DRAFT

Park County Hazard Mitigation Plan Update

October, 2013

Prepared For:
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Park County

Hazard Mitigation Plan Update

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November 2013

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Project #103S2693

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EXECUTIVE SUMMARY

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

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

Park County and a partnership of local governments within the County have developed and maintained a hazard mitigation plan to reduce risks from natural disasters and to comply with the DMA.

PLAN UPDATE

Federal regulations require monitoring, evaluation and updating of hazard mitigation plans. An update provides an opportunity to reevaluate recommendations, monitor the impacts of actions that have been accomplished, and determine if there is a need to change the focus of mitigation strategies. A jurisdiction covered by a plan that has expired is no longer in compliance with the DMA.

The initial Park County Multi-Jurisdictional Multi-Hazard Mitigation Plan was approved by the Federal Emergency Management Agency (FEMA) on December 16, 2008. Since then, the partnership has completed or initiated ongoing action approximately half of the original 40 initiatives identified in the initial plan. The others either were determined to be no longer applicable or are carried forward into this plan. While the initial performance of this plan was relatively successful, the following enhancements would enable the plan to better support local needs:

- Integration of GIS and County Assessor records into an integrated database. Use of best available data to update the risk assessment portion of the plan
- Use of available tools to enhance the risk assessment to better support future grant applications and local emergency management programs
- Regular engagement of the public to see if the perception of risk within the planning area has changed since the initial effort
- Re-energizing and educating the participating partners on the funding opportunities the plan can enable.

Updating the plan consisted of the following phases:

- **Phase 1, Organize and Review**—A planning team was assembled to provide technical support for the plan update, consisting of key County staff from the Department of Emergency Management and a technical consultant. The first step in developing the plan update was to re-establish a planning partnership. Planning partners participating in the

update were the Towns of Fairplay and Alma, the Southern Park County Fire Protection District, the South Park Ambulance District, the North-West Fire Protection District, and the Platte Canyon Fire Protection District in Bailey. A steering committee was assembled to oversee plan update, consisting of planning partner staff and community representatives from planning area. Coordination with other county, state and federal agencies involved in hazard mitigation occurred throughout the plan update process. This phase included a comprehensive review of the existing plan, the Colorado State Hazard Mitigation Plan, and existing programs that may support or enhance hazard mitigation actions.

- **Phase 2, Update the Risk Assessment**—Risk assessment is the process of measuring the potential loss of life, personal injury, economic injury, and property damage resulting from natural hazards. This process assesses the vulnerability of people, buildings and infrastructure to natural hazards. All facets of the risk assessment of the plan were re-visited by the planning team and updated with the best available data and technology. The work included the following:
  - Hazard identification and profiling
  - Assessment of the impact of hazards on physical, social and economic assets
  - Vulnerability identification
  - Estimates of the cost of potential damage.
- **Phase 3, Engage the Public**—A public involvement strategy agreed upon by the Steering Committee was implemented by the planning team. All meetings were open to the public. Public meetings were held to present the risk assessment as well as the draft plan. Participation in the hazard mitigation survey occurred across the County, a County website included plan updates, and there were multiple media releases.
- **Phase 4, Assemble the Updated Plan**—The planning team and Steering Committee assembled key information into a document to meet the DMA requirements for all planning partners.
- **Phase 5, Plan Adoption/Implementation**—Once pre-adoption approval has been granted by Colorado's Office of Emergency Management and FEMA Region VIII, the final adoption phase will begin. Each planning partner will individually adopt the updated plan. The plan maintenance process includes a schedule for monitoring and evaluating the plan's progress annually and producing a plan revision every five years. Throughout the life of this plan, a steering committee representative of the original committee will provide a consistent source of guidance and oversight.

MITIGATION GUIDING PRINCIPLE, GOALS AND OBJECTIVES

The following guiding principle for this plan update process guided the Committee:

> Develop and maintain a disaster-resistant community that is more resilient to the economic and physical devastation associated with all hazard events.

The following plan goals and objectives were determined by the Committee:

- **Goal 1**: Ensure hazard awareness and risk reduction principles are institutionalized into the Park County jurisdictions' daily activities, processes and functions, by incorporating them into policy documents and initiatives.
  - Objective 1A: Be proactive in incorporating emergency management plans into all other institutional County plans, documents and practices.

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- **Goal 2:** Increase the county jurisdictions' floodplain management activities and participation in the National Flood Insurance Program.
  - Objective 2A: Assess current and applicable jurisdictional plans and documents regarding flood management to determine what changes and/or additions will be required in future revisions in order to reduce exposure and increase awareness of flood hazards in and to county property, residents and businesses.
- **Goal 3:** Develop support for mitigation among local jurisdictions and local officials.
  - Objective 3A: Continually assess ongoing disaster preparedness programs and activities to implement changes that improve disaster preparedness for Park County.
- **Goal 4:** Enhance countywide understanding and awareness of community preparedness needs.
  - Objective 4A: Educate the public about preparedness activities and mitigation goals, allowing each citizen the opportunity to reduce personal risk and to increase property protection.
- **Goal 5:** Conduct exercises and training regarding the prevention and mitigation of Park County hazards**.**
  - Objective 5A: Ensure readiness through a variety of training mechanisms including opportunities involving public officials and community members regarding the identified hazards, to improve long-term planning and mitigation activities.
- **Goal 6**: Explore diverse public notification systems for impending hazards.
  - Objective 6A: Ensure that the public has more than one means of obtaining information about emergencies and disasters in the county through development of redundant notification systems.
- **Goal 7:** Enhance the safety of residents and businesses by protecting public and private infrastructure and critical facilities from the effects of natural and human-caused hazards.
  - Objective 7A: Ensure that countywide, measures are taken addressing specific risks to infrastructure posed by identified hazards and the resultant critical infrastructure needs and develop a funding mechanism for the priority areas.
- **Goal 8:** Improve emergency service capabilities.
  - Objective 8A**:** Enhance interagency operations by strengthening the emergency operations center capabilities across jurisdictional boundaries.
- **Goal 9:** Enhance interagency collaboration throughout the County and with adjacent neighbors.
  - **Objective 9A:** Continue to work with the Emergency Services Council in Park County to address emergency and disaster-related issues and concerns.
  - **Objective 9B:** Continue to work with area partners through mutual aid agreements and long-term planning efforts.

MITIGATION INITIATIVES

Mitigation initiatives presented in this update are activities designed to reduce or eliminate losses resulting from natural hazards. The update process resulted in the identification of 78 mitigation initiatives for implementation by individual planning partners as listed in Table ES-1.

TABLE ES-1.
ACTION PLAN—COUNTYWIDE MITIGATION INITIATIVES

#	Priority	Project Status	Project Name	Benefit To Community	Problem/Project Description	Wildfire	Severe Storms (lightning, hail & high winds)	Severe Winter Weather	Drought and Extreme Temperatures	Landslide	Earthquake	Hazardous Materials	Flood	Land Subsidence/Sinkholes/Soil Erosion	Tornado	Dam Failure	HAZMAT	Lead & Support Agency	Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal:
COUNTYWIDE MITIGATION ACTIONS																						
1	High	New	Harden County communication and tower facilities.	H	Communication during emergency events is critical. There is a significant need to harden existing County radio and microwave communication and tower facilities for all hazards.	X	X	X	X	X	X	X	X	X	X	X		County OEM	H	C	2014 and ongoing	Goal 7, Objective 7A
2	High	2009 Plan	CWPP Implementation	H	Implement the recommendations of the 2007 Community Wildfire Protection Plan to lessen the likelihood that future fires will cause harm to existing and future buildings.	X			X									OEM and local emergency services	M	Staff time and grants	2015	Goals 1, 3, 4 and 7, Objectives 1A, 4A and 7A
3	High	2009 Plan	Community Wildfire Education	H	Continue community outreach and conduct workshops to educate property owners at risk from wildfire about specific maintenance strategies to reduce their risk from wildfire, and develop a list of the components of a homeowner's wildfire emergency evacuation kit and publicize the need for such kits.	X												OEM	L	Staff Time	Ongoing	Goals 1 and 4, Objectives 1A & 4A.

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TABLE ES-1.
ACTION PLAN—COUNTYWIDE MITIGATION INITIATIVES

#	Priority	Project Status	Project Name	Benefit To Community	Problem/Project Description	Wildfire	Severe Storms (lightning, hail & high winds)	Severe Winter Weather	Drought and Extreme Temperatures	Landslide	Earthquake	Hazardous Materials	Flood	Land Subsidence/Sinkholes/Soil Erosion	Tornado	Dam Failure	HAZMAT	Lead & Support Agency	Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal:
4	High	2009 Plan	Winter Weather Outreach and Education	M	Create an education program regarding winter weather preparedness for citizens. Ensure that ranch owners and pet owners are included in this process, and specific strategies for protecting livestock and pets from severe winter weather events are addressed			X										OEM	L	Staff Time	Ongoing	Goals 1 and 4, Objectives 1A & 4A.
5	High	2009 Plan	Continue to regularly conduct emergency exercises	H	Conduct one exercise annually, involving members of the public, regarding the four phases of emergency management, to increase understanding of each person's role during a disaster, including public health issues such as Pandemic Flu.	X	X	X	X	X	X	X	X	X	X	X		OEM and local emergency services	M	Staff Time	Ongoing	Goals 1, 5 & 9, Objectives 1A, 5A & 9A
6	High	2009 Plan	Harden Infrastructure	H	As funding becomes available, harden infrastructure at greatest risk from wildfire. Develop infrastructure protection strategies and implement those strategies.	X												OEM and local emergency services	H	Staff time, general fund and grants	Ongoing	Goals 7, 8 & 9, Objectives 7A, 8A & 9B
7	High	2009 Plan	Continue to regularly conduct emergency exercises related to dam preparedness	M	Continue to conduct regular exercises for dam failure and dam preparedness. Work with those partners who maintain dams in Park County to ensure they are maintained and that emergency exercises for simulated dam failure response are conducted.								X					OEM and local emergency services	M	Staff Time	Ongoing	Goals 1, 5 & 9, Objectives 1A, 5A & 9A

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8	High	2009 Plan	Maintain Current Emergency Operations Center (EOC) Policies and Procedures	H	County Emergency Manager to update and maintain current EOC policies and procedures manual for all county employees and emergency responders on an on-going basis. Participate in county, regional, and statewide exercises to determine strengths and weaknesses in EOC operations, enhancing support activities during an actual disaster.	X	X	X	X	X	X	X	X	X	X	X		OEM	L	Staff time, general fund and grants	Ongoing	Goals 1 & 8, Objectives 1A & 8A
9	High	2009 Plan	Evacuation Drills	H	Conduct an evacuation drill of the Park County 911 Communications Center at least once annually to ensure the safety of all employees, and to ensure a seamless communications system during an emergency.	X	X	X	X	X	X	X	X	X	X	X		OEM, Sheriff & police departments	L	Staff time, general fund and grants	Ongoing	Goals 1 & 8, Objectives 1A & 8A
10	High	New	Be Wise, Be Prepared	M	Update, expand and reprint county winter disaster preparedness booklet to cover all hazards and distribute to residents of the County through a mass mailing or by making it available to organizations such as homeowner associations and fire districts for distribution.	X	X	X	X	X	X	X	X	X	X	X	X	County Emergency Management	M	Grants, County and other organizations funding	2014-2015	Goals 1 and 4, Objectives 1A & 4A

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11	Med	2009 Plan	Drought and Water Wise Education	M	Educate the public about ways to lessen the effects of drought, and the need to be water-wise.				X									OEM	L	Staff Time	Ongoing	Goals 1 and 4, Objectives 1A & 4A.
12	Med	New	North-West FPD Wildfire Hazard Mitigation	H	North-West FPD completed a CWPP in 2010. Included in this plan are proposed locations for wildfire mitigation projects based on risk and hazard severity to reduce the frequency and intensity of wildfires within the District. All of these projects would benefit from funding in order to proceed.	X		X										North-West FPD, Towns, Park County OEM, U.S. Forest Service, homeowner associations etc.	M	Grants with soft, in-kind matches	2014-2015	Goals 1, 3 and 7, Objectives 1A and 7A
13	Med	New	North-West FPD CWPP renewal	H	North-West FPD's CWPP will be in need of review and renewal by 2015 in order to stay current and meet grant requirements. By keeping the plan current, North-West FPD can provide the most accurate information to its residents and remain eligible for grant funding to perform mitigation work called for in the CWPP.	X			X									North-West FPD, Towns, Park County OEM,	M	FEMA & CWCB grants, etc.	2014-2015	Goals 1, 3 and 7, Objectives 1A, 3A and 7A
14	Med	New	Fuels/Defensible Space Treatment	H	There has been a lack of fuels treatment / reduction and implementation of defensible space around structures in the wildland / urban interface area. Actively addressing this issue will provide increased protection to life and property.	X			X									Platte Canyon Fire etc.	M	FEMA & CWCB grants, etc.	2014 and ongoing	Goals 1, 3 and 7, Objectives 1A, 3A and 7A

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15	Med	New	Wildfire mitigation actions in the areas identified as the highest risk areas in the CWPP.	H	Research the availability and make grant applications for wildfire mitigation actions in the areas identified as the highest risk areas in the CWPP.	X												County OEM & Fire Districts	L	FEMA & CWCB grants, etc.	2013 and ongoing	Goals 1, 3 and 7, Objectives 1A, 3A and 7A
16	Med	New	Generators for the Fairplay Town Hall, Police Department and Public Works	M	Acquire generators for the Fairplay Town Hall, Police Department and Public Works	X	X	X	X	X	X	X	X	X	X	X		Fairplay town manager	M	Town budget, FEMA and other grants.	2014 on	Goal 8, Objective 8A
17	Med	New	Generators for Southern Park County FPD/ Guffey	M	Acquire generators to support South Park and Guffey	X	X	X	X	X	X	X	X	X	X	X		Southern Park County FPD	M	FPD Budget, FEMA and other grants	2014 on	Goal 8, Objective 8A
18	Med	New	Alternative emergency vehicle access routes	H	Investigate the status of and need to establish alternative emergency vehicle access routes in the County	X	X	X	X	X	X	X	X	X	X	X		South Park Ambulance	L	Staff time	2013 on	Goal 1, Objective 1A
19	Med	New	Revise local code requirements for ingress/egress	H	Investigate the process and revise current county codes to require that all new platted subdivisions have a minimum of two ingress and egress points.	X	X	X	X	X	X	X	X	X	X	X		South Park Ambulance with County Planning	L	Staff time	2014 onward	Goal 1, Objective 1A
20	Med	2009 Plan	High wildfire risk area land standards		Adopt land and building standards for future development in the county's mapped areas of high wildfire risk.	X			X									Park County Planning with assistance from OEM	L	Staff time	2014 onward	Goal 1, Objective 1A

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21	Med	2009 Plan	Wildfire mitigation activities in high risk areas	H	Identify the priority areas for high wildfire risk that have not burned in the last five years. Encourage and assist neighborhoods and homeowner associations in developing local wildfire plans, allowing for mitigation project development in the high hazard areas and technical input to future land use decisions.	X			X									Park County OEM and Fire Districts	L	Staff time	2014 onward	Goals 1, 3, 4 and 7, Objectives 1A, 4A and 7A
22	Med	2009 Plan	Severe storm notification systems	M	Develop a program to better receive, coordinate and distribute information about likely thunderstorms, with assistance from NOAA and NWS.		X											Park County OEM	M	Staff time and grants	2015	Goal 6, Objective 6A
23	Med	2009 Plan	High risk landslide areas and future land use	L	In conjunction with CGS and/or USGS, define the high priority areas for landslides in Park County to guide future land use decisions and future mitigation decisions.					X								Park County OEM and Engineering				Goal 1, Objective 1A
24	Med	2009 Plan	Dam failure warning systems	M	Work with the Division of Water Resources to rank high priority dams within Park County and for installation of dam failure warning systems and plans.								X					Park County OEM			2016	Goals 3, 6 and 7, Objectives 3A, 6A and & 7A
25	Low	2009 Plan	Amend current codes as necessary related to seismic risk	L	Adopt zoning and subdivision regulations for proposed development in or adjacent to areas of high seismic risk.						X								L	Staff time	2016	Goal 1, Objective 1A

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26	Low	2009 Plan	Flooding and Updating Land Use Codes	M	Identify flood values at risk, cross-referenced with hazards, and by the end of 2015, update county Land Use Regulations to include mitigation measures for flooding in order to lessen flood damages to existing and future buildings.								X						L	Staff time	2015	Goals 1 & 2, Objectives 1A & 2A
27	Low	New	Foster Mutual Aide Agreements	H	Continue to foster and maintain mutual aid agreements with local and regional partners to enhance Park County's ability to protect its citizens and infrastructure form the impacts of natural hazards.	X	X	X	X	X	X	X	X	X	X	X		Park County OEM, Police/Sheriff and Fire Districts	L	Staff time	Ongoing	Goal 9, Objective 9A
28	Low	2009 Plan	Stream management	M	Identify stream reaches that do not meet water quality standards, specifically those with sediment buildup and provide technical information to local officials from the three Park County jurisdictions about the significance and consequences of sediment buildup in local streams.								X					public works	L	Staff time/ general fund	2015	Goals 2 & 9, Objective 2A
29	Low	2009 Plan	Community Thunderstorm Education	M	Educate the public about thunderstorm awareness and safety precautions		X											OEM	L	Staff Time	Ongoing	Goals 1 and 4, Objectives 1A & 4A.

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30	Low	2009 Plan	Continued Development of After Action Reports	H	Continually produce a written After Action Report for every exercise and disaster in Park County, and make those results known to all involved so that processes and procedures can be improved in future operations.	X	X	X	X	X	X	X	X	X	X	X		OEM and local emergency services	L	Staff Time	Ongoing	Goals 1 & 9, Objectives 1A & 9 A/B
31	Low	2009 Plan	Emergency Notification Systems	H	Create a public notification program for severe thunderstorms and lightning, tornados, winter weather, and flash flooding.		X	X					X	X				OEM and local emergency services	M	Staff time and grants	2016	Goal 6, Objective 6A
32	Low	2009 Plan	VMS for Emergency Notification	H	Utilize additional Variable Message Sign (VMS) boards on Highways, as well as county roads, to warn the public about possible hazards in the area.	X	X	X	X	X	X	X	X	X	X	X		OEM and local emergency services	L	Staff time	Ongoing	Goal 6, Objective 6A
33	Low	2009 Plan	Security / risk profiles for County Critical Facilities	H	As funding becomes available, develop detailed risk profiles for each identified critical facility, keeping in mind security needs and vulnerabilities in order to make buildings more secure, especially those critical during an emergency response.	X	X	X	X	X	X	X	X	X	X	X		OEM	H	Staff time, general fund and grants	2017	Goal 7, Objective 7A

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34	Low	2009 Plan	Flood Hazard Protection Plans	M	Continue to identify those areas of Park County most in need of flood hazard reduction plans with detailed engineering analyses. Identify specific drainage "hot spots" in the Park County jurisdictions, develop engineering plans to improve bridges, culverts, channels and other infrastructure in those areas, fund the projects and complete them to lessen the likelihood that future floods will cause harm to existing and future buildings.								X					OEM	M	Staff time, general fund and grants	Ongoing	Goals 1, 2 & 3, Objectives 1A, 2A and 3A.
35	Low	2009 Plan	Seismic Mapping	L	With the assistance of CGS and USGS, map highest priority locations for detailed seismic risk studies and other geologic hazards in Park County and identify bridges and other infrastructure subject to the greatest seismic risk.						X							OEM	H	Staff time, general fund and grants	2014	Goal 1, Objective 1A
36	Low	2009 Plan	ID High Risk Drought Communities	M	Continue to identify those unincorporated communities in Park County most at risk due to drought, develop Community Water Conservation Plans, and alternate water supply locations for those communities, and implement those plans.				X									OEM	M	Staff time, general fund and grants	2016	Goals 1 & 9, Objectives 1A & 9A

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37	Low	2009 Plan	Drought monitoring	M	Identify specific locations and specific parameters for a long-term drought monitoring program and implement the monitoring program. Obtain assistance and technical recommendations from the Natural Resources Conservation Service for an improved program of drought preparedness and drought response (Fairplay).				X									OEM	M	Staff time, general fund and grants	2015	Goals 3 & 4, Objectives 3A & 4A
FAIRPLAY MITIGATION ACTIONS																						
38	High	New	Building ordinance updates	High	Investigate the adoption of an Ordinance that requires Fire Retardant materials in new building construction and any remodels/replacements.	X												Fairplay Administrator	Low	General Fund/Staff Time	2014	
39	High		Private property fire mitigation	High	Since the threat and impact of wildfires in our community continues to rise, investigate what would be necessary to implement a program requiring property owners to mitigate fire sources on their property, such as dead vegetation. These actions would also reduce potential damage in high wind events, tornados and drought.	X	X		X						X			Fairplay	Medium	General Fund/Staff Time/DHS Grants	2014 and on-going	

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40	High		Improve winter access to critical facilities	High	Public Works will make road access during severe winter weather a priority such as plowing and sanding, making access to critical facilities easier.			X										Fairplay Department of Public Works	Medium	General Fund	2014 and on-going	
41	Med	New	Severe winter weather public education	Medium	Educate Fairplay residents, business owners and visitors on the potential impacts of severe winter weather and provide FEMA sponsored brochures regarding severe winter weather preparedness. The Police and Public Works will handout these to town citizens and make the available at Town Hall.			X										Fairplay Police Department	Low	General Fund and FEMA grants	2014 and on-going	
42	Med	New	Drainage assessment and culvert installation	Medium	Public Works will undertake an assessment of Fairplay's current drainage system. Based on the results, the town will strive to install new culverts as indicated and needed. Additionally, PW's will create a maintenance plan to repair and maintain drainage culverts in the Town's higher flood areas								X					Fairplay Department of Public Works	High	General Fund	2014 and on-going	

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43	Low	New	HAZMAT planning and response	Medium	Work together with the North-West Fire Protection District and the Colorado State Patrol to implement their existing HAZMAT plans as the predominant threat from HAZMAT is on the two State highways running through Fairplay.												X	Police department together North-West FPD and State Patrol	Low	General fund	2014 and on-going	
44	Low	New	HAZMAT training	Medium	All Police and Public Works employees will attend a HAZMAT Awareness Program in the next year.												X	Fairplay Police and Public Works Departmen ts	Medium	General Fund and DHS Grants	2014 and on-going	
ALMA MITIGATION ACTIONS																						
45	High	New	Develop alternative water supplies	High	As climate change continues to affect the region, it will be important to identify alternative water supplies for time of drought. Consider the development of mutual aid agreements with alternative suppliers. Additionally, look at obtaining additional water rights.				X									Town Administra tor	High	General Fund	2013 & on-going	
46	High	New	Back-up power	High	Research options, cost, funding and acquisition of back-up power sources for Alma essential services to avoid water shortages, etc. during extended power outages.	X	X	X	X	X	X	X	X	X	X	X	X	Town Administra tor	M	Governm ent Surplus /general Fund	2013	

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47	High	New	Tree Watch program	High	Support programs such as a "tree watch" program that encourages residents to proactively manage vegetative problem areas (beetle kill) by use of selective removal of hazardous trees, tree replacement, etc.		X	X							X			Town Administrator	M	General fund / staff time	2014 & on-going	
48	High	New	Tree Trimming	High	Develop and implement a program which encourages residents to trim or remove trees that could affect power lines		X	X							X			Town Administrator	L	General fund / staff time	2014 & on-going	
49	Med	New	Defensible Space	High	Review current town codes and policies and update as necessary to encourage residents and businesses to create and maintain defensible space around structures and infrastructure.	X												Town Administrator	L	General Fund	2013 & on-going	
50	Med	New	Safe Room	High	Develop a safe room plan for Alma community facilities and residents		X	X							X			Town Administrator	H	General Fund/grants	2015	
51	Med	New	Fire retardant building materials	High	Review current town codes and policies and update as necessary to require the use of fire-retardant building materials in high fire hazard areas.	X												Town Administrator	L	General Fund	2013 & on-going	
52	Low	New	Lightning rods	Medium	Continue to Install and upgrading lightning rods on public structures as needed		X											Town Administrator	M	General fund / water / sewer	2013 & on-going	

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53	Low	New	Adopt no adverse impact standards	Medium	Consider establishing an administrative procedure or change in the current codes that requires builders to develop a site drainage plan ensuring "no adverse impact" when they apply for permits for new construction within the town.								X					Town Administrator	L	General fund, staff time	2014	
54	Low	New	Mapping of flood prone areas	Medium	Complete GIS and other automated inventories for stormwater, problem drainage areas, DFIRM and other community assets.								X					Town Administrator	H	General fund	2015	
North-West Fire District																						
55	High	New	North-West FPD Wildfire Hazard Mitigation	H	North-West FPD completed a CWPP in 2010. Included in this plan are proposed locations for wildfire mitigation projects based on risk and hazard severity to reduce the frequency and intensity of wildfires within the District. All of these projects would benefit from funding in order to proceed.	X		X										North-West FPD, Towns, U.S. Forest Service, homeowner associations etc.	M	Grants with soft, in-kind matches	2014-2015	Goals 1, 3 and 7, Objectives 1A and 7A

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56	High	New	North-West FPD CWPP renewal	H	North-West FPD's CWPP will be in need of review and renewal by 2015 in order to stay current and meet grant requirements. By keeping the plan current, North-West FPD can provide the most accurate information to its residents and remain eligible for grant funding to perform mitigation work called for in the CWPP.	X			X									North-West FPD and Towns	M	FEMA & CWCB grants, etc.	2014-2015	Goals 1, 3 and 7, Objectives 1A, 3A and 7A
57	High	New	Harden County communication and tower facilities.	H	Communication during emergency events is critical. There is a significant need to harden existing North-West FPD radio and microwave communication and tower facilities for all hazards.	X	X	X	X	X	X	X	X	X	X	X		North-West FPD	H	C	2014 and ongoing	Goal 7, Objective 7A
58	High	New	Fuels/Defensible Space Treatment	H	There has been a lack of fuels treatment / reduction and implementation of defensible space around structures in the wildland / urban interface area. Actively addressing this issue will provide increased protection to life and property within the North-West FPD.	X			X									North-West FPD	M	FEMA & CWCB grants, etc.	2014 and ongoing	Goals 1, 3 and 7, Objectives 1A, 3A and 7A

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59	Med	New	Wildfire mitigation actions in the areas identified as the highest risk areas in the CWPP.	H	Research the availability and make grant applications for wildfire mitigation actions in the areas identified as the highest risk areas in the North-West FPD CWPP.	X												North-West FPD	L	FEMA & CWCB grants, etc.	2013 and ongoing	Goals 1, 3 and 7, Objectives 1A, 3A and 7A
60	Med	2009 Plan	Community Wildfire Education	H	Continue community outreach and conduct workshops to educate property owners at risk within the North-West FPD from wildfire about specific maintenance strategies to reduce their risk from wildfire, and develop a list of the components of a homeowner's wildfire emergency evacuation kit and publicize the need for such kits.	X												North-West FPD	L	Staff Time	Ongoing	Goals 1 and 4, Objectives 1A & 4A.
61	Med	2009 Plan	Continue to regularly conduct emergency exercises	H	North-West FPD to actively participate in one exercise annually, involving members of the public, regarding the four phases of emergency management, to increase understanding of each person's role during a disaster, including public health issues such as Pandemic Flu.	X	X	X	X	X	X	X	X	X	X	X		North-West FPD together with County OEM and other FPDs	M	Staff Time	Ongoing	Goals 1, 5 & 9, Objectives 1A, 5A & 9A

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#	Priority	Project Status	Project Name	Benefit To Community	Problem/Project Description	Wildfire	Severe Storms (lightning, hail & high winds)	Severe Winter Weather	Drought and Extreme Temperatures	Landslide	Earthquake	Hazardous Materials	Flood	Land Subsidence/Sinkholes/Soil Erosion	Tornado	Dam Failure	HAZMAT	Lead & Support Agency	Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal:
62	Low	2009 Plan	Winter Weather Outreach and Education	M	Create an education program regarding winter weather preparedness for citizens within the North-West FPD. Ensure that ranch owners and pet owners are included in this process, and specific strategies for protecting livestock and pets from severe winter weather events are addressed			X										North-West FPD	L	Staff Time	Ongoing	Goals 1 and 4, Objectives 1A & 4A.
63	Low	New	Alternative emergency vehicle access routes	H	Investigate the status of and need to establish alternative emergency vehicle access routes in the County	X	X	X	X	X	X	X	X	X	X	X		North-West FPD together with all County	L	Staff time	2013 on	Goal 1, Objective 1A
64	Low	New	Be Wise, Be Prepared	M	Update, expand and reprint county winter disaster preparedness booklet to cover all hazards and distribute to residents of the County through a mass mailing or by making it available to organizations such as homeowner associations and fire districts for distribution. Ensure that the County-wide public addresses any factors that may be unique to residents and businesses located within the North-West FPD boundaries.	X	X	X	X	X	X	X	X	X	X	X	X	North-West FPD together with County OEM and other FPDs	M	Grants, County and other organizations funding	2014-2015	Goals 1 and 4, Objectives 1A & 4A

TABLE ES-1.
ACTION PLAN—COUNTYWIDE MITIGATION INITIATIVES

#	Priority	Project Status	Project Name	Benefit To Community	Problem/Project Description	Wildfire	Severe Storms (lightning, hail & high winds)	Severe Winter Weather	Drought and Extreme Temperatures	Landslide	Earthquake	Hazardous Materials	Flood	Land Subsidence/Sinkholes/Soil Erosion	Tornado	Dam Failure	HAZMAT	Lead & Support Agency	Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal:
Platte Canyon FPD / Bailey																						
65	High	New	Fuels/Defensible Space Treatment	H	There has been a lack of fuels treatment / reduction and implementation of defensible space around structures in the wildland / urban interface area. Actively addressing this issue will provide increased protection to life and property within the North-West FPD.	X			X									Platte Canyon FPD	M	FEMA & CWCB grants, etc.	2014 and ongoing	Goals 1, 3 and 7, Objectives 1A, 3A and 7A
66	High	New	CWPP	H	Implement and maintain current Community Wildfire Protection Plans	X												Platte Canyon FPD	M	FEMA & CWCB grants, etc.	2014 and ongoing	Goals 1, 3 and 7, Objectives 1A, 3A and 7A
67	Med	New	Harden Bailey and area communication and tower facilities.	H	Communication during emergency events is critical. There is a significant need to harden existing County radio and microwave communication and tower facilities for all hazards.	X	X	X	X	X	X	X	X	X	X	X		Platte Canyon FPD	H	C	2014 and ongoing	Goal 7, Objective 7A
68	Low	New	Winter Weather Outreach and Education	M	Create an education program regarding winter weather preparedness for Bailey and area residents. Ensure that ranch owners and pet owners are included in this process, and specific strategies for protecting livestock and pets from severe winter weather events are addressed			X										Platte Canyon FPD	L	Staff Time	Ongoing	Goals 1 and 4, Objectives 1A & 4A.

TABLE ES-1.
ACTION PLAN—COUNTYWIDE MITIGATION INITIATIVES

#	Priority	Project Status	Project Name	Benefit To Community	Problem/Project Description	Wildfire	Severe Storms (lightning, hail & high winds)	Severe Winter Weather	Drought and Extreme Temperatures	Landslide	Earthquake	Hazardous Materials	Flood	Land Subsidence/Sinkholes/Soil Erosion	Tornado	Dam Failure	HAZMAT	Lead & Support Agency	Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal:
Southern Park County FPD/South Park Ambulance District																						
69	High	New	Alternative emergency vehicle access routes	H	Investigate the status of and need to establish alternative emergency vehicle access routes in the County	X	X	X	X	X	X	X	X	X	X	X	X	South Park Ambulance	L	Staff time	2013 on	Goal 1, Objective 1A
70	High	2009 Plan	Wildfire mitigation activities in high risk areas	H	Identify the priority areas for high wildfire risk that have not burned in the last five years. Encourage and assist neighborhoods and homeowner associations in developing local wildfire plans, allowing for mitigation project development in the high hazard areas and technical input to future land use decisions.	X			X									Park County OEM and Fire Districts	L	Staff time	2014 onward	Goals 1, 3, 4 and 7, Objectives 1A, 4A and 7A
71	High	New	Be Wise, Be Prepared	M	South Park Ambulance is interested in working together with County OEM and other agencies to update, expand and reprint county winter disaster preparedness booklet to cover all hazards and distribute to residents of the County through a mass mailing or by making it available to organizations such as homeowner associations and fire districts for distribution.	X	X	X	X	X	X	X	X	X	X	X	X	South Park Ambulance with County Emergency Manageme nt	M	Grants, County and other organizati ons funding	2014-2015	Goals 1 and 4, Objectives 1A & 4A

TABLE ES-1.
ACTION PLAN—COUNTYWIDE MITIGATION INITIATIVES

#	Priority	Project Status	Project Name	Benefit To Community	Problem/Project Description	Wildfire	Severe Storms (lightning, hail & high winds)	Severe Winter Weather	Drought and Extreme Temperatures	Landslide	Earthquake	Hazardous Materials	Flood	Land Subsidence/Sinkholes/Soil Erosion	Tornado	Dam Failure	HAZMAT	Lead & Support Agency	Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal:
72	High	2009 Plan	Dam failure warning systems	M	South Park emergency responders will work with the County OEM and the Division of Water Resources to rank high priority dams within Park County and for installation of dam failure warning systems and plans.								X					South Park emergency responders w/ Park County OEM			2016	Goals 3, 6 and 7, Objectives 3A, 6A and & 7A
73	Med	New	Revise local code requirements for ingress/egress	H	South Park Ambulance will work together with public officials to investigate the process and revise current county codes to require that all new platted subdivisions have a minimum of two ingress and egress points.	X	X	X	X	X	X	X	X	X	X	X	X	South Park Ambulance with County Planning	L	Staff time	2014 onward	Goal 1, Objective 1A
74	Med	2009 Plan	Severe storm notification systems	M	Develop a program to better receive, coordinate and distribute information about likely thunderstorms, with assistance from NOAA and NWS.		X											Park County OEM	M	Staff time and grants	2015	Goal 6, Objective 6A
75	Med	New	Harden County communication and tower facilities.	H	Southern Park FPD recognizes that communication during emergency events is critical. There is a significant need to harden existing County radio and microwave communication and tower facilities for all hazards. Southern Park County FPD will work together with local officials to find the mechanisms to harden these facilities.	X	X	X	X	X	X	X	X	X	X	X	X	County OEM	H	C	2014 and ongoing	Goal 7, Objective 7A

TABLE ES-1.
ACTION PLAN—COUNTYWIDE MITIGATION INITIATIVES

#	Priority	Project Status	Project Name	Benefit To Community	Problem/Project Description	Wildfire	Severe Storms (lightning, hail & high winds)	Severe Winter Weather	Drought and Extreme Temperatures	Landslide	Earthquake	Hazardous Materials	Flood	Land Subsidence/Sinkholes/Soil Erosion	Tornado	Dam Failure	HAZMAT	Lead & Support Agency	Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal:
76	Low	New	Fuels/Defensible Space Treatment	H	South Park emergency responders recognize that there has been a lack of fuels treatment / reduction and implementation of defensible space around structures in the wildland / urban interface area within their service area. They propose to actively address this issue recognizing that it will provide increased protection to life and property.	X			X									Southern Park County FPD together with other area agencies	M	FEMA & CWCB grants, etc.	2014 and ongoing	Goals 1, 3 and 7, Objectives 1A, 3A and 7A
77	Low	2009 Plan	Winter Weather Outreach and Education	M	Southern Park FPD proposes to work with County officials and other area first responders to create an education program regarding winter weather preparedness for citizens. They will ensure that ranch owners and pet owners are included in this process, and specific strategies for protecting livestock and pets from severe winter weather events are addressed.			X										OEM	L	Staff Time	Ongoing	Goals 1 and 4, Objectives 1A & 4A.
78	Low	2009 Plan	Harden Infrastructure	H	As funding becomes available, Southern Park County FPD recognizes the need to harden infrastructure at greatest risk from wildfire. Develop infrastructure protection strategies and implement those strategies.	X												Southern Park County FPD, County OEM and local emergency services	H	Staff time, general fund and grants	Ongoing	Goals 7, 8 & 9, Objectives 7A, 8A & 9B

PART 1 —
THE PLANNING PROCESS

CHAPTER 1.
INTRODUCTION TO THE PLANNING PROCESS

1.1 WHY PREPARE THIS PLAN?

1.1.1 The Big Picture

Hazard mitigation is defined as a way to reduce or alleviate the loss of life, personal injury, and property damage that can result from a disaster through long- and short-term strategies. It involves strategies such as planning, policy changes, programs, projects, and other activities that can mitigate the impacts of hazards. The responsibility for hazard mitigation lies with many, including private property owners; business and industry; and local, state, and federal government.

The federal Disaster Mitigation Act (DMA) of 2000 (Public Law 106-390) required state and local governments to develop hazard mitigation plans as a condition for federal disaster grant assistance. Prior to 2000, federal disaster funding focused on disaster relief and recovery, with limited funding for hazard mitigation planning. The DMA increased the emphasis on planning for disasters before they occur.

The DMA encourages state and local authorities to work together on pre-disaster planning, and it promotes sustainability for disaster resistance. "Sustainable hazard mitigation" includes the sound management of natural resources and the recognition that hazards and mitigation must be understood in the largest possible social and economic context. The enhanced planning network called for by the DMA helps local governments articulate accurate needs for mitigation, resulting in faster allocation of funding and more cost-effective risk reduction projects.

The Colorado Division of Emergency Management (CDEM), and Region VIII of the Federal Emergency Management Agency (FEMA) would like all communities in Colorado to prepare local hazard mitigation plans to reduce and mitigate future losses from natural or human-caused hazard events. By completing and adopting these plans, communities throughout the State may be eligible for grants and other assistance in implementing them. To facilitate development of local plans throughout Colorado, CDEM staff are available to provide technical assistance and support to communities throughout the plan development process by both attending and participating in committee meetings as well as conference calls, meetings, etc. Lessons learned from other plan success stories in the state can be used to strengthen the plan development process. In preparing their hazard mitigation plan, Park County, the Towns of Alma and Fairplay, the Platte Canyon Fire Protection District (FPD), the North-West Fire Protection District and Southern Park County Fire Protection District benefited from mitigation planning work lessons learned in Colorado and in other jurisdictions across the country.

The Park County Hazard Mitigation Plan will be a useful tool for all community stakeholders by increasing public awareness about local hazards and risks, while at the same time providing information about options and resources available to reduce those risks. Teaching the public about potential hazards and potential strategies for addressing them will help each of the area's jurisdictions protect themselves against the effects of the hazards, and will enable informed decision making on where to live, purchase property, or locate businesses. The Park County Hazard Mitigation Plan covers all of Park County, including Alma and Fairplay, Platte Canyon Fire Protection District, North-West Fire Protection District and Southern Park County Fire Protection District. It serves as a strategic planning tool for use by those jurisdictions in their efforts to identify and mitigate the future impacts of hazard events.

1.1.2 Local Concerns

On October 30, 2000, President Clinton signed into law the Disaster Mitigation Act of 2000 (DMA 2000), which established a national disaster hazard mitigation grant program that would help to reduce loss of life and property, human suffering, economic disruption, and disaster assistance costs resulting from natural disasters.

DMA 2000 amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act and added a new section to the law, Section 322 Mitigation Planning. Section 322 emphasizes the need for State, local and tribal entities to closely coordinate mitigation planning and implementation efforts. Section 322 requires local governments to prepare and adopt jurisdiction-wide hazard mitigation plans for disasters declared after November 1, 2003, (subsequently revised to November 1, 2004) as a condition of receiving Hazard Mitigation Grant Program (HMGP) project grants and other forms of non-emergency disaster assistance, and authorizes up to 7 percent of HMGP funds available to a State to be used for development of State, local and tribal mitigation plans. Local governments must review and, if necessary, update their mitigation plan every five years from the original date of the plan to continue program eligibility.

1.1.3 Purposes for Planning

This hazard mitigation plan update identifies resources, information, and strategies for reducing risk from natural hazards. Elements and strategies in the plan were selected because they meet a program requirement and because they best meet the needs of the planning partners and their citizens. One of the benefits of multi-jurisdictional planning is the ability to pool resources and eliminate redundant activities within a planning area that has uniform risk exposure and vulnerabilities. The Federal Emergency Management Agency (FEMA) encourages multi-jurisdictional planning under its guidance for the DMA. The plan will help guide and coordinate mitigation activities throughout the planning area. The plan was developed to meet the following objectives:

- Meet or exceed requirements of the DMA.
- Enable all planning partners to continue using federal grant funding to reduce risk through mitigation.
- Meet the needs of each planning partner as well as state and federal requirements.
- Create a risk assessment that focuses on Park County hazards of concern.
- Create a single planning document that integrates all planning partners into a framework that supports partnerships within the County, and puts all partners on the same planning cycle for future updates.
- Meet the planning requirements of FEMA's Community Rating System (CRS), allowing planning partners that participate in the CRS program to maintain or enhance their CRS classifications.
- Coordinate existing plans and programs so that high-priority initiatives and projects to mitigate possible disaster impacts are funded and implemented.

1.2 WHO WILL BENEFIT FROM THIS PLAN?

All citizens and businesses of Park County are the ultimate beneficiaries of this hazard mitigation plan update. The plan reduces risk for those who live in, work in, and visit the County. It provides a viable planning framework for all foreseeable natural hazards that may impact the County. Participation in development of the plan by key stakeholders in the County helped ensure that outcomes will be mutually beneficial. The resources and background information in the plan are applicable countywide, and the

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plan's goals and recommendations can lay groundwork for the development and implementation of local mitigation activities and partnerships.

1.3 HOW TO USE THIS PLAN

This plan presents all federally required elements of a disaster mitigation plan that apply to the entire planning area. This includes the description of the planning process, public involvement strategy, goals and objectives, countywide hazard risk assessment, countywide mitigation initiatives, and a plan maintenance strategy. It also includes all federally required elements for each participating jurisdiction. All planning partners will adopt the plan in its entirety.

The following appendices include information or explanations to support the main content of the plan:

- Appendix A—A glossary of acronyms and definitions
- Appendix B—Public outreach information, including the hazard mitigation questionnaire and summary and documentation of public meetings.
- Appendix C—A template for progress reports to be completed as this plan is implemented
- Appendix D—A menu of possible mitigation alternatives used to develop the action plan
- Appendix E—Plan Adoption Resolutions from Planning Partners

CHAPTER 2.
PLAN UPDATE—WHAT HAS CHANGED

2.1 THE PREVIOUS PLAN

Due to the history of disasters in Park County, and the development of an emergency management department, the Board of Commissioners recognized the need to develop a multi-hazard mitigation plan in the mid-2000s. The county contacted the State of Colorado, who provided assistance through the Division of Emergency Management, Mitigation Branch. After receiving funding in 2007, Park County contracted with the engineering consulting firm, Dewberry, to assist in the development of a multi-hazard mitigation plan including a hazard identification and risk assessment and a mitigation strategy. The Mitigation Advisory Committee worked with the consultants throughout the planning process to ensure that potential stakeholders participated in the planning process and had opportunities to provide guidance and input in the draft and final phases of the plan.

The multi-hazard mitigation plan included Park County, the Town of Alma and the Town of Fairplay. The Board of County Commissioners for Park County and the Town Boards for Alma and Fairplay each adopted the mitigation plan. Prior to submitting the draft plan for review and approval by the Colorado Water Conservation Board, the Colorado Division of Emergency Management, and FEMA Region VIII, the three Park County jurisdictions each adopted a formal resolution approving the draft plan. When the draft plan was revised and approved, the three jurisdictions each adopted a formal resolution approving the final plan, which was completed in 2009. The 2009 plan reviewed hazards and assigned hazard ratings to them as shown in Table 2-1.

TABLE 2-1.
2009/2010 HAZARD RANKINGS

HAZARD	Colorado 2010 Ranking for Park County	Park County.	Fairplay	Alma	Bailey
Wildfire	X	Significant	Significant	Significant	Significant
Drought	X	Moderate	Limited	Limited	Moderate
Severe Winter Weather	X	Significant	Significant	Significant	Significant
Flooding	X	Moderate	Moderate	Moderate	Moderate
Severe Thunderstorm, Hail Storm, High Wind Events	X	Limited	Limited	None	Limited
Earthquake	X	Limited	Limited	None	None
Landslide		Limited	Limited	Moderate	Limited
HAZMAT		Significant	Significant	Significant	Significant
Avalanche		Not Profiled	Not Profiled	Not Profiled	Not Profiled
Tornado		Not Profiled	Not Profiled	Not Profiled	Not Profiled
Dam Failure		Limited	Limited	Moderate	None
Sinkholes	X	Not Profiled	Not Profiled	Not Profiled	Not Profiled

As part of its mitigation strategy, the 2009 plan identified nine goals in four categories:

- Category I: Planning And Collaboration—Planning and Collaboration focuses on revising or commissioning, creating, approving and implementing plans that will reduce the county's vulnerability to all hazards addressed in the Hazard Mitigation Plans. An emphasis will be placed on ensuring the participation of all jurisdictions within Park County.
  - Goal 1: Ensure hazard awareness and risk reduction principles are institutionalized into the Park County jurisdictions daily activities, processes and functions, by incorporating them into policy documents and initiatives.
  - Goal 2: Increase the county jurisdictions floodplain management activities and participation in the National Flood Insurance Program.
  - Goal 3: Develop support for mitigation among local jurisdictions and local officials.
  - Category II: Community Awareness And Training—Community Awareness Training focuses on ways to best make citizens aware of the risk of a hazard affecting them, and how best to mitigate against and prepare for said hazards.
  - Goal 4: Enhance countywide understanding and awareness of community preparedness needs.
  - Goal 5: Conduct exercises and training regarding the prevention and mitigation of Park County hazards.
  - Goal 6: Explore diverse public notification systems for impending hazards.
- Category III: Hazard Reduction—Hazard Reduction focuses on ways to reduce risk through structural projects and participation in regional, state or federal hazard reduction programs.
  - Goal 7: Enhance the safety of residents and businesses by protecting public and private infrastructure and critical facilities from the effects of natural and human-caused hazards.
  - Category IV: Emergency Services—Emergency Services focuses on best preparing emergency services to mitigate against and to respond to all hazards through the use of redundant exercises and policy and procedure reviews.
  - Goal 8: Improve emergency services capabilities.
  - Goal 9: Enhance interagency collaboration through mutual aid agreements and long-term planning.

A future vision and one or two objectives were then identified for each of the nine goals. A mitigation action was then identified to achieve each objective—40 mitigation actions altogether. The "STAPLE/E" criteria were then used to assign a priority ranking for each action (high, medium or low priority). The STAPLE/E criteria are evaluation criteria in seven categories: social, technical, administrative, political, legal, economic and environmental. The priority evaluation identified 12 mitigation actions as high priority, 21 as medium priority, and seven as low priority.

2.2 WHY UPDATE?

Title 44 of the Code of Federal Regulations (44 CFR) stipulates that hazard mitigation plans must present a schedule for monitoring, evaluating, and updating the plan. This provides an opportunity to reevaluate recommendations, monitor the impacts of actions that have been accomplished, and determine if there is a need to change the focus of mitigation strategies. A jurisdiction covered by a plan that has expired is not able to pursue elements of federal funding under the Robert T. Stafford Act for which a current hazard mitigation plan is a prerequisite.

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2.3 THE UPDATED PLAN—WHAT IS DIFFERENT?

The updated plan differs from the initial plan in a variety of ways:

- At the direction of the County, the data and information from the 2009 Plan was presumed to be correct and no attempt was made to update historical information carried forward from the previous plan. Updated information reflects the time period from approval of the previous plan to current.
- The 2009 plan had two participating jurisdictions: Alma and Fairplay. This update includes those two communities plus the Platte Canyon Fire Protection District, the North-West Fire Protection District, the Southern Park County Fire Protection District and the South Park Ambulance District.
- While the previous plan data was predominantly presented in drainage basin area information, this plan is primarily presented to reflect data (as available) relevant to the planning partners' geography.

Table 2-2 indicates the major changes between the two plans as they relate to 44 CFR planning requirements.

TABLE 2-2.
PLAN CHANGES CROSSWALK (TO BE COMPLETED PRIOR TO SUBMITTAL TO STATE)

44 CFR Requirement	Previous Plan	Updated Plan
§201.6(b): In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include: (1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval; (2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and (3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.		
§201.6(c)(2): The plan shall include a risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.		
§201.6(c)(2)(i): [The risk assessment shall include a] description of the … location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.		
§201.6(c)(2)(ii): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i). This description shall include an overall summary of each hazard and its impact on the community		
§201.6(c)(2)(ii): [The risk assessment] must also address National Flood Insurance Program insured structures that have been repetitively damaged floods		

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TABLE 2-2.
PLAN CHANGES CROSSWALK (TO BE COMPLETED PRIOR TO SUBMITTAL TO STATE)

44 CFR Requirement	Previous Plan	Updated Plan
§201.6(c)(2)(ii)(A): The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area.		
§201.6(c)(2)(ii)(B): [The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) and a description of the methodology used to prepare the estimate.		
§201.6(c)(2)(ii)(C): [The plan should describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.		
§201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.		
§201.6(c)(3)(i): [The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.		
§201.6(c)(3)(ii): [The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.		
§201.6(c)(3)(ii): [The mitigation strategy] must also address the jurisdiction's participation in the National Flood Insurance Program, and continued compliance with the program's requirements, as appropriate.		

TABLE 2-2.
PLAN CHANGES CROSSWALK (TO BE COMPLETED PRIOR TO SUBMITTAL TO STATE)

44 CFR Requirement	Previous Plan	Updated Plan
§201.6(c)(3)(iii): [The mitigation strategy shall describe] how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.		
§201.6(c)(4)(i): [The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.		
§201.6(c)(4)(ii): [The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.		
§201.6(c)(4)(iii): [The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.		
§201.6(c)(5): [The local hazard mitigation plan shall include] documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commission, Tribal Council).		

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CHAPTER 3.
PLAN METHODOLOGY

To develop the Park County Hazard Mitigation Plan Update, the County followed a process that had the following primary objectives:

- Secure grant funding
- Form a planning team
- Establish a planning partnership
- Define the planning area
- Establish a steering committee
- Coordinate with other agencies
- Review existing programs
- Engage the public.

These objectives are discussed in the following sections.

3.1 GRANT FUNDING

This planning effort was supplemented by a grant from FEMA/Colorado Office of Emergency Management was the applicant agent for the grant. The grant was applied for in 2012 and funding was appropriated in 2013. It covered 75 percent of the cost for development of this plan; the County and its planning partners covered the balance through in-kind contributions.

3.2 FORMATION OF THE PLANNING TEAM

Park County hired Tetra Tech, Inc. to assist with development and implementation of the plan. The Tetra Tech project manager assumed the role of the lead planner, reporting directly to a County-designated project manager. A planning team was formed to lead the planning effort, made up of the following members:

- Park County agencies:
  - Emergency Management
  - Development Services
  - GIS Mapping
  - Sheriff's Office
  - Building, Public Health, Communications Department
  - Human Resources
  - Tourism
- Town of Alma
- Town of Fairplay

- Special Districts:
  - Platte Canyon Fire Protection District
  - North-West Fire Protection District
  - South Park Ambulance District
  - Southern Park County Fire Protection District
- Colorado State Patrol
- Coalition for the Upper South Platte
- Platte Canyon School District
- Bureau of Land Management

3.3 ESTABLISHMENT OF THE PLANNING PARTNERSHIP

Park County opened this planning effort to all eligible local governments and jurisdictions within the County. The planning team made a presentation at a stakeholder meeting on April 25, 2013 to introduce the mitigation planning process and solicit planning partners. A follow-up to the initial stakeholder meeting was held on May 9, 2013 with potential planning partners. Key meeting objectives were as follows:

- Provide an overview of the Disaster Mitigation Act.
- Describe the reasons for a plan.
- Outline the County work plan.
- Outline planning partner expectations.
- Seek commitment to the planning partnership.
- Seek volunteers for the Steering Committee.
- Review the 2009 Plan overarching Goals and Objectives

The planning partners covered under this plan are shown in Table 3-1.

TABLE 3-1.
PLANNING PARTNERS

Jurisdiction	Point of Contact	Title
Park County	Tom Eisenman	Park County Administrator
Town of Fairplay	Dave Gottschalk	Fairplay Police Chief
Platte Canyon Fire Protection District	Joe Burgett	Platte Canyon FPD
North-West Fire Protection District	Brian Foltz, Kristy Olme	North-West FPD Rep
Southern Park County Fire Protection District	Kent Wierman, Mike Simpson	Chief
South Park Ambulance District	Paul Mattson	South Park Ambulance Rep

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3.4 DEFINING THE PLANNING AREA

The planning area was defined to consist of the all of Park County and its participating communities. All partners to this plan have jurisdictional authority within this planning area.

3.5 THE STEERING COMMITTEE

Hazard mitigation planning enhances collaboration and support among diverse parties whose interests can be affected by hazard losses. A steering committee was formed to oversee all phases of the plan. The members of this committee included key planning partner staff, citizens, and other stakeholders from within the planning area. The planning team assembled a list of candidates representing interests within the planning area that could have recommendations for the plan or be impacted by its recommendations. While the partnership confirmed an invited committee of more than 30 members at the kickoff meeting, any interested citizen was welcome and encouraged to participate in this dynamic process. Table 3-2 lists the committee members.

TABLE 3-2.
STEERING COMMITTEE MEMBERS

Name	Organization
Brian Foltz	North-West Fire Protection District
Carol Ekarius	Coalition for the Upper South Platte
Cindy Gharst	Park Co. HR
Corey Flint	Alma Police Department
Dave Rollins	Colorado State Patrol
David Gottschalk	Town of Fairplay
Ed Skerjanec	Bureau of Land Manage.
Fred Wegener	Park County Sheriff's Office
Gene Stanley	Park County Emergency Management
Greg Flint	Alma Police Department
Jara Johnson	CUSP
Joe Burgett	Platte Canyon Fire Protection District
John Logan	Park Co. Building Department
Kat Herrera	Park Co. GIS
Kent Wierman/Mike Simpson	Southern Park County Fire Protection District
Kristy Olme	North-West Fire Protection District
Linda Balough	Park County Tourism
Lynn Ramey/Sandra Harshaw	Park County Public Health
Maria Mitchell	Park Co. Communications
Paul Mattson/D. Sander	South Park Ambulance District
Tom Eisenman	Park Co. Administration

The Steering Committee agreed to meet a minimum of four times or as needed throughout the course of the plan's development. The planning team facilitated each Steering Committee meeting, which addressed a set of objectives based on the work plan established for the plan. The Steering Committee met three times from April of 2013 through August 2013. Meeting agendas and attendance logs are available for review in Appendix B. All Steering Committee meetings were open to the public and agendas and meeting notes were posted to the hazard mitigation plan website.

3.6 COORDINATION WITH OTHER AGENCIES

Opportunities for involvement in the planning process must be provided to local and regional agencies involved in hazard mitigation, agencies with authority to regulate development, businesses, academia, and other private and nonprofit interests (44 CFR, Section 201.6(b)(2)). This task was accomplished by the planning team as follows:

- **Steering Committee Involvement**—Agency representatives were invited to participate on the Steering Committee.
- **Agency Notification**—The following agencies were invited to participate in the plan development process from the beginning and were kept apprised of plan development milestones:
  - Bureau of Land Management
  - Platte Canyon School District
  - Colorado State Forest Service
  - Colorado Office of Emergency Management

  These agencies received meeting announcements, meeting agendas, and meeting minutes by e-mail throughout the plan development process. These agencies supported the effort by attending meetings or providing feedback on issues.
- **Pre-Adoption Review**—All the agencies listed above were provided an opportunity to review and comment on this plan, primarily through the hazard mitigation plan website. Each agency was sent an e-mail message informing them that draft portions of the plan were available for review. In addition, the complete draft plan was sent to Colorado Office of Emergency Management for a pre-adoption review to ensure program compliance.

3.7 REVIEW OF EXISTING PROGRAMS

Hazard mitigation planning must include review and incorporation, if appropriate, of existing plans, studies, reports and technical information (44 CFR, Section 201.6(b)(3)). Chapter 6 of this plan provides a review of laws and ordinances in effect within the planning area that can affect hazard mitigation initiatives. Chapter 6 also presents an assessment of all planning partners' regulatory, technical and financial capabilities to implement hazard mitigation initiatives.

3.8 PUBLIC INVOLVEMENT

Broad public participation in the planning process helps ensure that diverse points of view about the planning area's needs are considered and addressed. The public must have opportunities to comment on disaster mitigation plans during the drafting stages and prior to plan approval (44 CFR, Section 201.6(b)(1)). The Community Rating System expands on these requirements by making CRS credits available for optional public involvement activities.

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3.8.1 Strategy

The strategy for involving the public in this plan emphasized the following elements:

- Include members of the public on the Steering Committee.
- Use a questionnaire to determine if the public's perception of risk and support of hazard mitigation has changed since the initial planning process.
- Attempt to reach as many planning area citizens as possible using multiple media.
- Identify and involve planning area stakeholders.

Stakeholders and the Steering Committee

Stakeholders are the individuals, agencies and jurisdictions that have a vested interest in the recommendations of the hazard mitigation plan, including planning partners. The effort to include stakeholders in this process included stakeholder invitation for participation on the Steering Committee. One example of this type participation was the contributions of the Coalition for the Upper South Platte in all meetings and discussion.

Questionnaire

A hazard mitigation plan questionnaire (see Figure 3-1) was developed by the planning team with guidance from the Steering Committee. The questionnaire was used to gauge household preparedness for natural hazards and the level of knowledge of tools and techniques that assist in reducing risk and loss from natural hazards. This questionnaire was designed to help identify areas vulnerable to one or more natural hazards. The answers to its 35 questions helped guide the Steering Committee in selecting goals, objectives and mitigation strategies. A web-based version of the questionnaire was made available on the hazard mitigation plan website as well as the Park County website. Approximately 70 questionnaires were completed during the course of this planning process. The complete questionnaire and a summary of its findings (see Figure 3-2) can be found in Appendix B of this plan. Responses were received from residents throughout the County.

Meetings

Meetings were held on April 25, 2013 in the County Building in Fairplay, on May 9, 2013 at the school district offices in Bailey, on August 8, 2013 in Fairplay, and on August 8, 2013 at the Community Center in Fairplay. Each ran from 1:30 PM to approximately 3:30 PM. All meetings were posted, advertised and noticed compliant with Park County standards and open to any and all interested public.

The meeting format allowed attendees to examine graphics and handouts and have direct conversations with project staff. Reasons for planning and information generated for the risk assessment were shared with attendees via a PowerPoint presentation. Planning partners and the planning team were present to answer questions.

Internet

At the beginning of the plan development process, announcements were posted on the County website to keep the public informed about plan development milestones and to solicit relevant input (see Figure 3-3):

http://www.parkco.us/CivicAlerts.aspx

Park County, CO Hazard Mitigation Plan Update

Public Involvement/Participation

PARK COUNTY EMERGENCY MANAGEMENT

Park County is in the process of updating the County's Hazard Mitigation Plan. Community input and involvement is instrumental in the development of a mitigation plan update that truly reflects the perceptions and needs of Park County residents.

We have developed a community survey and would like as much input from Park County residents, businesses and interested citizens as possible. Please take a few minutes to fill out this survey so that your ideas may become a part of the plan to make Park County a safer and more resilient county to natural hazards!

Community Survey Link:

http://www.surveymonkey.com/s/Park_County_CO_Natural_Hazards_Survey

If you have any questions, please don't hesitate to contact: **Laura Johnston** at:

Tetra Tech Inc. laura.johnston@tetratech.com or 303-312-8807

TETRA TECH

Figure 3-1. Hazard Mitigation Questionnaire

Which of the following have provided you with useful information to help you be prepared for a natural hazard event? (Check all that apply)

	Response Percent	Response Count
Emergency preparedness information from a government source (e.g., federal, state, or local emergency management)	56.7%	34
Personal experience with one or more natural hazards/disasters	58.3%	35
Locally provided news or other media information	48.3%	29
Schools and other academic institutions	6.7%	4
Attended meetings that have dealt with disaster preparedness	16.7%	10
Community Emergency Response Training (CERT)	13.3%	8
Church	5.0%	3
None	8.3%	5
Other (please specify) Show Responses	11.7%	7
	answered question	60
	skipped question	9

Where in Park County do you live?

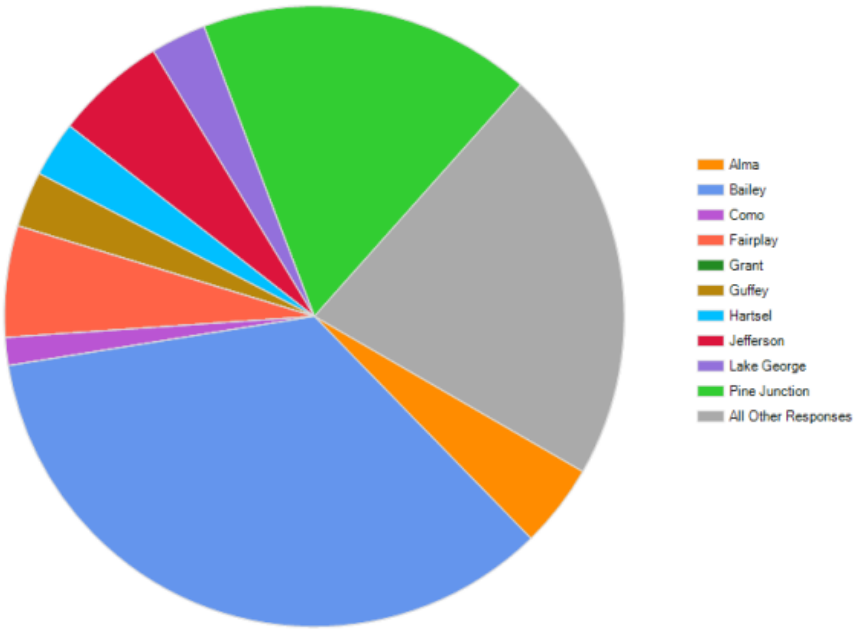

Figure 3-2. Sample Results Page from Questionnaire Distributed to the Public

Figure 3-3. Sample Page from Hazard Mitigation Plan Web Site

The site's address was publicized in all press releases, mailings, questionnaires and public meetings. Information on the plan development process, the Steering Committee, the questionnaire and phased drafts of the plan was made available to the public on the site throughout the process. The County intends to keep postings active after the plan's completion to keep the public informed about successful mitigation projects and future plan updates.

3.8.2 Public Involvement Results

By engaging the public through the public involvement strategy, the concept of mitigation was introduced to the public, and the Steering Committee received feedback from the survey that was used in developing the components of the plan. Details of responses and comments received are summarized in Appendix B.

3.9 PLAN DEVELOPMENT CHRONOLOGY/MILESTONES

Table 3-3 summarizes important milestones in the development of the plan.

TABLE 3-3.
PLAN DEVELOPMENT MILESTONES

Date	Event	Description
2012		
	Submit grant application	Seek funding for plan development process
X/X	Receive notice of grant award	Funding secured.
X/X		
2013		
01/11	Initiate consultant procurement	Seek a planning expert to facilitate the process
02/27	Select Tetra Tech to facilitate plan development	Facilitation contractor secured
03/28	Steering Committee formed	Steering Committee kick-off meeting. Participants in the Plan were identified as: Park County, Alma, Fairplay, Platte Canyon Fire District, North-West Fire Protection District, and Southern Park County Fire Protection, South Park Ambulance District
04/25	Steering Committee Meeting #1 – Kickoff	1. Steering Committee purpose and responsibilities 2. Overview, purpose and goals of the Update Process 3. Final Result (Example of outline in packets) 4. Community Participation and Survey as an integral part of this process (in packet) 5. Review, discuss and amend Mitigation Goals and Objectives (in packet) 6. Hazard analysis review a. Hazards prioritized and profiled in current plan (in packet) b. Hazard history (in packets) c. Thoughts input etc.
05/06	Public Outreach	Community Survey posted on County Website inviting participation from all interested and affected parties. Notice also posted at facilities across the County.
05/09	Steering Committee meeting #2	1. Review Mitigation Goals and Objectives as modified at the kick-off and via email (handout) 2. Hazard analysis review a. Hazard history (revised handout) b. Hazards prioritized and profiled in 2010 State Plan, Park County 2009 Plan and as discussed at the kick-off meeting (in packet) c. Thoughts input etc. 3. Hazard Prioritization exercise (handout) 4. Discussion on Critical Facilities (handout) 5. 2009 Plan Mitigation Actions Update (handout)

TABLE 3-3.
PLAN DEVELOPMENT MILESTONES

Date	Event	Description
08/08	Steering Committee/Third Work Session	1. Results of the Hazard Identification and Risk Assessments 2. Survey Results 3. Review of final Goals and Objectives 4. Discussion on what is a mitigation strategy/action/project 5. Review/update current plans of actions 6. Development of new mitigation actions
10/25	Draft Plan	Internal review draft provided by planning team to County OEM
10/25	Public Comment Period	Initial public comment period of draft plan opens. Draft plan posted on plan website with press release notifying public of plan availability
11/06	Public Outreach	Board of County Commissioners meeting on Draft Plan
X/X	Adoption	Adoption window of final plan b opens
X/X	Plan Approval	Final draft plan submitted to [STATE REVIEW AGENCY] for review and approval
X/X	Plan Approval	Final plan approved by FEMA

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CHAPTER 4.
GUIDING PRINCIPLE, GOALS AND OBJECTIVES

Hazard mitigation plans must identify goals for reducing long-term vulnerabilities to identified hazards (44 CFR Section 201.6(c)(3)(i)). The Steering Committee established a guiding principle, a set of goals and measurable objectives for this plan, based on data from the preliminary risk assessment and the results of the public involvement strategy. The guiding principle, goals and objectives in this plan all support each other. Goals support the guiding principle, and objectives meet multiple goals.

4.1 GUIDING PRINCIPLE

A guiding principle focuses the range of objectives and actions to be considered. The guiding principle for the Park County Hazard Mitigation Plan Update is as follows:

- Develop and maintain a disaster resistant community that is more resilient to the economic and physical devastation associated with all hazard events

4.2 GOALS

The following are the mitigation goals for this plan:

- **Over Arching Goal:** Develop and maintain a disaster-resistant community that is more resilient to the economic and physical devastation associated with all hazard events.
- **Goal 1:** Ensure hazard awareness and risk reduction principles are institutionalized into the Park County jurisdictions' daily activities, processes and functions, by incorporating them into policy documents and initiatives.
- **Goal 2:** Increase the county jurisdictions' floodplain management activities and participation in the National Flood Insurance Program.
- **Goal 3:** Develop support for mitigation among local jurisdictions and local officials.
- **Goal 4:** Enhance countywide understanding and awareness of community preparedness needs.
- **Goal 5:** Conduct exercises and training regarding the prevention and mitigation of Park County hazards.
- **Goal 6:** Explore diverse public notification systems for impending hazards.
- **Goal 7:** Enhance the safety of residents and businesses by protecting public and private infrastructure and critical facilities from the effects of natural and human-caused hazards.
- **Goal 8:** Improve emergency service capabilities.
- **Goal 9:** Enhance interagency collaboration throughout the County and with adjacent neighbors.

4.3 OBJECTIVES

The following are the mitigation objectives for this plan:

- **Objective 1A:** Be proactive in incorporating emergency management plans into all other institutional County plans, documents and practices.

- **Objective 2A:** Assess current and applicable jurisdictional plans and documents regarding flood management to determine what changes and/or additions will be required in future revisions in order to reduce exposure and increase awareness of flood hazards in and to county property, residents and businesses.
- **Objective 3A:** Continually assess ongoing disaster preparedness programs and activities to implement changes that improve disaster preparedness for Park County.
- **Objective 4A:** Educate the public about preparedness activities and mitigation goals, allowing each citizen the opportunity to reduce personal risk and to increase property protection.
- **Objective 6A:** Ensure that the public has more than one means of obtaining information about emergencies and disasters in the county through development of redundant notification systems.
- **Objective 7A:** Ensure that countywide, measures are taken addressing specific risks to infrastructure posed by identified hazards and the resultant critical infrastructure needs and develop a funding mechanism for the priority areas.
- **Objective 8A:** Enhance interagency operations by strengthening the emergency operations center capabilities across jurisdictional boundaries.
- **Objective 9A:** Continue to work with the Emergency Services Council in Park County to address emergency and disaster-related issues and concerns.
- **Objective 9B:** Continue to work with area partners through mutual aid agreements and long-term planning efforts.

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PART 2 —
RISK ASSESSMENT

CHAPTER 5.
IDENTIFIED HAZARDS OF CONCERN AND RISK ASSESSMENT METHODOLOGY

Risk assessment is the process of measuring the potential loss of life, personal injury, economic injury, and property damage resulting from natural hazards. It allows emergency management personnel to establish early response priorities by identifying potential hazards and vulnerable assets. The process focuses on the following elements:

- Hazard identification—Use all available information to determine what types of disasters may affect a jurisdiction, how often they can occur, and their potential severity.
- Vulnerability identification—Determine the impact of natural hazard events on the people, property, environment, economy and lands of the region.
- Cost evaluation—Estimate the cost of potential damage or cost that can be avoided by mitigation.

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

5.1 IDENTIFIED HAZARDS OF CONCERN

For this plan, the Steering Committee considered the full range of natural hazards that could impact the planning area and then listed hazards that present the greatest concern. The process incorporated review of state and local hazard planning documents, as well as information on the frequency, magnitude and costs associated with hazards that have impacted or could impact the planning area.

- Wildfires, severe winter weather, drought, and severe thunderstorms/hail storms/high wind events, and drought can cause extensive property and agricultural losses throughout the County.
- Hazardous materials transport incidents are the only human-caused hazard to be given consideration in the planning process. They pose significant risk to life, property and watercourses along the U.S. Highway 285 corridor, the U.S. Highway 24 corridor and the State Highway 9 corridor. The extent of these impacts is best expressed when compared to the total number of square miles in the County and its total population. Therefore, 2,211 square miles and 17,283 residents have the potential of being impacted to some degree by five of the nine natural and human-caused hazards that have been identified in Park County.
- Landslides are isolated events, for the most part, and therefore have limited effects on the County as a whole. The same is true for dam failures, tornadoes, flooding, avalanches and earthquakes. The effects are usually area-specific and not usually widespread, based on historical occurrences. It should be noted, however, that several of the reservoirs in Park County are quite large. If the dams that contain them were to fail, the impacts of the dam failure flooding would be extensive and widespread.

5.2 CLIMATE CHANGE

Climate includes patterns of temperature, precipitation, humidity, wind and seasons. Climate plays a fundamental role in shaping natural ecosystems, and the human economies and cultures that depend on

them. "Climate change" refers to changes over a long period of time. It is generally perceived that climate change will have a measurable impact on the occurrence and severity of natural hazards around the world. Impacts include the following:

- Snow cover losses will continue, and declining snowpack will affect snow-dependent water supplies and stream flow levels around the world.
- As snow cover declines the freeze thaw cycles are affected and in some cases the depth of permafrost is decreasing.
- The risk of drought and the frequency, intensity, and duration of heat waves are expected to increase.
- More extreme precipitation is likely, increasing the risk of flooding.
- The world's average temperature is expected to increase.

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

This hazard mitigation plan update addresses climate change as a secondary impact for each identified hazard of concern. Each chapter addressing one of the hazards of concern includes a section with a qualitative discussion on the probable impacts of climate change for that hazard. While many models are currently being developed to assess the potential impacts of climate change, there are currently none available to support hazard mitigation planning. As these models are developed in the future, this risk assessment may be enhanced to better measure these impacts.

5.3 METHODOLOGY

The risk assessments in Chapter 7 through Chapter 15 describe the risks associated with each identified hazard of concern. Each chapter describes the hazard, the planning area's vulnerabilities, and probable event scenarios. The following steps were used to define the risk of each hazard:

- Identify and profile each hazard—The following information is given for each hazard:
  - Geographic areas most affected by the hazard
  - Event frequency estimates
  - Severity estimates
  - Warning time likely to be available for response.
- Determine exposure to each hazard—Exposure was determined by overlaying hazard maps with an inventory of structures, facilities, and systems to determine which of them would be exposed to each hazard.
- Assess the vulnerability of exposed facilities—Vulnerability of exposed structures and infrastructure was determined by interpreting the probability of occurrence of each event and assessing structures, facilities, and systems that are exposed to each hazard. Tools such as GIS and FEMA's hazard-modeling program called HAZUS-MH were used to perform this assessment for the flood, dam failure and earthquake hazards. Outputs similar to those from HAZUS were generated for other hazards, using maps generated by the HAZUS program.

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5.4 RISK ASSESSMENT TOOLS

5.4.1 Earthquake and Flood—HAZUS-MH

Overview

In 1997, FEMA developed the standardized Hazards U.S., or HAZUS, model to estimate losses caused by earthquakes and identify areas that face the highest risk and potential for loss. HAZUS was later expanded into a multi-hazard methodology, HAZUS-MH, with new models for estimating potential losses from hurricanes and floods.

HAZUS-MH is a GIS-based software program used to support risk assessments, mitigation planning, and emergency planning and response. It provides a wide range of inventory data, such as demographics, building stock, critical facility, transportation and utility lifeline, and multiple models to estimate potential losses from natural disasters. The program maps and displays hazard data and the results of damage and economic loss estimates for buildings and infrastructure. Its advantages include the following:

- Provides a consistent methodology for assessing risk across geographic and political entities.
- Provides a way to save data so that it can readily be updated as population, inventory, and other factors change and as mitigation planning efforts evolve.
- Facilitates the review of mitigation plans because it helps to ensure that FEMA methodologies are incorporated.
- Supports grant applications by calculating benefits using FEMA definitions and terminology.
- Produces hazard data and loss estimates that can be used in communication with local stakeholders.
- Is administered by the local government and can be used to manage and update a hazard mitigation plan throughout its implementation.

Levels of Detail for Evaluation

HAZUS-MH provides default data for inventory, vulnerability and hazards; this default data can be supplemented with local data to provide a more refined analysis. The model can carry out three levels of analysis, depending on the format and level of detail of information about the planning area:

- **Level 1**—All of the information needed to produce an estimate of losses is included in the software's default data. This data is derived from national databases and describes in general terms the characteristic parameters of the planning area.
- **Level 2**—More accurate estimates of losses require more detailed information about the planning area. To produce Level 2 estimates of losses, detailed information is required about local geology, hydrology, hydraulics and building inventory, as well as data about utilities and critical facilities. This information is needed in a GIS format.
- **Level 3**—This level of analysis generates the most accurate estimate of losses. It requires detailed engineering and geotechnical information to customize it for the planning area.

Application for This Plan

The following methods were used to assess specific hazards for this plan:

- Flood—A Level 1, general building stock analysis was performed using the default HAZUS-MH database. An updated inventory was used in place of the HAZUS-MH defaults for

essential facilities, transportation and utilities. Current Park County Digital Flood Insurance Rate Maps (DFIRMs) were used to delineate flood hazard areas and estimate potential losses from the 100- and 500-year flood events. Using the DFIRM floodplain boundaries and a U.S. Geological Survey (USGS) 10-meter resolution digital elevation model (DEM), a flood depth grid was generated and integrated into the model.

- Earthquake—A Level 1 analysis was performed to assess earthquake risk and exposure. An updated inventory of essential facilities, transportation and utility features was used in place of the HAZUS-MH defaults. Two events were modeled:
  - The arbitrary events was a Magnitude-7.0 event on the Mosquito Range (epicenter at 39.38N, 106.16W).
  - The standard HAZUS analysis was run for the 500-year probabilistic event.

5.4.2 Landslide, Severe Weather and Wildfire

For landslide, severe weather, and wildfire, historical data was not adequate to model future losses. However, HAZUS-MH is able to map hazard areas and calculate exposures if geographic information is available on the locations of the hazards and inventory data. Areas and inventory susceptible to some of the hazards of concern were mapped and exposure was evaluated. For other hazards, a qualitative analysis was conducted using the best available data and professional judgment. Locally relevant information was gathered from a variety of sources. Frequency and severity indicators include past events and the expert opinions of geologists, emergency management specialists and others. The initial data source was the Park County GIS database, augmented with state and federal data sets. Additional data sources for specific hazards were as follows:

- Landslide—Data on landslide areas, unstable slopes, and rock fall areas was provided Park County GIS .
- Severe Weather—Temperature and precipitation data was provided by the Natural Resources Conservation Service, National Water and Climatic Center's PRISM project. Tornado and hail data provided by the NOAA Storm Prediction Center.
- Wildfire—Information on wildfire hazards areas was provided by the Colorado Wildfire Risk Assessment (WRA) tool.

5.4.3 Drought

The risk assessment methodologies used for this plan focus on potential damage to structures. Because drought does not impact structures, the risk assessment for drought was more limited and qualitative than the assessment for the other hazards of concern.

5.4.4 Limitations

Loss estimates, exposure assessments and hazard-specific vulnerability evaluations rely on the best available data and methodologies. Uncertainties are inherent in any loss estimation methodology and arise in part from incomplete scientific knowledge concerning natural hazards and their effects on the built environment. Uncertainties also result from the following:

- Approximations and simplifications necessary to conduct a study
- Incomplete or outdated inventory, demographic or economic parameter data.
- GIS and Assessor data not integrated.
- The unique nature, geographic extent and severity of each hazard

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- Mitigation measures already employed
- The amount of advance notice residents have to prepare for a specific hazard event.

These factors can affect loss estimates by a factor of two or more. Therefore, potential exposure and loss estimates are approximate. The results do not predict precise results and should be used only to understand relative risk. Over the long term, Park County and its planning partners will collect additional data to assist in estimating potential losses associated with other hazards.

CHAPTER 6.
PARK COUNTY PROFILE

Established in 1861, Park County is located in the central part of Colorado, with the unincorporated town of Hartsel as the geographic center of the state (see Figure 6-1). Park County is the 17th largest of Colorado's 64 counties in area. Park County is approximately 40 miles from east to west and 50 miles from north to south, encompassing over 2,200 square miles. The entire county population as of the 2010 Census was 16,262 persons, 15,312 of whom live in unincorporated areas. In the past, Park County's economy was based on mining and ranching. Currently, the Park County economy is dependent upon summer tourism and construction and on residents in the Platte Canyon area around Bailey who commute to work in the Denver metropolitan area and on residents in the Alma/Fairplay Area who commute to work in Summit County.

6.1 GEOGRAPHIC FEATURES

The county crosses five watersheds and contains the headwaters of the South Platte River. Dams and reservoirs have been constructed to provide water for Front Range municipalities, and they also serve as fishing and recreation sites for Park County residents and visitors. Five water storage reservoirs (Antero, Eleven Mile, Tarryall, Spinney, and Montgomery) have become important wildlife and aquatic recreation areas, attracting a half-million people to the region each year. Within the county borders are portions of three wilderness areas, two state parks, 12 state wildlife areas, and more territory above 9,000 feet than any other Colorado county. Federal lands comprise 51 percent of Park County's landmass. State-owned lands account for about 8 percent and privately owned land for about 41 percent. Notable features on federal land include:

- 644,000-acre Pike National Forest
- Lost Creek, Mount Evans, and Buffalo Peaks Wilderness Areas
- Eleven Mile Canyon Recreation Area
- Bristlecone Pine Scenic Area
- Wilkerson Pass Visitor Center
- Colorado Trail

6.1.1 Mountain Ranges

Several named mountain ranges define the perimeter of Park County, including the Mosquito Range above Fairplay and Alma. This spectacular range includes four of Colorado's peaks higher than 14,000 feet, as well as 25 named summits above 13,000 feet. Other mountains in the County include:

- Buffalo Peaks west of Hartsel
- Continental Divide north of Jefferson and Como
- Front Range and Kenosha Mountains above Bailey and Grant
- Tarryall Mountains north of Lake George
- Thirtynine Mile Volcanic Field surrounding the town of Guffey

Within this ring of mountain ranges is South Park, a 900-square mile park located in the geographic center of Colorado. With an average elevation of 9,000 feet, the shortgrass prairie of South Park supports herds of elk, deer, bighorn sheep, and antelope, as well as the beaver, raccoon, bobcat, mountain lion, black bear, and waterfowl. Communities in South Park include Fairplay, Alma, Como, Jefferson, Hartsel, and Tarryall.

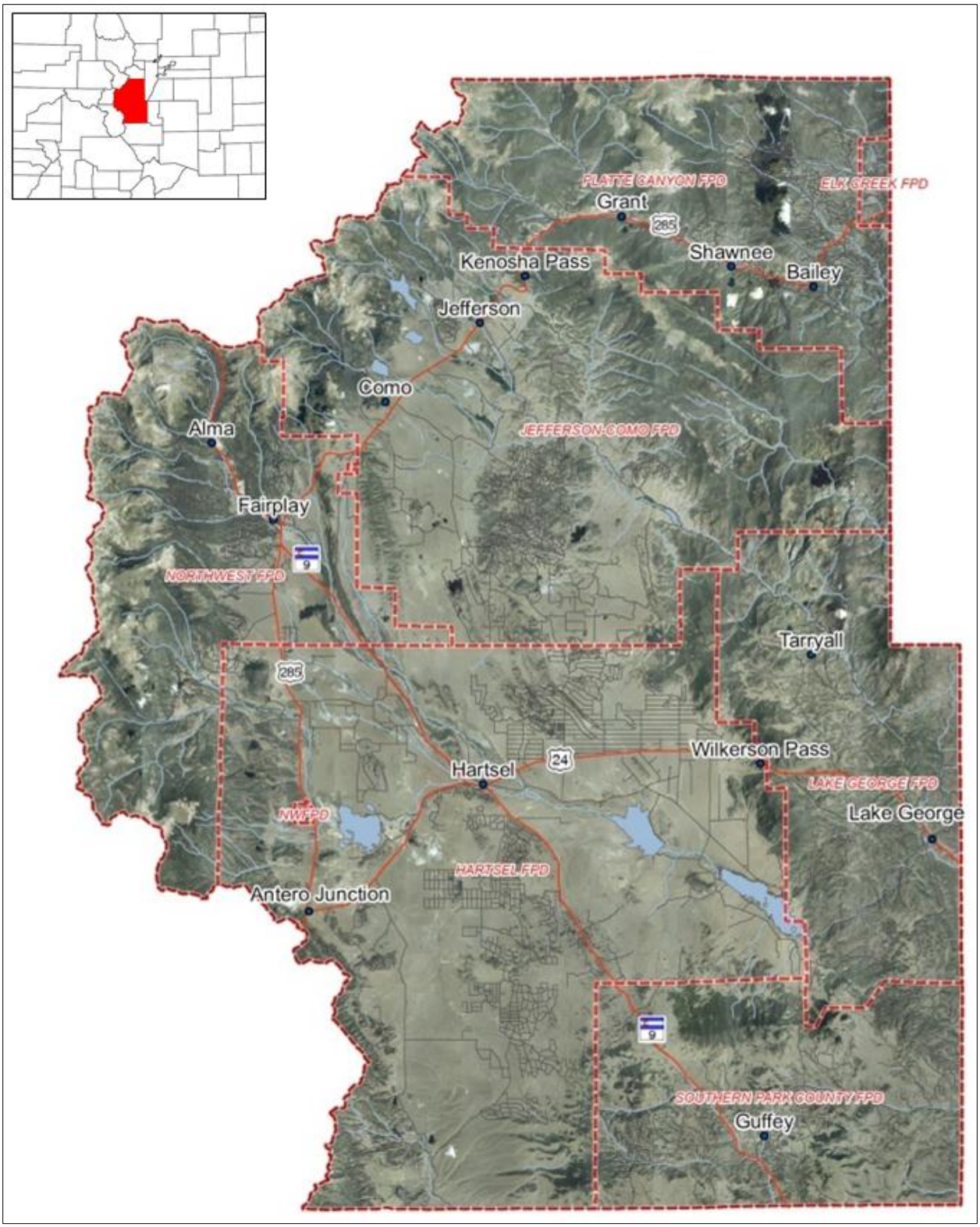

Figure 6-1. Main Features of the Planning Area

6.1.2 Canyons

The northeastern third of Park County is known as the Platte Canyon Area. This densely forested area is bisected by the North Fork of the South Platte River that follows U.S. Highway 285 through the communities of Bailey, Shawnee, and Grant. This portion of the County is lower, with an average elevation of 8,300 feet above sea level.

The southern third of Park County includes the communities of Lake George, Hartsel, and Guffey. This area is characterized by rolling prairie and remnant volcanoes. Dramatic landforms such as Eleven Mile Canyon and Tarryall River Canyon have been carved by the South Platte River and its tributaries.

6.2 JURISDICTIONS AND LAND COVER

Park County is bordered by Lake County to the west, Summit County to the northwest, Clear Creek County to the north, Jefferson County to the northeast, Teller County to the east, and Fremont County to the southeast and final, Chaffee County to the southwest. There are two incorporated towns in the county:

- Fairplay—9,957 feet above sea level. Founded in 1867. As the incorporated seat of Park County, Fairplay is the county government seat. According to the State Demographer, about 700 people now reside within the Fairplay town limits. It is estimated that about 2,000 more reside in outlying areas.
- Alma—10,350 feet above sea level. Founded in 1873. Located on Colorado Highway 9, six miles northwest of Fairplay, Alma is the highest incorporated town in North America. The estimated population is 270, with 1,000 residents in nearby subdivisions. Historically, Alma was the center for the local mining industry. With continued development of residential subdivisions around Alma, the area is predominantly a bedroom community for several ski resorts in Summit County, 25-40 miles to the north, beyond Hoosier Pass.

Unincorporated communities in the county include Bailey, Como, Grant, Hartsel, Jefferson, Lake George, Guffey, Pine Junction, Shawnee and Tarryall.

The total land area of Park County is approximately 1,415,040 acres or 2,211 square miles. Federal and State lands comprise 59 percent of the total land. Approximately 41 percent of the land in the county is private, although 78 percent of that private land remains undeveloped. The Town of Fairplay is approximately 704 acres (1.1 square mile) in size, and the Town of Alma is approximately 192 acres (0.36 square miles).

Most of Park County is rangeland and the rest is mountainous, which makes it susceptible to both forest fires and range fires. Dry rangeland is often used as grazing grounds for agricultural animals. According to Park County, as of 2013 there were 283 subdivisions, totaling 234,300 acres, many which overlap the wildland/urban interface.

6.3 HISTORICAL OVERVIEW

Park County provides a rich tableau of both human and natural history. Prehistoric geologic processes resulted in the formation of the Rocky Mountains and, together with volcanic activity, created a rich mineral-laden area called the Colorado Mineral belt which extends from the Four Corners area northeast through Breckinridge, Golden and Boulder. Evidence has been found to suggest that Paleo-Indians and other prehistoric peoples lived in Park County as early at 6000 B.C. When Spanish explorers arrived in the 1500s, the nomadic Mountain Ute Indians were well established in the area, finding the area bountiful with plants and animals, and salt from the natural saline springs.

The first official U.S. Government explorer in the region, Lt. Zebulon Pike, arrived at the Eleven Mile Canyon in 1806 with a team of 21 men. He was scouting the newly acquired western land for President Thomas Jefferson. At about the same time, mountain men were expanding into the area to hunt and trap for the booming fur trade. During the 1850s there were major Mountain Ute camps in the area of Park County and on occasion bands of rival tribes would enter the area causing skirmishes over the hunting grounds.

The first gold to be discovered in the Western United States was found in 1803 near Como. However, it was not until gold was discovered in Tarryall Creek in 1859 that a gold rush began. Soon "Pikes Peak or Bust" was the motive for tens of thousands of gold seekers to come to Colorado – approximately a third of whom settled in Park County. Supporting industries also grew during this time creating opportunities for ranchers and stockmen who eventually displaced the Native Americans.

The Denver, South Park & Pacific Railway blasted through the Platte Canyon in 1878 and ushered in an era of economic growth in the area through mining, logging and ranching communities that thrived along the line. The railroad itself did not fare as well; after declaring bankruptcy, it abandoned the Park County segment of the rail in 1937.

Throughout the early 1900s, Park County was a tourist destination and was promoted as a place to escape the city and enjoy outdoor recreation. Tourists could travel by train to any one of the several resorts throughout Platte Canyon which hosted outdoor activities such as fishing, horseback riding and golfing. For 30 years, the railroad operated 'fish trains' bringing fishermen to their favorite fishing locations and thousands of trout were brought in 'fish cars' to stock the river each year.

From 1922 to 1952, floating gold recovery plants lined the South Platte River offering a new form of industrial mining. Huge dredges moved forward, separating gold from rock and ejecting the waste into large rock piles that can still be seen today. In 1957, the South Park Historical Foundation was founded and began preserving items of the gold mining era. Together, with local civic groups, the Foundation was instrumental in re-creating an historic mining town on the outskirts of Fairplay. Today, the South Park City Museum provides visitors with an idea of life in a Colorado mining town at the turn of the century and includes 34 buildings and 60,000 artifacts.

