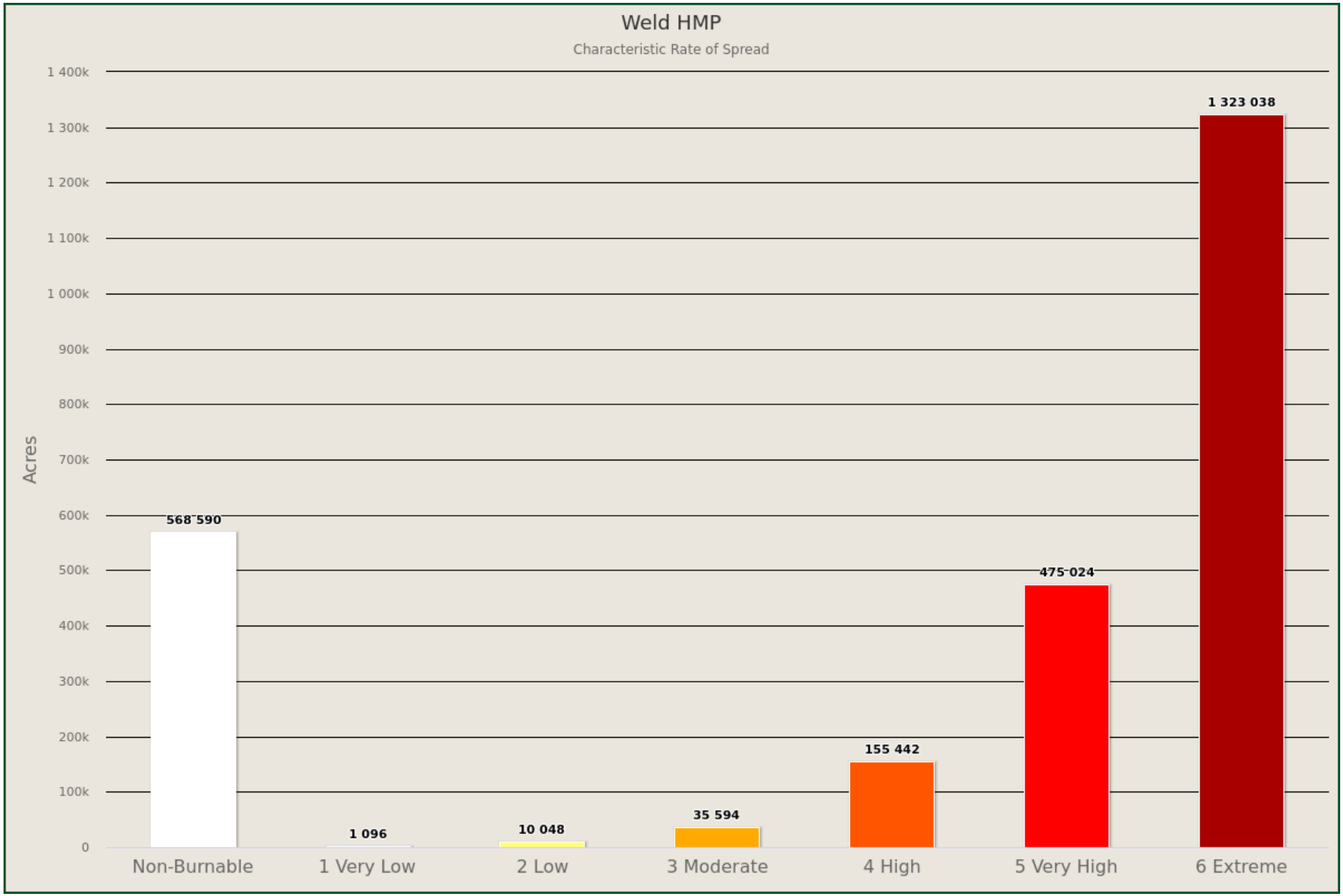
Characteristic Rate of Spread is the typical or representative rate of spread of a potential fire based on a weighted average of four percentile weather categories. Rate of spread is the speed with which a fire moves in a horizontal direction across the landscape, usually expressed in chains per hour (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.

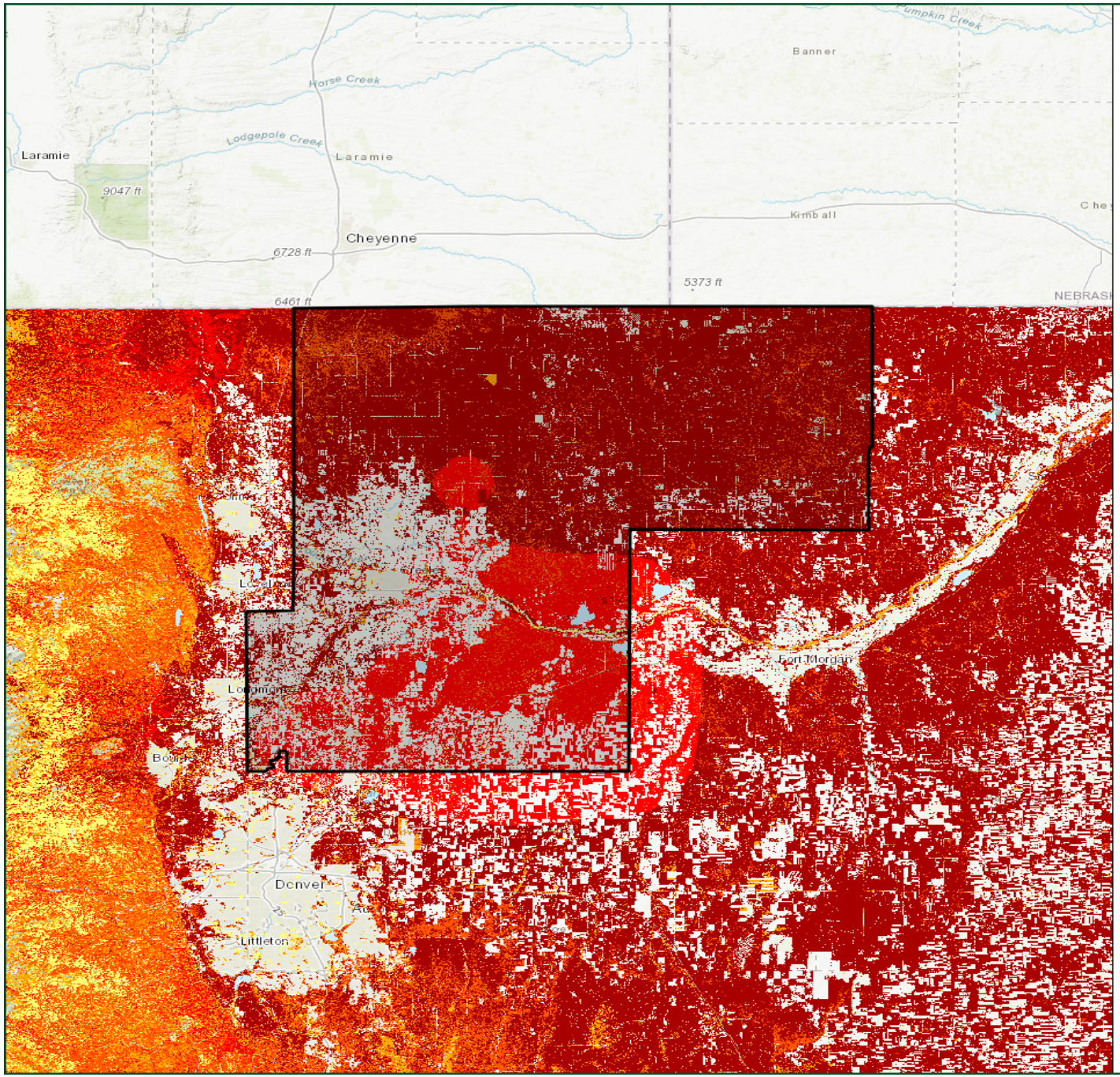


Rate of spread is a fire behavior output, which is influenced by three environmental factors - fuels, weather, and topography. Weather is by far the most dynamic variable as it changes frequently. To account for this variability, four percentile weather categories were created from historical weather 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	568,590	22.1 %
1 Very Low	1,096	0.0 %
2 Low	10,048	0.4 %
3 Moderate	35,594	1.4 %
4 High	155,442	6.1 %
5 Very High	475,024	18.5 %
6 Extreme	1,323,038	51.5 %
Total	**2,568,832**	**100 %**


Weld HMP
Characteristic Rate of Spread
Acres
1 400k
1 300k
1 200k
1 100k
1 000k
900k
800k
700k
600k
500k
400k
300k
200k
100k
0
568 590
1 096
10 048
35 594
155 442
475 024
1 323 038
Non-Burnable
1 Very Low
2 Low
3 Moderate
4 High
5 Very High
6 Extreme



Weld HMP

Characteristic Rate of Spread

- 1 Very Low
- 2 Low
- 3 Moderate
- 4 High
- 5 Very High
- 6 Extreme

20 mi

N

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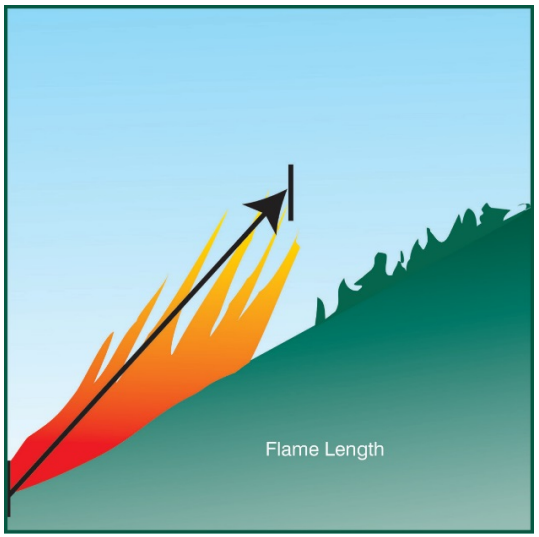
Characteristic Flame Length

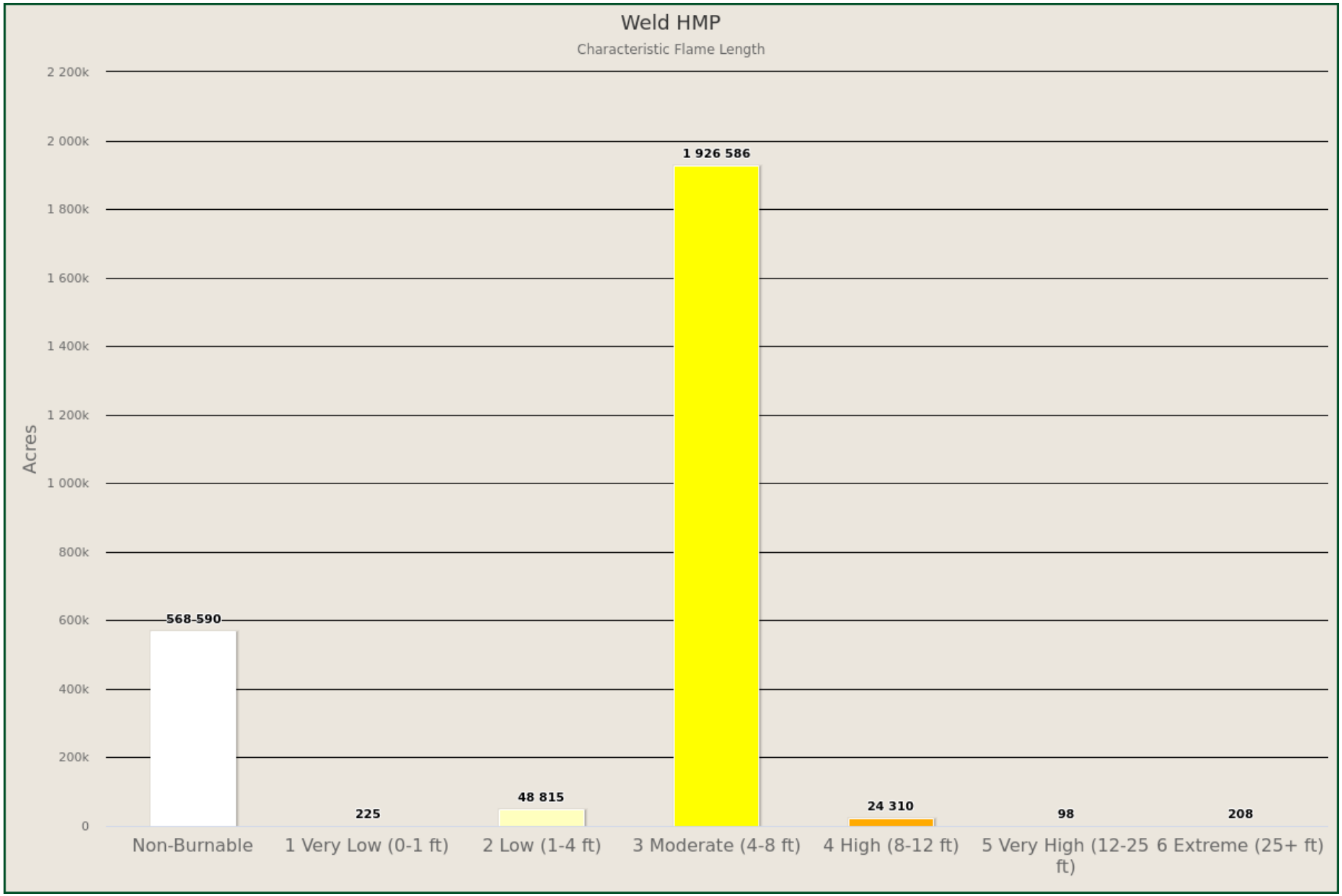
Characteristic Flame Length is the typical or representative flame length of a potential fire based on a weighted average of four percentile weather categories. Flame Length is defined as the distance between the flame tip and the midpoint of the flame depth at the base of the flame, which is generally 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.