In 1997, the Governor designated the region as an official State Heritage Area helping to continue the legacy of Park County as a favorite vacation destination. In addition to breathtaking scenery and abundant outdoor recreational opportunities, the area houses several sites that are listed on the National Register of Historic Places

6.4 TRANSPORTATION

Three highways pass through Park County. They are U.S. Highway 285, U.S. Highway 24, and Colorado State Highway 9. U.S. Highway 285 is considered by the Colorado Department of Transportation as a "Primary Arterial." It transects the county running east to west through Bailey and then north to south through the county, exiting into Chaffee County. U.S. Highway 24, an east to west highway, travels from Teller County to Lake George and on to Hartsel, continuing from Hartsel to Chaffee County. State Highway 9, a southeast to northwest highway, runs from Fremont County through Guffey and Hartsel to Fairplay and then from Fairplay to Alma and into Summit County and Breckenridge.

County roads provide access to many of the county's unincorporated areas. Most of the roads in Park County are unpaved and many are not maintained by the County. Numerous National Forest access routes provide automobile access into and through the County. Some of the National Forest routes are suitable for four-wheel drive only.

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Other transportation features in the county are as follows:

- Greyhound Bus Lines serves the County (Fairplay) with limited bus service.
- The Arrow/Black Hills Stage Lines also serve Park County with a stop in Fairplay at the Sinclair Station. does not have a public transportation service.
- Blue River Shuttles provides shuttle service between Alma and Fairplay over to Breckenridge. The system works on a reservation-only basis,
- There are no commuter rail lines currently active within Park County.
- The county does not currently have an airstrip or airport. The closest private service airport is available in either Leadville, CO, approximately 17 miles from Fairplay or in Buena Vista at the Buena Vista-Central Colorado Regional Airport, approximately 28 miles away.

6.5 SCHOOLS

Park County has two school districts, divided between the north and the south portions of the county. RE-1 District – Platte Canyon School District and Schools in Bailey serve the northeastern part of the county from Kenosha Pass to Conifer. Park County School District – RE-2 District Schools serve the entire South Park region from Kenosha Pass south and west to the Chaffee County line, including Alma and Fairplay. There are two charter schools in Park County. One is in Lake George and the other is in Guffey. There are no colleges or technical schools within Park County. The nearest colleges are in Summit County or in Chaffee County.

6.6 RECREATION

There are roughly 1,300 square miles (832,000 acres) of recreational land within the county. There are five major water storage reservoirs (Antero, Elevenmile, Tarryall, Spinney and Montgomery) which have become important wildlife and aquatic recreation areas, attracting over a half-million people to the region each year for boating, hunting, fishing and camping. Additionally, there are 20 + other lakes/reservoirs located across the County offering a variety of recreational opportunities.

Park County features dozens of headwater lakes and streams, many working ranches, and hundreds of historic structures built by miners and settlers. In recent years the area has gained popularity as a high-altitude venue for mountaineers, fly fishermen and off-highway vehicle enthusiasts. The unique opportunity to cross-country ski, hike, view wildlife, visit mining attractions and fish all in the same weekend in Park County's twelve state wildlife areas, three national wildlife areas, reservoirs, two state parks, and streams with over 50 miles of Gold Medal trout waters draws visitors from around the world.

Thirty-one public campgrounds are distributed throughout the county with recreation trails, fishing waters and historic sites nearby. In addition, there are nine ranch-style guest resorts, three historic hotels and five motels that provide accommodation for area visitors.

The Mosquito Range above Fairplay contains four peaks higher than 14,000 feet. Traversing this range is Mosquito Pass (13,186 feet), the highest automobile pass in North America. Numerous other mountain byways, jeep roads and off-highway vehicle routes throughout the county provide self-guided auto tours to old mining camps, ghost towns and backcountry areas.

Eleven Mile and Spinney Mountain State Parks near Lake George provide facilities (seasonal) for fly and lure fishing, boating, sailing, camping and hunting.

6.7 MAJOR PAST HAZARD EVENTS

Presidential disaster declarations are typically issued for hazard events that cause more damage than state and local governments can handle without assistance from the federal government, although no specific dollar loss threshold has been established for these declarations. A presidential disaster declaration puts various federal recovery programs into motion to help disaster victims, businesses and public entities. Some of the programs are matched by state programs. The planning area has experienced ten events since 1969 for which presidential disaster declarations were issued. These events are listed in Table 6-1.

TABLE 6-1.
PRESIDENTIAL DISASTER DECLARATIONS FOR HAZARD EVENTS IN THE PLANNING AREA

Type of Event	Disaster Declaration #	Incident Date
Wildfire (Nash Ranch Fire)	FM-2778	6/24/2008
Severe Winter Weather (Snowstorm)	EM-3185	3/17/2003
Wildfire (Hayman Fire)	FM-2421	06/08/2002
Hurricane Katrina Evacuation	DR-3224	8/29/2005
Wildfire (Colorado Black Mountain Fire)	FM-2403	5/5/2002
Wildfire – Colorado Wildfires	DR-1421	4/23/2002
Wildfire – Snaking Fire	FM-2399	4/23/2002
Wildfire – High Meadows Fire	FM-2309	6/12/2000
Buffalo Creek Fire	FM-2178	5/18/1996
Colorado Severe Storms, Flooding	DR-261	5/19/1969

Review of these events helps identify targets for risk reduction and ways to increase a community's capability to avoid large-scale events in the future. Still, many natural hazard events do not trigger federal disaster declaration protocol but have significant impacts on their communities. These events are also important to consider in establishing recurrence intervals for hazards of concern.

The Spatial Hazard Events and Losses Database for the United States (SHELDUS) is a county-level hazard data set for the U.S. for 18 different natural hazard events types such as thunderstorms, hurricanes, floods, wildfires, and tornados. SHELDUS does not address human-caused hazards such as hazardous materials transport. For each event the database includes the beginning date, location (county and state), property losses, crop losses, injuries, and fatalities that affected each county. The data are from several national data sources, such as National Climatic Data Center's monthly Storm Data publications Per the Park County website. Only events that generated more than $50,000 in damage are included in SHELDUS. Since 1995, SHELDUS additionally includes all events that are reported in the National Climate Data Center's Storm Data with a specific dollar amount. Data and maps were compiled and geo-referenced by the Hazards Research Lab at the University of South Carolina.

SHELDUS has not kept records for all hazards that affect Park County. However, there are records that relate to winter weather, wind, flooding, drought, and severe thunderstorms and lightning. SHELDUS has not recorded wildfire incidents that have taken place in the county. The hazards that have been taken into account by SHELDUS since 1960 have caused more than $10 million in property damage and $1.2 million in crop damage. Table 6-2 summarizes available SHELDUS data for Park County.

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TABLE 6-2.
SUMMARY OF PAST EVENTS BY HAZARD TYPE

Hazard	Total Number of Events Since 1960 (SHELDUS)
Avalanche	6
Drought	1
Flooding	4
Hail/Lightning/High Winds and or Severe Storm	109
Severe Winter Weather	63
Tornado	1

Note: SHELDUS has not kept records for all hazards that affect Park County

6.8 PHYSICAL SETTING

6.8.1 Geology

Park County is located in the geographic transition from the foothills of Colorado's Front Range to the high peaks of the Continental Divide and the equally high peaks of the basin divide between the South Platte River Basin headwaters and the Arkansas River Basin headwaters. Several named mountain ranges define the perimeter of Park County, the highest in elevation being the Mosquito Range above Fairplay and Alma. This spectacular range includes four of Colorado's peaks higher than 14,000 feet, as well as 25 named summits above 13,000 feet. Starting in the northeastern quadrant and following a counterclockwise path, the mountain ranges in the county include the Front Range and Kenosha Mountains above the unincorporated communities of Bailey and Grant, the Continental Divide north of Jefferson and Como, the Mosquito Range, (including the Buffalo Peaks west of Hartsel), the Thirtynine Mile Volcanic Area surrounding the town of Guffey, the Puma Hills just west of Lake George (including Wilkerson Pass), and the Tarryall Mountains forming the divide between Tarryall Creek and the South Platte River north of Lake George.

Within this ring of mountain ranges is South Park, a 900-square mile park (large mountain valley) located in the geographic center of Colorado. With an average elevation of 9,000 feet, the short grass prairie of South Park supports herds of elk, deer, bighorn sheep and antelope, as well as beaver, raccoon, bobcat, mountain lion, black bear and waterfowl. Communities in South Park include Fairplay, Como, Jefferson and Hartsel. South Park forms one of six geographic regions of Park County (see Figure 6-2).

The second region, the northeastern portion of Park County is known as the Platte Canyon Area. This densely forested area is bisected by the North Fork of the South Platte River that follows U.S. Highway 285 through the communities of Bailey, Shawnee and Grant. This area of the county is lower, with an average elevation of 8,300 feet above sea level.

The third and fourth regions are formed by the highest mountains in the county. Immediately south and west of the Platte Canyon Area is the Continental Divide, separating the Colorado River Basin in Summit County from the South Platte River Basin in Park County. To the south of the Continental Divide is the fourth geographic area, the Mosquito Range. This north-south range includes Park County's highest peaks. The Town of Alma is located at the point where these two mountainous regions meet each other and transition into South Park.

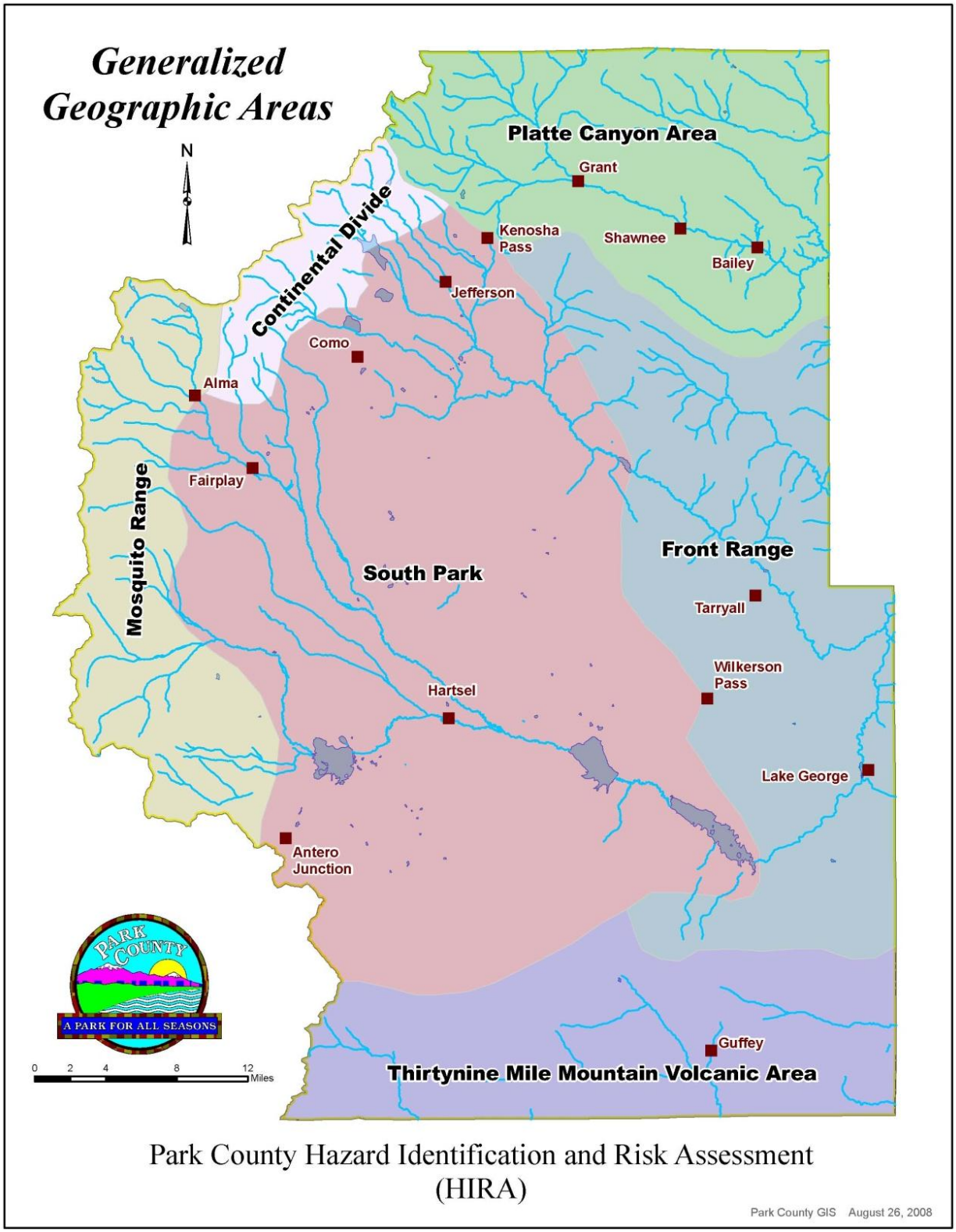

Figure 6-2. Generalized Geographic Regions

The fifth region, the southern region of Park County is the Thirtynine Mile Mountain Volcanic Area. This region extends from the Kaufman Ridge, dividing Park County and Chaffee County, all the way across southern Park County to the Teller County boundary, sloping down southward from South Park toward the Arkansas River valley. It includes the community of Guffey. The entire region is characterized by rolling prairies and remnant volcanoes. The final region is the eastern region of the county, the Front Range, which is east of the Puma Hills and north of the Thirtynine Mile Volcanic Area. It includes the unincorporated communities of Lake George and Tarryall. The South Platte River and its tributaries have carved dramatic landforms such as Elevenmile and Tarryall River Canyons, providing a rugged, hilly transition from the Thirtynine Mile Mountain Volcanic Area northward to the Platte Canyon Area.

The majority of Park County is located within the South Platte River basin. Two forks of the South Platte, the Middle Fork and the South Fork, join near Hartsel to form the South Platte River. Farther downstream, near Lake George, the major tributary of Tarryall Creek joins the South Platte just before it exits Park County. The third fork of the South Platte in Park County, the North Fork, along with its two major tributaries, Elk Creek and Deer Creek, does not meet the South Platte until the community of South Platte, downstream of Park County in Jefferson County. A small part of Park County, in the south and just upstream of Fremont County and Teller County, is formed by three major headwaters tributaries of the Arkansas River. Those tributaries are Badger Creek, Currant Creek, and West Fourmile Creek.

6.8.2 Climate

All of the land in Park County falls within the Southern Rockies Level III eco-region. That eco-region encompasses very diverse terrain and experiences very diverse weather. There are ten sub-regions within the Southern Rockies eco-region. Park County spans the full range of those sub-regions, from the alpine zone to grassland parks. Monthly averages are presented in Table 6-3

TABLE 6-3.
MONTHLY AVERAGE TEMPERATURE AND SNOW FOR PARK COUNTY AREA

	Bailey, Colorado Monthly Averages				Lake George, Colorado Monthly Averages			
	Temperature (ºF)		Snow (inches)		Temperature (ºF)		Snow (inches)	
	High	Low	Snowfall	Snow Depth	High	Low	Snowfall	Snow Depth
Jan.	39.7	8.8	7.1	6	32.5	-0.4	5.6	2
Feb	42.3	10.4	9.0	7	35.9	2.4	6.4	2
Mar.	47.1	15.9	16.6	5	42.4	12.8	12.6	2
Apr.	54.7	22.9	15.1	2	50.7	22.5	11.1	1
May	64	30.9	3.7	0	60.7	31.9	2.9	0
June	74.7	37.9	0.3	0	70.9	39.7	0.2	0
July	79.6	43.7	0	0	76.4	46	0	0
Aug.	77.3	42.2	0	0	73.6	44.8	0	0
Sep.	71.5	34.1	1.6	0	67.4	36.5	1.2	0
Oct.	61.4	24.7	6.2	0	57.5	26.1	5.0	0
Nov	47.2	16.1	10.1	2	42.7	14.6	6.6	1
Dec.	40.4	9.8	8.6	5	33.4	2.9	7.5	2
Annual	58.3	24.8	78.3	2	53.7	23.3	59.1	1

Source: Western Regional Climate Center Data

Key annual average climate date for the county are as follows:

- January Average High Temperature—34ºF
- January Average Low Temperature—5.9ºF
- July Average High Temperature—74.9ºF
- July Average Low Temperature—41.1ºF
- Annual Rainfall—16.9 inches
- Annual Snowfall—122.98 inches

Figure 6-3, Figure 6-4 and Figure 6-5 show the distribution over the county of annual average precipitation and minimum and maximum temperatures, respectively.

6.8.3 Potential Interactions between Pine Beetle Infestations and Other Hazards

Park County's as well as Colorado forests in general continue to face risk from insect and/or disease outbreaks. While these insect outbreaks were not included in the list of hazards to be addressed in Park County's Mitigation Plan, they are of serious concern because of their relationship to other hazards already being analyzed in this plan. The outbreaks vary in intensity, and in the speed with which they kill trees. Surrounding counties, mostly to the north, including Jefferson, Clear Creek, Summit and Eagle Counties, are all experiencing epidemic infestations. Lake and Chaffee Counties, to the west, are beginning to see problems as well. The nearby problems are in turn posing a threat to Park County forests as the insects migrate toward more food. The most aggressive and prevalent invasive species in the County is Mountain Pine Beetle, a species that primarily affects lodge pole and ponderosa pines. That species has reached significant infestation levels near Weston Pass and Trout Creek Pass.

However, it should be noted that it has been reported that "The (infested) acres in Park County had declined notably since 2010 and Park County may see declining impact over the next several years, depending on forest condition," per Sky Stephens, forest entomologist with the Colorado State Forest Service, as reported in an article from the Park County Flume.

In Park County, 51 percent of the land is federally owned, and much of that is under the control of the U.S. Forest Service. Chris Kuennen, forester at Fairplay-based South Park Ranger District, said that the Forest Service has been clearing the land of dead and dying trees, including those infested with the mountain pine beetle, in an effort to increase the health and vigor of the forest.

Cutting out dead and diseased trees within the forest is first a safety issue to visitors, but it also helps to control the insects. Additionally, the practice is a deterrent to wildfires. Kuennen said in a Flume article, "When trees are thinned to increase the space between trees, it disturbs the beetles. When they finish with one pine tree and move on to a neighboring tree, they don't want to fly too far."

Other factors have also aided in slowing the beetles include: "Wetter summers have helped," Kuennen said. Trees are healthier when they get enough water. "A big cold snap early (in the season) before the beetles' ethylene glycol gets into their systems helps, too," he said. Ethylene glycol is antifreeze that mountain pine beetles produce during the winter to replace water in their cells. It helps them survive temperatures as low as 30 degrees below zero for a period of two weeks, according to www.coloradoforestry.org. The beetles will die if they are in minus 30 degree temperatures for longer than two weeks. Kuennen said a wind chill factor of minus 30 would have the same effect.

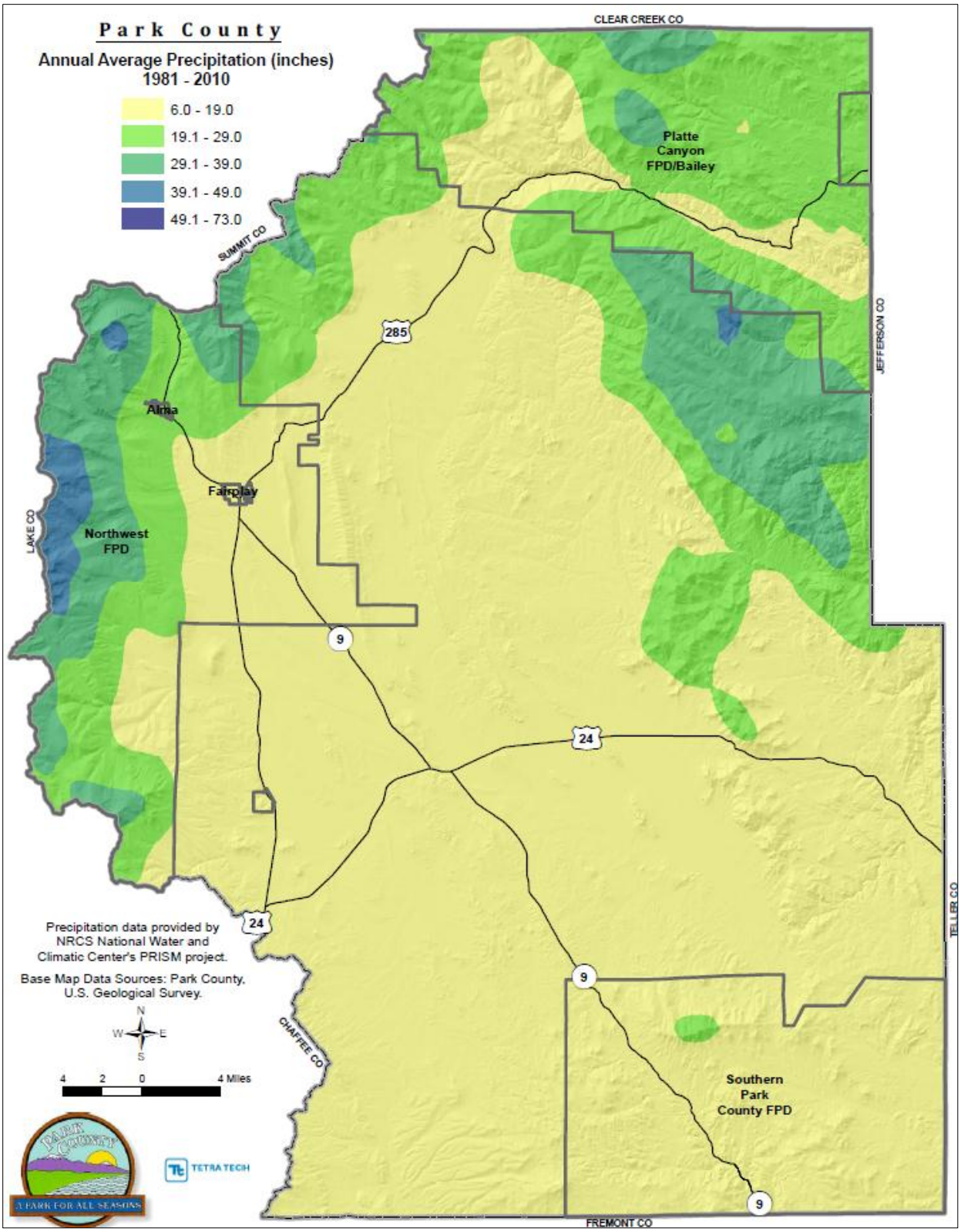

Figure 6-3. Park County Average Annual Precipitation, 1981 – 2010

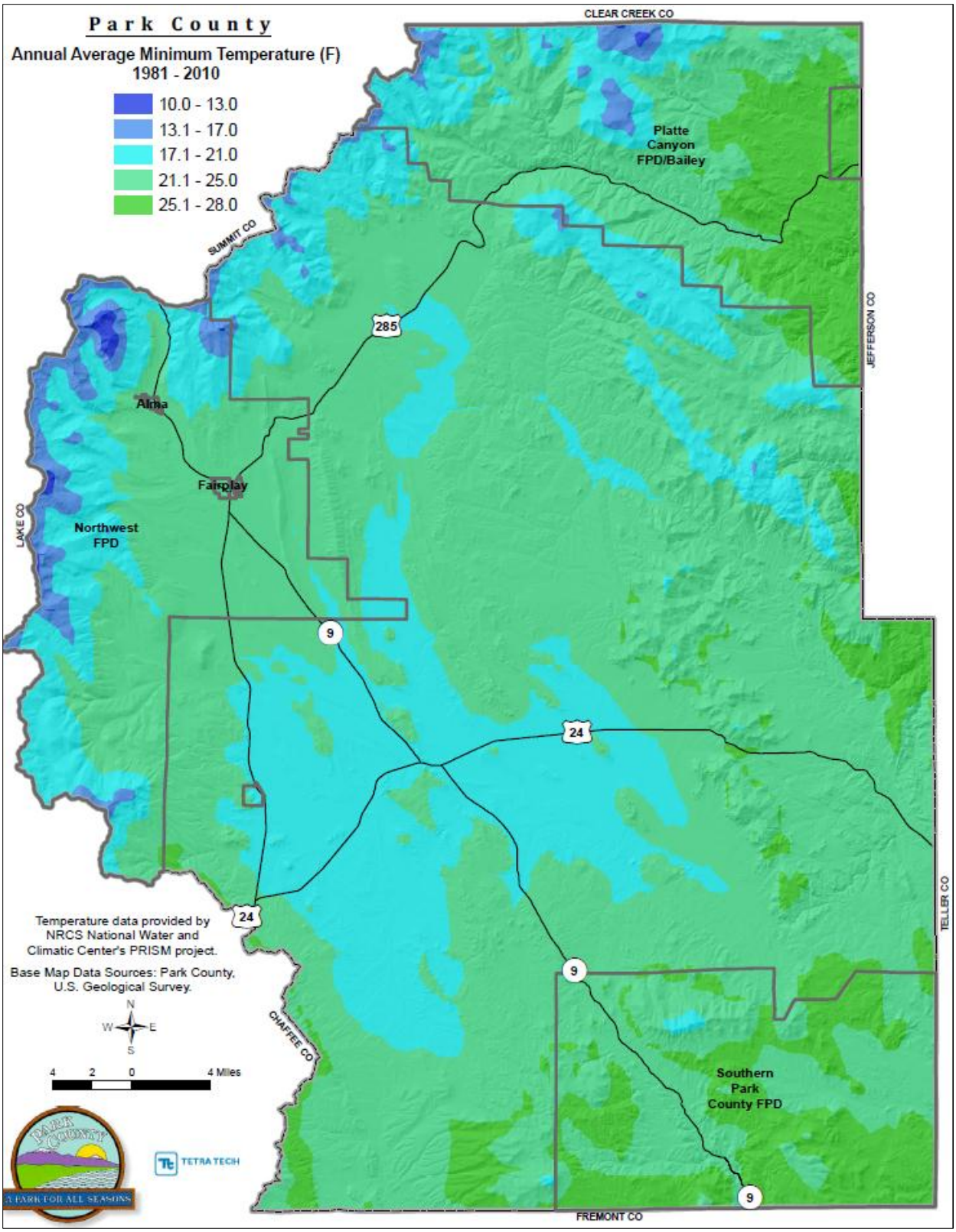

Figure 6-4. Park County Average Minimum Temperature, 1981 – 2010

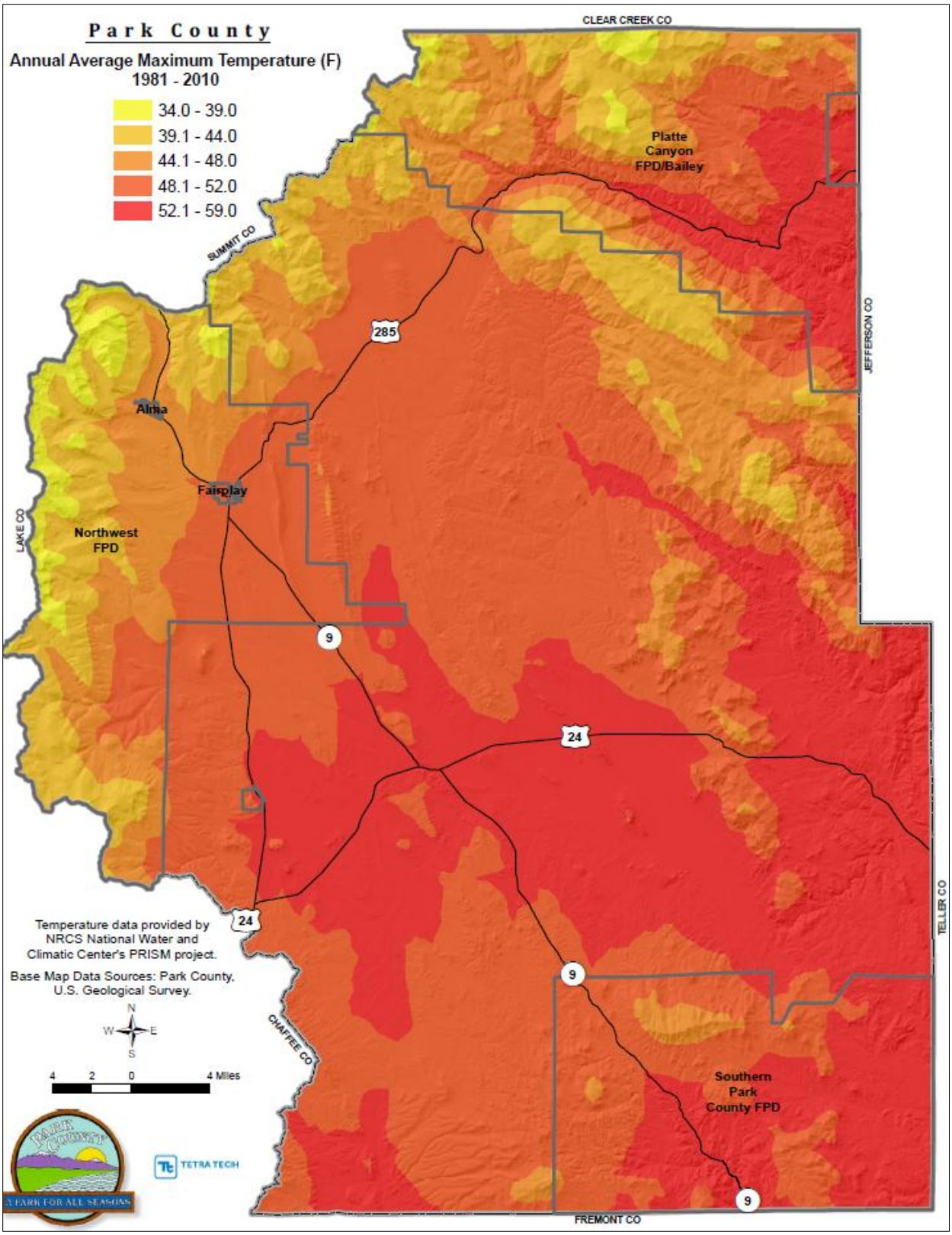

Figure 6-5. Park County Average Maximum Temperature, 1981 – 2010

Forest infestations can play a significant role in increasing the risks from and potential impacts of other hazards. Dead trees contribute to more fuels for forest fires, though they do decrease the risk of crown fires. Dead trees are subject to blowing over during severe winter weather or severe thunderstorms, raising the potential for downing power lines, blocking roads, and falling on houses, businesses, properties and recreational trails. Dead trees also increase the risk of debris flows during heavy rain or snowmelt induced flooding and dam failure events. In addition, dead trees lead to soil instability, exacerbating the risk of and the impacts of landslides. Conversely, one other hazard, Drought, can play a role in increasing the initial risk of a Mountain Pine Beetle infestation. Table 6-4 summarizes these interrelationships.

TABLE 6-4.
CORRELATION OF POTENTIAL PINE BEETLE INFESTATION TO OTHER HAZARDS

Hazard	This Hazard Contributes to Pine Beetle Risk	Pine Beetle Exacerbates Overall Risk From This Hazard	Pine Beetle Exacerbates Impacts From This Hazard	No Correlation
Wildfire		X		
Severe Winter Weather			X	
Hazardous Materials				X
Flooding		X	X	
Drought	X		?	
Severe Thunderstorms, Hailstorms & Wind			X	
Landslides		X	X	
Dam Failure		X	X	
Earthquakes				X

6.9 CRITICAL FACILITIES AND INFRASTRUCTURE

Critical facilities and infrastructure are those that are essential to the health and welfare of the population. These become especially important after a hazard event. Critical facilities typically include police and fire stations, schools and emergency operations centers. Critical infrastructure can include the roads and bridges that provide ingress and egress and allow emergency vehicles access to those in need, and the utilities that provide water, electricity and communication services to the community. Also included are "Tier II" facilities and railroads, which hold or carry significant amounts of hazardous materials with a potential to impact public health and welfare in a hazard event. As defined for this hazard mitigation plan update, critical facilities include but are not limited to the following:

- Police stations, fire stations, city/county government facilities (including those that house critical information technology and communication infrastructure), vehicle and equipment storage facilities, and emergency operations centers needed for disaster response before, during, and after hazard events
- Public and private utilities and infrastructure vital to maintaining or restoring normal services to areas damaged by hazard events. These facilities include but are not limited to:

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  - Public and private water supply infrastructure, water and wastewater treatment facilities and infrastructure, potable water pumping, flow regulation, distribution and storage facilities and infrastructure
  - Public and private power generation (electrical and non-electrical), regulation and distribution facilities and infrastructure
  - Data and server communication facilities
  - Structures that manage or limit the impacts of natural hazards such as regional flood conveyance systems, potable water trunk main interconnect systems and redundant pipes crossing fault lines and reservoirs
  - Major road and rail systems including bridges, airports and marine terminal facilities
- Educational facilities, including K-12 and community college.
- Community gathering places, such as libraries, community centers, senior centers, veterans halls, and the County fairground
- Hospitals, nursing homes, and housing likely to contain occupants who may not be sufficiently mobile to avoid death or injury during a hazard event
- Structures or facilities that produce, use, or store highly volatile, flammable, explosive, toxic, and/or water-reactive materials.
- Utilities
  - Water
    - The Towns of Fairplay and Alma provide central water systems that store and distribute water to their residents.
    - Several subdivisions have private water treatment plants, while many other residents get potable water from well systems.
  - Sewage Treatment
    - Sewage for Alma and Fairplay is processed by treatment facilities.
    - Sewage treatment from individual sewage disposal systems in Park County, usually consisting of septic tanks and leach fields, is controlled through a permit system that requires soil samples, test holes, percolation tests and the availability of sufficient space. The County's Environmental Health Office issues septic tank permits to ensure compliance with state guidelines.
  - Electricity
    - IREA and Xcel Energy supply electricity to portions of Park County.
- Police and Fire
  - The Park County Sheriff's Office patrols unincorporated portions of the county.
  - The Town of Alma and the Town of Fairplay are both served by their own police departments.
  - The Colorado State Patrol enforces traffic law along U.S. Highway 285, U.S. Highway 24, and State Highway 9.
  - Figure 6-1 identifies the seven fire protection districts within Park County.

- These vary from fully volunteer to paid fire districts. The following is a list of the fire protection districts and the areas they serve:
  - Elk Creek Fire Protection District – parts of Bailey and Conifer
  - Platte Canyon Fire Protection District – Bailey and land up to the top of Kenosha Pass.
  - Jefferson/Como Fire Protection District – South of Kenosha Pass through the Town of Como.
  - North-West Fire Protection District – East of Hoosier Pass including the Towns of Fairplay and Alma and south to the Chaffee county line.
  - Hartsel Fire Protection District – The Town of Hartsel and all surrounding area in the center of Park County.
  - Lake George Fire Protection District – East of Wilkerson Pass and the community of Lake George.
  - Southern Park County Fire Protection District – The community of Guffey and the southeast corner of Park County.

- Communications
  - Park County is served by one Public Safety Answering Point, which is located in the Town of Fairplay. All responding agencies are dispatched through the Park County Communications Center.
    - Telephone Companies:
      - → Qwest
    - Long-Distance Companies:
      - → Qwest
    - Cellular Companies:
      - → Verizon Wireless
      - → T-Mobile
      - → Cingular / AT&T
      - → Sprint

There are multiple providers of telecommunication services in Park County who are ready and able to provide Internet, E-Mail, inbound 800 numbers, outbound WATTS Systems and dedicated telephone lines for computer systems.

Figure 6-6 shows the location of critical facilities in unincorporated areas of the county. Due to the sensitivity of this information, a detailed list of facilities is not provided. The list is on file with each planning partner. All critical facilities/infrastructure were analyzed in HAZUS to help rank risk and identify mitigation actions. The risk assessment for each hazard qualitatively discusses critical facilities with regard to that hazard.

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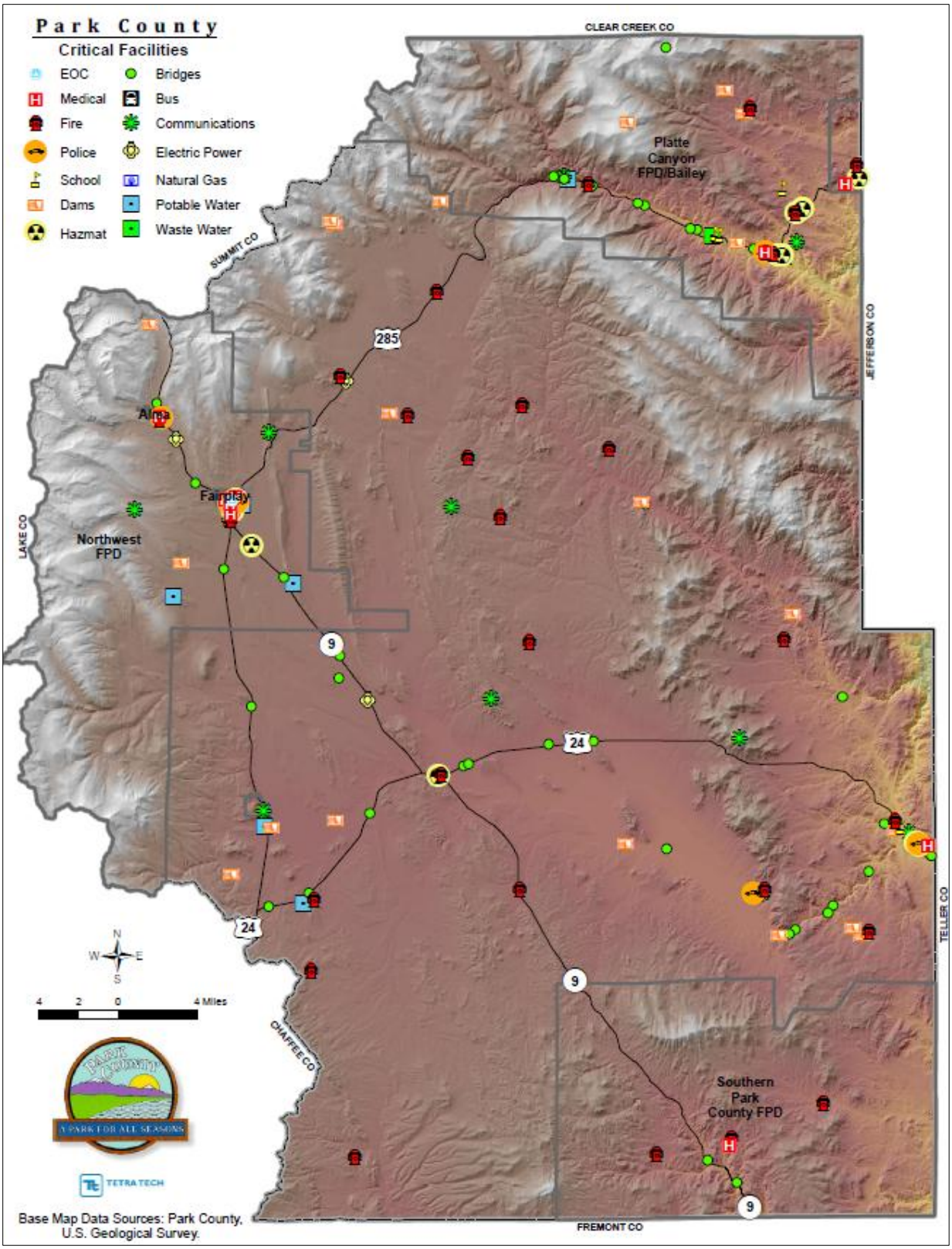

Figure 6-6. Critical Facilities in Park County

6.10 DEMOGRAPHICS

Some populations are at greater risk from hazard events because of decreased resources or physical abilities. Elderly people, for example, may be more likely to require additional assistance. Research has shown that people living near or below the poverty line, the elderly (especially older single men), the disabled, women, children, ethnic minorities and renters all experience, to some degree, more severe effects from disasters than the general population. These vulnerable populations may vary from the general population in risk perception, living conditions, access to information before, during and after a hazard event, capabilities during an event, and access to resources for post-disaster recovery. Indicators of vulnerability—such as disability, age, poverty, and minority race and ethnicity—often overlap spatially and often in the geographically most vulnerable locations. Detailed spatial analysis to locate areas where there are higher concentrations of vulnerable community members would assist the County in extending focused public outreach and education to these most vulnerable citizens.

6.10.1 Population Characteristics

Knowledge of the composition of the population and how it has changed in the past and how it may change in the future is needed for making informed decisions about the future. Information about population is a critical part of planning because it directly relates to land needs such as housing, industry, stores, public facilities and services, and transportation. Park County Park County is the 17th largest of Colorado's 64 counties. The State of Colorado Department of Local Affairs estimated the planning area's population at 16,206 as of 2010 and 16,029 as of 2012.

Population changes are useful socio-economic indicators. A growing population generally indicates a growing economy, while a decreasing population signifies economic decline. Between 2000 and 2010, Colorado's population grew by almost 17 while the population of Park County increased by 11.6 percent.

Table 6-5 shows the population of incorporated municipalities and the combined unincorporated areas in Park County from 2000 to 2010. In 2000, about 94 percent of the planning area's residents lived outside incorporated. This percentage was estimated to have remained steady at 94 percent in the 2011 population estimates. Overall growth in incorporated areas was 15 percent from 2000 to 2010, while the unincorporated areas of the county grew about 10.0 percent during the same timeframe.

Park County's rate of population growth was above the state average during the booming 1990s. The 2000 U.S. Census estimated that Park County's total population was 14,523. The Town of Fairplay's 2000 population was 610. The Town of Alma's 2000 population was 179. Park County was the third fastest growing county in Colorado during the 1990s, behind Douglas and Elbert Counties. A significant amount of the growth can be traced to new residents who commute to Summit, Jefferson or Denver Counties for employment.

For those years between the U.S. Census Bureau's population measurements, the office of the State Demographer, located in the Colorado Division of Local Government, develops annual population estimates for all Colorado counties and municipalities. Those estimates show that the Park County communities continued to grow, at least through 2006, but at a slower rate than in the 1990s. Table 6-6 illustrates that trend. The estimates also show that growth in Park County is expected to have generally plateaued for the time.

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TABLE 6-5.
ANNUAL POPULATION DATA

	Population			
	Alma	Fairplay	Unincorporated County	**Total**
2000	182	633	13,914	**14,729**
2001	190	644	14,338	**15,172**
2002	246	647	14,524	**15,417**
2003	257	661	14,871	**15,789**
2004	264	664	14,985	**15,913**
2005	271	669	15,121	**16,061**
2006	276	672	15,180	**16,128**
2007	282	679	15,375	**16,336**
2008	287	677	15,314	**16,278**
2009	297	666	15,008	**15,971**
2010	270	680	15,312	**16,206**
2011 (estimated)	268	675	15,136	**16,063**

Source: https://dola.colorado.gov/demog_webapps/mpe_parameters.jsf

TABLE 6-6.
POPULATION GROWTH IN PARK COUNTY – 2000 TO 2006

Community	2000 Census	2006 State Estimate	Rate of Growth
Park County	14,523	16,802	15.7%
Unincorporated Park County	13,734	15,867	15.5%
Alma	179	229	27.9%
Fairplay	610	706	15.7%

As of the 2010 U.S. Census, 47.3 percent of Park County residents are female and 52.7 percent are male. The median age is 40 years. People from the ages of 18 to 64 comprise 64.7 percent of the population. Approximately 22.5 percent of the population is below the age of 18, while 12.8 percent of the population is 65 years or older.

Countywide, 4.9 percent of the population identifies itself as Hispanic, 95.5 percent identifies itself as White non-Hispanic, 0.8 percent are American Indian, 1.1 percent are Asian and 0.5 percent are African-American. 96.9 percent of the population speaks English at home, while 3.1 percent of the population speaks a language other than English at home.

Figure 6-7 represents population trends that are tracked by the Colorado Department of Local Affairs. Estimates of the total population at July 1 of each calendar year are prepared by the Demographic Section in cooperation with the U. S. Bureau of the Census, after consultation with each local government. Park County's population grew at a rate of 102 percent from 1990 to 2000, and projections predict continued growth, although at a significantly slower rate than during the 1990s.

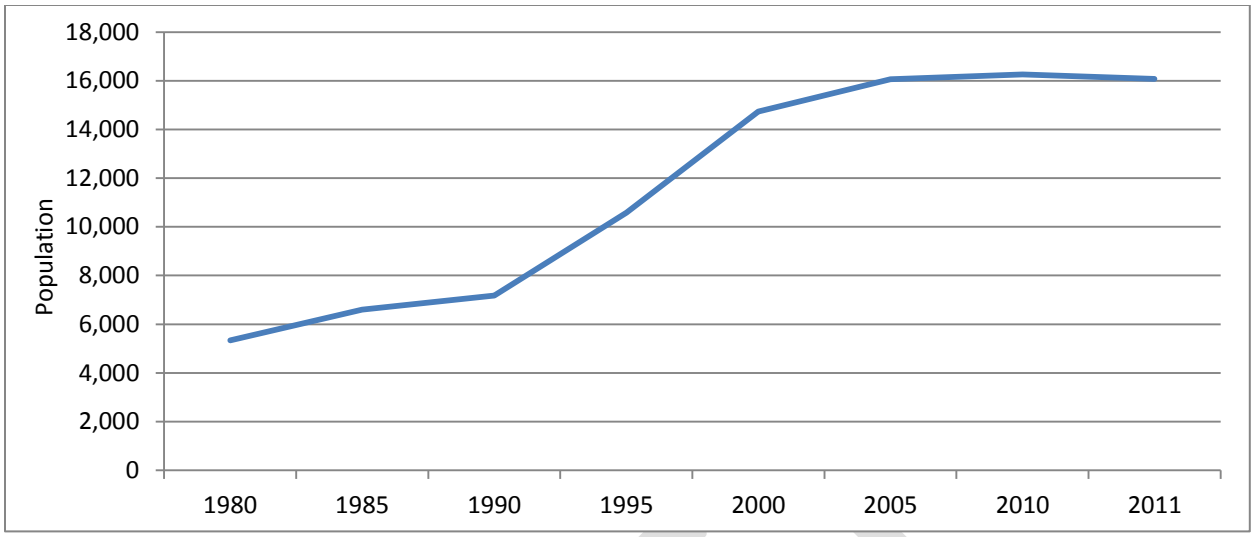

Figure 6-7. Park County Population, 1980- 2012

Population growth in Park County between the year 2000 and 2040 is projected to rise at an average rate of 2.3 percent with the strongest rate of growth occurring between the years 2010 and 2025 when growth is projected at approximately 4.0 percent. The projected growth rate is greater than the State's for that same period which is projected at 1.5 percent with a high of 1.9 percent between 2015 and 2020. Table 6-7 and Figure 6-8 present population projections through 2040 for the county and the state.

TABLE 6-7.
PROJECTED POPULATION CHANGE 2000-2040

Years	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2025-2030	2030-2035	2035-2040
Colorado	1.4%	1.6%	1.7%	1.9%	1.7%	1.4%	1.3%	1.1%
Park County	1.8%	0.3%	3.9%	4.1%	4.0%	2.7%	1.3%	0.5%

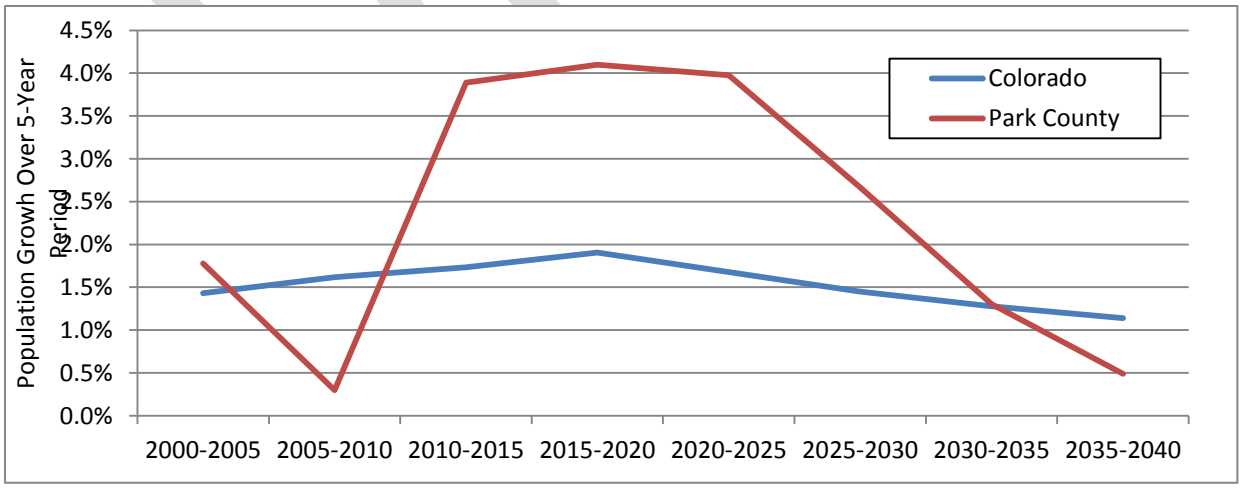

Figure 6-8. Projected Population Growth

6.10.2 Income and Housing

In the United States, individual households are typically expected to use private resources to prepare for, respond to and recover from disasters to some extent. This means that households living in poverty are automatically disadvantaged when confronting hazards. Additionally, the poor typically occupy more poorly built and inadequately maintained housing. Mobile or modular homes, for example, are more susceptible to damage in earthquakes and floods than other types of housing. In urban areas, the poor often live in older houses and apartment complexes, which are more likely to be made of un-reinforced masonry, a building type that is particularly susceptible to damage during earthquakes. Furthermore, residents below the poverty level are less likely to have insurance to compensate for losses incurred from natural disasters. This means that residents below the poverty level have a great deal to lose during an event and are the least prepared to deal with potential losses. The events following Hurricane Katrina in 2005 illustrated that personal household economics significantly impact people's decisions on evacuation. Individuals who cannot afford gas for their cars will likely decide not to evacuate.

Based on U.S. Census Bureau estimates, per capita income in the planning area in 2011 was $30,908, and the median household income was $61,284. It is estimated that about 15.8 percent of households receive an income between $100,000 and $149,999 per year and 5.0 percent are above $150,000 annually.

According to the 2010 U.S. Census, Park County had a total of 13,947 housing units. 7174 households were occupied, 6,773 were vacant. Of the "vacant" units, 5870 were used for seasonal use. Owner occupied housing units totaled 6,069, while rental units totaled 1,105. Since 15.4 percent of the county's occupied housing units are rented, efforts should be made to target both homeowner and renter demographics in future educational and outreach efforts about hazards and disasters. The median home value in Park County is $245,114.00 while the median rent is $877/month (U.S. Census Bureau, 2010). The average number of persons per household in Park County is 2.23 persons.

6.10.3 Age Distribution

As a group, the elderly are more likely to lack the physical and economic resources to respond to hazard events and to suffer health-related consequences making recovery slower. They are more likely to be vision, hearing, and/or mobility impaired, and more likely to experience mental impairment or dementia. Additionally, the elderly are more likely to live in assisted-living facilities where emergency preparedness occurs at the discretion of facility operators. These facilities are typically identified as "critical facilities" by emergency managers because they require extra notice to implement evacuation. Elderly residents living in their own homes may have more difficulty evacuating their homes and could be stranded in dangerous situations. This population group is more likely to need special medical attention, which may not be readily available during natural disasters due to isolation caused by the event. Specific planning attention for the elderly is an important consideration given the current aging of the American population.

Children under 14 are particularly vulnerable to disaster events because of their young age and dependence on others for basic necessities. Very young children may additionally be vulnerable to injury or sickness; this vulnerability can be worsened during a natural disaster because they may not understand the measures that need to be taken to protect themselves from hazards.

The overall age distribution for the planning area is illustrated in Figure 6-9. Based on 2010 U.S. Census data estimates, 11.6 percent of the planning area's population is 65 or older, compared to the state average of 10.9 percent. Children under 18 account for nearly 5 percent of individuals who are below the poverty line. It is also estimated that 4.4 percent of the County's population is 5 years of age or younger, compared to the state average of 6.7 percent.

Sources: http://quickfacts.census.gov/qfd/states/08000.html; http://www.colorado.gov/

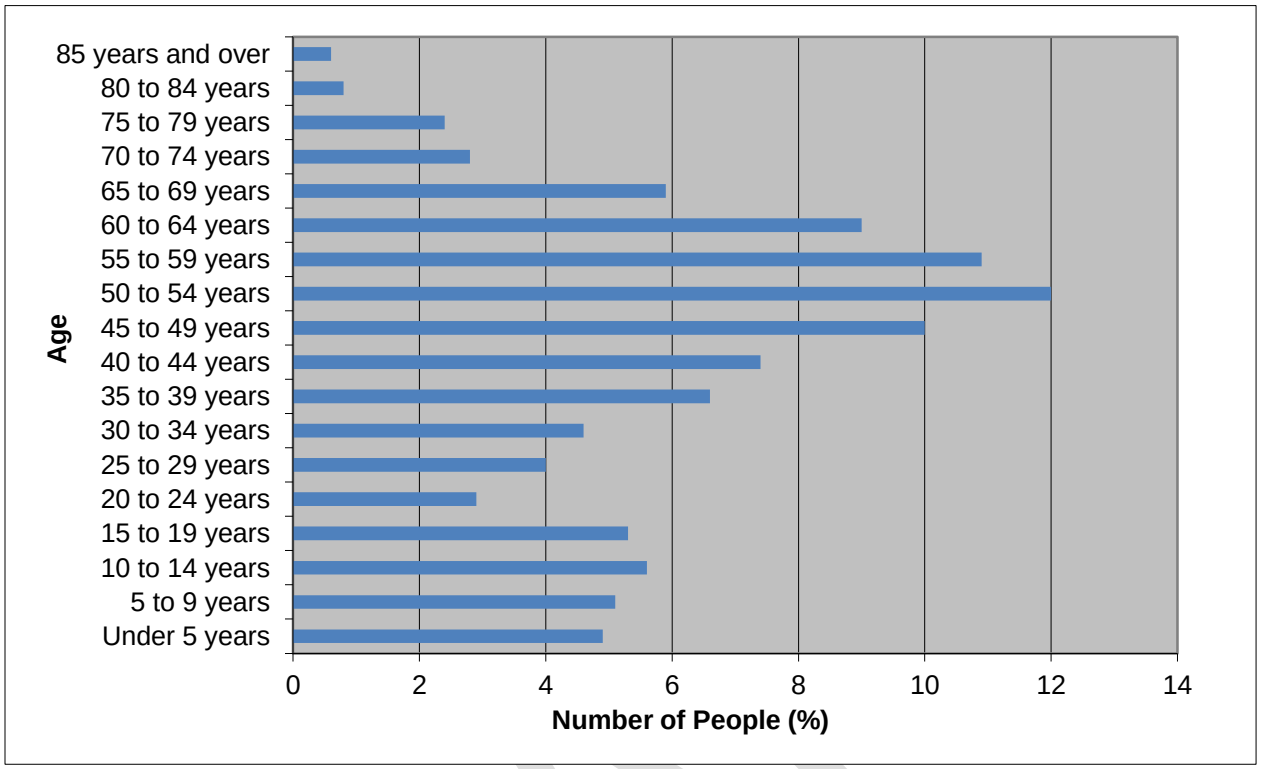

Figure 6-9. Planning Area Age Distribution

6.10.4 Race, Ethnicity and Language

Research shows that minorities are less likely to be involved in pre-disaster planning and experience higher mortality rates during a disaster event. Post-disaster recovery can be ineffective and is often characterized by cultural insensitivity. Since higher proportions of ethnic minorities live below the poverty line than the majority white population, poverty can compound vulnerability. According to the U.S. Census, the racial composition of the planning area is predominantly white, at about 95.5 percent. The largest minority populations are Hispanic or Latino at 4.9 percent and Native American at 1.1 percent. Figure 6-10 shows the racial distribution in the planning area.

The planning area has a 2.3-percent foreign-born population. Other than English, the most commonly spoken language in the planning area is Spanish. The census estimates 18 percent of the residents speak English "not well."

6.10.5 Disabled Populations

The 2010 U.S. Census estimates that 54 million non-institutionalized Americans with disabilities live in the U.S. This equates to about one-in-five persons. People with disabilities are more likely to have difficulty responding to a hazard event than the general population. Local government is the first level of response to assist these individuals, and coordination of efforts to meet their access and functional needs is paramount to life safety efforts. It is important for emergency managers to distinguish between functional and medical needs in order to plan for incidents that require evacuation and sheltering. Knowing the percentage of population with a disability will allow emergency management personnel and first responders to have personnel available who can provide services needed by those with access and functional needs.

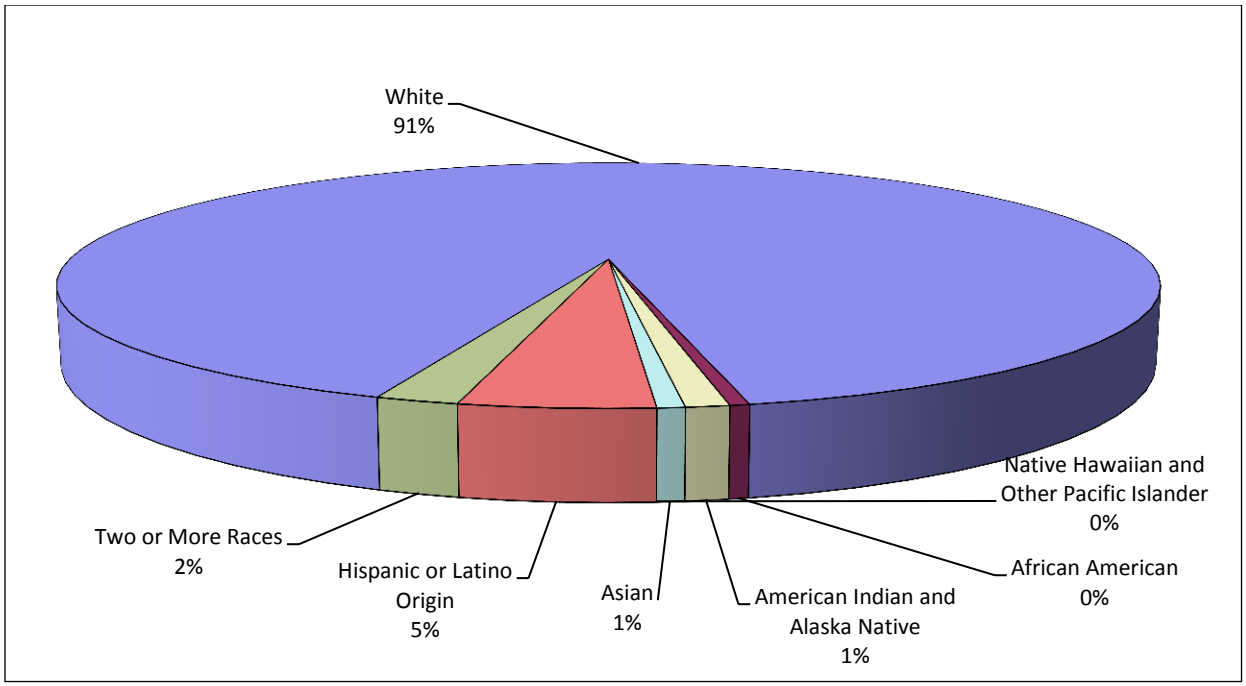

Figure 6-10. Planning Area Race Distribution

Historically in Park County, according to the U.S. Census, approximately 7.2 percent of the population ages 5 to 20 years lives with some form of disability within the planning area. 14.3 percent of the population ages 21 to 64 and 31 percent of the population age 65 and older also live with some form of disability. (Source: American Fat Finder).

6.11 ECONOMY

6.11.1 Industry, Businesses and Institutions

The planning area's economy is strongly based in the management, business, science and arts occupations (32.3 percent) followed by the sales and related occupations (26.0 percent), and natural resources, construction and maintenance occupations (15.5 percent). Production, transportation and material moving occupations (10.8 percent) and service occupations (15.4 percent) make up the smallest source of the local economy. Figure 6-11 shows the breakdown of industry types in Park County.

6.11.2 Employment Trends and Occupations

According to the American Community Survey, about 70.5 percent of Park County's population is in the labor force. Of the working-age population group (ages 16-64), 79 percent of men and 64 percent of women are in the labor force.

Figure 6-12 compares the State of Colorado and Park County's unemployment trends from 2009 through 2013 Park County's unemployment rate was lowest in April of 2007 at 3.6 percent. Unemployment rates climbed to 10.7 percent in 2011, but have since been on an improved slightly. The July 2013 unemployment figure for Park County was 6.1 percent.

Source: http://data.bls.gov/timeseries/LASST08000003

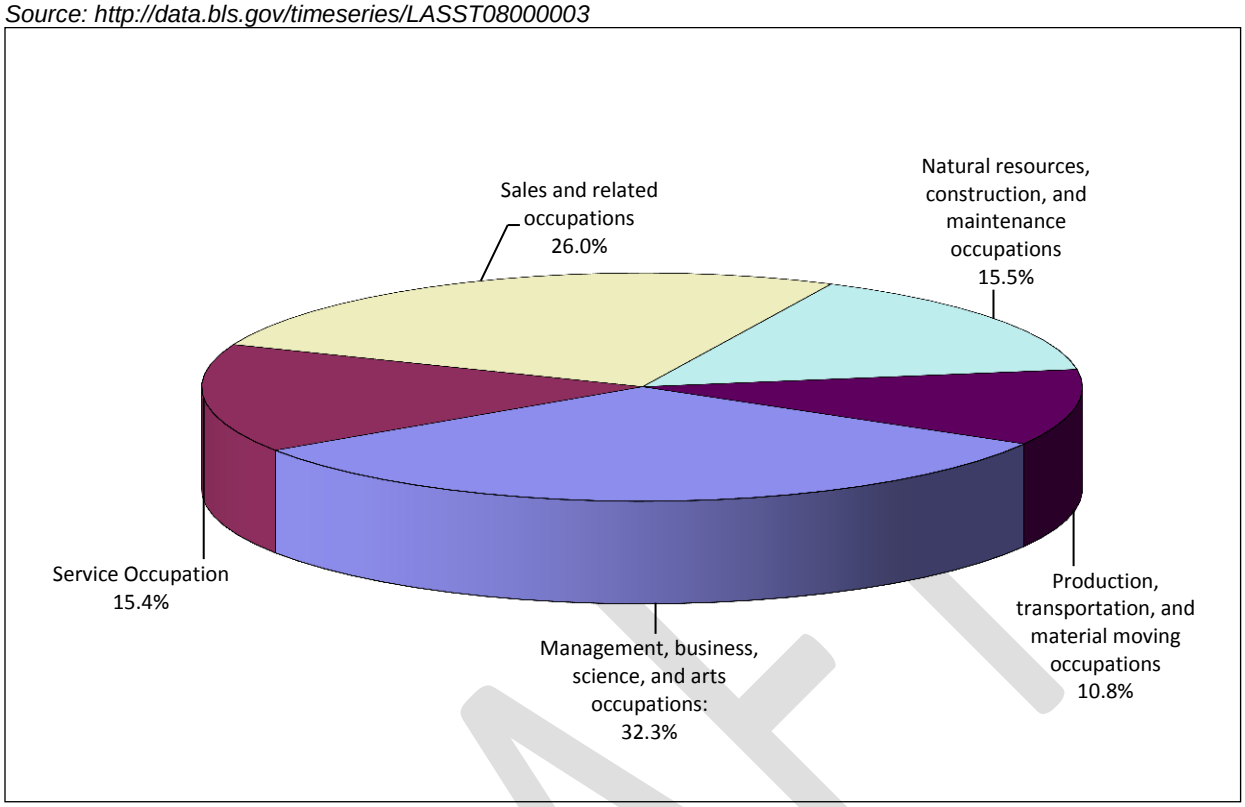

Figure 6-11. Industry in the Planning Area

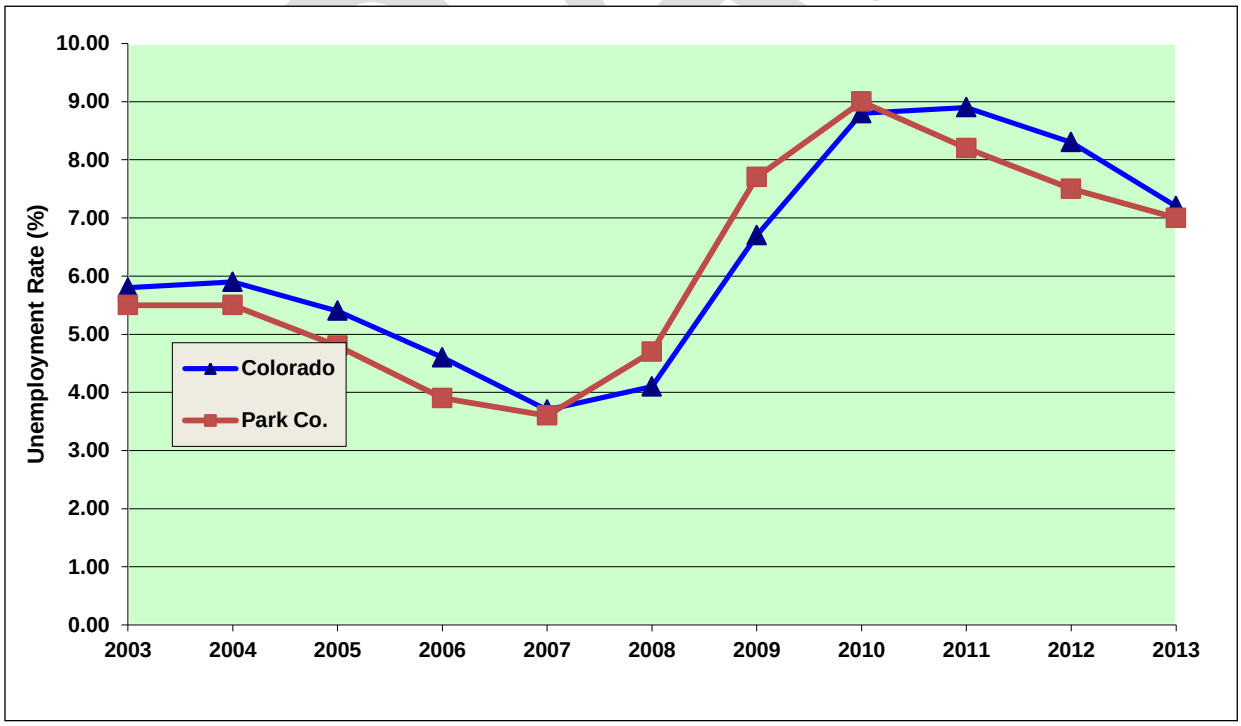

Figure 6-12. Colorado and Park County Unemployment Rate

Management and business make up over 32.5 percent of the jobs in the planning area. The largest employers in the county are Park County government, local school districts as well as some of the seasonal recreation facilities within the county. Public administration occupations make up 18 percent of the county's working population. Other major occupations are sales (26 percent) and natural resources, construction and maintenance positions (15.5 percent). Only about 26.2 percent of the employment in the planning area is in service, production, transportation and materials moving occupations.

The U.S. Census estimates that 73.1 percent of Park County workers commute alone (by car, truck or van) to work, and mean travel time to work is 40.8 minutes (the state average is 24.3 minutes).

According to the Colorado Department of Labor and Employment, there were 8,559 individuals employed in Park County during July of 2013. Of these 65 percent of the total workers were employed in the private sector. The largest private-sector employer is the accommodations and food services (14 percent of the workers), followed by construction (11 percent), the retail trade (9 percent), professional and technical services (5 percent), administrative services (4.5 percent), health care (4 percent), manufacturing (3 percent), and the wholesale trade (2 percent).

Construction and food/lodging establishments have been the two largest private employers for several consecutive years. In recent years the retail trade has surpassed professional services in terms of the number employed. Ranching, mining and entertainment, once significant employment sectors in the county, have provided negligible employment for many years.

The average annual 2012 wage paid in Park County was $33,436 compared to the State average of $53, 664. Industries paying the highest average wages include finance and insurance and the wholesale trade followed by information services professional and technical services mining transportation, educational services and manufacturing On average, the lowest wages in Park County are paid to lodging and food service workers.

It is estimated that a majority (85 percent) of the adult work force now commutes daily to locations of employment outside Park County for three reasons:

- The majority of Park County's adult population has relocated here while retaining employment in neighboring counties or cities (i.e. Denver);
- The higher wage scale in neighboring areas; and
- The lack of industry in the county as a whole.

Park County is a place where the quality of life does not equate to the convenience of suburban amenities. In many areas, the allure of mountain living may be tempered by the reality of driving 50 miles daily to work, the grocery store or a hospital. While community infrastructure development has not kept pace with population growth, "basic" services and amenities are gradually being established in the Bailey and Fairplay areas of Park County.

6.12 LAND USE DEVELOPMENT

While Park County experienced significant growth for Colorado during the 1990s and early 2000s, growth has stabilized. Park County has been undergoing a significant transition in its land use patterns and its economic base. There are still numerous historic mines and there are still many large ranches, but they no longer play as significant a role in the local economy as they once did. Residential subdivisions serving commuters to the Denver area and to Summit County and recreational subdivisions serving second-home owners are now becoming an important part of the landscape. Park County has been responding to these demographic changes through its planning efforts.

Park County last updated its Strategic Master Plan in 2001. Recommendations and policies contained in the Master Plan largely reflect the results of a community survey that was mailed to all 7,588 households. In addition, several workshops were held in every area in the county, with hundreds of residents participating in crafting "preferred development scenarios" for their communities and areas. From the survey, workshops, interviews and other public forums, several guiding principles emerged for Park County Government:

- Ensure that growth is sustainable (i.e. consistent with existing resources and carrying capabilities).
- Encourage new commercial development that will add value to each community.
- Protect the rights of private property owners.
- Ensure the rate of development allows the county and others to provide adequate levels of service.
- Protect surface water and ground water resources.
- Preserve and enhance critical natural areas.
- Mitigate existing and human-caused hazards.
- Preserve and protect cultural resources and structures.
- Target high density residential and commercial uses to areas around towns and rural population centers.
- Maintain the rural character of the county and rural areas through conservation of open space.
- Encourage heritage tourism and entrepreneurial business development to diversify the economy.
- Encourage site planning that minimizes the fragmentation of undeveloped lands, habitat, etc.
- Protect and preserve access routes to public lands.
- Promote new recreation opportunities for residents.
- Require new development to pay its fair share of the cost of providing services to such development.

In accordance with state subdivision enabling authority, Park County regulations establish two categories of subdivisions: subdivisions with individual parcels smaller than 35 acres and subdivisions with individual parcels equal to or larger than 35 acres. The land use requirements for smaller parcel subdivisions are more stringent than those for 35 acre parcel subdivisions.

The unincorporated areas of Park County are zoned through the county's zoning regulations. The incorporated towns within the county have enacted zoning and other land use regulations for development within their respective jurisdictions.

While there is significant growth within Park County, the County is managing growth so as not to increase vulnerability to hazards. The Master Plan discourages development in fire prone areas, wetlands, areas subject to erosion and other geologic hazards, and in floodplains. Because many of the areas of the county that are hazard-prone are on land that is publicly owned, the fact that a large percentage of land in Park County is controlled by federal and state agencies serves as an additional constraint to increased vulnerability.

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Figure 6-13 presents building permit data trends that are tracked by the Colorado Department of Local Affairs. Residential building permits are obtained mainly from the annual survey reports by the Housing Division of the U.S. Census Bureau. The permits include both private and public new housing units. Data prior to 1995 included the subtraction of demolitions. In most cases the permits do not cover mobile homes or trailers. Table 6-8 presents countywide property tax data by land use classification.

Source: https://dola.colorado.gov/demog_webapps/psc_parameters.jsf

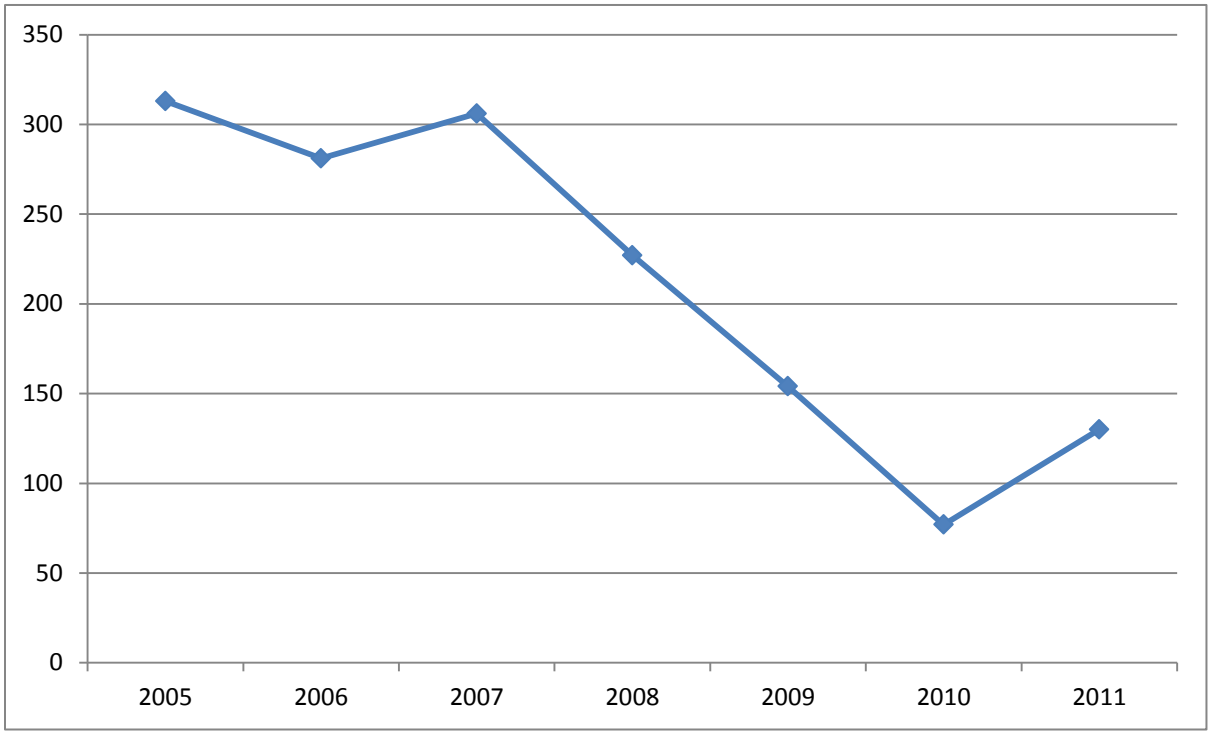

Figure 6-13. Park County Building Permits, 2005 – 2011

TABLE 6-8.
2011 PARK COUNTY PROPERTY TAX ROLL

Property Classification	Number of Parcels	Assessed Valuation	Percent of Tax Role
Residential Properties	11,494	$219,003,940.00	50
Vacant Land	23,760	$163,660,600.00	37
Commercial Properties	320	$24,018,672.00	5
State Assessed Public Utilities	38	$19,065,000.00	4
Agricultural Properties	1082	$7,084,940.00	2
Personal Property	322	$2,795,848.00	1
Natural Resources Properties	10	$4,247,820.00	1
Industrial Properties	7	$812,840.00	0
County Total	**38,787**	**$440,689,660.00**	**100**

As its population has grown, the Town of Fairplay has made efforts to attract more businesses to the community. The new market and the new bowling alley are examples of such businesses. These new businesses help Fairplay and the county economically and provide an increased sense of community.

Park County has large, though mostly untapped, natural resources, including mineral deposits such as gold, silver, uranium, rhodochrosite and several others. Most of these minerals are located on privately held patented mining claims.

Park County has adopted a comprehensive plan that forms the basis for land use decision and policy making their jurisdictions. Decisions on land use will be governed by these programs. This plan will work together with these programs to support wise land use in the future by providing vital information on the risk associated with natural hazards in the planning area.

All planning partners will incorporate this hazard mitigation plan update in their future planning efforts by reference. This will ensure that future development trends can be established with the benefits of the information on risk and vulnerability to natural hazards identified in this plan.

6.13 LAWS AND CAPABILITY ASSESSMENT

Existing laws, ordinances and plans at the federal, state and local level can support or impact hazard mitigation initiatives identified in this plan. Hazard mitigation plans are required to include a review and incorporation, if appropriate, of existing plans, studies, reports, and technical information as part of the planning process (44 CFR, Section 201.6(b)(3)). Pertinent federal and state laws are described below. A review of each planning partners existing local plans, studies, reports, and technical information is also provided.

6.13.1 Federal

Disaster Mitigation Act

The DMA is the current federal legislation addressing hazard mitigation planning. It emphasizes planning for disasters before they occur. It specifically addresses planning at the local level, requiring plans to be in place before Hazard Mitigation Grant Program funds are available to communities. This Plan is designed to meet the requirements of DMA, improving the planning partners' eligibility for future hazard mitigation funds.

Endangered Species Act

The federal Endangered Species Act (ESA) was enacted in 1973 to conserve species facing depletion or extinction and the ecosystems that support them. The act sets forth a process for determining which species are threatened and endangered and requires the conservation of the critical habitat in which those species live. The ESA provides broad protection for species of fish, wildlife and plants that are listed as threatened or endangered. Provisions are made for listing species, as well as for recovery plans and the designation of critical habitat for listed species. The ESA outlines procedures for federal agencies to follow when taking actions that may jeopardize listed species and contains exceptions and exemptions. It is the enabling legislation for the Convention on International Trade in Endangered Species of Wild Fauna and Flora. Criminal and civil penalties are provided for violations of the ESA and the Convention.

Federal agencies must seek to conserve endangered and threatened species and use their authorities in furtherance of the ESA's purposes. The ESA defines three fundamental terms:

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- **Endangered** means that a species of fish, animal or plant is "in danger of extinction throughout all or a significant portion of its range." (For salmon and other vertebrate species, this may include subspecies and distinct population segments.)
- **Threatened** means that a species "is likely to become endangered within the foreseeable future." Regulations may be less restrictive for threatened species than for endangered species.
- **Critical habitat** means "specific geographical areas that are…essential for the conservation and management of a listed species, whether occupied by the species or not."

Five sections of the ESA are of critical importance to understanding it:

- **Section 4: Listing of a Species**—The National Oceanic and Atmospheric Administration Fisheries Service (NOAA Fisheries) is responsible for listing marine species; the U.S. Fish and Wildlife Service is responsible for listing terrestrial and freshwater aquatic species. The agencies may initiate reviews for listings, or citizens may petition for them. A listing must be made "solely on the basis of the best scientific and commercial data available." After a listing has been proposed, agencies receive comment and conduct further scientific reviews for 12 to 18 months, after which they must decide if the listing is warranted. Economic impacts cannot be considered in this decision, but it may include an evaluation of the adequacy of local and state protections. Critical habitat for the species may be designated at the time of listing.
- **Section 7: Consultation**—Federal agencies must ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed or proposed species or adversely modify its critical habitat. This includes private and public actions that require a federal permit. Once a final listing is made, non-federal actions are subject to the same review, termed a "consultation." If the listing agency finds that an action will "take" a species, it must propose mitigations or "reasonable and prudent" alternatives to the action; if the proponent rejects these, the action cannot proceed.
- **Section 9: Prohibition of Take—**It is unlawful to "take" an endangered species, including killing or injuring it or modifying its habitat in a way that interferes with essential behavioral patterns, including breeding, feeding or sheltering.
- **Section 10: Permitted Take**—Through voluntary agreements with the federal government that provide protections to an endangered species, a non-federal applicant may commit a take that would otherwise be prohibited as long as it is incidental to an otherwise lawful activity (such as developing land or building a road). These agreements often take the form of a "Habitat Conservation Plan."
- **Section 11: Citizen Lawsuits**—Civil actions initiated by any citizen can require the listing agency to enforce the ESA's prohibition of taking or to meet the requirements of the consultation process.

With the listing of salmon and trout species as threatened or endangered, the ESA has impacted most of the Pacific Coast states. Although some of these areas have been more impacted by the ESA than others due to the known presence of listed species, the entire region has been impacted by mandates, programs and policies based on the presumption of the presence of listed species. Most West Coast jurisdictions must now take into account the impact of their programs on habitat.

The Clean Water Act

The federal Clean Water Act (CWA) employs regulatory and non-regulatory tools to reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage

polluted runoff. These tools are employed to achieve the broader goal of restoring and maintaining the chemical, physical, and biological integrity of the nation's surface waters so that they can support "the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water."

Evolution of CWA programs over the last decade has included a shift from a program-by-program, source-by-source, pollutant-by-pollutant approach to more holistic watershed-based strategies. Under the watershed approach, equal emphasis is placed on protecting healthy waters and restoring impaired ones. A full array of issues are addressed, not just those subject to CWA regulatory authority. Involvement of stakeholder groups in the development and implementation of strategies for achieving and maintaining water quality and other environmental goals is a hallmark of this approach.

National Flood Insurance Program

The National Flood Insurance Program (NFIP) provides federally backed flood insurance in exchange for communities enacting floodplain regulations. Participation and good standing under NFIP are prerequisites to grant funding eligibility under the Robert T. Stafford Act. The County and most of the partner municipalities for this plan participate in the NFIP and have adopted regulations that meet the NFIP requirements. At the time of the preparation of this plan, all participating jurisdictions in the partnership were in good standing with NFIP requirements.

6.13.2 State

Under House Bill 12-1283, the former Division of Emergency Management moved from the Department of Local Affairs to the newly created Division of Homeland Security and Emergency Management under the Colorado Department of Public Safety, effective July 1, 2012. The division consists of three offices:

- Office of Emergency Management
- Office of Preparedness
- Office of Prevention and Security

Homeland Security and Emergency Management operate under the following division mission: The Mission of the Division of Homeland Security and Emergency Management is to support the needs of local government and partner with them before, during and after a disaster and to enhance preparedness statewide by devoting available resources toward prevention, protection, mitigation, response and recovery, which will ensure greater resiliency of our communities. The Division vision is: The Vision of the division of Homeland Security and Emergency Management is to unify homeland security and emergency management within the Colorado Department of Public Safety to support tribal and local government and ensure State and Federal agency coordination.

6.13.3 Park County

Table 6-9 presents an overview of government data for Park County. Specific governmental capabilities of the county and of incorporated towns are assessed in the following sections.

Staff and Organizational Capability

Park County has a staff and organizational capability to implement hazard mitigation strategies. The County is administered by a three-person commission (3 County Commissioners) form of government. Commissioners are elected at large from one of three geographic districts for four-year staggered terms. The Commission oversees the day-to-day operations of county government and manages the various county departments. They also direct and supervise the administration of all county offices, boards, and agencies under the general direction and control of the Commission.

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TABLE 6-9.
GOVERNMENT

Type of Government (Park County)	County Commissioners
Type of Government (Town of Alma)	Mayor/Town Board
Type of Government (Town of Fairplay)	Mayor/Town Board
Planning Commission	Yes
Zoning Regulations	Yes
State Sales Tax	2.9%
Full-time Firefighters	10
Volunteer Firefighters	200+
Fire Insurance Rating	Fire District Dependent
Enforcement Officers	70
Enforcement Vehicles	55

Responsibilities

Colorado state statutes designate counties to function as a service of the State and to serve as the legislative, policymaking, and administrative body governing the unincorporated areas. The specific powers, authorities, and responsibilities of the Board of County Commissioners include the following:

- The responsibility to provide leadership to county operations through the adoption of the annual budget, which includes all departments, commissions, and other spending agencies funded by County appropriations
- The power to levy taxes, subject to State tax revenue limitations
- The authority to represent and manage the business and concerns of the County and to care for its property

The County has a number of professional staff departments to serve the residents of the county and to carry out day-to-day administrative activities. These include the following:

- County Administrator
- Assessor
- Budget and Finance
- Building
- Clerk and Recorder
- Community Development
- Coroner
- Development Services
- Emergency Management
- Fairgrounds
- GIS Mapping
- Historic Preservation
- Human Resources
- Human Services
- Library
- Public Health
- Road & Bridge
- Sheriff's Office
- Treasurer and Public Trustee
- Tourism
- Veteran's Services

There are also Boards and Committees that provide administrative support to the County including a Planning Commission and Board of Adjustment. The Emergency Management Department is responsible for mitigation, preparedness, response, and recovery operations within Park County, with the assistance from the Planning Department and emergency services agencies including law enforcement agencies and fire districts. The Planning Department is also responsible for addressing land use planning as well as developing mitigation strategies. The Planning Department has been involved in the development of this mitigation plan to identify gaps, weaknesses or opportunities for enhancement with existing mitigation programs. For the most part, it was determined that the county departments are adequately staffed and trained to accomplish their missions, but they lack adequate funding.

Technical Capability

Technical Expertise

Park County has an emergency management director on staff to administer its hazard mitigation programs. The county also relies on outside contractors/consultants to perform required technical work where the County does not have the expertise. There is also an Geographic Information Services/Mapping Department, which can enhance local government operations and the county's ability to develop and maintain a state-of-the art hazard mitigation program.

Geographic Information Systems

GIS systems can best be described as a set of tools (hardware, software, and trained staff) used to collect, manage, analyze and display spatially-referenced data. Many local governments are now incorporating GIS systems into their existing planning and management operations. Park County utilizes their Mapping/GIS Department in several county emergency planning activities, and has the capability to assist in furthering hazard mitigation goals.

- **Geologic Mapping**. The mapping identifies selected areas of potential geologic problems such as mudflow/debris flow flooding, rock fall, landslide deposits, mine subsidence, and potentially active faults.
- **Addressing**. County GIS is undertaking an effort to improve digital addressing in support of 9-1-1 and other emergency response applications.

Geographic Information Systems (GIS) are commonly used in the identification and mitigation of natural disasters as well as recovery from disasters. The application of spatially referenced watersheds, precipitation monitoring locations, stream networks, stream gages, floodplains, and diversion structures could provide Park County with the tools to better mitigate damage from flooding and to predict potential for flooding.

Park County has a long range goal to interface the Countywide GIS mapping with the County Assessor's property data records. Development of this interface would be beneficial to future planning efforts as it would allow more accurate projections to be developed regarding the potential impacts /dollar losses of natural hazards in the future.

Internet Access

Park County provides its employees with high-speed broadband Internet service. Employees have personal internet accounts which they can utilize while at work. The County does have a website which electronically connects with its constituents. This provides an enormous opportunity for local officials to keep abreast of the latest information relative to their work and makes receiving government services more affordable and convenient. Additionally, Park County has an emergency management webpage that gives citizens the opportunity to remain informed during disasters and to prepare for emergencies before

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they occur. Information technology also offers increased economic opportunities, higher living standards, more individual choices, and wider and more meaningful participation in government and public life. Simply put, information technology can make distance – a major factor for county officials and residents - far less important than in the past. Internet access will help further the County's hazard mitigation awareness programs, but should be supplemented with more traditional (and less technical) means as well.

Reverse 911

The County implemented a Reverse 911 system several years ago to provide emergency notification to residents. Special buffer 'pre-plan' zones have been pre-created to notify residents in the event of a flood or other emergency in the County. Pre-plan areas include: flood zones, other hazard areas.

Fiscal Capability

Park County has fiscal capability to implement hazard mitigation strategies. For Fiscal Year 2013, the county has budgeted total annual expenditures of $29,892,844.00. The majority of these funds are obligated to general fund expenditures. The County receives most of its revenues through property taxes, grant monies, and other restricted intergovernmental contributions (Federal and State pass through dollars). The County has a one-percent sales tax. This tax is paid on all retail goods purchased in Park County as well as lodging and restaurant transactions. It is likely that Park County could afford to provide the cost share for the existing hazard mitigation grant programs. However, current budget deficits at both the State and local government level in Colorado, combined with the apparent increased reliance on local accountability by the Federal government, creates a significant and growing concern for the county regarding possible future directions for mitigation programs. Under the DMA 2000, FEMA has made special accommodations for "small and impoverished communities," who will be eligible for a 90-percent federal share, 10-percent non-federal cost share for projects funded through the Pre-Disaster Mitigation (PDM) grant program. According to the current Interim Final Rule for Section 322 of the Act, Park County will not qualify as a small and impoverished county. The definition is restricted to "communities of 3,000 or fewer individuals that is identified by the State as a rural county."

Policy and Program Capability

This part of the capabilities assessment includes the identification and evaluation of existing plans, policies, practices, programs, or activities that either increase or decrease the county's vulnerability to hazards. Positive activities, which decrease hazard vulnerability, will be sustained and enhanced to the fullest extent possible. Negative activities, which increase hazard vulnerability, will be targeted for reconsideration and will be thoroughly addressed within the Mitigation Strategy for Park County.

Recent Hazard Mitigation Efforts

The County has developed a Community Wildfire Protection Plan as have many of the fire protection districts that has been approved by the Board of Commissioners and the State and Federal land managers that outlines mitigation projects to decrease wildfire danger throughout the County. Many of Park County's local communities have also become FireWise Communities, allowing citizens to participate in wildfire mitigation.

CRS (Community Rating System) Activities

Communities that regulate development in floodplains are able participate in the NFIP. In return, the NFIP makes federally backed flood insurance policies available for properties in the county. The CRS was implemented in 1990 as a program for recognizing and encouraging county floodplain management activities that exceed the minimum NFIP standards. There are ten CRS classes: class 1 requires the most

credit points and gives the largest premium reduction; class 10 receives no premium reduction. Park County does not currently participate in the CRS.

Emergency Operations Plans

Park County has developed and adopted an Emergency Operations Plan which predetermines actions to be taken by government agencies and private organizations in response to an emergency or disaster event. The Plan describes the County's capabilities to respond to emergencies and establishes the responsibilities and procedures for responding effectively to the actual occurrence of a disaster. The plan does not specifically address hazard mitigation, but it does identify the specific operations to be undertaken by the County to protect lives and property immediately before, during and immediately following an emergency. There are no foreseeable conflicts between this Hazard Mitigation Plan and Park County's Emergency Operations Plan, primarily because they are each focused on two separate phases of emergency management (mitigation vs. preparedness and response). The Plan identifies the County Commission as having the lead role in the long-term recovery phase following a disaster – which presents a unique window of opportunity for implementing hazard mitigation strategies. However, none are specified within the Emergency Operations Plan.

Floodplain Management Plan

Park County's Floodplain Management authority exists within the Land Use Regulations, Article 7, Division 10, Section 7-1000 through 7-1009. The County does not currently have a separate floodplain management plan for NFIP purposes. This Hazard Mitigation Plan is intended to fulfill the CRS planning requirement, if and when, the County decides to participate in the CRS.

Stormwater Management Plan

Park County does not currently have an adopted storm water management plan; however, the County is an agent of the State of Colorado for storm water management purposes under the Federal Clean Water Act, which addresses the discharge of pollutants to surface waters from "point sources" and "non-point sources."

Watershed Protection Plan

Park County does not currently have a separate watershed protection plan.

Open Space Plan

Park County does not currently have a separate open space plan.

Comprehensive Plan

In 2001 the Board of Park County Commissioners adopted the Park County Strategic Master Plan as a blueprint for new Land Use Regulations that were subsequently refined and adopted in 2003 and revised in 2005. Hazard mitigation planning is not specifically addressed in the plan. The County is currently in the process of updating the Plan. It is anticipated that all updates of the Comprehensive Plan will reflect recommendations made in the current mitigation plan and vice versa, ensuring that all County planning efforts are integrated.

Recommendations and policies contained in the Master Plan largely reflect the results of a community survey that was mailed to all 7,588 households. In addition, several community workshops were held in every area in the county where hundreds of residents participated in crafting "preferred development scenarios" for their communities and areas. From the survey, workshops, interviews and other public forums, several guiding principles emerged for Park County:

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- Ensure that growth is sustainable (i.e. consistent with existing resources and carrying capacities).
- Encourage new commercial development that will add value to each community (i.e. grocery stores).
- Protect the rights of private property owners.
- Ensure the rate of development allows the county and others to provide adequate levels of service.
- Protect surface water and groundwater resources.
- Preserve and enhance critical natural areas.
- Mitigate existing and potential man-made hazards.
- Preserve and protect cultural resources & structures.
- Target high density residential and commercial uses to areas around towns and rural population centers.
- Maintain the rural character of the county and rural areas through preservation of open space.
- Encourage heritage tourism and entrepreneurial business development to diversify the economy.
- Encourage site planning that minimizes the fragmentation of undeveloped lands, habitat, etc.
- Protect and preserve access routes to public lands.
- Promote new recreation opportunities for residents.
- Require new development to pay its fair share of the cost of providing services to such development.

Legal Authority

Local governments in Colorado have a wide range of tools available to them for implementing mitigation programs, policies, and actions. A hazard mitigation program can utilize any or all of the four broad types of government powers granted by the State of Colorado, which are (a) regulation (by ordinance in the case of cities and towns), (b) acquisition, (c) taxation, and (d) spending. The scope of this local authority is subject to constraints, however, as Colorado' political subdivisions must not act without proper delegation from the State. All power is vested in the State and can only be exercised by local governments to the extent it is delegated. Thus, this portion of the capabilities assessment will summarize Colorado's enabling legislation that grants the four types of government powers listed above within the context of available hazard mitigation tools and techniques.

Regulation

- **General Police Power**—Colorado' local governments have been granted broad regulatory powers in their jurisdictions. Colorado State Statutes bestow the general police power on local governments, allowing them to enact and enforce ordinances/regulations that define, prohibit, regulate or abate acts, omissions, or conditions detrimental to the health, safety, and welfare of the people, and to define and abate nuisances (including public health nuisances). Since hazard mitigation can be included under the police power (as protection of public health, safety and welfare), towns, cities and counties may include requirements for hazard mitigation in local ordinances/regulations. Local governments may also use their ordinance/regulation-making power to abate "nuisances," which could include, by local definition, any activity or condition making people or property more vulnerable to any

hazard. Park County has enacted and enforces regulations designed to promote the public health, safety and general welfare of its citizenry and that are, therefore, relevant to hazard mitigation.

- **Building Codes and Building Inspection**—Many structural mitigation measures involve constructing and retrofitting homes, businesses, and other structures according to standards designed to make the buildings more resilient to the impacts of natural hazards. Many of these standards are imposed through building codes. Municipalities and counties may adopt codes for their respective areas, if approved by the state, as providing "adequate minimum standards." Local regulations cannot be less restrictive than the State code. Local governments in Colorado are also empowered to carry out building inspections. The State legislation empowers cities and counties to create an inspection department, and enumerates its duties and responsibilities which include enforcing State and local laws relating to the construction of buildings, installation of plumbing, electrical, heating systems, etc.; building maintenance; and other matters. Park County has adopted the 2006 building code and has established a Building/ Inspections Office to carry out its building inspections.
- **Land Use**—Regulatory powers granted by the State to local governments provide the most basic means by which a local government can control the use of land within its jurisdiction. Through various land use regulatory powers, a local government can control the amount, timing, density, quality, and location of new development. All of these characteristics of growth can determine the level of vulnerability of the county in the event of a natural hazard. Land use regulatory powers include the power for counties and municipalities to engage in planning, and enact and enforce zoning regulations/ordinances, subdivision controls, and floodplain regulations/ordinances. Each local community possesses great power to prevent unsuitable development in hazard-prone areas. Park County has adopted a land use regulation. The Park County Land Use Regulations currently in effect were adopted on November 11, 2011.
  - ***Planning***—According to State statutes, local governments in Colorado may create or designate a planning agency. The planning agency may perform a number of duties including: make studies of the area; determine objectives; prepare and adopt plans for achieving those objectives; develop and recommend policies, ordinances, and administrative means to implement plans; and perform other related duties. The importance of the planning powers of local governments is illustrated by the requirement that zoning regulations be made in accordance with a comprehensive plan. While the regulation/ordinance itself may provide evidence that zoning is being conducted "in accordance with a plan," the existence of a separate planning document ensures that the government is developing regulations and ordinances that are consistent with the overall goals of the county. Park County has established a Planning Office and Zoning Office.
  - ***Zoning***—Zoning is the traditional and most common tool available to local governments to control the use of land. Broad enabling authority is granted for municipalities and counties in Colorado to engage in zoning. Land "uses", which are controlled by zoning, include the type of use (e.g., residential, commercial, industrial) as well as minimum specifications for use such as lot size, building height and setbacks, density of population, etc. Local governments are authorized to divide their territorial jurisdiction into districts, and to regulate and restrict the erection, construction, reconstruction, alteration, repair or use of buildings, structures, or land within those districts. Districts may include general use districts, overlay districts, and special use districts or conditional use districts. Zoning regulations/ordinances consist of maps and written text. Park County enforces a County wide zoning regulation.

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- ***Subdivision Regulations***—Subdivision regulations control any division of land into parcels for the purpose of building development or sale. Flood-related subdivision controls typically require that sub-dividers install adequate drainage facilities and design water and sewer systems to minimize flood damage and contamination. They prohibit the subdivision of land subject to flooding unless flood hazards are overcome through filling or other measures, and they prohibit filling of floodway areas. Subdivision regulations require that subdivision plans be approved prior to the division of land. Subdivision regulations are a more limited tool than zoning and only indirectly affect the type of use made of land or minimum specifications for structures. Subdivision of land is defined in Park County as: "To plat, parcel, create, separate, sell, convey, transfer, grant, gift, dispose of or otherwise split real property into two or more properties or Easements." Park County has adopted subdivision regulations as part of the Land Use Regulations. The current regulations are dated November 2005.

  All proposed subdivisions must go through an approval process. Subdivision plats are required for review and must include a graphic description of areas subject to flooding. Lands subject to flooding, irregular drainage conditions, excessive erosion and other reasons considered unsuitable for residential use shall not be permitted for residential use unless the hazards can be and are corrected. Plats are also reviewed by the local permit officer to determine whether the property has other environmental concerns, and specifies what permits are required. Final plats must be prepared by a registered or licensed professional land surveyor. The Land Use Administrator and Code Enforcement Office also review plats to identify matters of topography and drainage concern. Although not designed specifically for hazard mitigation purposes, this regulation will prevent flood losses in tandem with the Floodplain Regulations. It will also minimize the adverse effects that development can have on storm water drainage through impervious surface requirements and through sedimentation and erosion control. Through its roadway requirements, the regulation also provides for adequate ingress and egress to subdivisions by emergency vehicles for fires or severe weather events. The mitigation effectiveness of this regulation is moderate.

- ***Stormwater Regulations***—Storm water regulations are most often **used** to control runoff and erosion potential which results from small-scale development of less than five acres. A reduction in damage from small-scale development is achieved through requirements such as on-site retention/detention ponds, etc. The State of Colorado encourages local governments to adopt storm water regulations under land use authorities. The County addresses storm water regulations in Section 7-602 entitled Drainage, Erosion and Sedimentation Control as part of the current Land Use Regulations.

- ***Floodplain Regulation***—Colorado State statutes provide cities and counties land use authority. In particular, issues such as floodwater control are empowered through State Statute. The County has adopted floodplain regulations. The current regulations are dated November 2011.

  The Floodplain Regulations are designed to minimize public and private losses due to flood conditions in specific areas. It requires a development permit to be submitted to the County prior to any construction or substantial improvement activities. Permits will only be approved if they meet the provisions of the regulations, which include development standards that will minimize the potential for flood losses. Standards are established for construction materials, equipment, methods, practices and uses. Most importantly, the regulations establish the requirements for elevation and flood proofing (non-residential) to the base flood elevation. These regulations require the minimum regulatory standards of the NFIP for development within the floodplain intended to reduce flood losses and

promote wise use of the floodplain. The County also requires that anyone proposing a development in the floodway or floodplain prepare a plan which shows 1) the floodplain and floodways and overall site affected, 2) the proposed improvements or development, 3) the elevations of the area in question, and 4) any existing or proposed structures, fill, storage of materials, drainage facilities and the location of each. The County's floodplain areas were last studied in 1991. No floodplain areas in the County are currently being re-studied as part of the State's Floodplain Mapping Program. It is possible floodplain areas will be redelineated with updated topography, and that base flood elevations will be recalculated at some point in the future, as funding becomes available. The mitigation effectiveness of these regulations is high. Park County participates in the National Flood Insurance Program (NFIP).

- □ Initial Map Date: 11/22/77
- □ Current Map Effective Date: 12/18/2009
- □ As of 6/25/2013, Park County had twenty nine (29) flood insurance policies in effect.

- **State of Emergency Regulation**—Park County does not have an Emergency Regulation

Acquisition

The power of acquisition can be a useful tool for pursuing local mitigation goals. Local governments may find the most effective method for completely "hazard proofing" a particular piece of property or area is to acquire the property (either in fee or a lesser interest, such as an easement), thus removing the property from the private market and eliminating or reducing the possibility of inappropriate development occurring. Colorado legislation empowers cities, towns, and counties to acquire property for public purpose by gift, grant, devise, bequest, exchange, purchase, lease, or eminent domain. Park County has not undertaken acquisition as a mitigation measure/tool.

Taxation

The power to levy taxes and special assessments is an important tool delegated to local governments by Colorado law. The power of taxation extends beyond merely the collection of revenue, and can have a profound impact on the pattern of development in the county. Communities have the power to set preferential tax rates for areas which are more suitable for development in order to discourage development in otherwise hazardous areas. Local units of government also have the authority to levy special assessments on property owners for all or part of the costs of acquiring, constructing, reconstructing, extending or otherwise building or improving flood protection works within a designated area. This can serve to increase the cost of building in such areas, thereby discouraging development. Because the usual methods of apportionment seem mechanical and arbitrary, and because the tax burden on a particular piece of property is often quite large, the major constraint in using special assessments is political. Special assessments seem to offer little in terms of control over land use in developing areas. They can, however, be used to finance the provision of necessary services within municipal or county boundaries. In addition, they are useful in distributing to the new property owners the costs of the infrastructure required by new development. Park County does levy property taxes.

Spending

The fourth major power that has been delegated from the Colorado General Assembly to local governments is the power to make expenditures in the public interest. Hazard mitigation principles can be made a routine part of all spending decisions made by the local government, including the adoption annual budgets and a Capital Improvement Plan (CIP). A CIP is a schedule for the provision of municipal or county services over a specified period of time. Capital programming, by itself, can be used as a growth management technique, with a view to hazard mitigation. By tentatively committing itself to a

timetable for the provision of capital to extend services, a county can control growth, to some extent, especially in areas where the provision of on-site sewage disposal and water supply are unusually expensive. In addition to formulating a timetable for the provision of services, a local county can regulate the extension of and access to services. A CIP that is coordinated with extension and access policies can provide a significant degree of control over the location and timing of growth. These tools can also influence the cost of growth. If the CIP is effective in directing growth away from environmentally sensitive or high hazard areas, for example, it can reduce environmental costs. Park County does not have a CIP.

6.13.4 Town of Alma

Staff and Organizational Capability

The Town of Alma has a staff and organizational capability to implement hazard mitigation strategies. The town is administered by a seven-person town council form of government. The Town Administration oversees the day-to-day operations of town government and manages the various departments. The Council directs and supervises the administration of all town offices, boards, and agencies under the general direction and control of the Council. Responsibilities of the Administrator and the Council include:

- Development of the annual budget,
- Coordination of public relations programs,
- Administration of equal employment opportunity and affirmative action policies and programs,
- Human resource management and payroll,
- Risk management,
- Facilities management, and
- A number of delegated programs.

The Town of Alma has a number of professional staff departments to serve the residents of the town and to carry out day-to-day administrative activities. These include the following:

- Town Planner
- Public Works Director
- Town Clerk
- Human Services (in cooperation with Park County Government)
- Planning and Zoning (in cooperation with Park County Government)
- Police Department
- Assessor (in cooperation with Park County Government)
- Treasurer
- Library

There are also Boards and Committees that provide administrative support to the town including a Planning Commission and Board of Adjustment. The Park County Emergency Management Department is responsible for mitigation, preparedness, response, and recovery operations within Park County, with the assistance from the Planning Department and emergency services agencies including law enforcement

agencies and fire districts. The County Office of Emergency Management works closely with the Town of Alma to meet town and county emergency management goals. The Planning Department is also responsible for addressing land use planning as well as developing mitigation strategies. The Planning Department has been involved in the development of this mitigation plan to identify gaps, weaknesses or opportunities for enhancement with existing mitigation programs. For the most part, it was determined that the town departments are adequately staffed and trained to accomplish their missions, but they lack adequate funding.

Technical Capability

Technical Expertise

The Town of Alma works cooperatively with the County Office of Emergency Management, and the floodplain official on staff to administer its hazard mitigation programs. It also relies on outside contractors/consultants to perform required technical work where the town does not have the expertise.

Geographic Information Systems

GIS systems can best be described as a set of tools (hardware, software, and trained staff) used to collect, manage, analyze and display spatially-referenced data. Many local governments are now incorporating GIS systems into their existing planning and management operations. The Town of Alma utilizes the Park County Mapping/GIS Department in several town emergency planning activities, and has the capability to assist in furthering hazard mitigation goals.

Internet Access

The Town of Alma provides its employees with satellite Internet service. The Town of Alma maintains a website about the town, electronically connecting with its constituents. This provides an enormous opportunity for locals to keep abreast of the latest information relative to their work and makes receiving government services more affordable and convenient. Additionally, Park County has an emergency management webpage that gives citizens the opportunity to remain informed during disasters and to prepare for emergencies before they occur. Information technology also offers increased economic opportunities, higher living standards, more individual choices, and wider and more meaningful participation in government and public life. Simply put, information technology can make distance - a major factor for town officials and residents - far less important than in the past. Internet access will help further the town's hazard mitigation awareness programs, but should be supplemented with more traditional (and less technical) means as well.

Fiscal Capability

The Town of Alma has limited fiscal capability to implement hazard mitigation strategies. For Fiscal Year 2012, the town has budgeted total annual expenditures of $341,113.00. The majority of these funds are obligated to general fund expenditures. The Town also has two enterprise funds for water ($115,212.00) and sewer (49,265.00). The Town receives most of its revenues through property taxes, grant monies, and other restricted intergovernmental contributions (Federal and State pass through dollars). The Town also receives revenues through a 3-percent sales tax. It is likely that the Town of Alma could afford to provide the cost share for the existing hazard mitigation grant programs. However, current budget deficits at both the State and local government level in Colorado, combined with the apparent increased reliance on local accountability by the Federal government, creates a significant and growing concern for the town regarding possible future directions for mitigation programs. Under the DMA 2000, FEMA has made special accommodations for "small and impoverished communities," who will be eligible for a 90-percent federal share, 10-percent non-federal cost share for projects funded through the Pre-Disaster Mitigation (PDM) grant program. According to the current Interim Final Rule for Section 322 of the Act, Park

County will not qualify as a small and impoverished county. The definition is restricted to "communities of 3,000 or fewer individuals that is identified by the State as a rural county."

Policy and Program Capability

This part of the capabilities assessment includes the identification and evaluation of existing plans, policies, practices, programs, or activities that either increase or decrease the county's vulnerability to hazards. Positive activities, which decrease hazard vulnerability, will be sustained and enhanced to the fullest extent possible. Negative activities, which increase hazard vulnerability, will be targeted for reconsideration and will be thoroughly addressed within the Mitigation Strategy for the Town of Alma.

Recent Hazard Mitigation Efforts

Park County has developed a Community Wildfire Protection Plan that has been approved by the Board of Commissioners and the State and Federal land managers that outlines mitigation projects to decrease wildfire danger throughout the County. Many of Park County's local communities have also become FireWise Communities, allowing citizens to participate in wildfire mitigation. The Town of Alma is included in the County plan.

CRS (Community Rating System) Activities

Communities that regulate development in floodplains are able participate in the NFIP. In return, the NFIP makes federally backed flood insurance policies available for properties in the county. The CRS was implemented in 1990 as a program for recognizing and encouraging county floodplain management activities that exceed the minimum NFIP standards. There are ten CRS classes: class 1 requires the most credit points and gives the largest premium reduction; class 10 receives no premium reduction. The Town of Alma does not currently participate in the CRS.

Emergency Operations Plans

Park County has developed and adopted an Emergency Operations Plan which predetermines actions to be taken by government agencies and private organizations in response to an emergency or disaster event. The Plan describes the County's capabilities to respond to emergencies and establishes the responsibilities and procedures for responding effectively to the actual occurrence of a disaster. The plan does not specifically address hazard mitigation, but it does identify the specific operations to be undertaken by the County to protect lives and property immediately before, during and immediately following an emergency. There are no foreseeable conflicts between this Hazard Mitigation Plan and Park County's Emergency Operations Plan, primarily because they are each focused on two separate phases of emergency management (mitigation vs. preparedness and response). The Plan identifies the County Commission as having the lead role in the long-term recovery phase following a disaster – which presents a unique window of opportunity for implementing hazard mitigation strategies. However, none are specified within the Emergency Operations Plan. The Town of Alma does not currently have an Emergency Operations Plan separate from the County.

Floodplain Management Plan

The Town of Alma's Floodplain Management authority exists within the town Land Use Regulations, Article IX, zoning ordinance 2003-3. The Town does not currently have a separate floodplain management plan for NFIP purposes, except for provisions listed in the land use regulations. This Hazard Mitigation Plan is intended to fulfill the CRS planning requirement, if and when, the town decides to participate in the CRS.

Stormwater Management Plan

The Town of Alma has a storm water management plan for Highway 9 and for all new subdivisions (11/2006).

Watershed Protection Plan

The Town of Alma has a watershed protection plan, adopted in 1982.

Open Space Plan

The Town of Alma has an open space plan as part of their land use regulations.

Comprehensive Plan

The Town adopted a Comprehensive Plan in 2000. The plan provides the future vision for the town regarding growth and development. Hazard mitigation planning is not specifically addressed in the plan.

Legal Authority

Local governments in Colorado have a wide range of tools available to them for implementing mitigation programs, policies, and actions. A hazard mitigation program can utilize any or all of the four broad types of government powers granted by the State of Colorado, which are (a) regulation (by ordinance in the case of cities and towns), (b) acquisition, (c) taxation, and (d) spending. The scope of this local authority is subject to constraints, however, as Colorado' political subdivisions must not act without proper delegation from the State. All power is vested in the State and can only be exercised by local governments to the extent it is delegated. Thus, this portion of the capabilities assessment will summarize Colorado's enabling legislation that grants the four types of government powers listed above within the context of available hazard mitigation tools and techniques.

Regulation

- **General Police Power**— Colorado' local governments have been granted broad regulatory powers in their jurisdictions. Colorado State Statutes bestow the general police power on local governments, allowing them to enact and enforce ordinances/regulations that define, prohibit, regulate or abate acts, omissions, or conditions detrimental to the health, safety, and welfare of the people, and to define and abate nuisances (including public health nuisances). Since hazard mitigation can be included under the police power (as protection of public health, safety and welfare), towns, cities and counties may include requirements for hazard mitigation in local ordinances/regulations. Local governments may also use their ordinance/regulation-making power to abate "nuisances," which could include, by local definition, any activity or condition making people or property more vulnerable to any hazard. The Town of Alma has enacted and enforces ordinances designed to promote the public health, safety and general welfare of its citizenry and that are, therefore, relevant to hazard mitigation.
- **Building Codes and Building Inspection**— Building Codes and Building Inspection- Many structural mitigation measures involve constructing and retrofitting homes, businesses, and other structures according to standards designed to make the buildings more resilient to the impacts of natural hazards. Many of these standards are imposed through building codes. Municipalities and counties may adopt codes for their respective areas, if approved by the state, as providing "adequate minimum standards." Local regulations cannot be less restrictive than the State code. Local governments in Colorado are also empowered to carry out building inspections. The State legislation empowers cities and counties to create an inspection department, and enumerates its duties and responsibilities which include enforcing

State and local laws relating to the construction of buildings, installation of plumbing, electrical, heating systems, etc.; building maintenance; and other matters. The Town of Alma manages all of its own building permits.

- **Land Use**— Regulatory powers granted by the State to local governments provide the most basic means by which a local government can control the use of land within its jurisdiction. Through various land use regulatory powers, a local government can control the amount, timing, density, quality, and location of new development. All of these characteristics of growth can determine the level of vulnerability of the county in the event of a natural hazard. Land use regulatory powers include the power for counties and municipalities to engage in planning, and enact and enforce zoning regulations/ordinances, subdivision controls, and floodplain regulations/ordinances. Each local community possesses great power to prevent unsuitable development in hazard-prone areas. The Town of Alma has adopted a land use regulation.
  - ***Planning***— According to State statutes, local governments in Colorado may create or designate a planning agency. The planning agency may perform a number of duties including: make studies of the area; determine objectives; prepare and adopt plans for achieving those objectives; develop and recommend policies, ordinances, and administrative means to implement plans; and perform other related duties. The importance of the planning powers of local governments is illustrated by the requirement that zoning regulations be made in accordance with a comprehensive plan. While the regulation/ordinance itself may provide evidence that zoning is being conducted "in accordance with a plan," the existence of a separate planning document ensures that the government is developing regulations and ordinances that are consistent with the overall goals of the community. The Town of Alma has established a Planning Department and Commission.
  - ***Zoning***— Zoning is the traditional and most common tool available to local governments to control the use of land. Broad enabling authority is granted for municipalities and counties in Colorado to engage in zoning. Land "uses", which are controlled by zoning, include the type of use (e.g., residential, commercial, industrial) as well as minimum specifications for use such as lot size, building height and setbacks, density of population, etc. Local governments are authorized to divide their territorial jurisdiction into districts, and to regulate and restrict the erection, construction, reconstruction, alteration, repair or use of buildings, structures, or land within those districts. Districts may include general use districts, overlay districts, and special use districts or conditional use districts. Zoning regulations/ordinances consist of maps and written text. The Town of Alma enforces a zoning regulation.
  - ***Subdivision Regulations***— Subdivision regulations control the division of land into parcels for the purpose of building development or sale. Flood-related subdivision controls typically require that sub-dividers install adequate drainage facilities and design water and sewer systems to minimize flood damage and contamination. They prohibit the subdivision of land subject to flooding unless flood hazards are overcome through filling or other measures, and they prohibit filling of floodway areas. Subdivision regulations require that subdivision plans be approved prior to the division or sale of land. Subdivision regulations are a more limited tool than zoning and only indirectly affect the type of use made of land or minimum specifications for structures. Subdivision is defined as all divisions of a tract or parcel of land into two or more lots and all divisions involving a new street. In Park County, the definition of subdivision does not include the division of land into parcels greater than 35 acres. The Town of Alma has adopted subdivision regulations as part of the Land Use Regulations.

The Subdivision Regulations controls divisions of two or more parcels as a subdivision. The term "subdivision" does not apply to any division of land that creates parcels of land where each parcel is 35 acres or more in size or a subdivision of land that is approved as a Subdivision Exemption. All proposed subdivisions must go through an approval process. Subdivision plats are required for review and must include a graphic description of areas subject to flooding. Lands subject to flooding, irregular drainage conditions, excessive erosion and other reasons considered unsuitable for residential use shall not be permitted for residential use unless the hazards can be and are corrected. Plats are also reviewed by the Town Council to determine whether the property has other environmental concerns, and specifies what permits are required. Final plats shall be prepared by a registered or licensed professional land surveyor. The Town staff, attorney and engineer also review plats to identify matters of topography and drainage concern. Although not designed specifically for hazard mitigation purposes, this regulation will prevent flood losses in tandem with the Floodplain Regulations. It will also minimize the adverse effects that development can have on storm water drainage through impervious surface requirements and through sedimentation and erosion control. Through its roadway requirements, the ordinance also provides for adequate ingress and egress to subdivisions by emergency vehicles for fires or severe weather events. The mitigation effectiveness of this regulation is moderate.

Stormwater Regulations— Storm water regulations are most often used to control runoff and erosion potential which results from small-scale development of less than five acres. A reduction in damage from small-scale development is achieved through requirements such as on-site retention/detention ponds, etc. The State of Colorado encourages local governments to adopt storm water regulations under land use authorities. The Town of Alma has adopted storm water regulations.

– ***Floodplain Regulation***— Colorado State statutes provide cities and counties land use authority. In particular, issues such as floodwater control are empowered through State Statute. The Town of Alma has adopted floodplain regulations.

- **State of Emergency Regulation**—Park County does not have an Emergency Regulation

Acquisition

The power of acquisition can be a useful tool for pursuing local mitigation goals. Local governments may find the most effective method for completely "hazard proofing" a particular piece of property or area is to acquire the property (either in fee or a lesser interest, such as an easement), thus removing the property from the private market and eliminating or reducing the possibility of inappropriate development occurring. Colorado legislation empowers cities, towns, and counties to acquire property for public purpose by gift, grant, devise, bequest, exchange, purchase, lease, or eminent domain. The Town of Alma has not undertaken acquisition as a mitigation measure/tool.

Taxation

The power to levy taxes and special assessments is an important tool delegated to local governments by Colorado law. The power of taxation extends beyond merely the collection of revenue, and can have a profound impact on the pattern of development in the county. Communities have the power to set preferential tax rates for areas which are more suitable for development in order to discourage development in otherwise hazardous areas. Local units of government also have the authority to levy special assessments on property owners for all or part of the costs of acquiring, constructing, reconstructing, extending or otherwise building or improving flood protection works within a designated area. This can serve to increase the cost of building in such areas, thereby discouraging development. Because the usual methods of apportionment seem mechanical and arbitrary, and because the tax burden

on a particular piece of property is often quite large, the major constraint in using special assessments is political. Special assessments seem to offer little in terms of control over land use in developing areas. They can, however, be used to finance the provision of necessary services within municipal or county boundaries. In addition, they are useful in distributing to the new property owners the costs of the infrastructure required by new development. The Town of Alma does levy property taxes.

Spending

The fourth major power that has been delegated from the Colorado General Assembly to local governments is the power to make expenditures in the public interest. Hazard mitigation principles can be made a routine part of all spending decisions made by the local government, including the adoption annual budgets and a Capital Improvement Plan (CIP). A CIP is a schedule for the provision of municipal or county services over a specified period of time. Capital programming, by itself, can be used as a growth management technique, with a view to hazard mitigation. By tentatively committing itself to a timetable for the provision of capital to extend services, a county can control growth, to some extent, especially in areas where the provision of on-site sewage disposal and water supply are unusually expensive. In addition to formulating a timetable for the provision of services, a local county can regulate the extension of and access to services. A CIP that is coordinated with extension and access policies can provide a significant degree of control over the location and timing of growth. These tools can also influence the cost of growth. If the CIP is effective in directing growth away from environmentally sensitive or high hazard areas, for example, it can reduce environmental costs. The Town of Alma prepares an annual budget and a capital improvement plan.

6.13.5 Town of Fairplay

Staff and Organizational Capability

The Town of Fairplay has a staff and organizational capability to implement hazard mitigation strategies. The town is administered by a five-person town council form of government. The Council oversees the day-to-day operations of town government and manages the various departments. They also direct and supervise the administration of all town offices, boards, and agencies under the general direction and control of the Council. Responsibilities include:

- Approval of the annual budget,
- Coordination of public relations programs,
- Provision of administrative services to the county,
- Administration of equal employment opportunity and affirmative action policies and programs,
- Human resource management and payroll,
- Risk management,
- Facilities management, and
- A number of delegated programs.

The Town of Fairplay has a number of professional staff departments to serve the residents of the town and to carry out day-to-day administrative activities. These include the following:

- Land Use Administrator
- Public Works Director
- County Clerk and Recorder

- Human Services (in cooperation with Park County Government)
- Planning and Zoning (in cooperation with Park County Government)
- Police Department
- Assessor (in cooperation with Park County Government)
- Treasurer
- Library

There are also Boards and Committees that provide administrative support to the town including a Planning Commission and Board of Adjustment. The Park County Emergency Management Department is responsible for mitigation, preparedness, response, and recovery operations within Park County, with the assistance from the Planning Department and emergency services agencies including law enforcement agencies and fire districts. The County Office of Emergency Management works closely with the town of Fairplay to meet town and county emergency management goals. The Planning Department is also responsible for addressing land use planning as well as developing mitigation strategies. The Planning Department has been involved in the development of this mitigation plan to identify gaps, weaknesses or opportunities for enhancement with existing mitigation programs. For the most part, it was determined that the town departments are adequately staffed and trained to accomplish their missions, but they lack adequate funding.

Technical Capability

Technical Expertise

The Town of Fairplay works cooperatively with the County Office of Emergency Management, and the floodplain official on staff to administer its hazard mitigation programs. It also relies on outside contractors/consultants to perform required technical work where the town does not have the expertise.

Geographic Information Systems

GIS systems can best be described as a set of tools (hardware, software, and trained staff) used to collect, manage, analyze and display spatially-referenced data. Many local governments are now incorporating GIS systems into their existing planning and management operations. The Town of Fairplay utilizes the Park County Mapping/GIS Department in several town emergency planning activities, and has the capability to assist in furthering hazard mitigation goals.

Internet Access

The Town of Fairplay provides its employees with dial-up internet service, but is currently transitioning to a satellite high-speed service. However, employees have personal internet accounts which they can utilize while at work. The town does have a website which electronically connects with its constituents. This provides an enormous opportunity for local officials to keep abreast of the latest information relative to their work and makes receiving government services more affordable and convenient. Additionally, Park County has an emergency management webpage that gives citizens the opportunity to remain informed during disasters and to prepare for emergencies before they occur. Information technology also offers increased economic opportunities, higher living standards, more individual choices, and wider and more meaningful participation in government and public life. Simply put, information technology can make distance – a major factor for town officials and residents - far less important than in the past. Internet access will help further the town’s hazard mitigation awareness programs, but should be supplemented with more traditional (and less technical) means as well.

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Fiscal Capability

The Town of Fairplay has fiscal capability to implement hazard mitigation strategies. For Fiscal Year 2007, the town has budgeted total annual expenditures of $740,795.00. The majority of these funds are obligated to general fund expenditures. The Town receives most of its revenues through property taxes, grant monies, and other restricted intergovernmental contributions (Federal and State pass through dollars). The Town also has a sales tax of 4 percent. It is likely that the Town of Fairplay could afford to provide the cost share for the existing hazard mitigation grant programs. However, current budget deficits at both the State and local government level in Colorado, combined with the apparent increased reliance on local accountability by the Federal government, creates a significant and growing concern for the town regarding possible future directions for mitigation programs. Under the DMA 2000, FEMA has made special accommodations for "small and impoverished communities," who will be eligible for a 90-percent federal share, 10-percent non-federal cost share for projects funded through the Pre-Disaster Mitigation (PDM) grant program. According to the current Interim Final Rule for Section 322 of the Act, Park County will not qualify as a small and impoverished county. The definition is restricted to "communities of 3,000 or fewer individuals that is identified by the State as a rural county."

Policy and Program Capability

This part of the capabilities assessment includes the identification and evaluation of existing plans, policies, practices, programs, or activities that either increase or decrease the county's vulnerability to hazards. Positive activities, which decrease hazard vulnerability, will be sustained and enhanced to the fullest extent possible. Negative activities, which increase hazard vulnerability, will be targeted for reconsideration and will be thoroughly addressed within the Mitigation Strategy for the Town of Fairplay.

Recent Hazard Mitigation Efforts

Park County has developed a Community Wildfire Protection Plan that has been approved by the Board of Commissioners and the State and Federal land managers that outlines mitigation projects to decrease wildfire danger throughout the County. Many of Park County's local communities have also become FireWise Communities, allowing citizens to participate in wildfire mitigation. The Town of Fairplay is included in the County plan.

CRS (Community Rating System) Activities

Communities that regulate development in floodplains are able participate in the NFIP. In return, the NFIP makes federally backed flood insurance policies available for properties in the county. The CRS was implemented in 1990 as a program for recognizing and encouraging county floodplain management activities that exceed the minimum NFIP standards. There are ten CRS classes: class 1 requires the most credit points and gives the largest premium reduction; class 10 receives no premium reduction. The Town of Fairplay does not currently participate in the CRS.

Emergency Operations Plans

Park County has developed and adopted an Emergency Operations Plan which predetermines actions to be taken by government agencies and private organizations in response to an emergency or disaster event. The Plan describes the County's capabilities to respond to emergencies and establishes the responsibilities and procedures for responding effectively to the actual occurrence of a disaster. The plan does not specifically address hazard mitigation, but it does identify the specific operations to be undertaken by the County to protect lives and property immediately before, during and immediately following an emergency. There are no foreseeable conflicts between this Hazard Mitigation Plan and Park County's Emergency Operations Plan, primarily because they are each focused on two separate phases of emergency management (mitigation vs. preparedness and response). The Plan identifies the County

Commission as having the lead role in the long-term recovery phase following a disaster – which presents a unique window of opportunity for implementing hazard mitigation strategies. However, none are specified within the Emergency Operations Plan. The Town of Fairplay does not currently have an Emergency Operations Plan separate from the County, but they are in the process of writing and adopting one.

Floodplain Management Plan

The Town of Fairplay does not currently have a floodplain management plan for NFIP purposes. This Hazard Mitigation Plan is intended to fulfill the CRS planning requirement, if and when, the town decides to participate in the CRS.

Stormwater Management Plan

The Town of Fairplay does not currently have an adopted storm water management plan; however, Park County is an agent of the State of Colorado for storm water management purposes under the Federal Clean Water Act, which addresses the discharge of pollutants to surface waters from "point sources" and "non-point sources."

Watershed Protection Plan

The Town of Fairplay currently has a separate watershed protection plan, adopted in 2002.

Open Space Plan

The Town of Fairplay has an open space plan in their Zoning Regulations, adopted in 2006.

Comprehensive Plan

The Town of Fairplay adopted a Strategic Master Plan in 2001. The 2001 Park County Strategic Master Plan is an advisory document containing a toolbox of implementation strategies to:

- Guide future growth and development
- Protect natural and cultural resources
- Protect agricultural lands
- Protect private property rights
- Prompt revisions to the Park County Land Use Regulations.

The Strategic Plan is currently in the process of being revised. The updated plan will continue to provide the future vision for the town regarding growth and development. Hazard mitigation planning is not specifically addressed in the current plan but it is the goal for the updated plan to integrate and reflect the work done in this mitigation plan update process.

Legal Authority

Local governments in Colorado have a wide range of tools available to them for implementing mitigation programs, policies, and actions. A hazard mitigation program can utilize any or all of the four broad types of government powers granted by the State of Colorado, which are (a) regulation (by ordinance in the case of cities and towns), (b) acquisition, (c) taxation, and (d) spending. The scope of this local authority is subject to constraints, however, as Colorado' political subdivisions must not act without proper delegation from the State. All power is vested in the State and can only be exercised by local governments to the extent it is delegated. Thus, this portion of the capabilities assessment will summarize Colorado's

enabling legislation that grants the four types of government powers listed above within the context of available hazard mitigation tools and techniques.

Regulation

- **General Police Power**— Colorado' local governments have been granted broad regulatory powers in their jurisdictions. Colorado State Statutes bestow the general police power on local governments, allowing them to enact and enforce ordinances that define, prohibit, regulate or abate acts, omissions, or conditions detrimental to the health, safety, and welfare of the people, and to define and abate nuisances (including public health nuisances). Since hazard mitigation can be included under the police power (as protection of public health, safety and welfare), towns, cities and counties may include requirements for hazard mitigation in local ordinances. Local governments may also use their regulation/ordinance-making power to abate "nuisances," which could include, by local definition, any activity or condition making people or property more vulnerable to any hazard. The Town of Fairplay has enacted and enforces ordnances designed to promote the public health, safety and general welfare of its citizenry and that are, therefore, relevant to hazard mitigation.
- **Building Codes and Building Inspection**— Many structural mitigation measures involve constructing and retrofitting homes, businesses, and other structures according to standards designed to make the buildings more resilient to the impacts of natural hazards. Many of these standards are imposed through building codes. Municipalities and counties may adopt codes for their respective areas, if approved by the state, as providing "adequate minimum standards." Local regulations cannot be less restrictive than the State code. Local governments in Colorado are also empowered to carry out building inspections. It empowers cities and counties to create an inspection department, and enumerates its duties and responsibilities which include enforcing State and local laws relating to the construction of buildings, installation of plumbing, electrical, heating systems, etc.; building maintenance; and other matters. The Town of Fairplay has adopted the 2006 building code and has established a Building/ Inspections Office to carry out its building inspections.
- **Land Use**— Regulatory powers granted by the State to local governments provide the most basic means by which a local government can control the use of land within its jurisdiction. Through various land use regulatory powers, a local government can control the amount, timing, density, quality, and location of new development. All of these characteristics of growth can determine the level of vulnerability of the county in the event of a natural hazard. Land use regulatory powers include the power for counties and municipalities to engage in planning, and enact and enforce zoning regulations/ordinances, subdivision controls, and floodplain regulations/ordinances. Each local possesses great power to prevent unsuitable development in hazard-prone areas. The Town of Fairplay has adopted a land use regulation.
  - ***Planning***— According to State statutes, local governments in Colorado may create or designate a planning agency. The planning agency may perform a number of duties including: make studies of the area; determine objectives; prepare and adopt plans for achieving those objectives; develop and recommend policies, ordinances, and administrative means to implement plans; and perform other related duties. The importance of the planning powers of local governments is illustrated by the requirement that zoning regulations be made in accordance with a comprehensive plan. While the regulation/ordinance itself may provide evidence that zoning is being conducted "in accordance with a plan," the existence of a separate planning document ensures that the government is developing regulations and ordinances that are consistent with the overall goals of the community. The Town of Fairplay has established a Town Planner.

- ***Zoning***— Zoning is the traditional and most common tool available to local governments to control the use of land. Broad enabling authority is granted for municipalities and counties in Colorado to engage in zoning. Land "uses", which are controlled by zoning, include the type of use (e.g., residential, commercial, industrial) as well as minimum specifications for use such as lot size, building height and setbacks, density of population, etc. Local governments are authorized to divide their territorial jurisdiction into districts, and to regulate and restrict the erection, construction, reconstruction, alteration, repair or use of buildings, structures, or land within those districts. Districts may include general use districts, overlay districts, and special use districts or conditional use districts. Zoning regulations/ordinances consist of maps and written text. The Town of Fairplay enforces a zoning regulation.

- ***Subdivision Regulations***— Subdivision regulations control the division of land into parcels for the purpose of building development or sale. Flood-related subdivision controls typically require that sub-dividers install adequate drainage facilities and design water and sewer systems to minimize flood damage and contamination. They prohibit the subdivision of land subject to flooding unless flood hazards are overcome through filling or other measures, and they prohibit filling of floodway areas. Subdivision regulations require that subdivision plans be approved prior to the division or sale of land. Subdivision regulations are a more limited tool than zoning and only indirectly affect the type of use made of land or minimum specifications for structures. Subdivision is defined as all divisions of a tract or parcel of land into two or more lots and all divisions involving a new street. In Park County, the definition of subdivision does not include the division of land into parcels greater than 35 acres. The Town of Fairplay adopted subdivision regulations in 2006 as part of the Land Use Regulations.

  The Park County Subdivision Regulations control divisions of two or more parcels as a subdivision. The term "subdivision" does not apply to any division of land that creates parcels of land where each parcel is 35 acres or more in size or a subdivision of land that is approved as a Subdivision Exemption. All proposed subdivisions must go through an approval process. Subdivision plats are required for review and must include a graphic description of areas subject to flooding. Lands subject to flooding, irregular drainage conditions, excessive erosion and other reasons considered unsuitable for residential use shall not be permitted for residential use unless the hazards can be and are corrected. Plats are also reviewed by the local permit officer to determine whether the property has other environmental concerns, and specifies what permits are required. Final plats shall be prepared by a registered or licensed professional land surveyor. The Land Use Administrator and Code Enforcement Office also review plats to identify matters of topography and drainage concern. Although not designed specifically for hazard mitigation purposes, this regulation will prevent flood losses in tandem with the Floodplain Regulations. It will also minimize the adverse effects that development can have on storm water drainage through impervious surface requirements and through sedimentation and erosion control. Through its roadway requirements, the ordinance also provides for adequate ingress and egress to subdivisions by emergency vehicles for fires or severe weather events. The mitigation effectiveness of this regulation is moderate.

- ***Stormwater Regulations***— Storm water regulations are most often used to control runoff and erosion potential which results from small-scale development of less than five acres. A reduction in damage from small-scale development is achieved through requirements such as on-site retention/detention ponds, etc. The State of Colorado encourages local governments to adopt storm water regulations under land use authorities. The Town of Fairplay has not adopted storm water regulations.

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- ***Floodplain Regulation***— Colorado State statutes provide cities and counties land use authority. In particular, issues such as floodwater control are empowered through State Statute. The Town of Fairplay has adopted floodplain regulations. They were adopted in 2002 and can be found in Article 24, Section 16.24.90 of the Zoning Regulations.

  The Floodplain Regulations are designed to minimize public and private losses due to flood conditions in specific areas. It requires a development permit to be submitted to the town prior to any construction or substantial improvement activities. Permits will only be approved if they meet the provisions of the ordinance, which include development standards that will minimize the potential for flood losses. Standards are established for construction materials, equipment, methods, practices and uses. Most importantly, the ordinance establishes the requirements for elevation and flood proofing (non-residential) to the base flood elevation. This ordinance requires the minimum standards of the NFIP. The County's floodplain areas were last studied in 1991. No floodplain areas in the County are currently being re-studied as part of the State's Floodplain Mapping Program. It is possible floodplain areas will be redelineated with updated topography, and that base flood elevations will be recalculated at some point in the future, as funding becomes available. The mitigation effectiveness of this ordinance is high.

  The Town of Fairplay participates in the National Flood Insurance Program (NFIP).

  - Initial Map Date: 7/18/75
  - Current Map Effective Date: 4/1/87
  - As of 12/31/2007, Park County did not have any flood insurance policies in effect.

- **State of Emergency Regulation**— The Town of Fairplay does not have an Emergency Regulation.
- **Ordinances/Regulations—** Colorado law prescribes that counties adopt regulations and that cities and towns adopt ordinances. The Town of Fairplay has adopted several ordinances that are relevant to hazard mitigation, as described in more detail below.

Acquisition

The power of acquisition can be a useful tool for pursuing local mitigation goals. Local governments may find the most effective method for completely "hazard proofing" a particular piece of property or area is to acquire the property (either in fee or a lesser interest, such as an easement), thus removing the property from the private market and eliminating or reducing the possibility of inappropriate development occurring. Colorado legislation empowers cities, towns, and counties to acquire property for public purpose by gift, grant, devise, bequest, exchange, purchase, lease, or eminent domain. The Town of Fairplay has not undertaken acquisition as a mitigation measure/tool.

Taxation

The power to levy taxes and special assessments is an important tool delegated to local governments by Colorado law. The power of taxation extends beyond merely the collection of revenue, and can have a profound impact on the pattern of development in the county. Communities have the power to set preferential tax rates for areas which are more suitable for development in order to discourage development in otherwise hazardous areas. Local units of government also have the authority to levy special assessments on property owners for all or part of the costs of acquiring, constructing, reconstructing, extending or otherwise building or improving flood protection works within a designated area. This can serve to increase the cost of building in such areas, thereby discouraging development. Because the usual methods of apportionment seem mechanical and arbitrary, and because the tax burden on a particular piece of property is often quite large, the major constraint in using special assessments is

political. Special assessments seem to offer little in terms of control over land use in developing areas. They can, however, be used to finance the provision of necessary services within municipal or county boundaries. In addition, they are useful in distributing to the new property owners the costs of the infrastructure required by new development. The Town of Fairplay does levy property taxes.

Spending

The fourth major power that has been delegated from the Colorado General Assembly to local governments is the power to make expenditures in the public interest. Hazard mitigation principles can be made a routine part of all spending decisions made by the local government, including the adoption annual budgets and a Capital Improvement Plan (CIP). A CIP is a schedule for the provision of municipal or county services over a specified period of time. Capital programming, by itself, can be used as a growth management technique, with a view to hazard mitigation. By tentatively committing itself to a timetable for the provision of capital to extend services, a county can control growth, to some extent, especially in areas where the provision of on-site sewage disposal and water supply are unusually expensive. In addition to formulating a timetable for the provision of services, a local county can regulate the extension of and access to services. A CIP that is coordinated with extension and access policies can provide a significant degree of control over the location and timing of growth. These tools can also influence the cost of growth. If the CIP is effective in directing growth away from environmentally sensitive or high hazard areas, for example, it can reduce environmental costs. The Town of Fairplay does not have a CIP.

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CHAPTER 7.
DROUGHT

7.1 GENERAL BACKGROUND

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

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

DEFINITIONS

Drought—The cumulative impacts of several dry years on water users. It can include deficiencies in surface and subsurface water supplies and generally impacts health, well-being, and quality of life.

Hydrological Drought—Deficiencies in surface and subsurface water supplies.

Socioeconomic Drought—Drought impacts on health, well-being and quality of life.

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

7.2 HAZARD PROFILE

Droughts originate from a deficiency of precipitation resulting from an unusual weather pattern. If the weather pattern lasts a short time (a few weeks or a couple months), the drought is considered short-term. If the weather pattern becomes entrenched and the precipitation deficits last for several months or years, the drought is considered to be long-term. It is possible for a region to experience a long-term circulation pattern that produces drought, and to have short-term changes in this long-term pattern that result in short-term wet spells. Likewise, it is possible for a long-term wet circulation pattern to be interrupted by short-term weather spells that result in short-term drought.

7.2.1 Past Events

A number of significant droughts have been recorded in Colorado since 1900. The most recent droughts extended from 1998 to 2002 and 2011-2013. These periods saw rainfall levels well below normal and caused many communities throughout the region to institute water restrictions. Late summer of 2013 brought relief from the current drought conditions in Park County and Colorado overall. Drought conditions have abated in most all the State with the exception of some locations in southeast Colorado. During the two recent drought periods, the area saw rainfall levels well below normal and caused many communities throughout the region to institute water restrictions. Park County has identified drought as a 'High Hazard' in the initial assessment of hazards. Although meteorologists have attempted to predict long-term changes and trends in weather patterns, the onset of a significant drought cannot be predicted. Extended periods of dry weather have occurred many times from over the past 100 years.

7.2.2 Location

several indices are used to measure drought:

- The ***U.S. Drought Monitor*** is produced by the National Drought Mitigation Center at the University of Nebraska-Lincoln, the U.S. Department of Agriculture, and the National Oceanic and Atmospheric Administration (NOAA). It maps current drought conditions weekly. Figure 7-1 and Figure 7-2 show conditions in Colorado as of September 3, 2013.
- The ***Palmer Drought Index (PDI)*** measures the duration and intensity of long-term drought-inducing circulation patterns. Long-term drought is cumulative, so the intensity of drought during a given month is dependent on the current weather patterns plus the cumulative patterns of previous months. Weather patterns can change quickly from a long-term drought pattern to a long-term wet pattern, and the PDI can respond fairly rapidly. Figure 7-3 shows this index for August 2013 (most current available).
- The drought forecast or drought outlook depicts large scale trends The ***U. S. Seasonal Drought Outlook*** maps shows anticipated long term trends for drought tendency. On the map, the red/brown shading denotes persistent or intensifying conditions while the green shading indicates areas that are likely to no longer be considered in a drought condition. Figure 7-4 shows this index for August 15, 2013 (most current available).
- While the Palmer indices consider precipitation, evapotranspiration and runoff, the ***Standardized Precipitation Index (SPI)*** considers only precipitation. In the SPI, an index of zero indicates the median precipitation amount; the index is negative for drought and positive for wet conditions. The SPI is computed for time scales ranging from one month to 24 months. Figure 7-5 shows the 24-month SPI map for May 2011 through April 2013.

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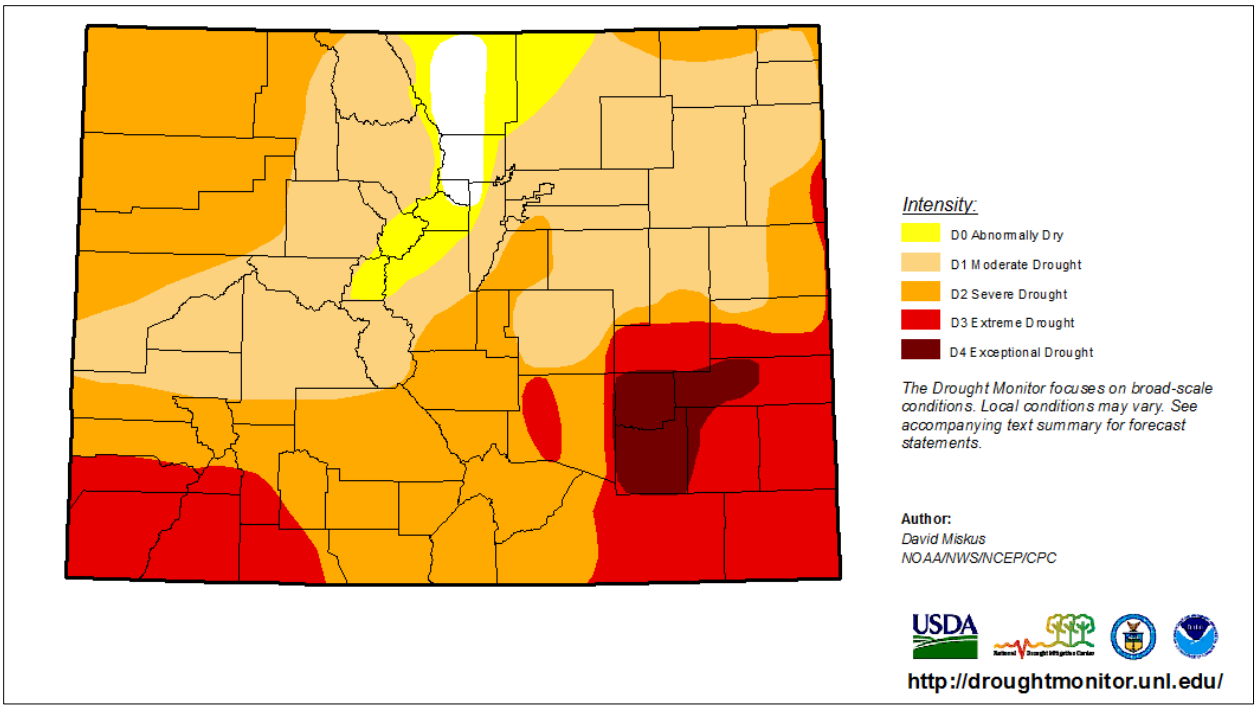

Figure 7-1. Colorado Drought Index for Week Ending September 3, 2013

Drought Condition (Percent Area): Colorado

Statistics type: Traditional (D0-D4, D1-D4, etc.) Categorical (D0, D1, etc.)

Week	Date	Nothing	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	9/3/2013	1.91	98.09	93.75	59.65	21.67	3.01
Last Week	8/27/2013	1.91	98.09	93.81	59.65	22.17	2.48
3 Months Ago	6/4/2013	0.00	100.00	93.18	72.32	26.51	15.84
Start of Calendar Year	1/1/2013	0.00	100.00	100.00	95.06	53.47	13.48
Start of Water Year	9/25/2012	0.00	100.00	100.00	100.00	61.75	16.89
One Year Ago	8/28/2012	0.00	100.00	100.00	99.96	67.31	12.30

Figure 7-2. U.S. Drought Monitor – Colorado Statistics (September 3, 2013)

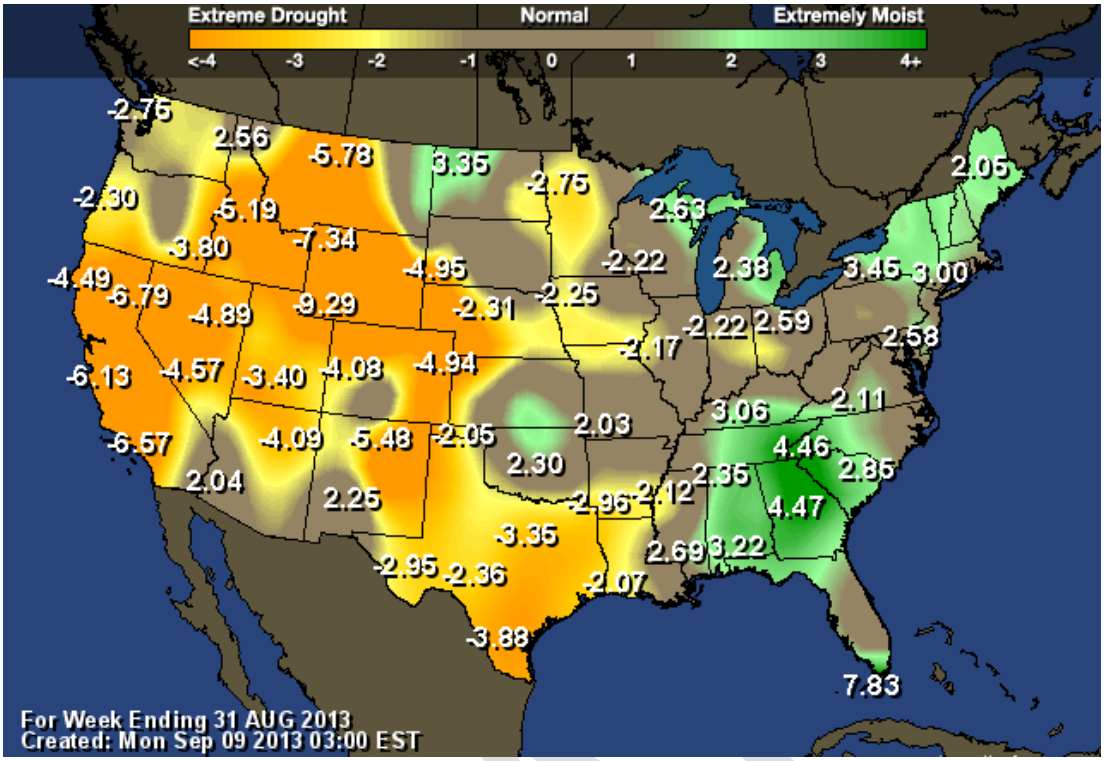

Figure 7-3. Palmer Drought Severity Index (31 AUG 2013)

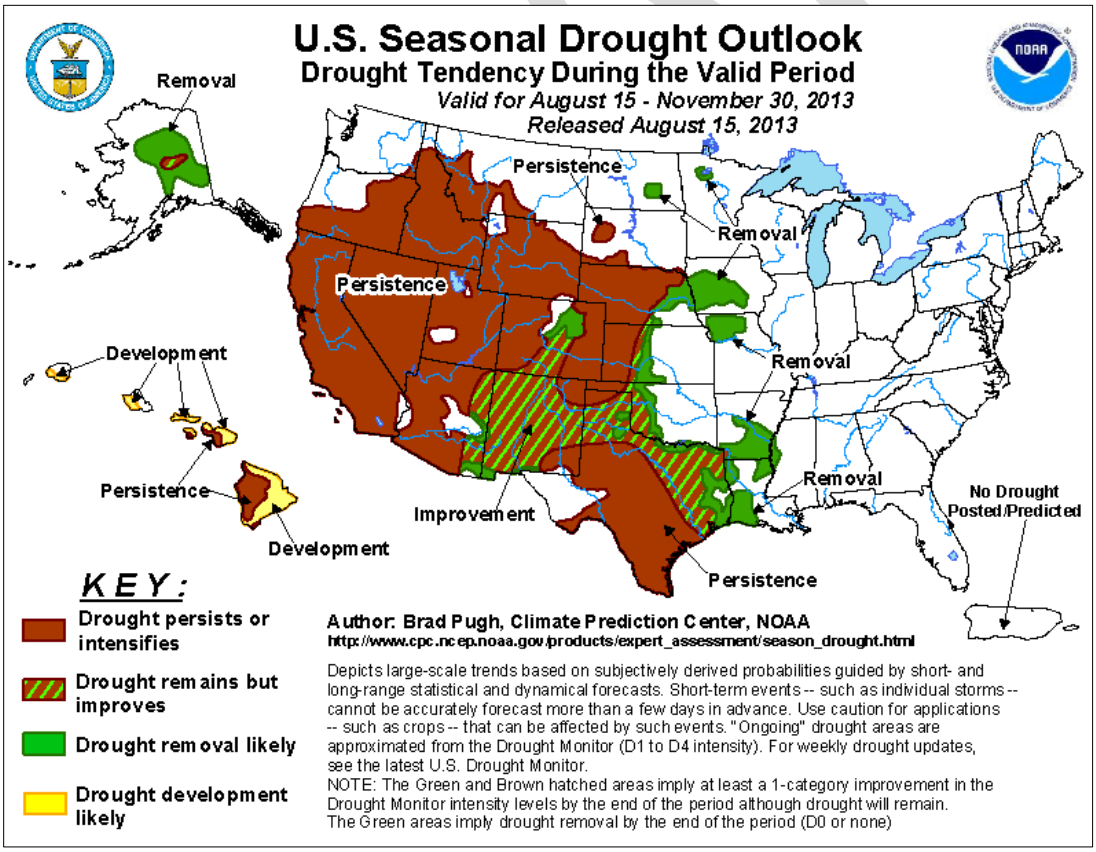

Figure 7-4. Palmer Hydrological Drought Index Long-Term Hydrologic Conditions (April 2013)

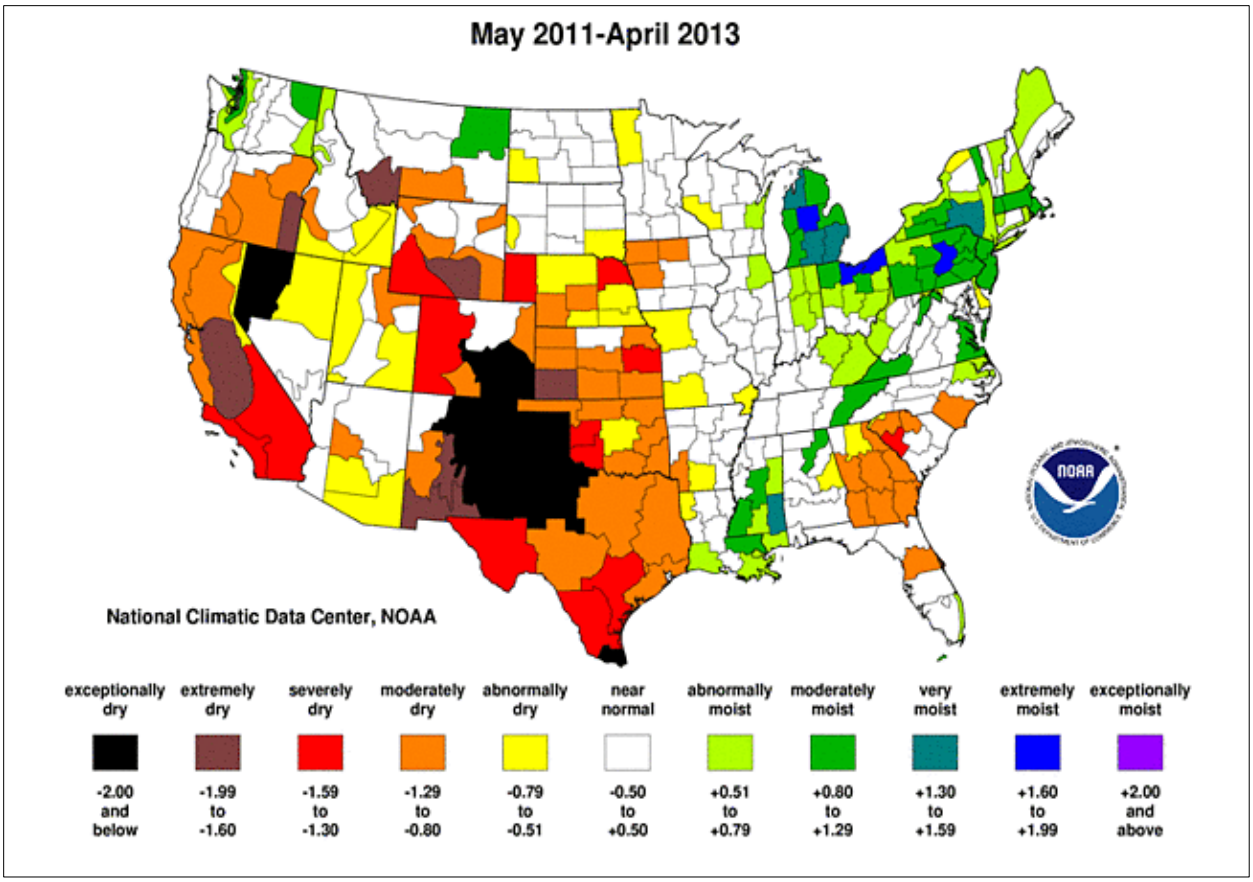

Figure 7-5. 24-Month Standardized Precipitation Index (May 2011 – April 2013)

The U.S. Drought Monitor is jointly produced by the National Drought Mitigation Center at the University of Nebraska-Lincoln, the United States Department of Agriculture, and the National Oceanic and Atmospheric Administration.

While Park County has experienced historical droughts, like the recent ones from 2012 to 2013 and 1998 to 2004. Snow pack in the Colorado high country in 2012 and 2013 was significantly below normal levels. Conditions were projected to be extreme. The summer monsoon season brought substantial relief beginning in mid-summer of 2013 as seen in the above graphics. There are currently no maps showing which specific portions of the county were affected by historical droughts or by precipitation, stream flow, or temperature conditions which might be precursors to droughts. Likewise, there are currently no maps showing which portions of Park County might be impacted at any point in time by ongoing drought conditions or which portions could potentially be impacted at a future point in time by imminent drought conditions.

At present there is no mapping to display or analyze historical or current drought information or projected drought information for Park County according to the eight major watersheds in the county. No distinctions have been made regarding specific locations within Park County which have a history of more frequent or more severe drought impacts or which specific locations might be more prone to future drought conditions.

7.2.3 Frequency

The probability of a future drought in Park County is likely, with between 10 and 100 percent chance of occurrence in any given year, or a recurrence interval of 10 years or less. According to information from the Colorado Drought Mitigation and Response Plan, Colorado was in drought for 48 of the past 115 years (1893-2007). Thus, there is a 42 percent chance that a drought will happen in Colorado in any given year, and a drought can be expected somewhere in the state every 2.4 years.

7.2.4 Severity

If a significant drought event were to occur, it could bring extensive economic, social, and environmental impacts to the County. Commonly one of the most significant economic effects to a community is the impact on agriculture. through higher costs of irrigation (energy usage of pumps), lack of water availability for surface water rights holders, lower groundwater tables, the potential for drilling new and/or deepening current wells, potentially accelerated sales of livestock herds and increased costs of livestock feed (especially if the region as a whole is suffering from drought). Significant increases in the prices of essential items such as hay can have a prohibitive effect on ranching operations. Other economic effects could be felt by businesses that rely on adequate water levels for their day-to-day business such as carwashes and laundries.

Drought can also create conditions that promote the occurrence of other natural hazards such as wildfires and wind erosion. The likelihood of flash flooding is increased if a period of severe drought is followed by a period of extreme precipitation. Another significant side-effect from drought is the increase in the threat of wildfires in forested/grassland areas of the county. Drought conditions can lead to increased susceptibility of wildfires to grow at a more rapid pace than during periods of normal moisture. Low-flow conditions also decrease the quantity and pressure of water available to firefighters to fight fires.

Environmental drought impacts include both human and animal habitats, and hydrologic units. During periods of drought, the amount of available water decreases in lakes, streams, aquifers, soil, wetlands, springs, and other surface and subsurface water sources. This decrease in water availability can affect water quality such as salinity, bacteria, turbidity, and temperature increase and pH changes. Changes in any of these levels can have a significant effect on the aquatic habitat of a numerous plants and animals found throughout the County. Low water flow can result in decreased sewage flows and subsequent increases in contaminants in the water supply. Decrease in the availability of water also decreases drinking water supply and the food supply as food sources become scarcer. This disruption can work its way up the food chain within a habitat. Loss of biodiversity and increases in mortality can lead to increases in disease and endangered species.

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

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

On average, the nationwide annual impacts of drought are greater than the impacts of any other natural hazard. They are estimated to be between $6 billion and $8 billion annually in the United States and occur primarily in the agriculture, transportation, recreation and tourism, forestry, and energy sectors. Social

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and environmental impacts are also significant, although it is difficult to put a precise cost on these impacts.

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

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

Extreme drought can affect groundwater sources though generally not as quickly as surface water supplies, but groundwater supplies generally take longer to recover. Reduced precipitation during a drought means that groundwater supplies are not replenished at a normal rate. This can lead to a reduction in groundwater levels and problems such as reduced pumping capacity or wells going dry. Shallow wells are more susceptible than deep wells. Reduced replenishment of groundwater affects streams. Much of the flow in streams comes from groundwater, especially during the summer when there is less precipitation and after snowmelt ends. Reduced groundwater levels mean that even less water will enter streams when steam flows are lowest.

Drought also is often accompanied by extreme heat. When temperatures reach 90ºF and above, people are vulnerable to sunstroke, heat cramps and heat exhaustion. Pets and livestock are also vulnerable to heat-related injuries. Crops can be vulnerable as well.

Additionally, there is increased danger of wildfires associated with most droughts. Millions of board feet of timber have been lost, and in many cases erosion occurred, which caused serious damage to aquatic life, irrigation, and power production by heavy silting of streams, reservoirs, and rivers.

7.2.5 Warning Time

Droughts are climatic patterns that occur over long periods of time. Only generalized warning can take place due to the numerous variables that scientists have not pieced together well enough to make accurate and precise predictions.

Empirical studies conducted over the past century have shown that meteorological drought is never the result of a single cause. It is the result of many causes, often synergistic in nature; these include global weather patterns that produce persistent, upper-level high-pressure systems along the West Coast with warm, dry air resulting in less precipitation.

Scientists at this time do not know how to predict drought more than a month in advance for most locations. Predicting drought depends on the ability to forecast precipitation and temperature. Anomalies of precipitation and temperature may last from several months to several decades. How long they last depends on interactions between the atmosphere and the oceans, soil moisture and land surface processes, topography, internal dynamics, and the accumulated influence of weather systems on the global scale.

7.3 SECONDARY HAZARDS

The secondary hazard most commonly associated with drought is wildfire. A prolonged lack of precipitation dries out vegetation, which becomes increasingly susceptible to ignition as the duration of the drought extends.

If a significant drought event occurs, there is a potential for a variety of secondary impacts. The most common secondary effects of drought are impacts to local commerce, including tourism and providers of goods and services to Park County's agricultural community. Droughts lead to diminished stream flows, lower reservoir levels, and in the extreme, dried-up reservoirs, which can all have an adverse effect on water-related recreation. Activities such as fishing can be significantly restricted because of drought. Also there are many places in the forest that cannot be accessed because the increase in wildfire danger. In addition, wildfires that result from drought conditions can impact tourism and they can impact infrastructure like roads and utilities.

7.4 CLIMATE CHANGE IMPACTS

The long-term effects of climate change on regional water resources are unknown, but global water resources are already experiencing the following stresses without climate change:

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

With a warmer climate, droughts could become more frequent, more severe, and longer-lasting. From 1987 to 1989, losses from drought in the U.S. totaled $39 billion (OTA, 1993). More frequent extreme events such as droughts could end up being more cause for concern than the long-term change in temperature and precipitation averages.

The best advice to water resource managers regarding climate change is to start addressing current stresses on water supplies and build flexibility and robustness into any system. Flexibility helps to ensure a quick response to changing conditions, and robustness helps people prepare for and survive the worst conditions. With this approach to planning, water system managers will be better able to adapt to the impacts of climate change.

7.5 EXPOSURE

All people, property and environments in the planning area would be exposed to some degree to the impacts of moderate to extreme drought conditions.

7.6 VULNERABILITY

Drought produces a complex web of impacts that spans many sectors of the economy and reaches well beyond the area experiencing physical drought. This complexity exists because water is integral to the ability to produce goods and provide services. Drought can affect a wide range of economic, environmental and social activities. The vulnerability of an activity to the effects of drought usually

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depends on its water demand, how the demand is met, and what water supplies are available to meet the demand.

7.6.1 Population

The planning partnership has the ability to minimize any impacts on residents and water consumers in the county should several consecutive dry years occur. No significant life or health impacts are anticipated as a result of drought within the planning area.

7.6.2 Property

No structures will be directly affected by drought conditions, though some structures may become vulnerable to wildfires, which are more likely following years of drought. Droughts can also have significant impacts on landscapes, which could cause a financial burden to property owners. However, these impacts are not considered critical in planning for impacts from the drought hazard.

7.6.3 Critical Facilities

Critical facilities as defined for this plan will continue to be operational during a drought. Critical facility elements such as landscaping may not be maintained due to limited resources, but the risk to the planning area's critical facilities inventory will be largely aesthetic. For example, when water conservation measures are in place, landscaped areas will not be watered and may die. These aesthetic impacts are not considered significant.

7.6.4 Environment

Environmental losses from drought are associated with damage to plants, animals, wildlife habitat, and air and water quality; forest and range fires; degradation of landscape quality; loss of biodiversity; and soil erosion. Some of the effects are short-term and conditions quickly return to normal following the end of the drought. Other environmental effects linger for some time or may even become permanent. Wildlife habitat, for example, may be degraded through the loss of wetlands, lakes and vegetation. However, many species will eventually recover from this temporary aberration. The degradation of landscape quality, including increased soil erosion, may lead to a more permanent loss of biological productivity. Although environmental losses are difficult to quantify, growing public awareness and concern for environmental quality has forced public officials to focus greater attention and resources on these effects.

7.6.5 Economic Impact

Economic impact will be largely associated with industries that use water or depend on water for their business. For example, landscaping businesses were affected in the droughts of the past as the demand for service significantly declined because landscaping was not watered. Agricultural industries will be impacted if water usage is restricted for irrigation.

7.7 FUTURE TRENDS IN DEVELOPMENT

Several of the planning partners in this effort have established comprehensive plans that include policies directing land use and dealing with issues of water supply and the protection of water resources. These plans provide the capability at the local level to protect future development from the impacts of drought. All planning partners reviewed their general plans under the capability assessments performed for this effort. Deficiencies identified by these reviews can be identified as mitigation actions to increase the capability to deal with future trends in development.

7.8 SCENARIO

An extreme multiyear drought more intense than the 2002 or 2012-13 droughts could impact the region with little warning. Combinations of low precipitation and unusually high temperatures could occur over several consecutive years. Intensified by such conditions, extreme wildfires could break out throughout the planning area, increasing the need for water. Surrounding communities, also in drought conditions, could increase their demand for water supplies relied upon by the planning partnership, causing social and political conflicts. If such conditions persisted for several years, the economy of Park County could experience setbacks, especially in water dependent industries.

7.9 ISSUES

The current Colorado Drought Mitigation and Response Plan provides some guidance as to how Park County could gather data related to past, current, and future drought conditions. The data might be organized and presented according to major watershed to determine whether historical drought impacts or impending drought risks show variability depending on geographic location within Park County, perhaps indicating preliminarily whether some of the major watersheds are more prone to drought than others at a particular point in time. The state's plan utilized a number of drought identification databases including the Colorado Modified Palmer Drought Index, the Surface Water Supply Index or the Standardized Precipitation Index.

Drought mitigation planning work conducted elsewhere in Colorado in a manner that is consistent with the state drought plan indicates some collection and organization of data that could be undertaken by Park County. The stream flow values for April through September, April to June precipitation data (as a percent of normal) from official NOAA Cooperative stations, and July to September precipitation data (as a percent of normal) were the basic data that were used to analyze and illustrate the levels of drought and drought frequency in these other Colorado communities. For each of these three variables, color-coded tables were developed that depicted values that were:

- Between 99 and 86 percent of normal
- Between 85 and 76 percent of normal
- 75 percent or less than normal.

Typically one of these three variables was 'drier' than normal on a given year (rarely did all three register as above normal), not necessarily indicating drought conditions (perhaps simply demonstrating that Colorado's climate is semi-arid. There were, however, several years when two or three of these variables were classified as 'severe' or less than 75 percent of normal, generally correlating quite well with drought conditions.

Another important factor that was reviewed in examining drought-like conditions in these communities was periods of anomalously warm weather, most notably the number of days where the daily high temperature meets or exceeds 85ºF in the lower elevation of the mountain counties. The more days when afternoon high temperatures were reaching the 85ºF mark, the greater the demand was for irrigation of crops and the more stressed rangeland grasses were. In addition, the greater the number of 'warm' days, the greater the wildfire threat became because of the acceleration of drying of forest land and adjacent underbrush. Again color-coded tables were developed to display ranking of: a) much above normal, b) above normal, c) slightly above normal, d) normal, e) slightly below normal, f) below normal, and g) well below normal. The data showed that some distinct, prolonged periods of warm days appeared. These periods did correlate with most, but not all, of the dry periods of summertime droughts. To the extent possible, Park County can organize these data by the eight major watersheds to determine potential regional drought patterns within the county.

There are other drought-related data sources available to Park County to help with pre-drought preparation. Two of these data sources are related to ocean temperatures that have been correlated to drought in particular portions of North America. Initial research in Colorado shows that the 3-month average values of the Multivariate El Niño/Southern Oscillation Index (MEI) provides useful information about potential drought. The basic relationship indicates that La Nina ocean temperatures (i.e. 3-month average values of the MEI that are $\leq$ -0.25) do have a tendency to result in very dry or at best average conditions.

Likewise, research shows an initial correlation with the value of the North Atlantic Oscillation (NAO). If the April to June (3-month average) NAO $\leq$ 0.00, there may be impending low precipitation conditions. The comparison of the January to May (5-month average) NAO to the number of days with maximum temperatures $\geq$ 85ºF indicated some ability to detect the threat of hot days. When the NAO for this period was > 0.00 then, historically many of the observed years had at least an average or above average number of days $\geq$ 85ºF. Conversely in years when the NAO for this period was < 0.00 then there were few years where the number of days 85ºF and above were average or above average.

The third data source available to Park County is the seasonal water supply forecasts from Natural Resources Conservation Service (NRCS). Forecasts of less than 80 percent for the April to September period indicate potential problems. These forecasts are typically issued within the first 3-7 days of the month. The fourth data source is the snow-water equivalent information from the NRCS. When snow-water equivalent values are less than 90 percent of normal, then snowmelt runoff may be low.

The research described above lays out a path that Park County can follow for collecting and analyzing drought-related data in a GIS environment, employing a watershed-based framework. It demonstrates some of the proactive steps that local governments in a semi-arid state like Colorado can take to lessen the adverse effects of potential droughts prior to the onset of drought conditions. This kind of approach can be of particular value in addressing a hazard that can have as slow and unnoticeable an onset as drought can have.

The planning team has identified the following drought-related issues:

- Identification and development of alternative water supplies
- Utilization of groundwater recharge techniques to stabilize the groundwater supply
- The probability of increased drought frequencies and durations due to climate change
- The promotion of active water conservation even during non-drought periods.

CHAPTER 8.
EARTHQUAKE

8.1 GENERAL BACKGROUND

The community and Steering Committee universally ranked earthquake as a low hazard, so a risk assessment for this hazard was not required; it is provided here for general information.

8.1.1 How Earthquakes Happen

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

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

DEFINITIONS

Earthquake—The shaking of the ground caused by an abrupt shift of rock along a fracture in the earth or a contact zone between tectonic plates.

Epicenter—The point on the earth's surface directly above the hypocenter of an earthquake. The location of an earthquake is commonly described by the geographic position of its epicenter and by its focal depth.

Fault—A fracture in the earth's crust along which two blocks of the crust have slipped with respect to each other.

Focal Depth—The depth from the earth's surface to the hypocenter.

Hypocenter—The region underground where an earthquake's energy originates

Liquefaction—Loosely packed, water-logged sediments losing their strength in response to strong shaking, causing major damage during earthquakes.

Geologists classify faults by their relative hazards. Active faults, which represent the highest hazard, are those that have ruptured to the ground surface during the Holocene period (about the last 11,000 years). Potentially active faults are those that displaced layers of rock from the Quaternary period (the last 1,800,000 years). Determining if a fault is "active" or "potentially active" depends on geologic evidence, which may not be available for every fault. Although there are probably still some unrecognized active faults, nearly all the movement between the two plates, and therefore the majority of the seismic hazards, are on the well-known active faults.

Faults are more likely to have earthquakes on them if they have more rapid rates of movement, have had recent earthquakes along them, experience greater total displacements, and are aligned so that movement can relieve accumulating tectonic stresses. A direct relationship exists between a fault's length and location and its ability to generate damaging ground motion at a given site. In some areas, smaller, local faults produce lower magnitude quakes, but ground shaking can be strong, and damage can be significant as a result of the fault's proximity to the area. In contrast, large regional faults can generate great magnitudes but, because of their distance and depth, may result in only moderate shaking in the area.

8.1.2 Earthquake Classifications

Earthquakes are typically classified in one of two ways: By the amount of energy released, measured as **magnitude**; or by the impact on people and structures, measured as **intensity**.

Magnitude

Currently the most commonly used magnitude scale is the moment magnitude (M_w) scale, with the follow classifications of magnitude:

- Great—$M_w \geq 8$
- Major—$M_w = 7.0 - 7.9$
- Strong—$M_w = 6.0 - 6.9$
- Moderate—$M_w = 5.0 - 5.9$
- Light—$M_w = 4.0 - 4.9$
- Minor—$M_w = 3.0 - 3.9$
- Micro—$M_w < 3$

Estimates of moment magnitude roughly match the local magnitude scale (ML) commonly called the Richter scale. One advantage of the moment magnitude scale is that, unlike other magnitude scales, it does not saturate at the upper end. That is, there is no value beyond which all large earthquakes have about the same magnitude. For this reason, moment magnitude is now the most often used estimate of large earthquake magnitudes.

Intensity

Currently the most commonly used intensity scale is the modified Mercalli intensity scale, with ratings defined as follows (USGS, 1989):

- I. Not felt except by a very few under especially favorable conditions
- II. Felt only by a few persons at rest, especially on upper floors of buildings.
- III. Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it is an earthquake. Standing cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
- IV. Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like a heavy truck striking building. Standing cars rocked noticeably.
- V. Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
- VI. Felt by all; many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
- VII. Damage negligible in buildings of good design and construction; slight in well-built ordinary structures; considerable in poorly built or badly designed structures. Some chimneys broken.
- VIII. Damage slight in specially designed structures; considerable damage in ordinary buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
- IX. Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.

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- X. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
- XI. Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
- XII. Damage total. Lines of sight and level are distorted. Objects thrown into the air.

8.1.3 Ground Motion

Earthquake hazard assessment is also based on expected ground motion. This involves determining the annual probability that certain ground motion accelerations will be exceeded, then summing the annual probabilities over the time period of interest. The most commonly mapped ground motion parameters are the horizontal and vertical peak ground accelerations (PGA) for a given soil or rock type. Instruments called accelerographs record levels of ground motion due to earthquakes at stations throughout a region. These readings are recorded by state and federal agencies that monitor and predict seismic activity.

Maps of PGA values form the basis of seismic zone maps that are included in building codes such as the International Building Code. Building codes that include seismic provisions specify the horizontal force due to lateral acceleration that a building should be able to withstand during an earthquake. PGA values are directly related to these lateral forces that could damage "short period structures" (e.g. single-family dwellings). Longer period response components determine the lateral forces that damage larger structures with longer natural periods (apartment buildings, factories, high-rises, bridges). Table 8-1 lists damage potential and perceived shaking by PGA factors, compared to the Mercalli scale.

TABLE 8-1.
MERCALLI SCALE AND PEAK GROUND ACCELERATION COMPARISON

Modified Mercalli Scale	Perceived Shaking	Potential Structure Damage		Estimated PGA[a] (%g)
		Resistant Buildings	Vulnerable Buildings	
I	Not Felt	None	None	<0.17%
II-III	Weak	None	None	0.17% - 1.4%
IV	Light	None	None	1.4% - 3.9%
V	Moderate	Very Light	Light	3.9% - 9.2%
VI	Strong	Light	Moderate	9.2% - 18%
VII	Very Strong	Moderate	Moderate/Heavy	18% - 34%
VIII	Severe	Moderate/Heavy	Heavy	34% - 65%
IX	Violent	Heavy	Very Heavy	65% - 124%
X - XII	Extreme	Very Heavy	Very Heavy	>124%

a. PGA measured in percent of g, where g is the acceleration of gravity
Sources: USGS, 2008; USGS, 2010

8.1.4 Effect of Soil Types

The impact of an earthquake on structures and infrastructure is largely a function of ground shaking, distance from the source of the quake, and liquefaction, a secondary effect of an earthquake in which soils lose their shear strength and flow or behave as liquid, thereby damaging structures that derive their support from the soil. Liquefaction generally occurs in soft, unconsolidated sedimentary soils. A program

called the National Earthquake Hazard Reduction Program (NEHRP) creates maps based on soil characteristics to help identify locations subject to liquefaction. Table 8-2 summarizes NEHRP soil classifications. NEHRP Soils B and C typically can sustain ground shaking without much effect, dependent on the earthquake magnitude. The areas that are commonly most affected by ground shaking have NEHRP Soils D, E and F. In general, these areas are also most susceptible to liquefaction.

TABLE 8-2.
NEHRP SOIL CLASSIFICATION SYSTEM

NEHRP Soil Type	Description	Mean Shear Velocity to 30 m (m/s)
A	Hard Rock	1,500
B	Firm to Hard Rock	760-1,500
C	Dense Soil/Soft Rock	360-760
D	Stiff Soil	180-360
E	Soft Clays	< 180
F	Special Study Soils (liquefiable soils, sensitive clays, organic soils, soft clays >36 m thick)	

8.2 HAZARD PROFILE

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

Small, local faults produce lower magnitude quakes, but ground shaking can be strong and damage can be significant in areas close to the fault. In contrast, large regional faults can generate earthquakes of great magnitudes but, because of their distance and depth, they may result in only moderate shaking in an area. Known faults in Colorado are shown in Figure 8-1. Figure 8-2 shows the location of faults within Park County. Faults have been classified based on the geologic time frame of their latest suspected movement (in order of activity occurrence, most recent is listed first):

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

8.2.1 Past Events

Figure 8-3 shows the location and magnitude of past earthquakes recorded in Park County. Past events throughout the state are shown on Figure 8-1.