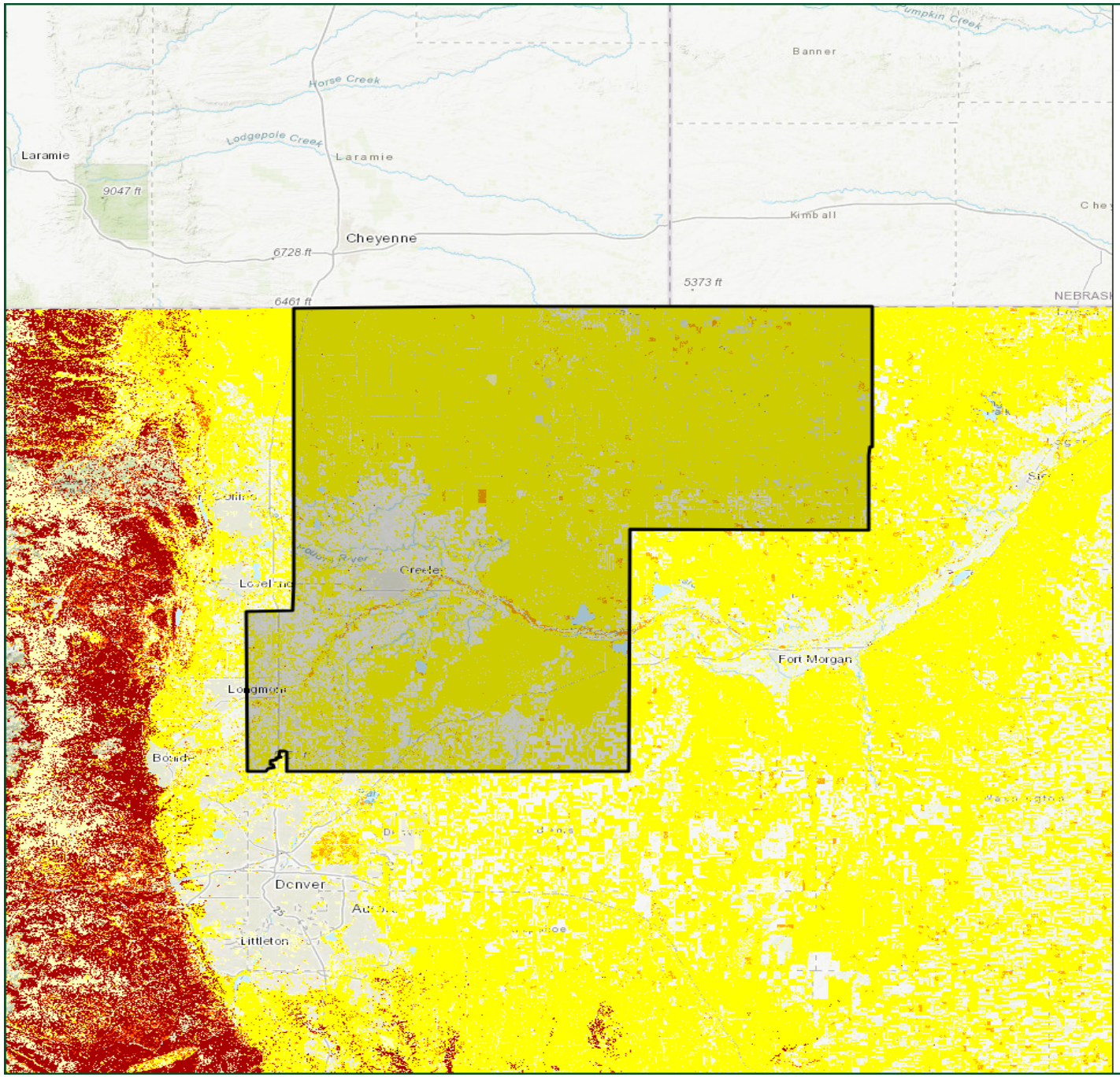


Flame length is a fire behavior output, which is influenced by three environmental factors - fuels, weather, and topography. Weather is by far the most dynamic variable as it changes frequently. To account for this variability, four percentile weather categories were created from historical weather observations 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	568,590	22.1 %
1 Very Low (0-1 ft)	225	0.0 %
2 Low (1-4 ft)	48,815	1.9 %
3 Moderate (4-8 ft)	1,926,586	75.0 %
4 High (8-12 ft)	24,310	0.9 %
5 Very High (12-25 ft)	98	0.0 %
6 Extreme (25+ ft)	208	0.0 %
Total	**2,568,832**	**100 %**


Weld HMP
Characteristic Flame Length
Acres
2 200k
2 000k
1 800k
1 600k
1 400k
1 200k
1 000k
800k
600k
400k
200k
0
568-590
225
48 815
1 926 586
24 310
98
208
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)



Weld HMP

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)

20 mi

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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.

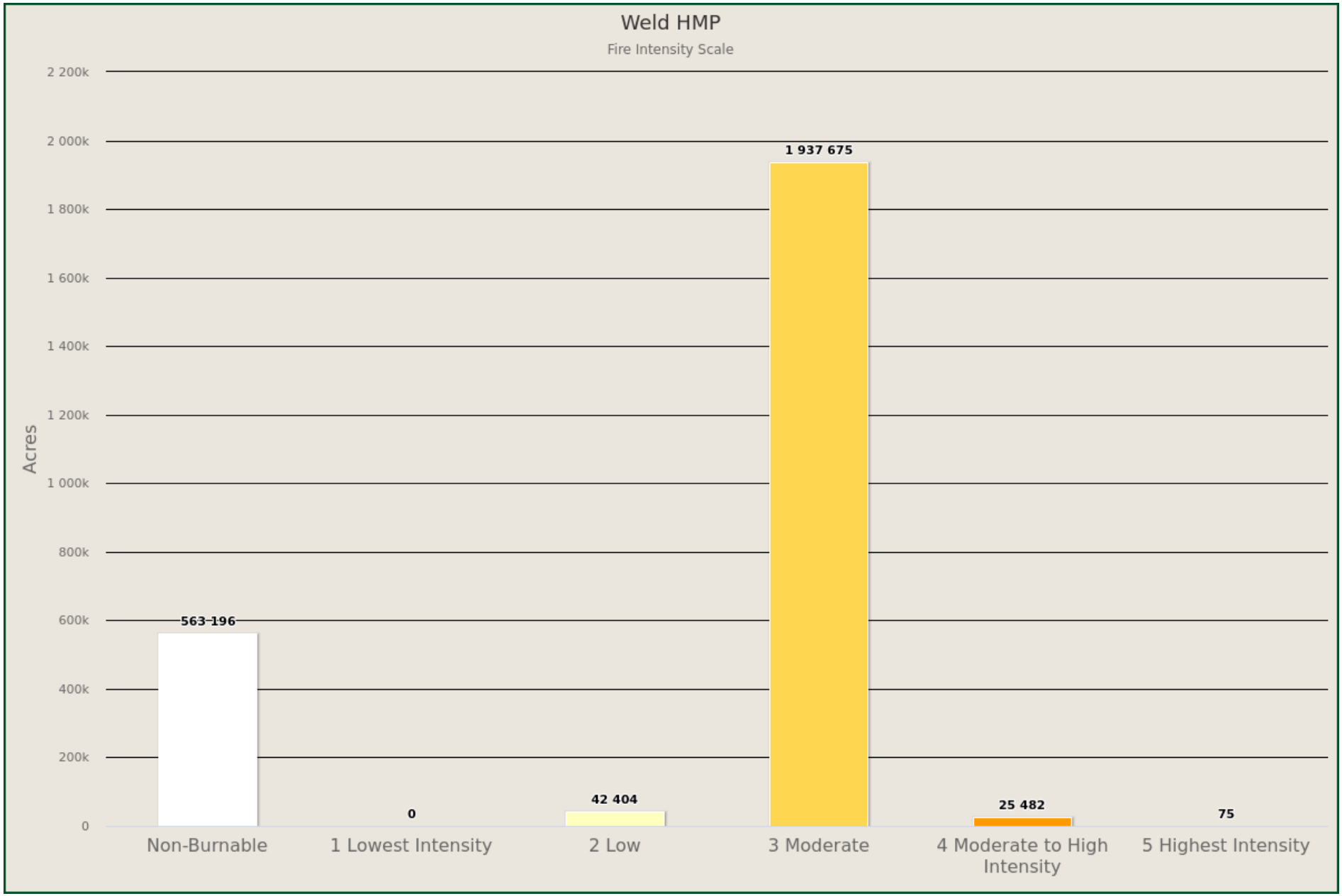
Since all areas in Colorado have fire intensity scale calculated consistently, it allows for comparison and ordination of areas across the entire state. For example, a high fire intensity area in Eastern Colorado is equivalent to a high fire intensity area in Western Colorado.

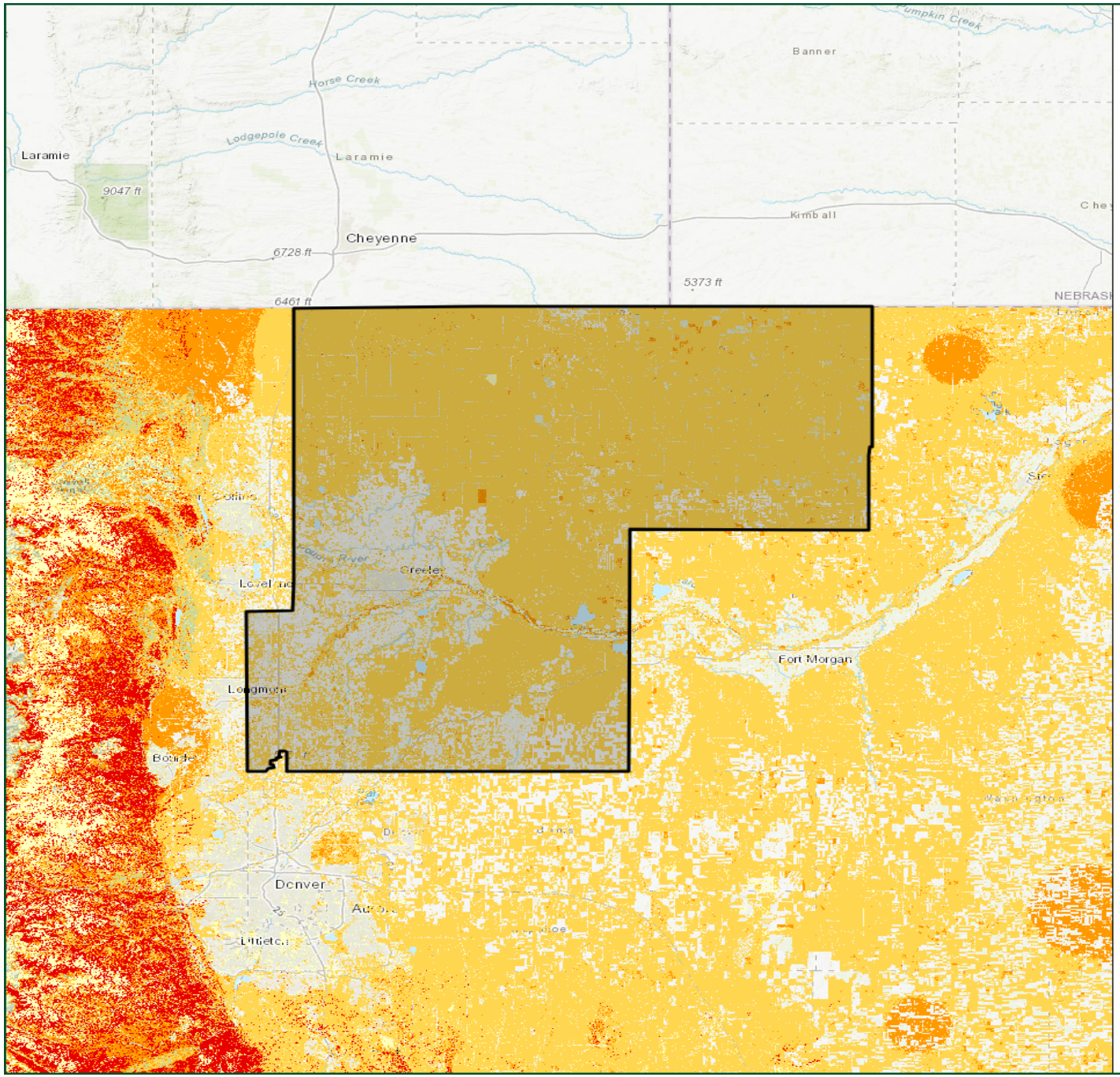
Fire intensity scale is a fire behavior output, which is influenced by three environmental factors - fuels, weather, and topography. Weather is by far the most dynamic variable as it changes frequently.

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	563,196	21.9 %
1 Lowest Intensity	0	0.0 %
2 Low	42,404	1.7 %
3 Moderate	1,937,675	75.4 %
4 Moderate to High Intensity	25,482	1.0 %
5 Highest Intensity	75	0.0 %
Total	**2,568,832**	**100 %**


Weld HMP
Fire Intensity Scale
Acres
2 200k
2 000k
1 800k
1 600k
1 400k
1 200k
1 000k
800k
600k
400k
200k
0
563 196
0
42 404
1 937 675
25 482
75
Non-Burnable
1 Lowest Intensity
2 Low
3 Moderate
4 Moderate to High Intensity
5 Highest Intensity



Weld HMP

Fire Intensity Scale

- Non-Burnable
- 1 Lowest Intensity
- 2 Low
- 3 Moderate
- 4 Moderate to High Intensity
- 5 Highest Intensity

20 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

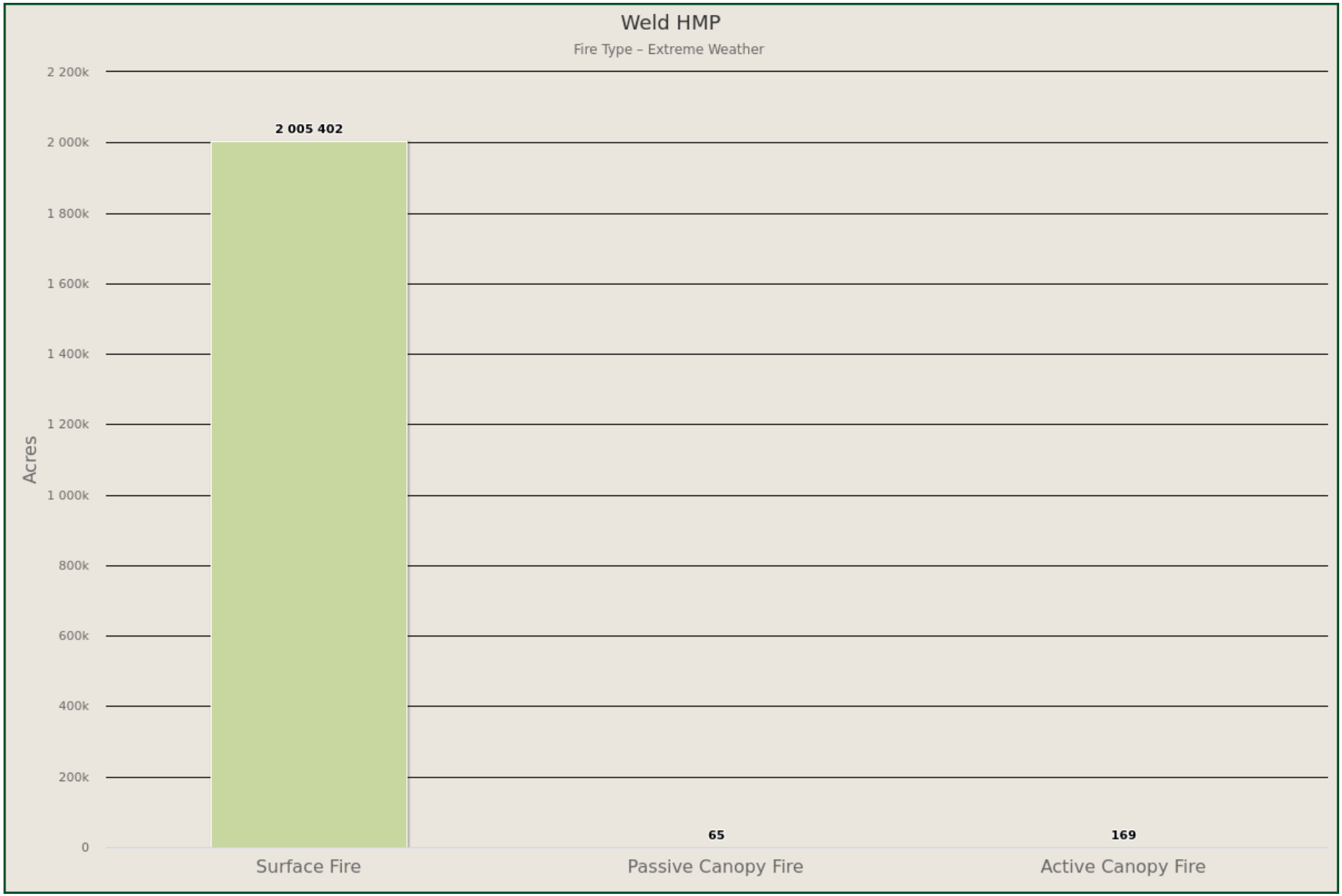
A type of crown fire in which the crowns of individual trees or small groups of trees burn, but solid flaming in the canopy cannot be maintained except for short periods (Scott & Reinhardt, 2001).

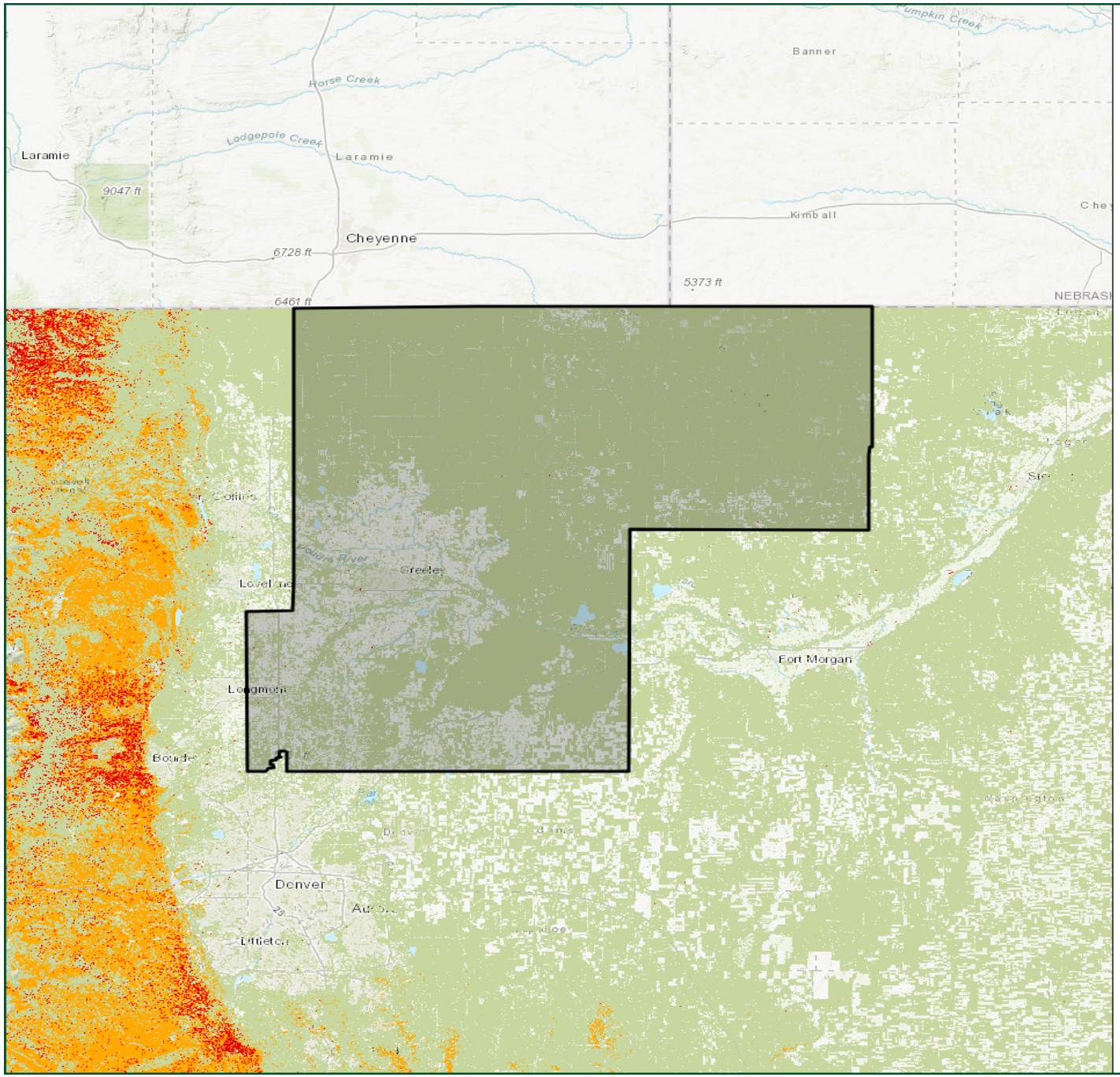
Active Canopy Fire

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	2,005,402	100.0 %
Passive Canopy Fire	65	0.0 %
Active Canopy Fire	169	0.0 %
Total	**2,005,636**	**100 %**


Weld HMP
Fire Type – Extreme Weather
Acres
2 200k
2 000k
1 800k
1 600k
1 400k
1 200k
1 000k
800k
600k
400k
200k
0
2 005 402
65
169
Surface Fire
Passive Canopy Fire
Active Canopy Fire



Weld HMP

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.

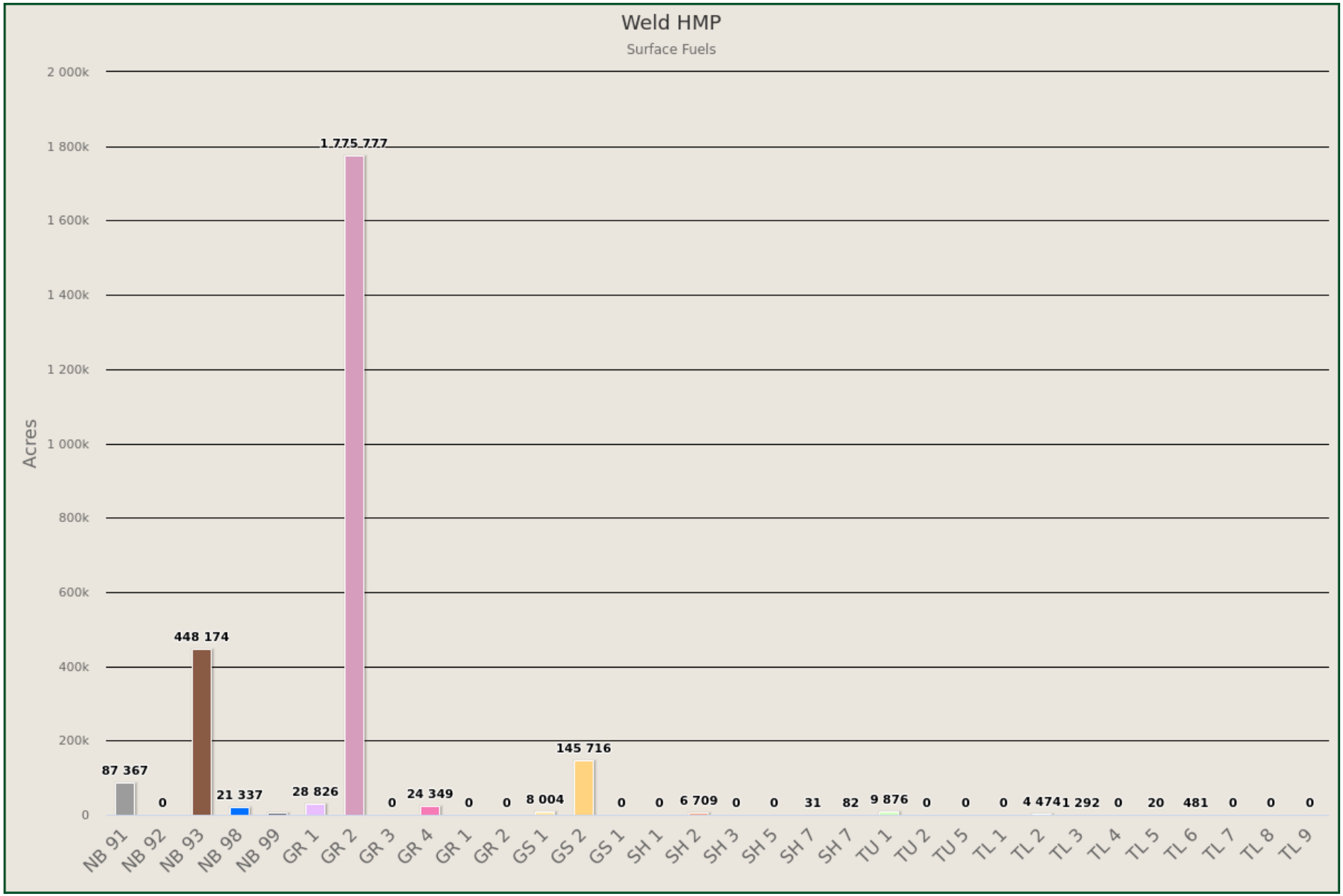
Unmanaged forest with dead and downed trees and branches