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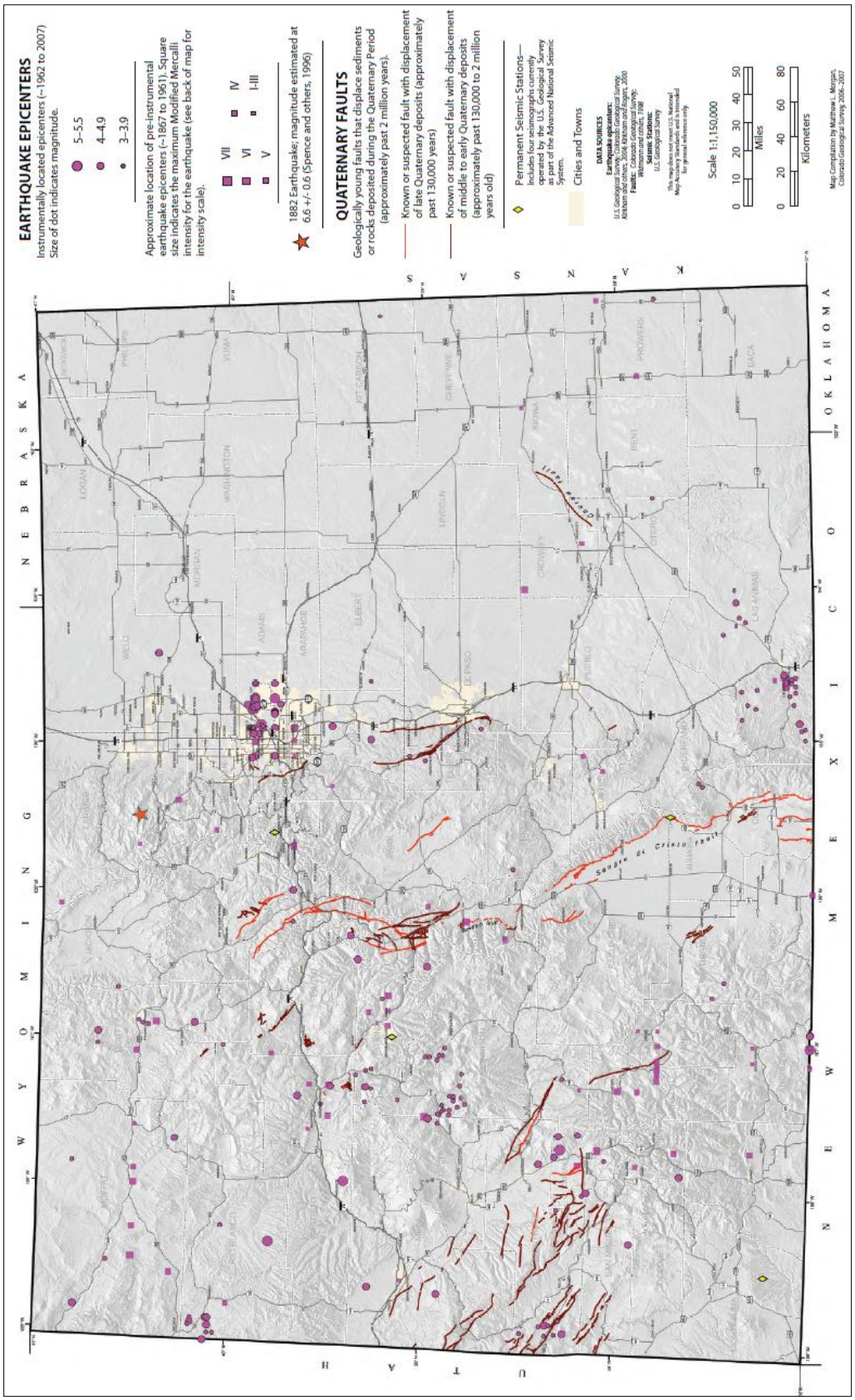

Source: Colorado Earthquake Hazard Mitigation Council 2008

Figure 8-1. Locations of Historical Earthquakes and Known or Suspected Geologically Young Faults

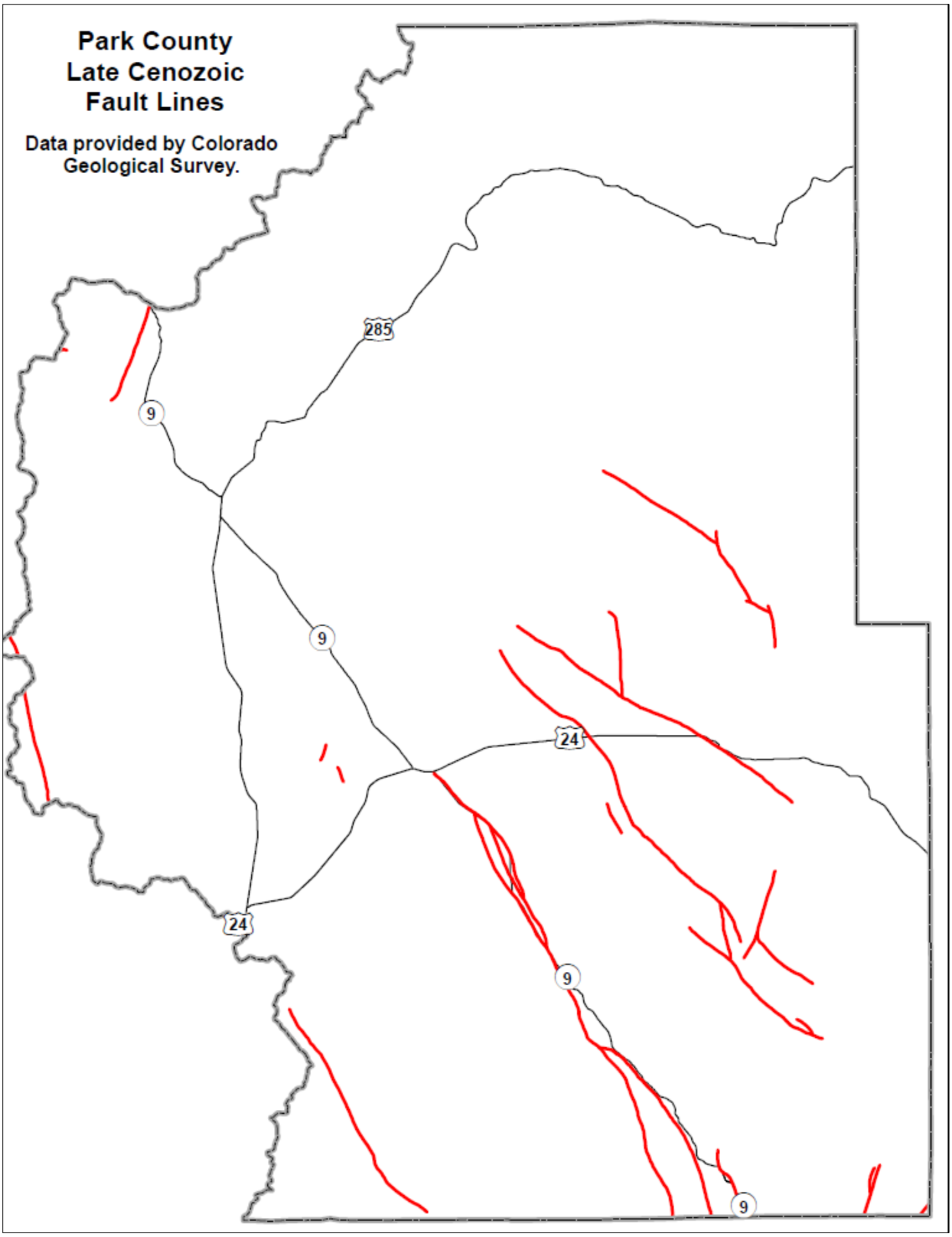

Figure 8-2. Park County Cenozoic Fault Lines

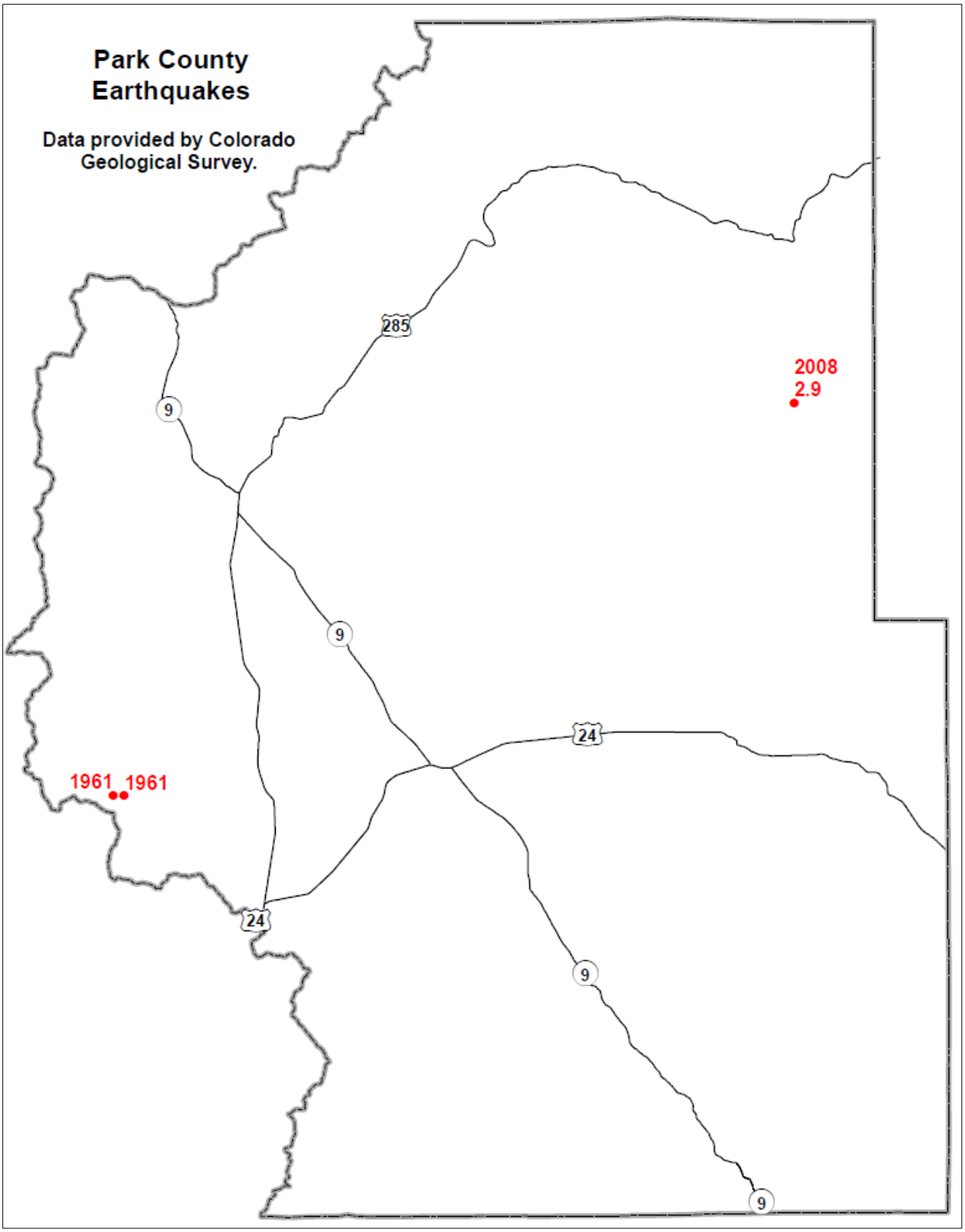

Figure 8-3. Park County Earthquakes, 1568 – 2009

8.2.2 Location

Identifying the extent and location of an earthquake is not as simple as it is for other hazards such as flood, landslide or wild fire. The impact of an earthquake is largely a function of the following components:

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

Mapping that shows the impacts of these components was used to assess the risk of earthquakes within the planning area. While the impacts from each of these components can build upon each other during an earthquake event, the mapping looks at each component individually. The mapping used in this assessment is described below.

Earthquake Scenarios

Two types of earthquake scenarios defined in HAZUS-MH were used in this plan:

- An arbitrary earthquake event is defined by the location of its epicenter and by its magnitude. The epicenter is defined by entry of latitude and longitude. The user specifies the magnitude, depth, type, rupture orientation and length.
- The probabilistic hazard option allows the user to generate estimate of damage and loss based on probabilistic seismic hazard for a specified return period.

Two earthquake scenario were selected for this plan:

- Mosquito Range Fault Zone Scenario—A Magnitude 7.0 event with a shallow depth and epicenter 8 miles northwest of Alma. See Figure 8-4.
- 500-Year Probabilistic Scenario—See Figure 8-5.

NEHRP Soil Maps

NEHRP soil types define the locations that will be significantly impacted by an earthquake. Currently NEHRP soils data is not available for the State of Colorado.

Liquefaction Maps

Soil liquefaction maps are useful tools to assess potential damage from earthquakes. Currently soil liquefaction data is not available for the State of Colorado.

8.2.3 Frequency

Relative to other western states, Colorado’s earthquake hazard is higher than Kansas or Oklahoma, but lower than Utah, and certainly much lower than Nevada and California. Even though the seismic hazard in Colorado is low to moderate, it is likely that future damaging earthquakes will occur. It is prudent to expect future earthquakes as large as magnitude 6.5, the largest event of record. Calculations based on the historical earthquake record 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.

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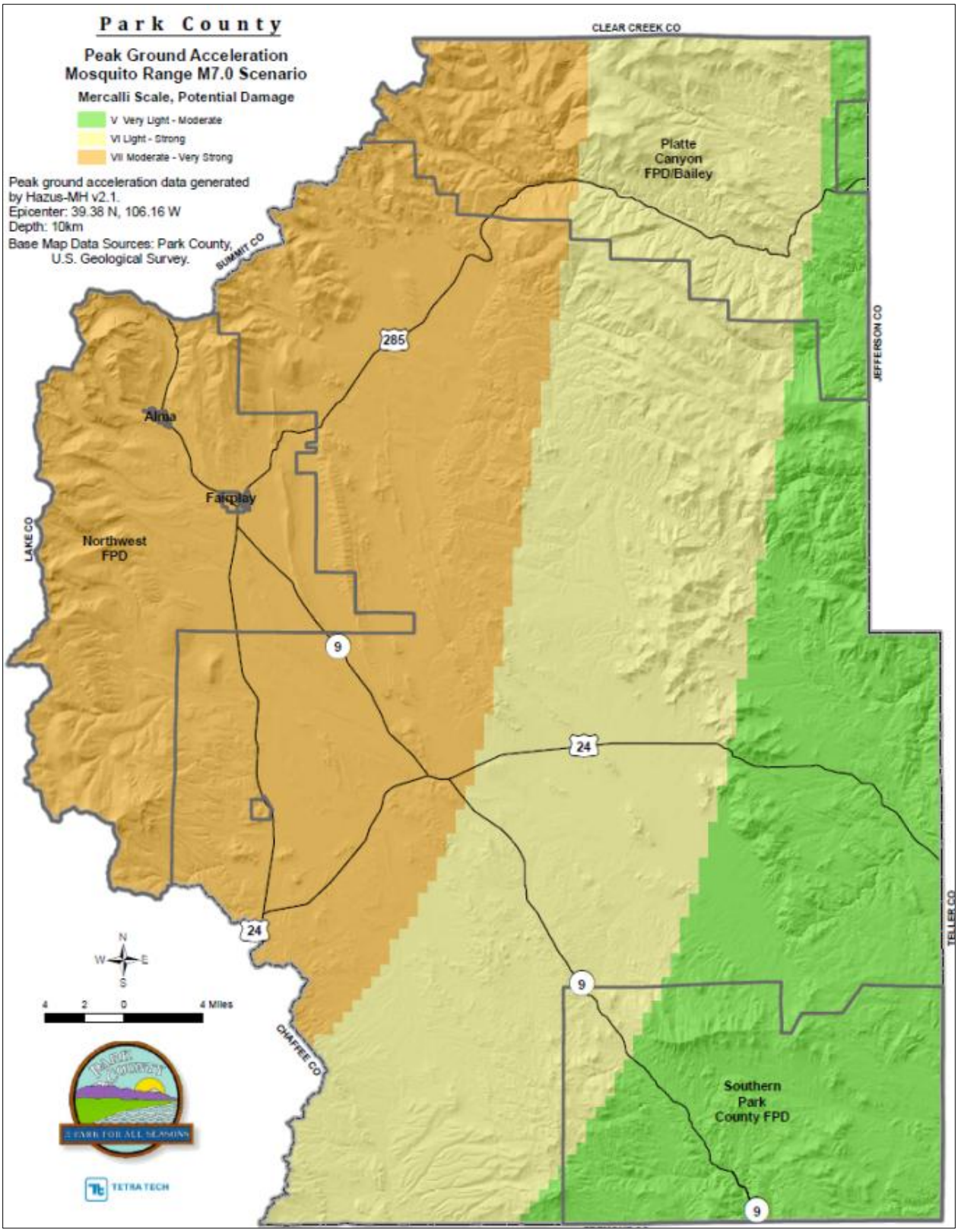

Figure 8-4. Peak Ground Acceleration; Mosquito Range Magnitude 7.0 Scenario

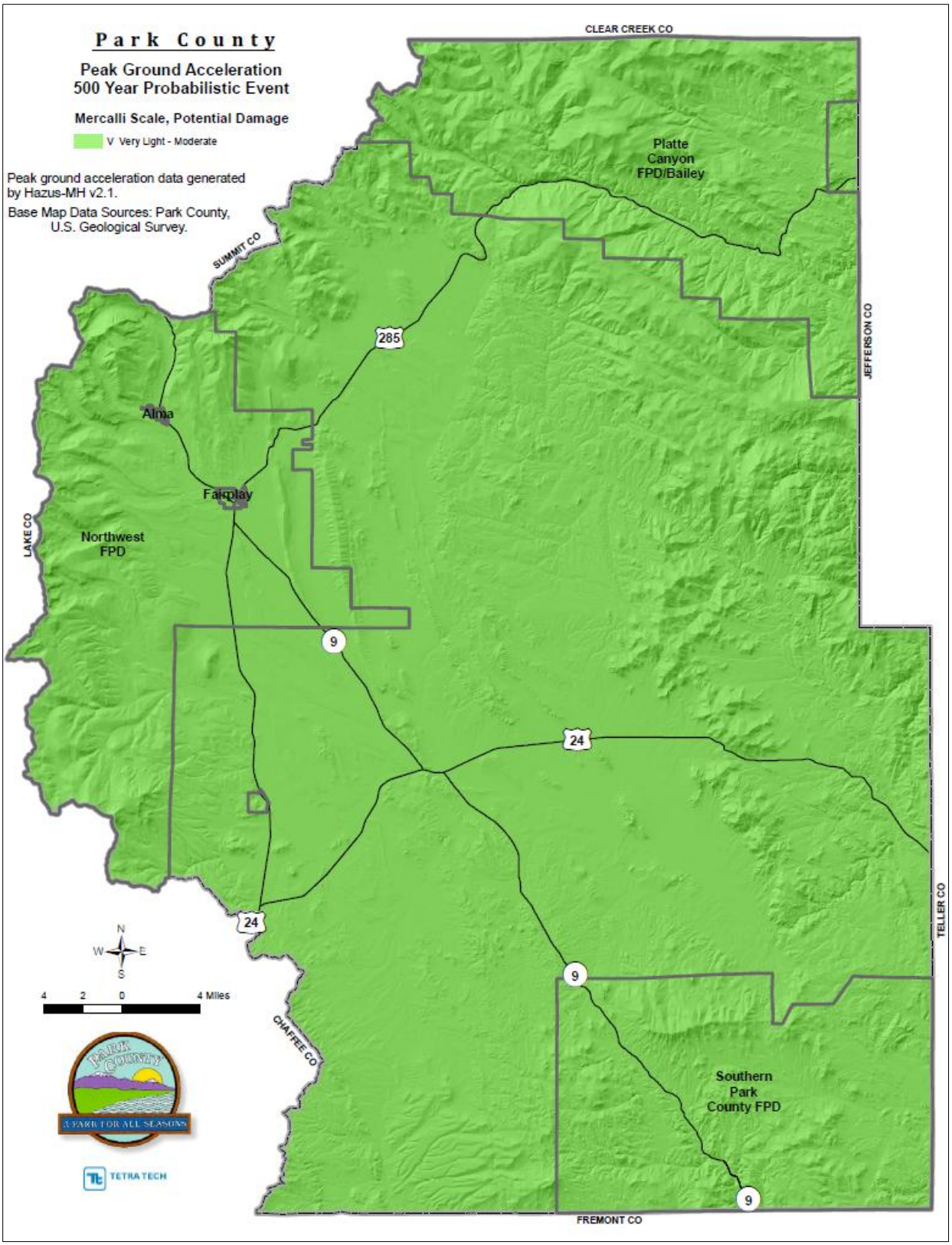

Figure 8-5. Peak Ground Acceleration; 500-Year Probabilistic Event

8.2.4 Severity

Earthquakes can cause structural damage, injury, and loss of life, as well as damage to infrastructure networks, such as water, power, communication, and transportation lines. Damage and life loss can be particularly devastating in communities where buildings were not designed to withstand seismic forces (e.g., historic structures). Other damage-causing effects of earthquakes include surface rupture, fissuring, settlement, and permanent horizontal and vertical shifting of the ground. Secondary impacts can include landslides, rock falls, liquefaction, fires, dam failure and hazardous materials incidents.

The severity of an earthquake can be expressed in terms of intensity or magnitude. Intensity represents the observed effects of ground shaking on people, buildings, and natural features. The USGS has created ground motion maps based on current information about several fault zones. These maps show the PGA that has a certain probability (2 percent or 10 percent) of being exceeded in a 50-year period. The PGA is measured in numbers of g's (the acceleration associated with gravity). Figure 8-6 shows the PGA with a 2-percent exceedance chance in 50 years in Colorado.

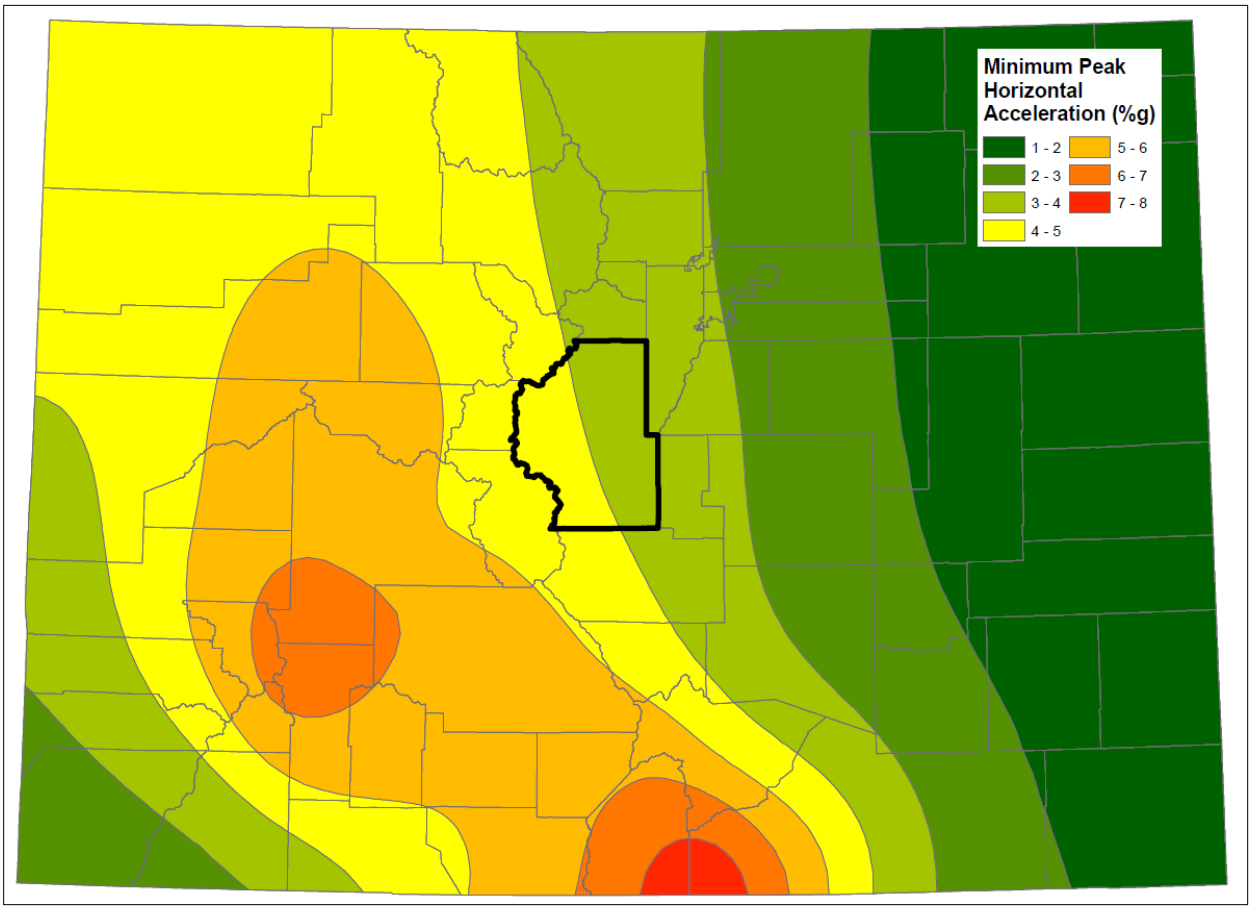

Figure 8-6. PGA with 2-Percent Probability of Exceedance in 50 Years, Colorado

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

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

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

Some slightly elevated hazards may be experienced in those areas subjected to deep mining. The presence of mine portals and shafts in the sub terrain provide the rock strata with a void in which to settle following a seismic event. The settlement of earth into these voids can cause fissures or sinkholes on the surface, which could cause significant damage to buildings and other infrastructure on the surface, even following a minor seismic event.

The Primary Effects of an earthquake can range from toppled chimneys and broken windows, to cracked walls and roadways, to complete collapse of structures and bridges. Depending on the magnitude and location of the earthquake the overall effects on the community can range from minimal to catastrophic. In larger events loss of life and injuries can be extensive and the cost of damages can be massive.

8.2.5 Warning Time

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

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

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

8.3 SECONDARY HAZARDS

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

In some cases the Secondary Effects from an earthquake can be as damaging and disruptive to a community and its citizens. The most significant potential secondary effect of an earthquake to the County is the potential for landslides. Ground shaking during an earthquake can cause previously weakened steep slopes to fail, as well as otherwise stable slopes. The specific impacts of landslides are discussed further in other sections of this Plan.

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In addition to landslides other secondary effects can include disruption of critical services such as water, electrical, and telephone services. Damage to police stations, fire stations, and other emergency service facilities can weaken a community's ability to respond in the crucial hours and days following an event.

8.4 CLIMATE CHANGE IMPACTS

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

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

8.5 EXPOSURE

Because of the large area affected by most earthquakes, as well as the vast diversity of the locations and intensities of historical earthquakes that have and can affect Colorado, no specific areas of Park County can be identified as a higher risk of being affected by an earthquake. However, this same distinction also indicates that the entire County is at a similar risk to earthquake.

8.5.1 Population

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

8.5.2 Property

According to HAZUS there are 12,096 buildings in the planning area, with a total assessed value of $2,347,083,000. Since all structures in the planning area are susceptible to earthquake impacts to varying degrees, this total represents the county-wide property exposure to seismic events. Most of the buildings (95 percent) are residential.

8.5.3 Critical Facilities and Infrastructure

All critical facilities in the planning area are exposed to the earthquake hazard. Hazardous materials releases can occur during an earthquake from fixed facilities or transportation-related incidents. Transportation corridors can be disrupted during an earthquake, leading to the release of materials to the surrounding environment. Facilities holding hazardous materials are of particular concern because of possible isolation of neighborhoods surrounding them. During an earthquake, structures storing these materials could rupture and leak into the surrounding area or an adjacent waterway, having a disastrous effect on the environment.

8.5.4 Environment

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

8.6 VULNERABILITY

Earthquake vulnerability data was generated using a Level 2 HAZUS-MH analysis. Once the location and size of a hypothetical earthquake are identified, HAZUS-MH estimates the intensity of the ground shaking, the number of buildings damaged, the number of casualties, the damage to transportation systems and utilities, the number of people displaced from their homes, and the estimated cost of repair and clean up.

8.6.1 Population

Linguistically Isolated Populations

Approximately 5 percent of residents in the planning area do not speak English as their native language Problems arise when there is an urgent need to inform non-English speaking residents of an earthquake event. They are vulnerable because of difficulties in understanding hazard-related information from predominantly English-speaking media and government agencies.

Population Below Poverty Level

Approximately 9 percent of households in the planning area are listed as being below the poverty level. These households may lack the financial resources to improve their homes to prevent or mitigate earthquake damage. Poorer residents are also less likely to have insurance to compensate for losses in earthquakes.

Population Over 65 Years Old

Approximately 6.6 percent of residents in the planning area are over 65 years old. This population group is vulnerable because they are more likely to need special medical attention, which may not be available due to isolation caused by earthquakes. Elderly residents also have more difficulty leaving their homes during earthquake events and could be stranded in dangerous situations.

Displaced Households and Shelter Requirements

Impacts on persons and households in the planning area were estimated as follows for the 500-year earthquake and the Mosquito Range scenario event through the Level 2 HAZUS-MH analysis:

- Number of displaced households:
  - 500-year earthquake: None
  - Mosquito Range earthquake: 3
- Number of persons requiring short-term shelter:
  - 500-year earthquake: None
  - Mosquito Range earthquake: 2

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8.6.2 Property

The number of structures does not reflect the number of total housing units, as many multi-family units and attached housing units are reported as one structure. Approximately 18.2 percent of the planning area's structures were constructed after the Uniform Building Code was amended in 1994 to include seismic safety provisions. Approximately 3.5 percent were built before 1933 when there were no building permits, inspections, or seismic standards.

The County and the two municipalities within Park County have adopted the 2006 International Building Code (IBC). The Code requires varying levels of seismic design, which depend on an importance factor determined by the structures use and nature of occupancy. The seismic provisions of the 2006 IBC are based on the 2003 *National Earthquake Hazards Reduction Program (NEHRP) Recommended Provisions for Seismic Regulations for New Buildings*. The higher levels of seismic design are assigned to those structures where the risk of injury or loss of life is highest, or those whose function is most critical to the community should an event occur. Examples of these structures include schools, health care facilities, power-generating facilities, water and wastewater treatment facilities, police stations, and fire stations. Although these structures are required to be designed to resist higher levels of seismic activity, they also represent the highest vulnerability to earthquake losses within the County.

The Colorado Geological Survey (CGS) performs subdivision development reviews to ensure that potential geologic problems have been identified, and if so, adequately addressed. These reviews are required to be submitted by County planning departments for new subdivisions (voluntary for cities or towns) as required by Senate Bill 35 (1972). School sites must be submitted by school districts as directed by House Bill 1045 (1984). Other proposed uses including airports, landfills, water treatment plants, utility rights of way, highway rights of way, as well as the effects of large developments such as mines and ski areas are required to be reviewed under House Bill 1041 (1974).

Loss Potential

Property losses were estimated through the Level 2 HAZUS-MH analysis for the 500-year earthquake and the Mosquito Range Scenario event. Table 8-3 shows the results for two types of property loss:

- Structural loss, representing damage to building structures
- Non-structural loss, representing the value of lost contents and inventory, relocation, income loss, rental loss, and wage loss.

TABLE 8-3.
LOSS ESTIMATE FOR PROBABILISTIC EARTHQUAKE

	Estimated Loss in Park County Associated with Earthquake		
	Structure	Contents	**Total**
500- Year Earthquake	$1,765,851	$297,907	**$2,045,759 (0.1% of planning area total)**
Mosquito Ridge Fault Scenario	$19,401,296	$4,259,910	**$23,660,206 (1% of planning area total)**

The HAZUS-MH analysis also estimated the following amounts of earthquake-caused debris:

- 500-year earthquake: 1,250 tons of debris to be removed
- Mosquito Range earthquake: 15,130 tons of debris to be removed

8.6.3 Critical Facilities and Infrastructure

Level of Damage

HAZUS-MH classifies the vulnerability of critical facilities to earthquake damage in five categories: no damage, slight damage, moderate damage, extensive damage, or complete damage. The model was used to assign a vulnerability category to each critical facility in the planning area except hazmat facilities and "other infrastructure" facilities, for which there are no established damage functions. The analysis was performed for the 500-year event and the Mosquito Range Fault scenario. Table 8-4 and Table 8-5 summarize the results.

Time to Return to Functionality

HAZUS-MH estimates the time to restore critical facilities to fully functional use. Results are presented as probability of being functional at specified time increments: 1, 3, 7, 14, 30 and 90 days after the event. For example, HAZUS-MH may estimate that a facility has 5 percent chance of being fully functional at Day 3, and a 95-percent chance of being fully functional at Day 90. The analysis of critical facilities in the planning area was performed for the 500-year and Mosquito Range earthquake event. Table 8-6 and Table 8-7 summarize the results.

8.6.4 Environment

The environment vulnerable to earthquake hazard is the same as the environment exposed to the hazard.

TABLE 8-4.
ESTIMATED DAMAGE TO CRITICAL FACILITIES FROM 500-YEAR EARTHQUAKE

Category[a]	No Damage	Slight Damage	Moderate Damage	Extensive Damage	Complete Damage
Medical and Health	0	9	0	0	**0**
Protective Functions	5	32	0	0	**0**
Schools	8	4	0	0	**0**
Other Critical Functions	1	0	0	0	**0**
Bridges	41	0	0	0	**0**
Water supply	8	0	0	0	**0**
Wastewater	2	0	0	0	**0**
Power	4	0	0	0	**0**
Communications	13	0	0	0	**0**
Total	**82**	**45**	**0**	**0**	**0**

a. Vulnerability not estimated for hazmat facilities or for "other infrastructure" facilities due to lack of established damage functions for these type facilities.

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TABLE 8-5.
ESTIMATED DAMAGE TO CRITICAL FACILITIES FROM MOSQUITO RANGE SCENARIO

Category[a]	No Damage	Slight Damage	Moderate Damage	Extensive Damage	Complete Damage
Medical and Health	0	9	0	0	0
Protective Functions	5	32	0	0	0
Schools	8	4	0	0	0
Other Critical Functions	1	0	0	0	0
Bridges	41	0	0	0	0
Water supply	2	6	0	0	0
Wastewater	1	1	0	0	0
Power	1	3	0	0	0
Communications	4	9	0	0	0
Total	**63**	**64**	**0**	**0**	**0**

a. Vulnerability not estimated for hazmat facilities or for "other infrastructure" facilities due to lack of established damage functions for these type facilities.

TABLE 8-6.
FUNCTIONALITY OF CRITICAL FACILITIES FOR 500-YEAR EVENT

Planning Unit	# of Critical Facilities	Probability of Being Fully Functional (%)					
		at Day 1	at Day 3	at Day 7	at Day 14	at Day 30	at Day 90
Medical and Health	9	39.3	40.5	94.3	95.5	99.3	99.6
Protective Functions	37	44.0	45.2	93.7	94.8	98.3	98.5
Schools	12	77.2	77.7	97.7	98.2	99.7	99.8
Other Critical functions	1	99.7	99.8	99.9	99.9	99.9	99.9
Bridges	41	100.0	100.0	100.0	100.0	100.0	100.0
Water supply	8	96.0	99.8	99.9	99.9	99.9	99.9
Wastewater	2	93.3	98.9	99.9	99.9	99.9	99.9
Power	4	95.5	99.6	99.9	99.9	99.9	99.9
Communications	13	99.5	99.9	99.9	99.9	99.9	99.9
Total/Average	**127**	**82.7**	**84.6**	**98.3**	**98.7**	**99.6**	**99.7**

TABLE 8-7.
FUNCTIONALITY OF CRITICAL FACILITIES FOR MOSQUITO RANGE SCENARIO

Planning Unit	# of Critical Facilities	Probability of Being Fully Functional (%)					
		at Day 1	at Day 3	at Day 7	at Day 14	at Day 30	at Day 90
Medical and Health	9	12.6	13.8	67.7	69.1	88.4	92.7
Protective Functions	37	20.2	21.3	70.9	72.1	90.0	93.7
Schools	12	56.1	56.7	83.0	83.6	94.4	96.5
Other Critical functions	1	98.5	99.4	99.7	99.7	99.8	99.9
Bridges	41	96.2	97.5	98.2	98.2	98.4	99.1
Water supply	8	73.4	95.8	98.5	98.5	98.9	99.8
Wastewater	2	63.8	89.1	97.5	98.6	98.7	99.8
Power	4	67.4	91.1	98.9	99.7	99.9	99.9
Communications	13	91.8	98.4	99.1	99.6	99.8	99.9
Total/Average	**127**	**64.4**	**73.7**	**90.4**	**91.0**	**96.5**	**97.9**

8.7 FUTURE TRENDS IN DEVELOPMENT

Land use in the planning area will be directed by general plans adopted in Park County. The safety elements of the general plans establish standards and plans for the protection of the community from hazards. The information in this plan provides the participating partners a tool to ensure that there is no increase in exposure in areas of high seismic risk. Development in the planning area will be regulated through building standards and performance measures so that the degree of risk will be reduced. The geologic hazard portions of the planning area are heavily regulated under California's General Planning Law. The International Building Code establishes provisions to address seismic risk.

8.8 SCENARIO

An earthquake does not have to occur within the planning area to have a significant impact on the people, property and economy of the county. Any seismic activity of 6.0 or greater on faults within the planning area would have significant impacts throughout the county. Earthquakes of this magnitude or higher would lead to massive structural failure of property on highly liquefiable soils. Levees and revetments built on these poor soils would likely fail, representing a loss of critical infrastructure. These events could cause secondary hazards, including landslides and mudslides that would further damage structures. River valley hydraulic-fill sediment areas are also vulnerable to slope failure, often as a result of loss of cohesion in clay-rich soils.

8.9 ISSUES

Based on the historical earthquake record and geologic studies in Colorado, an event of magnitude 6½ to 7¼ could occur somewhere in the state. Scientists are unable to accurately predict when the next major earthquake will occur in Colorado; they are only able to predict that one indeed will occur. The major factor preventing the precise identification of the time or location of the next damaging earthquake is the limited knowledge of potentially active faults. Given Colorado's continuing active economic growth and the accompanying expansion of population and infrastructure, it is prudent to continue the study and analysis of earthquake hazards. Existing knowledge should be used to incorporate appropriate levels of seismic safety in building codes and practices. The continued and expanded use of seismic safety

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provisions in critical and vulnerable structures and in emergency planning statewide is also recommended. Concurrently, we should expand earthquake monitoring, geological and geophysical research, and mitigation planning.

Colorado is comprised of areas with low to moderate potential for damaging earthquakes, based on research by geologists and geophysicists who specialize in seismology. There are about 90 potentially active faults that have been identified in Colorado, with documented movement within the last 1.6 million years. However, there are several thousand other faults that have been mapped in Colorado that have not been sufficiently studied to know whether they are capable of generating earthquakes or not. It is not possible to accurately estimate the timing or location of future dangerous earthquakes in Colorado.

The lack of an adequate network of seismometers in Colorado makes it difficult to detect and locate earthquakes. Moreover, the historical record is quite short (~150 years). Nevertheless, the available seismic hazard information can provide a basis for a reasoned and prudent approach to seismic safety.

At present, Park County does not anticipate any further earthquake mapping or analyses.

Important issues associated with an earthquake include but are not limited to the following:

- It is estimated that roughly 40 percent of the planning area's building stock was built prior to 1975, when seismic provisions became uniformly applied through building code applications.
- Critical facility owner should be encouraged to create or enhance continuity of operations plans using the information on risk and vulnerability contained in this plan.
- Geotechnical standards should be established that take into account the probable impacts from earthquakes in the design and construction of new or enhanced facilities.
- There are a number of earthen dams within the planning area. Dam failure warning and evacuation plans and procedures should be reviewed and updated to reflect the dams' risk potential associated with earthquake activity in the region.
- Earthquakes could trigger other natural hazard events such as dam failures and landslides, which could severely impact the county.
- A worst-case scenario would be the occurrence of a large seismic event during a flood or high-water event. Levee failures could happen at multiple locations, increasing the impacts of the individual events.

CHAPTER 9.
FLOOD

9.1 GENERAL BACKGROUND

The hazard of flooding was ranked as medium countywide for in this update process.

A floodplain is the area adjacent to a river, creek or lake that becomes inundated during a flood. Floodplains may be broad, as when a river crosses an extensive flat landscape, or narrow, as when a river is confined in a canyon.

When floodwaters recede after a flood event, they leave behind layers of rock and mud. These gradually build up to create a new floor of the floodplain. Floodplains generally contain unconsolidated sediments (accumulations of sand, gravel, loam, silt, and/or clay), often extending below the bed of the stream. These sediments provide a natural filtering system, with water percolating back into the ground and replenishing groundwater. These are often important aquifers, the water drawn from them being filtered compared to the water in the stream. Fertile, flat reclaimed floodplain lands are commonly used for agriculture, commerce and residential development.

DEFINITIONS

Flood—The inundation of normally dry land resulting from the rising and overflowing of a body of water.

Floodplain—The land area along the sides of a river that becomes inundated with water during a flood.

100-Year Floodplain—The area flooded by a flood that has a 1-percent chance of being equaled or exceeded each year. This is a statistical average only; a 100-year flood can occur more than once in a short period of time. The 1-percent annual chance flood is the standard used by most federal and state agencies.

Return Period—The average number of years between occurrences of a hazard (equal to the inverse of the annual likelihood of occurrence).

Riparian Zone—The area along the banks of a natural watercourse.

Connections between a river and its floodplain are most apparent during and after major flood events. These areas form a complex physical and biological system that not only supports a variety of natural resources but also provides natural flood and erosion control. When a river is separated from its floodplain with levees and other flood control facilities, natural, built-in benefits can be lost, altered, or significantly reduced.

While there is no official record of major flooding events in Park County, the County always faces significant potential for flooding hazards. The County is surrounded by mountains, with steep ridges and pronounced valleys and includes the headwaters of one of Colorado's most significant watersheds, the South Platte River, as well as two other significant watercourses. The county includes Front Range foothills in the northeast, mountains as high as more than 14,000 feet in and adjacent to the Continental Divide in the north and west. Flooding can be caused either by severe rainstorms or mountain snowmelt. Figure 9-1 shows the major watersheds within Park County.

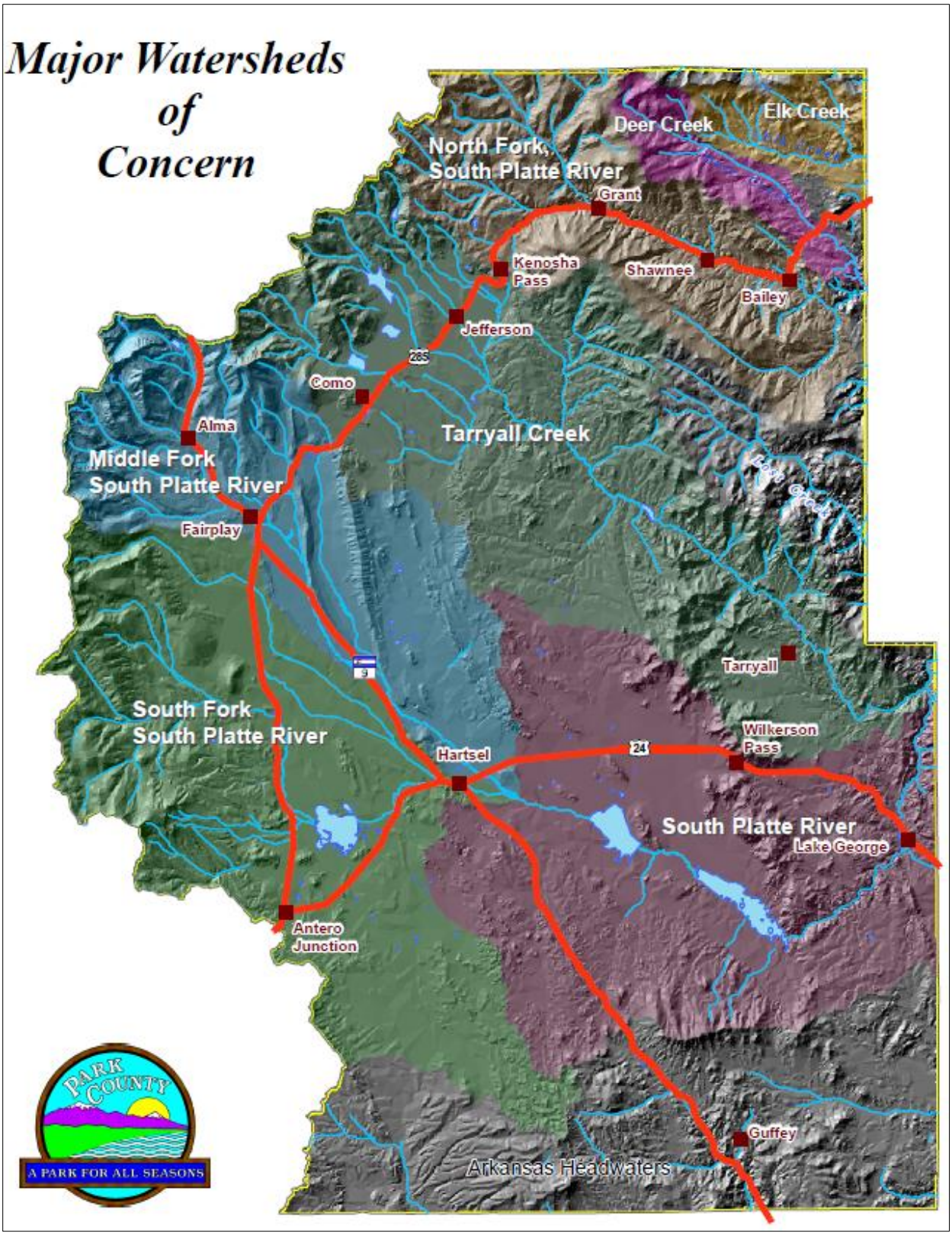

Figure 9-1. Park County Watersheds

9.1.1 Measuring Floods and Floodplains

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

The extent of flooding associated with a 1-percent annual probability of occurrence (the base flood or 100-year flood) is used as the regulatory boundary by many agencies. Also referred to as the special flood hazard area, this boundary is a convenient tool for assessing vulnerability and risk in flood-prone communities. Many communities have maps that show the extent and likely depth of flooding for the base flood. Corresponding water-surface elevations describe the elevation of water that will result from a given discharge level, which is one of the most important factors used in estimating flood damage.

9.1.2 Floodplain Ecosystems

Floodplains can support ecosystems that are rich in plant and animal species. A floodplain can contain 100 or even 1,000 times as many species as a river. Wetting of the floodplain soil releases an immediate surge of nutrients: those left over from the last flood, and those that result from the rapid decomposition of organic matter that has accumulated since then. Microscopic organisms thrive and larger species enter a rapid breeding cycle. Opportunistic feeders (particularly birds) move in to take advantage. The production of nutrients peaks and falls away quickly, but the surge of new growth endures for some time. This makes floodplains valuable for agriculture. Species growing in floodplains are markedly different from those that grow outside floodplains. For instance, riparian trees (trees that grow in floodplains) tend to be very tolerant of root disturbance and very quick-growing compared to non-riparian trees.

9.1.3 Effects of Human Activities

Because they border water bodies, floodplains have historically been popular sites to establish settlements. Human activities tend to concentrate in floodplains for a number of reasons: water is readily available; land is fertile and suitable for farming; transportation by water is easily accessible; and land is flatter and easier to develop. But human activity in floodplains frequently interferes with the natural function of floodplains. It can affect the distribution and timing of drainage, thereby increasing flood problems. Human development can create local flooding problems by altering or confining drainage channels. This increases flood potential in two ways: it reduces the stream's capacity to contain flows, and it increases flow rates or velocities downstream during all stages of a flood event. Human activities can interface effectively with a floodplain as long as steps are taken to mitigate the activities' adverse impacts on floodplain functions.

9.1.4 Federal Flood Programs

National Flood Insurance Program

The NFIP makes federally backed flood insurance available to homeowners, renters, and business owners in participating communities. For most participating communities, FEMA has prepared a detailed Flood Insurance Study. The study presents water surface elevations for floods of various magnitudes, including the 1-percent annual chance flood and the 0.2-percent annual chance flood (the 500-year flood). Base flood elevations and the boundaries of the 100- and 500-year floodplains are shown on Flood Insurance

Rate Maps (FIRMs), which are the principle tool for identifying the extent and location of the flood hazard. FIRMs are the most detailed and consistent data source available, and for many communities they represent the minimum area of oversight under their floodplain management program.

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

- New buildings and those undergoing substantial improvements must, at a minimum, be elevated to protect against damage by the 100-year flood.
- New floodplain development must not aggravate existing flood problems or increase damage to other properties.
- New floodplain development must exercise a reasonable and prudent effort to reduce its adverse impacts on threatened salmonid species.

Park County entered the NFIP on July 16, 1987. Structures permitted or built in the County before then are called "pre-FIRM" structures, and structures built afterwards are called "post-FIRM." The insurance rate is different for the two types of structures. The effective date for the current countywide FIRM is June 16, 2009. This map is a DFIRM (digital flood insurance rate map).

The Community Rating System

The CRS is a voluntary program within the NFIP that encourages floodplain management activities that exceed the minimum NFIP requirements. Flood insurance premiums are discounted to reflect the reduced flood risk resulting from community actions meeting the following three goals of the CRS:

- Reduce flood losses.
- Facilitate accurate insurance rating.
- Promote awareness of flood insurance.

For participating communities, flood insurance premium rates are discounted in increments of 5 percent. For example, a Class 1 community would receive a 45 percent premium discount, and a Class 9 community would receive a 5 percent discount. (Class 10 communities are those that do not participate in the CRS; they receive no discount.) The CRS classes for local communities are based on 18 creditable activities in the following categories:

- Public information
- Mapping and regulations
- Flood damage reduction
- Flood preparedness.

Figure 9-2 shows the nationwide number of CRS communities by class as of May 2012, when there were 1,211 communities receiving flood insurance premium discounts under the CRS program. CRS activities can help to save lives and reduce property damage. Communities participating in the CRS represent a significant portion of the nation's flood risk; over 66 percent of the NFIP's policy base is located in these communities. Communities receiving premium discounts through the CRS range from small to large and represent a broad mixture of flood risks, including both coastal and riverine flood risks.

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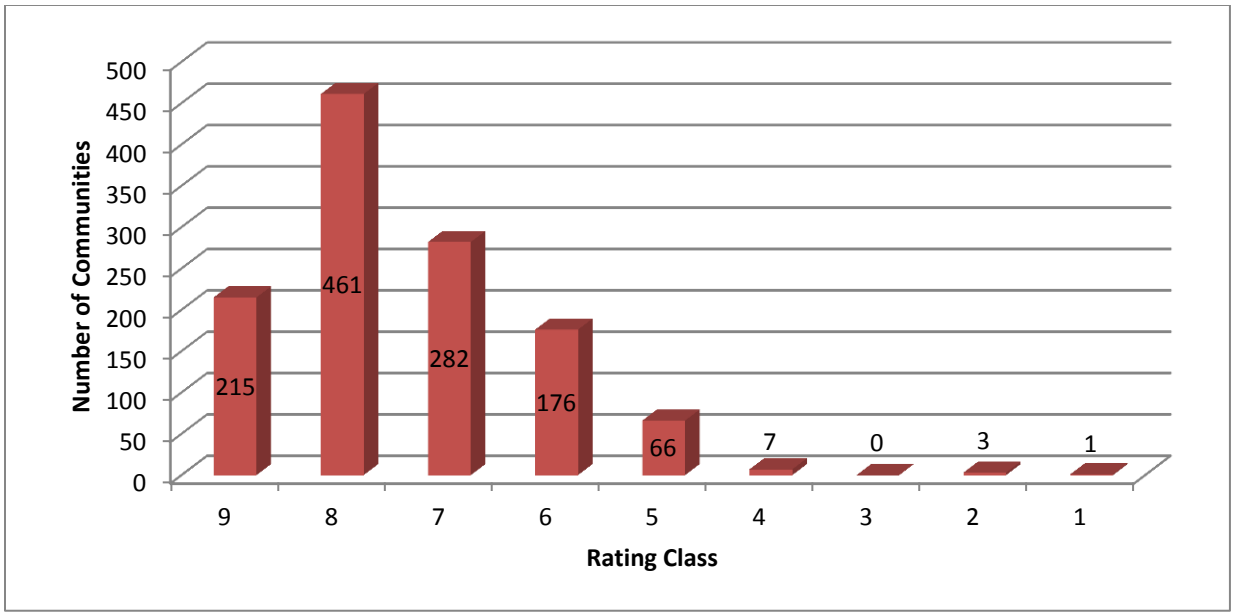

Figure 9-2. CRS Communities by Class Nationwide as of May 2012

Through the National Flood Insurance Program (NFIP), FEMA has developed FIRMs that identify flood zones through detailed hydrologic and hydraulic studies for many communities throughout Colorado. To date, no such detailed studies have been prepared for Park County, Alma or Fairplay. When such detailed studies are prepared, the flood zones represent the areas susceptible to the 1% annual chance flood, or a 100-year flood. When these floodplain studies are detailed, FEMA will calculate Base Flood Elevations (BFEs), which are used to define the 100-year floodplain. The BFE is a commonly used standard level for determining flood risk, and managing potential floodplain development. When the floodplain studies are approximate, BFEs may be estimated through approximate engineering techniques or through techniques that are not based on any engineering.

The FEMA maps for Park County and for the Town of Fairplay were developed through mapping techniques that are not based on engineering analysis. The index map for the Park County FIRMs, showing the layout of the individual map panels from 1987, has been digitized and the Park County watershed boundaries have been superimposed on that index map, shown in Figure 9-3.

9.2 HAZARD PROFILE

Flooding in the planning area is typically caused by high-intensity, short-duration (1 to 3 hours) storms concentrated on a stream reach with already saturated soil. Two types of flooding are typical:

- Flash floods that occur suddenly after a brief but intense downpour. They move rapidly, end suddenly, and can occur in areas not generally associated with flooding (such as subdivisions not adjacent to a water body and areas serviced by underground drainage systems). Although the duration of these events is usually brief, the damage they cause can be severe. Flash floods cannot be predicted accurately and happen whenever there are heavy storms.
- Riverine floods described in terms of their extent (including the horizontal area affected and the vertical depth of floodwater) and the related probability of occurrence (expressed as the percentage chance that a flood of a specific extent will occur in any given year).

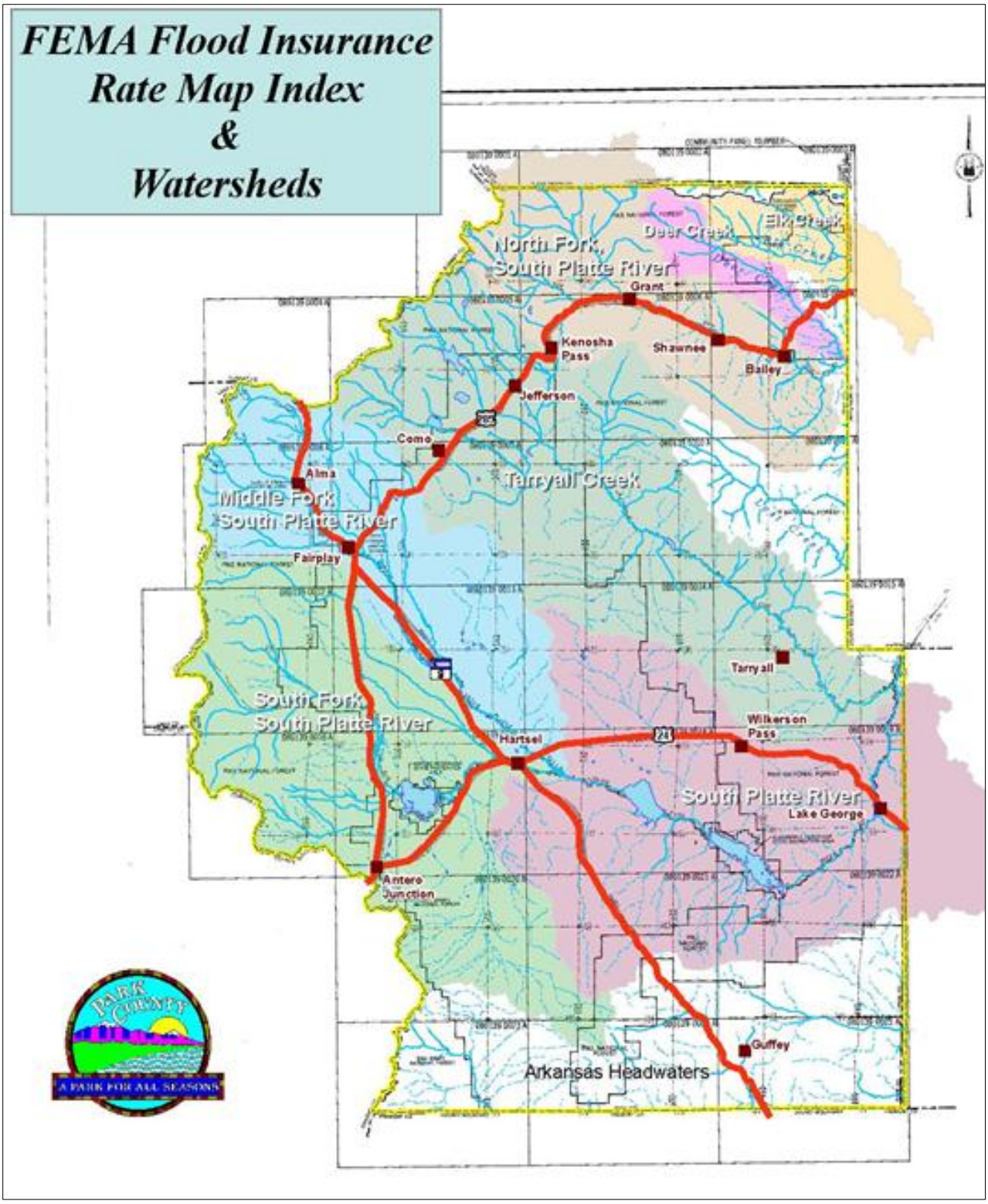

Figure 9-3. Index Map for Park County FIRM

Flooding is predominantly confined within traditional riverine valleys. Locally, some natural or manmade levees separate channels from floodplains and cause independent overland flow paths. Occasionally, railroad, highway or canal embankments form barriers, resulting in ponding or diversion of the flow. Some localized flooding not associated with stream overflow can occur where there are no drainage facilities to control flows or when runoff volumes exceed the design capacity of drainage facilities. Mapped FEMA flood zones in Park County are shown on Figure 9-4.

9.2.1 Principal Flooding Sources

The portions of the county most susceptible to flooding are those directly adjacent to the area's major drainage ways and selected smaller tributaries throughout the area. Due to the mountainous terrain in much of the county and the associated steep slopes, a great deal of development in the county is located in the valleys along these streams. Development generally consists of residential uses, with commercial districts primarily limited to the two incorporated towns, Fairplay and Alma.

Town of Alma

Elk Creek is a major tributary to the North Fork of the South Platte. The headwaters of Elk Creek are located in the Mt. Evans Wilderness Area. It flows through the northeast corner of the county from west-northwest to east-southeast, crossing into Jefferson County about halfway between Pine Junction and the boundary between Park County and Clear Creek County. Numerous subdivisions near Pine Junction and Bailey, including Harris Park, are located along or near Elk Creek and its tributaries. Due to the number of properties in the proximity of these streams, and the potential threat to property and life that they could pose during a flood event, they warrant significant planning considerations as well as considerations for a Colorado Water Conservation Board (CWCB) Map Modernization project. Mapped FEMA flood zones in the Town of Alma are shown on Figure 9-5.

Town of Fairplay

Deer Creek is another major tributary to the North Fork of the South Platte River. The headwaters of Deer Creek and its tributaries are located in the Mt. Evans Wilderness Area. The Deer Creek watershed is parallel and just south of the Elk Creek watershed. Deer Creek and its tributaries pass through several subdivisions, including Highland Park. Deer Creek crosses Highway 285 about half way between Pine Junction and Bailey and continues to the east/southeast, joining the North Fork of the South Platte River approximately at the Park County-Jefferson County boundary, roughly four to five miles south of Pine Junction. As is the case with Elk Creek the large number of properties in the proximity of Deer Creek and its tributaries merit significant planning considerations as well as considerations for a Map Modernization project with the CWCB. Mapped FEMA flood zones in the Town of Fairplay are shown on Figure 9-6.

Platte Canyon FPD

Mapped FEMA flood zones in the Platte Canyon FPD are shown on Figure 9-7. The North Fork of the South Platte River basin is the major drainage way for northern Park County. A major portion of the headwaters of the North Fork of the South Platte River is located on the Continental Divide near Webster Pass along the county's border with Summit County. There are also headwater streams on the southwestern flanks of Mt. Evans in Clear Creek County. One of the North Fork's primary tributary watersheds, the Geneva Creek watershed, originates near Guanella Pass in Clear Creek County. Geneva Creek joins the North Fork at Grant. Another tributary to the North Fork, Kenosha Gulch flows down from Kenosha Pass and joins the North Fork in Webster. Immediately upstream of Grant, the Roberts Tunnel, a Denver Water diversion facility, empties into the North Fork and substantially alters the hydrology of the watershed.

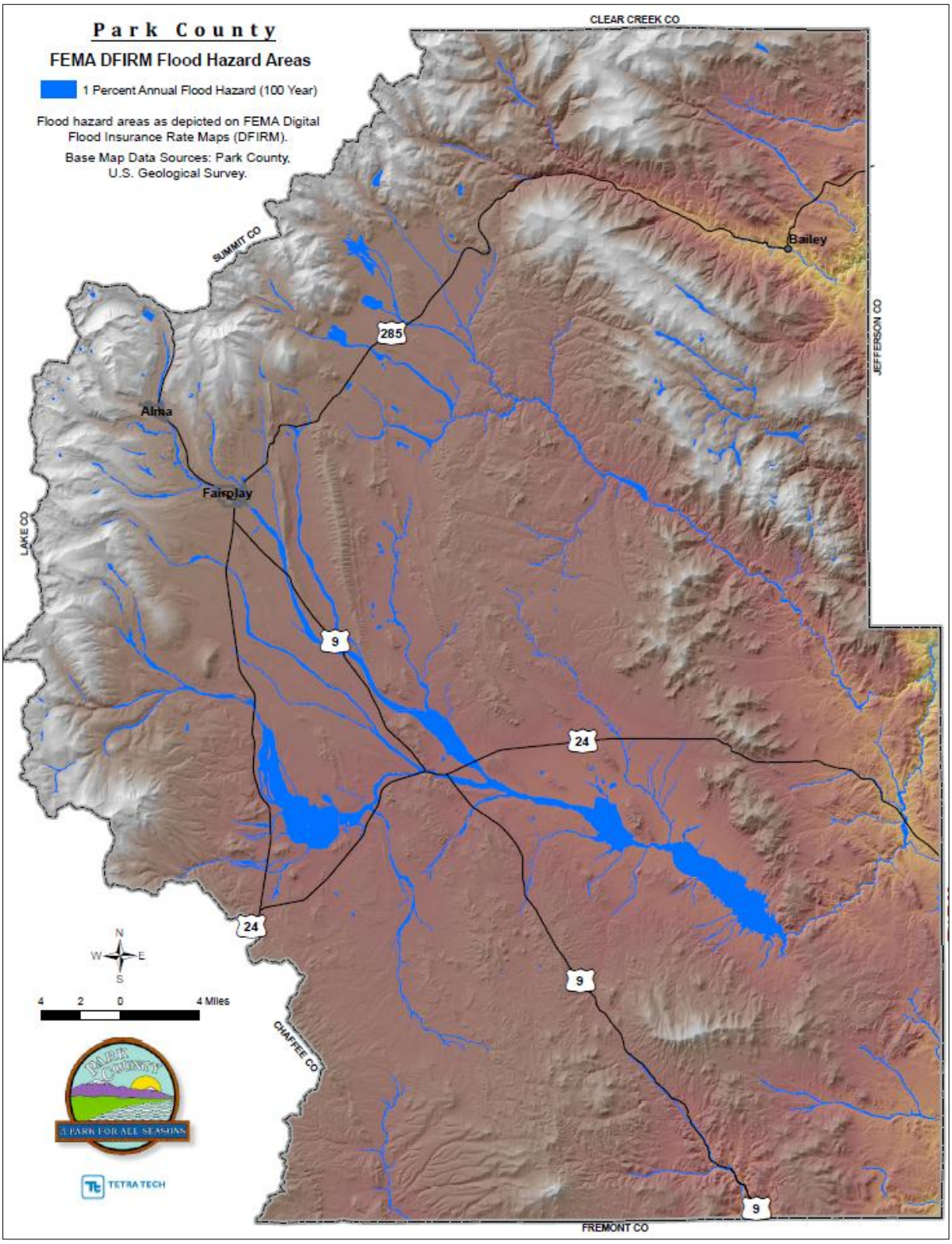

Figure 9-4. FEMA Flood Hazard Areas in Park County

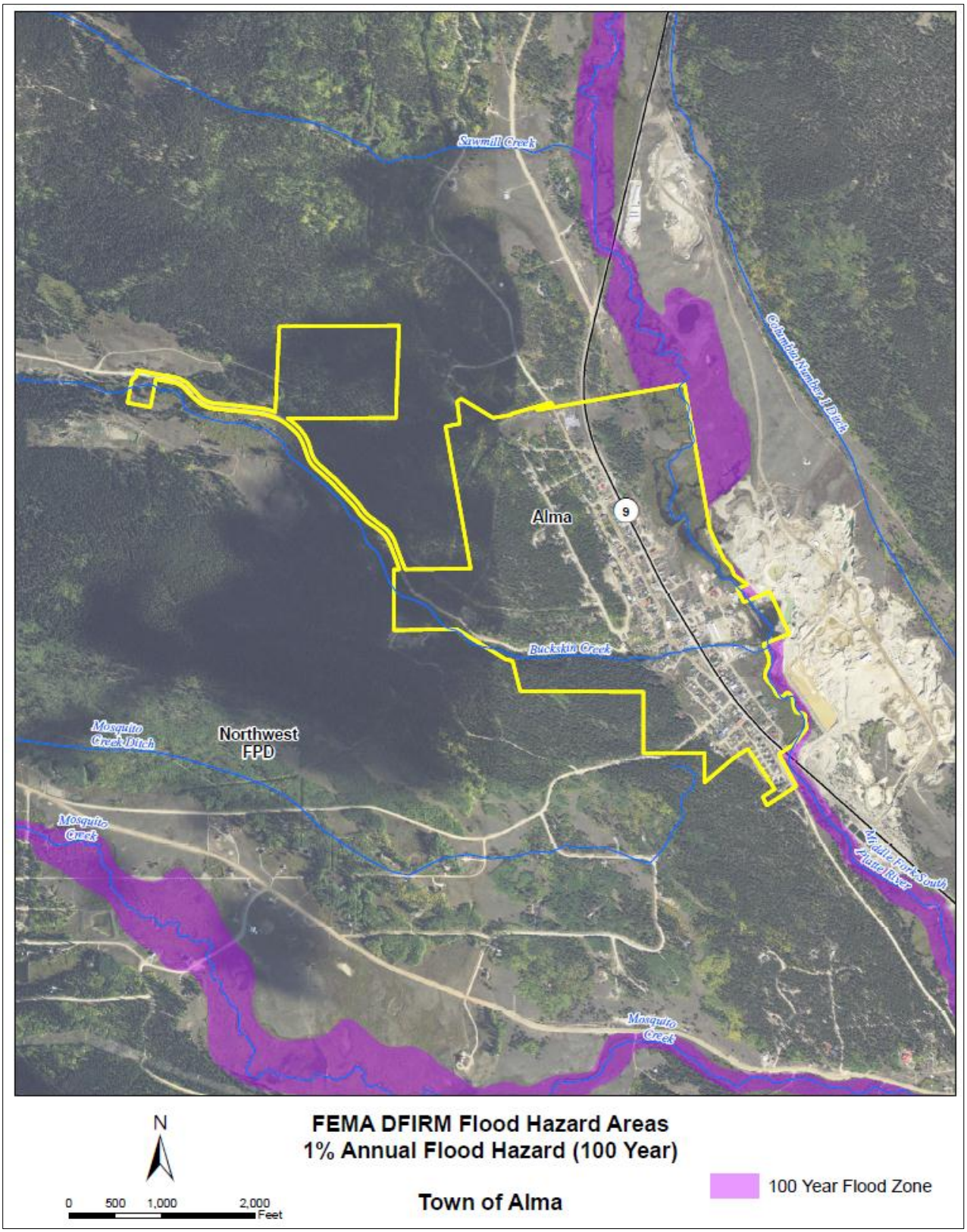

Figure 9-5. FEMA Flood Hazard Areas in the Town of Alma

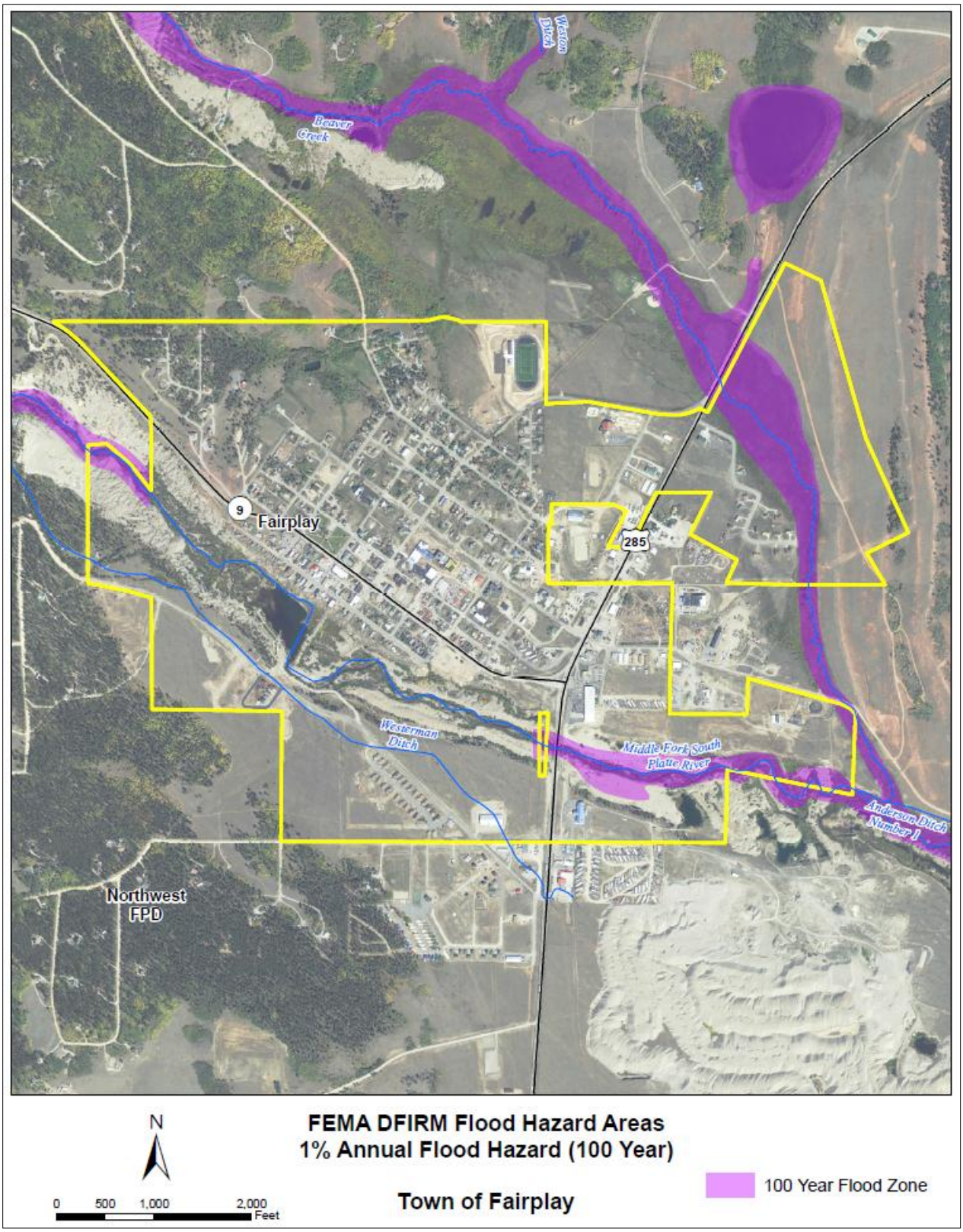

Figure 9-6. FEMA Flood Hazard Areas in the Town of Fairplay

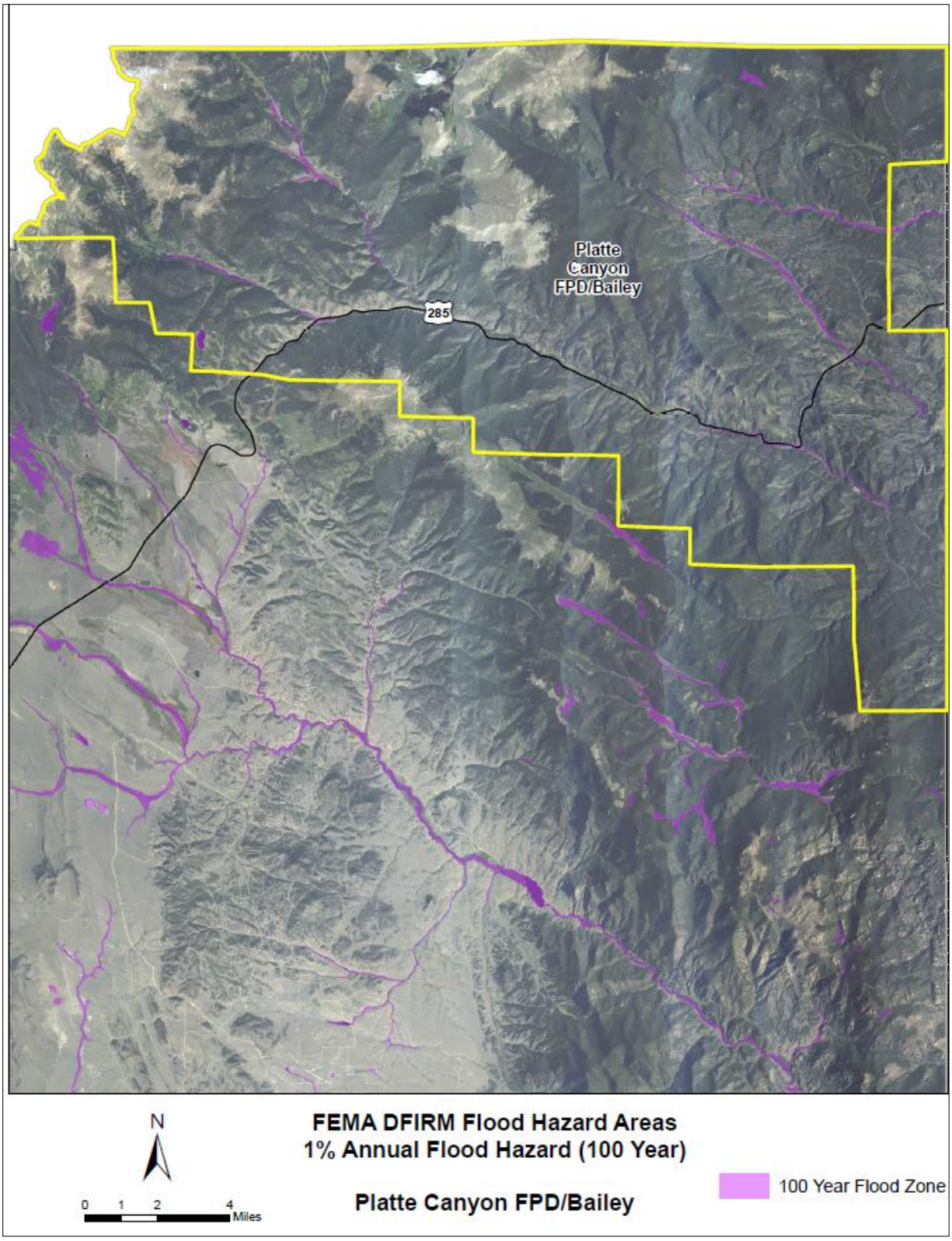

Figure 9-7. FEMA Flood Hazard Areas in the Platte Canyon FPD

The North Fork flows along U.S. Highway 285 between Webster and Bailey. It poses a threat to infrastructure and property in the Platte Canyon portion of the county, including the Bailey area. Downstream of Bailey, the river continues in a generally eastward direction, crossing into Jefferson County roughly four to five miles south of Pine Junction. Due to steep mountainous terrain in the headwaters of the river's drainage area, the potential for rapid flooding following a moderate to significant rain event or spring snowmelt is high. Selected sections of the North Fork between Grant and Bailey may need to be considered for a Map Modernization project in conjunction with the CWCB.

As mentioned above, a significant hydrologic feature in the North Fork of the South Platte watershed comes from Dillon Reservoir, through the Roberts Tunnel, which conveys water by gravity from Dillon Reservoir into Park County. The Denver Water Board operates Dillon Reservoir and the Roberts Tunnel. Thousands of cubic-feet-per-second are added to the North Fork, dramatically altering the North Fork's channel and the hydrology of the entire watershed below Grant.

The North Fork of the South Platte River watershed was impacted by the Hayman, Snaking and Hi Meadow fires. Wildfires substantially increase the risk of flooding and debris flows. Post-wildfire floods and debris have occurred in nearby burn areas. Perhaps the closest such event occurred in Buffalo Creek (in adjoining Jefferson County), in 1995, resulting in two fatalities and substantial property and infrastructure damage.

North-West FPD

Mapped FEMA flood zones in the North-West FPD are shown on Figure 9-8. The Tarryall Creek basin's headwaters are located in the mountains of the Continental Divide, which is the county's border with Summit County. The mainstream of Tarryall Creek begins near Boreas Pass, while several major tributaries begin near Georgia Pass. Tarryall Creek flows east/southeast, crossing U.S. Highway 285 between Jefferson and Como, and eventually joining the South Platte River roughly 6 miles downstream of Lake George. Tarryall Reservoir, a Division of Wildlife facility, is located between Jefferson and Tarryall Creek's confluence with the South Platte River. Some of the primary tributaries to Tarryall Creek are Jefferson Creek and Michigan Creek. Jefferson Lake, a storage reservoir owned by the city of Aurora, lies upstream of Jefferson on the Jefferson Lake Fork of Jefferson Creek. The Tarryall Creek watershed, including the mainstream of the creek, was impacted by the Hayman Fire. This watershed has an elevated risk to post-wildfire flash flooding and debris flows.

The headwaters of the Middle Fork of the South Platte River are located along the Continental Divide near Hoosier Pass and the Mosquito Range. The Mosquito Range serves as the boundary between the South Platte Basin and the Arkansas Basin. Colorado Springs Utility's Montgomery Reservoir stores water that flows down from the Divide in the northern portion of this watershed. The river then flows south toward the town of Alma.

The Middle Fork passes along the eastern side of Alma as it flows south towards Fairplay. Buckskin Creek, a major tributary to the Middle Fork, originates in the Mosquito Range, flows from west to east through Alma and crosses State Highway 9 in the center of town. It joins the Middle Fork of the South Platte on the east side of Alma.

The Middle Fork flows along the west side of Fairplay in an incised valley well below most urban development. Beaver Creek is east of Fairplay and joins the Middle Fork south of town. The primary flooding risk in Fairplay from the Middle Fork and Beaver Creek is to U.S. Highway 285 and State Highway 9. Dry gulches in town could also pose a flood threat in the event of heavy precipitation. After the Middle Fork crosses U.S. Highway 285, it continues to the southeast and eventually has its confluence with the South Fork of the South Platte River upstream of Hartsel to form the South Platte River.

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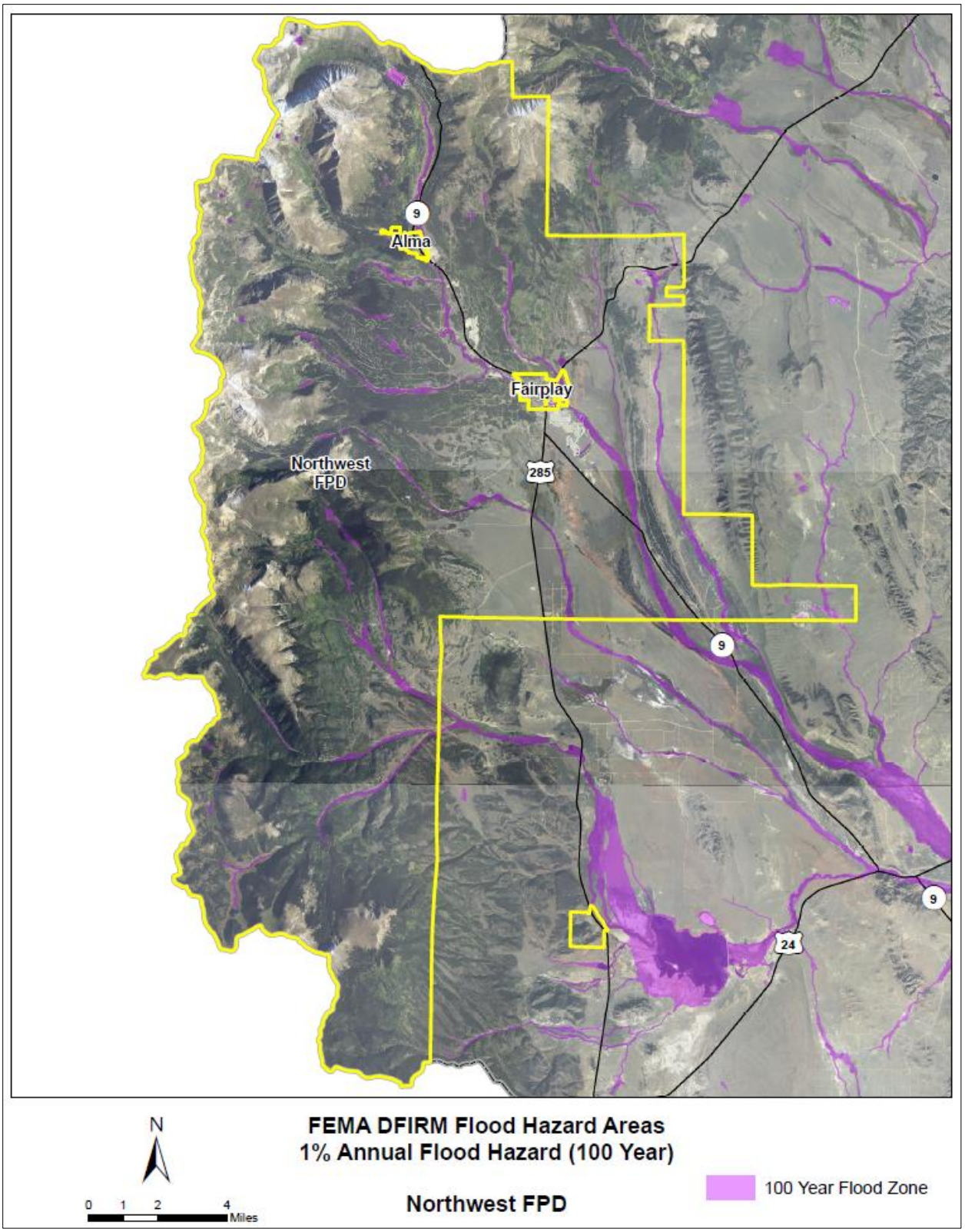

Figure 9-8. FEMA Flood Hazard Areas in the North-West Fire Protection District

Southern Park County FPD

Mapped FEMA flood zones in the Southern Park County FPD are shown on Figure 9-9. The headwaters of the South Fork of the South Platte River are in the Mosquito Range and the mountains south of the Mosquito Range on the County's border with Lake County and Chaffee County. From its headwaters, the South Fork flows toward the southeast and into the Denver Water Board's Antero Reservoir. Downstream of Antero Reservoir, the river flows northeast before joining the Middle Fork of the South Platte River upstream of Hartsel to form the South Platte River.

The Middle Fork enters the area just upstream of Hartsel from the north/northwest, while the South Fork enters the area just upstream of Hartsel from due west. When the Middle Fork and the South Fork of the South Platte River join upstream of Hartsel, they form the South Platte River. The Middle Fork, the South Fork, and the South Platte all pose a potential flooding threat to buildings and infrastructure, including U.S. Highway 24 and State Highway 9, in and around Hartsel. Consideration may need to be given to a Map Modernization project in conjunction with the CWCB for the Hartsel area.

Downstream of Hartsel, the river flows southeast into the City of Aurora's Spinney Mountain Reservoir. Shortly thereafter, the river enters Eleven Mile Canyon and flows into the Denver Water Board's Eleven Mile Reservoir. Eleven Mile Reservoir is the largest reservoir in the county with 3,405 surface acres and a capacity of 97,779 acre-feet when full. From the outlet of Eleven Mile Reservoir, the river turns to the northeast and eventually flows through the community of Lake George. It continues in a northeasterly direction before flowing briefly through Teller County, and then becoming the boundary between Jefferson and Douglas Counties.

9.2.2 Past Events

Since the documented history of flood events in Park County is so limited, area/community -specific flood history has been provided to accompany the basin descriptions.

Floods are the most common and widespread of all natural hazards. Some floods develop slowly, but flash floods can happen in just minutes. Flood prone areas have been identified in 267 cities and towns and in all of the 64 counties in Colorado.

Documented history of flood events in Park County is minimal. A summary of recorded flood events in Park County was compiled from the Spatial Hazard Events and Losses Database for the United States (SHELDUS), as summarized in Table 9-1.

TABLE 9-1.
FLOODING EVENTS

Date	Hazard Type	Injuries	Deaths	Property Damage ($)	Crop Damage
7/28/1982	Flooding, Severe Storm/Thunder Storm	0	0	7142.86	0
6/7/1979	Flooding	0	0	793.65	$172,413

Note: SHELDUS did not indicate the specific location of the two events listed above location

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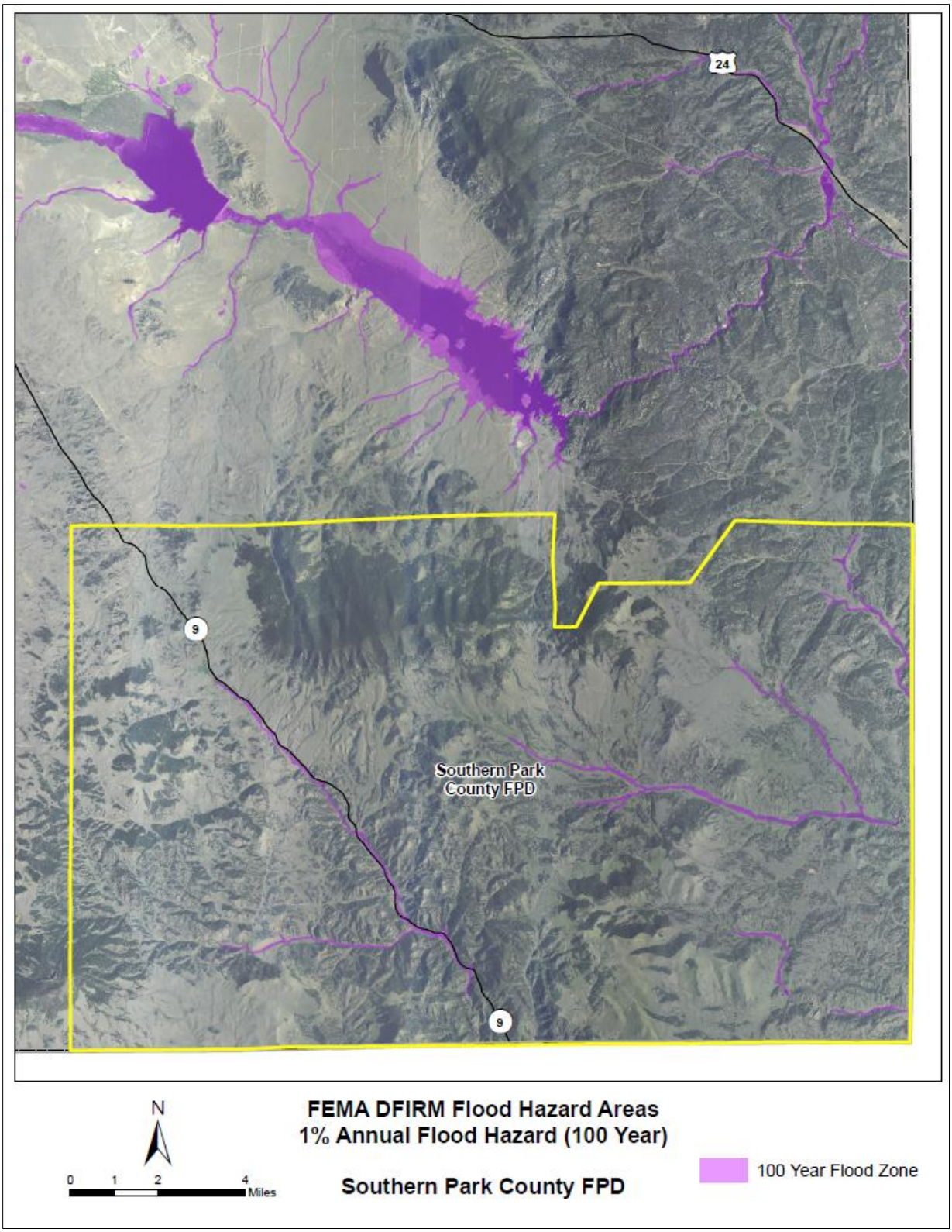

Figure 9-9. FEMA Flood Hazard Areas in the Southern Park County FPD

The portions of the county most susceptible to flooding are those directly adjacent to the area's major drainage ways and selected smaller tributaries throughout the area. Due to the mountainous terrain in much of the county and the associated steep slopes, a great deal of development in the county is located in the valleys along these streams. Development generally consists of residential uses, with commercial districts primarily limited to the two incorporated towns, Fairplay and Alma.

Through the National Flood Insurance Program (NFIP), FEMA has developed FIRMs that identify flood zones through detailed hydrologic and hydraulic studies for many communities throughout Colorado. To date, no such detailed studies have been prepared for Park County, Alma or Fairplay. When such detailed studies are prepared, the flood zones represent the areas susceptible to the 1-percent annual chance flood, or a 100-year flood. When these floodplain studies are detailed, FEMA will calculate BFEs to define the 100-year floodplain. The BFE is a commonly used standard level for determining flood risk, and managing potential floodplain development. When the floodplain studies are approximate, BFEs may be estimated through approximate engineering techniques or through techniques that are not based on any engineering. The FEMA maps for Park County and for the Town of Fairplay were developed through mapping techniques that are not based on engineering analysis.

Elk Creek Basin

The section of Elk Creek and its tributaries that is most susceptible to flooding is between the Mt. Evans Wilderness and Harris Park. There is residential development along the main stem of Elk Creek and several of its tributaries. The Elk Creek Basin has not been studied in detail as part of a FEMA Flood Insurance Study, and BFEs have not been determined for the 100-year flood. The lack of engineering analysis currently available for the Elk Creek Basin makes it difficult to estimate the number of properties in the 100-year floodplain.

This watershed is subject to snowmelt flooding, rainfall flooding, post-wildfire flooding and debris flows.

No 100-year flood events have been officially recorded in the Elk Creek Basin. This does not preclude the occurrence of a 100-year event in the future. Given the significant population in the Elk Creek Basin, the high rate of population growth, the existing infrastructure at risk to flooding and the fact that the watershed has experienced a wildfire in the past five years, Park County may want to consider a Map Modernization project in this basin.

Deer Creek Basin

The section of Deer Creek and its tributaries that is most susceptible to flooding extends from Highland Park, beyond U.S. Highway 285, all the way to the confluence of Deer Creek with the North Fork of the South Platte River near the Park County-Jefferson County line. There is residential development along the main stem of Deer Creek and several of its tributaries. The Deer Creek Basin has not been studied in detail as part of a FEMA Flood Insurance Study, and BFEs have not been determined for the 100-year flood. The lack of engineering analysis currently available for the Deer Creek Basin makes it difficult to estimate the number of properties in the 100-year floodplain.