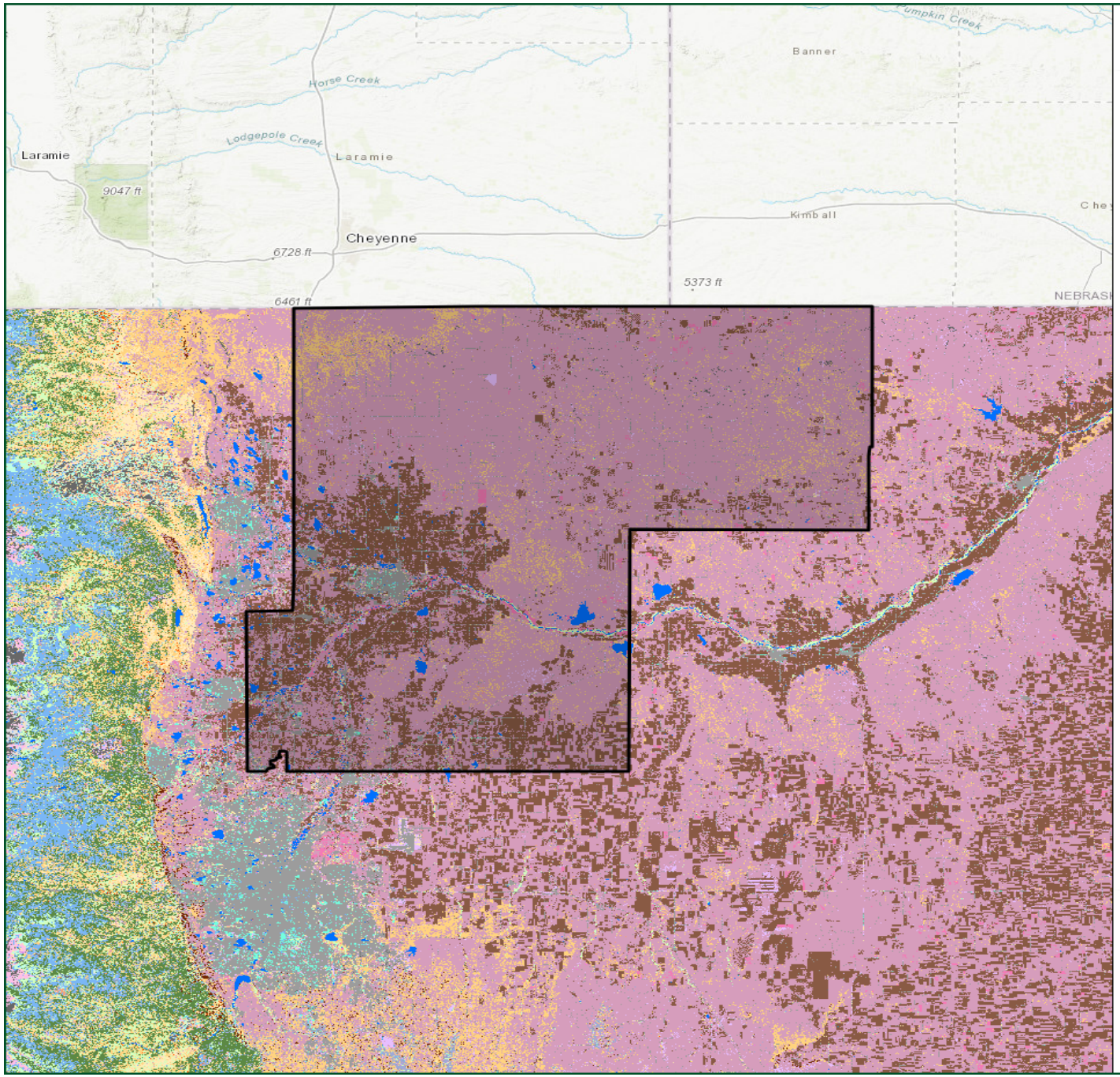
Slash on the ground indicates that forest management treatments have occurred in this area

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	87,367	3.4 %
NB 92	Snow/Ice	0	0 %
NB 93	Agriculture	448,174	17.4 %
NB 98	Water	21,337	0.8 %
NB 99	Barren	6,187	0.2 %
GR 1	Short, sparse, dry climate grass	28,826	1.1 %
GR 2	Low load, dry climate grass	1,775,777	69.1 %
GR 3	Low load, very coarse, humid climate grass	0	0 %
GR 4	Moderate load, dry climate grass	24,349	0.9 %
GR 1	GT 10,000 ft elevation	0	0 %
GR 2	GT 10,000 ft elevation	0	0 %
GS 1	Low load, dry climate grass-shrub	8,004	0.3 %
GS 2	Moderate load, dry climate grass-shrub	145,716	5.7 %
GS 1	GT 10,000 ft elevation	0	0 %
SH 1	Low load, dry climate shrub	0	0.0 %
SH 2	Moderate load, dry climate shrub	6,709	0.3 %
SH 3	Moderate load, humid climate shrub	0	0 %
SH 5	High load, humid climate shrub	0	0 %
SH 7	Very high load, dry climate shrub	31	0.0 %
SH 7	Oak Shrubland without changes	82	0.0 %
TU 1	Light load, dry climate timber-grass-shrub	9,876	0.4 %
TU 2	Moderate load, humid climate timber-shrub	0	0 %
TU 5	Very high load, dry climate timber-shrub	0	0 %
TL 1	Low load, compact conifer litter	0	0 %
TL 2	Low load, broadleaf litter	4,474	0.2 %
TL 3	Moderate load, conifer litter	1,292	0.1 %
TL 4	Small downed logs	0	0 %
TL 5	High load, conifer litter	20	0.0 %
TL 6	Moderate load, broadleaf litter	481	0.0 %
TL 7	Large downed logs	0	0 %
TL 8	Long-needle litter	0	0 %
TL 9	Very high load, broadleaf litter	0	0 %
Total		**2,568,701**	**100 %**


Weld HMP
Surface Fuels
Acres
2 000k
1 800k
1 600k
1 400k
1 200k
1 000k
800k
600k
400k
200k
0
87 367
0
448 174
21 337
28 826
1 775 777
0
24 349
0
0
8 004
145 716
0
0
6 709
0
0
31
82
9 876
0
0
0
4 474
1 292
0
20
481
0
0
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



Weld HMP

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.

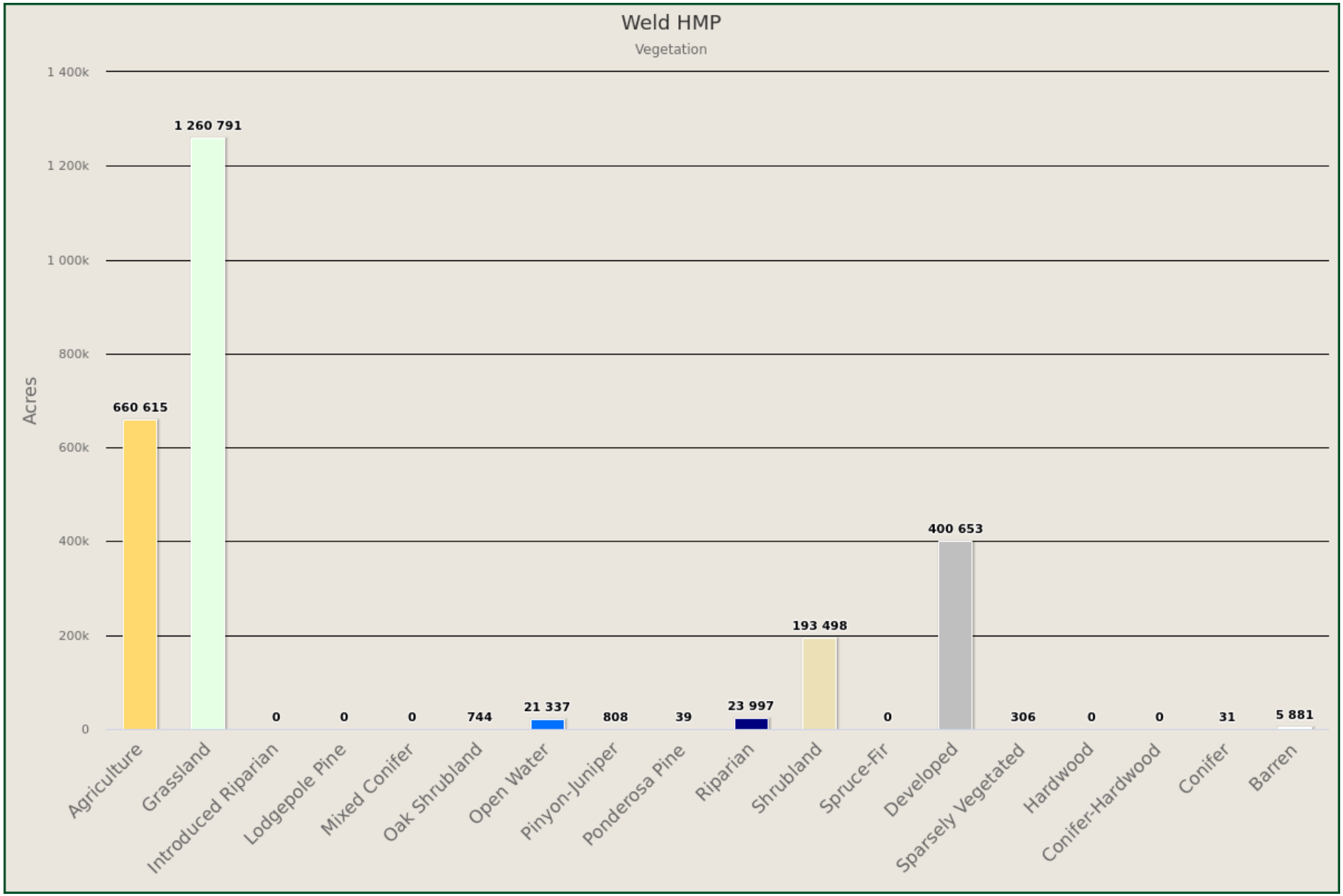
Douglas-fir understory in a ponderosa pine forest.

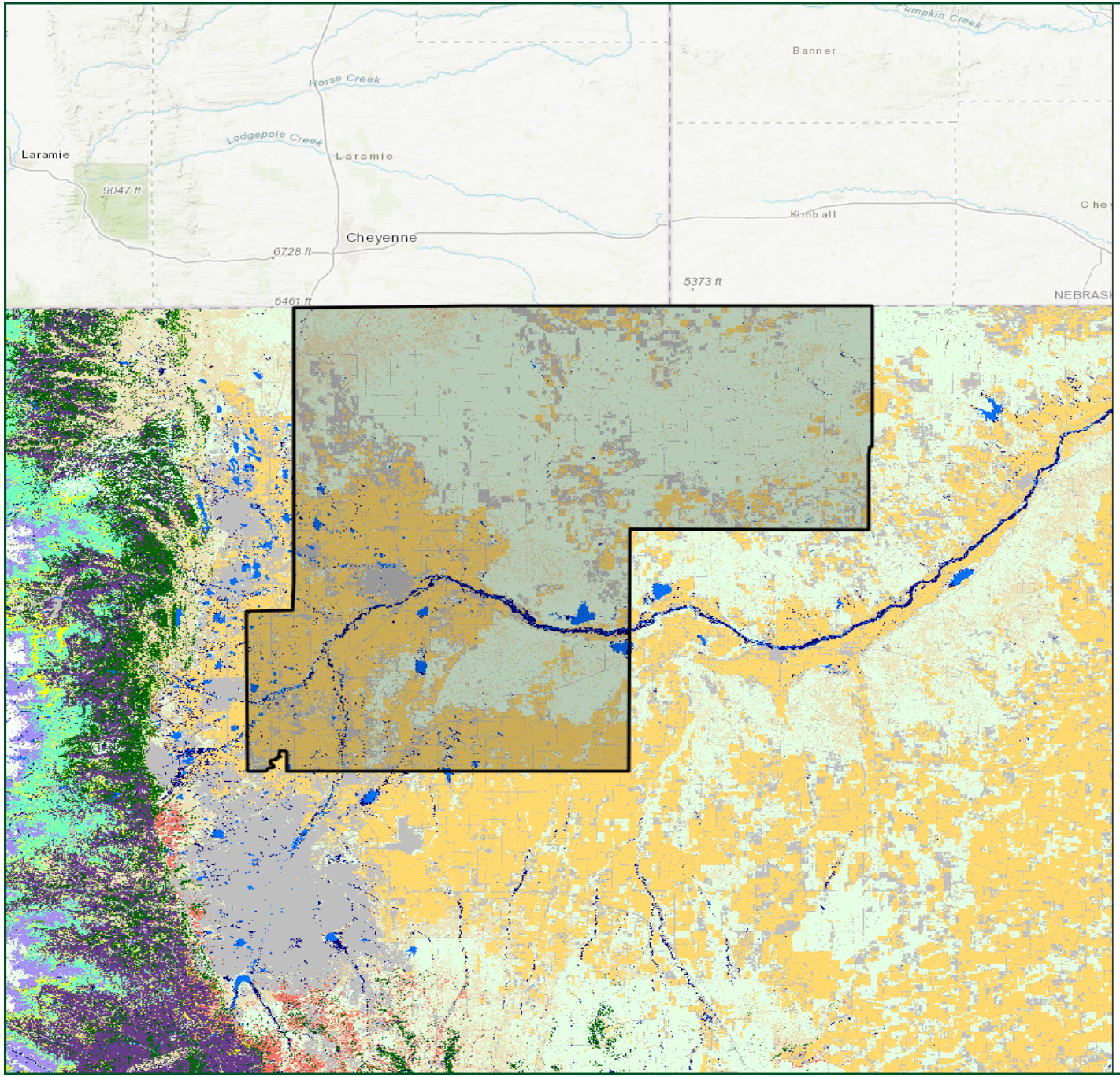
Grasslands occur both on Colorado's Eastern Plains and on the Western Slope.

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	660,615	25.7 %
Grassland	1,260,791	49.1 %
Introduced Riparian	0	0 %
Lodgepole Pine	0	0 %
Mixed Conifer	0	0 %
Oak Shrubland	744	0.0 %
Open Water	21,337	0.8 %
Pinyon-Juniper	808	0.0 %
Ponderosa Pine	39	0.0 %
Riparian	23,997	0.9 %
Shrubland	193,498	7.5 %
Spruce-Fir	0	0 %
Developed	400,653	15.6 %
Sparsely Vegetated	306	0.0 %
Hardwood	0	0 %
Conifer-Hardwood	0	0 %
Conifer	31	0.0 %
Barren	5,881	0.2 %
Total	**2,568,701**	**100 %**


Weld HMP
Vegetation
Acres
1 400k
1 200k
1 000k
800k
600k
400k
200k
0
660 615
1 260 791
0
0
0
744
21 337
808
39
23 997
193 498
0
400 653
306
0
0
31
5 881
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



Weld HMP

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

20 mi

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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.