This watershed is subject to snowmelt flooding, rainfall flooding, post-wildfire flooding and debris flows.

As noted in the hazard history section, no 100-year flood events have been officially recorded in the Deer Creek Basin. This does not preclude the occurrence of a 100-year event in the future. Given the significant population in the Deer Creek Basin, the high rate of population growth, the existing infrastructure at risk to flooding and the fact that the watershed has experienced a wildfire in the past ten years, Park County may want to consider a Map Modernization project in this basin.

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North Fork South Platte Basin

The section of the North Fork of the South Platte and its tributaries that is most susceptible to flooding is in the corridor between Grant and Bailey along U.S. Highway 285. There is residential and commercial development along the main stem of the North Fork and several of its tributaries. The North Fork Basin has not been studied in detail as part of a FEMA Flood Insurance Study, and BFEs have not been determined for the 100-year flood. The lack of engineering analysis currently available for the North Fork Basin makes it difficult to estimate the number of properties in the 100-year floodplain.

This watershed is subject to snowmelt flooding, rainfall flooding, post-wildfire flooding and debris flows.

As noted in the hazard history section, no 100-year flood events have been officially recorded in the North Fork Basin. This does not preclude the occurrence of a 100-year event in the future. Given the significant population in the North Fork Basin, the high rate of population growth, the existing infrastructure at risk to flooding and the fact that the watershed has experienced a wildfire in the past five years, Park County may want to consider a Map Modernization project in this basin.

Tarryall Creek Basin

The section of Tarryall Creek and its tributaries that is most susceptible to flooding is in the corridor between the developments just north of U.S. Highway 285 in the vicinity of Jefferson and Como all the way to Tarryall Reservoir. There is development along the main stem of the Tarryall Creek and several of its tributaries. The Tarryall Creek Basin has not been studied in detail as part of a FEMA Flood Insurance Study, and BFEs have not been determined for the 100-year flood. The lack of engineering analysis currently available for the Tarryall Creek Basin makes it difficult to estimate the number of properties in the 100-year floodplain.

This watershed is subject to snowmelt flooding on larger streams, rainfall flooding on smaller streams, post-wildfire flooding and debris flows.

As noted in the hazard history section, no 100-year flood events have been officially recorded in the Tarryall Creek Basin. This does not preclude the occurrence of a 100-year event in the future. Given the moderate population in the Tarryall Creek Basin, the low rate of population growth, the existing infrastructure at risk to flooding, it does not appear that Park County will need to consider a significant Map Modernization project in this basin, even though the watershed experienced a wildfire within the past five years.

Middle Fork South Platte Basin

The two municipalities in Park County, the Town of Alma and the Town of Fairplay, are both entirely contained within the Middle Fork of the South Platte Basin. The Hazard Areas description for this basin has been split into three sections, one for unincorporated Park County, and one each for the two towns.

Middle Fork South Platte River (Unincorporated Park County)

The section of the Middle Fork of the South Platte and its tributaries within unincorporated Park County that is most susceptible to flooding is in the corridor between Hoosier Pass and the Town of Fairplay along State Highway 9 and several county roads. There is residential and commercial development along the main stem of the Middle Fork and several of its tributaries. The Middle Fork Basin has not been studied in detail as part of a FEMA Flood Insurance Study, and BFEs have not been determined for the 100-year flood. The lack of engineering analysis currently available for the Middle Fork Basin makes it difficult to estimate the number of properties in the 100-year floodplain.

This watershed is subject to snowmelt flooding on large streams and rainfall flooding on smaller streams.

As noted in the hazard history section, no 100-year flood events have been officially recorded in the Middle Fork Basin. This does not preclude the occurrence of a 100-year event in the future. Given the moderate population in the unincorporated portion of the Middle Fork Basin, the low rate of population growth, and the existing infrastructure at risk to flooding, it does not appear that Park County will need to consider a significant Map Modernization project in the unincorporated section of the basin.

Middle Fork South Platte River (Alma)

The Middle Fork of the South Platte and Buckskin Creek within the Town of Alma are susceptible to flooding. There is residential and commercial development along the main stem of the Middle Fork and Buckskin Creek. The Middle Fork Basin has not been studied in detail as part of a FEMA Flood Insurance Study, and BFEs have not been determined for the 100-year flood. The lack of engineering analysis currently available for the Middle Fork Basin makes it difficult to estimate the number of properties in the 100-year floodplain.

This watershed is subject to snowmelt flooding on large streams and rainfall flooding on smaller streams.

As noted in the hazard history section, no 100-year flood events have been officially recorded in the Middle Fork Basin. This does not preclude the occurrence of a 100-year event in the future. Given the moderate population in the Town of Alma, the moderate rate of population growth, and the existing infrastructure at risk to flooding, it appears that the Town of Alma may want to consider a Map Modernization project in the incorporated section of the basin and collaboration with the county to simultaneously map unincorporated areas adjacent to the town, as appropriate.

Middle Fork South Platte River (Fairplay)

The Middle Fork of the South Platte and various dry gulches within the Town of Fairplay are susceptible to flooding. There is residential and commercial development along the main stem of the Middle Fork and various dry gulches. The Middle Fork Basin has not been studied in detail as part of a FEMA Flood Insurance Study, and BFEs have not been determined for the 100-year flood. The lack of engineering analysis currently available for the Middle Fork Basin makes it difficult to estimate the number of properties in the 100-year floodplain.

This watershed is subject to snowmelt flooding on large streams and rainfall flooding on smaller streams.

As noted in the hazard history section, no 100-year flood events have been officially recorded in the Middle Fork Basin. This does not preclude the occurrence of a 100-year event in the future. Given the significant population in the Town of Fairplay, the moderate rate of population growth, and the existing infrastructure at risk to flooding, it appears that the Town of Fairplay may want to consider a Map Modernization project in the incorporated section of the basin and collaboration with the county to simultaneously map unincorporated areas adjacent to the town, as appropriate.

South Fork South Platte Basin

The sections of the South Fork of the South Platte River and its tributaries which are most susceptible to flooding are in the corridor between the U.S. Forest Service's boundary with private property and State Highway 9 and the corridor between Antero Reservoir and Hartsel. There is a moderate amount of development along the main stem of the South Fork and some of its tributaries. The South Fork Basin has not been studied in detail as part of a FEMA Flood Insurance Study, and BFEs have not been determined

for the 100-year flood. The lack of engineering analysis currently available for the South Fork Basin makes it difficult to estimate the number of properties in the 100-year floodplain.

This watershed is subject to snowmelt flooding on large streams and rainfall flooding on smaller streams.

As noted in the hazard history section, no 100-year flood events have been officially recorded in the South Fork Basin. This does not preclude the occurrence of a 100-year event in the future. Given the low population in the South Fork Basin, the low rate of population growth, and the existing infrastructure at risk to flooding, it does not appear that Park County will need to consider a significant Map Modernization project in this basin.

South Platte River Basin

The sections of the South Platte River and its tributaries that are most susceptible to flooding are the Hartsel area and the Lake George area. There is a moderate amount of development along the main stem of the South Platte and some of its tributaries. The South Platte Basin has not been studied in detail as part of a FEMA Flood Insurance Study, and BFEs have not been determined for the 100-year flood. The lack of engineering analysis currently available for the South Platte Basin makes it difficult to estimate the number of properties in the 100-year floodplain.

This watershed is subject to snowmelt flooding on large streams, rainfall flooding on smaller streams, post-wildfire flooding and debris flows.

As noted in the hazard history section, no 100-year flood events have been officially recorded in the South Platte Basin. This does not preclude the occurrence of a 100-year event in the future. Given the moderate population in the South Platte Basin, the moderate rate of population growth, the existing infrastructure at risk to flooding and the fact that the watershed has experienced a wildfire in the past five years, Park County may want to consider a Map Modernization project in this basin.

Arkansas River Headwaters Basin

The section of the Arkansas River Headwaters Basin and tributaries that is most susceptible to flooding is the Guffey area. There is a small amount of development along the main stems of two of the major tributaries, Badger Creek and Currant Creek and tributaries to those streams and to Four Mile Creek. The Arkansas Headwaters Basin has not been studied in detail as part of a FEMA Flood Insurance Study, and BFEs have not been determined for the 100-year flood. The lack of engineering analysis currently available for the Arkansas Headwaters Basin makes it difficult to estimate the number of properties in the 100-year floodplain.

This watershed is subject to rainfall flooding, post-wildfire flooding and debris flows.

As noted in the hazard history section, no 100-year flood events have been officially recorded in the Arkansas Headwaters Basin. This does not preclude the occurrence of a 100-year event in the future. Given the low population in the Arkansas Headwaters Basin, the low rate of population growth, the existing infrastructure at risk to flooding and the fact that the watershed has experienced a wildfire in the past five years, it does not appear that Park County will need to consider a significant Map Modernization project in this basin.

9.2.3 Frequency

Park County is subject both to the flash flooding that occurs following a period of intense or sustained rainfall and to snowmelt flooding during the spring/summer runoff. The highly mountainous terrain and

associated steep slopes cause rainwater and snowmelt to runoff rapidly, quickly filling streambeds following an event. Snowmelt typically occurs in May or June. Flood producing rainstorms can occur throughout the year. Historically the most common months for significant flooding have been May through September. These months, along with March and April, have the highest average precipitation and the highest frequency of intense rain events. Occasionally, rainstorms can occur during snowmelt runoff, resulting in rain-on-snow flooding.

9.2.4 Severity

Because of the mountainous terrain of the drainage area, flooding occurs rapidly. When the flood event is a result of a rainstorm, flooding often occurs before the rain event has passed, and flow passes very quickly through the smaller tributaries of the area into the larger streams. Both with snowmelt flooding and rainfall flooding, the combined effect of these smaller tributaries can create extremely fast-moving floodwaters that greatly exceed the capacity of the larger streams. These fast-moving floodwaters allow little time for residents in the floodplain to evacuate themselves or protect their property, and the force of such rapidly flowing waters increase the potential of damage and loss of life. The duration of these flood events vary depending on the specific characteristics of that particular snowmelt season, or if the cause is rain, the characteristics of that specific rain event. Depending on the magnitude of the snowpack and the thermal input from the sun, snowmelt floods can last from a few days to one or two weeks. In the case of a rain event, floodwaters generally recede rapidly once the rain event has ended, but can last from a few hours to a few days.

9.2.5 Warning Time

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

Because flash floods occur rapidly and allow very little warning time, the only potential warning to an upcoming flood event comes through the ability to forecast a heavy rain event prior to its occurrence. The National Weather Service (NWS) issues flood watches and warnings when heavy rains or severe storms threaten the area. These warnings are carried to local residents through local media outlets such as television and radio stations. In addition, the NWS, in conjunction with the National Oceanic and Atmospheric Administration (NOAA), operates the NOAA Weather Radio System; which is a nationwide network of radio transmitters that broadcasts severe weather data to relatively inexpensive special receivers that can be purchased by the public. When a severe weather alert is issued, the transmitter will switch to alert mode, notifying residents of the potential risk. Although not extensive, the measures provide residents and citizens located in a flood prone area, some warning time to prepare for a potential flood.

Water and snow levels are monitored prior to spring thaw. Those levels are reviewed and if it is determined that high water may occur with the spring run-off the following steps are taken:

- Public Awareness.
- Evaluation of waterways to see where trouble spots may be so they may be mitigated. Special attention to those spots with history of problems.
- Ensure the storage of adequate numbers of sand bags.
- Ensure evacuation points are ready.
- Alert property owners to the need of flood insurance in advance.

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- Alert private property owners of need for safe storage of valuables, stocking up on necessities, notification lists, etc.

9.3 SECONDARY HAZARDS

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

If a significant flood event occurs, there is a potential for a variety of secondary impacts. Some of the most common secondary effects of flooding are impacts to infrastructure and utilities such as roadways, water service, and wastewater treatment, and impacts to local commerce, including tourism. Many of the roadways in the County are vulnerable to damage due to floodwaters. The effect of flood damages to roadways can limit access to areas, cutting off some residents from emergency services as well as other essential services, as well as hampering outsiders visiting the County or traveling through on their way to other destinations.

Since a major heating source in the area is propane gas, there may be many properties in floodplains with above-ground fuel storage tanks. It is likely that the majority of tanks in the floodplain are not secured or strapped down. If these tanks were to be damaged or dislodged during a flood event, the resulting gas leaks could present serious explosion risks. Tanks can also become floating projectiles in quickly moving floodwaters, causing serious damage to property and danger to individuals in their path.

Another secondary effect of flooding is erosion which can, in turn, contribute to sedimentation. Some stream reaches in Park County historically have failed to meet state water quality standards because of sediment loading. Park County can identify specific stream reaches that have sediment loading problems. Then the county can begin to investigate possible causes of the sediment loading in the affected stream reaches. Those causes may include historical mining activity in or near the streams and/or their tributaries, past wildfires in the watershed upstream, naturally erosive soils, destabilizing agricultural practices, upstream urbanization and the application of traction sand on adjacent highways. The county could subsequently approach state and federal agencies about possible technical and financial assistance in identifying the causes of sediment loading and the potential value of various mitigation measures.

9.4 CLIMATE CHANGE IMPACTS

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

- Historical hydrologic patterns can no longer be solely relied upon to forecast the water future.
- Precipitation and runoff patterns are changing, increasing the uncertainty for water supply and quality, flood management and ecosystem functions.

- Extreme climatic events will become more frequent, necessitating improvement in flood protection, drought preparedness and emergency response.

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

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

9.5 EXPOSURE

The Level 2 HAZUS-MH protocol was used to assess the risk and vulnerability to flooding in the planning area. The model used census data at the block level and FEMA floodplain data, which has a level of accuracy acceptable for planning purposes. Where possible, the HAZUS-MH default data was enhanced using local GIS data from county, state and federal sources.

9.5.1 Population

Estimated Park County structures exposed to the FEMA floodplain were generated using HAZUS-MH. HAZUS analyzed census blocks that intersect the 100-year floodplains identified on FIRMs.

Using HAZUS-MH, it was estimated that 5,611 buildings are exposed to the 100-year floodplain, over 90 percent of these buildings are residential.

Structures in the Floodplain

Table 9-2 summarizes the number of structures in the floodplain by geographic area. The HAZUS-MH model determined that there are 5,611 structures within the 100-year floodplain.

Exposed Value

Using HAZUS-MH, Table 9-3 summarizes the estimated value of exposed buildings in the planning area. Land use within the floodplain could not be calculated at the time of the writing of this plan as the Park County Assessor data base does not yet support this type information for analysis.

9.5.2 Critical Facilities and Infrastructure

Table 9-4 through Table 9-5 summarize the critical facilities and infrastructure in the 100-year and 500-year floodplains of the planning area. Details are provided in the following sections.

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TABLE 9-2.
AREA AND STRUCTURES IN THE 100-YEAR FLOODPLAIN

	Number of Structures in Floodplain							
	Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	**Total**
Alma	71	5	2	0	0	1	0	79
Fairplay	63	2	0	0	0	0	0	65
North-West FPD	1,010	26	9	2	1	0	0	1,049
Platte Canyon FPD	1,913	72	25	6	5	1	2	2,023
Southern Park County FPD	433	16	8	4	0	2	1	463
Area Outside of Jurisdictions	1,841	42	26	8	4	9	2	1,933
Total	**5,331**	**163**	**69**	**20**	**10**	**13**	**5**	**5,611**

TABLE 9-3.
VALUE OF STRUCTURES IN 100-YEAR FLOODPLAIN

	Value Exposed			% of Total Assessed Value
	Structure	Contents	**Total**	
Alma	$8,607,000	$5,070,000	$13,677,000	34.36%
Fairplay	$8,542,000	$4,562,000	$13,104,000	13.47%
North-West FPD	$127,878,200	$69,410,824	$197,289,024	56.05%
Platte Canyon FPD	$299,543,110	$170,180,791	$469,723,901	44.35%
Southern Park County FPD	$46,588,253	$26,496,741	$73,084,994	74.28%
Area Outside of Jurisdictions	$226,269,437	$126,676,645	$352,946,081	50.38%
Total	**$717,428,000**	**$402,397,000**	**$1,119,825,000**	**47.71%**

TABLE 9-4.
CRITICAL FACILITIES IN THE 100-YEAR FLOODPLAIN

Jurisdiction	Medical and Health Services	Government Function	Protective	Hazardous Materials	Schools	Other	**Total**
Alma	0	0	0	0	0	0	**0**
Fairplay	0	0	0	0	0	0	**0**
North-West FPD	0	0	0	0	0	0	**0**
Platte Canyon FPD	0	0	0	1	0	0	**1**
Southern Park County FPD	0	0	0	0	0	0	**0**
Unincorporated	0	0	2	0	0	0	**2**
Total	**0**	**0**	**2**	**1**	**0**	**0**	**3**

TABLE 9-5.
CRITICAL INFRASTRUCTURE IN THE 100-YEAR FLOODPLAIN

Jurisdiction	Bridges	Water Supply	Wastewater	Power	Communications	Other	**Total**
Alma	0	0	0	0	0	0	**0**
Fairplay	1	0	0	0	0		**1**
North-West FPD	4	0	0	0	0	1	**5**
Platte Canyon FPD	3	0	0	0	0	1	**4**
Southern Park County FPD	2	0	0	0	0		**2**
Unincorporated	15	1	0	0	0	7	**23**
Total	**25**	**1**	**0**	**0**	**0**	**9**	**35**

Tier II Facilities

Tier II facilities are those that use or store materials that can harm the environment if damaged by a flood. During a flood event, containers holding these materials can rupture and leak into the surrounding area, having a disastrous effect on the environment as well as residents.

Utilities and Infrastructure

It is important to determine who may be at risk if infrastructure is damaged by flooding. Roads or railroads that are blocked or damaged can isolate residents and can prevent access throughout the county, including for emergency service providers needing to get to vulnerable populations or to make repairs. Bridges washed out or blocked by floods or debris also can cause isolation. Water and sewer systems can be flooded or backed up, causing health problems. Underground utilities can be damaged. Dikes can fail or be overtopped, inundating the land that they protect. The following sections describe specific types of critical infrastructure.

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Roads

The following major roads in the planning area pass through the 100-year floodplain and thus are exposed to flooding: U.S. Highway 24, U.S. Highway 285 and Colorado State Highway 9. Some of these roads are built above the flood level, and others function as levees to prevent flooding. Still, in severe flood events these roads can be blocked or damaged, preventing access to some areas.

Bridges

Flooding events can significantly impact road bridges. These are important because often they provide the only ingress and egress to some neighborhoods. An analysis showed that there are 25 bridges that are in or cross over the 100-year floodplain.

Water and Sewer Infrastructure

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

Levees

Levees have historically been used to control flooding in portions of the planning area. The county has over 156.44 miles of earthen levees and revetments managed by Park County Flood Control District as well as the reclamation districts in the county. There are also levees on many smaller rivers, streams and creeks that protect small areas of land. Many of the levees are older and were built under earlier flood management goals. Many of these older levees are exposed to scouring and failure due to old age and construction methods.

9.5.3 Environment

Flooding is a natural event, and floodplains provide many natural and beneficial functions. Nonetheless, with human development factored in, flooding can impact the environment in negative ways. Migrating fish can wash into roads or over dikes into flooded fields, with no possibility of escape. Pollution from roads, such as oil, and hazardous materials can wash into rivers and streams. During floods, these can settle onto normally dry soils, polluting them for agricultural uses. Human development such as bridge abutments and levees, and logjams from timber harvesting can increase stream bank erosion, causing rivers and streams to migrate into non-natural courses.

9.6 VULNERABILITY

Many of the areas exposed to flooding may not experience serious flooding or flood damage. This section describes vulnerabilities in terms of population, property, infrastructure and environment.

9.6.1 Population

Impacts on persons and households in the planning area were estimated as follows for the 100-year flood through the Level 2 HAZUS-MH analysis:

- Number of displaced households: 304
- Number of persons requiring short-term shelter: 26

9.6.2 Property

HAZUS-MH calculates losses to structures from flooding by looking at depth of flooding and type of structure. Using historical flood insurance claim data, HAZUS-MH estimates the percentage of damage to structures and their contents by applying established damage functions to an inventory. For this analysis, local data on facilities was used instead of the default inventory data provided with HAZUS-MH.

The analysis is summarized in Table 9-6 for the 100-year event. It is estimated that there would be up to $26.8 million of flood loss from a 100-year flood event in the planning area. This represents 1.15 percent of the total exposure to the 100-year flood and 0.5 percent of the total assessed value for the county.

TABLE 9-6.
LOSS ESTIMATES FOR 100-YEAR FLOOD EVENT

	Structures Impacted[a]	Estimated Loss Associated with Flood			% of Total Value
		Structure	Contents	**Total**	
Alma	79	$38,000	$28,000	**$66,000**	0.17%
Fairplay	65	4322,000	$191,000	**$513,000**	0.53%
North-West FPD	1,049	42,410,589	$1,562,481	**$3,973,070**	1.13%
Platte Canyon FPD	2,023	$7,080,198	$5,304,267	**$12,384,465**	1.17%
Southern Park County FPD	463	$569,694	$419,487	**$989,181**	1.01%
Unincorporated	1,933	$4,412,518	$4,537,766	**$8,950,284**	1.28%
Total	**5,611**	**$14,833,000**	**$12,043,000**	**$26,876,000**	**1.15%**

a. Impacted structures are those structures with finished floor elevations below the 100-year water surface elevation. These structures are the most likely to receive significant damage in a 100-year flood event

National Flood Insurance Program

Table 9-7 lists flood insurance statistics that help identify vulnerability in the planning area. Currently, Fairplay participates in the National Flood Insurance Program as does the County, with 29 total flood insurance policies. According to FEMA statistics, no claims have been filed nor paid in the recent past.

TABLE 9-7.
FLOOD INSURANCE STATISTICS

Jurisdiction	Date of Entry Initial FIRM Effective Date	# of Flood Insurance Policies as of 12/31/2012	Total Population	# of Letter of Map Correction	Claims, 11/1978 to 3/31/2010	Value of Claims paid, 11/1978 to 12/31/2010
Fairplay	12/18/2009	0	610	0	0	0
Unincorporated	12/18/2009	29	13.399	11	0	0
Countywide		**29**	**14,009**	**11**	**0**	**0**

Source: FEMA Rep Loss Claims Data 6/25/2013

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Properties constructed after a FIRM has been adopted are eligible for reduced flood insurance rates. Such structures are less vulnerable to flooding since they were constructed after regulations and codes were adopted to decrease vulnerability. Properties built before a FIRM is adopted are more vulnerable to flooding because they do not meet code or are located in hazardous areas. The first FIRMs in Park County were available in 1978. The most current firm is dated 12/18/2009.

The following information from flood insurance statistics is relevant to reducing flood risk:

- The use of flood insurance in the planning area is well below the national average. A nominal percent of insurable buildings in the county are covered by flood insurance. According to an NFIP study, less than 1 percent of single-family homes in special flood hazard areas are covered by flood insurance nationwide.

Repetitive Loss

A repetitive loss property is defined by FEMA as an NFIP-insured property that has experienced any of the following since 1978, regardless of any changes in ownership:

- Four or more paid losses in excess of $1,000
- Two paid losses in excess of $1,000 within any rolling 10-year period
- Three or more paid losses that equal or exceed the current value of the insured property.

Repetitive loss properties make up only 1 to 2 percent of flood insurance policies in force nationally, yet they account for 40 percent of the nation's flood insurance claim payments. In 1998, FEMA reported that the NFIP's 75,000 repetitive loss structures have already cost $2.8 billion in flood insurance payments and that numerous other flood-prone structures remain in the floodplain at high risk. The government has instituted programs encouraging communities to identify and mitigate the causes of repetitive losses. A recent report on repetitive losses by the National Wildlife Federation found that 20 percent of these properties are outside any mapped 100-year floodplain. The key identifiers for repetitive loss properties are the existence of flood insurance policies and claims paid by the policies.

FEMA-sponsored programs, such as the CRS, require participating communities to identify repetitive loss areas. A repetitive loss area is the portion of a floodplain holding structures that FEMA has identified as meeting the definition of repetitive loss. Identifying repetitive loss areas helps to identify structures that are at risk but are not on FEMA's list of repetitive loss structures because no flood insurance policy was in force at the time of loss.

At this time, there are no (0) Repetitive Loss properties in Park County, the Town of Alma or the Town of Fairplay. This fact was verified through a review of FEMA's ***Community Information System*** (CIS) website. The Town of Alma does not currently participate in the NFIP. According to the CIS, there are no (0) flood insurance policies in force in unincorporated Park County and there are no (0) flood insurance policies in the Town of Fairplay. Since none of those insured properties or any other uninsured properties within those two jurisdictions are Repetitive Loss properties, the issue of Repetitive Loss is not presently a concern in either of those communities. Likewise the issue of Repetitive Loss properties is not a concern in the Town of Alma, where there are currently no flood insurance policies in force.

9.6.3 Critical Facilities and Infrastructure

HAZUS-MH was used to estimate the flood loss potential to critical facilities exposed to the flood risk. Using depth/damage function curves to estimate the percent of damage to the building and contents of critical facilities, HAZUS-MH correlates these estimates into an estimate of functional down-time (the estimated time it will take to restore a facility to 100 percent of its functionality). This helps to gauge how

long the planning area could have limited usage of facilities deemed critical to flood response and recovery. The HAZUS critical facility results are as follows:

- **100-year flood event**—On average, critical facilities would receive 8.62 percent damage to the structure and 26.13 percent damage to the contents during a 100-year flood event. The estimated time to restore these facilities to 100 percent of their functionality is 470 days.

9.6.4 Environment

The environment vulnerable to flood hazard is the same as the environment exposed to the hazard. Loss estimation platforms such as HAZUS-MH are not currently equipped to measure environmental impacts of flood hazards. The best gauge of vulnerability of the environment would be a review of damage from past flood events. Loss data that segregates damage to the environment was not available at the time of this plan. Capturing this data from future events could be beneficial in measuring the vulnerability of the environment for future updates.

9.7 FUTURE TRENDS

The county has experienced moderate growth over the past 10 years. However, economic challenges in the past several years impacted growth in the County. Park County and its planning partners are optimistic that growth will continue the county as the state and national economies strengthen.

The County and its planning partners are equipped to handle future growth within flood hazard areas. All municipal planning partners have general plans that address frequently flooded areas in their safety elements. All partners have committed to linking their general plans to this hazard mitigation plan update. This will create an opportunity for wise land use decisions as future growth impacts flood hazard areas.

9.8 SCENARIO

The primary water courses in the planning area have the potential to flood at irregular intervals, generally in response to a succession of intense winter rainstorms. Storm patterns of warmer, moist air usually late spring and late summer ("summer monsoons"). A series of such weather events can cause severe flooding in the planning area. The worst-case scenario is a series of storms that flood numerous drainage basins in a short time. This could overwhelm the response and floodplain management capability within the planning area. Major roads could be blocked, preventing critical access for many residents and critical functions. High in-channel flows could cause water courses to scour, possibly washing out roads and creating more isolation problems. In the case of multi-basin flooding, the County would not be able to make repairs quickly enough to restore critical facilities and infrastructure.

9.9 ISSUES

A potential source of potential floodwater is trans-basin diversions of water from elsewhere into Park County. Prior history from Pitkin and Lake Counties may be instructive. In 1995, Pitkin County faced heavy snowpack, potential rainfalls and cresting streams. In an effort to mitigate possible flooding, Pitkin County officials requested from the Colorado Division of Water Resources that water be released through trans-basin diversions under the Continental Divide and into Lake County. Unfortunately, they neglected to coordinate with their counterparts in Lake County where record flood flows were being experienced. The result of the proposed diversions from Pitkin County would have been an even more elevated risk for flooding in Lake County and the Arkansas River Basin.

Such a scenario could play out in Park County as well. Park County has two trans-basin diversions that flow into the county, the Otero Pipeline and the Roberts Tunnel. The Otero Pipeline conveys water from the Arkansas Basin into Spinney Mountain Reservoir on the South Platte River. The Roberts Tunnel

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serves as a conduit for water flowing from Dillon Reservoir into the Denver Metro Area. In the case of rapid snowmelt or extreme rain events within the Arkansas River Basin or within the Blue River Basin in Summit County, a scenario similar to that of Pitkin and Lake Counties in 1995 could arise. The Mitigation Advisory Committee is encouraged to evaluate current procedures regarding such a scenario, and perhaps consider a recommended mitigation action relating to communication between Summit, Lake or Chaffee Counties, Park County and Denver Water or the City of Aurora, as appropriate, to help mitigate any potential problems flooding exacerbation resulting from trans-basin diversions.

FEMA's predecessor agency, the Federal Insurance Administration of the Department of Housing and Urban Development, prepared Flood Hazard Boundary Maps for Park County in 1977. Those maps are approximate floodplain maps with no documented engineering analysis available. They were converted into FIRMs in 1987 without any engineering analysis. In addition, the Federal Insurance Administration prepared a Flood Hazard Boundary Maps for the Town of Fairplay that was later converted by FEMA into a Flood Insurance Rate Map in 1986, again without any engineering analysis. The CWCB prepared a report in 1999 that included the only hydrologic analysis of stream reaches within the county. Through a USGS regional regression analysis, it established peak 100-year flow levels for Geneva Creek just upstream of its confluence with the North Fork of the South Platte River in Grant and for Tarryall Creek downstream of its confluence with Jefferson Creek. Whether or not the approximate maps described above are digitized, they do not provide any engineering information.

The 1987 FIRMS for unincorporated Park County and the 1986 FIRM for the Town of Fairplay have not been updated since their original completion. Therefore they are subject to limited engineering and technical analysis and evaluation. However, they still officially serve as the source and basis for important hazard identification and risk assessment tools for use in evaluating floods risks and for overall floodplain management. The FIRMS are available at the Park County Mapping Department in Fairplay. The overview index map for the 1987 Park County FIRMS is shown in Figure 4-12.

Park County's existing approximate floodplain maps do not provide any engineering information. The maps are not based on any hydrologic or hydraulic analyses. During the fall of 2007, the CWCB indicated its interest in working with Park County to develop floodplain mapping for selected stream reaches in the County, utilizing engineering analyses that would be performed as part of the project. Ultimately, during the spring of 2008, Park County and the CWCB negotiated a project scope that consisted of digitizing the existing approximate floodplain maps without developing any new detailed floodplain mapping or enhanced approximate floodplain mapping. At the time of completion of this mitigation plan, that Map Modernization (Phase I) project was still in progress.

Once the digital Map Modernization project has been completed, the Park County GIS department can superimpose the boundaries of the individual watersheds on the digital floodplain maps and subsequently create separate watershed floodplain maps for each watershed in the county. Eventually detailed floodplain mapping or enhanced approximate floodplain mapping could be added to the initial approximate digital floodplain mapping. Annual mapping projects, with funding being shared an ongoing basis by Park County and CWCB and/or appropriate federal agencies, could be conducted in order of priority.

The planning team has identified the following flood-related potential issues relevant to the planning area:

- The accuracy of the existing flood hazard mapping produced by FEMA in reflecting the true flood risk within the planning area is challenging. Not all of the areas protected by levees are accredited by the FEMA mapping process.

- The extent of the flood-protection currently provided by flood control facilities (dams, dikes and levees) is not known due to the lack of an established national policy on flood protection standards.
- Older levees are subject to failure or do not meet current building practices for flood protection.
- The risk associated with the flood hazard overlaps the risk associated with other hazards such as earthquake, landslide and fishing losses. This provides an opportunity to seek mitigation alternatives with multiple objectives that can reduce risk for multiple hazards.
- There is little consistency of land-use practices and regulatory floodplain management scope within the planning area.
- How will potential climate change impact flood conditions in the planning area?
- More information is needed on flood risk to support the concept of risk-based analysis of capital projects.
- There needs to be a sustained effort to gather historical damage data, such as high water marks on structures and damage reports, to measure the cost-effectiveness of future mitigation projects.
- Ongoing flood hazard mitigation will require funding from multiple sources.
- Floodplain residents need to continue to be educated about flood preparedness and the resources available during and after floods.
- The concept of residual risk should be considered in the design of future capital flood control projects and should be communicated with residents living in the floodplain.
- The promotion of flood insurance as a means of protecting private property owners from the economic impacts of frequent flood events should continue.
- Existing floodplain-compatible uses such as agricultural and open space need to be maintained. There is constant pressure to convert these existing uses to more intense uses within the planning area during times of moderate to high growth.
- The economy affects a jurisdiction's ability to manage its floodplains. Budget cuts and personnel losses can strain resources needed to support floodplain management.

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CHAPTER 10.
SEVERE WINTER WEATHER

10.1 GENERAL BACKGROUND

The severe winter weather hazard was ranked as high universally across the county in this update process.

Severe winter storms and blizzards are extra-tropical cyclones that originate as mid-latitude depressions (FEMA, 1997). Snowstorms, blizzards, and ice storms are the most common examples. These storms can bring heavy snowfall, high winds, ice, and extreme cold with them. Historically, winter storms in south central Colorado have produced significant snowfall and high winds often causing blizzard or whiteout conditions.

DEFINITIONS

Freezing Rain—The result of rain occurring when the temperature is below the freezing point. The rain freezes on impact, resulting in a layer of glaze ice up to an inch thick. In a severe ice storm, an evergreen tree 60 feet high and 30 feet wide can be burdened with up to six tons of ice, creating a threat to power and telephone lines and transportation routes.

Winter Storm—A storm having significant snowfall, ice, and/or freezing rain; the quantity of precipitation varies by elevation.

10.1.1 Blizzards and Snowstorms

The National Weather Service defines a winter storm as having significant snowfall, ice and/or freezing rain; the quantity of precipitation varies by elevation. Heavy snowfall in mountainous areas is 12 inches or more in a 12-hour period or 18 inches or more in a 24-hour period. There are three key ingredients to a severe winter storm:

- Cold Air—Below-freezing temperatures in the clouds and near the ground are necessary to make snow and/or ice.
- Moisture—Moisture is required in order to form clouds and precipitation. Air blowing across a body of water, such as a large lake or the ocean, is an excellent source of moisture.
- Lift—Lift is required in order to raise the moist air to form the clouds and cause precipitation. An example of lift is warm air colliding with cold air and being forced to rise over the cold dome. The boundary between the warm and cold air masses is called a front. Another example of lift is air flowing up a mountain side.

Heavy snow can immobilize a region and paralyze a city, stranding commuters, stopping the flow of supplies, and disrupting emergency and medical services. Accumulations of snow can collapse buildings and knock down trees and power lines. In rural areas, homes and farms may be isolated for days, and unprotected livestock may be lost. In the mountains, heavy snow can lead to avalanches. The cost of snow removal, repairing damages, and loss of business can have large economic impacts on cities and towns.

Areas most vulnerable to winter storms are those affected by convergence of dry, cold air from the interior of the North American continent, and warm, moist air off the Pacific Ocean. Typically, significant winter storms occur during the transition between cold and warm periods.

10.1.2 Ice Storms

In addition to snow, winter storms can also bring sleet and freezing rain to the area. Sleet is generally described as frozen water particles that fall in the form of ice, while freezing rain falls as super cooled water which can freeze on impact with the ground, trees, or roadways. In its most severe form, freezing rain can fall as part of an ice storm that can coat the area with a layer of ice up to 2" thick. Ice storms can cause significant damage by snapping tree limbs and bending trees to the ground. These fallen limbs and trees can completely block roadways, cut access to certain areas of the County for days, and interfere with and destroy overhead utility lines. The county is also prone to winter ground blizzards in which wind and snow combine to cause drifting, "whiteout" visibility conditions, dangerous or impassible driving conditions, and hazards to the safety of humans and livestock.

Ice storms occur when rain falls from a warm, moist, layer of atmosphere into a below freezing, drier layer near the ground. The rain freezes on contact with the cold ground and exposed surfaces causing damage to trees, utility wires, and structures.

10.2 HAZARD PROFILE

10.2.1 Past Events

Table 10-1 summarizes severe weather events in the planning area since 1970, as recorded by the National Oceanic and Atmospheric Administration (NOAA). Severe winter storms, including late spring snowstorms are common in Colorado. From January 1 to January 6, 1949, one of the most severe blizzards of record occurred in the Great Basin, middle Rockies, and northwestern Great Plains. In Colorado, heavy snow/blizzards occurred on 11/17/75; 12/23/82; 3/14/83; 2/8/1995; 3/17/2003 and 12/28/2006 (SHELDUS).

TABLE 10-1.
PAST SEVERE WEATHER EVENTS IMPACTING PLANNING AREA

Date	Type	Deaths or Injuries	Property Damage
12/28/2006	Severe Winter Weather	0	$108.00
3/17/2003	Severe Winter Weather	0	$3,100,000
2/8/1995	Severe Winter Weather	0	$40,698
3/2-9/1992	Severe Winter Weather	0	$1087.00
3-4/1990	Severe Winter Weather	1	$254.00
2/17/1989	Severe Winter Weather	0	$79,365
10/15/1984	Severe Winter Weather	0	$11,111.11
6/6/1984	Severe Winter Weather	0	$4,166.67
5/16/1983	High Wind & Severe Winter Weather	0	$26,315.79
12/23/1982	Severe Winter Weather / Blizzard	.1	$793,651.00
3/10/1977	High Wind & Severe Winter Weather	0.03	$172,413.80
11/17/1975	High Wind & Severe Winter Weather	0.02	$11,363.64

The winters of 2006-2007 and 2007-2008 were particularly harsh in Park County. On December 20, 2006, an upslope snowstorm moved into Colorado's plains-foothills-mountains interface from the east and dropped more than a foot of snow (in some areas more than 2 feet) on the I-25 Front Range corridor, and

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on mountain areas of the state, including parts of Park County. On December 28 and 29, 2006, another powerful front moved through Colorado, depositing more snow on the Front Range and the central mountains. The combination of heavy snowfall and high winds left residents in some portions of Park County stranded and unable get supplies such as food, essential medications and propane. Livestock was also affected as residents could not access some of their herds and get them food.

With the development of a La Nina in the fall of 2007, forecasters predicted a moderate to dry winter in 2007-2008 for the Southwestern United States, including Colorado. La Nina is a system of cool water in the tropics of the Pacific Ocean, which influences weather in other places, including North America. The forecasters were relying on historical climate data that has examined the correlation between the existence of a La Nina and climate conditions in Colorado. Colorado's climate history showed that generally the state experiences drier than normal winters during a La Nina. For example, during the La Nina in the winter of 2000-2001, snowpack in Park County was well below normal. Snowpack was roughly 70 percent of normal in the South Platte Basin in 2000-2001 and 81 percent of normal in the Arkansas River Basin. Snowpack in most of the state that year was below 85 percent of normal. However, instead of the predicted "moderate to dry winter," in the winter of 2007-2008, snowfall levels throughout the state were significantly above normal. Throughout January and February 2008, Park County was subject to frequent heavy snowfall, coupled with hurricane force winds, sometimes in excess of 110 miles per hour.

Because of the constant inclement weather, the county did not have sufficient equipment and manpower to plow all of its roads and provide access to stranded residents and motorists. On Monday, February 11, 2008, after a third activation of the emergency operations center to deal with stranded motorists and residents, the Park County Emergency Manager, in conjunction with emergency responders and other county officials, declared a state of emergency.

By February 11, more than 600 miles of road were buried. Roads that Park County Road and Bridge plowed would quickly be rendered inaccessible due to the sustained winds. Snowdrifts were reported as high as 24 feet in the Como area, and were between 8 and 12 feet in the Town of Fairplay. Some drifts were 25 feet wide and the sustained winds rendered some of them so hard that the county's equipment had difficulty plowing the snow/ice mixture. Many residents found themselves trapped in their homes, unable to get food, medication, propane and other essential items. A few residents were unable to get to their homes and needed emergency shelter. 911 dispatch informed the Emergency Manager that they were receiving 40-60 calls daily from stranded residents. After declaring a state of emergency, the county opened a phone bank to reach stranded citizens. It was quickly determined that nearly 250 residents were trapped in their homes.

To address the overwhelming needs, Park County requested aid from other counties in the immediate area and around the state, as well as from state agencies, including the Colorado Department of Transportation and the Colorado Department of Corrections. The Colorado Division of Emergency Management provided more comprehensive communications equipment to accommodate the added manpower and the large operation area. Two simultaneous operations took place; one to get food, medication and propane to stranded residents through search and rescue teams using snowmobiles, and the other to plow roads as quickly as possible. On February 15, feeding operations for stranded livestock took place.

That day, wireless and landline telephone service malfunctioned due to a failure at a Qwest facility. Crews requested help from the Civil Air Patrol to determine locations of livestock in need of food. Despite the communications failure, the county was able to begin demobilizing some crews on February 15, as most priority areas had been addressed. Several crews stayed through February 17 to continue road and bridge operations. When the state of emergency was lifted on February 19, crews had cleared more than 90 percent of the 600 miles of roads. Even with the donations of equipment and manpower, the initial cost to the county was around $225,000.

10.2.2 Location

To date, some preliminary distinctions have been made regarding which areas of Park County may have a history of more frequent or more significant severe winter weather impacts or be more prone to future severe winter weather impacts. During and after the severe winter of 2007-2008, the Park County GIS department mapped road segments and other locations where drifting of snow was significant enough to require a major allocation of resources just to provide basic access for people and, in some cases, livestock. This mapping, shown in Figure 10-1, provides a starting point for exploring the possibility of making distinctions about the impacts of severe winter weather in Park County. A number of factors contribute to an area's vulnerability to damage, and some of these factors could be the subjects of further historical research, making use of geographic data from the past two winters as a start. Aside from this initial mapping, there are currently no maps showing which specific portions of the county were affected by historical severe winter weather events in other years. Likewise, there are currently no detailed maps showing which portions of Park County could be impacted by severe winter weather in the future.

Certain characteristics of an area or of a structure increase its resistance to damage from severe winter weather. Many of these characteristics are unique to the location or the structure in question. Continuing to document specific historical events would further the process of determining whether certain locations in Park County are inherently more prone to the impacts of severe winter weather than other locations.

At present, Park County is in the beginning stages of developing detailed severe winter weather event mapping and analyses. The county has gathered initial data related to past severe winter weather events, starting with the winter of 2007-2008. The harsh winter of 2007–2008 demonstrated that ground blizzards and heavy drifting are important components of severe winter weather in Park County. The GIS department has mapped specific locations impacted by the severe winter weather in 2007–2008 and will in the near future, superimpose on that mapping the boundaries of the eight major watersheds. While the winter of 2006–2007 was not as severe as the winter of 2007-2008, there may be additional historical information from that winter that could be added to the GIS mapping that has already been prepared. Three factors that can cause severe winter weather problems at a specific location are heavy snowfall, high winds, and heavy drifting (height and/or width of drifts). In both of the most recent winters, specific roads, subdivisions and communities were more significantly affected.

While documenting such historical occurrences and their specific locations may be anecdotal, the enhancement of the initial mapping of locations experiencing serious blizzards and heavy drifting events during those two winters will ensure the development and maintenance of an ongoing geographic record of severe winter weather events and their impacts in Park County. Organizing and presenting the data according to major watershed will help in preliminary analysis of whether historical severe winter weather events or future severe winter weather risks show any clear pattern of variability depending on geographic location within Park County, even though the major streams themselves do not directly cause severe winter weather incidents.

10.2.3 Frequency

The State of Colorado experiences severe winter storms each year and the mountainous areas of the state regularly experience several severe snowstorms each year. These storms can produce between 4 and 12 inches (or more) of snow from each event. Total average annual snowfall within the County varies from month to month and from region to region.

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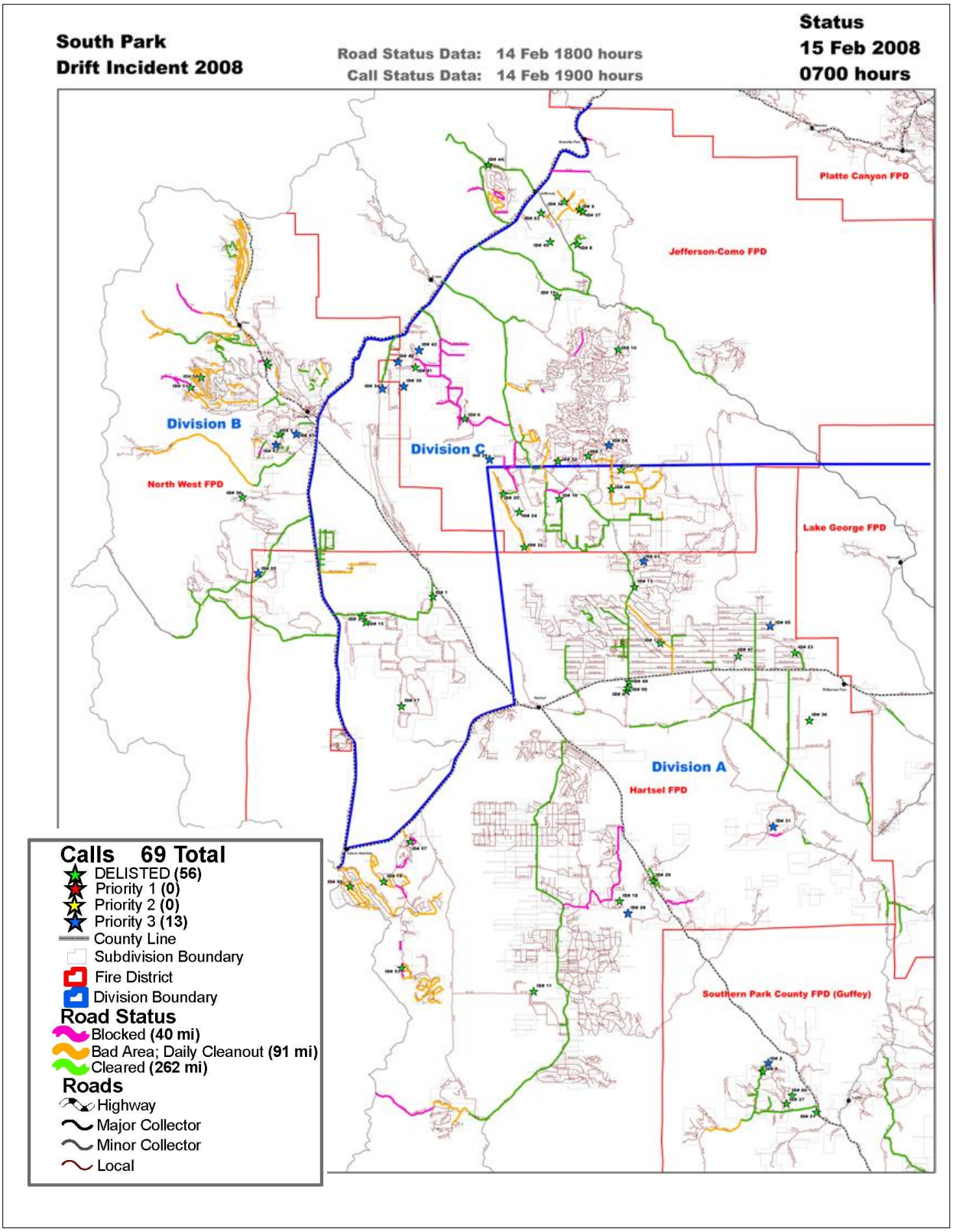

Figure 10-1. GIS Snow Mapping for Winter 2007-2008

10.2.4 Severity

The most common problems associated with severe storms are immobility and loss of utilities. Fatalities are uncommon, but can occur. Roads may become impassable due to downed trees, ice or snow, or a landslide. Power lines may be downed due to high winds or ice accumulation, and services such as water or phone may not be able to operate without power.

Winter storms can disrupt lives for periods of a few hours or up to several days, depending upon the severity of the storm. Transportation systems are usually among the first and hardest hit sectors of a community. Snow and ice can block primary and secondary roads, and treacherous conditions make driving difficult; some motorists may be stranded during a storm, and emergency vehicles may not be able to access all areas. The steep slopes found throughout the County exacerbate the situation, making some of the secondary roads impassable during even a minor winter weather event. Ground blizzards present significant risk to drivers, ranchers and their livestock and others trying to negotiate the dangerous conditions.

Utility infrastructure can also be adversely affected by winter storms. Heavy snow and ice can cause power lines to snap, leaving citizens without power and, in some cases, heat for hours or even days. Likewise, telephone lines can also snap, disabling communication within portions of a community. Frozen water pipes can rupture in people's homes, and water and sewer mains can also freeze and leak or rupture if not properly maintained. These ruptures can lead to flooding and property damage.

People's health can also be adversely affected by severe winter weather. People who lose heat in their homes and do not seek alternate shelter, people who get stuck in snowdrifts while driving, or people working and playing outdoors can suffer from hypothermia and frostbite. Since winter weather hazards generally affect the entire County and vary in intensity and form, it is not possible to quantify primary effects or specific damages.

Ranchers in particular have suffered severe economic consequences during severe winter weather events. Following the severe winter storms of 2006-2007 and 2007-2008, ranchers reported significant livestock losses, in part due to the extreme cold that came with the snow. Furthermore, some ranchers reported that costs of hay nearly tripled in the wake of these storms.

10.2.5 Warning Time

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

The National Weather Service tracks winter storms by radar. Based on this radar information, as well as models, the National Weather Service provides up-to-date weather information and issues winter storm watches to indicate when conditions are favorable for a winter storm and winter storm warnings if a storm is actually occurring or detected by radar. On average, south central Colorado will experience between one and two severe winter storms in a given year. Snowfalls amounts for these storms can vary from a few inches to more than a foot of snow in some cases. The higher elevations of the County can experience several feet of snow in a severe winter storm.

Longer-term forecasting of severe winter weather in Colorado has proven to be challenging. The correlation between La Nina conditions and other ocean temperature conditions and winter weather in Colorado is a complicated matter and scientific research will need to continue. While long range forecasting should not be abandoned, it should be performed carefully and its findings should be utilized with appropriate awareness of its limitations and complications.

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10.3 SECONDARY HAZARDS

The most significant secondary hazards associated with severe local storms are floods, falling and downed trees, landslides and downed power lines. Rapidly melting snow combined with heavy rain can overwhelm both natural and man-made drainage systems, causing overflow and property destruction. Landslides occur when the soil on slopes becomes oversaturated and fails.

Secondary effects of winter storms are broad. Treacherous driving conditions can result in automobile accidents in which passengers may be injured and property damages may occur. Impassible roads can delay deliveries of heating fuel. Impassable roads can also result in schools being closed because buses are not able to access their routes and bring children to school. The costs of salting and sanding roads and of snow removal can be staggering to communities both large and small. The costs to repair roads after spring thaws can also be significant. Furthermore, first responders such as the fire department are frequently called upon to deliver essential items such as medications to populations that cannot navigate roads during inclement weather.

After a significant snowfall, or after a winter during which there were several significant snowfalls, the resulting thaw that occurs when the temperature rises above freezing can cause flooding in some areas. As noted elsewhere in this document, May through September are the months with the highest occurrences of flooding. Because of the mountainous terrain in this area, flood events tend to occur rapidly and with little warning.

The local economy can also suffer if businesses close due to inclement winter weather. The impact could be significant in a larger event. In addition, disabled transportation systems may mean that shipments of goods and services are delayed, which may result in decreased inventory for retailers and increased inventory for industrial and commercial suppliers.

10.4 CLIMATE CHANGE IMPACTS

Climate change presents a significant challenge for risk management associated with severe weather. The frequency of severe weather events has increased steadily over the last century. The number of weather-related disasters during the 1990s was four times that of the 1950s, and cost 14 times as much in economic losses. Historical data shows that the probability for severe weather events increases in a warmer climate (see Figure 10-2). The changing hydrograph caused by climate change could have a significant impact on the intensity, duration and frequency of storm events. All of these impacts could have significant economic consequences.

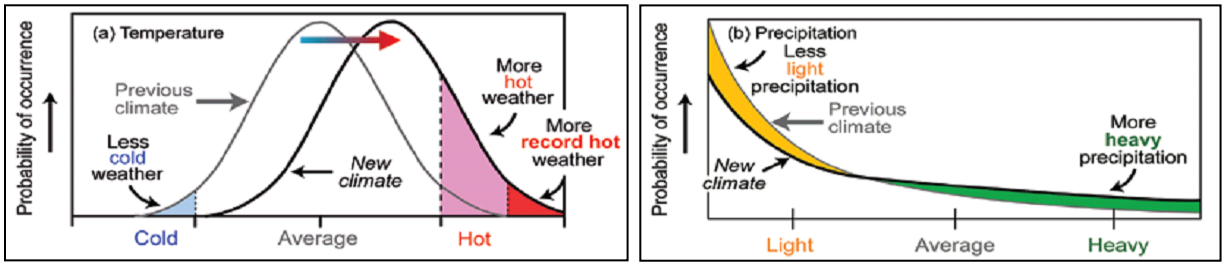

Figure 10-2. Severe Weather Probabilities in Warmer Climates

10.5 EXPOSURE

10.5.1 Population

A lack of data separating severe weather damage from flooding and landslide damage prevented a detailed analysis for exposure and vulnerability. However, it can be assumed that the entire planning area is exposed to some extent to severe weather events. Certain areas are more exposed due to geographic location and local weather patterns. Populations living at higher elevations with large stands of trees or power lines may be more susceptible to wind damage and black out, while populations in low-lying areas are at risk for possible flooding.

10.5.2 Property

According to the Park County HAZUS Default Data, there are 334,741 buildings within the census tracts that define the planning area. Most of these buildings are residential. It is estimated that 20 percent of the residential structures were built without the influence of a structure building code with provisions for wind loads. All of these buildings are considered to be exposed to the severe weather hazard, but structures in poor condition or in particularly vulnerable locations (located on hilltops or exposed open areas) may risk the most damage. The frequency and degree of damage will depend on specific locations.

10.5.3 Critical Facilities and Infrastructure

All critical facilities exposed to flooding (Chapter 9) are also likely exposed to severe weather. Additional facilities on higher ground may also be exposed to wind damage or damage from falling trees. The most common problems associated with severe weather are loss of utilities. Downed power lines can cause blackouts, leaving large areas isolated. Phone, water and sewer systems may not function. Roads may become impassable due to ice or snow or from secondary hazards such as landslides.

10.5.4 Environment

The environment is highly exposed to severe weather events. Natural habitats such as streams and trees are exposed to the elements during a severe storm and risk major damage and destruction. Prolonged rains can saturate soils and lead to slope failure. Flooding events caused by severe weather or snowmelt can produce river channel migration or damage riparian habitat. Storm surges can erode beachfront bluffs and redistribute sediment loads.

10.6 VULNERABILITY

10.6.1 Population

Vulnerable populations are the elderly, low income or linguistically isolated populations, people with life-threatening illnesses, and residents living in areas that are isolated from major roads. Power outages can be life threatening to those dependent on electricity for life support. Isolation of these populations is a significant concern. These populations face isolation and exposure during severe weather events and could suffer more secondary effects of the hazard.

10.6.2 Property

All property is vulnerable during severe weather events, but properties in poor condition or in particularly vulnerable locations may risk the most damage. Those in higher elevations and on ridges may be more prone to wind damage. Those that are located under or near overhead lines or near large trees may be vulnerable to falling ice or may be damaged in the event of a collapse.

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Loss estimations for the severe weather hazard are not based on damage functions, because no such damage functions have been generated. Instead, loss estimates were developed representing 10 percent, 30 percent and 50 percent of the assessed value of exposed structures. This allows emergency managers to select a range of potential economic impact based on an estimate of the percent of damage to the general building stock. Damage in excess of 50 percent is considered to be substantial by most building codes and typically requires total reconstruction of the structure. Table 10-2 lists the loss estimates.

TABLE 10-2.
LOSS ESTIMATES FOR SEVERE WEATHER

		Estimated Loss Potential from Severe Weather		
	Exposed Value	10% Damage	30% Damage	50% Damage
Alma	$39,810,000	$3,981,000	$11,943,000	$19,905,000
Fairplay	$97,311,000	$9,731,100	$29,193,300	$48,655,500
North-West FPD	$351,992,279	$35,199,228	$105,597,684	$175,996,140
Platte Canyon FPD	$1,059,028,949	$105,902,895	$317,708,685	$529,514,475
Southern Park County FPD	$98,391,294	$9,839,129	$29,517,388	$49,195,647
Unincorporated	$700,549,477	$70,054,948	$210,164,843	$350,274,739
Total	**$2,37,083,000**	**$234,708,300**	**$704,124,900**	**$1,173,541,500**

10.6.3 Critical Facilities and Infrastructure

Incapacity and loss of roads are the primary transportation failures resulting from severe weather, mostly associated with secondary hazards. Landslides caused by heavy prolonged rains can block roads. High winds can cause significant damage to trees and power lines, blocking roads with debris, incapacitating transportation, isolating population, and disrupting ingress and egress. Snowstorms in higher elevations can significantly impact the transportation system and the availability of public safety services. Of particular concern are roads providing access to isolated areas and to the elderly.

Prolonged obstruction of major routes due to landslides, snow, debris or floodwaters can disrupt the shipment of goods and other commerce. Large, prolonged storms can have negative economic impacts for an entire region.

Severe windstorms, downed trees, and ice can create serious impacts on power and above-ground communication lines. Freezing of power and communication lines can cause them to break, disrupting electricity and communication. Loss of electricity and phone connection would leave certain populations isolated because residents would be unable to call for assistance.

10.6.4 Environment

The vulnerability of the environment to severe weather is the same as the exposure.

10.7 FUTURE TRENDS IN DEVELOPMENT

All future development will be affected by severe storms. The ability to withstand impacts lies in sound land use practices and consistent enforcement of codes and regulations for new construction. The planning partners have adopted the International Building Code. This code is equipped to deal with the

impacts of severe weather events. Land use policies identified in general plans within the planning area also address many of the secondary impacts (flood and landslide) of the severe weather hazard. With these tools, the planning partnership is well equipped to deal with future growth and the associated impacts of severe weather.

10.8 SCENARIO

Although severe local storms are infrequent, impacts can be significant, particularly when secondary hazards of flood and landslide occur. A worst-case event would involve prolonged high winds and severe cold temperatures during a winter storm. Such an event would have both short-term and longer-term effects. Initially, schools and roads would be closed due to power outages caused by high winds and downed tree obstructions. In more rural areas, some subdivisions could experience limited ingress and egress.

10.9 ISSUES

Important issues associated with a severe weather in the planning area include the following:

- Older building stock in the planning area is built to low code standards or none at all. These structures could be highly vulnerable to severe weather events such as windstorms.
- Redundancy of power supply must be evaluated.
- The capacity for backup power generation is limited.
- Isolated population centers.

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CHAPTER 11.
WILDFIRE

11.1 GENERAL BACKGROUND

Wildfire hazard was ranked as high across the county in this update process with the exception of Fairplay, where the hazard risk was ranked as medium.

A wildfire is any uncontrolled fire occurring on undeveloped land that requires fire suppression. Wildfires can be ignited by lightning or by human activity such as smoking, campfires, equipment use, and arson. Most fires in Park County have been started by lightning. However, historically many of the worst fires in Park County have been human caused, primarily because of the timing and the location of those starts.

11.1.1 Ignition Risk

Ignition Risk is the likelihood of a fire actually starting in a given area. This is a function of many items, including lightning occurrence, weather patterns, population and amount of human activity, access to wildland areas, vegetation types, arson occurrence, and others. Increased development and population in the wildland areas, as well as the amount of human activity in those areas are also increasing the risk of fires occurring. While historical wildfire data may be an indication of how likely a wildfire occurrence may be, it is not a factor that causes a fire.

Ignition risk can be broken into two categories of factors, natural factors and manmade factors.

- Natural Factors
  - Weather factors – These include drought conditions and the likelihood of a thunderstorm occurring. Wildfire ignition risk increases significantly in times of drought.
  - Vegetation types and conditions – Vegetation types and conditions such as forest infestation from beetle kill or other diseases influence ignition risk.
- Manmade Factors
  - Population density - An overwhelming majority of wildfires. As population increases, the more opportunities for wildfire ignition exist. There has been an increase in people living in the wildland-urban interface, as well as an increase in use of the forest for recreational purposes, due to the

DEFINITIONS

Conflagration—A fire that grows beyond its original source area to engulf adjoining regions. Wind, extremely dry or hazardous weather conditions, excessive fuel buildup and explosions are usually the elements behind a wildfire conflagration.

Firestorm—A fire that expands to cover a large area, often more than a square mile. A firestorm usually occurs when many individual fires grow together into one. The involved area becomes so hot that all combustible materials ignite, even if they are not exposed to direct flame. Temperatures may exceed 1000°C. Superheated air and hot gases of combustion rise over the fire zone, drawing surface winds in from all sides, often at velocities approaching 50 miles per hour. Although firestorms seldom spread because of the inward direction of the winds, once started there is no known way of stopping them. Within the area of the fire, lethal concentrations of carbon monoxide are present; combined with the intense heat, this poses a serious life threat to responding fire forces. In very large events, the rising column of heated air and combustion gases carries enough soot and particulate matter into the upper atmosphere to cause cloud nucleation, creating a locally intense thunderstorm and the hazard of lightning strikes.

Interface Area—An area susceptible to wildfires and where wildland vegetation and urban or suburban development occur together. An example would be smaller urban areas and dispersed rural housing in forested areas.

Wildfire—Fires that result in uncontrolled destruction of forests, brush, field crops, grasslands, and real and personal property in non-urban areas. Because of their distance from firefighting resources, they can be difficult to contain and can cause a great deal of destruction.

population growth in Colorado. Human Behavior – Humans intentionally or unintentionally start most wildfires. Human actions could be smoking, campfires, arson, or careless use of equipment.

- Distance to Roads – Travel corridors increase the probability of human presence, which in turn can result in increased potential for wildfire ignition. Hence, areas of the County that are in close proximity to roadways have a higher probability of wildfire.
- Railroad Buffer – Railroad operations can produce sparks that may ignite a wildfire.

11.1.2 Fuels Hazard

Fuels Hazard is based on the type of fire behavior that could result if a fire occurs and spreads in the vegetation type or "fuel bed" that exists at a given location. The primary characteristics that define fire behavior are flame lengths (fire intensity), rate of spread (how fast it moves), and what type of general fire behavior (surface fire only, surface fire with torching, or crown fire). These characteristics are a function of the type of fuels, weather that can occur, and the topography in the areas of concern. They are important because they indicate how quickly a fire could reach areas of concern, how difficult it will be to fight and what type of equipment is needed, and what kind of damage and effects it can cause.

Defining the fuels hazard and the resultant fire behavior that would be anticipated from that fuels hazard is important because it indicates how quickly a fire could reach areas of concern, how difficult it will be to fight and what type of equipment is needed, and what kind of damage and effects it can cause. Fire behavior is affected by a number of attributes of area being burned and conditions at the time of the fire.

- Land Cover – The potential fuels covering the land at risk (e.g. grasses, crops, forest, urban development, etc.) determine the ease of ignition, as well as the burn intensity and advancement opportunities.
- Vegetative Conditions – The health of the forest and the specific mixture of species will have an effect on how the fire burns and how rapidly it spreads. Alterations in vegetation composition and structure caused by fire suppression, land use changes, long duration droughts, and insect and disease epidemics generally create a greater risk of high intensity and damaging fires.
- Topography – Through convective pre-heating, wildfires generally advance uphill. In general, the steeper the slope, the greater the ease of wildfire advancement. The mountainous terrain (i.e. steep slopes) of the County is conducive to the advancement of wildfires.
- Slope Orientation – Slopes that generally face south receive more direct sunlight, thereby drying fuels and creating conditions more conducive to wildfire ignition.
- Weather Conditions – Wildfire risk increases significantly in times of drought. In the case of a wet spring followed by a dry summer, dense, dry forest undergrowth can contribute to increased fire intensity as well. Temperature, wind, atmospheric humidity and precipitation conditions greatly influence fire behavior.
- Triangle Factors - Wildfires require three components to ignite and burn; fuel to burn, oxygen and heat to bring any fuel up to an ignition temperature. The fire triangle is the combination of these three factors. The basis for effective fire-fighting consists of eliminating one or more of these factors.

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11.2 HAZARD PROFILE

11.2.1 Past Events

During a "typical" year, about 1,600 wildfires consume a total of 8,000 to 10,000 acres of forest and grassland in the State of Colorado. Some years are not "typical." In 2002 Colorado saw the one of its worst wildfire season in its history, with 3,072 wildfires burning over 600,000 acres – the most acreage in the nation following Alaska, and Oregon. 380 houses and 624 outbuildings were lost. Insurance claims reached $79.3 million and firefighting and emergency rehabilitation efforts exceeded $200 million.

Both 2012 and 2013 were especially bad years for Colorado wildfires. The Waldo Canyon fire started approximately 4 miles northwest of Colorado Springs on June 23, 2012. It was declared 100-percent contained on July 10, 2012 after no smoke plumes were visible on a small portion of the containment line on Blodgett Peak. While not located in Park County, the fire was active in the nearby Pike National Forest and adjoining areas, covering a total of 18,247 acres (29 square miles) The fire had caused the evacuation of over 32,000 residents of Colorado Springs, Manitou Springs and Woodland Park, several small mountain communities along the southwestern side of Highway 24, and partial evacuation of the United States Air Force Academy. Approximately 346 homes were destroyed by the fire. U.S. Highway 24, a major east-west road, was closed in both directions. The Waldo Canyon Fire resulted in insurance claims totaling more than $453.7 million. It was the most destructive fire in Colorado state history, as measured by the number of homes destroyed, until the Black Forest fire surpassed it almost a year later, consuming 511 homes and damaging 28 others. While the Waldo Canyon fire predominantly burned away from Teller County, impacts were felt within the County. Transportation routes, community resources, safe ingress/egress and quality of life were directly impacted.

The Black Forest fire was a forest fire that began near Highway 83 and Shoup Road in Black Forest, Colorado (El Paso County) around 1:00 p.m. on June 11, 2013. As of June 20, 2013, the fire was 100 percent contained, 14,280 acres were burned, at least 509 homes were said to be destroyed, and two people had died.[4] This was the most destructive fire in the state's history, surpassing the 2012 Waldo Canyon Fire which also began near Colorado Springs. Most of the Waldo Canyon blaze actually was in the city limits, while Black Forest is to the north of the city. The evacuation area covered 94,000 acres, 13,000 homes and 38,000 people.

Over the last 30 years more than 770 fires have occurred on National Forest and U.S. Bureau of Land Management lands in Park County, or an average of 25 per year. During this same time period 23,500 acres have burned on National Forest and other public lands within Park County. The most recent fires to affect Park County were the Lake George Fire of 2012, the Springer Fire in 2011, the Nash Ranch Fire in 2008, High Meadow Fire of 2000, The Snaking, Black Mountain and Hayman Fires of 2002 and the Campbell Fire of 2003. Table 11-1 lists those fires, the dates they ignited, and their location.

One of the worst wildfires in Colorado history, the Hayman Fire, ignited in eastern Park County and burned nearly 138,000 acres from June 8 – 28, 2002, (including 60,000 acres on June 9th alone) in Park, Teller, Jefferson and Douglas Counties. It thrived in dry forests that had become overpopulated with trees and undergrowth. Some of the greatest challenges in fighting this particular fire were the acute drought conditions existing in 2002, extreme weather events at the beginning of the fire, (winds of 20-50 mph coupled with 5 percent relative humidity) and the prevalence of crown fire and long-range spotting. These factors led to numerous breaches of firebreaks and treatments during the Hayman Fire.

TABLE 11-1.
RECENT WILDFIRES IN PARK COUNTY

Name of Fire	Ignition Date	Location	Total Acres Burned
Lake George	June 10, 2012	Lake George	40
Springer Fir	November 2011	Pike National Forest (3.5 miles from Lake George)	1,145
Nash Ranch Fire	June 24, 2008	Northeast Park County and Jefferson County	11,00
Camel Fire	July 8, 2003	Guffey	510
Black Mountain Fire	May 5, 2002		
Multiple Fires	April - June 2002	Various	137,760
High Meadow Fire	June 12, 2000	Bailey	4,000
Snaking Fire	April 23, 2002	Behind Platte Canyon High School	2,590
Black Mountain Fire	May 5, 2002	Northeast corner of Park County	345
Campbell Fire	July 8, 2003	15 miles northeast of Guffey	505
Hayman Fire	June 8, 2002	Ignited 4 miles northwest of Lake George (in Park County), burned in Park, Teller, Douglas and Jefferson Counties	137,760

11.2.2 Location

Colorado overall is one of the fastest growing states in the nation. Much of this growth, including growth in Park County, is occurring outside urban boundaries. This increase in growth is occurring in the wildland-urban interface (WUI) area. The WUI is defined as the area where structures and other human improvements meet and mix with undeveloped wildland or vegetative fuels. Population growth within the WUI substantially increases the risk from wildfires. For Park County, the Colorado Wildfire Risk Assessment (WRA) estimates that 55 percent of the County population live within the WUI and is at risk from wildfire. Teller County population, area and housing density within the WUI are shown in Figure 11-1, Figure 11-2 and Figure 11-3, respectively.

Much of Park County is mountainous and wooded, leaving a large part of the county at risk to wildfire. Areas of steep terrain with forested mountain vegetation (ponderosa pine and Douglas fir) are at the greatest risk. Further exacerbating the problem is the lack of easy access to many of the county's heavily forested areas. Park County also has numerous potential wildland-urban-interface areas prone to wildfire. According to the WRA "red zone" mapping, the most densely populated area in the county, the Platte Canyon area in the northeast, is at considerable risk for such events. Other areas are at risk as well. Wildfire risk is significant in the area along U.S. 285 south of Kenosha Pass, the towns of Alma and Fairplay, and the Antero Junction area. To a great extent, the Colorado Wildfire Protection Plan (CWPP) confirmed the general findings of the WRA. There were a total of 275 subdivisions identified in Park County in the CWPP, spread across the county with varying degrees of exposure to wildfire. The only areas that are not at risk are those areas where there is no vegetation or the vegetation is not capable of supporting a fire no matter what the conditions. The overall findings of the CWPP assessment were that many areas in the county's eastern side face significant wildfire risk. As was the case with the WRA, the analysis for the CWPP found the Platte Canyon district to have the greatest risk of wildfire of any area in Park County. The CWPP analyses did indicate a wildfire risk in the Guffey area that had not been identified in the WRA's statewide "red zone" map.

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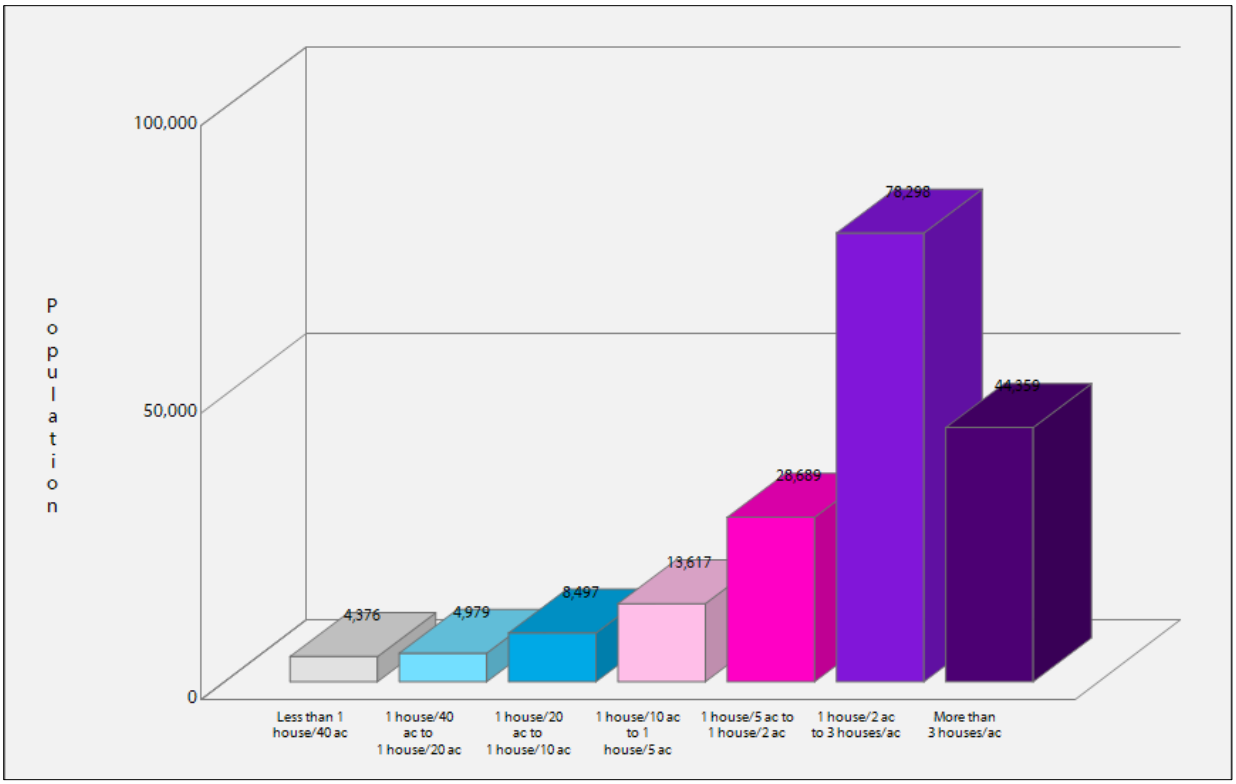

Figure 11-1. Wildland Urban Interface – Population

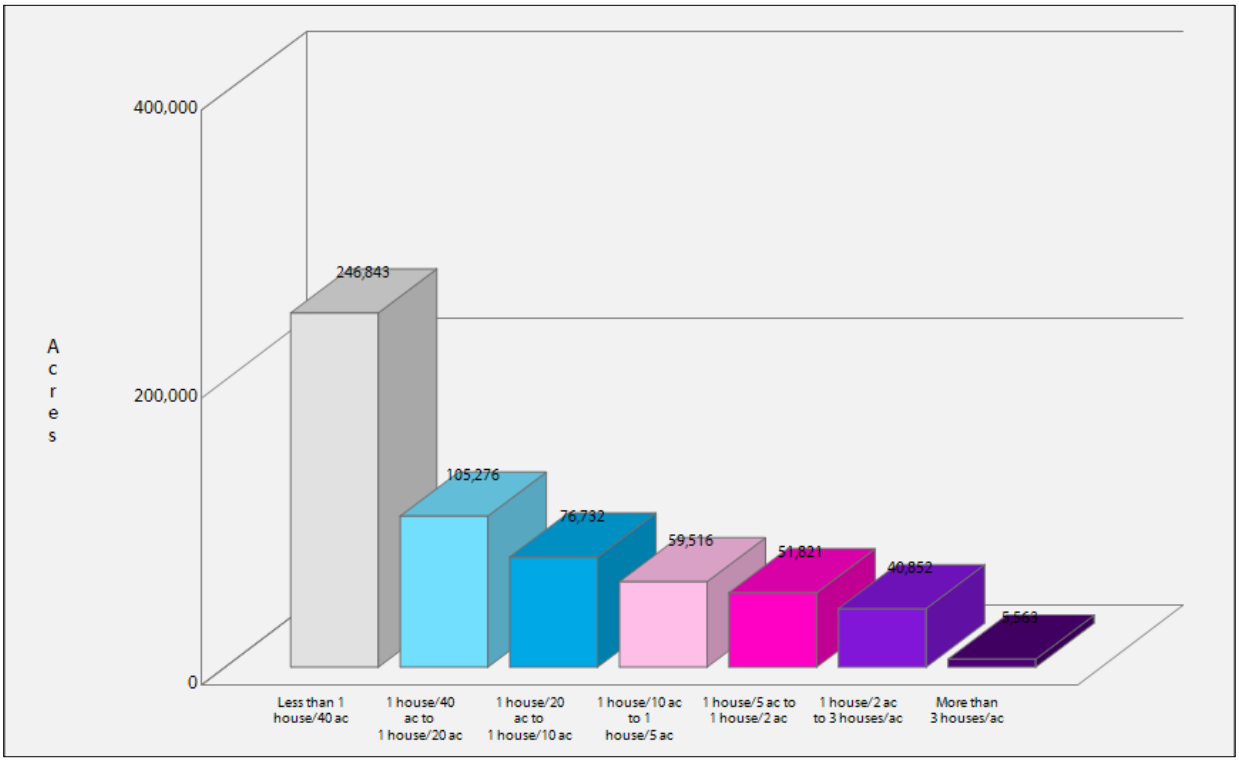

Figure 11-2. Wildland Urban Interface – Area

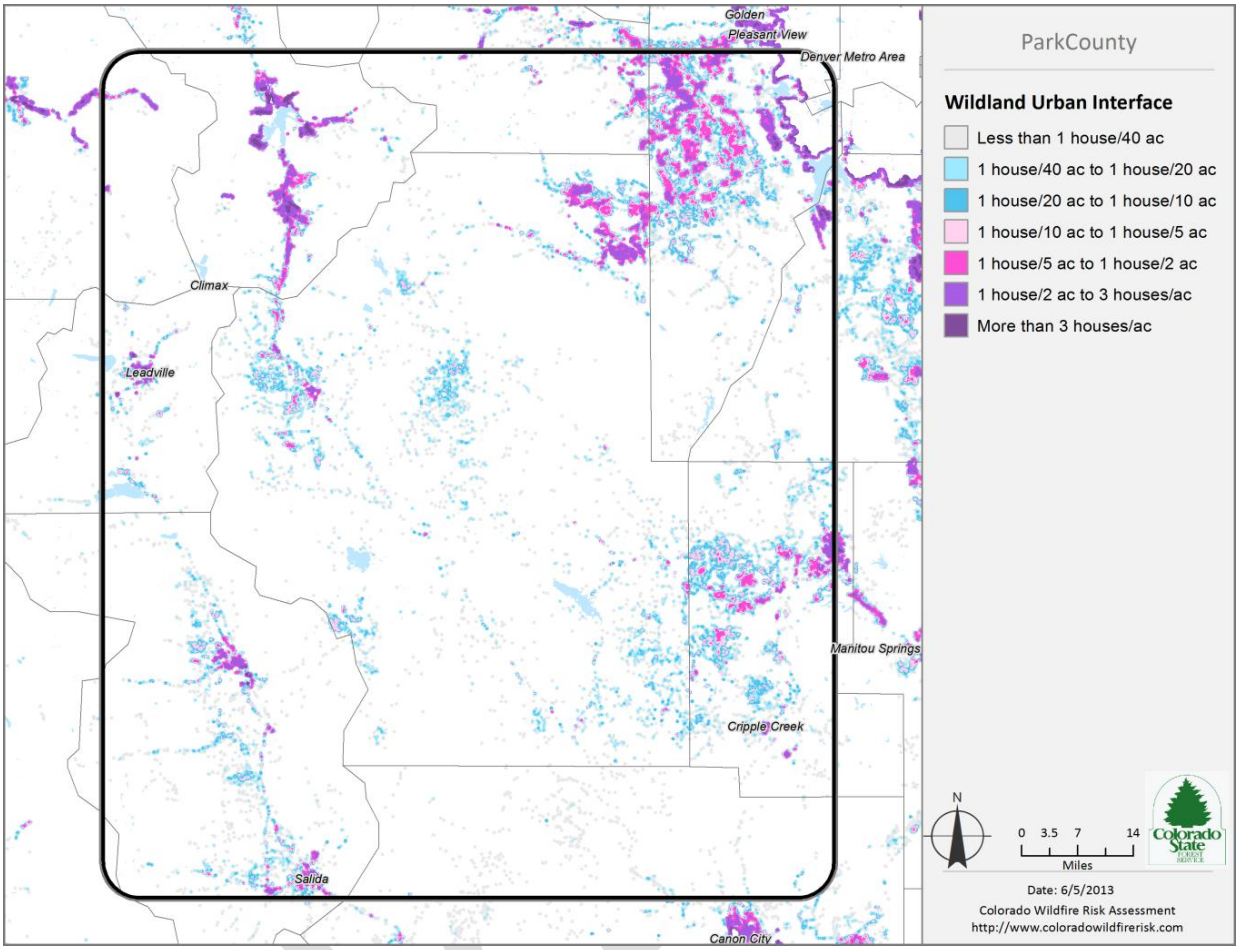

Figure 11-3. Wildland Urban Interface – Housing Density

At present there is mapping showing those portions of Park County facing the greatest likelihood of being impacted in the future by wildfires. The possibility of a correlation between location within any one of the eight major watersheds in the county and the risk of future wildfires has been initially examined through the county's GIS capabilities, as part of this project. Distinctions have been made regarding specific locations within Park County which have a history of wildfires and regarding specific locations which might be more prone to future wildfires. The CWPP process identified the specific areas of Park County with the greatest vulnerabilities to wildland fire, sometimes providing similar findings to those of the WRA and sometimes pointing out new hazard areas besides the "red zones." Figure 11-4, which was generated for the Colorado Wildfire Risk Assessment illustrates the fuel hazards profile for the entire county. While there are areas of risk throughout the county, this map shows that the areas of particularly high risk are in the Platte Canyon area, as well as Tarryall, Lake George and Guffey.

A subdivision hazard assessment (Figure 11-5) was also completed as part of the CWPP process, examining the relative vulnerabilities of the many subdivisions located in Park County. The map below points out "very high" risks to subdivisions near Alma, Fairplay and Guffey. There is "moderate" to "high" risk to areas in the Platte Canyon district, south of Como along U.S. Highway 285, and near Antero Junction. Figure 11-6 displays the overall results of the CWPP assessment. When taking into account all factors, the Platte Canyon district was determined to have the highest level of risk to wildfire. Many areas in the eastern side of the county face considerable risk, as well as the area along U.S. 285 south of Kenosha Pass, the towns of Alma and Fairplay, and the Antero Junction area.

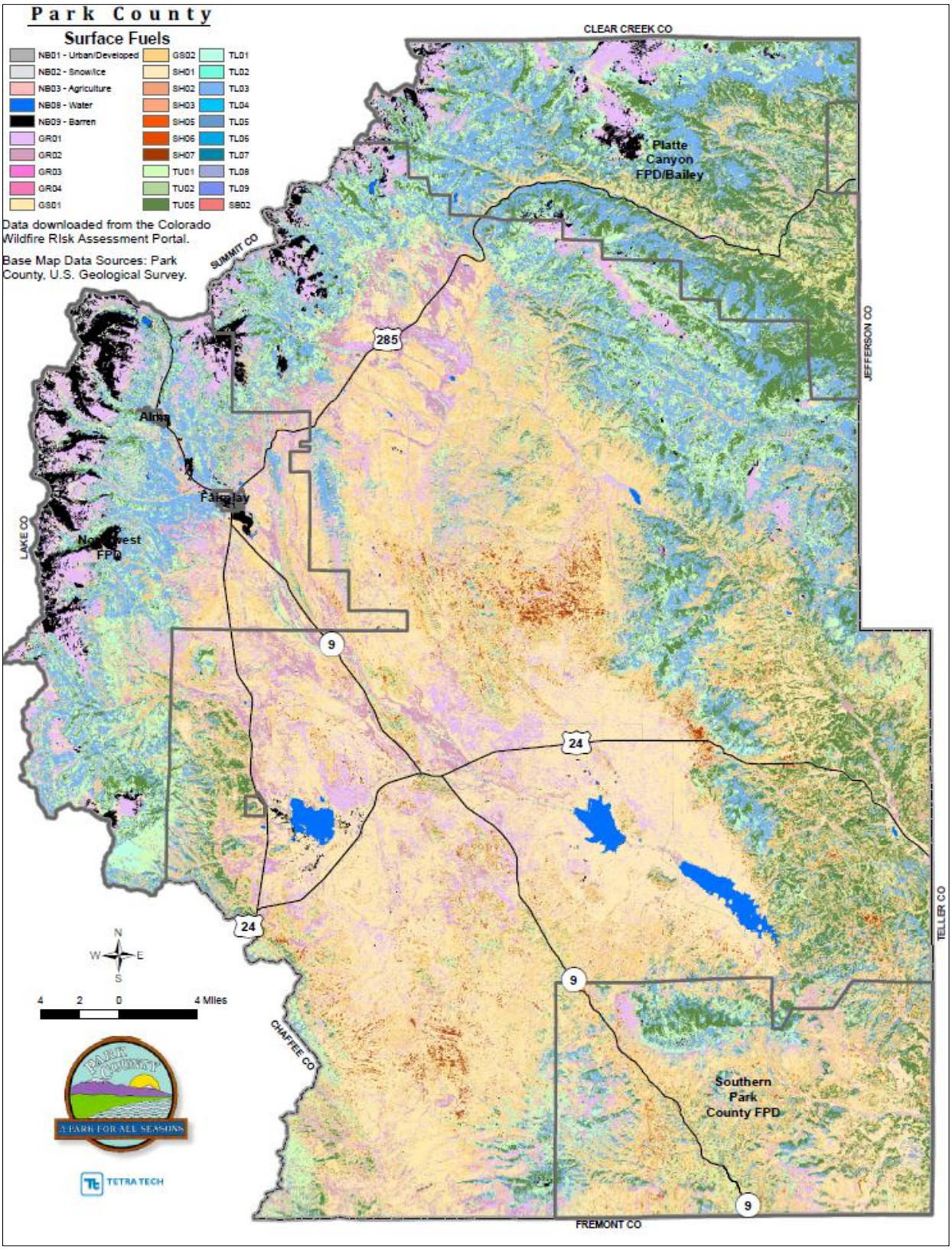

Figure 11-4. Park County Fuel Hazards Profile

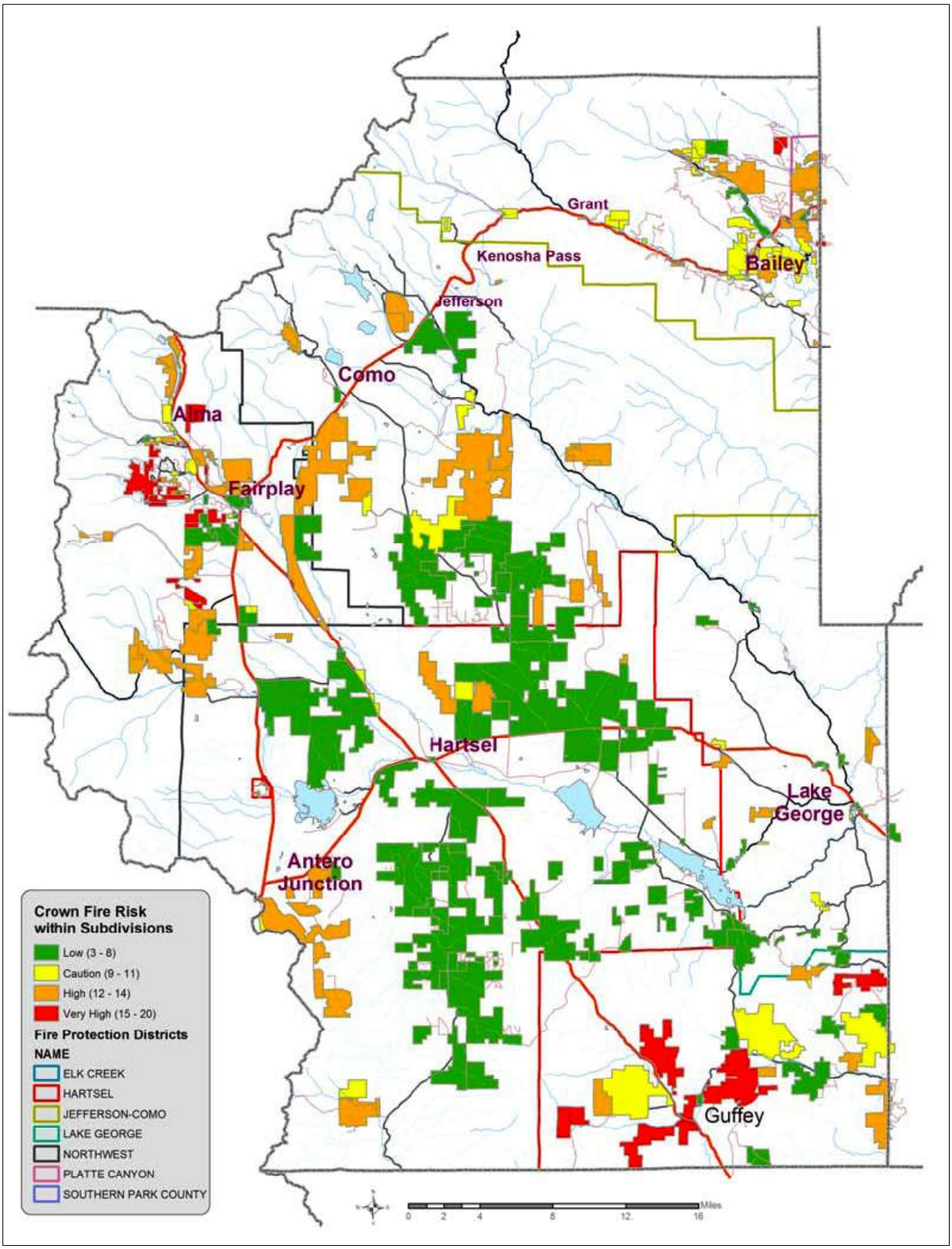

Figure 11-5. Fire Risk Within Subdivisions

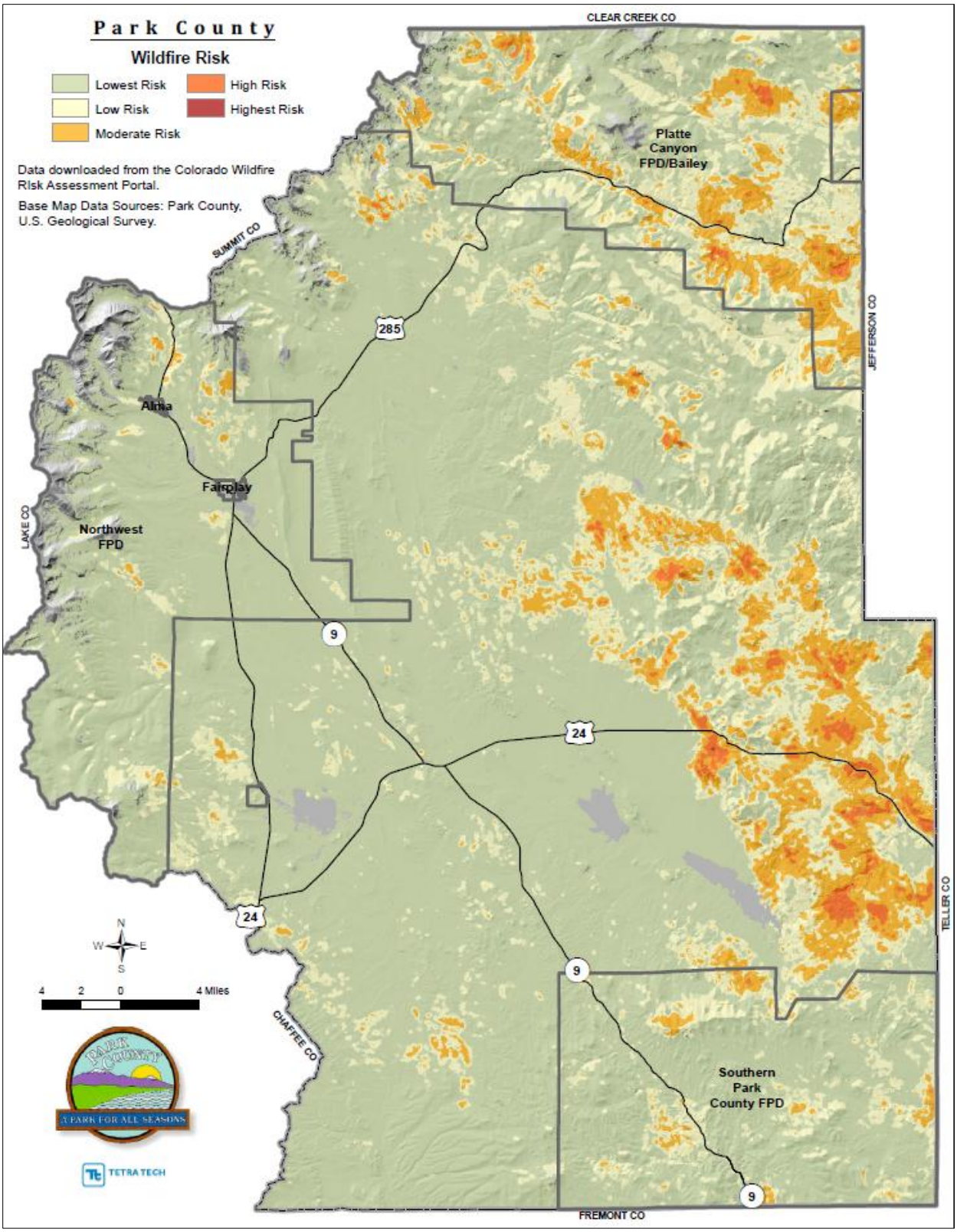

Figure 11-6. Overall Risk from Colorado Wildfire Risk Assessment

Most of the highest vulnerabilities correspond to the state WRA "red zone" assessment, but there are some differences. Most particularly the more detailed analyses of the CWPP emphasize the risk posed to the Guffey area that was not indicated in the statewide "red zone" map.