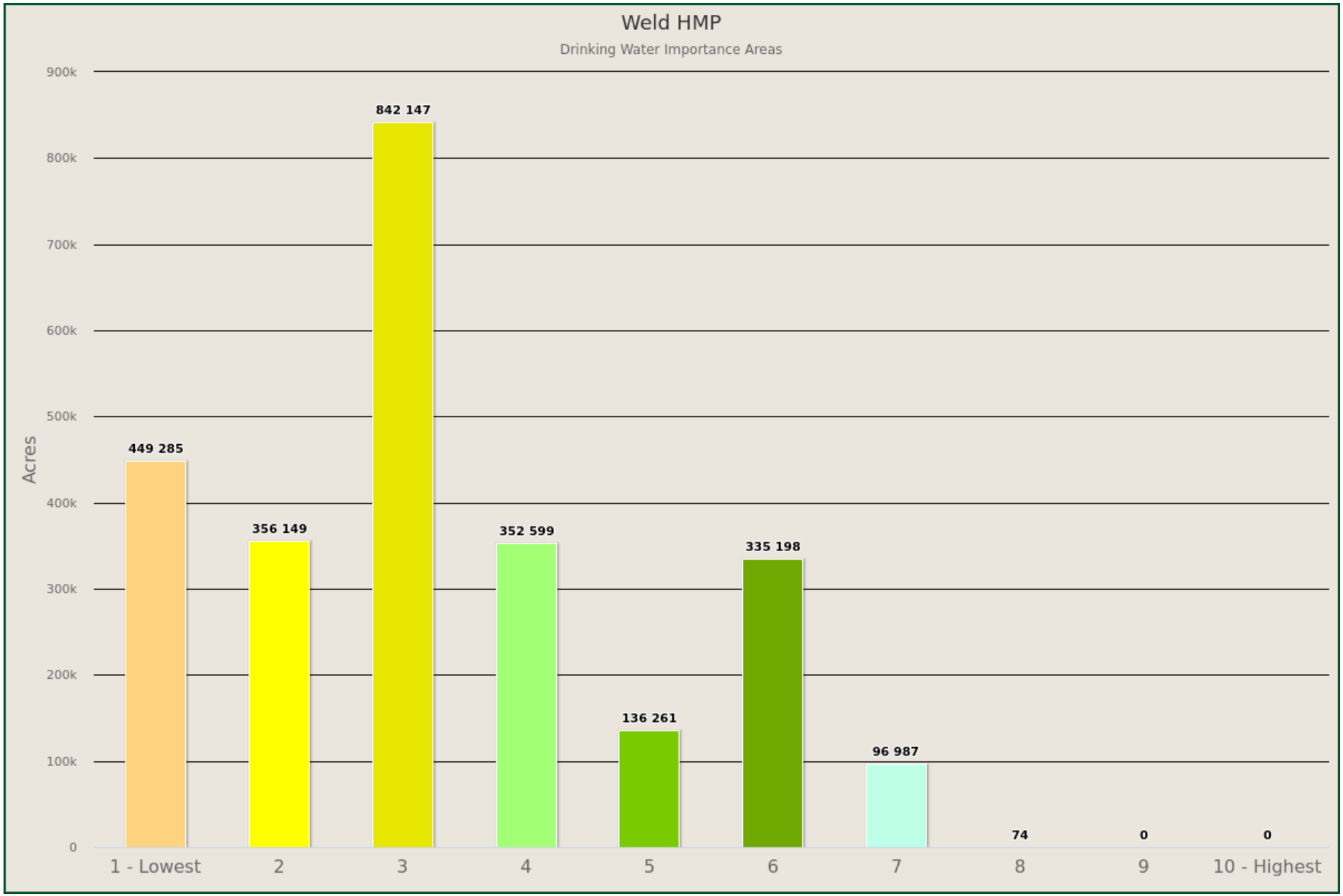
Four major river systems – the Platte, Colorado, Arkansas and Rio Grande – originate in the Colorado mountains and fully drain into one-third of the landmass of the lower 48 states. Mountain snows supply 75 percent of the water to these river systems.

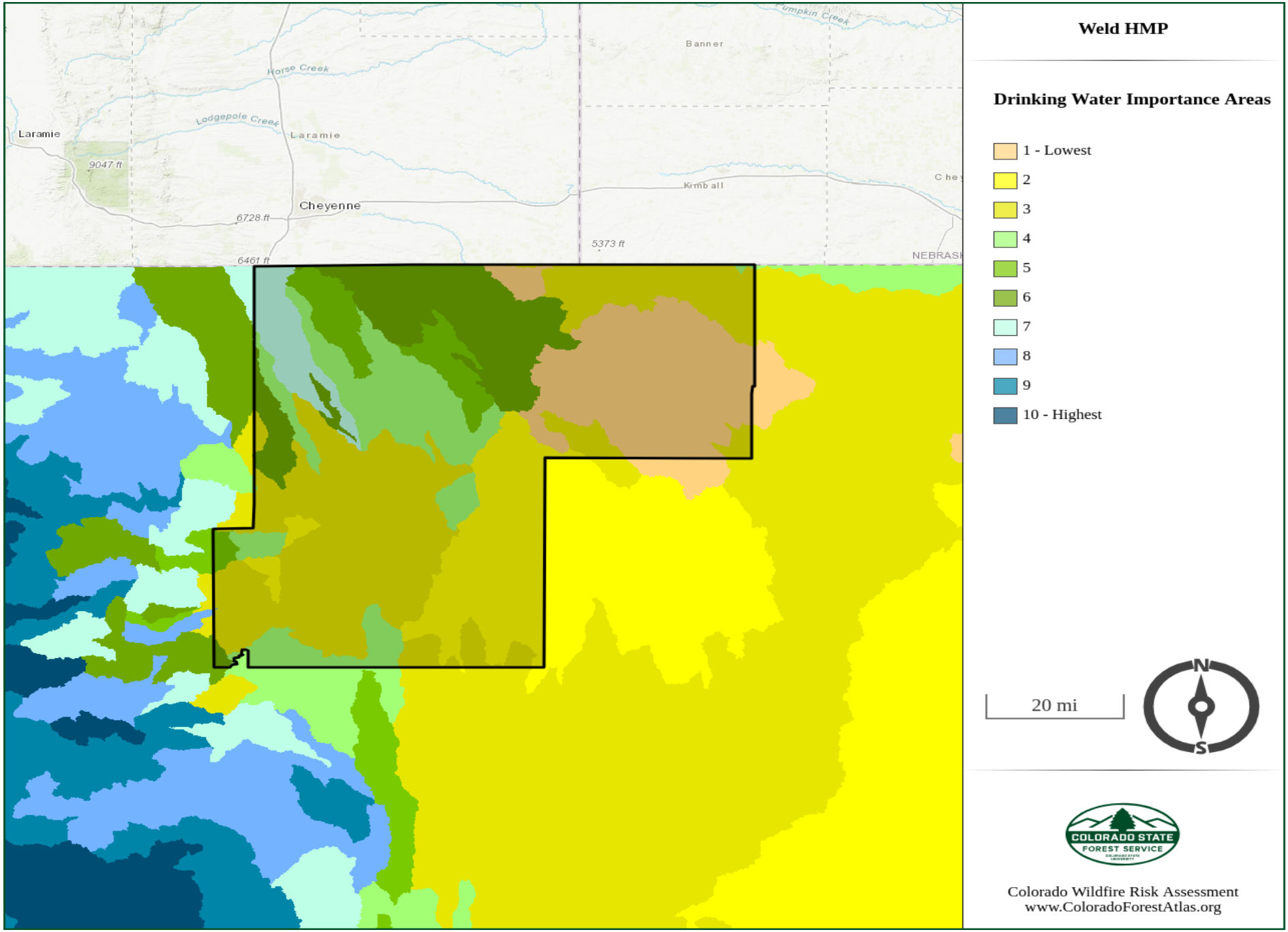
Virtually all of Colorado's drinking water comes from snowmelt carried at some point by a river.

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	449,285	17.5 %
2	356,149	13.9 %
3	842,147	32.8 %
4	352,599	13.7 %
5	136,261	5.3 %
6	335,198	13.0 %
7	96,987	3.8 %
8	74	0.0 %
9	0	0 %
10 - Highest	0	0 %
Total	**2,568,701**	**100 %**


Weld HMP
Drinking Water Importance Areas
Acres
900k
800k
700k
600k
500k
400k
300k
200k
100k
0
449 285
356 149
842 147
352 599
136 261
335 198
96 987
74
0
0
1 - Lowest
2
3
4
5
6
7
8
9
10 - Highest


Weld HMP
Drinking Water Importance Areas
1 - Lowest
2
3
4
5
6
7
8
9
10 - Highest
20 mi
N
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Laramie
Horse Creek
Lodgepole Creek
Laramie
9047 ft
Cheyenne
6728 ft
6461 ft
Banner
Kimball
5373 ft

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.

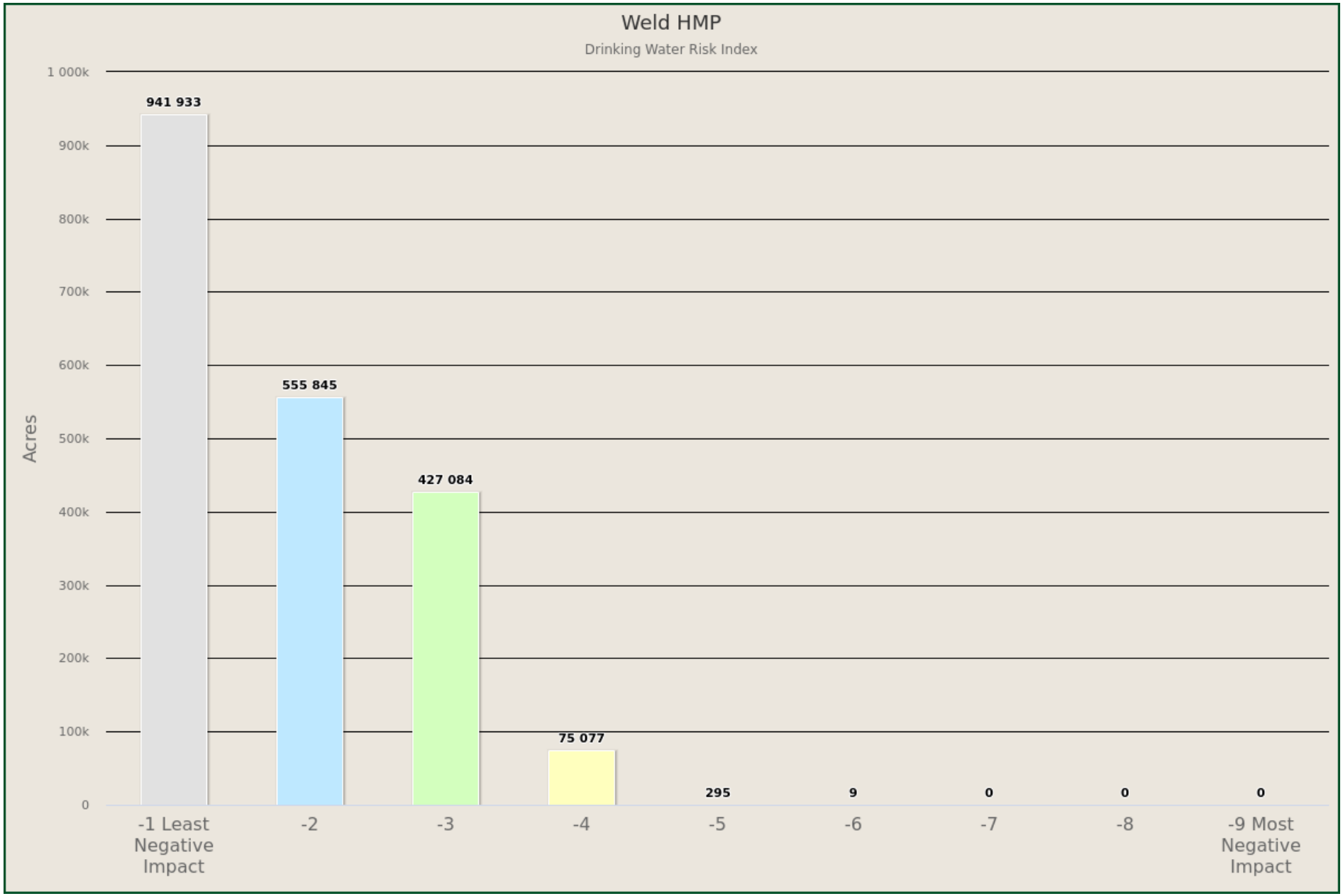
The loss of critical surface vegetation leaves forested slopes extremely vulnerable to large-scale soil erosion and flooding during subsequent storm events. In turn, these threats can impact the health, safety and integrity of communities and natural resources downstream. The likelihood that such a post-fire 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.