Areas of Park County at high risk for wildfire, as determined in the CWPP, include rural areas, more heavily populated areas, and wildlife-urban interface areas. The county also has many areas with few permanent residents that are attractive to tourists for recreation, including hiking, camping and boating in the county's reservoirs. The result is a threat to human life and property as well as the potential for negative economic impacts on the county from a loss of tourism. Figure 11-7 identifies the wildfire risk in Park County. Wildfire risk represents the possibility of loss or harm occurring from a wildfire. It is the primary output of the Colorado WRA. Risk is derived by combining the assessment outputs for wildfire threat and the fire effects. 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.

Source: Colorado Wildfire Risk Assessment Report, June 2013

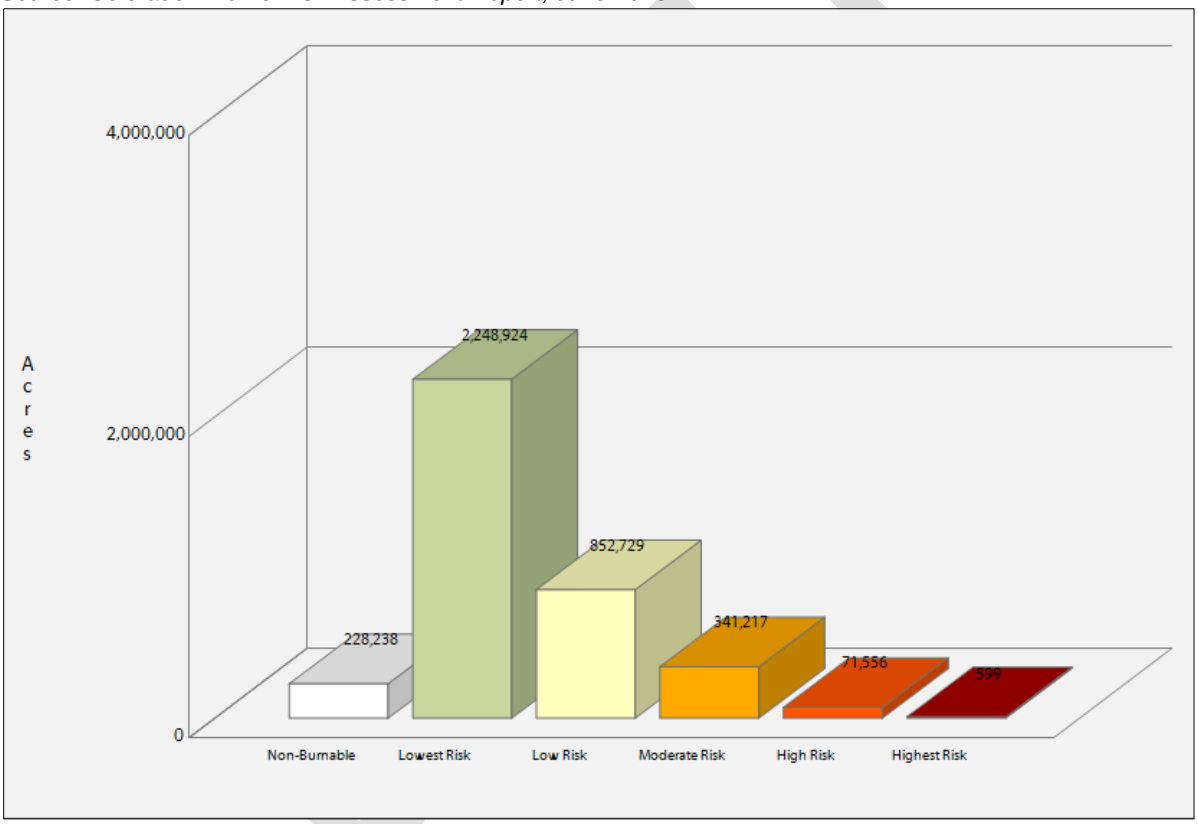

Figure 11-7. Park County Wildfire Risk in Acres

Wildfire risk combines the likelihood of a fire occurring (threat), with those areas of most concern that are adversely impacted by fire (fire effects), to derive a single overall measure of wildfire risk. Since all areas in Colorado have risk calculated consistently, it allows for comparison and ordination of areas across the entire state. Fire effects are a key component of wildfire risk. The purpose of fire effects is to identify areas that have important values or assets that would be adversely impacted by a wildfire. Fire effects inputs include wildland urban interface, forest assets, riparian assets and drinking water importance areas (watersheds). Refer to the values-impacted rating for more information about fire effects. To aid in the use of wildfire risk for planning activities, the output values are categorized into five classes. These are given general descriptions from lowest to highest risk.

Beyond those initial efforts of mapping the entire county, Park County has prepared maps of three of the participating areas and the perimeters of recent historical wildfires, the current population density and the standard background features from USGS 7.5' quadrangle maps. Those individual watershed maps, shown in Figure 11-8 through Figure 11-10, demonstrate that, due to a combination of current forest conditions and population density.

11.2.3 Frequency

The Colorado wildfire season is highly variable depending on elevation. Low elevation grasslands, western valleys, and Front Range plains can have fires year round. The wildfire risk in the higher elevation areas that are forested is primarily driven by summer monsoons. Those areas tend to have a split fire season. High fire danger can occur in the spring and early summer ahead of the monsoon, and then again in the fall as the summer rains end. The spring and fall also typically have the windiest conditions.

The highest elevations, such as those found in northwestern Park County, generally have a minimal fire season. The forest does not have time to dry out between snowmelt and the monsoons. It normally takes a drought year with limited snowpack or a late or minimal monsoon to create high fire dangers at these elevations.

As fire activity fluctuates during the year from month to month, it also varies from year to year. Historically extended periods of drought and hot weather can increase the risk of wildfire. During years with adequate rain and snowfall amounts fire occurrences are generally low; during other years, when there are extended periods of warm, dry, windy days, increased fire activity is exhibited. Wet years can grow extensive amounts of grass fuels that can increase fire hazard later in the same year or during the next year.

Long-term climate trends as well as short-term weather patterns play a major role in the risk of wildfires occurring. Long-term droughts create conditions conducive to significant fires at the higher elevations and exacerbate conditions at lower elevations in the county. They make overall fire occurrence more likely, larger fires more likely, and make it more difficult to control and suppress fires. Short-term heat waves along with periods of low humidity can also increase the risk of fire, while high winds directed at a fire can cause it to spread rapidly. Particularly in the lower elevations, extended periods of hot, dry, windy weather can create the potential for problem fires. Some ongoing wildfire research has tried to establish a link between climate change and increased wildfire risk.

Figure 11-11 displays the fire history data for Park County from 1999 to 2008 as documented in the WRA. Fire history statistics provide insight as to the number of fires, acres burned and cause of fires in Colorado**.** These statistics are useful for prevention and mitigation planning. They can be used to quantify the level of fire business, determine the time of year most fires typically occur and develop a fire prevention campaign aimed at reducing a specific fire cause.

Ten years of historical fire report data was used to create the fire occurrence summary charts. Wildfire Ignition data was compiled from federal and local sources for the years 1999 through 2008. Federal wildfire ignitions were spatially referenced by latitude and longitude coordinates, and state and local wildfire ignitions were spatially referenced by zip code. All ignitions references were updated to remove duplicate records and correct inaccurate locations.

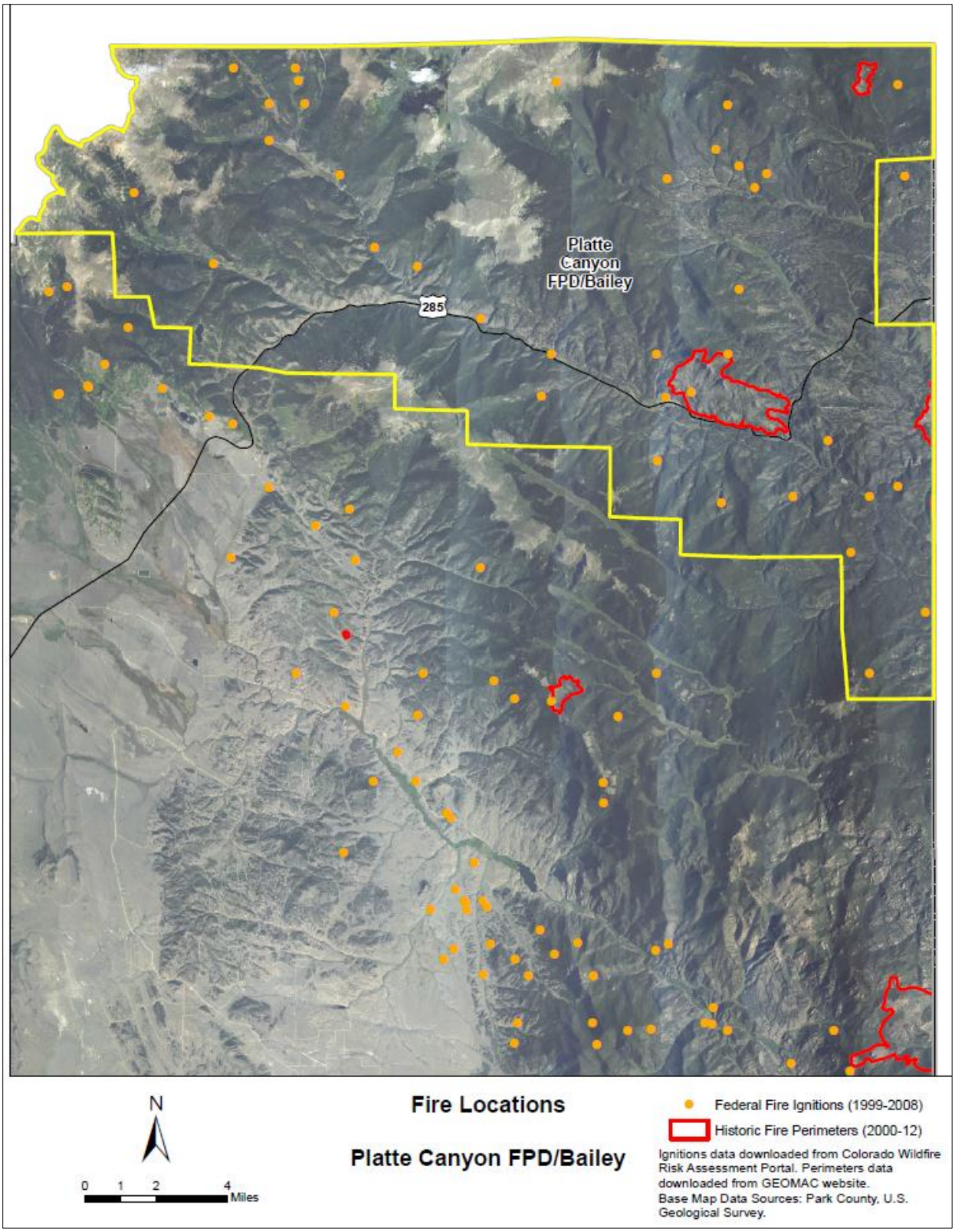

Figure 11-8. Recent Wildfires in Platte Canyon FPD

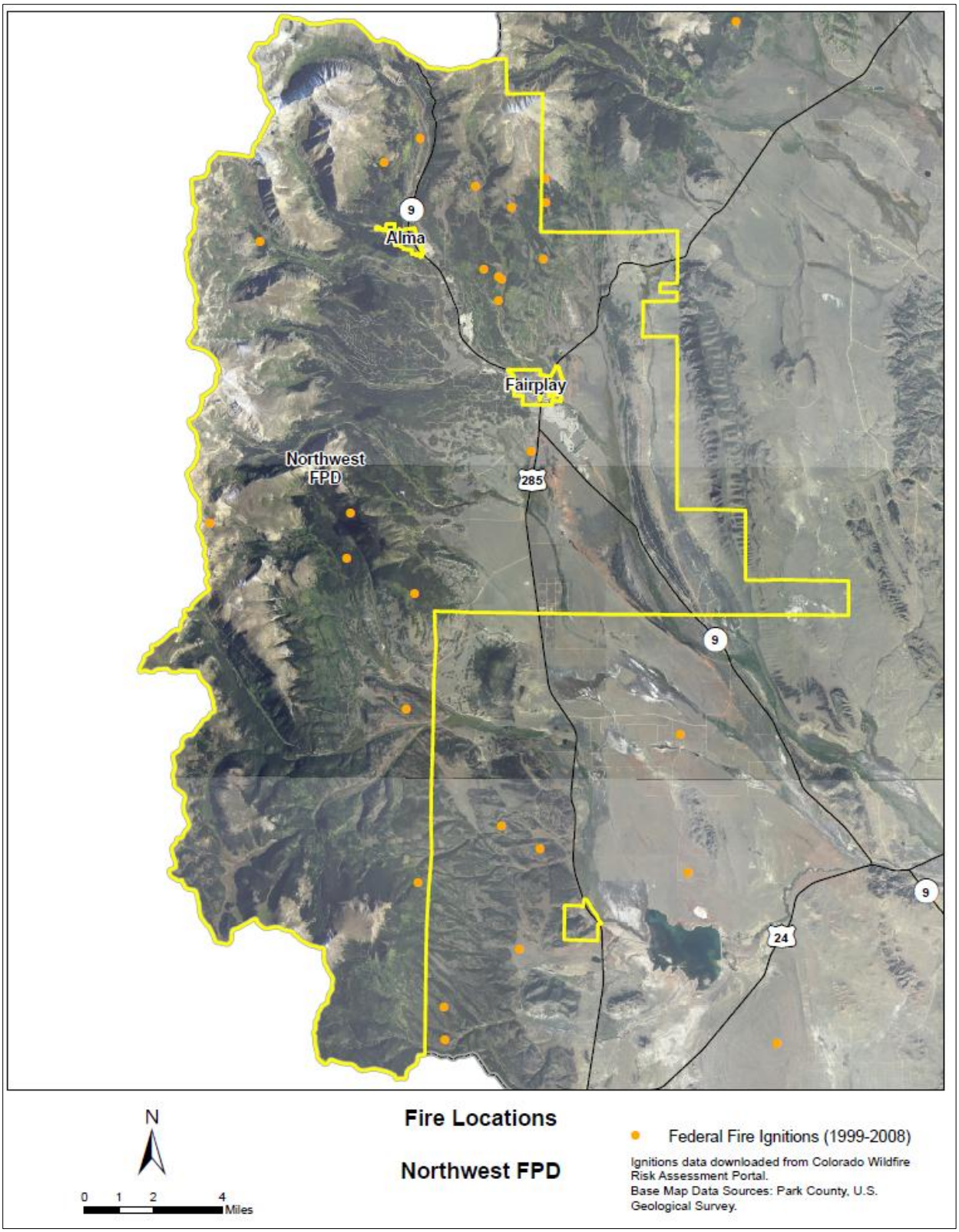

Figure 11-9. Recent Wildfires in North-West Fire Protection District

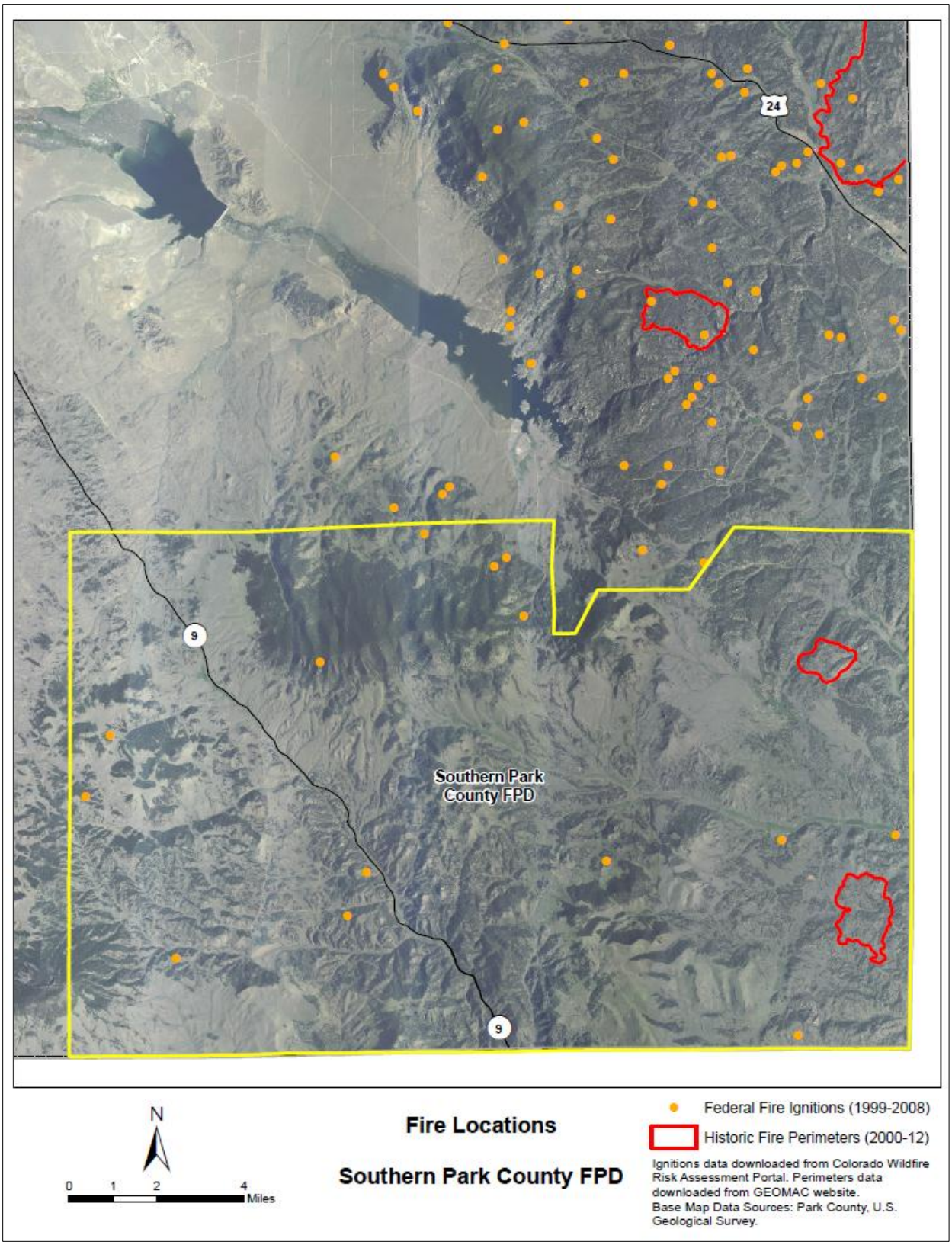

Figure 11-10. Recent Wildfires in Southern Park County Fire Protection District

Source: Colorado Wildfire Risk Assessment Summary Report for Park County 2013

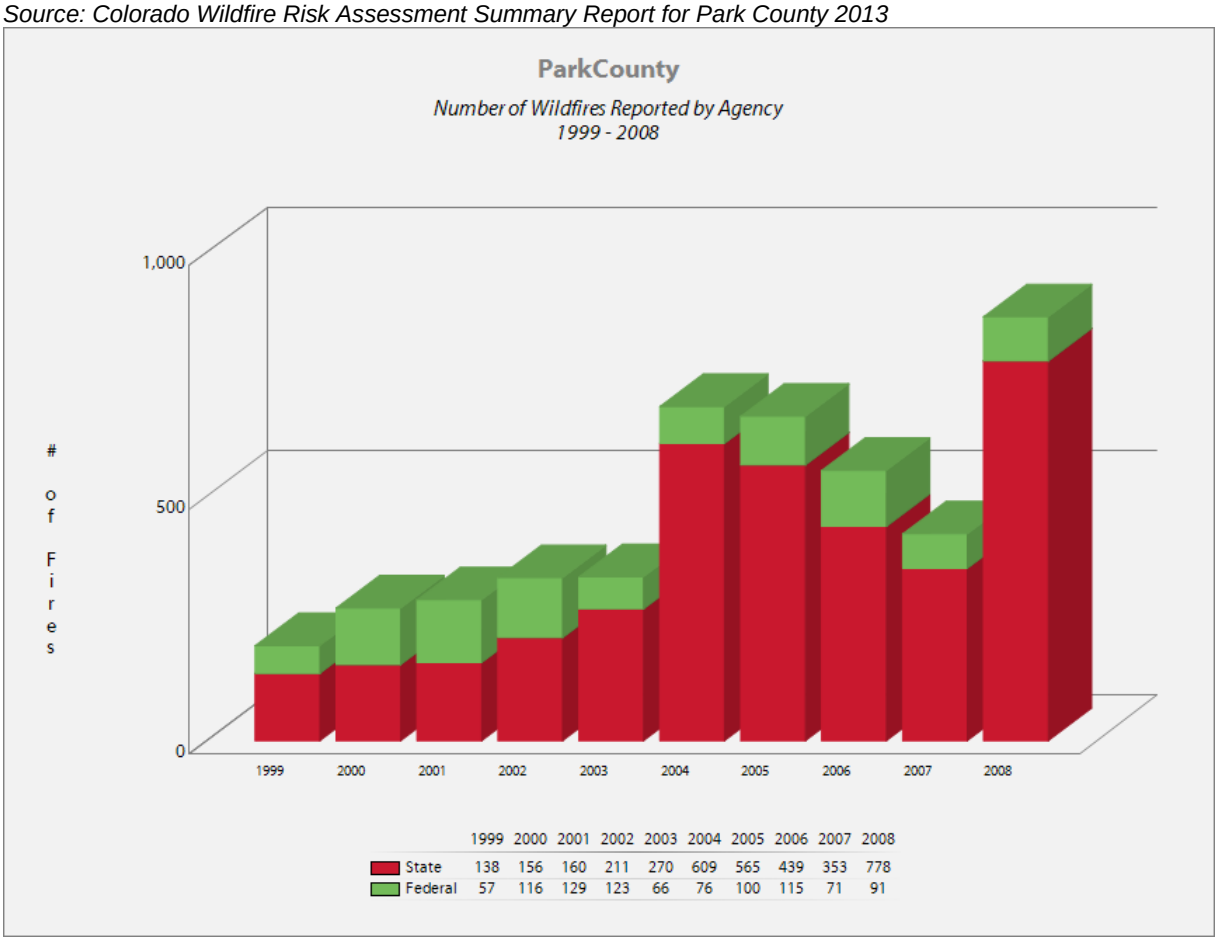

Figure 11-11. Number of Annual Wildfires Reported By Agency

Federal wildfire ignitions are symbolized in the Colorado WRA by the cause of fire. Fire reports were gathered from the following federal data sources:

- U.S. Forest Service
- U.S. Fish and Wildlife Service
- Bureau of Land Management
- Bureau of Indian Affairs
- National Park Service

State wildfire ignitions were gathered from fire department reports submitted by:

- Volunteer Fire Departments
- Combination Fire Departments (paid and volunteer)
- Paid Fire Departments
- Fire Protection Districts
- Counties

11.2.4 Severity

Direct impacts from wildfires can include the loss of structures and infrastructure, injuries or loss of life to firefighters and to the public, health impacts from smoke, the immediate costs of fighting the fire, closure of public lands, highways, or other locations, temporary loss of business, and community disruptions, such as evacuation. Longer-term impacts include impacts on tourism and recreation, loss of jobs or businesses, loss of community water supplies and/or storage/purification facilities, devaluation of property or businesses, and other long-term disruptions to the communities.

Fire hazards present a considerable risk to vegetation and wildlife habitats. Short-term loss caused by a wildfire can include the destruction of timber, wildlife habitat, scenic vistas, and watersheds. Long-term effects include smaller timber harvests, reduced access to affected recreational areas, and destruction of cultural and economic resources and community infrastructure. Vulnerability to flooding increases due to the destruction of watersheds. The potential for significant damage to life and property exists in WUI areas, where development is adjacent to densely vegetated areas.

Given the immediate response times to reported fires, the likelihood of injuries and casualties is minimal. Smoke and air pollution from wildfires can be a health hazard, especially for sensitive populations including children, the elderly and those with respiratory and cardiovascular diseases. Wildfire may also threaten the health and safety of those fighting the fires. First responders are exposed to the dangers from the initial incident and after-effects from smoke inhalation and heat stroke. In addition, wildfire can lead to ancillary impacts such as landslides in steep ravine areas and flooding due to the impacts of silt in local watersheds.

11.2.5 Warning Time

Wildfires are often caused by humans, intentionally or accidentally. There is no way to predict when one might break out. Since fireworks often cause brush fires, extra diligence is warranted around the Fourth of July when the use of fireworks is highest. Dry seasons and droughts are factors that greatly increase fire likelihood. Dry lightning may trigger wildfires. Severe weather can be predicted, so special attention can be paid during weather events that may include lightning. Reliable National Weather Service lightning warnings are available on average 24 to 48 hours prior to a significant electrical storm.

If a fire does break out and spread rapidly, residents may need to evacuate within days or hours. A fire's peak burning period generally is between 1 p.m. and 6 p.m. Once a fire has started, fire alerting is reasonably rapid in most cases. The rapid spread of cellular and two-way radio communications in recent years has further contributed to a significant improvement in warning time.

Extreme drought conditions monitored and the following steps taken:

- Alerts to both private and public entities.
- Literature on defensible space and other protective measures.
- Burn Bans.
- Wildfire orientation meetings with all assisting agencies with resources checked.

County Wildfire Safety Program.

Colorado State Forest Service, U.S. Forest Service, U.S. Bureau of Land Management, Elk Creek Fire Protection District, Hartsel Fire Protection District, Jefferson/Como Fire Protection District, Lake George Fire Protection District, North-West Fire Protection District, Platte Canyon Fire Protection District, Southern Park County Fire Protection District, citizens and Park County have initiated an effort to

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mitigate wildfires within Park County. While saving lives is their first priority, a firefighter's second mandate is to save structures in the event of a wildfire. The purpose of this Wildfire Safety Program is to assist homeowners, firefighters, and the community in the event of a wildfire by providing them with the following information:

- For the homeowner, specific information about how to make their homes less susceptible to wildfire,
- For the firefighter, an assessment of the structure with respect to access, materials and vegetation- specific information to make fighting fires safer for all emergency personnel, and
- For the community, the ability to map structures and access in wildfire-prone areas of the county.

The premise of the Wildfire Safety Program is to educate homeowners about Home Fire Protection in a region where wildfire is an integral part of the ecosystem. As Park County grows, property owners encroach more and more on wildland areas, making their susceptibility to fire greater. Park County is using protocols from the ***FireWise*** program, as well as several other programs, to provide homeowners with information about how they can protect themselves; this includes information about Access, Vegetation and Topography, Defensible Space, Structure Information, Utilities, and Water Sources.

In 2007, Park County completed the first step in this process, which was the development of a community wildfire protection plan for the county. This plan includes extensive GIS data and mapping to illustrate the greatest areas of need, along with survey information from individual fire districts about high hazard areas. Additional information about this plan can be found on the emergency management website at: www.parkco.us/oem.htm.

Since that time, Park County fire districts have been working on various fire mitigation projects, ranging from slash programs to neighborhoods becoming ***FireWise*** communities.

11.3 SECONDARY HAZARDS

Wildfires can generate a range of secondary effects, which in some cases may cause more widespread and prolonged damage than the fire itself. Fires can cause direct economic losses in the reduction of harvestable timber and indirect economic losses in reduced tourism. Wildfires cause the contamination of reservoirs, destroy transmission lines and contribute to flooding. They strip slopes of vegetation, exposing them to greater amounts of runoff. This in turn can weaken soils and cause failures on slopes. Major landslides can occur several years after a wildfire. Most wildfires burn hot and for long durations that can bake soils, especially those high in clay content, thus increasing the imperviousness of the ground. This increases the runoff generated by storm events, thus increasing the chance of flooding.

There are numerous secondary effects of wildfires that could impact Park County. These include impacts on tourism, and thus the local economy, through activities such as camping, hiking, hunting, and fishing. The impacts can include physical losses, such as heavily burned landscapes, or degraded property values and loss of tourism due to a perception that an event inflicted more widespread damage than it actually caused. Additional secondary impacts due to wildfire include a degradation of air and water quality, as well as a threat to wildlife habitat including endangered species.

The risk of flooding increases significantly following any fire event. Fires cause problems with soil impermeability and increased potential for debris flows. Flash floods have been often documented in the wake of wildfires, in general in the western United States and specifically in Colorado. Most notably, in nearby Jefferson County, the Buffalo Creek Flood killed two people and destroyed 4 homes and the town of Buffalo Creek's fire station less than two months after a wildfire burned 11,900 acres in the same area

in May of 1995. Post-wildfire flooding has also occurred in the portion of Park County within the Hayman fire burn area, including the Sportsman's Paradise subdivision near Lake George.

There are significant costs of long-term rehabilitation of the fire area. Often, the greatest costs or impacts to communities and people occur after the fire is out. Costs range from long-term forest rehabilitation to the rebuilding of infrastructure lost in the event.

11.4 CLIMATE CHANGE IMPACTS

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

Historically, drought patterns in the West are related to large-scale climate patterns in the Pacific and Atlantic oceans. The El Niño–Southern Oscillation in the Pacific varies on a 5- to 7-year cycle, the Pacific Decadal Oscillation varies on a 20- to 30-year cycle, and the Atlantic Multidecadal Oscillation varies on a 65- to 80-year cycle. As these large-scale ocean climate patterns vary in relation to each other, drought conditions in the U.S. shift from region to region.

Climate scenarios project summer temperature increases between 2ºC and 5°C and precipitation decreases of up to 15 percent. Such conditions would exacerbate summer drought and further promote high-elevation wildfires, releasing stores of carbon and further contributing to the buildup of greenhouse gases. Forest response to increased atmospheric carbon dioxide—the so-called "fertilization effect"—could also contribute to more tree growth and thus more fuel for fires, but the effects of carbon dioxide on mature forests are still largely unknown. High carbon dioxide levels should enhance tree recovery after fire and young forest regrowth, as long as sufficient nutrients and soil moisture are available, although the latter is in question for many parts of the western United States because of climate change.

11.5 EXPOSURE

Values-at-risk is an assessment of which items that are important to people and communities, as well as natural resources, could be lost or negatively impacted by a wildfire. These include many items, such as homes, businesses, and other developments, infrastructure, air sheds, watersheds, recreation areas, utilities, wildlife habitat, etc. The more of these values there are, and the greater their importance to people and communities, the more the potential risk.

- Infrastructure – This includes roads, utility lines, and railroads
- Property – This includes homes, private land, livestock and agriculture holdings.
- Critical Facilities – This includes important government facilities including hospitals, police and fire facilities, schools, and any other facilities deemed essential by the County
- Watersheds – Wildfires can affect water quality and will significantly increase the risk of flooding and debris flows in the wake of a wildfire event.

11.5.1 Population

Population could not be examined because census block group areas do not coincide with the fire risk areas nor do the County records (assessors etc.) support analysis at this level.

11.5.2 Property

Property damage from wildfires can be severe and can significantly alter entire communities. Exposure values in the various wildfire hazard zones in the planning area are shown in Table 11-2 through Table 11-5, based on HAZUS-MH census block data.

TABLE 11-2.
EXPOSURE AND VALUE OF STRUCTURES IN HIGH WILDFIRE RISK AREAS

Jurisdiction	Value Exposed			% of Total Assessed Value
	Structure	Contents	**Total**	
Alma	$0	$0	$0	0.00%
Fairplay	$0	$0	$0	0.00%
North-West FPD	$0	$0	$0	0.00%
Platte Canyon FPD	$3,252,775	$1,731,461	$4,984,236	0.47%
Southern Park County FPD	$42,778	$25,656	$68,435	0.07%
Area Outside of Jurisdictions	$6,229,423	$3,285,059	$9,514,482	1.36%
Total	**$9,524,976**	**$5,042,177**	**$14,567,153**	**0.62%**

TABLE 11-3.
EXPOSURE AND VALUE OF STRUCTURES IN MODERATE WILDFIRE RISK AREAS

Jurisdiction	Value Exposed			% of Total Assessed Value
	Structure	Contents	**Total**	
Alma	$0	$0	$0	0.00%
Fairplay	$0	$0	$0	0.00%
North-West FPD	$6,017,545	$3,069,019	$9,086,565	2.58%
Platte Canyon FPD	$135,622,766	$74,794,767	$210,417,534	19.87%
Southern Park County FPD	$2,751,763	$1,574,500	$4,326,262	4.40%
Area Outside of Jurisdictions	$35,512,062	$18,860,529	$54,372,591	7.76%
Total	**$179,904,136**	**$98,298,815**	**$278,202,952**	**11.85%**

TABLE 11-4.
EXPOSURE AND VALUE OF STRUCTURES IN LOW WILDFIRE RISK AREAS

Jurisdiction	Value Exposed			% of Total Assessed Value
	Structure	Contents	**Total**	
Alma	$0	$0	$0	0.00%
Fairplay	$2,180,303	$1,111,575	$3,291,878	3.38%
North-West FPD	$28,283,120	$14,770,989	$43,054,109	12.23%
Platte Canyon FPD	$395,317,073	$220,366,987	$615,684,060	58.14%
Southern Park County FPD	$17,660,313	$9,800,564	$27,460,877	27.91%
Area Outside of Jurisdictions	$98,902,039	$57,387,453	$156,289,491	22.31%
Total	**$542,342,848**	**$303,437,568**	**$845,780,416**	**36.04%**

TABLE 11-5.
EXPOSURE AND VALUE OF STRUCTURES IN LOWEST WILDFIRE RISK AREAS

Jurisdiction	Value Exposed			% of Total Assessed Value
	Structure	Contents	**Total**	
Alma	$19,026,028	$10,691,057	$29,717,085	74.65%
Fairplay	$27,749,063	$14,957,677	$42,706,740	43.89%
North-West FPD	$193,001,657	$103,787,458	$296,789,115	84.32%
Platte Canyon FPD	$173,546,802	$100,244,757	$273,791,559	25.85%
Southern Park County FPD	$59,331,472	$33,367,178	$92,698,650	94.21%
Area Outside of Jurisdictions	$240,136,351	$135,120,016	$375,256,367	53.57%
Total	**$712,791,374**	**$398,168,142**	**$1,110,959,516**	**47.33%**

11.5.3 Critical Facilities and Infrastructure

Table 11-6 identifies critical facilities exposed to the wildfire hazard in the county. Currently there are 12 registered Tier II hazardous material containment sites in wildfire risk zones. During a wildfire event, these materials could rupture due to excessive heat and act as fuel for the fire, causing rapid spreading and escalating the fire to unmanageable levels. In addition they could leak into surrounding areas, saturating soils and seeping into surface waters, and have a disastrous effect on the environment.

In the event of wildfire, there would likely be little damage to the majority of infrastructure. Most road and railroads would be without damage except in the worst scenarios. Power lines are the most at risk to wildfire because most are made of wood and susceptible to burning. In the event of a wildfire, pipelines could provide a source of fuel and lead to a catastrophic explosion.

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TABLE 11-6.
CRITICAL FACILITIES AND INFRASTRUCTURE IN WILDFIRE RISK AREAS

	Number of Critical Facilities in Hazard Zone			
	Lowest Risk	Low Risk	Moderate Risk	High Risk
Medical and Health Services	5	0	1	0
Protective Function	24	4	4	0
Schools	5	2	1	0
Hazmat	8	4	0	0
Other Critical Function	9	3	2	0
Bridges	26	9	4	2
Water	5	2	0	0
Wastewater	0	2	0	0
Power	4	0	0	0
Communications	6	4	1	0
Total	**92**	**30**	**13**	**2**

11.5.4 Environment

Fire is a natural and critical ecosystem process in most terrestrial ecosystems, dictating in part the types, structure, and spatial extent of native vegetation. However, wildfires can cause severe environmental impacts:

- Damaged Fisheries—Critical fisheries can suffer from increased water temperatures, sedimentation, and changes in water quality.
- Soil Erosion—The protective covering provided by foliage and dead organic matter is removed, leaving the soil fully exposed to wind and water erosion. Accelerated soil erosion occurs, causing landslides and threatening aquatic habitats.
- Spread of Invasive Plant Species—Non-native woody plant species frequently invade burned areas. When weeds become established, they can dominate the plant cover over broad landscapes, and become difficult and costly to control.
- Disease and Insect Infestations—Unless diseased or insect-infested trees are swiftly removed, infestations and disease can spread to healthy forests and private lands. Timely active management actions are needed to remove diseased or infested trees.
- Destroyed Endangered Species Habitat—Catastrophic fires can have devastating consequences for endangered species.
- Soil Sterilization—Topsoil exposed to extreme heat can become water repellant, and soil nutrients may be lost. It can take decades or even centuries for ecosystems to recover from a fire. Some fires burn so hot that they can sterilize the soil.

Many ecosystems are adapted to historical patterns of fire occurrence. These patterns, called “fire regimes,” include temporal attributes (e.g., frequency and seasonality), spatial attributes (e.g., size and spatial complexity), and magnitude attributes (e.g., intensity and severity), each of which have ranges of natural variability. Ecosystem stability is threatened when any of the attributes for a given fire regime diverge from its range of natural variability.

11.6 VULNERABILITY

Structures, above-ground infrastructure, critical facilities and natural environments are all vulnerable to the wildfire hazard. There is currently no validated damage function available to support wildfire mitigation planning. Except as discussed in this section, vulnerable populations, property, infrastructure and environment are assumed to be the same as described in the section on exposure.

Likelihood of Values at Risk Being Affected by Wildfire – Given that a fire has started, that it is behaving dangerously, that there are values at risk, it is possible to determine the likelihood that those values will actually be affected by the fire. Characteristics such as local firefighting capacity, response times, accessibility to subdivisions or other values, structure design, defensible space, fuel treatments, etc. define this likelihood.

- Availability of Suppression Resources – Suppression resources include manpower, hand equipment, vehicles, and aircraft with fire retardant or water.
- Response Times – How quickly people and equipment can get to a fire. Wind and precipitation conditions can affect the ability to combat fires with air tankers and helicopters.
- Construction Materials – The flammability of the materials used to build any values at risk will determine its risk of being affected by a wildfire.
- Water Sources – Helicopters, air tankers and tanker trucks depend on water sources such as streams, lakes and ponds.
- Accessibility to Values at Risk - Steep slopes are a detriment to firefighting efforts because of the difficulty in accessing and transporting firefighting equipment to wildfire sites. A road's driving condition, its width, its grade and the radius of turns will all affect accessibility of vehicles to combat a fire.

Wildfires can be described as either a wildland fire or a WUI fire. The former involves situations where wildfire occurs in an area that is mostly undeveloped except for the possible existence of basic infrastructure such as roads and power lines. A wildland-urban interface fire is a wildfire that impacts an area that includes structures and other human developments. In WUI fires, the fire is fueled by both naturally occurring vegetation and the urban structural elements themselves. According to the National Fire Plan issued by the U.S. Departments of Agriculture and Interior, the wildland-urban interface is defined as "…the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildlands or vegetative fuels."

Over the years, many of Colorado's forests, primarily in the mid-elevation zones populated by ponderosa pine and Douglas Fir, have become denser, making them more susceptible to insect and disease infection and crown fires. In many locations they have also accumulated significantly greater levels of surface fuels.

Historically, these types of forests burned on a relatively short interval (10 to 40 years), with low to moderate intensities. Fire suppression has been the primary tool in combating past wildfires in Park County. As a result, forests have seen relatively unfettered growth of trees and underbrush. This has resulted in significant increases in fuels for fire. Fire suppression, historical logging and grazing practices, as well as many other changes in land use since the turn of the 19th century, have created conditions where there is a much greater potential for larger and higher intensity fires.

Drought conditions greatly increase the risk for wildfire in the arid Inter-Mountain West and specifically in Park County. A prolonged period of higher temperatures and decreased precipitation leads to adversely dry trees and forest undergrowth. Drought also exacerbates other problems like changing fuel conditions,

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beetle kill and other diseases. Oftentimes in years of drought, snowpack will melt away earlier than normal and leave forests dry and vulnerable for a longer period of time. Such conditions led to 2002 being one of the worst fire seasons in Park County and across Colorado on record. Such conditions will affect even the County's highest elevation areas that normally see low wildfire risk.

Another emerging risk for forests is pine-beetle. Many areas in Colorado, including the Arkansas Valley, as well as Jackson, Grand, Routt, Eagle and Summit Counties, have experienced mountain pine beetle epidemics. Other insect or diseases are also occurring in many locations in Colorado. Though Park County has not seen beetle infestations to the same degree as the aforementioned areas, some beetle kill has begun to spread over the continental divide from Summit County as well as areas in and around Bailey. Trees killed by pine beetle are particularly susceptible to crown fires and add to surface fuel loading as they fall.

11.6.1 Population

There are no recorded incidents of loss of life from wildfires within the planning area. Given the immediate response times to reported fires, the likelihood of injuries and casualties is minimal; therefore, injuries and casualties were not estimated for the wildfire hazard.

Smoke and air pollution from wildfires can be a severe health hazard, especially for sensitive populations, including children, the elderly and those with respiratory and cardiovascular diseases. Smoke generated by wildfire consists of visible and invisible emissions that contain particulate matter (soot, tar, water vapor, and minerals), gases (carbon monoxide, carbon dioxide, nitrogen oxides), and toxics (formaldehyde, benzene). Emissions from wildfires depend on the type of fuel, the moisture content of the fuel, the efficiency (or temperature) of combustion, and the weather. Public health impacts associated with wildfire include difficulty in breathing, odor, and reduction in visibility.

Wildfire may also threaten the health and safety of those fighting the fires. First responders are exposed to the dangers from the initial incident and after-effects from smoke inhalation and heat stroke.

11.6.2 Property

Loss estimations for the wildfire hazard are not based on damage functions, because no such damage functions have been generated. Instead, loss estimates were developed representing 10 percent, 30 percent and 50 percent of the assessed value of exposed structures. This allows emergency managers to select a range of economic impact based on an estimate of the percent of damage to the general building stock. Damage in excess of 50 percent is considered to be substantial by most building codes and typically requires total reconstruction of the structure. Table 11-7 lists the loss estimates for the general building stock for jurisdictions that have an exposure to a fire hazard severity zone.

11.6.3 Critical Facilities and Infrastructure

Critical facilities of wood frame construction are especially vulnerable during wildfire events. In the event of wildfire, there would likely be little damage to most infrastructure. Most roads and railroads would be without damage except in the worst scenarios. Power lines are the most at risk from wildfire because most poles are made of wood and susceptible to burning. Fires can create conditions that block or prevent access and can isolate residents and emergency service providers. Wildfire typically does not have a major direct impact on bridges, but it can create conditions in which bridges are obstructed. Many bridges in areas of high to moderate fire risk are important because they provide the only ingress and egress to large areas and in some cases to isolated neighborhoods.

TABLE 11-7.
LOSS ESTIMATES FOR WILDFIRE

		Estimated Loss Potential from Wildfire		
	Exposed Value	10% Damage	30% Damage	50% Damage
Alma	$29,717,085	$2,971,708.50	$8,915,125.50	$14,858,542.50
Fairplay	$45,998,618	$4,599,861.80	$13,799,585.40	$22,999,309.00
North-West FPD	$348,929,789	$34,892,978.90	$104,678,936.70	$174,464,894.50
Platte Canyon FPD	$1,104,877,389	$110,487,738.90	$331,463,216.70	$552,438,694.50
Southern Park County FPD	$124,554,224	$12,455,422.40	$37,366,267.20	$62,277,112.00
Area Outside of Jurisdictions	$595,432,931	$59,543,293.10	$178,629,879.30	$297,716,465.50
Total	**$2,249,510,037**	**$224,951,003**	**$674,853,011**	**$1,124,755,018**

11.7 FUTURE TRENDS IN DEVELOPMENT

The county has experienced moderate growth over the past 10 years. However, similar to most of the State, economic challenges in the past years likely impacted growth in the County, with some area experiencing negative growth. Park County and its planning partners are optimistic that sustained growth will return to the county as the state and national economies strengthen.

The highly urbanized portions of the planning area have little or no wildfire risk exposure. Urbanization tends to alter the natural fire regime, and can create the potential for the expansion of urbanized areas into wildland areas. The expansion of the wildland urban interface can be managed with strong land use and building codes. The planning area is well equipped with these tools and this planning process has asked each planning partner to assess its capabilities with regards to the tools. As the planning area experiences future growth, it is anticipated that the exposure to this hazard will remain as assessed or even decrease over time due to these capabilities.

11.8 SCENARIO

A major conflagration in the planning area might begin with a wet spring, adding to fuels already present on the forest floor. Flashy fuels would build throughout the spring. The summer could see the onset of insect infestation. A dry summer could follow the wet spring, exacerbated by dry hot winds. Carelessness with combustible materials or a tossed lit cigarette, or a sudden lighting storm could trigger a multitude of small isolated fires.

The embers from these smaller fires could be carried miles by hot, dry winds. The deposition zone for these embers would be deep in the forests and interface zones. Fires that start in flat areas move slower, but wind still pushes them. It is not unusual for a wildfire pushed by wind to burn the ground fuel and later climb into the crown and reverse its track. This is one of many ways that fires can escape containment, typically during periods when response capabilities are overwhelmed. These new small fires would most likely merge. Suppression resources would be redirected from protecting the natural resources to saving more remote subdivisions.

The worst-case scenario would include an active fire season throughout the American west, spreading resources thin. Firefighting teams would be exhausted or unavailable. Many federal assets would be responding to other fires that started earlier in the season. While local fire districts would be extremely

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useful in the urban interface areas, they have limited wildfire capabilities or experience, and they would have a difficult time responding to the ignition zones. Even though the existence and spread of the fire is known, it may not be possible to respond to it adequately, so an initially manageable fire can become out of control before resources are dispatched.

To further complicate the problem, heavy rains could follow, causing flooding and landslides and releasing tons of sediment into rivers, permanently changing floodplains and damaging sensitive habitat and riparian areas. Such a fire followed by rain could release millions of cubic yards of sediment into streams for years, creating new floodplains and changing existing ones. With the forests removed from the watershed, stream flows could easily double. Floods that could be expected every 50 years may occur every couple of years. With the streambeds unable to carry the increased discharge because of increased sediment, the floodplains and floodplain elevations would increase.

11.9 ISSUES

The major issues for wildfire are the following:

- Public education and outreach to people living in or near the fire hazard zones should include information about and assistance with mitigation activities such as defensible space, and advance identification of evacuation routes and safe zones.
- Wildfires could cause landslides as a secondary natural hazard.
- Climate change could affect the wildfire hazard.
- Future growth into interface areas should continue to be managed.
- Area fire districts need to continue to train on wildland-urban interface events.
- Vegetation management activities. This would include enhancement through expansion of the target areas as well as additional resources.
- Regional consistency of higher building code standards such as residential sprinkler requirements and prohibitive combustible roof standards.
- Fire department water supply in high risk wildfire areas.
- Expand certifications and qualifications for fire department personnel. Ensure that all firefighters are trained in basic wildfire behavior, basic fire weather, and that all company officers and chief level officers are trained in the wildland command and strike team leader level.

CHAPTER 12.
DAM FAILURE

12.1 GENERAL BACKGROUND

Dam failure hazard was ranked as low across the county with the exception of the southern portion of Park County. While hazards ranked as low are not required to be profiled, information for the full county was included in this plan update.

12.1.1 Causes of Dam Failure

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

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

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

DEFINITIONS

Dam—Any artificial barrier and/or any controlling works, together with appurtenant works, that can or does impound or divert water.

Dam Failure—An uncontrolled release of impounded water due to structural deficiencies in dam.

Emergency Action Plan—A document that identifies potential emergency conditions at a dam and specifies actions to be followed to minimize property damage and loss of life. The plan specifies actions the dam owner should take to alleviate problems at a dam. It contains procedures and information to assist the dam owner in issuing early warning and notification messages to responsible downstream emergency management authorities of the emergency situation. It also contains inundation maps to show emergency management authorities the critical areas for action in case of an emergency. (FEMA 64)

High Hazard Dam—Dams where failure or operational error will probably cause loss of human life. (FEMA 333)

Significant Hazard Dam—Dams where failure or operational error will result in no probable loss of human life but can cause economic loss, environmental damage or disruption of lifeline facilities, or can impact other concerns. Significant hazard dams are often located in rural or agricultural areas but could be located in areas with population and significant infrastructure. (FEMA 333)

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

12.1.2 Regulatory Oversight

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

U.S. Army Corps of Engineers Dam Safety Program

The U.S. Army Corps of Engineers is responsible for safety inspections of some federal and non-federal dams in the United States that meet the size and storage limitations specified in the National Dam Safety Act. The Corps has inventoried dams; surveyed each state and federal agency's capabilities, practices and regulations regarding design, construction, operation and maintenance of the dams; and developed guidelines for inspection and evaluation of dam safety (U.S. Army Corps of Engineers, 1997).

Federal Energy Regulatory Commission Dam Safety Program

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

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

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

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

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

12.2 HAZARD PROFILE

12.2.1 Location

Dam failure inundation maps have been prepared for the 23 dams in Park County that are regulated by the Colorado Division of Water Resources. A 24th dam, Altura (Duck Lake) Dam, which is one mile north of

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Park County in Clear Creek County, is included in this risk assessment because it drains directly into Park County and would affect Park County if it failed. Any low-lying areas below these dams that have been identified in the dam failure inundation maps are at potential risk for a dam failure flood. The dam failure inundation maps are on file at the Dam Safety Branch of the Division of Water Resources. For security reasons access to these maps is strictly controlled.

Table 12-1 lists all regulated dams affecting Park County. The 23 dams in Park County that are regulated by the Colorado Division of Water Resources are in various locations within six of the eight major watersheds in the county. A 24th dam, Altura (Duck Lake) Dam, located a mile north of Park County on Guanella Pass Road in Clear Creek County, is included since it drains directly into Park County and its failure would affect Park County more than Clear Creek County. The six major reservoirs in Park County that are owned or operated by outside entities warrant more significant planning consideration and a vulnerability analysis. The size and location of these reservoirs means that they present the greatest risk to communities or infrastructure in the case of a dam failure. Table 12-2 denotes the location, and ownership status of each of the six reservoirs.

The portions of Park County most susceptible to dam failure flooding are areas downstream of the 24 regulated dams that are directly adjacent to the county's major drainage ways and selected smaller tributaries. The dam failure flooding hazards in each of the major watersheds are as follows:

- **Elk Creek Basin—**The section of Elk Creek and its tributaries that is most susceptible to flooding is between the Mt. Evans Wilderness and Harris Park. There is residential development along the main stem of Elk Creek and several of its tributaries. None of the six major reservoirs is located within this basin and none has the potential to impact the basin directly.
- **Deer Creek Basin—**The section of Deer Creek and its tributaries that is most susceptible to flooding extends from Highland Park, beyond U.S. Highway 285, all the way to the confluence of Deer Creek with the North Fork of the South Platte River near the Park County-Jefferson County line. There is residential development along the main stem of Deer Creek and several of its tributaries. None of the twenty four regulated dams is located within the Deer Creek Basin and none has the potential to impact the basin directly. None of the six major reservoirs is located within this basin and none has the potential to impact the basin directly.
- **North Fork South Platte Basin—**The section of the North Fork of the South Platte and its tributaries that is most susceptible to flooding is in the corridor between Grant and Bailey along U.S. Highway 285. There is residential and commercial development along the main stem of the North Fork and several of its tributaries. None of the six major reservoirs is located within this basin and none has the potential to impact the basin directly.
- **Tarryall Creek Basin—**The section of Tarryall Creek and its tributaries that is most susceptible to flooding is in the corridor between the developments just north of U.S. Highway 285 in the vicinity of Jefferson and Como all the way to Tarryall Reservoir. There is development along the main stem of the Tarryall Creek and several of its tributaries. Two of the six major reservoirs are located within the Tarryall Creek Basin. Dam failure flooding would cause adverse impacts in portions of the basin directly downstream of these reservoirs. The section of Tarryall Creek and its tributaries that is most susceptible to flooding is in the corridor between the developments just north of U.S. Highway 285 in the vicinity of Jefferson and Como all the way to Tarryall Reservoir. There is development along the main stem of the Tarryall Creek and several of its tributaries. In addition, dam failure flooding in the Tarryall Creek Basin could cause flooding downstream of the confluence of Tarryall Creek with the South Platte River, within the South Platte River Basin.

TABLE 12-1.
REGULATED DAMS IN PARK COUNTY

Dam	Watershed	Major Reservoir
Antero Dam	South Fork South Platte River	Yes
Altura (Duck Lake) Dam*	North Fork South Platte River	
Baker Dam	Tarryall Creek	
Bayou Salado Dam	Tarryall Creek	
Buffalo Creek Dam	South Fork South Platte River	
Camp Alexander Dam	South Fork South Platte River	
Cline Dam	Tarryall Creek	
Eleven Mile Canyon Dam	South Platte River	Yes
Estates Number 1 Dam	Elk Creek	
Jefferson Lake Dam	Tarryall Creek	Yes
Joe Wilson Recreation Dam	South Platte River	
Krain Dam	Tarryall Creek	
Lake George Dam	South Platte River	
Lininger Lake Dam	North Fork South Platte River	
Lower Michigan Dam	Tarryall Creek	
Montgomery Dam	Middle Fork South Platte River	Yes
OYE Dam	South Fork South Platte River	
Spinney Mountain Dam	South Platte River	Yes
Tarryall Dam	Tarryall Creek	Yes
Tarryall Ranch Reservoir Number 1 Dam	Tarryall Creek	
Upper Michigan Dam	Tarryall Creek	
Wagon Tongue Dam	South Platte River	
Wagon Tongue Number 2 Dam	South Platte River	
Whiteford Lake Dam	North Fork South Platte River	

Source: http://www.hometownlocator.com/DisplayCountyFeatures.cfm?FeatureType=dam&SCFIPS=08093
* Duck Lake is in Clear Creek County, 1 mile north of the Park County line. This reservoir drains into Park County.

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TABLE 12-2.
MAJOR RESERVOIRS

Reservoir	Watershed Where Reservoir Is Located	Other Watersheds Potentially Affected	Owner/ Operator	Downstream Communities and Infrastructure
Antero Reservoir	South Fork South Platte River	South Platte River	Denver Water	Hartsel, Lake George, Spinney Mountain Reservoir, Eleven Mile Reservoir, U.S. 24
Eleven Mile Reservoir	South Platte River		Denver Water	Lake George, U.S. 24
Jefferson Lake	Tarryall Creek	South Platte River	City of Aurora	Jefferson, Tarryall Reservoir, U.S. 285
Montgomery Reservoir	Middle Fork South Platte River	South Platte River	Colorado Springs Utilities	Town of Alma, Town of Fairplay, Hartsel, Lake George, Spinney Mountain Reservoir, Eleven Mile Reservoir, State Highway 9, U.S. 285, U.S. 24
Spinney Mountain Reservoir	South Platte River		City of Aurora	Lake George, Eleven Mile Reservoir, U.S. 24
Tarryall Reservoir	Tarryall Creek	South Platte River	Division of Wildlife	Tarryall, Private Subdivisions near Lake George

- Middle Fork South Platte Basin:
  - **Middle Fork South Platte River (unincorporated Park County)—**The section of the Middle Fork of the South Platte and its tributaries within unincorporated Park County that is most susceptible to flooding is in the corridor between Hoosier Pass and the Town of Fairplay along State Highway 9 and several county roads. There is residential and commercial development along the main stem of the Middle Fork and several of its tributaries. One of the six major reservoirs is located within the Middle Fork South Platte River Basin. Dam failure flooding would cause adverse impacts in portions of the basin directly downstream of this reservoir that is within unincorporated Park County. The section of the Middle Fork of the South Platte and its tributaries within unincorporated Park County that is most susceptible to flooding is in the corridor between Hoosier Pass and the Town of Fairplay along State Highway 9 and several county roads. There is residential and commercial development along the main stem of the Middle Fork and several of its tributaries. In addition, dam failure flooding in the Middle Fork South Platte River Basin could cause flooding downstream of the confluence of the Middle Fork of the South Platte River with the South Fork of the South Platte River, within the South Platte River Basin.
  - **Middle Fork South Platte River (Alma)—**The Middle Fork of the South Platte and Buckskin Creek within the Town of Alma are susceptible to flooding. There is residential and commercial development along the main stem of the Middle Fork and Buckskin Creek. One of the six major reservoirs is located within the Middle Fork South Platte River Basin. Dam failure flooding would cause adverse impacts in portions of the basin directly downstream of this reservoir that is within the Town of Alma. The Middle Fork of the South Platte and Buckskin Creek within the Town of Alma are susceptible to flooding. There is residential and commercial development along the main stem of the

Middle Fork and Buckskin Creek. In addition, dam failure flooding in the Middle Fork South Platte River Basin could cause flooding downstream of the confluence of the Middle Fork of the South Platte River with the South Fork of the South Platte River, within the South Platte River Basin.

– **Middle Fork South Platte River (Fairplay)—**The Middle Fork of the South Platte and various dry gulches within the Town of Fairplay are susceptible to flooding. There is residential and commercial development along the main stem of the Middle Fork and various dry gulches. One of the six major reservoirs is located within the Middle Fork South Platte River Basin. Dam failure flooding would cause adverse impacts in portions of the basin directly downstream of this reservoir that is within the Town of Fairplay. The Middle Fork of the South Platte and various dry gulches within the Town of Fairplay are susceptible to flooding. There is residential and commercial development along the main stem of the Middle Fork and various dry gulches. In addition, dam failure flooding in the Middle Fork South Platte River Basin could cause flooding downstream of the confluence of the Middle Fork of the South Platte River with the South Fork of the South Platte River, within the South Platte River Basin.

- **South Fork South Platte Basin—**The sections of the South Fork of the South Platte River and its tributaries which are most susceptible to flooding are in the corridor between the U.S. Forest Service's boundary with private property and State Highway 9 and the corridor between Antero Reservoir and Hartsel. There is a moderate amount of development along the main stem of the South Fork and some of its tributaries. One of the six major reservoirs is located within the South Fork South Platte River Basin. Dam failure flooding would cause adverse impacts in portions of the basin directly downstream of this reservoir. The sections of the South Fork of the South Platte River and its tributaries which are most susceptible to flooding are in the corridor between the U.S. Forest Service's boundary with private property and State Highway 9 and the corridor between Antero Reservoir and Hartsel. There is a moderate amount of development along the main stem of the South Fork and some of its tributaries. In addition, dam failure flooding in the South Fork South Platte River Basin could cause flooding downstream of the confluence of the South Fork of the South Platte River with the Middle Fork of the South Platte River, within the South Platte River Basin.
- **South Platte River Basin—**The sections of the South Platte River and its tributaries that are most susceptible to flooding are the Hartsel area and the Lake George area. There is a moderate amount of development along the main stem of the South Platte and some of its tributaries. Two of the six major reservoirs are located within the South Platte River Basin and the other four major reservoirs have the potential to impact the basin directly. The sections of the South Platte River and its tributaries that are most susceptible to flooding are the Hartsel area and the Lake George area. There is a moderate amount of development along the main stem of the South Platte and some of its tributaries.
- **Arkansas River Headwaters Basin—**The section of the Arkansas River Headwaters Basin and tributaries that is most susceptible to flooding is the Guffey area. There is a small amount of development along the main stems of two of the major tributaries, Badger Creek and Currant Creek and tributaries to those streams and to Four Mile Creek. None of the 24 regulated dams is located within the Arkansas River Headwaters Basin and none has the potential to impact the basin directly.

Dam failure inundation maps have been prepared for all 24 dams in or immediately adjacent to Park County that are regulated by the Colorado Division of Water Resources, including the six reservoirs deemed in the Vulnerability Analysis to be "major reservoirs". While all 24 reservoirs pose some risk to Park County, the size and location of the six major reservoirs means that they present the greatest risk to

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communities or infrastructure in the case of a dam failure. The dam failure inundation maps are on file at the Dam Safety Branch of the Division of Water Resources. For security reasons access to these maps is, and must continue to be, strictly controlled.

12.2.2 Frequency

Dam failure events are infrequent and usually coincide with events that cause them, such as earthquakes, landslides and excessive rainfall and snowmelt. There is a "residual risk" associated with dams. Residual risk is the risk that remains after safeguards have been implemented. For dams, the residual risk is associated with events beyond those that the facility was designed to withstand. However, the probability of any type of dam failure is low in today's regulatory and dam safety oversight environment.

12.2.3 Severity

According to the Association of State Dam Safety Officials, the hazard potential classification for a dam is intended to rank dams in terms of potential losses to downstream interests if the dam should fail for any reason. The classification is based on the incremental adverse consequences (after vs. before) of failure or improper operation of the dam, and has no relationship to the current structural integrity, operational status, flood routing capability, or safety condition of the dam or its appurtenances. The hazard potential classification is based on potential adverse impacts/losses in four categories: environmental, life line, economic, and/or human life.

FEMA Publication No. 333 has adopted three hazard potential classification categories for dams as follows: LOW, SIGNIFICANT, and HIGH HAZARD POTENTIAL, listed in order of increasing incremental adverse consequences. When loss of one or more human lives is probable, High Potential Hazard classification if required. Some regulators use numbers or letters in lieu of these titles and may have more than three hazard potential classifications based on legislative requirements or agency history.

The selection of a hazard potential classification for a dam should be made using a phased approach utilizing three levels of effort: presumptive, incremental hazard assessment (dam break studies), and risk based assessment. It is intended that the engineer making the classification determination will proceed from the simplest method (presumptive) using existing data and field reconnaissance, to the most complex (risk based assessment) in a step sequence. In most cases, all three methods will not be required.

The hazard potential classification for a dam may change over time. New downstream development, raising of a dam to increase storage, the finding of an endangered or threatened species (plant or animal), revisions to National Weather Service Hydrometerological Reports, or downstream land use changes could warrant changing the hazard potential classification of the dam. Thus, it will be necessary to periodically review and update the classification of each dam based on the prior documented classification. It is recommended that the hazard potential classification review cycle for each dam correspond to the inspection frequency adopted by the regulatory agency.

For projects with several independent elements (dams, spillways, powerhouse, low level outlet, etc.), the overall Project hazard potential classification will be that assigned to the highest rated project element.

Size classification is based on either structural height or reservoir storage capacity, whichever gives the higher classification. Size classifications (Table 12-3) are SMALL, INTERMEDIATE, or LARGE. Height and/or storage capacity are used by many states to legislatively define State Dam Safety office jurisdictional or non-jurisdictional dams. In some states, very high or large storage dams are automatically assigned High Hazard Potential. The size classification is also used to define dams listed in the U.S. Army Corps of Engineers National Inventory of Dams.

TABLE 12-3.
CORPS OF ENGINEERS HAZARD POTENTIAL CLASSIFICATION

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

a. Categories are assigned to overall projects, not individual structures at a project.
b. Loss of life potential based on inundation mapping of area downstream of the project. Analyses of loss of life potential should take into account the population at risk, time of flood wave travel, and warning time.
c. Indirect threats to life caused by the interruption of lifeline services due to project failure or operational disruption; for example, loss of critical medical facilities or access to them.
d. Damage to project facilities and downstream property and indirect impact due to loss of project services, such as impact due to loss of a dam and navigation pool, or impact due to loss of water or power supply.
e. Environmental impact downstream caused by the incremental flood wave produced by the project failure, beyond what would normally be expected for the magnitude flood event under which the failure occurs.

Source: U.S. Army Corps of Engineers, 1995

The hazard potential and size classifications of a project depend on the legislative authority, rules, and regulations of the project regulatory authority, and can vary significantly between state and federal agencies.

The aftermath of a dam failure can range from moderate to severe. It is likely that the failure of major dams will cause widespread loss of life downstream to humans and animals, as well as extreme environmental stress along the flood path. Water supplies upstream could be left completely dry, while water supplies downstream are overrun or contaminated with debris from the ensuing flood.

12.2.4 Warning Time

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

Park County and its planning partners have established protocols for flood warning and response to imminent dam failure in the flood warning portion of its adopted emergency operations plan. These protocols are tied to the emergency action plans created by the dam owners.

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All of the dams in the county meet regulatory standards; none of them pose an immediate threat of failing. However, if one were to fail, the potential effects from dam failures could be varied depending on the scope and location of such a failure. For example, a failure of the Montgomery Dam could have catastrophic effects on the towns of Alma and Fairplay, as well as to infrastructure such as State Highway 9 and U.S. 285, and possibly to dams downstream on the South Platte. It could also have severe environmental impacts along the Middle Fork of the South Platte and the South Platte. A failure of Antero Dam could have a domino effect, triggering the failure of Spinney Mountain Dam and Eleven Mile Dam downstream. Similarly a failure of Spinney Mountain Dam could trigger the failure of Eleven Mile Dam downstream. The effects of such a domino scenario would include flooding of Lake George, U.S. 24, numerous private subdivisions and eventually infrastructure in downstream counties, including Cheesman Reservoir. Any dam failure could pose severe to catastrophic effects on downstream areas, as well as severe to catastrophic economic effects on the county.

12.3 SECONDARY HAZARDS

Dam failure can cause severe downstream flooding, depending on the magnitude of the failure. Other potential secondary hazards of dam failure are landslides around the reservoir perimeter, bank erosion on the rivers, and destruction of downstream habitat.

If a significant flood event occurs, there is a potential for a variety of secondary impacts. Some of the most common secondary effects of flooding are impacts to infrastructure and utilities such as roadways, water service, and wastewater treatment, and impacts to local commerce, including tourism. Many of the roadways in the County are vulnerable to damage due to floodwaters. The effect of flood damages to roadways can limit access to areas, cutting off some residents from emergency services as well as other essential services, as well as hampering outsiders visiting the County or traveling through on their way to other destinations.

Since a major heating source in the area is propane gas, there may be many properties in floodplains with above-ground fuel storage tanks. It is likely that the majority of tanks in the floodplain are not secured or strapped down. If these tanks were to be damaged or dislodged during a flood event, the resulting gas leaks could present serious explosion risks. Tanks can also become floating projectiles in quickly moving floodwaters, causing serious damage to property and danger to individuals in their path.

12.4 CLIMATE CHANGE IMPACTS

Dams are designed partly based on assumptions about a river’s flow behavior, expressed as hydrographs. Changes in weather patterns can have significant effects on the hydrograph used for the design of a dam. If the hygrograph changes, it is conceivable that the dam can lose some or all of its designed margin of safety, also known as freeboard. If freeboard is reduced, dam operators may be forced to release increased volumes earlier in a storm cycle in order to maintain the required margins of safety. Such early releases of increased volumes can increase flood potential downstream. Throughout the west, communities downstream of dams are already increases in stream flows from earlier releases from dams.

Dams are constructed with safety features known as “spillways.” Spillways are put in place on dams as a safety measure in the event of the reservoir filling too quickly. Spillway overflow events, often referred to as “design failures,” result in increased discharges downstream and increased flooding potential. Although climate change will not increase the probability of catastrophic dam failure, it may increase the probability of design failures.

12.5 EXPOSURE AND VULNERABILITY

12.5.1 Population

Vulnerable populations are all populations downstream from dam failures that are incapable of escaping the area within the allowable time frame. This population includes the elderly and young who may be unable to get themselves out of the inundation area. The vulnerable population also includes those who would not have adequate warning from a television or radio emergency warning system.

12.5.2 Property

Vulnerable properties are those closest to the dam inundation area. These properties would experience the largest, most destructive surge of water. Low-lying areas are also vulnerable since they are where the dam waters would collect. Transportation routes are vulnerable to dam inundation and have the potential to be wiped out, creating isolation issues. This includes all roads, railroads and bridges in the path of the dam inundation. Those that are most vulnerable are those that are already in poor condition and would not be able to withstand a large water surge. Utilities such as overhead power lines, cable and phone lines could also be vulnerable. Loss of these utilities could create additional isolation issues for the inundation areas.

12.5.3 Critical Facilities

12.5.4 Environment

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

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

12.6 FUTURE TRENDS IN DEVELOPMENT

Land use in the planning area will be directed by general plans adopted under state law. The safety elements of the general plans establish standards and plans for the protection of the community from hazards. Dam failure is currently not addressed as a standalone hazard in the safety elements, but flooding is. The municipal planning partners have established comprehensive policies regarding sound land use in identified flood hazard areas. Most of the areas vulnerable to the more severe impacts from dam failure intersect the mapped flood hazard areas. Flood-related policies in the general plans will help to reduce the risk associated with the dam failure hazard for all future development in the planning area.

12.7 SCENARIO

An earthquake in the region could lead to liquefaction of soils around a dam. This could occur without warning during any time of the day. A human-caused failure such as a terrorist attack also could trigger a catastrophic failure of a dam that impacts the planning area. While the probability of dam failure is very low, the probability of flooding associated with changes to dam operational parameters in response to climate change is higher. Dam designs and operations are developed based on hydrographs with historical record. If these hydrographs experience significant changes over time due to the impacts of climate change, the design and operations may no longer be valid for the changed condition. This could have

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significant impacts on dams that provide flood control. Specified release rates and impound thresholds may have to be changed. This would result in increased discharges downstream of these facilities, thus increasing the probability and severity of flooding.

12.8 ISSUES

Keeping the need for security in mind, Park County could pursue the possibility of a GIS project with the Dam Safety Branch to provide authorized officials from Park County, Alma, and Fairplay with appropriate GIS mapping of dam failure risks. Such a project could initially focus just on the six major reservoirs. Once Park County and the CWCB complete digital floodplain mapping, there might be some value in overlaying a secure dam failure inundation zone GIS layer onto that floodplain mapping. Eventually such GIS information could be made available, in a strictly controlled manner, to those local agencies with an emergency response role in the event of dam failure flooding.

The most significant issue associated with dam failure involves the properties and populations in the inundation zones. Flooding as a result of a dam failure would significantly impact these areas. There is often limited warning time for dam failure. These events are frequently associated with other natural hazard events such as earthquakes, landslides or severe weather, which limits their predictability and compounds the hazard. Important issues associated with dam failure hazards include the following:

- Federally regulated dams have an adequate level of oversight and sophistication in the development of emergency action plans for public notification in the unlikely event of failure. However, the protocol for notification of downstream citizens of imminent failure needs to be tied to local emergency response planning.
- Mapping for federally regulated dams is already required and available; however, mapping for non-federal-regulated dams that estimates inundation depths is needed to better assess the risk associated with dam failure from these facilities.
- Most dam failure mapping required at federal levels requires determination of the probable maximum flood. While the probable maximum flood represents a worst-case scenario, it is generally the event with the lowest probability of occurrence. For non-federal-regulated dams, mapping of dam failure scenarios that are less extreme than the probable maximum flood but have a higher probability of occurrence can be valuable to emergency managers and community officials downstream of these facilities. This type of mapping can illustrate areas potentially impacted by more frequent events to support emergency response and preparedness.
- The concept of residual risk associated with structural flood control projects should be considered in the design of capital projects and the application of land use regulations.
- Addressing security concerns and the need to inform the public of the risk associated with dam failure is a challenge for public officials.
- Due to security issues, dam inundation maps are not typically available for use in analysis.

CHAPTER 13.
HAZARDOUS MATERIALS

13.1 GENERAL BACKGROUND

HAZMAT incidents were ranked as high across the County. While it is understood that this is an update of the County's natural hazard mitigation plan not including HAZMAT, some information has been included regarding the potential threat and impacts to the County.

Hazardous materials can include explosive, flammable, combustible, corrosive, oxidizing, toxic, infectious, and radioactive materials that are involved in an accidental or intentional release causing danger to the general public. However, a spill of benign materials can still be deemed hazardous if those benign materials (e.g. beverages or non-toxic materials) cause a danger to persons in the immediate area of the spill. Hazardous material events also can be caused by natural hazards such as earthquakes and floods.

13.2 HAZARD PROFILE

13.2.1 Past Events

The Colorado Department of Transportation indicates that roughly 10-15 percent of vehicles on Park County's major highways are single or combination axle trucks. While no major incidents were reported to the National Response Center from 2005- October of 2007, the county remains constantly vulnerable to hazardous materials spills. The most recent event recorded by the National Response Center was a tanker truck accident on May 20th, 2004. The accident occurred on U.S. Highway 285 near Bailey. Nearly 7,000 gallons of petroleum product discharged onto the highway and ignited, closing both directions of 285 for a significant period of time. Park County EMS and Fire responded and reported the driver as a casualty. No waterways were affected in this incident, but the highway's proximity to the North Fork of the South Platte River means that similar incidents on that stretch of highway could have much more severe consequences.

13.2.2 Location

While Park County has experienced historical HAZMAT events, there are currently no maps showing which specific portions of the county were affected by historical HAZMAT events. Likewise, there are currently no maps showing which specific corridors in Park County could potentially be impacted at a future point in time by HAZMAT events. The Park County Office of Emergency Management has identified the U.S. Highway 285 Corridor, the U.S. Highway 24 Corridor and the State Highway 9 Corridor as the HAZMAT Corridors of concern in the county. Park County GIS has already created numerous maps that already display these corridors, so no specific "HAZMAT Corridor" mapping was created as part of this plan.

According to the United States Department of Transportation, on average highway incidents are typically responsible greater than 85 percent of the total United States hazardous material spills. Park County does not have any industrial chemical facilities meaning that all Hazardous Materials incidents would occur on the county's highways.

Areas that could be affected by a HAZMAT Transport accident are the U.S. Highway 285 Corridor, the U.S. Highway 24 Corridor and the State Highway 9 Corridor. The North Fork of the South Platte River is

also at risk for contamination from a HAZMAT spill between Bailey and Grant. All communities along these corridors could be affected by such an incident.

At present there is no mapping to display or analyze historical HAZMAT information for Park County. No distinctions have been made regarding specific locations within Park County which have a history of more frequent or more severe HAZMAT impacts or which specific locations might be more prone to future HAZMAT impacts. Frequency

Hazardous materials incidents in Park County are highly likely, with nearly 100-percent chance of occurrence in any given year.

13.2.3 Severity

A hazard material spill or release may come from either fixed facilities or mobile containers. The duration of the event can last for hours or even days. Chemicals may be corrosive or otherwise damaging over time. Explosion and/or fire may be subsequent. In addition, contamination may be carried out of the incident area by persons, vehicles, water, and wind.

The magnitude of a hazardous material event is directly related to the amount of materials released, and the speed and efficiency of which emergency and cleanup crews respond. Another important factor is what form the spill is in. Solid state spills are typically the easiest to clean up and control, followed by liquid and gaseous state spills. Liquid state spills require rapid response if they are to be contained, and if they infiltrate a watershed, steps must be taken to monitor the influence downstream. Gaseous state spills are almost impossible to contain, and depending on the volume, usually require evacuations down wind.

Park County contains three major highways, the north-south U.S. Highway 285, which is considered the county's primary arterial, U.S. Highway 24, and State Highway 9. U.S. Highway 285 and State Highway 9 are often used as an alternate route to Interstate 70 for hazardous materials transports. U.S. Highway 24 is the primary route from Colorado Springs into the Central Mountains of Colorado. Incidents occurring in urban locations, such as Fairplay or downtown Bailey could have significant human consequences as well. Park County emergency services professionals have indicated that many hazardous materials pass through the county. Any number of hazardous materials, if released into the air by fire, wind or both could threaten people's health or lives, and would likely force evacuations.

13.3 SECONDARY HAZARDS

Secondary effects of HAZMAT incidents are contamination of streams, lakes and ponds (including reservoirs), and groundwater aquifers, soil contamination, and wildfires and building fires ignited by explosions of flammable materials, and hail damage to buildings, vehicles and crops. The specific impacts of wildfires are discussed further in other sections of this Plan. Other secondary effects of HAZMAT incidents can include disruption of transportation and other critical services such as water, electrical, and telephone services. Additional secondary effects include impacts on tourism, and thus the local economy, through activities such as camping, hiking, hunting, and fishing. Because water, soil, and vegetation can be affected by HAZMAT incidents, a secondary effect can be toxins carried out of the area by wildlife and fish that come into contact with the contaminated water, soil, and/or vegetation.

13.4 ISSUES

Fire Protection Districts within the County are the first line of defense in a HAZMAT response situation. The county also depends on aid from teams based in Jefferson, Teller and Summit Counties. Data relating to the number of vehicles transporting hazardous materials or the types of materials that they transport is limited. The Mitigation Advisory Committee may want to consider expanding data.

CHAPTER 14.
LANDSLIDE

14.1 GENERAL BACKGROUND

The threat and impact of landslides in Park County has been universally ranked as low across the County. As such, no hazard profile is required. However, a partial profile of the landslide hazard has been included in the plan for informational purposes.

A landslide is a mass of rock, earth or debris moving down a slope. Landslides may be minor or very large, and can move at slow to very high speeds. They can be initiated by storms, earthquakes, fires, volcanic eruptions or human modification of the land.

DEFINITIONS

Landslide—The sliding movement of masses of loosened rock and soil down a hillside or slope. Such failures occur when the strength of the soils forming the slope is exceeded by the pressure, such as weight or saturation, acting upon them.

Mass Movement—A collective term for landslides, debris flows, falls and sinkholes.

Mudslide (or Mudflow or Debris Flow)—A river of rock, earth, organic matter and other materials saturated with water.

Mudslides (or mudflows or debris flows) are rivers of rock, earth, organic matter and other soil materials saturated with water. They develop in the soil overlying bedrock on sloping surfaces when water rapidly accumulates in the ground, such as during heavy rainfall or rapid snowmelt. Water pressure in the pore spaces of the material increases to the point that the internal strength of the soil is drastically weakened. The soil's reduced resistance can then easily be overcome by gravity, changing the earth into a flowing river of mud or "slurry." A debris flow or mudflow can move rapidly down slopes or through channels, and can strike with little or no warning at avalanche speeds. The slurry can travel miles from its source, growing as it descends, picking up trees, boulders, cars and anything else in its path. Although these slides behave as fluids, they pack many times the hydraulic force of water due to the mass of material included in them. Locally, they can be some of the most destructive events in nature.

All mass movements are caused by a combination of geological and climate conditions, as well as the encroaching influence of urbanization. Vulnerable natural conditions are affected by human residential, agricultural, commercial and industrial development and the infrastructure that supports it.

14.2 HAZARD PROFILE

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

- A slope greater than 33 percent
- A history of landslide activity or movement during the last 10,000 years
- Stream or wave activity, which has caused erosion, undercut a bank or cut into a bank to cause the surrounding land to be unstable
- The presence or potential for snow avalanches

- The presence of an alluvial fan, indicating vulnerability to the flow of debris or sediments
- The presence of impermeable soils, such as silt or clay, which are mixed with granular soils such as sand and gravel.

Flows and slides are commonly categorized by the form of initial ground failure. Figure 14-1 through Figure 14-4 show common types of slides. The most common is the shallow colluvial slide, occurring particularly in response to intense, short-duration storms. The largest and most destructive are deep-seated slides, although they are less common than other types.

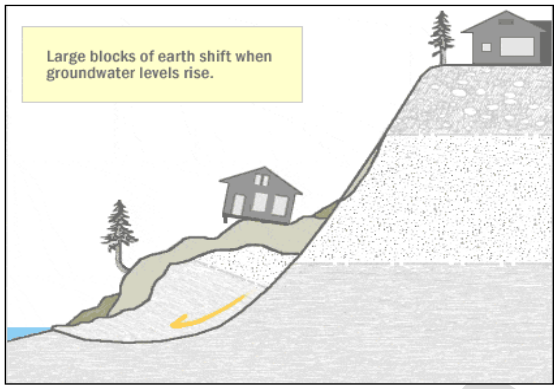

Figure 14-1. Deep Seated Slide

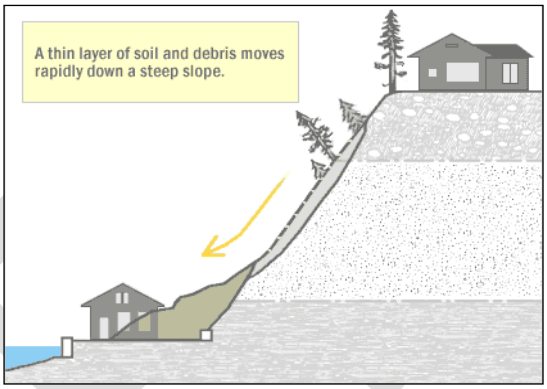

Figure 14-2. Shallow Colluvial Slide

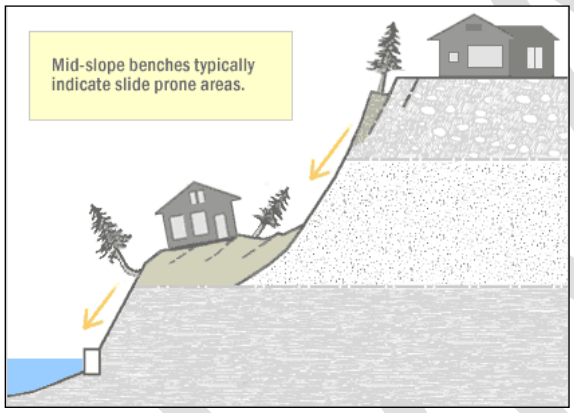

Figure 14-3. Bench Slide

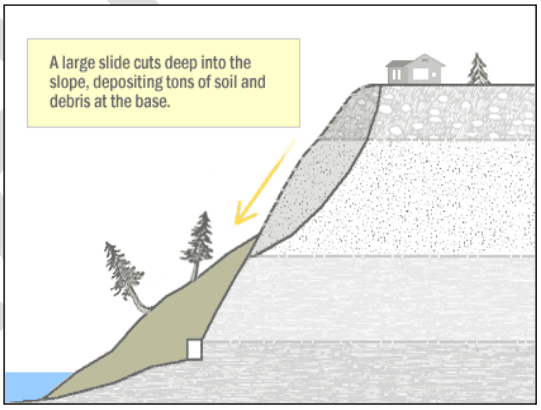

Figure 14-4. Large Slide

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

14.2.1 Past Events

There is little recorded information regarding landslides in Park County. According to the Spatial Hazard Events and Losses Database for the United States (SHELDUS), there have been two recorded landslide events in the planning area since 1960. These events occurred on April 6, 2006, and on January 1, 1997, and both coincided with presidential disaster declarations for severe storms and flooding. The combined estimated damage for these two events exceeded $20 million. There are no records in the County of

fatalities attributed to mass movement. However, deaths have occurred across the west coast as a result of slides and slope collapses.

14.2.2 Location

Historically, landslides have occurred throughout the mountainous areas of Park County. In some cases, slide locations are still visibly apparent; unfortunately, detailed historical records of the location and extent of landslides have not been kept. Colorado Geological Survey information was used to identify landslide susceptibility areas in Park County. Figure 14-5 illustrates landslide incidence and susceptibility areas in Park County.

Historical occurrences of landslides in the unincorporated areas of Park County were not available in the existing literature. Anecdotal evidence points to a high risk in areas such as the Placer Valley subdivision in the northwest part of the county. Other reports have indicated that forest-thinning operations (to mitigate wildfires) can sometimes destabilize soils and increase soil permeability, thus resulting in an increased potential for landslides and debris flows. No historical occurrences of landslides have been reported in the Towns of Alma and Fairplay.

When the base of a slope is eroded or undercut, the strength of the entire slope can be compromised. In mountainous regions of Park County, this commonly occurs along existing roadways, or during the construction of new roadways. Slope loading can also increase the potential for landslides. The construction of structures or roadways on a steep slope can increase the strain on the material, thus increasing the potential of a slide. The amount of ground cover and vegetation on a slope also can play a role in a slope's susceptibility to landslides, as dense cover can secure an otherwise unstable slope.

Park County has geologic mapping displaying which particular portions of the county have been identified as Landslide Deposits, as shown in Figure 14-5. In addition, there are maps displaying which portions of Park County have been identified as Debris Flow/Mudflow Flooding Areas, as shown in Figure 14-6. The county's GIS department will use the initial geologic mapping as a starting point and enhance it in the near future to examine further the possibility of correlating the risk of future landslides to particular locations in the county.