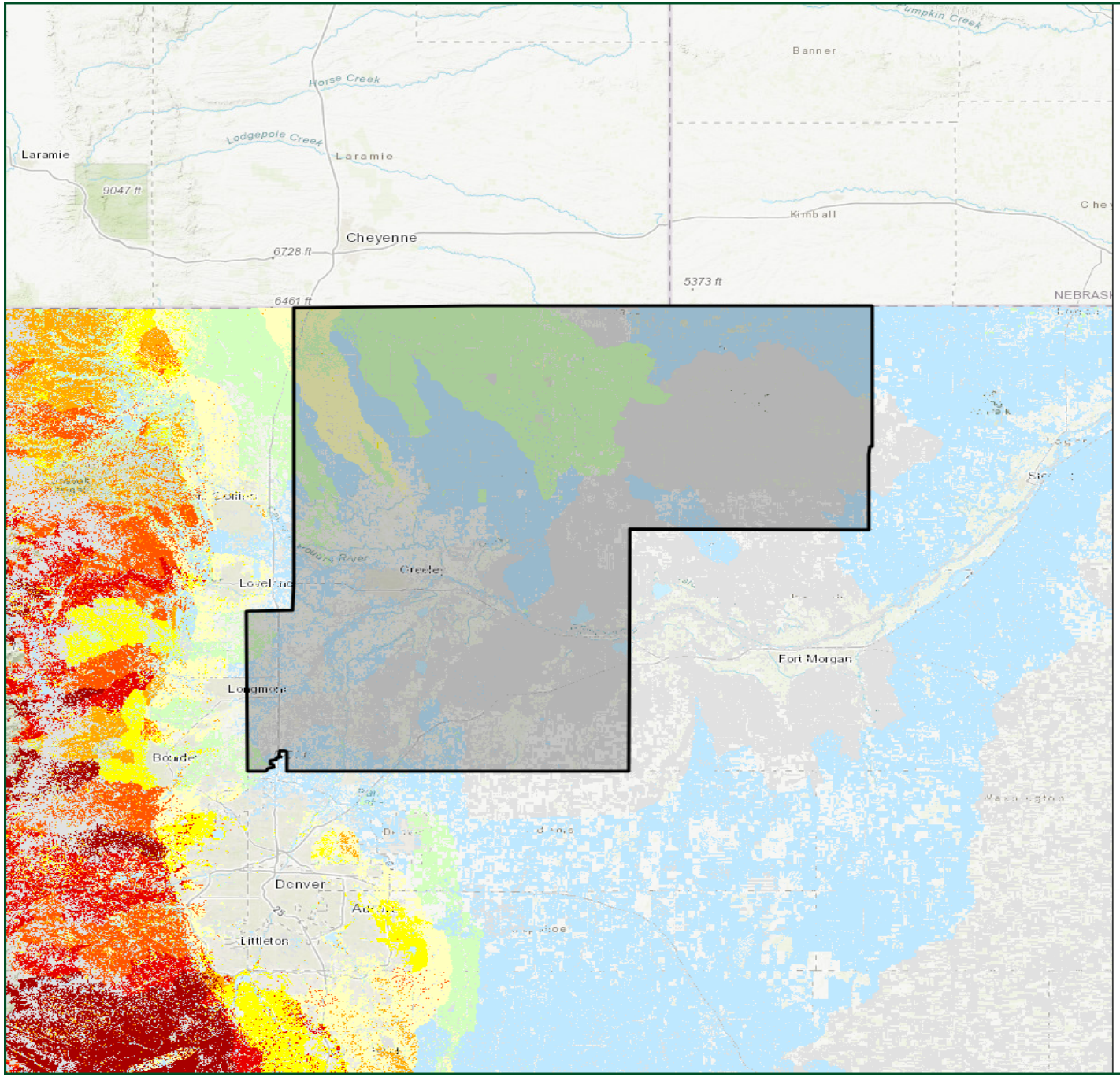
In the aftermath of the 2002 fire season, the Colorado Department of Health estimated that 26 municipal water storage facilities were shut down due to fire and post-fire impacts.

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	941,933	47.1 %
-2	555,845	27.8 %
-3	427,084	21.4 %
-4	75,077	3.8 %
-5	295	0.0 %
-6	9	0.0 %
-7	0	0 %
-8	0	0 %
-9 Most Negative Impact	0	0 %
Total	**2,000,243**	**100 %**


Weld HMP
Drinking Water Risk Index
Acres
1 000k
900k
800k
700k
600k
500k
400k
300k
200k
100k
0
941 933
555 845
427 084
75 077
295
9
0
0
0
-1 Least Negative Impact
-2
-3
-4
-5
-6
-7
-8
-9 Most Negative Impact



Weld HMP

Drinking Water Risk Index

- -1 Least Negative Impact
- -2
- -3
- -4
- -5
- -6
- -7
- -8
- -9 Most Negative Impact

20 mi

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Riparian Assets

Description

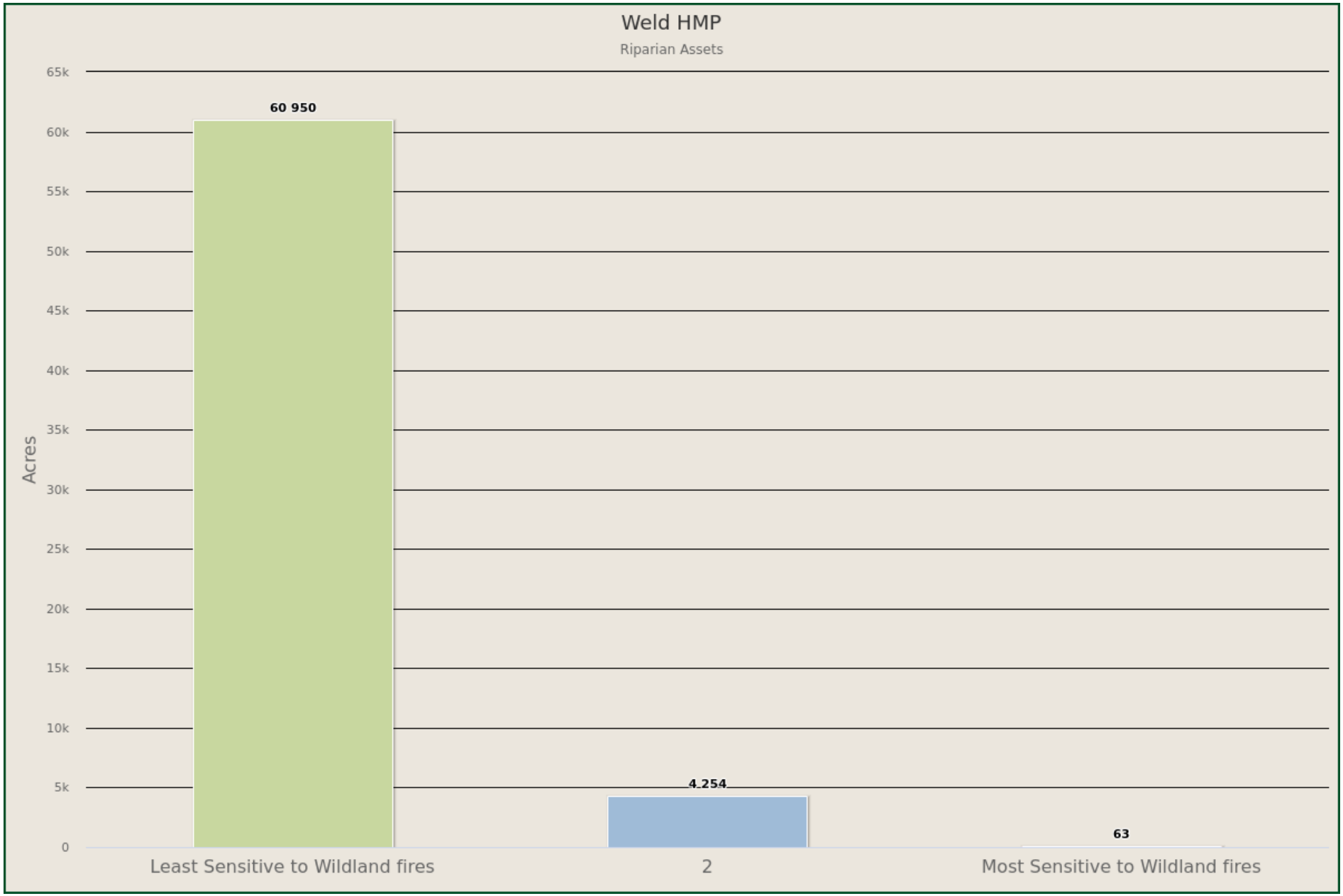
Riparian Assets are forested riparian areas characterized by functions of water quantity and quality, and ecology. This layer identifies riparian areas that are important as a suite of ecosystem services, including both terrestrial and aquatic habitat, water quality, water quantity, and other ecological 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.

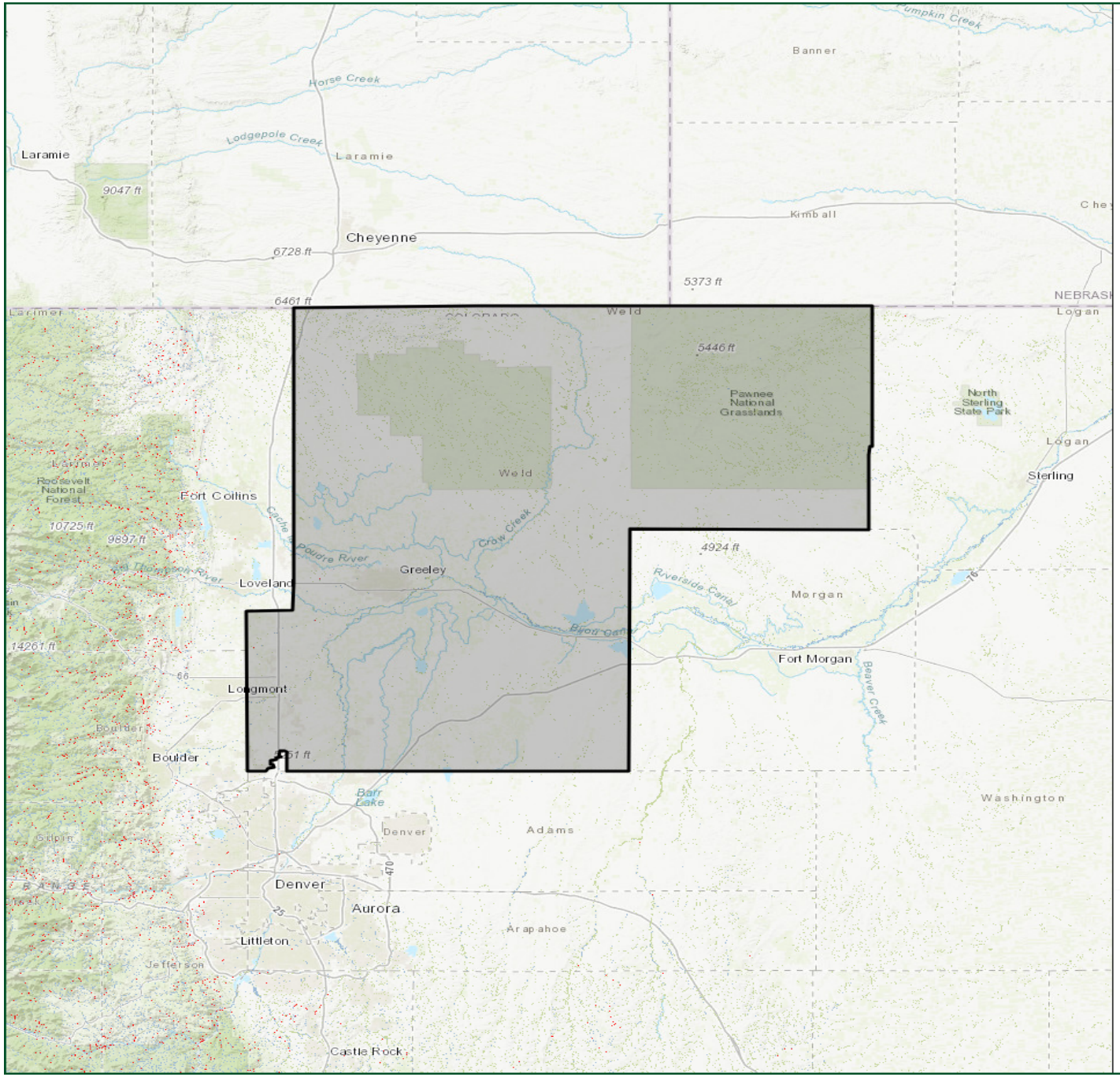
The process for defining these riparian areas involved identifying the riparian footprint and then assigning a rating based upon two important riparian functions – water quantity and quality, and ecological significance. A scientific model was developed by the West Wide Risk Assessment technical team 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	60,950	93.4 %
2	4,254	6.5 %
Most Sensitive to Wildland fires	63	0.1 %
Total	**65,267**	**100 %**


Weld HMP
Riparian Assets
65k
60k
55k
50k
45k
40k
35k
30k
25k
20k
15k
10k
5k
0
Acres
60 950
4 254
63
Least Sensitive to Wildland fires
2
Most Sensitive to Wildland fires



Weld HMP

Riparian Assets

- Least Sensitive to Wildland fires
- 2
- Most Sensitive to Wildland fires

20 mi

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Riparian Assets Risk Index

Description

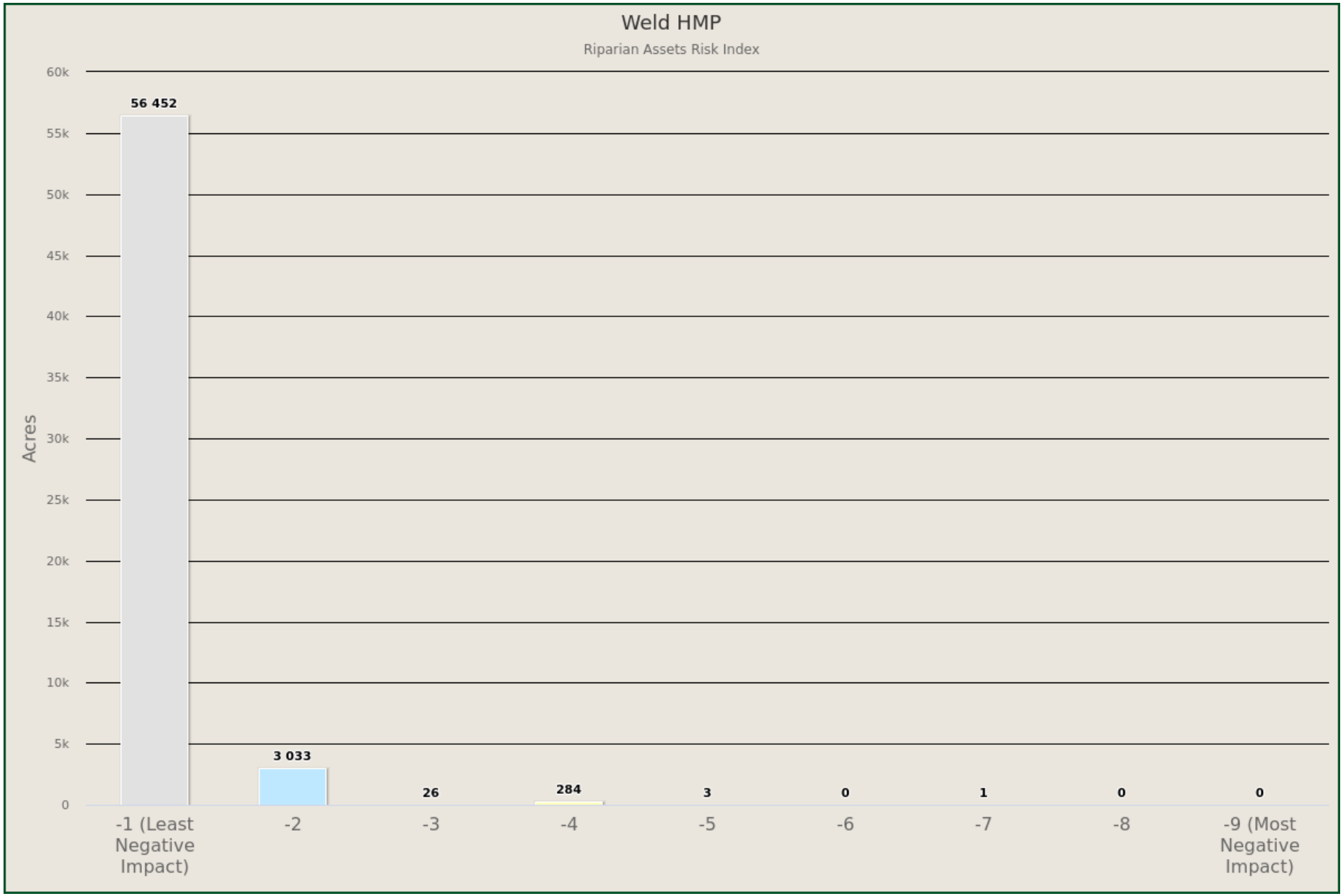
Riparian Assets Risk Index is a measure of the risk to riparian areas based on the potential negative impacts from wildfire. This layer identifies those riparian areas with the greatest potential for adverse effects from wildfire.

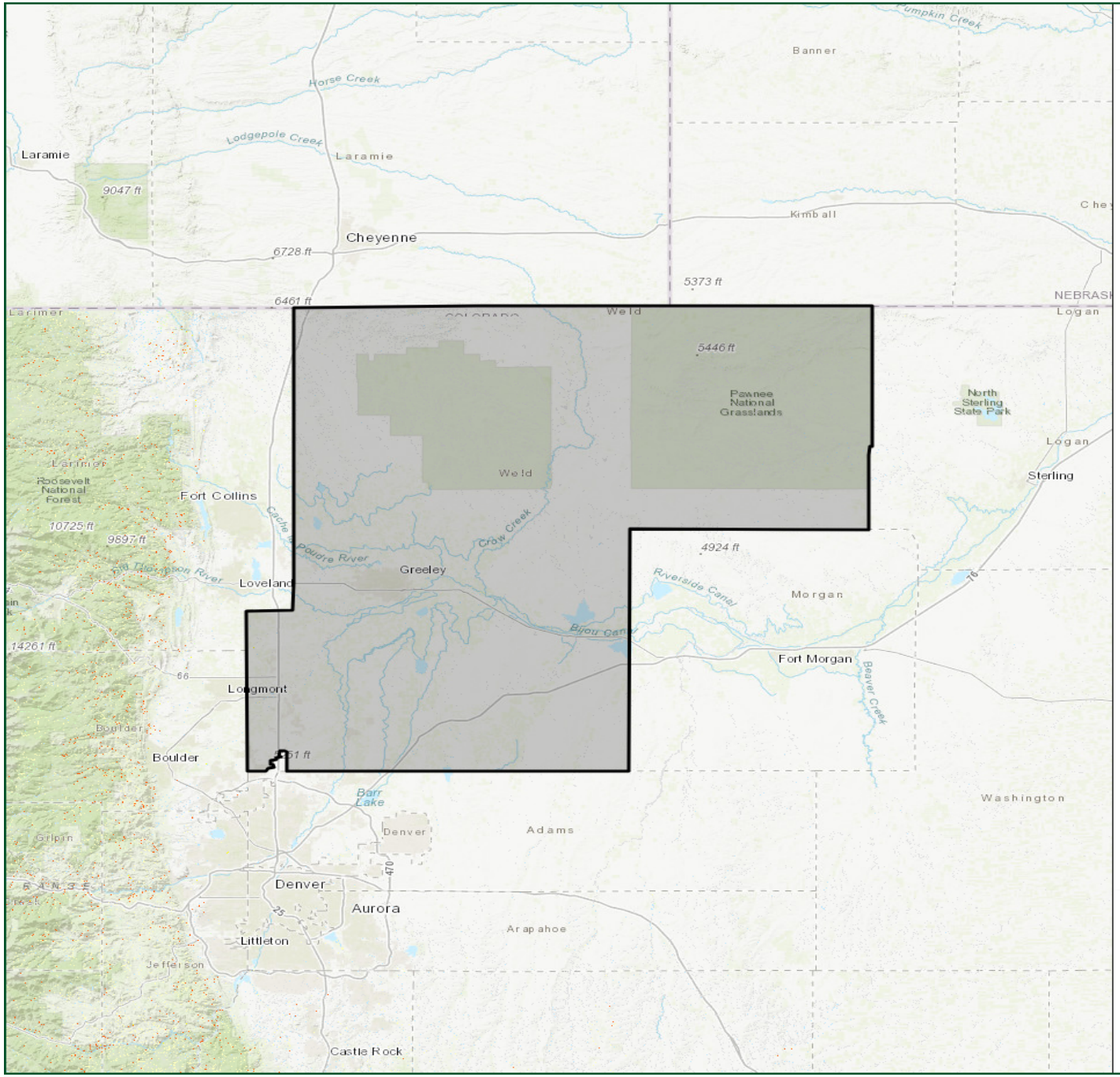
The range of values is from -1 to -9, with -1 representing the least negative impact and -9 representing the most negative impact.

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)	56,452	94.4 %
-2	3,033	5.1 %
-3	26	0.0 %
-4	284	0.5 %
-5	3	0.0 %
-6	0	0 %
-7	1	0.0 %
-8	0	0 %
-9 (Most Negative Impact)	0	0 %
Total	**59,798**	**100 %**


Weld HMP
Riparian Assets Risk Index
Acres
60k
55k
50k
45k
40k
35k
30k
25k
20k
15k
10k
5k
0
56 452
3 033
26
284
3
0
1
0
0
-1 (Least Negative Impact)
-2
-3
-4
-5
-6
-7
-8
-9 (Most Negative Impact)



Weld HMP

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.

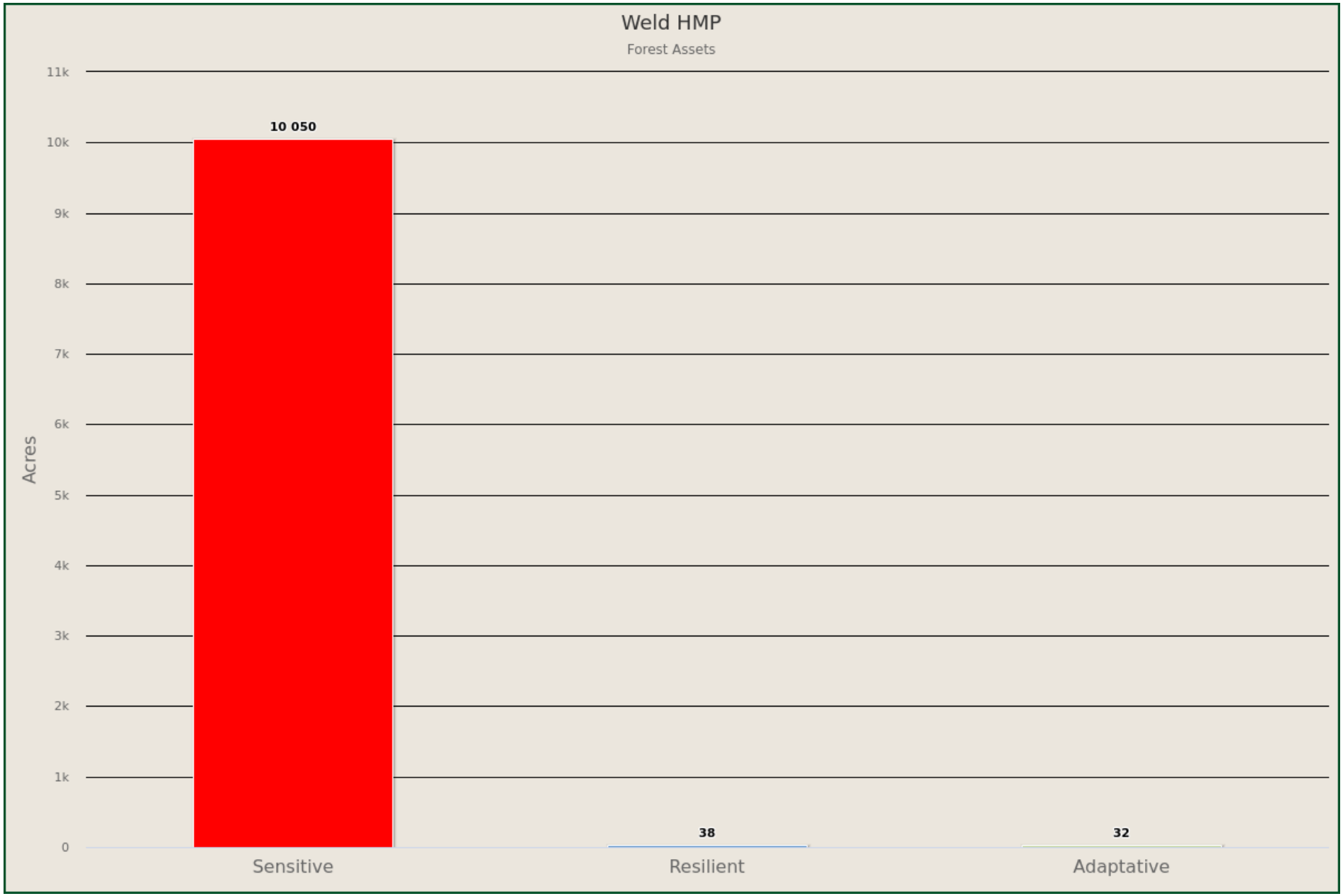
- **Sensitive** = These are tree species that are intolerant or sensitive to damage from fire with low intensity.
- **Resilient** = These are tree species that have characteristics that help the tree resist damage from fire and whose adult stages can survive low intensity fires.
- **Adaptive** = These are tree species adapted with the ability to regenerate following fire by sprouting or serotinous cones