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

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

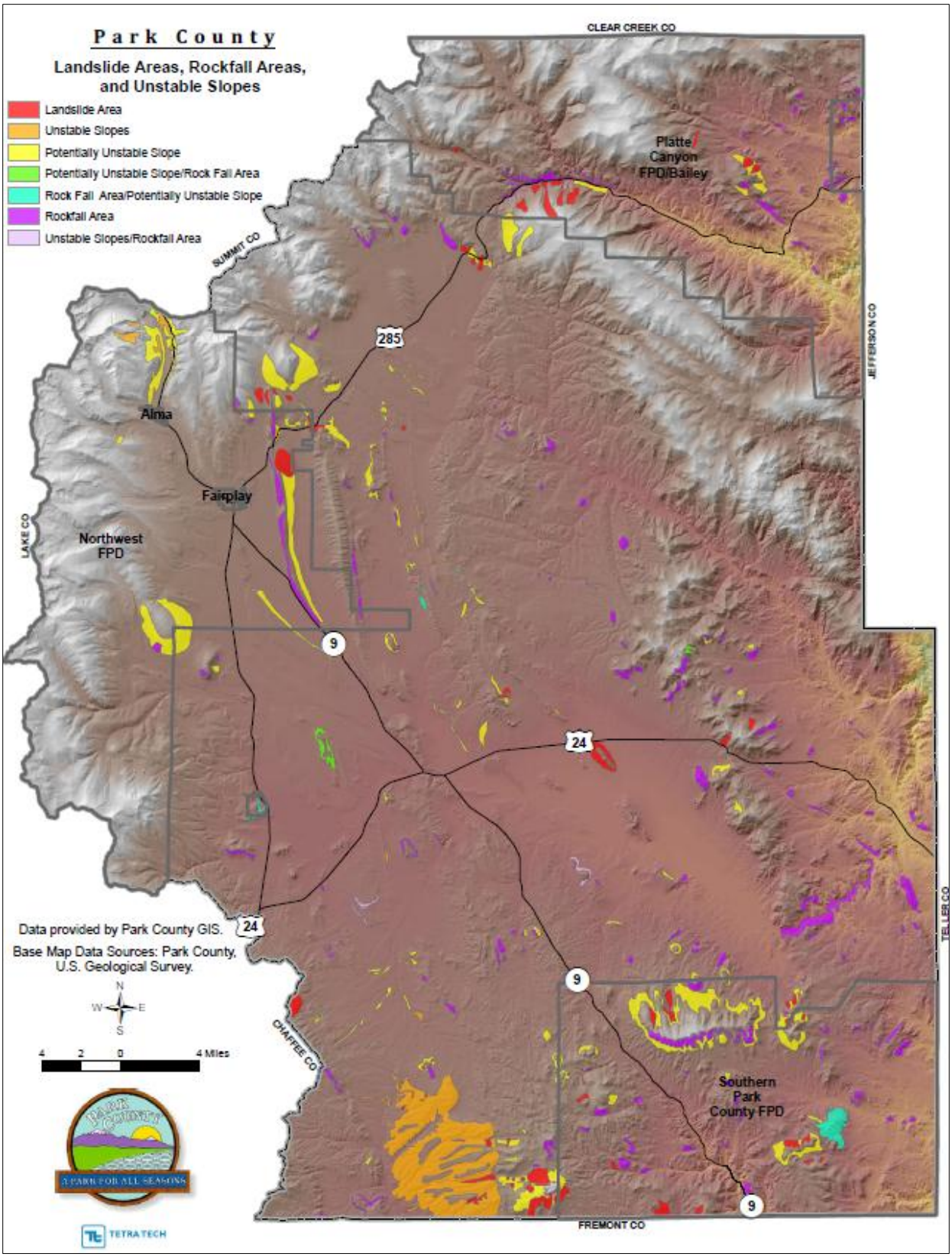

Figure 14-5. Landslide Deposits in Park County

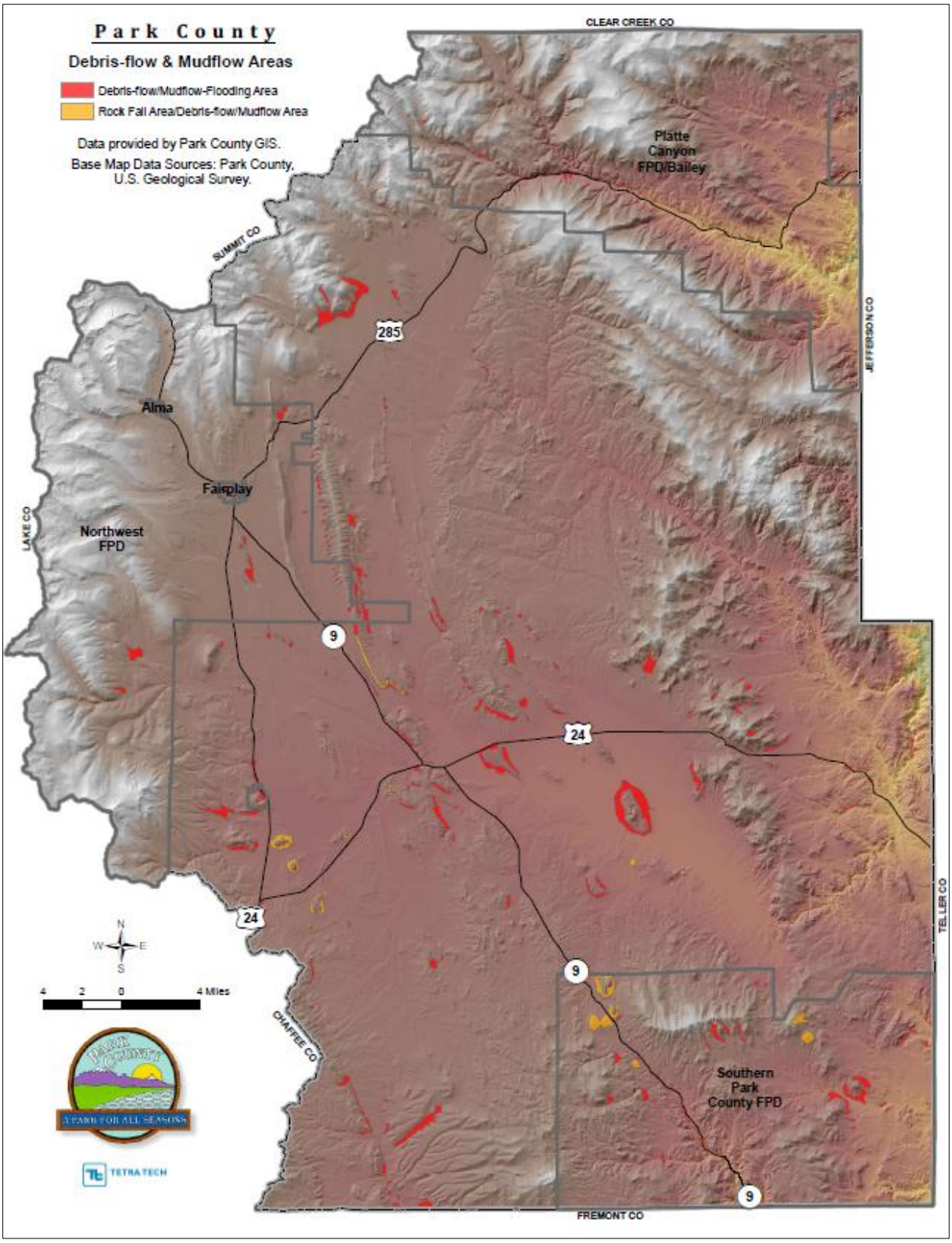

Figure 14-6. Debris and Mudflow Flooding Areas

14.2.3 Frequency

Landslides are often triggered by other natural hazards such as earthquakes, heavy rain, floods or wildfires, so landslide frequency is often related to the frequency of these other hazards. In Park County, landslides typically occur during and after major storms, so the potential for landslides largely coincides with the potential for sequential severe storms that saturate steep, vulnerable soils. Landslide events occurred during the winter storms of 2006 and 1997. According to SHELDUS records, the planning area has been impacted by severe storms at least once every other year since 1960. Until better data is generated specifically for landslide hazards, this severe storm frequency is appropriate for the purpose of ranking risk associated with the landslide hazard.

14.2.4 Severity

Landslides destroy property and infrastructure and can take the lives of people. Slope failures in the United States result in an average of 25 lives lost per year and an annual cost to society of about $1.5 billion. According to SHELDUS, the 2006 and 1997 storms caused in excess of $20 million in property damage due to landslides, mudslides and debris flows. This was about half of all damage caused by the storm. The landslides caused by the storm also caused tens of millions of dollars of damage to road infrastructure.

14.2.5 Warning Time

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

- Springs, seeps, or saturated ground in areas that have not typically been wet before
- New cracks or unusual bulges in the ground, street pavements or sidewalks
- Soil moving away from foundations
- Ancillary structures such as decks and patios tilting and/or moving relative to the main house
- Tilting or cracking of concrete floors and foundations
- Broken water lines and other underground utilities
- Leaning telephone poles, trees, retaining walls or fences
- Offset fence lines
- Sunken or down-dropped road beds
- Rapid increase in creek water levels, possibly accompanied by increased turbidity (soil content)
- Sudden decrease in creek water levels though rain is still falling or just recently stopped
- Sticking doors and windows, and open spaces indicating jambs and frames out of plumb
- A faint rumbling sound that increases in volume as the landslide nears
- Unusual sounds, such as trees cracking or boulders knocking together.

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14.3 SECONDARY HAZARDS

Common secondary effects of landslides are access limitations due to impassable roads and disruption of critical services due to landslide damage to power lines, telephone lines or water lines. In the case of damage to roads, the community may feel more significant economic and safety impacts due to the loss of function of the roadways, in addition to the damage to roads themselves. Many of the roadways throughout the County provide the only direct access from one community to another, or potentially the only access to certain remote areas. This reduction in access can increase the response time of emergency vehicles, creating a potentially serious threat to public safety in these areas. Damage to police stations, fire stations, and other emergency service facilities can weaken a community's ability to respond in the crucial hours and days following an event. Additional secondary effects include impacts on tourism, and thus the local economy, through activities such as camping, hiking, hunting, and fishing. Landslide debris can also partially or fully block rivers, in which case the potential for significant flooding exists.

Landslides can cause several types of secondary effects, such as blocking access to roads, which can isolate residents and businesses and delay commercial, public and private transportation. This could result in economic losses for businesses. Other potential problems resulting from landslides are power and communication failures. Vegetation or poles on slopes can be knocked over, resulting in possible losses to power and communication lines. Landslides also have the potential of destabilizing the foundation of structures, which may result in monetary loss for residents. They also can damage rivers or streams, potentially harming water quality, fisheries and spawning habitat.

14.4 CLIMATE CHANGE IMPACTS

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

14.5 EXPOSURE

14.5.1 Population

Population exposure was not assessed because census blocks do not coincide with landslide hazard areas.

14.5.2 Critical Facilities and Infrastructure

No loss estimation of critical facilities exposed to the landslide hazard was performed, due to the lack of established damage functions for the landslide hazard. A significant amount of infrastructure can be exposed to mass movements:

- **Roads**—Access to major roads is crucial to life-safety after a disaster event and to response and recovery operations. Landslides can block egress and ingress on roads, causing isolation for neighborhoods, traffic problems and delays for public and private transportation. This can result in economic losses for businesses.
- **Bridges**—Landslides can significantly impact road bridges. Mass movements can knock out bridge abutments or weaken the soil supporting them, making them hazardous for use.
- **Power Lines**—Power lines are generally elevated above steep slopes; but towers supporting them can be subject to landslides. A landslide could trigger failure of the soil underneath a tower, causing it to collapse and ripping down the lines. Power and communication failures due to landslides can create problems for vulnerable populations and businesses.

14.5.3 Environment

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

14.6 VULNERABILITY

Because the conditions that cause a landslide are extremely site specific, the impacts of an individual landslide can vary greatly. Landslides can damage or potentially destroy anything in the path of the slide including homes, businesses, roads, and utilities. The precise impacts of a landslide will depend on the specific characteristics of the slide, as well as the level of development in the slide area.

Due to the extreme steep slopes in the mountainous areas of Park County, virtually all of the development in the area is at moderate risk to the effects of landslides. The vulnerability of specific structures and assets can only be determined by a detailed investigation of the site characteristics, primarily the proximity to at-risk slopes. A majority of the unincorporated areas throughout the County have extremely steep slopes. The potential for landslide damage to structures in these areas could be moderate. Areas affected by wildfires also have seen increased activity and risk of landslides. In particular, areas around Bailey and Lake George have seen increased landslide risk due to soil instability and from sediment and debris left by wildfires. These landslides have the potential to affect both infrastructure and private property in those particular areas.

Based on past occurrences, the most vulnerable assets located within Park County are its roadways. Many of the roads in the area traverse steep slopes increasing the vulnerability to damage. The damage to a roadway affected by a landslide can vary from partial blockage to total destruction.

14.6.1 Population

Due to the nature of census block group data, it is difficult to determine demographics of populations vulnerable to mass movements. In general, all persons exposed to higher risk landslide areas are considered to be vulnerable. Increasing population and the fact that many homes are built on view property atop or below bluffs and on steep slopes subject to mass movement, increases the number of lives endangered by this hazard.

14.6.2 Property

Although complete historical documentation of the landslide threat in the planning area is lacking, the landslides of 1997 and 2006 suggest a significant vulnerability to such hazards. The millions of dollars in damage countywide attributable to mass movement during those storms affected private property and public infrastructure and facilities.

Loss estimations for the landslide hazard are not based on modeling utilizing damage functions, because no such damage functions have been generated. Instead, loss estimates were developed representing 10 percent, 30 percent and 50 percent of the assessed value of exposed structures. This allows emergency managers to select a range of economic impact based on an estimate of the percent of damage to the general building stock. Damage in excess of 50 percent is considered to be substantial by most building codes and typically requires total reconstruction of the structure.

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14.6.3 Critical Facilities and Infrastructure

A more in-depth analysis of the mitigation measures taken by these facilities to prevent damage from mass movements should be done to determine if they could withstand impacts of a mass movement. Several types of infrastructure are exposed to mass movements, including transportation, water and sewer and power infrastructure. Highly susceptible areas of the county include mountain and coastal roads and transportation infrastructure. At this time all infrastructure and transportation corridors identified as exposed to the landslide hazard are considered vulnerable until more information becomes available.

14.6.4 Environment

The environment vulnerable to landslide hazard is the same as the environment exposed to the hazard.

14.7 FUTURE TRENDS IN DEVELOPMENT

The County and its planning partners are equipped to handle future growth within landslide hazard areas. All municipal planning partners have general plans that address landslide risk areas in their safety elements. All partners have committed to linking their general plans to this hazard mitigation plan update. This will create an opportunity for wise land use decisions as future growth impacts landslide hazard areas.

The County has adopted the International Building Code (IBC). The IBC includes provisions for geotechnical analyses in steep slope areas that have soil types considered susceptible to landslide hazards. These provisions assure that new construction is built to standards that reduce the vulnerability to landslide risk.

14.8 SCENARIO

Major landslides in the planning area occur as a result of soil conditions that have been affected by severe storms, groundwater or human development. The worst-case scenario for landslide hazards in the planning area would generally correspond to a severe storm that had heavy rain and caused flooding. Landslides can occur any time of year when the ground is saturated with moisture and when the water table is high. As water seeps downward through upper soils that may consist of permeable sands and gravels and accumulates on impermeable silt, it will cause weakness and destabilization in the slope. A short intense storm could cause saturated soil to move, resulting in landslides. As rains continue, the groundwater table rises, adding to the weakening of the slope. Gravity, poor drainage, a rising groundwater table and poor soil exacerbate hazardous conditions.

Mass movements are becoming more of a concern as development moves outside of city centers and into areas less developed in terms of infrastructure. Most mass movements would be isolated events affecting specific areas. It is probable that private and public property, including infrastructure, will be affected. Mass movements could affect bridges that pass over landslide prone ravines and knock out rail service through the county. Road obstructions caused by mass movements would create isolation problems for residents and businesses in sparsely developed areas. Property owners exposed to steep slopes may suffer damage to property or structures. Landslides carrying vegetation such as shrubs and trees may cause a break in utility lines, cutting off power and communication access to residents.

Continued heavy rains and flooding will complicate the problem further. As emergency response resources are applied to problems with flooding, it is possible they will be unavailable to assist with landslides occurring all over Park County.

14.9 ISSUES

Further information regarding landslide hazards in Colorado is available in the Colorado Landslide Hazard Mitigation Plan, published in 1988 as Colorado Geologic Survey Bulletin 48. While none of the 49 specific locations identified in the plan as posing the most serious landslide threats in Colorado are in Park County, the plan includes useful background information which may be helpful to officials in Park County and Alma. That background information includes guidance on the evaluation and communication of landslide hazards, descriptions of specific mitigation concepts, and recommendations for implementation of mitigation by the State of Colorado, local governments, and private entities. Downloadable versions of the 1988 plan and a 2002 update to that plan are available at the website of the Colorado Division of Emergency Management.

Maps currently exist which show *Landslide Deposits* and *Debris Flow/Mudflow Flooding Areas* in Park County indicating which portions of the county could be impacted in the future by landslides. A detailed correlation has not been drawn, however, between the location of a site or region within any one of the eight major watersheds in the county and the risk of that site or region regarding landslides. Because landslides are often associated with streams or other water features, and because the topography and geology of Park County bears some relation to the major watersheds, Park County has chosen to examine briefly the possibility of such a correlation in the near future. The boundaries of the eight major watersheds will be superimposed on the existing mapping of *Landslide Deposits Debris* and *Flow/Mudflow Flooding Areas.* The preparation of that mapping as part of this project will be followed by a cursory examination by county staff of the possible correlation between the location of a site or region within a particular major watersheds and the risk of landslides. Beyond those initial efforts, Park County does not anticipate any landslide mapping or analyses.

The Colorado Geological Survey performs subdivision development reviews to ensure that potential geologic problems have been identified, and if so, adequately addressed. These reviews are required to be submitted by County planning departments for new subdivisions (voluntary for cities or towns) as required by Senate Bill 35 (1972). School sites must be submitted by school districts as directed by House Bill 1045 (1984). Other proposed uses including airports, landfills, water treatment plants, utility rights of way, highway rights of way, as well as the effects of large developments such as mines and ski areas are required to be reviewed under House Bill 1041 (1974).

Important issues associated with landslides in the planning area include the following:

- There are homes in landslide risk areas throughout the County. The degree of vulnerability of these structures depends on the codes and standards the structures were constructed to. Information to this level of detail is not currently available.
- Future development could lead to more homes in landslide risk areas.
- Mapping and assessment of landslide hazards are constantly evolving. As new data and science become available, assessments of landslide risk should be reevaluated.
- The impact of climate change on landslides is uncertain. If climate change impacts atmospheric conditions, then exposure to landslide risks is likely to increase.
- Landslides may cause negative environmental consequences, including water quality degradation.
- The risk associated with the landslide hazard overlaps the risk associated with other hazards such as earthquake, flood and wildfire. This provides an opportunity to seek mitigation alternatives with multiple objectives that can reduce risk for multiple hazards.

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CHAPTER 15.
SEVERE THUNDERSTORM, HAIL AND WIND

15.1 GENERAL BACKGROUND

The threat and impact of severe thunderstorm, hail and high winds received varying rankings across the County in this update process:

- Unincorporated Park County: High
- Fairplay: Low
- North-West Fire Protection District: High
- Alma: High
- Platte Canyon Fire Protection District: Medium
- Southern Park County Fire Protection District: High.

The County and participating jurisdictions Severe weather refers to any dangerous meteorological phenomena with the potential to cause damage, serious social disruption, or loss of human life. It includes thunderstorms, downbursts, tornadoes, waterspouts, snowstorms, ice storms, and dust storms.

Severe weather can be categorized into two groups: systems that form over wide geographic areas are classified as general severe weather; those with a more limited geographic area are classified as localized severe weather. Severe weather, technically, is not the same as extreme weather, which refers to unusual weather events at the extremes of the historical distribution for a given area.

DEFINITIONS

Severe Local Storm—Small-scale atmospheric systems, including tornadoes, thunderstorms, windstorms, ice storms and snowstorms. These storms may cause a great deal of destruction and even death, but their impact is generally confined to a small area. Typical impacts are on transportation infrastructure and utilities.

Thunderstorm—A storm featuring heavy rains, strong winds, thunder and lightning, typically about 15 miles in diameter and lasting about 30 minutes. Hail and tornadoes are also dangers associated with thunderstorms. Lightning is a serious threat to human life. Heavy rains over a small area in a short time can lead to flash flooding.

Tornado—Funnel clouds that generate winds up to 500 miles per hour. They can affect an area up to three-quarters of a mile wide, with a path of varying length. Tornadoes can come from lines of cumulonimbus clouds or from a single storm cloud. They are measured using the Fujita Scale, ranging from F0 to F5.

Windstorm—A storm featuring violent winds. Southwesterly winds are associated with strong storms moving onto the coast from the Pacific Ocean. Southern winds parallel to the coastal mountains are the strongest and most destructive winds. Windstorms tend to damage ridgelines that face into the winds.

15.1.1 Thunderstorms

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

Three factors cause thunderstorms to form: moisture, rising unstable air (air that keeps rising when disturbed), and a lifting mechanism to provide the disturbance. The sun heats the surface of the earth, which warms the air above it. If this warm surface air is forced to rise (hills or mountains can cause rising

motion, as can the interaction of warm air and cold air or wet air and dry air) it will continue to rise as long as it weighs less and stays warmer than the air around it. As the air rises, it transfers heat from the surface of the earth to the upper levels of the atmosphere (the process of convection). The water vapor it contains begins to cool and it condenses into a cloud. The cloud eventually grows upward into areas where the temperature is below freezing. Some of the water vapor turns to ice and some of it turns into water droplets. Both have electrical charges. Ice particles usually have positive charges, and rain droplets usually have negative charges. When the charges build up enough, they are discharged in a bolt of lightning, which causes the sound waves we hear as thunder. Thunderstorms have three stages (see Figure 15-1):

- The *developing stage* of a thunderstorm is marked by a cumulus cloud that is being pushed upward by a rising column of air (updraft). The cumulus cloud soon looks like a tower (called towering cumulus) as the updraft continues to develop. There is little to no rain during this stage but occasional lightning. The developing stage lasts about 10 minutes.
- The thunderstorm enters the *mature stage* when the updraft continues to feed the storm, but precipitation begins to fall out of the storm, and a downdraft begins (a column of air pushing downward). When the downdraft and rain-cooled air spread out along the ground, they form a gust front, or a line of gusty winds. The mature stage is the most likely time for hail, heavy rain, frequent lightning, strong winds, and tornadoes. The storm occasionally has a black or dark green appearance.
- Eventually, a large amount of precipitation is produced and the updraft is overcome by the downdraft beginning the *dissipating stage*. At the ground, the gust front moves out a long distance from the storm and cuts off the warm moist air that was feeding the thunderstorm. Rainfall decreases in intensity, but lightning remains a danger.

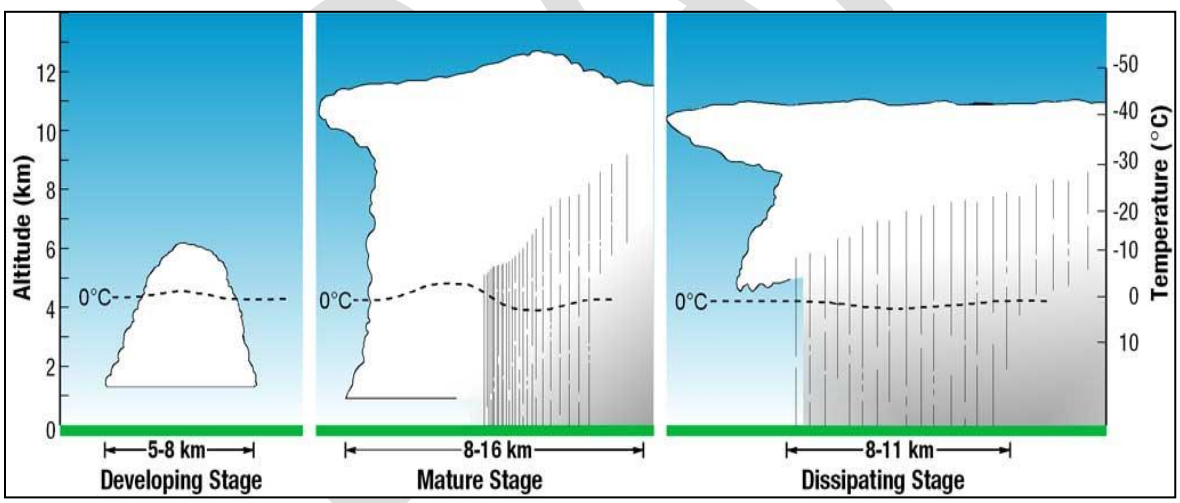

Figure 15-1. The Thunderstorm Life Cycle

There are four types of thunderstorms:

- **Single-Cell Thunderstorms—**Single-cell thunderstorms usually last 20 to 30 minutes. A true single-cell storm is rare, because the gust front of one cell often triggers the growth of another. Most single-cell storms are not usually severe, but a single-cell storm can produce a brief severe weather event. When this happens, it is called a pulse severe storm.
- **Multi-Cell Cluster Storm—**A multi-cell cluster is the most common type of thunderstorm. The multi-cell cluster consists of a group of cells, moving as one unit, with each cell in a

different phase of the thunderstorm life cycle. Mature cells are usually found at the center of the cluster and dissipating cells at the downwind edge. Multi-cell cluster storms can produce moderate-size hail, flash floods and weak tornadoes. Each cell in a multi-cell cluster lasts only about 20 minutes; the multi-cell cluster itself may persist for several hours. This type of storm is usually more intense than a single cell storm.

- **Multi-Cell Squall Line**—A multi-cell line storm, or squall line, consists of a long line of storms with a continuous well-developed gust front at the leading edge. The line of storms can be solid, or there can be gaps and breaks in the line. Squall lines can produce hail up to golf-ball size, heavy rainfall, and weak tornadoes, but they are best known as the producers of strong downdrafts. Occasionally, a strong downburst will accelerate a portion of the squall line ahead of the rest of the line. This produces what is called a bow echo. Bow echoes can develop with isolated cells as well as squall lines. Bow echoes are easily detected on radar but are difficult to observe visually.
- **Super-Cell Storm—**A super-cell is a highly organized thunderstorm that poses a high threat to life and property. It is similar to a single-cell storm in that it has one main updraft, but the updraft is extremely strong, reaching speeds of 150 to 175 miles per hour. Super-cells are rare. The main characteristic that sets them apart from other thunderstorms is the presence of rotation. The rotating updraft of a super-cell (called a mesocyclone when visible on radar) helps the super-cell to produce extreme weather events, such as giant hail (more than 2 inches in diameter), strong downbursts of 80 miles an hour or more, and strong to violent tornadoes.

The National Weather Service (NWS) considers a thunderstorm severe if it produces hail at least three-quarters of an inch in diameter, has winds of 58 miles per hour or higher, or produces a tornado. Severe thunderstorms are distinguished by stronger winds and heavier rain than the normal thunderstorm. These severe storms have the potential to produce damaging hail, spawn tornadoes, and initiate flash flooding. Thunderstorms may occur singly, in clusters, or in lines. Some of the most severe weather occurs when a single thunderstorm affects one location for an extended time.

15.1.2 Hail Storms

Hail occurs when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere where they freeze into ice. Recent studies suggest that super-cooled water may accumulate on frozen particles near the back-side of a storm as they are pushed forward across and above the updraft by the prevailing winds near the top of the storm. Eventually, the hailstones encounter downdraft air and fall to the ground.

Hailstones grow two ways: by wet growth or dry growth. In wet growth, a tiny piece of ice is in an area where the air temperature is below freezing, but not super cold. When the tiny piece of ice collides with a super-cooled drop, the water does not freeze on the ice immediately. Instead, liquid water spreads across tumbling hailstones and slowly freezes. Since the process is slow, air bubbles can escape, resulting in a layer of clear ice. Dry growth hailstones grow when the air temperature is well below freezing and the water droplet freezes immediately as it collides with the ice particle. The air bubbles are “frozen” in place, leaving cloudy ice.

Hailstones can have layers like an onion if they travel up and down in an updraft, or they can have few or no layers if they are “balanced” in an updraft. One can tell how many times a hailstone traveled to the top of the storm by counting its layers. Hailstones can begin to melt and then re-freeze together, forming large and very irregularly shaped hail.

The land area affected by individual hailstorms is not much smaller than that of a parent thunderstorm, an average of 15 miles in diameter around the center of a storm.

15.1.3 Damaging Winds

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

- **Straight-line winds**—Any thunderstorm wind that is not associated with rotation; this term is used mainly to differentiate from tornado winds. Most thunderstorms produce some straight-line winds as a result of outflow generated by the thunderstorm downdraft.
- **Downdrafts**—A small-scale column of air that rapidly sinks toward the ground.
- **Downbursts**—A strong downdraft with horizontal dimensions larger than 2.5 miles resulting in an outward burst or damaging winds on or near the ground. Downburst winds may begin as a microburst and spread out over a wider area, sometimes producing damage similar to a strong tornado. Although usually associated with thunderstorms, downbursts can occur with showers too weak to produce thunder.
- **Microbursts**—A small concentrated downburst that produces an outward burst of damaging winds at the surface. Microbursts are generally less than 2.5 miles across and short-lived, lasting only 5 to 10 minutes, with maximum wind speeds up to 168 mph. There are two kinds of microbursts: wet and dry. A wet microburst is accompanied by heavy precipitation at the surface. Dry microbursts, common in places like the high plains and the intermountain west, occur with little or no precipitation reaching the ground.
- **Gust front**—A gust front is the leading edge of rain-cooled air that clashes with warmer thunderstorm inflow. Gust fronts are characterized by a wind shift, temperature drop, and gusty winds out ahead of a thunderstorm. Sometimes the winds push up air above them, forming a shelf cloud or detached roll cloud.
- **Derecho**—A derecho is a widespread thunderstorm wind caused when new thunderstorms form along the leading edge of an outflow boundary (the boundary formed by horizontal spreading of thunderstorm-cooled air). The word “derecho” is of Spanish origin and means “straight ahead.” Thunderstorms feed on the boundary and continue to reproduce. Derechos typically occur in summer when complexes of thunderstorms form over plains, producing heavy rain and severe wind. The damaging winds can last a long time and cover a large area.
- **Bow Echo**—A bow echo is a linear wind front bent outward in a bow shape. Damaging straight-line winds often occur near the center of a bow echo. Bow echoes can be 200 miles long, last for several hours, and produce extensive wind damage at the ground.

Wind can be one of the most destructive forces of nature. Strong winds can erode mountains and shorelines, and topple trees and buildings. The extent and degree of damages from a high wind event are primarily related to the intensity of the event, measured in terms of wind speed. Sustained high winds can be the most damaging, although a concentrated gust also can cause significant damage. As wind speeds increase, the extent of damage varies depending on a number of site-specific characteristics that will be discussed later in this chapter.

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15.2 HAZARD PROFILE

15.2.1 Past Events

SHELDUS has records of 84 severe thunderstorm, high wind, hailstorm and tornado events in Park County from 1950 through 2013 (excluding winter weather events, which are presented in Chapter 10). Events since 1990 are shown in Table 15-1.

TABLE 15-1.
SEVERE WEATHER EVENTS

Date	Event	Property Damage
6/26/2010	Lightning	$1,000
1/27/2009	Wind	$3,125
1/7/2009	Wind	$93,636
8/23/2008	Tornado	$30,000
6/26/2008	Lightning	$10,000
11/27/2007	Wind	$0
12/20/2004	Wind	$23,529
6/15/2004	Lightning	$0
10/29/2003	Wind	$122,375
8/24/2003	Lightning	$0
8/5/2002	Lightning	$0
4/9/1999	Wind	$811,765
4/8/1999	Wind	$423,529
2/2/1999	Wind	$200,000
1/3/1996	Wind	$13,636
2/2/1995	Wind	$20,000
2/24/1994	Wind	$4,167
1/3/1994	Wind	$4,545
4/18/1993	Wind	$147
6/16/1992	Wind	$119
1/24/1992	Wind	$156
3/3/1991	Wind	$179
12/14/1990	Wind	$128
1/8/1990	Wind	$2,381

Source: SHELDUS

Locations of recorded extreme hail and tornado events in Park county are shown in Figure 15-2 and Figure 15-3, respectively.

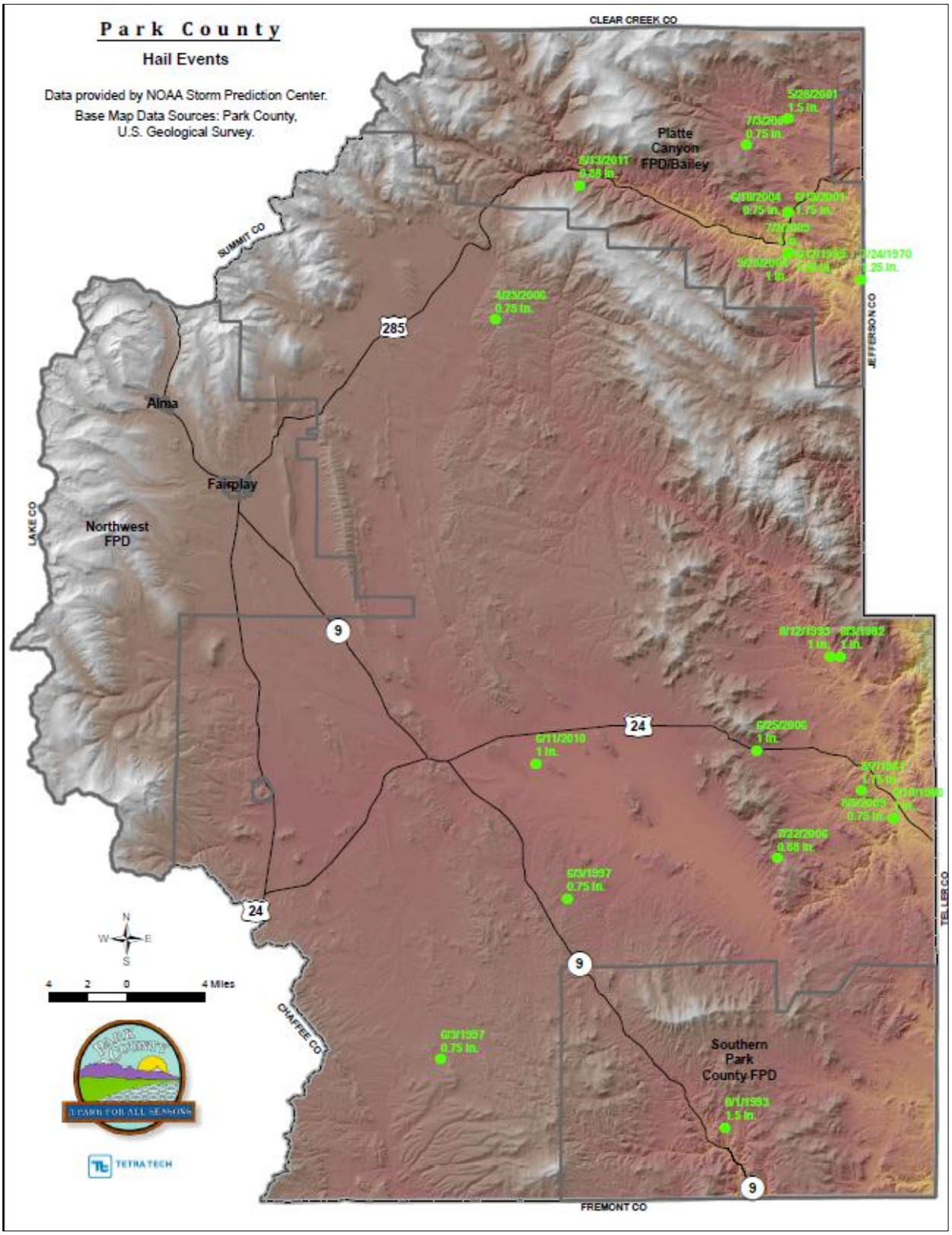

Figure 15-2. Recorded Extreme Hail Events in Park County

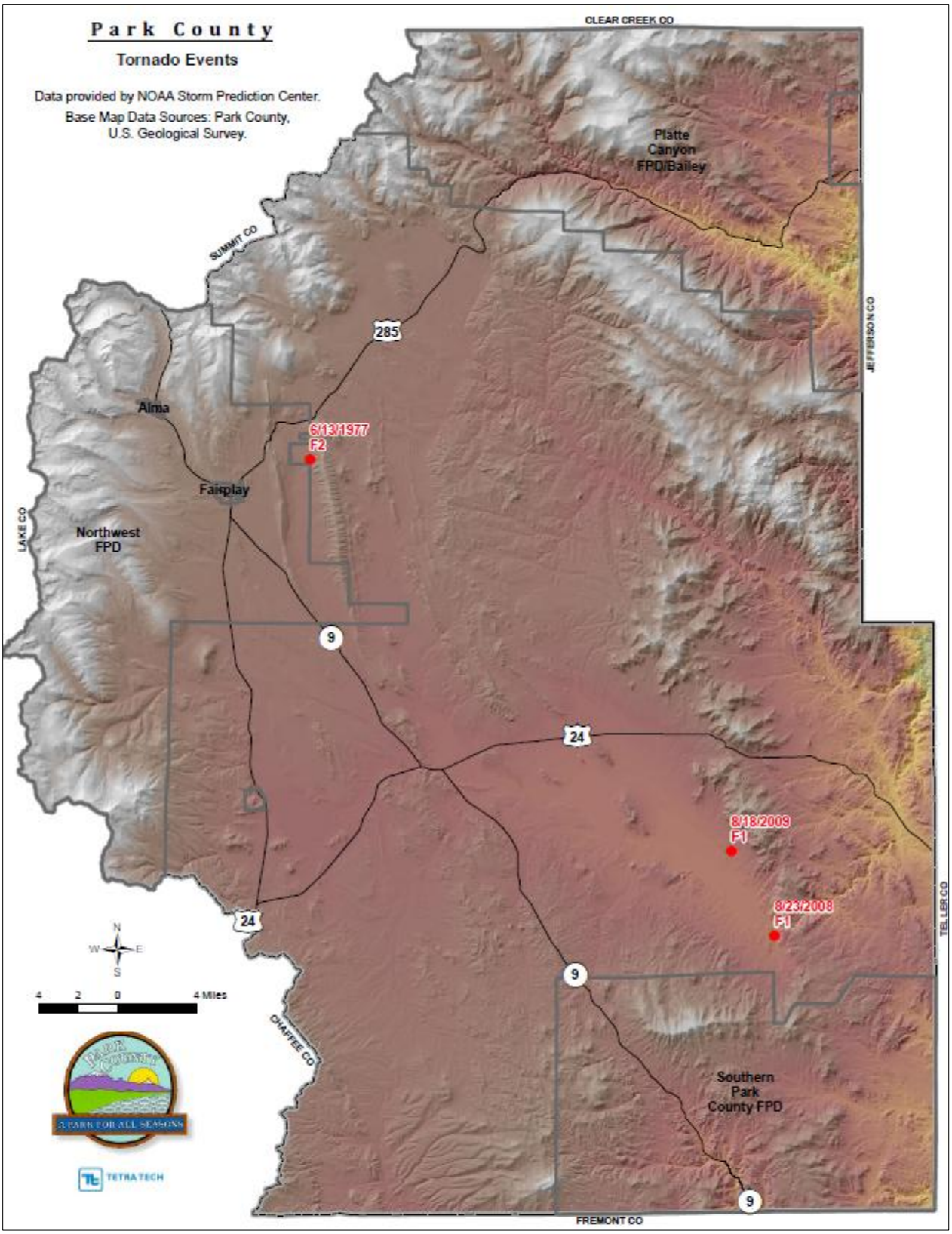

Figure 15-3. Recorded Tornado Events in Park County

The National Lightning Detection Network ranks Colorado 26th in the nation (excluding Alaska and Hawaii) in the number of cloud-to-ground lightning flashes, with an average of more than 500,000 cloud-to-ground lightning strikes per year. Figure 15-4 shows state-by-state lightning deaths between 2001-2010. Colorado ranks second for the number of deaths at 26. Only Florida, with 62 deaths, had more. In 2006, there were 5 lightning deaths and 15 reported lightning injuries in Colorado. In an average year in Colorado, 3 people are killed and 13 are injured.

Source: National Weather Service, www.lightningsafety.noaa.gov/

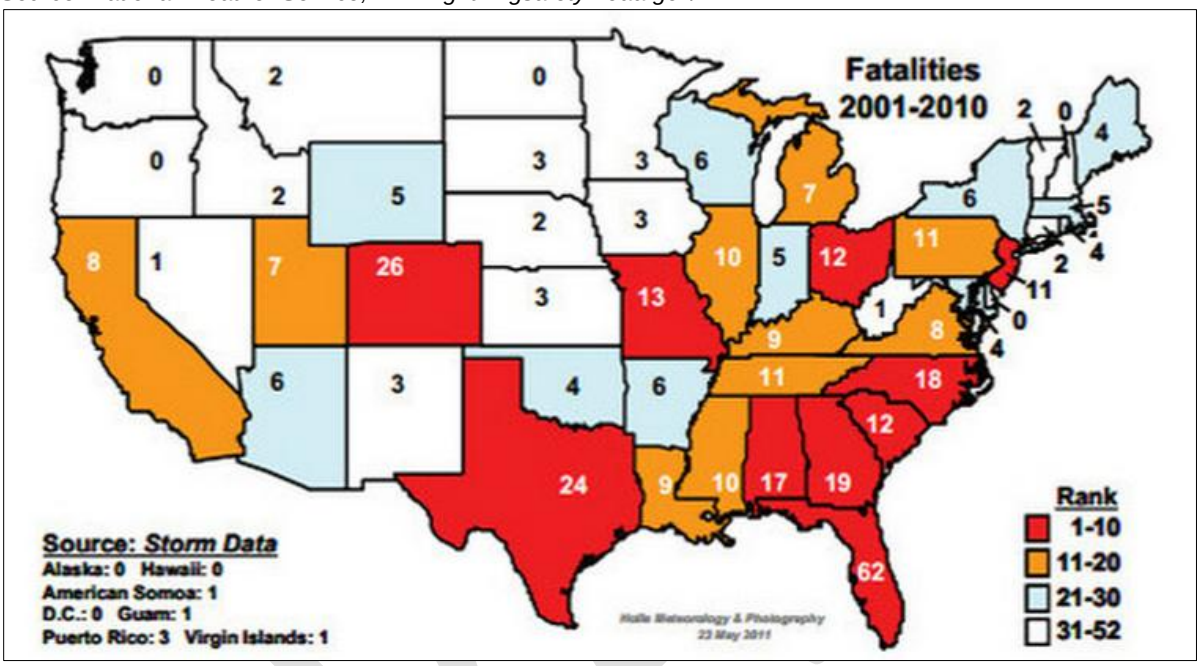

Figure 15-4. Lightning Fatalities in the United States, 2001-2010

15.2.2 Location

Severe weather events have the potential to happen anywhere in the planning area. Communities in low-lying areas next to streams or lakes are more susceptible to flooding. Wind events are most damaging to areas that are heavily wooded.

Severe thunderstorms have affected every portion of Park County. There are no proven indicators to predict where a thunderstorm may occur and they can often be expansive enough to affect the entire area. While Park County has experienced historical thunderstorms, hail storms, and wind events, there are currently no maps showing which specific portions of the county were affected by historical storm events. Likewise, there are currently no maps showing which portions of Park County could potentially be impacted at a future point in time by thunderstorms, hail storms, or wind events. Therefore, it is not possible to identify specific sections of Park County where thunderstorms are more likely to occur. However, very specific and localized geography can contribute to potential damages caused by these events, such as flooding, lightning-induced forest fires and winds in excess of 100 miles per hour. The entire County is considered to have an equal risk of being impacted by a thunderstorm event.

It should be noted that a natural lightning belt runs through a portion of Park County on the east side, from Cheesman Reservoir through Lake George and up into the Lost Park Wilderness Area. Within the Cheesman Lightning Belt there is a high risk of lightning strikes and fires resulting from those strikes within Park County.

15.2.3 Frequency

The severe weather events for Park County shown in Table 15-1 are often related to high winds associated with winter storms and thunderstorms. The planning area can expect to experience exposure to some type of severe weather event at least annually.

One of the most common hazards, severe thunderstorms, can occur throughout the year, although historical records indicate that in Park County the majority occur between April and October. Effects from severe thunderstorms can be high winds, heavy rain (possibly causing flooding), potentially life-threatening lightning, and hail.

Hailstorms occur more frequently in the late spring and throughout the summer. The hail season in Colorado is March through October, with June having the highest frequency of storms producing hail. The majority of hailstorms occur along the Front Range to the eastern plains Records indicate that Park County has endured damaging hail storms on a regular basis since records began being kept. It should be noted that most recently, in September of 2013, the front range communities of Denver and many foothill and mountain communities suffered an estimated $XXX million in damages from a single storm. Park County was not significantly impacted by this event.

15.2.4 Severity

The most common problems associated with severe storms are immobility and loss of utilities. Fatalities are uncommon, but can occur. Roads may become impassable due to flooding, downed trees, ice or snow, or a landslide. Power lines may be downed due to high winds or ice accumulation, and services such as water or phone may not be able to operate without power. Lightning can cause severe damage and injury.

Large hail, and the glass it may break, can injure people and animals. Hail can be smaller than a pea, or as large as a softball, and can be very destructive to automobiles, glass surfaces (e.g., skylights and windows), roofs, plants, and crops. The size of hailstones is a direct function of the severity and size of the storm.

Windstorms can be a frequent problem in the planning area and have been known to cause damage to utilities. The predicted wind speed given in wind warnings issued by the National Weather Service is for a one-minute average; gusts may be 25 to 30 percent higher.

Damaging wind events in Park County typically occur in the form of straight-line wind events which often accompany severe thunderstorms. Depending on the type of wind event, the damage sustained can range from extremely localized to widespread and from moderate to devastating. The potential impacts of a severe wind event depend on the specific characteristics but can include broken tree branches and uprooted trees; snapped power, cable, and telephone lines; damaged radio, television, and communication towers; damaged and torn off roofs; blown out walls and garage doors; overturned vehicles; totally destroyed homes and businesses; and serious injury and loss of life. Downed trees and power lines can fall across roadways and block key access routes, as well as cause extended power outages.

Central Colorado is classified as an area with a higher than average base wind speed nationally. According to the American Society of Civil Engineers *Minimum Design Loads for Buildings and other Structures* (ASCE 7-98), the design wind speed for Park County is 90 mph. This threshold is based on the 50-year recurrence interval wind event, and is intended to represent the potential base wind event, not winds associated with a tornado. Wind power classifications across Park County are shown on Figure 15-5. Figure 15-6 shows wind zones across the United States, including Colorado.

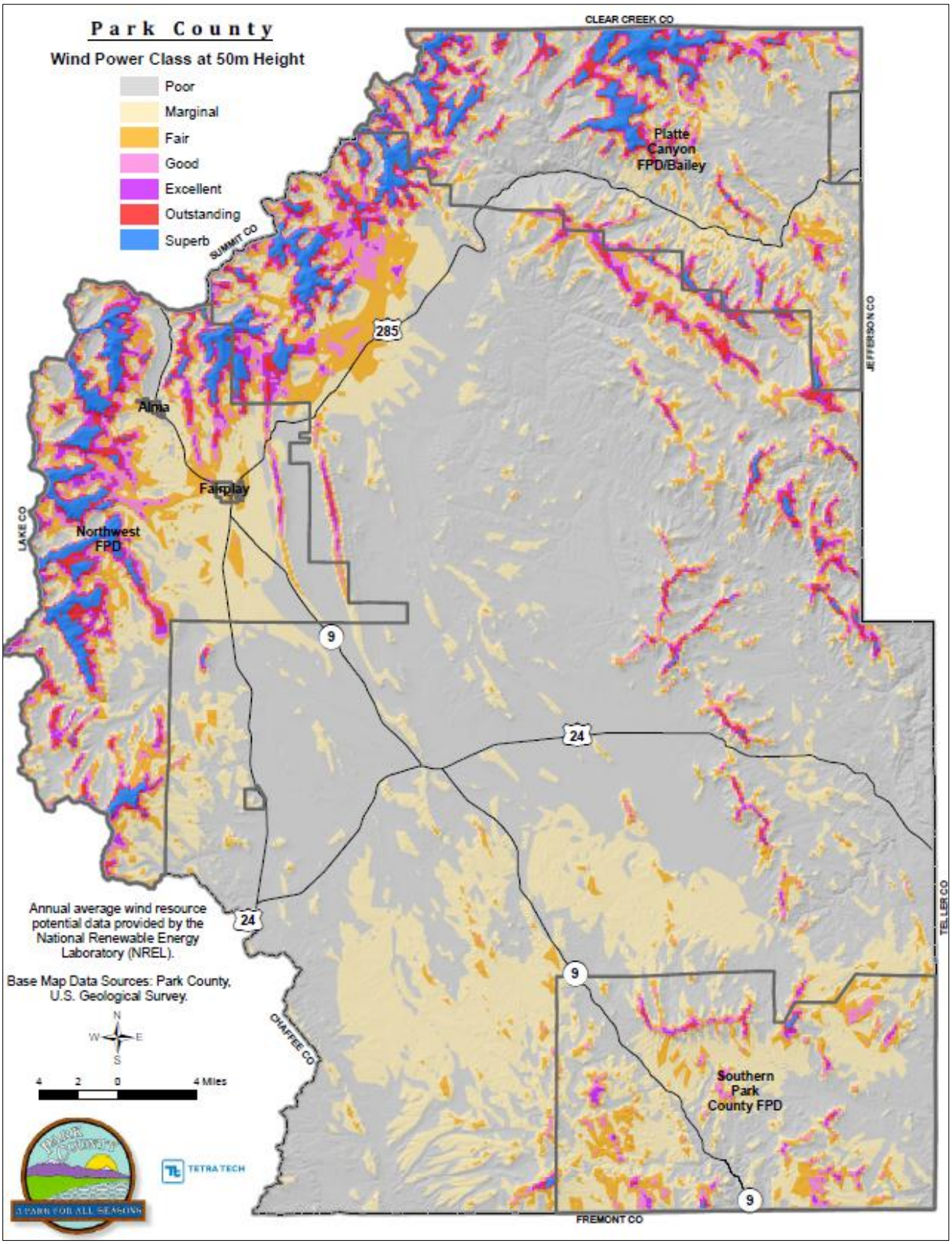

Figure 15-5. Wind Power Classifications in Park County

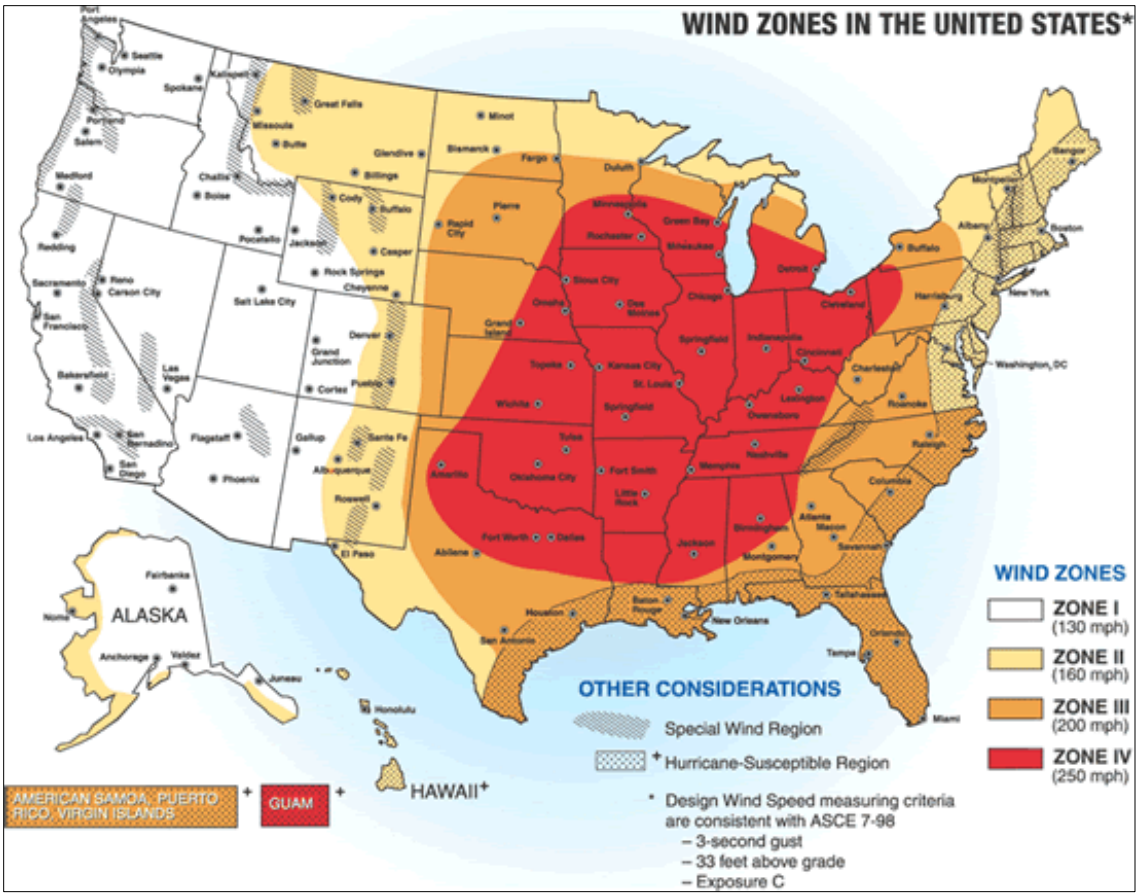

Figure 15-6. Wind Zones in the United States

Tornadoes are potentially the most dangerous of local storms, but they are not common in the planning area. If a major tornado were to strike within the populated areas of the county, damage could be widespread. Businesses could be forced to close for an extended period or permanently, fatalities could be high, many people could be homeless for an extended period, and routine services such as telephone or power could be disrupted. Buildings may be damaged or destroyed. California ranks 32nd among states for frequency of tornadoes, 44th for the frequency of tornados per square mile, 36th for injuries, and 31st for cost of damage. The state has no reported deaths from tornadoes.

Lightning is very unpredictable, which increases the risk to individuals and property. In the United States, 75 to 100 people are killed each year by lightning, although most lightning victims do survive. Persons struck by lightning often report a variety of long-term, debilitating symptoms, including memory loss, attention deficits, sleep disorders, numbness, dizziness, stiffness in joints, irritability, fatigue, weakness, muscle spasms, depression, and an inability to sit for long periods. It is a myth that lightning never strikes the same place twice. In fact, lightning will strike several times in the same place in the course of one discharge.

15.2.5 Warning Time

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

15.3 SECONDARY HAZARDS

The most significant secondary hazards associated with severe local storms are floods, falling and downed trees, landslides and downed power lines. Rapidly melting snow combined with heavy rain can overwhelm both natural and man-made drainage systems, causing overflow and property destruction. Landslides occur when the soil on slopes becomes oversaturated and fails.

Because severe thunderstorms can include high winds, heavy rain, lightning, and hail, there is a potential for a variety of secondary effects. Some common secondary effects of severe thunderstorms are downed trees and power lines, wind damage to buildings and vehicles, flooding impacts to infrastructure and utilities, wildfires and building fires ignited by lightning, and hail damage to buildings, vehicles and crops. The specific impacts of flooding and wildfires are discussed further in other sections of this Plan. Other secondary effects of severe thunderstorms can include disruption of critical services such as water, electrical, and telephone services. Damage to police stations, fire stations, and other emergency service facilities can weaken a community's ability to respond in the crucial hours and days following an event. Additional secondary effects include impacts on tourism, and thus the local economy, through activities such as camping, hiking, hunting, and fishing. Secondary effects of high winds include falling trees that are standing dead. When the pine beetle infestation problem worsens in Park County, the effects of these winds will be exacerbated.

15.4 CLIMATE CHANGE IMPACTS

Climate change presents a significant challenge for risk management associated with severe weather. The frequency of severe weather events has increased steadily over the last century. The number of weather-related disasters during the 1990s was four times that of the 1950s, and cost 14 times as much in economic losses. Historical data shows that the probability for severe weather events increases in a warmer climate (see Figure 10-2). The changing hydrograph caused by climate change could have a significant impact on the intensity, duration and frequency of storm events. All of these impacts could have significant economic consequences.

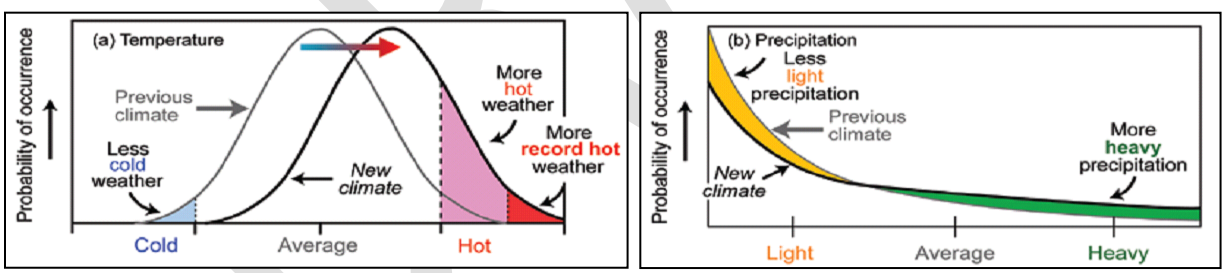

Figure 15-7. Severe Weather Probabilities in Warmer Climates

15.5 EXPOSURE

15.5.1 Population

A lack of data separating severe weather damage from flooding and landslide damage prevented a detailed analysis for exposure and vulnerability. However, it can be assumed that the entire planning area is exposed to some extent to severe weather events. Certain areas are more exposed due to geographic location and local weather patterns. Populations living at higher elevations with large stands of trees or power lines may be more susceptible to wind damage and black out, while populations in low-lying areas are at risk for possible flooding.

15.5.2 Property

The predominant building type in Park County is residential. It is estimated that 20 percent of the residential structures were built without the influence of a structure building code with provisions for wind loads. All of these buildings are considered to be exposed to the severe weather hazard, but structures in poor condition or in particularly vulnerable locations (located on hilltops or exposed open areas) may risk the most damage. The frequency and degree of damage will depend on specific locations.

15.5.3 Critical Facilities and Infrastructure

All critical facilities exposed to flooding (Chapter 9) are also likely exposed to severe weather. Additional facilities on higher ground may also be exposed to wind damage or damage from falling trees. The most common problems associated with severe weather are loss of utilities. Downed power lines can cause blackouts, leaving large areas isolated. Phone, water and sewer systems may not function. Roads may become impassable due to ice or snow or from secondary hazards such as landslides.

15.5.4 Environment

The environment is highly exposed to severe weather events. Natural habitats such as streams and trees are exposed to the elements during a severe storm and risk major damage and destruction. Prolonged rains can saturate soils and lead to slope failure. Flooding events caused by severe weather or snowmelt can produce river channel migration or damage riparian habitat. Storm surges can erode beachfront bluffs and redistribute sediment loads.

15.6 VULNERABILITY

15.6.1 Population

Vulnerable populations are the elderly, low income or linguistically isolated populations, people with life-threatening illnesses, and residents living in areas that are isolated from major roads. Power outages can be life threatening to those dependent on electricity for life support. Isolation of these populations is a significant concern. These populations face isolation and exposure during severe weather events and could suffer more secondary effects of the hazard.

Population density is an important factor when analyzing vulnerability to high wind events. The highest potential for damages, injuries, and loss of life is where the highest concentration of development exists. The population density in Park County varies, however, and areas of higher density are present. Therefore, these have a higher potential vulnerability to damage and loss of life in a high wind event.

15.6.2 Property

All property is vulnerable during severe weather events, but properties in poor condition or in particularly vulnerable locations may risk the most damage. Those in higher elevations and on ridges may be more prone to wind damage. Those that are located under or near overhead lines or near large trees may be vulnerable to falling ice or may be damaged in the event of a collapse.

Design Wind Pressures

Buildings must be designed to withstand both external and internal wind pressures on the structural framing and exterior elements. The level to which these structures are designed, as expected, directly correlates with its ability to resist damages due to high winds. The community's building code dictates to what design wind speed a structure must be designed to; as noted previously, the design wind speed for Park County is 90 mph. The County does have an adopted building code. For some building types, those

structures constructed subsequent to the adoption of the building code are the most likely to be the most resistant to damages from wind. However, no comprehensive data on the date built for these structures exists for Park County.

Building Type

The type of building construction will have a significant impact on potential damages from high wind events. A summary of basic building types – listed in order of decreasing vulnerability (from most to least vulnerable) – is provided below.

- **Manufactured**: This building type includes manufactured buildings that are produced in large numbers of identical or smaller units. These structures typically include light metal structures or mobile homes.
- **Non–Engineered Wood**: Wood buildings that have not been specifically engineered during design. These structures may include single and multi-family residences, some one or two story apartment units, and small commercial buildings.
- **Non-Engineered Masonry**: Masonry buildings that have not been specifically engineered during design. These structures may include single and multi-family residences, some one or two story apartment units, and some small commercial buildings.
- **Lightly Engineered**: Structures of this type may combine masonry, light steel framing, open-web steel joists, wood framing, and wood rafters. Because of the mixture of construction types within individual buildings, some portions of these buildings have been engineered while other portions of the same buildings have not. Examples of these structures include motels, commercial, and light industrial buildings.
- **Fully Engineered**: These buildings typically have been designed for a specific location, and have been fully engineered during design. Examples include high-rise office buildings, hotels, hospitals, and most public buildings.

Park County includes a variety of building types. Residential construction is primarily wood framed, varying from single story to multiple stories, although some masonry residential properties are present as well. As mentioned in the list above, manufactured and non-engineered wood framed structures are the most susceptible to potential damage. With these types of construction being the most prevalent for residential properties in Park County, many residential structures in the area could be classified to have a high level of vulnerability to wind events.

Other types of structures that are vulnerable to damages during high wind events and that are found throughout Park County are metal framed buildings, usually associated with light industrial building uses as well as agricultural buildings. Because these structures are unoccupied for a majority of the day, the potential losses for these structures may be lower than those of residential buildings. However, the high numbers of employees present in some industrial buildings during working hours can increase the potential for loss of life during a tornado or high wind event. Agricultural buildings, such as barns and silos, are not typically designed to be resistant to the forces of high winds. Although the potential for human losses in these structures may be lower, the potential for high amounts of damages are significant.

Other building related factors include height, shape, and the integrity of the building envelope. Taller buildings and those with complex shapes and complicated roofs are subject to higher wind pressures than those with simple configurations. The building envelope is composed of exterior building components and cladding elements including doors and windows, exterior siding, roof coverings, and roof sheathing. Any failure or breach of the building envelope can lead to increased pressures on the interior of the structure, further damage to contents and framing, and possible collapse.

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Estimating Losses

Potential damages due to a wind event can be estimated based on specific characteristics of a structure and a potential wind speed. The FEMA Benefit Cost module, used for estimating the benefits of potential wind mitigation projects, contains a wind damage function based on building type, and potential wind speed. This wind damage function expresses the potential damage to a building as a percentage of the buildings replacement value, and potential damages to a building's contents as a percentage of the value of its contents. For use in this module, FEMA separates structures according to the building types described in the Vulnerability Analysis.

Using these building types, and the potential wind speeds for Park County, potential damages can be expressed in terms of a percentage of the building and content values. ASCE 7-98 categorizes the South Central Colorado area as a 90-mph wind zone, based on a 50-year recurrence interval. Based on ASCE 7, the potential wind speed for an event with a 100-year recurrence interval was estimated to be 107 percent of the 50-year wind speed, or 96.3 mph. Table 15-2 includes estimates of potential damage of the specific building types in Park County for the 50- and 100-year interval wind event. It should be noted that the 100-year wind speed assumed corresponds with an F1 category tornado on the Fujita scale. Damages from the impact of a tornado stronger than an F1 could greatly exceed these estimates.

TABLE 15-2.
POTENTIAL SEVERE WEATHER EVENTS

	50-Year Event (90 mph)		100-Year Event (96.3 mph)	
Building Type	Building Damage	Contents Damage	Building Damage	Contents Damage
Light Engineered	5%	2.5%	15%	15%
Non-engineered wood	7.5%	5%	20%	20%
Non-engineered masonry	5%	2.5%	15%	15%
Fully Engineered	2.5%	2.5%	5%	15%
Manufactured Homes	25%	40%	50%	100%

Loss estimations for the severe weather hazard are not based on damage functions, because no such damage functions have been generated. Instead, loss estimates were developed representing 10 percent, 30 percent and 50 percent of the assessed value of exposed structures. This allows emergency managers to select a range of potential economic impact based on an estimate of the percent of damage to the general building stock. Damage in excess of 50 percent is considered to be substantial by most building codes and typically requires total reconstruction of the structure.

15.6.3 Critical Facilities and Infrastructure

Incapacity and loss of roads are the primary transportation failures resulting from severe weather, mostly associated with secondary hazards. Landslides caused by heavy prolonged rains can block roads. High winds can cause significant damage to trees and power lines, blocking roads with debris, incapacitating transportation, isolating population, and disrupting ingress and egress. Snowstorms in higher elevations can significantly impact the transportation system and the availability of public safety services. Of particular concern are roads providing access to isolated areas and to the elderly.

Prolonged obstruction of major routes due to landslides, snow, debris or floodwaters can disrupt the shipment of goods and other commerce. Large, prolonged storms can have negative economic impacts for an entire region.

Severe windstorms, downed trees, and ice can create serious impacts on power and above-ground communication lines. Freezing of power and communication lines can cause them to break, disrupting electricity and communication. Loss of electricity and phone connection would leave certain populations isolated because residents would be unable to call for assistance.

15.6.4 Environment

The vulnerability of the environment to severe weather is the same as the exposure.

15.7 FUTURE TRENDS IN DEVELOPMENT

All future development will be affected by severe storms. The ability to withstand impacts lies in sound land use practices and consistent enforcement of codes and regulations for new construction. The planning partners have adopted the International Building. This code is equipped to deal with the impacts of severe weather events. Land use policies identified in general plans within the planning area also address many of the secondary impacts (flood and landslide) of the severe weather hazard. With these tools, the planning partnership is well equipped to deal with future growth and the associated impacts of severe weather.

15.8 SCENARIO

Although severe local storms are infrequent, impacts can be significant, particularly when secondary hazards of flood and landslide occur. A worst-case event would involve prolonged high winds during a winter storm accompanied by thunderstorms. Such an event would have both short-term and longer-term effects. Initially, schools and roads would be closed due to power outages caused by high winds and downed tree obstructions. In more rural areas, some subdivisions could experience limited ingress and egress. Prolonged rain could produce flooding, overtopped culverts with ponded water on roads, and landslides on steep slopes. Flooding and landslides could further obstruct roads and bridges, further isolating residents.

15.9 ISSUES

Important issues associated with a severe weather in the planning area include the following:

- Older building stock in the planning area is built to low code standards or none at all. These structures could be highly vulnerable to severe weather events such as windstorms.
- Redundancy of power supply must be evaluated.
- The capacity for backup power generation is limited.
- Isolated population centers.

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CHAPTER 16.
PLANNING AREA RISK RANKING

A risk ranking was performed for the hazards of concern described in this plan. This risk ranking assesses the probability of each hazard's occurrence as well as its likely impact on the people, property, and economy of the planning area. The risk ranking was conducted via facilitated brainstorming sessions with the Steering Committee. Estimates of risk were generated with data from HAZUS-MH using methodologies promoted by FEMA. The results are used in establishing mitigation priorities.

16.1 PROBABILITY OF OCCURRENCE

The probability of occurrence of a hazard is indicated by a probability factor based on likelihood of annual occurrence:

- High—Hazard event is likely to occur within 25 years (Probability Factor = 3)
- Medium—Hazard event is likely to occur within 100 years (Probability Factor =2)
- Low—Hazard event is not likely to occur within 100 years (Probability Factor =1)
- No exposure—There is no probability of occurrence (Probability Factor = 0)

16.2 IMPACT

Hazard impacts were assessed in three categories: impacts on people, impacts on property and impacts on the local economy. Numerical impact factors were assigned as follows:

- **People**—Values were assigned based on the percentage of the total ***population exposed*** to the hazard event. The degree of impact on individuals will vary and is not measurable, so the calculation assumes for simplicity and consistency that all people exposed to a hazard because they live in a hazard zone will be equally impacted when a hazard event occurs. It should be noted that planners can use an element of subjectivity when assigning values for impacts on people. Impact factors were assigned as follows:
  - High—50 percent or more of the population is exposed to a hazard (Impact Factor = 3)
  - Medium—25 percent to 49 percent of the population is exposed to a hazard (Impact Factor = 2)
  - Low—25 percent or less of the population is exposed to the hazard (Impact Factor = 1)
  - No impact—None of the population is exposed to a hazard (Impact Factor = 0)
- **Property**—Values were assigned based on the percentage of the total ***property value exposed*** to the hazard event:
  - High—30 percent or more of the total assessed property value is exposed to a hazard (Impact Factor = 3)
  - Medium—15 percent to 29 percent of the total assessed property value is exposed to a hazard (Impact Factor = 2)
  - Low—14 percent or less of the total assessed property value is exposed to the hazard (Impact Factor = 1)

  - No impact—None of the total assessed property value is exposed to a hazard (Impact Factor = 0)

- **Economy**—Values were assigned based on the percentage of the total ***property value vulnerable*** to the hazard event. Values represent estimates of the loss from a major event of each hazard in comparison to the total assessed value of the property exposed to the hazard. For some hazards, such as wildfire, landslide and severe weather, vulnerability was considered to be the same as exposure due to the lack of loss estimation tools specific to those hazards. Loss estimates separate from the exposure estimates were generated for the earthquake and flood hazards using HAZUS-MH.
  - High—Estimated loss from the hazard is 20 percent or more of the total assessed property value (Impact Factor = 3)
  - Medium—Estimated loss from the hazard is 10 percent to 19 percent of the total assessed property value (Impact Factor = 2)
  - Low—Estimated loss from the hazard is 9 percent or less of the total assessed property value (Impact Factor = 1)
  - No impact—No loss is estimated from the hazard (Impact Factor = 0)

The impacts of each hazard category were assigned a weighting factor to reflect the significance of the impact. These weighting factors are consistent with those typically used for measuring the benefits of hazard mitigation actions: impact on people was given a weighting factor of 3; impact on property was given a weighting factor of 2; and impact on the economy was given a weighting factor of 1.

16.3 RISK RATING AND RANKING

The risk rating for each hazard was determined by multiplying the probability factor by the sum of the weighted impact factors for people, property and operations. Based on these ratings, a priority of high, medium or low was assigned to each hazard. The hazards ranked as being of highest concern are earthquake and severe weather. Hazards ranked as being of medium concern are landslide, flood and wildfire. The hazards ranked as being of lowest concern are drought and dam failure. Table 16-1 shows the summary/final hazard risk ranking for each hazard countywide and by participating jurisdiction.

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TABLE 16-1.
HAZARD RANKING BY JURISDICTION

	Unincorporated Park County	Fairplay	North-West FPD	Alma	Platte Canyon FPD	Southern Park County FPD
Wildfire	High	Medium	High	High	High	High
Drought	High	Low	High	High	High	High
Severe Winter Weather	High	High	High	High	High	High
Flooding	Medium	Medium	Medium	Medium	Medium	Medium
Severe Thunderstorm, Hail, Wind	High	Low	High	High	Medium	High
Earthquake	Low	Low	Low	Low	Low	Low
Landslide	Low	Low	Low	Low	Low	Low
Hazardous Materials	High	High	High	High	High	High
Avalanche	Low	None	Low	Low	None	Low
Tornado	Low	None	None	None	None	Medium
Dam Failure	Low	Low	Low	Low	Low	Medium
Sinkholes	None	Low	None	None	None	None

PART 3 —
MITIGATION STRATEGY

CHAPTER 17.
MITIGATION ALTERNATIVES

A menu of hazard mitigation alternatives was reviewed that presents a broad range of alternatives to be considered for use in the planning area, in compliance with 44 CFR (Section 201.6(c)(3)(ii)). The menu of mitigation initiatives, provided in Appendix D, was presented by hazard that is addressed by each initiative. The Committee reviewed the full range of initiatives as well as the County's ability to implement the variety of mitigation initiatives.

Hazard mitigation initiatives recommended in this plan were selected from among the alternatives presented in the menu as well as other projects known to be a necessity. The menu provided a catalog of mitigation ideas that are backed by a planning process, are consistent with the planning partners' goals and objectives, and are within the capabilities of the partners to implement. However, not all the alternatives met all the planning partners' selection criteria. Thus, the baseline was amended to fit Park County's specific needs.

CHAPTER 18.
MITIGATION INITIATIVES

18.1 SELECTED COUNTY-WIDE MITIGATION INITIATIVES

Table 18-1 presents the mitigation initiatives selected to represent the action plan for this hazard mitigation plan update.

18.2 STATUS OF MITIGATION INITIATIVES FROM PREVIOUS PLAN

Table 18-2 presents the status of mitigation initiatives included in the action plan from the 2009 hazard mitigation plan.

TABLE 18-1.
ACTION PLAN—COUNTYWIDE MITIGATION INITIATIVES

#	Priority	Project Status	Project Name	Benefit To Community	Problem/Project Description	Wildfire	Severe Storms (lightning, hail & high winds)	Severe Winter Weather	Drought and Extreme Temperatures	Landslide	Earthquake	Hazardous Materials	Flood	Land Subsidence/Sinkholes/Soil Erosion	Tornado	Dam Failure	HAZMAT	Lead & Support Agency	Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal:
COUNTYWIDE MITIGATION ACTIONS																						
1	High	New	Harden County communication and tower facilities.	H	Communication during emergency events is critical. There is a significant need to harden existing County radio and microwave communication and tower facilities for all hazards.	X	X	X	X	X	X	X	X	X	X	X		County OEM	H	C	2014 and ongoing	Goal 7, Objective 7A
2	High	2009 Plan	CWPP Implementation	H	Implement the recommendations of the 2007 Community Wildfire Protection Plan to lessen the likelihood that future fires will cause harm to existing and future buildings.	X			X									OEM and local emergency services	M	Staff time and grants	2015	Goals 1, 3, 4 and 7, Objectives 1A, 4A and 7A
3	High	2009 Plan	Community Wildfire Education	H	Continue community outreach and conduct workshops to educate property owners at risk from wildfire about specific maintenance strategies to reduce their risk from wildfire, and develop a list of the components of a homeowner's wildfire emergency evacuation kit and publicize the need for such kits.	X												OEM	L	Staff Time	Ongoing	Goals 1 and 4, Objectives 1A & 4A.

TABLE 18-1.
ACTION PLAN—COUNTYWIDE MITIGATION INITIATIVES

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4	High	2009 Plan	Winter Weather Outreach and Education	M	Create an education program regarding winter weather preparedness for citizens. Ensure that ranch owners and pet owners are included in this process, and specific strategies for protecting livestock and pets from severe winter weather events are addressed			X										OEM	L	Staff Time	Ongoing	Goals 1 and 4, Objectives 1A & 4A.
5	High	2009 Plan	Continue to regularly conduct emergency exercises	H	Conduct one exercise annually, involving members of the public, regarding the four phases of emergency management, to increase understanding of each person's role during a disaster, including public health issues such as Pandemic Flu.	X	X	X	X	X	X	X	X	X	X	X		OEM and local emergency services	M	Staff Time	Ongoing	Goals 1, 5 & 9, Objectives 1A, 5A & 9A
6	High	2009 Plan	Harden Infrastructure	H	As funding becomes available, harden infrastructure at greatest risk from wildfire. Develop infrastructure protection strategies and implement those strategies.	X												OEM and local emergency services	H	Staff time, general fund and grants	Ongoing	Goals 7, 8 & 9, Objectives 7A, 8A & 9B
7	High	2009 Plan	Continue to regularly conduct emergency exercises related to dam preparedness	M	Continue to conduct regular exercises for dam failure and dam preparedness. Work with those partners who maintain dams in Park County to ensure they are maintained and that emergency exercises for simulated dam failure response are conducted.								X					OEM and local emergency services	M	Staff Time	Ongoing	Goals 1, 5 & 9, Objectives 1A, 5A & 9A

TABLE 18-1.
ACTION PLAN—COUNTYWIDE MITIGATION INITIATIVES

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8	High	2009 Plan	Maintain Current Emergency Operations Center (EOC) Policies and Procedures	H	County Emergency Manager to update and maintain current EOC policies and procedures manual for all county employees and emergency responders on an on-going basis. Participate in county, regional, and statewide exercises to determine strengths and weaknesses in EOC operations, enhancing support activities during an actual disaster.	X	X	X	X	X	X	X	X	X	X	X		OEM	L	Staff time, general fund and grants	Ongoing	Goals 1 & 8, Objectives 1A & 8A
9	High	2009 Plan	Evacuation Drills	H	Conduct an evacuation drill of the Park County 911 Communications Center at least once annually to ensure the safety of all employees, and to ensure a seamless communications system during an emergency.	X	X	X	X	X	X	X	X	X	X	X		OEM, Sheriff & police departments	L	Staff time, general fund and grants	Ongoing	Goals 1 & 8, Objectives 1A & 8A
10	High	New	Be Wise, Be Prepared	M	Update, expand and reprint county winter disaster preparedness booklet to cover all hazards and distribute to residents of the County through a mass mailing or by making it available to organizations such as homeowner associations and fire districts for distribution.	X	X	X	X	X	X	X	X	X	X	X	X	County Emergency Management	M	Grants, County and other organizations funding	2014-2015	Goals 1 and 4, Objectives 1A & 4A

TABLE 18-1.
ACTION PLAN—COUNTYWIDE MITIGATION INITIATIVES

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11	Med	2009 Plan	Drought and Water Wise Education	M	Educate the public about ways to lessen the effects of drought, and the need to be water-wise.				X									OEM	L	Staff Time	Ongoing	Goals 1 and 4, Objectives 1A & 4A.
12	Med	New	North-West FPD Wildfire Hazard Mitigation	H	North-West FPD completed a CWPP in 2010. Included in this plan are proposed locations for wildfire mitigation projects based on risk and hazard severity to reduce the frequency and intensity of wildfires within the District. All of these projects would benefit from funding in order to proceed.	X		X										North-West FPD, Towns, Park County OEM, U.S. Forest Service, homeowner associations etc.	M	Grants with soft, in-kind matches	2014-2015	Goals 1, 3 and 7, Objectives 1A and 7A
13	Med	New	North-West FPD CWPP renewal	H	North-West FPD's CWPP will be in need of review and renewal by 2015 in order to stay current and meet grant requirements. By keeping the plan current, North-West FPD can provide the most accurate information to its residents and remain eligible for grant funding to perform mitigation work called for in the CWPP.	X			X									North-West FPD, Towns, Park County OEM,	M	FEMA & CWCB grants, etc.	2014-2015	Goals 1, 3 and 7, Objectives 1A, 3A and 7A
14	Med	New	Fuels/Defensible Space Treatment	H	There has been a lack of fuels treatment / reduction and implementation of defensible space around structures in the wildland / urban interface area. Actively addressing this issue will provide increased protection to life and property.	X			X									Platte Canyon Fire etc.	M	FEMA & CWCB grants, etc.	2014 and ongoing	Goals 1, 3 and 7, Objectives 1A, 3A and 7A

TABLE 18-1.
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15	Med	New	Wildfire mitigation actions in the areas identified as the highest risk areas in the CWPP.	H	Research the availability and make grant applications for wildfire mitigation actions in the areas identified as the highest risk areas in the CWPP.	X												County OEM & Fire Districts	L	FEMA & CWCB grants, etc.	2013 and ongoing	Goals 1, 3 and 7, Objectives 1A, 3A and 7A
16	Med	New	Generators for the Fairplay Town Hall, Police Departmen t and Public Works	M	Acquire generators for the Fairplay Town Hall, Police Department and Public Works	X	X	X	X	X	X	X	X	X	X	X		Fairplay town manager	M	Town budget, FEMA and other grants.	2014 on	Goal 8, Objective 8A
17	Med	New	Generators for Southern Park County FPD/ Guffey	M	Acquire generators to support South Park and Guffey	X	X	X	X	X	X	X	X	X	X	X		Southern Park County FPD	M	FPD Budget, FEMA and other grants	2014 on	Goal 8, Objective 8A
18	Med	New	Alternative emergency vehicle access routes	H	Investigate the status of and need to establish alternative emergency vehicle access routes in the County	X	X	X	X	X	X	X	X	X	X	X		South Park Ambulance	L	Staff time	2013 on	Goal 1, Objective 1A
19	Med	New	Revise local code requiremen ts for ingress/egr ess	H	Investigate the process and revise current county codes to require that all new platted subdivisions have a minimum of two ingress and egress points.	X	X	X	X	X	X	X	X	X	X	X		South Park Ambulance with County Planning	L	Staff time	2014 onward	Goal 1, Objective 1A
20	Med	2009 Plan	High wildfire risk area land standards		Adopt land and building standards for future development in the county's mapped areas of high wildfire risk.	X			X									Park County Planning with assistance from OEM	L	Staff time	2014 onward	Goal 1, Objective 1A

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21	Med	2009 Plan	Wildfire mitigation activities in high risk areas	H	Identify the priority areas for high wildfire risk that have not burned in the last five years. Encourage and assist neighborhoods and homeowner associations in developing local wildfire plans, allowing for mitigation project development in the high hazard areas and technical input to future land use decisions.	X			X									Park County OEM and Fire Districts	L	Staff time	2014 onward	Goals 1, 3, 4 and 7, Objectives 1A, 4A and 7A
22	Med	2009 Plan	Severe storm notification systems	M	Develop a program to better receive, coordinate and distribute information about likely thunderstorms, with assistance from NOAA and NWS.		X											Park County OEM	M	Staff time and grants	2015	Goal 6, Objective 6A
23	Med	2009 Plan	High risk landslide areas and future land use	L	In conjunction with CGS and/or USGS, define the high priority areas for landslides in Park County to guide future land use decisions and future mitigation decisions.					X								Park County OEM and Engineering				Goal 1, Objective 1A
24	Med	2009 Plan	Dam failure warning systems	M	Work with the Division of Water Resources to rank high priority dams within Park County and for installation of dam failure warning systems and plans.								X					Park County OEM			2016	Goals 3, 6 and 7, Objectives 3A, 6A and & 7A
25	Low	2009 Plan	Amend current codes as necessary related to seismic risk	L	Adopt zoning and subdivision regulations for proposed development in or adjacent to areas of high seismic risk.						X								L	Staff time	2016	Goal 1, Objective 1A

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26	Low	2009 Plan	Flooding and Updating Land Use Codes	M	Identify flood values at risk, cross-referenced with hazards, and by the end of 2015, update county Land Use Regulations to include mitigation measures for flooding in order to lessen flood damages to existing and future buildings.								X						L	Staff time	2015	Goals 1 & 2, Objectives 1A & 2A
27	Low	New	Foster Mutual Aide Agreements	H	Continue to foster and maintain mutual aid agreements with local and regional partners to enhance Park County's ability to protect its citizens and infrastructure form the impacts of natural hazards.	X	X	X	X	X	X	X	X	X	X	X		Park County OEM, Police/Sheriff and Fire Districts	L	Staff time	Ongoing	Goal 9, Objective 9A
28	Low	2009 Plan	Stream management	M	Identify stream reaches that do not meet water quality standards, specifically those with sediment buildup and provide technical information to local officials from the three Park County jurisdictions about the significance and consequences of sediment buildup in local streams.								X					public works	L	Staff time/ general fund	2015	Goals 2 & 9, Objective 2A
29	Low	2009 Plan	Community Thunderstorm Education	M	Educate the public about thunderstorm awareness and safety precautions		X											OEM	L	Staff Time	Ongoing	Goals 1 and 4, Objectives 1A & 4A.