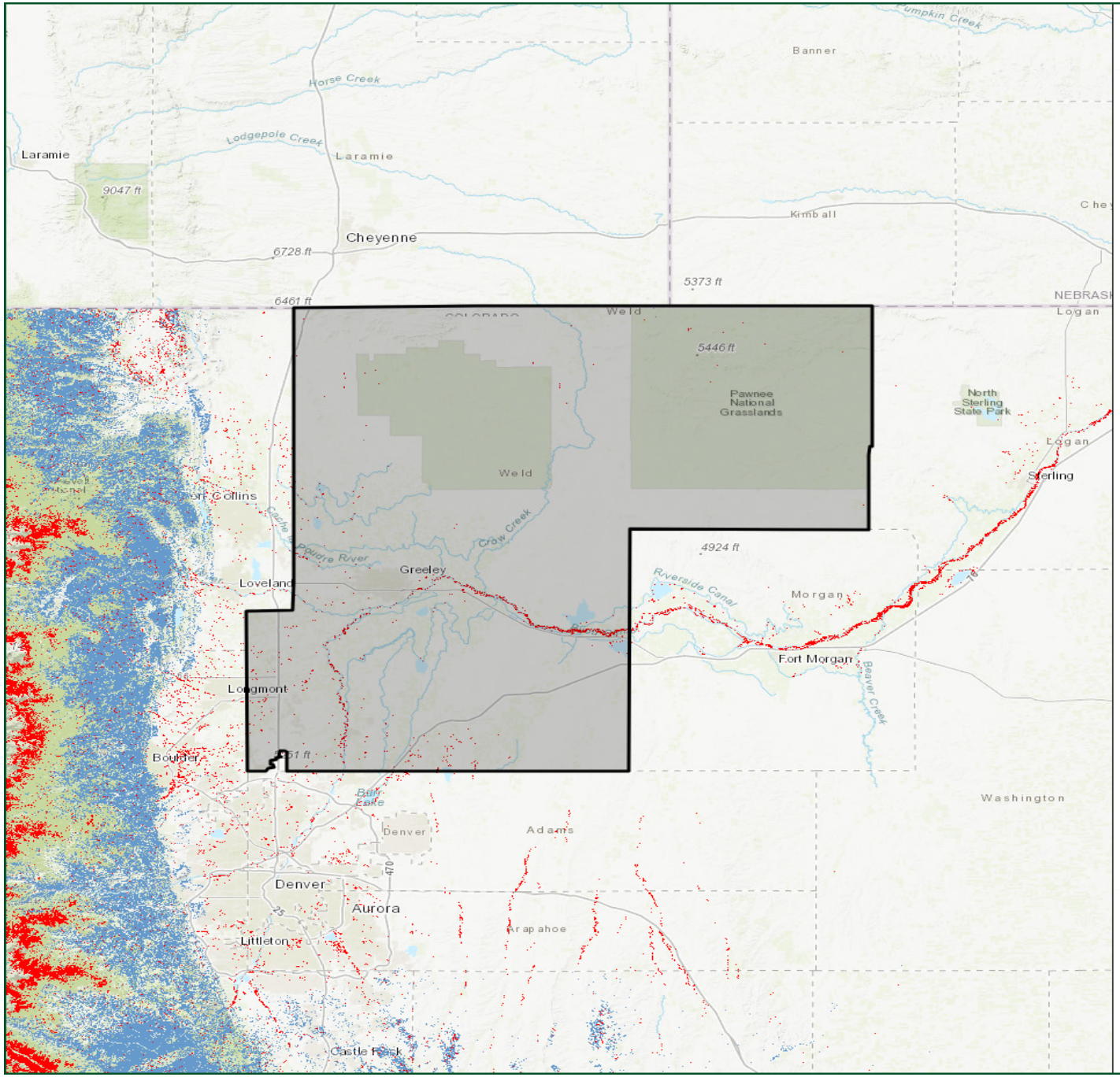
The range of values is from -1 to -9, with -1 representing the least negative impact and -9 representing the most negative impact.

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	10,050	99.3 %
Resilient	38	0.4 %
Adaptative	32	0.3 %
Total	**10,120**	**100 %**


Weld HMP
Forest Assets
11k
10k
9k
8k
7k
6k
5k
4k
3k
2k
1k
0
Acres
10 050
38
32
Sensitive
Resilient
Adaptative



Weld HMP

Forest Assets

- Sensitive
- Resilient
- Adaptative

20 mi

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Forest Assets Risk Index

Description

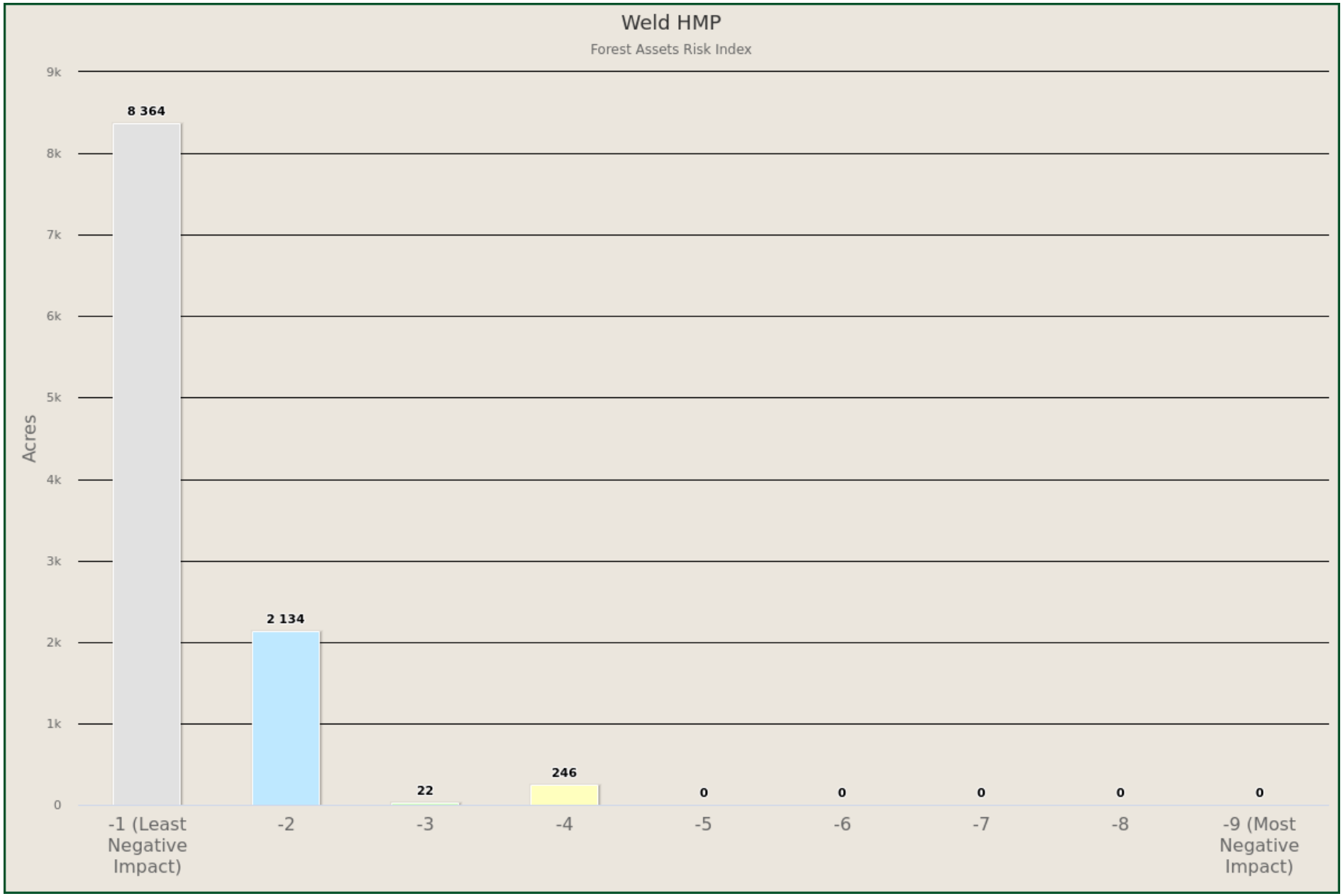
Forest Assets Risk Index is a measure of the risk to forested areas based on the potential negative impacts from wildfire. This layer identifies those forested areas with the greatest potential for adverse effects from wildfire.

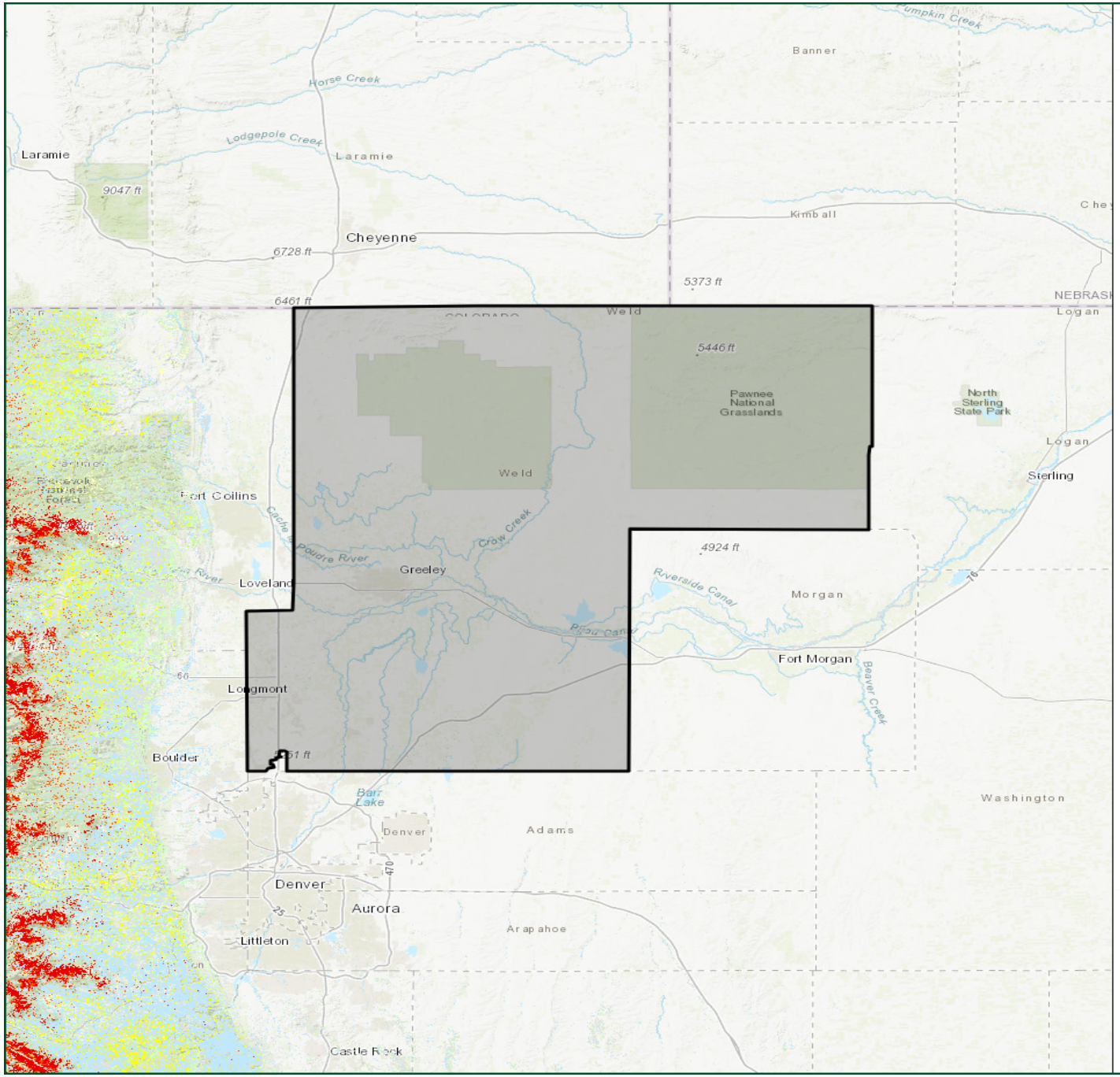
The range of values is from -1 to -9, with -1 representing the least negative impact and -9 representing the most negative impact.

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)	8,364	77.7 %
-2	2,134	19.8 %
-3	22	0.2 %
-4	246	2.3 %
-5	0	0 %
-6	0	0 %
-7	0	0 %
-8	0	0 %
-9 (Most Negative Impact)	0	0 %
Total	**10,766**	**100 %**


Weld HMP
Forest Assets Risk Index
Acres
9k
8k
7k
6k
5k
4k
3k
2k
1k
0
8 364
2 134
22
246
0
0
0
0
0
-1 (Least Negative Impact)
-2
-3
-4
-5
-6
-7
-8
-9 (Most Negative Impact)



Weld HMP

Forest Assets Risk Index

- -1 (Least Negative Impact)
- -2
- -3
- -4
- -5
- -6
- -7
- -8
- -9 (Most Negative Impact)

20 mi

N

S

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References

Anderson, H. E. (1982). Aids to determining fuel models for estimating fire behavior. USDA For. Serv. Gen. Tech. Rep. INT-122.

Colorado State Forest Service (November 2018). Colorado Wildfire Risk Assessment Final Report. A final report developed by CSFS and Technosylva Inc. (La Jolla, CA) documenting the technical methods and results for the Colorado wildfire risk assessment update project.

Colorado State Forest Service (July 2018). Fuels Calibration Final Report. A final report developed by CSFS and Technosylva Inc. (La Jolla, CA) documenting the technical methods and results for the Colorado fuels calibration project.

Colorado State Forest Service (2012). Colorado Wildfire Risk Assessment 2012 Final Report. A final report developed by CSFS and DTS (Fort Collins, CO) documenting the technical methods and specifications for the Colorado WRA project.

National Wildfire Coordinating Group (NWCG). (2008). Glossary of Wildland Fire Terminology. Publication Management System document PMS-205.

National Wildfire Coordinating Group (2004). Fireline Handbook. NWCG Handbook 3. PMS 410-1. NFES 0065. National Interagency Fire Center. Boise, Idaho 83705.

Scott, J. H., & Burgan, R. E. (2005). Standard Fire Behavior Fuel Models: A Comprehensive Set for Use with Rothermel's Surface Fire Spread Model. Ft. Collins, CO, Rocky Mountain Research Station: USDA Forest Service, Gen. Tech. Rpt. RMRS-GTR-153.

Scott, J. H., & Reinhardt, E. D. (2001). Assessing the Crown Fire Potential by Linking Models of Surface and Crown Fire Behavior. Ft. Collins, CO, Rocky Mountain Research Station: USDA Forest Service, Research Paper RMRS-RP-29.

11 Appendix F: FEMA Approval & Local Adoptions