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30	Low	2009 Plan	Continued Development of After Action Reports	H	Continually produce a written After Action Report for every exercise and disaster in Park County, and make those results known to all involved so that processes and procedures can be improved in future operations.	X	X	X	X	X	X	X	X	X	X	X		OEM and local emergency services	L	Staff Time	Ongoing	Goals 1 & 9, Objectives 1A & 9 A/B
31	Low	2009 Plan	Emergency Notification Systems	H	Create a public notification program for severe thunderstorms and lightning, tornados, winter weather, and flash flooding.		X	X					X	X				OEM and local emergency services	M	Staff time and grants	2016	Goal 6, Objective 6A
32	Low	2009 Plan	VMS for Emergency Notification	H	Utilize additional Variable Message Sign (VMS) boards on Highways, as well as county roads, to warn the public about possible hazards in the area.	X	X	X	X	X	X	X	X	X	X	X		OEM and local emergency services	L	Staff time	Ongoing	Goal 6, Objective 6A
33	Low	2009 Plan	Security / risk profiles for County Critical Facilities	H	As funding becomes available, develop detailed risk profiles for each identified critical facility, keeping in mind security needs and vulnerabilities in order to make buildings more secure, especially those critical during an emergency response.	X	X	X	X	X	X	X	X	X	X	X		OEM	H	Staff time, general fund and grants	2017	Goal 7, Objective 7A

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34	Low	2009 Plan	Flood Hazard Protection Plans	M	Continue to identify those areas of Park County most in need of flood hazard reduction plans with detailed engineering analyses. Identify specific drainage "hot spots" in the Park County jurisdictions, develop engineering plans to improve bridges, culverts, channels and other infrastructure in those areas, fund the projects and complete them to lessen the likelihood that future floods will cause harm to existing and future buildings.								X					OEM	M	Staff time, general fund and grants	Ongoing	Goals 1, 2 & 3, Objectives 1A, 2A and 3A.
35	Low	2009 Plan	Seismic Mapping	L	With the assistance of CGS and USGS, map highest priority locations for detailed seismic risk studies and other geologic hazards in Park County and identify bridges and other infrastructure subject to the greatest seismic risk.						X							OEM	H	Staff time, general fund and grants	2014	Goal 1, Objective 1A
36	Low	2009 Plan	ID High Risk Drought Communities	M	Continue to identify those unincorporated communities in Park County most at risk due to drought, develop Community Water Conservation Plans, and alternate water supply locations for those communities, and implement those plans.				X									OEM	M	Staff time, general fund and grants	2016	Goals 1 & 9, Objectives 1A & 9A

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37	Low	2009 Plan	Drought monitoring	M	Identify specific locations and specific parameters for a long-term drought monitoring program and implement the monitoring program. Obtain assistance and technical recommendations from the Natural Resources Conservation Service for an improved program of drought preparedness and drought response (Fairplay).				X									OEM	M	Staff time, general fund and grants	2015	Goals 3 & 4, Objectives 3A & 4A
FAIRPLAY MITIGATION ACTIONS																						
38	High	New	Building ordinance updates	High	Investigate the adoption of an Ordinance that requires Fire Retardant materials in new building construction and any remodels/replacements.	X												Fairplay Administrator	Low	General Fund/Staff Time	2014	
39	High		Private property fire mitigation	High	Since the threat and impact of wildfires in our community continues to rise, investigate what would be necessary to implement a program requiring property owners to mitigate fire sources on their property, such as dead vegetation. These actions would also reduce potential damage in high wind events, tornados and drought.	X	X		X						X			Fairplay	Medium	General Fund/Staff Time/DHS Grants	2014 and on-going	

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40	High		Improve winter access to critical facilities	High	Public Works will make road access during severe winter weather a priority such as plowing and sanding, making access to critical facilities easier.			X										Fairplay Department of Public Works	Medium	General Fund	2014 and on-going	
41	Med	New	Severe winter weather public education	Medium	Educate Fairplay residents, business owners and visitors on the potential impacts of severe winter weather and provide FEMA sponsored brochures regarding severe winter weather preparedness. The Police and Public Works will handout these to town citizens and make the available at Town Hall.			X										Fairplay Police Department	Low	General Fund and FEMA grants	2014 and on-going	
42	Med	New	Drainage assessment and culvert installation	Medium	Public Works will undertake an assessment of Fairplay's current drainage system. Based on the results, the town will strive to install new culverts as indicated and needed. Additionally, PW's will create a maintenance plan to repair and maintain drainage culverts in the Town's higher flood areas								X					Fairplay Department of Public Works	High	General Fund	2014 and on-going	

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43	Low	New	HAZMAT planning and response	Medium	Work together with the North-West Fire Protection District and the Colorado State Patrol to implement their existing HAZMAT plans as the predominant threat from HAZMAT is on the two State highways running through Fairplay.												X	Police department together North-West FPD and State Patrol	Low	General fund	2014 and on-going	
44	Low	New	HAZMAT training	Medium	All Police and Public Works employees will attend a HAZMAT Awareness Program in the next year.												X	Fairplay Police and Public Works Departmen ts	Medium	General Fund and DHS Grants	2014 and on-going	
ALMA MITIGATION ACTIONS																						
45	High	New	Develop alternative water supplies	High	As climate change continues to affect the region, it will be important to identify alternative water supplies for time of drought. Consider the development of mutual aid agreements with alternative suppliers. Additionally, look at obtaining additional water rights.				X									Town Administra tor	High	General Fund	2013 & on-going	
46	High	New	Back-up power	High	Research options, cost, funding and acquisition of back-up power sources for Alma essential services to avoid water shortages, etc. during extended power outages.	X	X	X	X	X	X	X	X	X	X	X	X	Town Administra tor	M	Governm ent Surplus /general Fund	2013	

TABLE 18-1.
ACTION PLAN—COUNTYWIDE MITIGATION INITIATIVES

#	Priority	Project Status	Project Name	Benefit To Community	Problem/Project Description	Wildfire	Severe Storms (lightning, hail & high winds)	Severe Winter Weather	Drought and Extreme Temperatures	Landslide	Earthquake	Hazardous Materials	Flood	Land Subsidence/Sinkholes/Soil Erosion	Tornado	Dam Failure	HAZMAT	Lead & Support Agency	Estimated Cost	Target Funding Source	Target Completion Date	Supported by Goal:
47	High	New	Tree Watch program	High	Support programs such as a "tree watch" program that encourages residents to proactively manage vegetative problem areas (beetle kill) by use of selective removal of hazardous trees, tree replacement, etc.		X	X							X			Town Administrator	M	General fund / staff time	2014 & on-going	
48	High	New	Tree Trimming	High	Develop and implement a program which encourages residents to trim or remove trees that could affect power lines		X	X							X			Town Administrator	L	General fund / staff time	2014 & on-going	
49	Med	New	Defensible Space	High	Review current town codes and policies and update as necessary to encourage residents and businesses to create and maintain defensible space around structures and infrastructure.	X												Town Administrator	L	General Fund	2013 & on-going	
50	Med	New	Safe Room	High	Develop a safe room plan for Alma community facilities and residents		X	X							X			Town Administrator	H	General Fund/grants	2015	
51	Med	New	Fire retardant building materials	High	Review current town codes and policies and update as necessary to require the use of fire-retardant building materials in high fire hazard areas.	X												Town Administrator	L	General Fund	2013 & on-going	
52	Low	New	Lightning rods	Medium	Continue to Install and upgrading lightning rods on public structures as needed		X											Town Administrator	M	General fund / water / sewer	2013 & on-going	

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53	Low	New	Adopt no adverse impact standards	Medium	Consider establishing an administrative procedure or change in the current codes that requires builders to develop a site drainage plan ensuring "no adverse impact" when they apply for permits for new construction within the town.								X					Town Administrator	L	General fund, staff time	2014	
54	Low	New	Mapping of flood prone areas	Medium	Complete GIS and other automated inventories for stormwater, problem drainage areas, DFIRM and other community assets.								X					Town Administrator	H	General fund	2015	
North-West Fire District																						
55	High	New	North-West FPD Wildfire Hazard Mitigation	H	North-West FPD completed a CWPP in 2010. Included in this plan are proposed locations for wildfire mitigation projects based on risk and hazard severity to reduce the frequency and intensity of wildfires within the District. All of these projects would benefit from funding in order to proceed.	X		X										North-West FPD, Towns, U.S. Forest Service, homeowner associations etc.	M	Grants with soft, in-kind matches	2014-2015	Goals 1, 3 and 7, Objectives 1A and 7A

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56	High	New	North-West FPD CWPP renewal	H	North-West FPD's CWPP will be in need of review and renewal by 2015 in order to stay current and meet grant requirements. By keeping the plan current, North-West FPD can provide the most accurate information to its residents and remain eligible for grant funding to perform mitigation work called for in the CWPP.	X			X									North-West FPD and Towns	M	FEMA & CWCB grants, etc.	2014-2015	Goals 1, 3 and 7, Objectives 1A, 3A and 7A
57	High	New	Harden County communication and tower facilities.	H	Communication during emergency events is critical. There is a significant need to harden existing North-West FPD radio and microwave communication and tower facilities for all hazards.	X	X	X	X	X	X	X	X	X	X	X		North-West FPD	H	C	2014 and ongoing	Goal 7, Objective 7A
58	High	New	Fuels/Defensible Space Treatment	H	There has been a lack of fuels treatment / reduction and implementation of defensible space around structures in the wildland / urban interface area. Actively addressing this issue will provide increased protection to life and property within the North-West FPD.	X			X									North-West FPD	M	FEMA & CWCB grants, etc.	2014 and ongoing	Goals 1, 3 and 7, Objectives 1A, 3A and 7A

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59	Med	New	Wildfire mitigation actions in the areas identified as the highest risk areas in the CWPP.	H	Research the availability and make grant applications for wildfire mitigation actions in the areas identified as the highest risk areas in the North-West FPD CWPP.	X												North-West FPD	L	FEMA & CWCB grants, etc.	2013 and ongoing	Goals 1, 3 and 7, Objectives 1A, 3A and 7A
60	Med	2009 Plan	Community Wildfire Education	H	Continue community outreach and conduct workshops to educate property owners at risk within the North-West FPD from wildfire about specific maintenance strategies to reduce their risk from wildfire, and develop a list of the components of a homeowner's wildfire emergency evacuation kit and publicize the need for such kits.	X												North-West FPD	L	Staff Time	Ongoing	Goals 1 and 4, Objectives 1A & 4A.
61	Med	2009 Plan	Continue to regularly conduct emergency exercises	H	North-West FPD to actively participate in one exercise annually, involving members of the public, regarding the four phases of emergency management, to increase understanding of each person's role during a disaster, including public health issues such as Pandemic Flu.	X	X	X	X	X	X	X	X	X	X	X		North-West FPD together with County OEM and other FPDs	M	Staff Time	Ongoing	Goals 1, 5 & 9, Objectives 1A, 5A & 9A

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62	Low	2009 Plan	Winter Weather Outreach and Education	M	Create an education program regarding winter weather preparedness for citizens within the North-West FPD. Ensure that ranch owners and pet owners are included in this process, and specific strategies for protecting livestock and pets from severe winter weather events are addressed			X										North-West FPD	L	Staff Time	Ongoing	Goals 1 and 4, Objectives 1A & 4A.
63	Low	New	Alternative emergency vehicle access routes	H	Investigate the status of and need to establish alternative emergency vehicle access routes in the County	X	X	X	X	X	X	X	X	X	X	X		North-West FPD together with all County	L	Staff time	2013 on	Goal 1, Objective 1A
64	Low	New	Be Wise, Be Prepared	M	Update, expand and reprint county winter disaster preparedness booklet to cover all hazards and distribute to residents of the County through a mass mailing or by making it available to organizations such as homeowner associations and fire districts for distribution. Ensure that the County-wide public addresses any factors that may be unique to residents and businesses located within the North-West FPD boundaries.	X	X	X	X	X	X	X	X	X	X	X	X	North-West FPD together with County OEM and other FPDs	M	Grants, County and other organizations funding	2014-2015	Goals 1 and 4, Objectives 1A & 4A

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Platte Canyon FPD																						
65	High	New	Fuels/Defensible Space Treatment	H	There has been a lack of fuels treatment / reduction and implementation of defensible space around structures in the wildland / urban interface area. Actively addressing this issue will provide increased protection to life and property within the North-West FPD.	X			X									Platte Canyon FPD	M	FEMA & CWCB grants, etc.	2014 and ongoing	Goals 1, 3 and 7, Objectives 1A, 3A and 7A
66	High	New	CWPP	H	Implement and maintain current Community Wildfire Protection Plans	X												Platte Canyon FPD	M	FEMA & CWCB grants, etc.	2014 and ongoing	Goals 1, 3 and 7, Objectives 1A, 3A and 7A
67	Med	New	Harden Bailey and area communication and tower facilities.	H	Communication during emergency events is critical. There is a significant need to harden existing County radio and microwave communication and tower facilities for all hazards.	X	X	X	X	X	X	X	X	X	X	X		Platte Canyon FPD	H	C	2014 and ongoing	Goal 7, Objective 7A
68	Low	New	Winter Weather Outreach and Education	M	Create an education program regarding winter weather preparedness for Bailey and area residents. Ensure that ranch owners and pet owners are included in this process, and specific strategies for protecting livestock and pets from severe winter weather events are addressed			X										Platte Canyon FPD	L	Staff Time	Ongoing	Goals 1 and 4, Objectives 1A & 4A.

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Southern Park County FPD/South Park Ambulance District																						
69	High	New	Alternative emergency vehicle access routes	H	Investigate the status of and need to establish alternative emergency vehicle access routes in the County	X	X	X	X	X	X	X	X	X	X	X	X	South Park Ambulance	L	Staff time	2013 on	Goal 1, Objective 1A
70	High	2009 Plan	Wildfire mitigation activities in high risk areas	H	Identify the priority areas for high wildfire risk that have not burned in the last five years. Encourage and assist neighborhoods and homeowner associations in developing local wildfire plans, allowing for mitigation project development in the high hazard areas and technical input to future land use decisions.	X			X									Park County OEM and Fire Districts	L	Staff time	2014 onward	Goals 1, 3, 4 and 7, Objectives 1A, 4A and 7A
71	High	New	Be Wise, Be Prepared	M	South Park Ambulance is interested in working together with County OEM and other agencies to update, expand and reprint county winter disaster preparedness booklet to cover all hazards and distribute to residents of the County through a mass mailing or by making it available to organizations such as homeowner associations and fire districts for distribution.	X	X	X	X	X	X	X	X	X	X	X	X	South Park Ambulance with County Emergency Manageme nt	M	Grants, County and other organizati ons funding	2014-2015	Goals 1 and 4, Objectives 1A & 4A

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72	High	2009 Plan	Dam failure warning systems	M	South Park emergency responders will work with the County OEM and the Division of Water Resources to rank high priority dams within Park County and for installation of dam failure warning systems and plans.								X					South Park emergency responders w/ Park County OEM			2016	Goals 3, 6 and 7, Objectives 3A, 6A and & 7A
73	Med	New	Revise local code requirements for ingress/egress	H	South Park Ambulance will work together with public officials to investigate the process and revise current county codes to require that all new platted subdivisions have a minimum of two ingress and egress points.	X	X	X	X	X	X	X	X	X	X	X	X	South Park Ambulance with County Planning	L	Staff time	2014 onward	Goal 1, Objective 1A
74	Med	2009 Plan	Severe storm notification systems	M	Develop a program to better receive, coordinate and distribute information about likely thunderstorms, with assistance from NOAA and NWS.		X											Park County OEM	M	Staff time and grants	2015	Goal 6, Objective 6A
75	Med	New	Harden County communication and tower facilities.	H	Southern Park FPD recognizes that communication during emergency events is critical. There is a significant need to harden existing County radio and microwave communication and tower facilities for all hazards. Southern Park County FPD will work together with local officials to find the mechanisms to harden these facilities.	X	X	X	X	X	X	X	X	X	X	X	X	County OEM	H	C	2014 and ongoing	Goal 7, Objective 7A

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76	Low	New	Fuels/Defensible Space Treatment	H	South Park emergency responders recognize that there has been a lack of fuels treatment / reduction and implementation of defensible space around structures in the wildland / urban interface area within their service area. They propose to actively address this issue recognizing that it will provide increased protection to life and property.	X			X									Southern Park County FPD together with other area agencies	M	FEMA & CWCB grants, etc.	2014 and ongoing	Goals 1, 3 and 7, Objectives 1A, 3A and 7A
77	Low	2009 Plan	Winter Weather Outreach and Education	M	Southern Park FPD proposes to work with County officials and other area first responders to create an education program regarding winter weather preparedness for citizens. They will ensure that ranch owners and pet owners are included in this process, and specific strategies for protecting livestock and pets from severe winter weather events are addressed.			X										OEM	L	Staff Time	Ongoing	Goals 1 and 4, Objectives 1A & 4A.
78	Low	2009 Plan	Harden Infrastructure	H	As funding becomes available, Southern Park County FPD recognizes the need to harden infrastructure at greatest risk from wildfire. Develop infrastructure protection strategies and implement those strategies.	X												Southern Park County FPD, County OEM and local emergency services	H	Staff time, general fund and grants	Ongoing	Goals 7, 8 & 9, Objectives 7A, 8A & 9B

TABLE 18-2.
STATUS OF MITIGATION INITIATIVES FROM 2009 HAZARD MITIGATION PLAN

		Project Status				Funding				
Action No.	Action	In Progress	Delayed*	Completed	No Longer Required*	Budgeted	Apply for Grant	Grant Received	Target Completion	Comments *(include explanation of delayed or no longer required actions)
1	All three Park County jurisdictions officially recognize the Mitigation Advisory Committee (MAC) and specify ongoing responsibilities of the MAC.				X					Administrative Action. No longer applicable.
2	Adopt land and building standards for future development in the county's mapped areas of high wildfire risk.	X								In progress in both Fairplay and County overall
3	Assess various snow data measurement activities for snow depth, wind velocity, and depth of snow drifting currently available within the county.			X						
4	Encourage changes to the current FEMA snow policy to reflect more than one way to measure impacts of snowfall and severe blizzard conditions, including providing comments during FEMA's snow policy comment period, which ends 8/25/08.			X						
5	Identify hazard areas for snowstorms or blizzards, and prepare shelters in those areas for residents and travelers in the event of severe winter weather incidents.			X						
6	Identify the priority areas for high wildfire risk that have not burned in the last five years. Encourage and assist neighborhoods and homeowner associations in developing local wildfire plans, allowing for mitigation project development in the high hazard areas and technical input to future land use decisions.			X						Multiple CWPPs existing. In updating process. Recommended analysis has been done.
7	Develop a program to better receive, coordinate and distribute information about likely thunderstorms, with assistance from NOAA and NWS.		X							Delayed. Not a high priority area and no funding.
8	In conjunction with CGS and/or USGS, define the high priority areas for landslides in Park County to guide future land use decisions and future mitigation decisions.	X								In progress

TABLE 18-2.
STATUS OF MITIGATION INITIATIVES FROM 2009 HAZARD MITIGATION PLAN

		Project Status				Funding				
Action No.	Action	In Progress	Delayed*	Completed	No Longer Required*	Budgeted	Apply for Grant	Grant Received	Target Completion	Comments *(include explanation of delayed or no longer required actions)
9	Work with the Division of Water Resources to rank high priority dams within Park County and for installation of dam failure warning systems and plans.	X								In progress, first 1/2 completed
10	Adopt zoning and subdivision regulations for proposed development in or adjacent to areas of high seismic risk.	X								In progress. County currently uses overlay maps at time of development review
11	Ensure all jurisdictions in Park County are in the National Flood Insurance Program through education and by assisting the towns through the process.				X					Not a high priority within the County
12	Identify flood values at risk, cross-referenced with hazards, and by the end of 2010, update county Land Use Regulations to include mitigation measures for flooding in order to lessen flood damages to existing and future buildings.		X							Recent changes in state statue warrants undated processes
13	Identify the highest priority floodplain mapping needs for Park County jurisdictions and fund those priorities to complete floodplain mapping in those areas, providing improved technical information for future land use decisions.		X							Updated digital mapping completed in 2008. Lack of funding for more comprehensive mapping. No County floodplain administrator
14	Update the county land use regulations to mitigate against landslides after providing technical information to local officials from the three Park County jurisdictions about the need for landslide mitigation to lessen the risk to the existing and future structures			X						Completed 2011 however, source unknown
15	Identify stream reaches that do not meet water quality standards, specifically those with sediment buildup and provide technical information to local officials from the three Park County jurisdictions about the significance and consequences of sediment buildup in local streams.	X								Dredging on-going in Fairplay via grant funding for stream work

TABLE 18-2.
STATUS OF MITIGATION INITIATIVES FROM 2009 HAZARD MITIGATION PLAN

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Action No.	Action	In Progress	Delayed*	Completed	No Longer Required*	Budgeted	Apply for Grant	Grant Received	Target Completion	Comments *(include explanation of delayed or no longer required actions)
16	Create an education program regarding winter weather preparedness for citizens. Ensure that ranch owners and pet owners are included in this process, and specific strategies for protecting livestock and pets from severe winter weather events are addressed	X								On-going via mailers and presentations
17	Educate the public about thunderstorm awareness and safety precautions and participate in the StormReady program sponsored by the National Weather Service.	X								On-going education is a priority. Attaining Storm Ready certification not a priority
18	Continue to build a broad-based grass roots campaign amongst the public, businesses, non-profit organizations, government and regulatory agencies through public education programs related to preparedness and mitigation; work to improve awareness and provide the information needed to recognize issues related to hazards, make informed decisions and take positive actions.				X					Delete - Not applicable
19	Conduct workshops to educate property owners at risk from wildfire about specific maintenance strategies to reduce their risk from wildfire, and develop a list of the components of a homeowner's wildfire emergency evacuation kit and publicize the need for such kits.			X						Initial work done. However, will continue to be ongoing
20	Educate the public about ways to lessen the effects of drought, and the need to be water-wise.			X						Fairplay and Alma both continue to address the issues
21	Conduct one exercise annually, involving members of the public, regarding the four phases of emergency management, to increase understanding of each person's role during a disaster, including public health issues such as Pandemic Flu.			X						Ongoing

TABLE 18-2.
STATUS OF MITIGATION INITIATIVES FROM 2009 HAZARD MITIGATION PLAN

		Project Status				Funding				
Action No.	Action	In Progress	Delayed*	Completed	No Longer Required*	Budgeted	Apply for Grant	Grant Received	Target Completion	Comments *(include explanation of delayed or no longer required actions)
22	Conduct regular exercises for dam failure and dam preparedness. Work with those partners who maintain dams in Park County to ensure they are maintained and that emergency exercises for simulated dam failure response are conducted.			X						Initial work completed. Ongoing
23	Continually produce a written After Action Report for every exercise and disaster in Park County, and make those results known to all involved so that processes and procedures can be improved in future operations.			X						Ongoing
24	Create a public notification program for severe thunderstorms and lightning, winter weather, and flash flooding.	X								County utilizes reverse 911. Note: lack of good forecasting for area is an issue. Project ongoing
25	Utilize additional Variable Message Sign (VMS) boards on Highways, as well as county roads, to warn the public about possible hazards in the area.	X								Ongoing
26	Implement the recommendations of the 2007 Community Wildfire Protection Plan to lessen the likelihood that future fires will cause harm to existing and future buildings.	X								Ongoing. Documents updated. 5-6 plans - varying level of implementation
27	Select specific strategies from FEMA's Community Rating System for improving local floodplain management programs, adopt those strategies and implement them to lessen the likelihood that future floods will cause harm to existing and future buildings.				X					No longer a County priority
28	Identify specific locations where each one of the three major impacts of thunderstorms (lightning causing wildfire, rain causing flooding, high wind) will have the highest impact.									Delete /Duplicative

TABLE 18-2.
STATUS OF MITIGATION INITIATIVES FROM 2009 HAZARD MITIGATION PLAN

		Project Status				Funding				
Action No.	Action	In Progress	Delayed*	Completed	No Longer Required*	Budgeted	Apply for Grant	Grant Received	Target Completion	Comments *(include explanation of delayed or no longer required actions)
29	Identify infrastructure at greatest risk from wildfire. Develop infrastructure protection strategies and implement those strategies.	X								Initial identification completed. Language to be amended to include as funds become available
30	Identify and map the specific locations of Critical Facilities in the Park County jurisdictions and develop detailed risk profiles for each facility, keeping in mind security needs and vulnerabilities in order to make buildings more secure, especially those critical during an emergency response.	X								Initial identification completed. Amend to include as opportunities and funds become available
31	Identify those areas of Park County most in need of flood hazard reduction plans with detailed engineering analyses. Identify specific drainage "hot spots" in the Park County jurisdictions, develop engineering plans to improve bridges, culverts, channels and other infrastructure in those areas, fund the projects and complete them to lessen the likelihood that future floods will cause harm to existing and future buildings.			X						Colorado Department of Transportation completed work on State Highway 9.
32	With the assistance of CGS and USGS, map highest priority locations for detailed Seismic Risk Studies in Park County and identify bridges and other infrastructure subject to the greatest seismic risk.	X								Ongoing
33	Identify those municipalities and unincorporated communities in Park County most at risk due to drought, develop Community Water Conservation Plans, and alternate water supply locations for those communities, and implement those plans.			X						Completed in Alma and Fairplay

TABLE 18-2.
STATUS OF MITIGATION INITIATIVES FROM 2009 HAZARD MITIGATION PLAN

		Project Status				Funding				
Action No.	Action	In Progress	Delayed*	Completed	No Longer Required*	Budgeted	Apply for Grant	Grant Received	Target Completion	Comments *(include explanation of delayed or no longer required actions)
34	Identify specific locations and specific parameters for a long-term drought monitoring program and implement the monitoring program. Obtain assistance and technical recommendations from the Natural Resources Conservation Service for an improved program of drought preparedness and drought response.				X					
35	Complete the EOC policies and procedures manual for all county employees and emergency responders by December 2008. Participate in county, regional, and statewide exercises to determine strengths and weaknesses in EOC operations, enhancing support activities during an actual disaster.			X						Manual completed in 2008. Reviewed on an annual basis. Will remain on-going
36	Participate in the South Central regional communications assessment to determine areas of improvement or collaboration to enhance emergency communications within the county and region.			X						Completed in 2011
37	Conduct an evacuation drill of the Park County 911 Communications Center at least once annually to ensure the safety of all employees, and to ensure a seamless communications system during an emergency.			X						Initial completed / ongoing
38	Create an ES Council subcommittee to address weather-related mitigation issues (drought, flooding and winter storms).				X					No longer applicable
39	Create an ES Council subcommittee for HAZMAT issues, and develop a HAZMAT mitigation plan for Park County.			X						Done in 2012
40	In conjunction with CGS and/or USGS and/or DEM, have the Emergency Services Council research options for landslide mitigation.				X					Duplicative

CHAPTER 19.
IMPLEMENTATION

19.1 PLAN ADOPTION

A hazard mitigation plan must document that it has been formally adopted by the governing body of the jurisdiction requesting federal approval of the plan (44 CFR Section 201.6(c)(5)). For multi-jurisdictional plans, each jurisdiction requesting approval must document that is has been formally adopted. This plan will be submitted for a pre-adoption review to the Colorado Office of Emergency Management and the Federal Emergency Management Agency prior to adoption. Once pre-adoption approval has been provided, all planning partners will formally adopt the plan. All partners understand that DMA compliance and its benefits cannot be achieved until the plan is adopted. Copies of the resolutions adopting this plan for all planning partners can be found in Appendix E of this plan.

19.2 PLAN MAINTENANCE STRATEGY

A hazard mitigation plan must present a plan maintenance process that includes the following (44 CFR Section 201.6(c)(4)):

- A section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan over a 5-year cycle
- A process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate
- A discussion on how the community will continue public participation in the plan maintenance process.

This chapter details the formal process that will ensure that the Park County Hazard Mitigation Plan remains an active and relevant document and that the planning partners maintain their eligibility for applicable funding sources. The plan maintenance process includes a schedule for monitoring and evaluating the plan annually and producing an updated plan every five years. This chapter also describes how public participation will be integrated throughout the plan maintenance and implementation process. It also explains how the mitigation strategies outlined in this plan will be incorporated into existing planning mechanisms and programs, such as comprehensive land-use planning processes, capital improvement planning, and building code enforcement and implementation. The Plan's format allows sections to be reviewed and updated when new data become available, resulting in a plan that will remain current and relevant.

19.2.1 Plan Implementation

The effectiveness of the hazard mitigation plan depends on its implementation and incorporation of its action items into partner jurisdictions' existing plans, policies and programs. Together, the action items in the plan provide a framework for activities that the Partnership can implement over the next 5 years. The planning team and the Steering Committee have established goals and objectives and have prioritized mitigation actions that will be implemented through existing plans, policies, and programs.

Park County Office of Emergency Management will have lead responsibility for overseeing the plan implementation and maintenance strategy. Plan implementation and evaluation will be a shared

responsibility among all planning partnership members and agencies identified as lead agencies in the mitigation action plans.

19.2.2 Steering Committee

The Steering Committee is a total volunteer body that oversaw the development of the plan and made recommendations on key elements of the plan, including the maintenance strategy. It was the Steering Committee's position that an oversight committee with representation similar to the initial Steering Committee should have an active role in the plan maintenance strategy. Therefore, it is recommended that a steering committee remain a viable body involved in key elements of the plan maintenance strategy. The new steering committee should strive to include representation from the planning partners, as well as other stakeholders in the planning area.

The principal role of the new steering committee in this plan maintenance strategy will be to review the annual progress report and provide input Park County Office of Emergency Management on possible enhancements to be considered at the next update. Future plan updates will be overseen by a steering committee similar to the one that participated in this plan development process, so keeping an interim steering committee intact will provide a head start on future updates. Completion of the progress report is the responsibility of each planning partner, not the responsibility of the steering committee. It will simply be the steering committee's role to review the progress report in an effort to identify issues needing to be addressed by future plan updates.

19.2.3 Annual Progress Report

The minimum task of each planning partner will be the evaluation of the progress of its individual action plan during a 12-month performance period. This review will include the following:

- Summary of any hazard events that occurred during the performance period and the impact these events had on the planning area
- Review of mitigation success stories
- Review of continuing public involvement
- Brief discussion about why targeted strategies were not completed
- Re-evaluation of the action plan to determine if the timeline for identified projects needs to be amended (such as changing a long-term project to a short-term one because of new funding)
- Recommendations for new projects
- Changes in or potential for new funding options (grant opportunities)
- Impact of any other planning programs or initiatives that involve hazard mitigation.

The planning team has created a template to guide the planning partners in preparing a progress report (see Appendix C). The plan maintenance steering committee will provide feedback to the planning team on items included in the template. The planning team will then prepare a formal annual report on the progress of the plan. This report should be used as follows:

- Posted on the Park County Office of Emergency Management website page dedicated to the hazard mitigation plan
- Provided to the local media through a press release
- Presented to planning partner governing bodies to inform them of the progress of actions implemented during the reporting period

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- For those planning partners that participate in the Community Rating System, the report can be provided as part of the CRS annual re-certification package. The CRS requires an annual recertification to be submitted by October 1 of every calendar year for which the community has not received a formal audit. To meet this recertification timeline, the planning team will strive to complete progress reports between June and September each year.

Uses of the progress report will be at the discretion of each planning partner. Annual progress reporting is not a requirement specified under 44 CFR. However, it may enhance the planning partnership's opportunities for funding. While failure to implement this component of the plan maintenance strategy will not jeopardize a planning partner's compliance under the DMA, it may jeopardize its opportunity to partner and leverage funding opportunities with the other partners.

19.2.4 Plan Update

Local hazard mitigation plans must be reviewed, revised if appropriate, and resubmitted for approval in order to remain eligible for benefits under the DMA (44 CFR, Section 201.6(d)(3)). The Park County partnership intends to update the hazard mitigation plan on a 5-year cycle from the date of initial plan adoption. This cycle may be accelerated to less than 5 years based on the following triggers:

- A Presidential Disaster Declaration that impacts the planning area
- A hazard event that causes loss of life
- A comprehensive update of the County or participating city's comprehensive plan

It will not be the intent of future updates to develop a complete new hazard mitigation plan for the planning area. The update will, at a minimum, include the following elements:

- The update process will be convened through a steering committee.
- The hazard risk assessment will be reviewed and, if necessary, updated using best available information and technologies.
- The action plans will be reviewed and revised to account for any initiatives completed, dropped, or changed and to account for changes in the risk assessment or new partnership policies identified under other planning mechanisms (such as the comprehensive plan).
- The draft update will be sent to appropriate agencies and organizations for comment.
- The public will be given an opportunity to comment on the update prior to adoption.
- The partnership governing bodies will adopt their respective portions of the updated plan.

19.2.5 Continuing Public Involvement

The public will continue to be apprised of the plan's progress through the Office of Emergency Management website and by providing copies of annual progress reports to the media. Each planning partner will provide links to the County hazard mitigation plan website on their individual jurisdictional websites to increase avenues of public access to the plan. The Park County Office of Emergency Management has agreed to maintain the hazard mitigation plan website. This site will not only house the final plan, it will become the one-stop shop for information regarding the plan, the partnership and plan implementation. Copies of the plan will be distributed to the Park County Library system. Upon initiation of future update processes, a new public involvement strategy will be initiated based on guidance from a new steering committee. This strategy will be based on the needs and capabilities of the planning partnership at the time of the update. At a minimum, this strategy will include the use of local media outlets within the planning area.

19.2.6 Incorporation into Other Planning Mechanisms

The information on hazard, risk, vulnerability, and mitigation contained in this plan is based on the best science and technology available at the time this plan was prepared. The Park County Comprehensive Plan and the comprehensive plans of the partner cities are considered to be integral parts of this plan. The County and partner cities, through adoption of comprehensive plans and zoning ordinances, have planned for the impact of natural hazards. The plan development process provided the County and the cities with the opportunity to review and expand on policies contained within these planning mechanisms. The planning partners used their comprehensive plans and the hazard mitigation plan as complementary documents that work together to achieve the goal of reducing risk exposure to the citizens of the planning area. An update to a comprehensive plan could also trigger an update to the hazard mitigation plan.

All municipal planning partners are committed to creating a linkage between the hazard mitigation plan and their individual comprehensive plans by identifying a mitigation initiative as such and giving that initiative a high priority. Other planning processes and programs to be coordinated with the recommendations of the hazard mitigation plan include the following:

- Partners' emergency response plans
- Capital improvement programs
- Municipal codes
- Community design guidelines
- Water-efficient landscape design guidelines
- Stormwater management programs
- Water system vulnerability assessments
- Master fire protection plans.

Some action items do not need to be implemented through regulation. Instead, these items can be implemented through the creation of new educational programs, continued interagency coordination, or improved public participation. As information becomes available from other planning mechanisms that can enhance this plan, that information will be incorporated via the update process.

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APPENDIX A.
ACRONYMS AND DEFINITIONS

APPENDIX A.
ACRONYMS AND DEFINITIONS

ACRONYMS

ASCE—American Society of Civil Engineers

BFE—Base flood elevation

CDEM— Colorado Division of Emergency Management

CFR—Code of Federal Regulations

CIP—Capital Improvement Plan

CRS—Community Rating System

CWCB— Colorado Water Conservation Board

CWPP— Colorado Wildfire Protection Plan

DFIRM—Digital Flood Insurance Rate Maps

DHS—Department of Homeland Security

DMA —Disaster Mitigation Act

EOC—Emergency Operations Center

EPA—U.S. Environmental Protection Agency

ESA—Endangered Species Act

FEMA—Federal Emergency Management Agency

FERC—Federal Energy Regulatory Commission

FIRM—Flood Insurance Rate Map

FPD—Fire Protection District

GIS—Geographic Information System

HAZUS-MH—Hazards, United States-Multi Hazard

HMGP—Hazard Mitigation Grant Program

IBC—International Building Code

IRC—International Residential Code

MM—Modified Mercalli Scale

NEHRP—National Earthquake Hazards Reduction Program

NFIP—National Flood Insurance Program

NAO— North Atlantic Oscillation

NOAA—National Oceanic and Atmospheric Administration

NRCS— Natural Resources Conservation Service

NWS—National Weather Service

PDM—Pre-Disaster Mitigation Grant Program

PDI—Palmer Drought Index

PGA—Peak Ground Acceleration

SHELDUS—Special Hazard Events and Losses Database for the U.S.

SPI—Standardized Precipitation Index

USGS—U.S. Geological Survey

WRA— Wildfire Risk Assessment

WUI—Wildland-urban interface

DEFINITIONS

100-Year Flood: The term "100-year flood" can be misleading. The 100-year flood does not necessarily occur once every 100 years. Rather, it is the flood that has a 1 percent chance of being equaled or exceeded in any given year. Thus, the 100-year flood could occur more than once in a relatively short period of time. The Federal Emergency Management Agency (FEMA) defines it as the 1 percent annual chance flood, which is now the standard definition used by most federal and state agencies and by the National Flood Insurance Program (NFIP).

Acre-Foot: An acre-foot is the amount of water it takes to cover 1 acre to a depth of 1 foot. This measure is used to describe the quantity of storage in a water reservoir. An acre-foot is a unit of volume. One acre foot equals 7,758 barrels; 325,829 gallons; or 43,560 cubic feet. An average household of four will use approximately 1 acre-foot of water per year.

Asset: An asset is any man-made or natural feature that has value, including, but not limited to, people; buildings; infrastructure, such as bridges, roads, sewers, and water systems; lifelines, such as electricity and communication resources; and environmental, cultural, or recreational features such as parks, wetlands, and landmarks.

Base Flood: The flood having a 1% chance of being equaled or exceeded in any given year, also known as the "100-year" or "1% chance" flood. The base flood is a statistical concept used to ensure that all properties subject to the National Flood Insurance Program (NFIP) are protected to the same degree against flooding.

Basin: A basin is the area within which all surface water—whether from rainfall, snowmelt, springs, or other sources—flows to a single water body or watercourse. The boundary of a river basin is defined by natural topography, such as hills, mountains, and ridges. Basins are also referred to as "watersheds" and "drainage basins."

Benefit: A benefit is a net project outcome and is usually defined in monetary terms. Benefits may include direct and indirect effects. For the purposes of benefit-cost analysis of proposed mitigation measures, benefits are limited to specific, measurable, risk reduction factors, including reduction in expected property losses (buildings, contents, and functions) and protection of human life.

Benefit/Cost Analysis: A benefit/cost analysis is a systematic, quantitative method of comparing projected benefits to projected costs of a project or policy. It is used as a measure of cost effectiveness.

Building: A building is defined as a structure that is walled and roofed, principally aboveground, and permanently fixed to a site. The term includes manufactured homes on permanent foundations on which the wheels and axles carry no weight.

Capability Assessment: A capability assessment provides a description and analysis of a community's current capacity to address threats associated with hazards. The assessment includes two components: an inventory of an agency's mission, programs, and policies, and an analysis of its capacity to carry them out. A capability assessment is an integral part of the planning process in which a community's actions to reduce losses are identified, reviewed, and analyzed, and the framework for implementation is identified. The following capabilities were reviewed under this assessment:

- Legal and regulatory capability
- Administrative and technical capability
- Fiscal capability

Community Rating System (CRS): The CRS is a voluntary program under the NFIP that rewards participating communities (provides incentives) for exceeding the minimum requirements of the NFIP and completing activities that reduce flood hazard risk by providing flood insurance premium discounts.

Critical Area: An area defined by state or local regulations as deserving special protection because of unique natural features or its value as habitat for a wide range of species of flora and fauna. A sensitive/critical area is usually subject to more restrictive development regulations.

Critical Facility: Facilities and infrastructure that are critical to the health and welfare of the population. These become especially important after any hazard event occurs. For the purposes of this plan, critical facilities include:

- Structures or facilities that produce, use, or store highly volatile, flammable, explosive, toxic and/or water reactive materials;
- Hospitals, nursing homes, and housing likely to contain occupants who may not be sufficiently mobile to avoid death or injury during a hazard event.
- Police stations, fire stations, vehicle and equipment storage facilities, and emergency operations centers that are needed for disaster response before, during, and after hazard events, and
- Public and private utilities, facilities and infrastructure that are vital to maintaining or restoring normal services to areas damaged by hazard events.
- Government facilities.

Dam: Any artificial barrier or controlling mechanism that can or does impound 10 acre-feet or more of water.

Dam Failure: Dam failure refers to a partial or complete breach in a dam (or levee) that impacts its integrity. Dam failures occur for a number of reasons, such as flash flooding, inadequate spillway size, mechanical failure of valves or other equipment, freezing and thawing cycles, earthquakes, and intentional destruction.

Debris Avalanche: Volcanoes are prone to debris and mountain rock avalanches that can approach speeds of 100 mph.

Debris Flow: Dense mixtures of water-saturated debris that move down-valley; looking and behaving much like flowing concrete. They form when loose masses of unconsolidated material are saturated, become unstable, and move down slope. The source of water varies but includes rainfall, melting snow or ice, and glacial outburst floods.

Debris Slide: Debris slides consist of unconsolidated rock or soil that has moved rapidly down slope. They occur on slopes greater than 65 percent.

Disaster Mitigation Act of 2000 (DMA); The DMA is Public Law 106-390 and is the latest federal legislation enacted to encourage and promote proactive, pre-disaster planning as a condition of receiving financial assistance under the Robert T. Stafford Act. The DMA emphasizes planning for disasters before they occur. Under the DMA, a pre-disaster hazard mitigation program and new requirements for the national post-disaster hazard mitigation grant program (HMGP) were established.

Drainage Basin: A basin is the area within which all surface water- whether from rainfall, snowmelt, springs or other sources- flows to a single water body or watercourse. The boundary of a river basin is defined by natural topography, such as hills, mountains and ridges. Drainage basins are also referred to as **watersheds** or **basins**.

Drought: Drought is a period of time without substantial rainfall or snowfall from one year to the next. Drought can also be defined as the cumulative impacts of several dry years or a deficiency of precipitation over an extended period of time, which in turn results in water shortages for some activity, group, or environmental function. A hydrological drought is caused by deficiencies in surface and subsurface water supplies. A socioeconomic drought impacts the health, well-being, and quality of life or starts to have an adverse impact on a region. Drought is a normal, recurrent feature of climate and occurs almost everywhere.

Earthquake: An earthquake is defined as a sudden slip on a fault, volcanic or magmatic activity, and sudden stress changes in the earth that result in ground shaking and radiated seismic energy. Earthquakes can last from a few seconds to over 5 minutes, and have been known to occur as a series of tremors over a period of several days. The actual movement of the ground in an earthquake is seldom the direct cause of injury or death. Casualties may result from falling objects and debris as shocks shake, damage, or demolish buildings and other structures.

Exposure: Exposure is defined as the number and dollar value of assets considered to be at risk during the occurrence of a specific hazard.

Extent: The extent is the size of an area affected by a hazard.

Fire Behavior: Fire behavior refers to the physical characteristics of a fire and is a function of the interaction between the fuel characteristics (such as type of vegetation and structures that could burn), topography, and weather. Variables that affect fire behavior include the rate of spread, intensity, fuel consumption, and fire type (such as underbrush versus crown fire).

Fire Frequency: Fire frequency is the broad measure of the rate of fire occurrence in a particular area. An estimate of the areas most likely to burn is based on past fire history or fire rotation in the area, fuel conditions, weather, ignition sources (such as human or lightning), fire suppression response, and other factors.

Flash Flood: A flash flood occurs with little or no warning when water levels rise at an extremely fast rate

Flood Insurance Rate Map (FIRM): FIRMs are the official maps on which the Federal Emergency Management Agency (FEMA) has delineated the Special Flood Hazard Area.

Flood Insurance Study: A report published by the Federal Insurance and Mitigation Administration for a community in conjunction with the community's Flood Insurance rate Map. The study contains such background data as the base flood discharges and water surface elevations that were used to prepare the FIRM. In most cases, a community FIRM with detailed mapping will have a corresponding flood insurance study.

Floodplain: Any land area susceptible to being inundated by flood waters from any source. A flood insurance rate map identifies most, but not necessarily all, of a community's floodplain as the Special Flood Hazard Area.

Floodway: Floodways are areas within a floodplain that are reserved for the purpose of conveying flood discharge without increasing the base flood elevation more than 1 foot. Generally speaking, no development is allowed in floodways, as any structures located there would block the flow of floodwaters.

Floodway Fringe: Floodway fringe areas are located in the floodplain but outside of the floodway. Some development is generally allowed in these areas, with a variety of restrictions. On maps that have identified and delineated a floodway, this would be the area beyond the floodway boundary that can be subject to different regulations.

Fog: Fog refers to a cloud (or condensed water droplets) near the ground. Fog forms when air close to the ground can no longer hold all the moisture it contains. Fog occurs either when air is cooled to its dew point or the amount of moisture in the air increases. Heavy fog is particularly hazardous because it can restrict surface visibility. Severe fog incidents can close roads, cause vehicle accidents, cause airport delays, and impair the effectiveness of emergency response. Financial losses associated with transportation delays caused by fog have not been calculated in the United States but are known to be substantial.

Freeboard: Freeboard is the margin of safety added to the base flood elevation.

Frequency: For the purposes of this plan, frequency refers to how often a hazard of specific magnitude, duration, and/or extent is expected to occur on average. Statistically, a hazard with a 100-year frequency is expected to occur about once every 100 years on average and has a 1 percent chance of occurring any given year. Frequency reliability varies depending on the type of hazard considered.

Fujita Scale of Tornado Intensity: Tornado wind speeds are sometimes estimated on the basis of wind speed and damage sustained using the Fujita Scale. The scale rates the intensity or severity of tornado events using numeric values from F0 to F5 based on tornado wind speed and damage. An F0 tornado (wind speed less than 73 miles per hour (mph)) indicates minimal damage (such as broken tree limbs), and an F5 tornado (wind speeds of 261 to 318 mph) indicates severe damage.

Goal: A goal is a general guideline that explains what is to be achieved. Goals are usually broad-based, long-term, policy-type statements and represent global visions. Goals help define the benefits that a plan is trying to achieve. The success of a hazard mitigation plan is measured by the degree to which its goals have been met (that is, by the actual benefits in terms of actual hazard mitigation).

Geographic Information System (GIS): GIS is a computer software application that relates data regarding physical and other features on the earth to a database for mapping and analysis.

Hazard: A hazard is a source of potential danger or adverse condition that could harm people and/or cause property damage.

Hazard Mitigation Grant Program (HMGP): Authorized under Section 202 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, the HMGP is administered by FEMA and provides grants to states, tribes, and local governments to implement hazard mitigation actions after a major disaster declaration. The purpose of the program is to reduce the loss of life and property due to disasters and to enable mitigation activities to be implemented as a community recovers from a disaster

Hazards U.S. Multi-Hazard (HAZUS-MH) Loss Estimation Program: HAZUS-MH is a GIS-based program used to support the development of risk assessments as required under the DMA. The HAZUS-MH software program assesses risk in a quantitative manner to estimate damages and losses associated with natural hazards. HAZUS-MH is FEMA's nationally applicable, standardized methodology and software program and contains modules for estimating potential losses from earthquakes, floods, and wind hazards. HAZUS-MH has also been used to assess vulnerability (exposure) for other hazards.

Hydraulics: Hydraulics is the branch of science or engineering that addresses fluids (especially water) in motion in rivers or canals, works and machinery for conducting or raising water, the use of water as a prime mover, and other fluid-related areas.

Hydrology: Hydrology is the analysis of waters of the earth. For example, a flood discharge estimate is developed by conducting a hydrologic study.

Intensity: For the purposes of this plan, intensity refers to the measure of the effects of a hazard.

Inventory: The assets identified in a study region comprise an inventory. Inventories include assets that could be lost when a disaster occurs and community resources are at risk. Assets include people, buildings, transportation, and other valued community resources.

Landslide: Landslides can be described as the sliding movement of masses of loosened rock and soil down a hillside or slope. Fundamentally, slope failures occur when the strength of the soils forming the slope exceeds the pressure, such as weight or saturation, acting upon them.

Lightning: Lightning is an electrical discharge resulting from the buildup of positive and negative charges within a thunderstorm. When the buildup becomes strong enough, lightning appears as a "bolt," usually within or between clouds and the ground. A bolt of lightning instantaneously reaches temperatures approaching 50,000ºF. The rapid heating and cooling of air near lightning causes thunder. Lightning is a major threat during thunderstorms. In the United States, 75 to 100 Americans are struck and killed by lightning each year (see http://www.fema.gov/hazard/thunderstorms/thunder.shtm).

Liquefaction: Liquefaction is the complete failure of soils, occurring when soils lose shear strength and flow horizontally. It is most likely to occur in fine grain sands and silts, which behave like viscous fluids when liquefaction occurs. This situation is extremely hazardous to development on the soils that liquefy, and generally results in extreme property damage and threats to life and safety.

Local Government: Any county, municipality, city, town, township, public authority, school district, special district, intrastate district, council of governments (regardless of whether the council of governments is incorporated as a nonprofit corporation under State law), regional or interstate government entity, or agency or instrumentality of a local government; any Indian tribe or authorized tribal organization, or Alaska Native village or organization; and any rural community, unincorporated town or village, or other public entity.

Magnitude: Magnitude is the measure of the strength of an earthquake, and is typically measured by the Richter scale. As an estimate of energy, each whole number step in the magnitude scale corresponds to the release of about 31 times more energy than the amount associated with the preceding whole number value.

Mass movement: A collective term for landslides, mudflows, debris flows, sinkholes and lahars.

Mitigation: A preventive action that can be taken in advance of an event that will reduce or eliminate the risk to life or property.

Mitigation Actions: Mitigation actions are specific actions to achieve goals and objectives that minimize the effects from a disaster and reduce the loss of life and property.

Objective: For the purposes of this plan, an objective is defined as a short-term aim that, when combined with other objectives, forms a strategy or course of action to meet a goal. Unlike goals, objectives are specific and measurable.

Peak Ground Acceleration: Peak Ground Acceleration (PGA) is a measure of the highest amplitude of ground shaking that accompanies an earthquake, based on a percentage of the force of gravity.

Preparedness: Preparedness refers to actions that strengthen the capability of government, citizens, and communities to respond to disasters.

Presidential Disaster Declaration: These declarations are typically made for events that cause more damage than state and local governments and resources can handle without federal government assistance. Generally, no specific dollar loss threshold has been established for such declarations. A Presidential Disaster Declaration puts into motion long-term federal recovery programs, some of which are matched by state programs, designed to help disaster victims, businesses, and public entities.

Probability of Occurrence: The probability of occurrence is a statistical measure or estimate of the likelihood that a hazard will occur. This probability is generally based on past hazard events in the area and a forecast of events that could occur in the future. A probability factor based on yearly values of occurrence is used to estimate probability of occurrence.

Repetitive Loss Property: Any NFIP-insured property that, since 1978 and regardless of any changes of ownership during that period, has experienced:

- Four or more paid flood losses in excess of $1000.00; or
- Two paid flood losses in excess of $1000.00 within any 10-year period since 1978 or
- Three or more paid losses that equal or exceed the current value of the insured property.

Return Period (or Mean Return Period): This term refers to the average period of time in years between occurrences of a particular hazard (equal to the inverse of the annual frequency of occurrence).

Riverine: Of or produced by a river. Riverine floodplains have readily identifiable channels. Floodway maps can only be prepared for riverine floodplains.

Risk: Risk is the estimated impact that a hazard would have on people, services, facilities, and structures in a community. Risk measures the likelihood of a hazard occurring and resulting in an adverse condition that causes injury or damage. Risk is often expressed in relative terms such as a high, moderate, or low likelihood of sustaining damage above a particular threshold due to occurrence of a specific type of

hazard. Risk also can be expressed in terms of potential monetary losses associated with the intensity of the hazard.

Risk Assessment: Risk assessment is the process of measuring potential loss of life, personal injury, economic injury, and property damage resulting from hazards. This process assesses the vulnerability of people, buildings, and infrastructure to hazards and focuses on (1) hazard identification; (2) impacts of hazards on physical, social, and economic assets; (3) vulnerability identification; and (4) estimates of the cost of damage or costs that could be avoided through mitigation.

Risk Ranking: This ranking serves two purposes, first to describe the probability that a hazard will occur, and second to describe the impact a hazard will have on people, property, and the economy. Risk estimates for the City are based on the methodology that the City used to prepare the risk assessment for this plan. The following equation shows the risk ranking calculation:

Risk Ranking = Probability + Impact (people + property + economy)

Robert T. Stafford Act: The Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 100-107, was signed into law on November 23, 1988. This law amended the Disaster Relief Act of 1974, Public Law 93-288. The Stafford Act is the statutory authority for most federal disaster response activities, especially as they pertain to FEMA and its programs.

Sinkhole: A collapse depression in the ground with no visible outlet. Its drainage is subterranean. It is commonly vertical-sided or funnel-shaped.

Special Flood Hazard Area: The base floodplain delineated on a Flood Insurance Rate Map. The special flood hazard area is mapped as a Zone A in riverine situations and zone V in coastal situations. The special flood hazard area may or may not encompass all of a community's flood problems

Stakeholder: Business leaders, civic groups, academia, non-profit organizations, major employers, managers of critical facilities, farmers, developers, special purpose districts, and others whose actions could impact hazard mitigation.

Stream Bank Erosion: Stream bank erosion is common along rivers, streams and drains where banks have been eroded, sloughed or undercut. However, it is important to remember that a stream is a dynamic and constantly changing system. It is natural for a stream to want to meander, so not all eroding banks are "bad" and in need of repair. Generally, stream bank erosion becomes a problem where development has limited the meandering nature of streams, where streams have been channelized, or where stream bank structures (like bridges, culverts, etc.) are located in places where they can actually cause damage to downstream areas. Stabilizing these areas can help protect watercourses from continued sedimentation, damage to adjacent land uses, control unwanted meander, and improvement of habitat for fish and wildlife.

Steep Slope: Different communities and agencies define it differently, depending on what it is being applied to, but generally a steep slope is a slope in which the percent slope equals or exceeds 25%. For this study, steep slope is defined as slopes greater than 33%.

Sustainable Hazard Mitigation: This concept includes the sound management of natural resources, local economic and social resiliency, and the recognition that hazards and mitigation must be understood in the largest possible social and economic context.

Thunderstorm: A thunderstorm is a storm with lightning and thunder produced by cumulonimbus clouds. Thunderstorms usually produce gusty winds, heavy rains, and sometimes hail. Thunderstorms are usually short in duration (seldom more than 2 hours). Heavy rains associated with thunderstorms can lead to flash flooding during the wet or dry seasons.

Tornado: A tornado is a violently rotating column of air extending between and in contact with a cloud and the surface of the earth. Tornadoes are often (but not always) visible as funnel clouds. On a local scale, tornadoes are the most intense of all atmospheric circulations, and winds can reach destructive speeds of more than 300 mph. A tornado's vortex is typically a few hundred meters in diameter, and damage paths can be up to 1 mile wide and 50 miles long.

Vulnerability: Vulnerability describes how exposed or susceptible an asset is to damage. Vulnerability depends on an asset's construction, contents, and the economic value of its functions. Like indirect damages, the vulnerability of one element of the community is often related to the vulnerability of another. For example, many businesses depend on uninterrupted electrical power. Flooding of an electric substation would affect not only the substation itself but businesses as well. Often, indirect effects can be much more widespread and damaging than direct effects.

Watershed: A watershed is an area that drains downgradient from areas of higher land to areas of lower land to the lowest point, a common drainage basin.

Wildfire: These terms refer to any uncontrolled fire occurring on undeveloped land that requires fire suppression. The potential for wildfire is influenced by three factors: the presence of fuel, topography, and air mass. Fuel can include living and dead vegetation on the ground, along the surface as brush and small trees, and in the air such as tree canopies. Topography includes both slope and elevation. Air mass includes temperature, relative humidity, wind speed and direction, cloud cover, precipitation amount, duration, and the stability of the atmosphere at the time of the fire. Wildfires can be ignited by lightning and, most frequently, by human activity including smoking, campfires, equipment use, and arson.

Windstorm: Windstorms are generally short-duration events involving straight-line winds or gusts exceeding 50 mph. These gusts can produce winds of sufficient strength to cause property damage. Windstorms are especially dangerous in areas with significant tree stands, exposed property, poorly constructed buildings, mobile homes (manufactured housing units), major infrastructure, and aboveground utility lines. A windstorm can topple trees and power lines; cause damage to residential, commercial, critical facilities; and leave tons of debris in its wake.

Zoning Ordinance: The zoning ordinance designates allowable land use and intensities for a local jurisdiction. Zoning ordinances consist of two components: a zoning text and a zoning map.

Park County
Hazard Mitigation Plan Update

APPENDIX B.
PUBLIC OUTREACH

APPENDIX B.
PUBLIC OUTREACH

Park County
Hazard Mitigation Plan Update

APPENDIX C.
EXAMPLE PROGRESS REPORT

APPENDIX C.
EXAMPLE PROGRESS REPORT

Park County
Hazard Mitigation Plan Update
Annual Progress Report

Reporting Period: *(Insert reporting period)*

Background: Park County and participating cities and special purpose districts in the county developed a hazard mitigation plan to reduce risk from all hazards by identifying resources, information, and strategies for risk reduction. The federal Disaster Mitigation Act of 2000 requires state and local governments to develop hazard mitigation plans as a condition for federal disaster grant assistance. To prepare the plan, the participating partners organized resources, assessed risks from natural hazards within the county, developed planning goals and objectives, reviewed mitigation alternatives, and developed an action plan to address probable impacts from natural hazards. By completing this process, these jurisdictions maintained compliance with the Disaster Mitigation Act, achieving eligibility for mitigation grant funding opportunities afforded under the Robert T. Stafford Act. The plan can be viewed on-line at:

INSERT LINK

Summary Overview of the Plan's Progress: The performance period for the Hazard Mitigation Plan became effective on ____, 2011, with the final approval of the plan by FEMA. The initial performance period for this plan will be 5 years, with an anticipated update to the plan to occur before _____, 2016. As of this reporting period, the performance period for this plan is considered to be __% complete. The Hazard Mitigation Plan has targeted __ hazard mitigation initiatives to be pursued during the 5-year performance period. As of the reporting period, the following overall progress can be reported:

- __ out of __ initiatives (__%) reported ongoing action toward completion.
- __ out of __ initiatives (__%) were reported as being complete.
- __ out of __ initiatives (___%) reported no action taken.

Purpose: The purpose of this report is to provide an annual update on the implementation of the action plan identified in the Park County Hazard Mitigation Plan Update. The objective is to ensure that there is a continuing and responsive planning process that will keep the Hazard Mitigation Plan dynamic and responsive to the needs and capabilities of the partner jurisdictions. This report discusses the following:

- Natural hazard events that have occurred within the last year
- Changes in risk exposure within the planning area (all of Park County)
- Mitigation success stories
- Review of the action plan
- Changes in capabilities that could impact plan implementation
- Recommendations for changes/enhancement.

The Hazard Mitigation Plan Steering Committee: The Hazard Mitigation Plan Steering Committee, made up of planning partners and stakeholders within the planning area, reviewed and approved this progress report at its annual meeting held on _____, 201_. It was determined through the plan's development process that a steering committee would remain in service to oversee maintenance of the plan. At a minimum, the Steering Committee will provide technical review and oversight on the development of the annual progress report. It is anticipated that there will be turnover in the membership annually, which will be documented in the progress reports. For this reporting period, the Steering Committee membership is as indicated in Table 1.

TABLE 1.
STEERING COMMITTEE MEMBERS

Name	Title	Jurisdiction/Agency

Natural Hazard Events within the Planning Area: During the reporting period, there were __ natural hazard events in the planning area that had a measurable impact on people or property. A summary of these events is as follows:

- _____
- _____

Changes in Risk Exposure in the Planning Area: *(Insert brief overview of any natural hazard event in the planning area that changed the probability of occurrence or ranking of risk for the hazards addressed in the hazard mitigation plan)*

Mitigation Success Stories: *(Insert brief overview of mitigation accomplishments during the reporting period)*

Review of the Action Plan: Table 2 reviews the action plan, reporting the status of each initiative. Reviewers of this report should refer to the Hazard Mitigation Plan for more detailed descriptions of each initiative and the prioritization process.

Address the following in the "status" column of the following table:

- *Was any element of the initiative carried out during the reporting period?*
- *If no action was completed, why?*
- *Is the timeline for implementation for the initiative still appropriate?*
- *If the initiative was completed, does it need to be changed or removed from the action plan?*

TABLE 2.
ACTION PLAN MATRIX

Action Taken? (Yes or No)	Time Line	Priority	Status	Status (X, O,✓)
Initiative #1—Harden County communication and tower facilities [description]				
Initiative #2 - CWPP Implementation in County				
Initiative #3 - Community Wildfire Education				
Initiative #4 – County Winter Weather Outreach and Education				
Initiative #5 -Continue to regularly conduct emergency exercises				
Initiative #6 -Harden Infrastructure				
Initiative #7 - Continue to regularly conduct emergency exercises related to dam preparedness				
Initiative #8— Maintain Current EOC Policies and Procedures				
Initiative #9 - Evacuation Drills				
Initiative #10 - Be Wise, Be Prepared				
Initiative #11 -Drought and Water Wise Education				
Initiative #12 - North-West FPD Wildfire Hazard Mitigation				
Initiative #13— North-West FPD CWPP renewal				

TABLE 2.
ACTION PLAN MATRIX

Action Taken? (Yes or No)	Time Line	Priority	Status	Status (X, O,✓)
Initiative #14 — Fuels/Defensible Space Treatment				
Initiative #15 - Wildfire mitigation actions in the areas identified as the highest risk areas in the CWPP				
Initiative #16— Wildfire mitigation actions in the areas identified as the highest risk areas in the CWPP.				
Initiative #17— Generators for the Fairplay Town Hall, Police Department and Public Works				
Initiative #18— Alternative emergency vehicle access routes				
Initiative #19 - Revise local code requirements for ingress/egress				
Initiative #20 - High wildfire risk area land standards				
Initiative #21 - Wildfire mitigation activities in high risk areas				
Initiative #22— Severe storm notification systems				
Initiative #23— High risk landslide areas and future land use				
Initiative #24 - Dam failure warning systems				
Initiative #25— Amend current codes as necessary related to seismic risk				
Initiative #26 - Flooding and Updating Land Use Codes				
Initiative #27 - Foster Mutual Aide Agreements				
Initiative #28 - Stream Management				
Initiative #29 — Community Thunderstorm Education				
Initiative # 30 — Continued Development of After Action Reports				
Initiative # 31 - Emergency Notification Systems				

TABLE 2.
ACTION PLAN MATRIX

Action Taken? (Yes or No)	Time Line	Priority	Status	Status (X, O,✓)
Initiative #32 - VMS for Emergency Notification]				
Initiative #33 — Security / risk profiles for County Critical Facilities				
Initiative #34 — Flood Hazard Protection Plans				
Initiative # 35— Seismic Mapping				
Initiative # 36— ID High Risk Drought Communities				
Initiative # 37 - Drought monitoring				
Initiative # 38 - Fairplay Building ordinance updates				
Initiative # 39 — Fairplay Private property fire mitigation				
Initiative # 40 - Fairplay Improve winter access to critical facilities				
Initiative # 41 - Fairplay Severe winter weather public education				
Initiative # 42 - Fairplay Drainage assessment and culvert installation				
Initiative # 43 — Fairplay HAZMAT planning and response				
Initiative # 44 — Fairplay HAZMAT training				
Initiative # 45 – Alma Develop alternative water supplies				
Initiative # 46 - Alma Back-up power				
Initiative # 47 - Alma Tree Watch program				
Initiative # 48 - Alma Tree Trimming				
Initiative # 49 — Alma Defensible Space				

TABLE 2.
ACTION PLAN MATRIX

Action Taken? (Yes or No)	Time Line	Priority	Status	Status (X, O,✓)
Initiative # 50 - Alma Safe Room				
Initiative # 51 - Alma Fire retardant building materials				
Initiative # 52 — Alma Lightning rods				
Initiative # 53 — Alma Adopt no adverse impact standards				
Initiative # 54 Alma Adopt no adverse impact standards				
Initiative # 55 — North-West FPD Wildfire Hazard Mitigation				
Initiative # 56 — North-West FPD CWPP renewal				
Initiative # 57 - North-West FPD Harden County communication and tower facilities.				
Initiative # 58 - North-West FPD Fuels/Defensible Space Treatment]				
Initiative # 59 - North-West FPD Wildfire mitigation actions in the areas identified as the highest risk areas in the CWPP.				
Initiative # 60 - North-West FPD Community Wildfire Education				
Initiative # 61 - North-West FPD Continue to regularly conduct emergency exercises]				
Initiative # 62 - North-West FPD Winter Weather Outreach and Education				
Initiative # 63 - North-West FPD Alternative emergency vehicle access routes				
Initiative # 64 — North-West FPD Be Wise, Be Prepared				
Initiative # 65 - Platte Canyon FPD Fuels/Defensible Space Treatment				
Initiative # 66 - Platte Canyon FPD CWPP				
Initiative # 67- Platte Canyon FPD Harden Bailey and area communication and tower facilities.				

TABLE 2.
ACTION PLAN MATRIX

Action Taken? (Yes or No)	Time Line	Priority	Status	Status (X, O,✓)
Initiative # 68 - Platte Canyon FPD Winter Weather Outreach and Education				
Initiative # 69 – Southern Park County FPD - Alternative emergency vehicle access routes				
Initiative # 70 - Southern Park County FPD - Wildfire mitigation activities in high risk areas				
Initiative # 71 - Southern Park County FPD - Be Wise, Be Prepared				
Initiative # 72 - Southern Park County FPD - Dam failure warning systems]				
Initiative # 73 - Southern Park County FPD - Revise local code requirements for ingress/egress				
Initiative # 74 - Southern Park County FPD - Revise local code requirements for ingress/egress				
Initiative # 75 - Southern Park County FPD - Harden County communication and tower facilities.				
Initiative # 76 - Southern Park County FPD - Fuels/Defensible Space Treatment				
Initiative # 77 - Southern Park County FPD - Winter Weather Outreach and Education				
Initiative # 78 — Southern Park County FPD - Harden Infrastructure				

Completion status legend:
- ✓= Project Completed
- O = Action ongoing toward completion
- X = No progress at this time

Changes That May Impact Implementation of the Plan: *(Insert brief overview of any significant changes in the planning area that would have a profound impact on the implementation of the plan. Specify any changes in technical, regulatory and financial capabilities identified during the plan's development)*

Recommendations for Changes or Enhancements: Based on the review of this report by the Hazard Mitigation Plan Steering Committee, the following recommendations will be noted for future updates or revisions to the plan:

- _____
- _____
- _____
- _____
- _____
- _____

Public review notice: *The contents of this report are considered to be public knowledge and have been prepared for total public disclosure. Copies of the report have been provided to the governing boards of all planning partners and to local media outlets and the report is posted on the Park County Hazard Mitigation Plan website. Any questions or comments regarding the contents of this report should be directed to:*

Insert Contact Info Here

Park County
Hazard Mitigation Plan Update

APPENDIX D.
MENU OF MITIGATION ALTERNATIVES

APPENDIX D.
MENU OF MITIGATION ALTERNATIVES

Mitigation Categories

The measures that communities and individuals can use to protect themselves from, or mitigate the impacts of, natural and man-made hazards fall into six categories:

1. Public Information and Education
2. Preventive Measures
3. Structural Projects
4. Property Protection
5. Emergency Services, and
6. Natural Resources Protection

SAMPLE MITIGATION INITIATIVES:

Hazard: All Hazards

- Incorporate an Emergency Telephone Notification System into the County/Community Emergency Communications Center
- Construct a new Emergency Operations Center
- Develop a Master Generator Plan for the Park County
- Public Education & Information Program Development
- Develop a Special Needs registry through the 9-1-1 databases to assist with educating, alerting, evacuating, or responding to vulnerable populations during disaster
- Provide for back-up power sources for County essential services facilities to avoid water shortages during extended power outages
- Provide backup power generators to fueling facilities
- Develop enhanced Emergency Planning for Special Needs populations in the County/Community Emergency Operations Plan and other planning documents
- Work with County Businesses to Develop a disaster Resistant Business Program
- Develop a comprehensive public education program on the dangers of carbon monoxide during extended power outages
- Develop multi-lingual Disaster Education public service announcements and educational videos
- Develop a separate “public safety” information area in all public libraries and public recreation facilities to disseminate disaster safety information appropriate to the area and the season
- Train/Educate builders, developers, architects and engineers in techniques of disaster-resistant homebuilding
- Develop and begin to implement a systematic process to evaluate and upgrade aging infrastructure such as transportation, drainage, utilities, and others that could be affected during a major natural disaster.
- Collaborate with other stakeholders (public, businesses, non-profit organizations, government and regulatory agencies, and others) for public outreach efforts.
- Continue the public outreach strategy to share responsibilities amongst the citizens, federal, state, and local governments.
- Develop and maintain the County’s Office of Emergency Management natural hazards website.
- Continue to pursue additional grants to implement risk reduction projects.

- Develop preparedness guides for County/Community residents and businesses.
- Continue to improve the communication of severe weather warnings, flood warning, and related information.
- Distribute NOAA weather radios to residents that are most vulnerable to severe weather.
- Determine which critical facilities currently have weather radios and feasibility of hard-wiring.
- Develop an improved critical facilities dataset to use in emergency planning efforts and in the 2018 mitigation plan update.
- Promote structural mitigation to assure redundancy of critical facilities, to include but not limited to roof structure improvement, to meet or exceed building code standards, upgrade of electrical panels to accept generators, etc.
- Pursue "Storm Ready" designation
- Adopt Continuity of Operations Plans for all applicable hazards
- Enforce and/or initiate triggers guiding improvements to structures such as: (< 50% substantial damage/improvements)
- Provide redundancy for critical facilities

Hazard: Floods, Dam/Levee Failure

- Evaluate repetitive loss properties and potential solutions to mitigate existing conditions.
- Continue National Flood Insurance Program (NFIP) and improve the county's Community Rating System (CRS) classification. Examine criteria and establish roles and responsibilities for completion.
- Acquire and remove Repetitive Loss Properties and repeatedly flooded properties where the County's Repetitive Loss and master drainage plans identify acquisition to be the most cost effective and desirable mitigation measure
- Implement structural and non-structural flood mitigation measures for flood-prone properties, as recommended in the basin-wide master drainage plans
- Develop a Dam/Levee Public Education and Evacuation Plan for targeted areas of the community
- Continue to update and revise Basin-wide Master Drainage Plans where changed conditions warrant
- Develop an outreach program aimed at identifying and assisting private dam owners with repairing or decommissioning at risk dams.
- Provide stricter floodplain regulations along the Arkansas River corridor.
- Consider establishing an administrative procedure or change in County/City codes for requiring builders to develop a site drainage plan ensuring "no adverse impact" when they apply for permits for new residential construction.
- Complete GIS and other automated inventories for stormwater, problem drainage areas, DFIRM and other City assets.
- Review compliance with the National Flood Insurance Program with an annual review of the Floodplain Ordinances and any newly permitted activities in the 100-year floodplain.

Hazard: Tornadoes, High Winds

- Develop a model SafeRoom project for a Mobile Home Park in Park County
- Develop a SafeRoom plan for County/Community facilities
- Individual SafeRoom rebate program
- Educate residents, building professionals and SafeRoom vendors on the ICC/NSSA "Standard for the Design and Construction of Storm Shelters" and consider incorporating into current regulatory measures
- Develop a program which encourages residents to trim or remove trees that could affect power lines
- Develop a program which encourages residents to obtain a NOAA weather radio.
- Secure emergency generators (or alternative power sources) for all critical and vital facilities

- Develop a program which encourages residents to be prepared including generators, 72-hour self-sufficiency kits, NOAA radios, etc.
- Support programs such as “Tree Watch” that proactively manage problem areas by use of selective removal of hazardous trees, tree replacement, etc.
- Establish and enforce building codes that require all roofs to withstand high wind loads
- Modify land use and environmental regulations to support vegetation management activities that improve reliability in utility corridors
- Modify landscape and other ordinances to encourage appropriate planting near overhead power, cable, and phone lines

Hazard: Lightning

- Install Lightning Warning & Alert Systems in public recreation areas
- Install lightning rods on public structures

Hazard: Expansive Soils

- Research the applicability of establishing an administrative procedure or change in County codes for requiring builders to check for expansive soils when they apply for permits for new residential construction and for using foundations that mitigate expansive soil damages when in a moderate or high-risk area.

Hazard: Extreme Heat

- Review the safety of Playground materials during extreme heat events

Hazard: Wildfire

- Implement a Firewise Community Education and Information Program
- Research the availability of use of possible weapons of mass destruction funds available to enhance fire capability in High Risk areas.
- Create and maintain defensible space around structures and infrastructure
- Update building codes to require the use of fire-retardant building materials in high fire hazard areas
- Require Higher regulatory standards - such as a prohibition on combustible roof materials
- Continue to develop partnerships with other organizations to implement wildfire mitigation plans and other hazard reduction programs.
- Complete and maintain a Community Wildfire Protection Plan including the assessment of parcels identified in the Wildland Urban Interface.
- Work with Colorado Forestry Association and Department of Natural Resources to review zoning and ordinances to identify areas to include wildfire mitigation principles.
- Investigate the status of and need to create additional emergency vehicle access in high hazard areas
- Seek alternative water supplies in urban wildland interface areas.

***Hazard:* Earthquake**

- Incorporate earthquakes in the Office of Emergency Management public outreach strategy.
- Work with Colorado Geological to continue the study and analyze earthquakes related to appropriate levels of seismic safety in building codes and practices.
- Further enhance seismic risk assessment to target high hazard buildings for mitigation opportunities.
- Develop a post disaster action plan that includes a grant funding and debris removal components.

***Hazard:* Avalanche**

- Ensure hazard maps are current and updated on a regular basis
- Enact tools to help manage development in hazard areas: better land controls, tax incentives, information
- Develop strategy to take advantage of post-disaster opportunities as they arise
- Continue to educate the public on the avalanche hazard and appropriate risk reduction alternatives.

***Hazard:* Drought**

- Develop a public education on drought resistance
- Identify alternative water supplies for time of drought. Mutual aid agreements with alternative suppliers.
- Consider providing incentives to property owners that utilize drought resistant landscapes in the design of their homes.
- Develop standards that require drought resistant landscapes on County and community owned facilities
- Implement storm water retention in regions ideally suited for groundwater recharges.
- Develop a residential and local business program to modify plumbing systems - i.e. water saving kits

APPENDIX E.
PLAN ADOPTION RESOLUTIONS FROM PLANNING PARTNERS

APPENDIX E.
PLAN ADOPTION RESOLUTIONS FROM PLANNING PARTNERS

To Be Provided With Final Release

Park County, CO Hazard Mitigation Plan Update

Steering Committee Kickoff Meeting

Thursday, April 25, 2013

1:30 PM

Agenda

1. Welcome and Introductions
2. Steering Committee purpose and responsibilities
3. Overview, purpose and goals of the Update Process
4. Final Result (Example of ToC in packets)
5. Community Participation and Survey as an integral part of this process (in packet)
6. Review, discuss and amend Mitigation Goals and Objectives (in packet)
7. Hazard analysis review
    a. Hazards prioritized and profiled in current plan (in packet)
    b. Hazard history (in packets)
    c. Thoughts input etc.
8. Next Meeting Date – May 9, 2013 at 1:30
9. Adjournment

Tetra Tech Inc. laura.johnston@tetratecc.com or 303-312-8807

Park County, Colorado
Hazard Mitigation Plan Update Steering Committee

Kick-off Meeting 4/25/2013

Name	Signature	Organization	Email Address
Alissa Roeder		Alma Police Department	almapd@townofalma.com
Becky Minnis			
Bill McLaughlin			
Carol Ekarius	Sent Jara Johnson	CUSP	carol@uppersouthplatte.org
Denny Sutherland		Platte Canyon Fire	plattecanyonchief@gmail.com
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Dutch Kleinhesselink			lgfpd@pcisys.net
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Joe Homlar			
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Kathy Boyce			
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Larry Long			larry.long@colostate.edu
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Tina Darrah			
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Kat Herrera	gis@parkco.us	Park GIS Dept.	
Monte Gore		Sheriff's Office	MGORE@PARKCO.US

Park County, CO Hazard Mitigation Plan Update

Steering Committee Second Meeting

Board Room at the Platte Canyon School District Complex

57393 U.S. Highway 285

Thursday, May 9, 2013

1:30 PM

Agenda

1. Welcome and Introductions
2. Review Mitigation Goals and Objectives as modified at the kick-off and via email (handout)
3. Hazard analysis review
    a. Hazard history (revised handout)
    b. Hazards prioritized and profiled in 2010 State Plan, Park County 2009 Plan and as discussed at the kick-off meeting (in packet)
    c. Thoughts input etc.
4. Hazard Prioritization exercise (handout)
5. Discussion on Critical Facilities (handout)
6. 2009 Plan Mitigation Actions Update (handout)
7. Next Meeting Date – tentatively late June/early July
8. Questions, closing comments, etc.
9. Adjournment

Tetra Tech Inc. laura.johnston@tetratech.com or 303-312-8807

Insert Sign-in Sheet Here

May 9, 2013

Park County, CO Hazard Mitigation Plan Update

Steering Committee Second Meeting

Fairplay Community Center

Thursday, August 8, 2013

1:30 PM

Agenda

1. Welcome and Introductions
2. Review of progress to date
3. Hazard Identification and Risk Assessment results overview
    a. Hazard identification
    b. Risk assessment
    c. Thoughts input etc.
4. Quick review of final Goals and Objectives
5. Discussion on what is a mitigation strategy/action/project
6. Review of Menu of actions (handout)
7. Discussion regarding projects – development of projects (handout)
8. Next steps - - project prioritization process (via email or in person?)
9. Meeting Date – tentatively early/mid September
10. Questions, closing comments, etc.
11. Adjournment

Tetra Tech Inc. laura.johnston@tetratech.com or 303-312-8807

Park County, Colorado
Hazard Mitigation Plan Update Steering Committee
Meeting #3 August , 2013

Name	Signature	Organization	Email Address
Alissa Roeder		Alma Police Department	almapd@townofalma.com
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Corey Flint		Alma	flints4@????.com
Dave Rollins		CSP	Dave.Rollins@state.co.us
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~~Denny Sutherland~~ /Gail Judge		Platte Canyon Fire	plattecanyonchief@gmail.com
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Nancy Comer		Town of Alma	

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Mike Simpson	Mike Simpson	SPCFPD	Chief@valleyfire.net
Kent Wienman	[illegible]	SPCFPD	Deputy Chief SPCX
Dave Sander	[illegible]	SPAD	Captain@southparkambulance.com
Cindy Gharst		PARK COUNTY	pchr@parkco.us
DAVID GOTTSCHALK		TOWN OF FAIRPLAY	pdchief@fairplayco.us

Park County, CO Survey: Natural Hazard Mitigation Planning

1. Where in Park County do you live?

	Response Percent	Response Count
Alma	4.3%	3
Bailey	**34.8%**	**24**
Como	1.4%	1
Fairplay	5.8%	4
Grant	0.0%	0
Guffey	2.9%	2
Hartsel	2.9%	2
Jefferson	5.8%	4
Lake George	2.9%	2
Pine Junction	17.4%	12
Shawnee	1.4%	1
Tarryall	1.4%	1
Unincorporated Park County	11.6%	8
Other (please specify)	7.2%	5
	answered question	**69**
	skipped question	**0**

2. Do you work in Park County?

	Response Percent	Response Count
Yes	34.4%	22
No	**65.6%**	**42**
	answered question	**64**
	skipped question	**5**

3. Which of the following natural hazard events have you or has anyone in your household experienced in the past 20 years within Park County? (Check all that apply)

	Response Percent	Response Count
Dam Failure	0.0%	0
Drought	50.0%	34
Earthquake	4.4%	3
Flooding	4.4%	3
Hazardous Material Spill	4.4%	3
Landslide	1.5%	1
Prolonged Electrical Power Outage	27.9%	19
Severe Winter Weather	**52.9%**	**36**
Severe Thunderstorm/Hail Storm/Wind Event	47.1%	32
Wild Fire	45.6%	31
None	13.2%	9
Other (please specify)	2.9%	2
	answered question	**68**
	skipped question	**1**

4. How prepared is your household to deal with a natural hazard event?

	Not at all prepared	Somewhat prepared	Adequately prepared	Well prepared	Very well prepared	Rating Average	Rating Count
Check one:	1.7% (1)	**48.3% (29)**	26.7% (16)	23.3% (14)	0.0% (0)	2.72	60
						answered question	**60**
						skipped question	**9**

5. Which of the following have provided you with useful information to help you be prepared for a natural hazard event? (Check all that apply)

	Response Percent	Response Count
Emergency preparedness information from a government source (e.g., federal, state, or local emergency management)	56.7%	34
Personal experience with one or more natural hazards/disasters	**58.3%**	**35**
Locally provided news or other media information	48.3%	29
Schools and other academic institutions	6.7%	4
Attended meetings that have dealt with disaster preparedness	16.7%	10
Community Emergency Response Training (CERT)	13.3%	8
Church	5.0%	3
None	8.3%	5
Other (please specify)	11.7%	7
	answered question	**60**
	skipped question	**9**

6. Which of the following steps has your household taken to prepare for a natural hazard event? (Check all that apply)

	Response Percent	Response Count
Received first aid/CPR training	56.7%	34
Made a fire escape plan	55.0%	33
Designated a meeting place	31.7%	19
Identified utility shutoffs	48.3%	29
Sand bags	3.3%	2
Prepared a disaster supply kit	40.0%	24
Installed smoke detectors on each level of the house	**83.3%**	**50**
Stored food and water	58.3%	35
Stored flashlights and batteries	80.0%	48
Stored a battery-powered radio	36.7%	22
Stored a fire extinguisher	81.7%	49
Stored medical supplies (first aid kit, medications)	68.3%	41
Natural hazard insurance (Flood, Earthquake, Wildfire)	28.3%	17
None	0.0%	0
Other (please specify)	8.3%	5
	answered question	**60**
	skipped question	**9**

7. How concerned are you about the following natural hazards in Park County? (Check one response for each hazard)

	Not Concerned	Somewhat Concerned	Concerned	Very Concerned	Extremely Concerned	Rating Average	R C
Dam Failure	**86.8% (46)**	13.2% (7)	0.0% (0)	0.0% (0)	0.0% (0)	1.13	
Drought	10.5% (6)	10.5% (6)	24.6% (14)	**31.6% (18)**	22.8% (13)	3.46	
Earthquake	**71.7% (38)**	24.5% (13)	1.9% (1)	1.9% (1)	0.0% (0)	1.34	
Flooding	**53.7% (29)**	37.0% (20)	7.4% (4)	1.9% (1)	0.0% (0)	1.57	
Hazardous Material Spill	**37.5% (21)**	**37.5% (21)**	12.5% (7)	10.7% (6)	1.8% (1)	2.02	
Landslide	**56.6% (30)**	30.2% (16)	11.3% (6)	1.9% (1)	0.0% (0)	1.58	
Prolonged Electrical Power Outage	10.7% (6)	23.2% (13)	**37.5% (21)**	25.0% (14)	3.6% (2)	2.88	
Severe Winter Weather	8.9% (5)	26.8% (15)	**35.7% (20)**	23.2% (13)	5.4% (3)	2.89	
Severe Thunderstorm/Hail Storm/Wind Storm	5.5% (3)	29.1% (16)	**40.0% (22)**	20.0% (11)	5.5% (3)	2.91	
Wild Fire	1.7% (1)	6.7% (4)	5.0% (3)	21.7% (13)	**65.0% (39)**	4.42	
Other	**54.5% (6)**	18.2% (2)	9.1% (1)	0.0% (0)	18.2% (2)	2.09	

(Please specify other natural hazard)

	answered question
	skipped question

8. Which of the following methods do you think are most effective for providing hazard and disaster information? (Check all that apply)

	Response Percent	Response Count
Newspaper	30.0%	18
Telephone Book	8.3%	5
Informational Brochures	23.3%	14
City Newsletters	13.3%	8
Public Meetings	38.3%	23
Workshops	13.3%	8
Schools	10.0%	6
TV News	46.7%	28
TV Ads	3.3%	2
Radio News	43.3%	26
Radio Ads	8.3%	5
Internet	**73.3%**	**44**
Outdoor Advertisements	13.3%	8
Fire Department/Rescue	43.3%	26
Law Enforcement	36.7%	22
Church (faith-based institutions)	10.0%	6
CERT Classes	11.7%	7
Public Awareness Campaign (e.g., Flood Awareness Week, Winter Storm Preparedness Month)	38.3%	23
Books	5.0%	3
Chamber of Commerce	10.0%	6
Academic Institutions	5.0%	3

Public Library	11.7%	7
Red Cross Information	13.3%	8
Community Safety Events	25.0%	15
Fair Booths	13.3%	8
Word of Mouth	33.3%	20
Social Media (Twitter, Facebook, Linkdin)	36.7%	22
Other (please specify)	3.3%	2
	answered question	**60**
	skipped question	**9**

9. Is your property located in or near a FEMA designated floodplain?

	Response Percent	Response Count
Yes	8.3%	5
No	**78.3%**	**47**
Not Sure	13.3%	8
	answered question	**60**
	skipped question	**9**

10. Do you have flood insurance?

	Response Percent	Response Count
Yes	6.7%	4
No	**86.7%**	**52**
Not Sure	6.7%	4
	answered question	**60**
	skipped question	**9**

11. Is your property located near an earthquake fault?

	Response Percent	Response Count
Yes	3.3%	2
No	**53.3%**	**32**
Not Sure	43.3%	26
	answered question	**60**
	skipped question	**9**

12. Do you have earthquake insurance?

	Response Percent	Response Count
Yes	1.7%	1
No	**85.0%**	**51**
Not Sure	13.3%	8
	answered question	**60**
	skipped question	**9**

13. Is your property located in an area at risk for wild fires?

	Response Percent	Response Count
Yes	**83.3%**	**50**
No	8.3%	5
Not Sure	8.3%	5
	answered question	**60**
	skipped question	**9**

14. Have you ever had problems getting homeowners or renters insurance due to risks from natural hazards?

	Response Percent	Response Count
Yes	13.3%	8
No	**71.7%**	**43**
Not Sure	15.0%	9
	If "yes," which natural hazard was involved?	7
	answered question	**60**
	skipped question	**9**

15. Do you have any special access or functional needs within your household that would require early warning or specialized response during disasters?

	Response Percent	Response Count
Yes	5.1%	3
No	**94.9%**	**56**
	answered question	**59**
	skipped question	**10**

16. If the answer to question # 15 was yes, would you like County Emergency Management personnel to contact you regarding your access and functional needs? If yes, please enter your contact information in the following text box.

	Response Percent	Response Count
Yes	7.9%	3
No	13.2%	5
Not Applicable	**78.9%**	**30**
	Contact Information	2
	answered question	**38**
	skipped question	**31**

17. When you moved into your home, did you consider the impact a natural disaster could have on your home?

	Response Percent	Response Count
Yes	**67.8%**	**40**
No	28.8%	17
Not Sure	3.4%	2
	answered question	**59**
	skipped question	**10**

18. Was the presence of a natural hazard risk zone (e.g., dam failure zone, flood zone, landslide hazard area, high fire risk area) disclosed to you by a real estate agent, seller, or landlord before you purchased or moved into your home?

	Response Percent	Response Count
Yes	6.8%	4
No	**86.4%**	**51**
Not Sure	6.8%	4
	answered question	**59**
	skipped question	**10**

19. Would the disclosure of this type of natural hazard risk information influence your decision to buy or rent a home?

	Response Percent	Response Count
Yes	**49.2%**	**29**
No	33.9%	20
Not Sure	16.9%	10
	answered question	**59**
	skipped question	**10**

20. How much money would you be willing to spend to retrofit your home to reduce risks associated with natural disasters? (for example, by clearing brush and plant materials from around your home to create a "defensible space" for wildfire, performing seismic upgrades, or replacing a combustible roof with non-combustible roofing)

	Response Percent	Response Count
$10,000 or above	5.1%	3
$5,000 to $9,999	10.2%	6
$1,000 to $4,999	23.7%	14
Less than $1,000	**32.2%**	**19**
Nothing	8.5%	5
Not Sure	20.3%	12
	answered question	**59**
	skipped question	**10**

21. Which of the following incentives would encourage you to spend money to retrofit your home to protect against natural disasters? (Check all that apply)

	Response Percent	Response Count
Insurance premium discount	**76.3%**	**45**
Mortgage discount	35.6%	21
Low interest rate loan	37.3%	22
Grant funding	69.5%	41
None	10.2%	6
Other (please specify)	8.5%	5
	answered question	**59**
	skipped question	**10**

22. If your property were located in a designated “high hazard” area or had received repetitive damages from a natural hazard event, would you consider a ”buyout” offered by a public agency?

	Response Percent	Response Count
Yes	**37.3%**	**22**
No	25.4%	15
Not Sure	**37.3%**	**22**
	answered question	**59**
	skipped question	**10**

23. Would you support the regulation (restriction) of land uses within known high hazard areas?

	Response Percent	Response Count
Would support	**61.4%**	**35**
Would not support	38.6%	22
	answered question	**57**
	skipped question	**12**

24. What types of projects do you believe the County, State or Federal government agencies should be doing in order to reduce damage and disruption from hazard events within Park County? Please rank each option as a high, medium or low priority.

	High	Medium	Low	Rating Average	Rating Count
Retrofit and strengthen essential facilities such as police, fire, schools and hospitals.	**43.1% (25)**	39.7% (23)	17.2% (10)	1.74	58
Retrofit infrastructure such as roads, bridges, drainage facilities, levees, water supply, waste water and power supply facilities.	**50.0% (29)**	34.5% (20)	15.5% (9)	1.66	58
Capital projects such as dams, levees, flood walls, drainage improvements and bank stabilization projects.	20.7% (12)	36.2% (21)	**43.1% (25)**	2.22	58
Strengthen codes and regulations to include higher regulatory standards in hazard areas.	24.1% (14)	34.5% (20)	**41.4% (24)**	2.17	58
Acquire vulnerable properties and maintain as open space.	22.4% (13)	34.5% (20)	**43.1% (25)**	2.21	58
Assist vulnerable property owners with securing funding for mitigation.	**41.4% (24)**	32.8% (19)	25.9% (15)	1.84	58
Provide better public information about risk, and the exposure to hazards within the operational area.	**47.4% (27)**	38.6% (22)	14.0% (8)	1.67	57
Perform projects that restore the natural environments capacity to absorb the impacts from natural hazards.	39.7% (23)	**41.4% (24)**	19.0% (11)	1.79	58
Perform projects that mitigate the potential impacts from climate change.	34.5% (20)	29.3% (17)	**36.2% (21)**	2.02	58
				answered question	**59**
				skipped question	**10**

25. Please indicate how you feel about the following statement: It is the responsibility of government (local, state and federal) to provide education and programs that promote citizen actions that will reduce exposure to the risks associated with natural hazards.

	Strongly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Strongly Agree	Rating Average	Rating Count
Choose one:	8.5% (5)	16.9% (10)	15.3% (9)	**32.2% (19)**	27.1% (16)	3.53	59
						answered question	**59**
						skipped question	**10**

26. Please indicate how you feel about the following statement: It is my responsibility to educate myself and take actions that will reduce my exposure to the risks associated with natural hazards.

	Strongly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Strongly Agree	Rating Average	Rating Count
Choose one:	0.0% (0)	3.4% (2)	5.1% (3)	23.7% (14)	**67.8% (40)**	4.56	59
						answered question	**59**
						skipped question	**10**

27. Please indicate how you feel about the following statement: Information about the risks associated with natural hazards is readily available and easy to locate.

	Strongly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Strongly Agree	Rating Average	Rating Count
Choose one:	5.1% (3)	18.6% (11)	15.3% (9)	**50.8% (30)**	10.2% (6)	3.42	59
						answered question	**59**
						skipped question	**10**

28. Please indicate your age range:

		Response Percent	Response Count
Under 18		1.7%	1
18 to 30		3.4%	2
31 to 40		6.9%	4
41 to 50		20.7%	12
51 to 60		29.3%	17
61 or older		**37.9%**	**22**
		answered question	**58**
		skipped question	**11**

29. Please indicate the primary language spoken in your household.

	Response Percent	Response Count
English	**98.3%**	**57**
Spanish	1.7%	1
Other Indo-European Languages	0.0%	0
Asian and Pacific Island Languages	0.0%	0
Other (please specify)	0.0%	0
	answered question	**58**
	skipped question	**11**

30. Please indicate your gender:

	Response Percent	Response Count
Male	**57.9%**	**33**
Female	42.1%	24
	answered question	**57**
	skipped question	**12**

31. Please indicate your highest level of education.

	Response Percent	Response Count
Grade school/No schooling	1.7%	1
Some high school	0.0%	0
High school graduate/GED	5.2%	3
Some college/Trade school	24.1%	14
College degree	**36.2%**	**21**
Graduate degree	31.0%	18
Other (please specify)	1.7%	1
	answered question	**58**
	skipped question	**11**

32. How long have you lived in Park County?

	Response Percent	Response Count
Less than 1 year	6.9%	4
1 to 5 years	20.7%	12
6 to 10 years	**31.0%**	**18**
11 to 20 years	19.0%	11
More than 20 years	22.4%	13
	answered question	**58**
	skipped question	**11**

33. Do you own or rent your place of residence?

	Response Percent	Response Count
Own	**96.6%**	**56**
Rent	3.4%	2
	answered question	**58**
	skipped question	**11**

34. How much is your gross household income?

	Response Percent	Response Count
$20,000 or less	5.7%	3
$20,001 to $49,999	13.2%	7
$50,000 to $74,999	30.2%	16
$75,000 to $99,999	15.1%	8
$100,000 or more	**35.8%**	**19**
	answered question	**53**
	skipped question	**16**

35. Do you have regular access to the Internet?

	Response Percent	Response Count
Yes	**98.3%**	**57**
No	0.0%	0
Not Sure	1.7%	1
	answered question	**58**
	skipped question	**11**

36. Comments

	Response Count
	18
answered question	**18**
skipped question	**51**

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