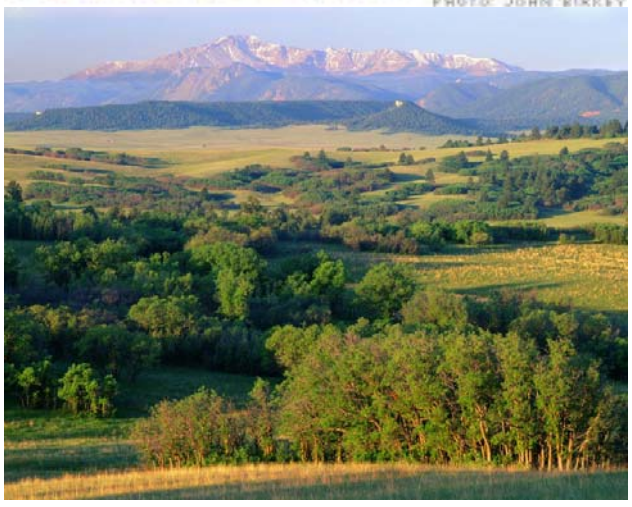
Douglas County
Local Hazard Mitigation Plan

Comprehensive Update
June 2015



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Executive Summary

The purpose of hazard mitigation is to reduce or eliminate long-term risk to people and property from hazards. Douglas County developed this Local Hazard Mitigation Plan (LHMP) update to make the County and its residents less vulnerable to future hazard events. This plan was prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 so that Douglas County would be eligible for the Federal Emergency Management Agency's (FEMA) Pre-Disaster Mitigation and Hazard Mitigation Grant programs.

The County followed a planning process prescribed by FEMA, which began with the formation of a hazard mitigation planning committee (HMPC) comprised of key County representatives, and other regional stakeholders. The HMPC conducted a risk assessment that identified and profiled hazards that pose a risk to the County, assessed the County's vulnerability to these hazards, and examined the capabilities in place to mitigate them. The County is vulnerable to several hazards that are identified, profiled, and analyzed in this plan. Floods, wildfires, and severe weather are among the hazards that can have a significant impact on the County.

Based on the risk assessment, the HMPC identified goals and objectives for reducing the County's vulnerability to hazards. The goals and objectives of this multi-hazard mitigation plan are:

Goal 1: Reduce impacts and damages from hazard events to people, property, local government assets, economy and natural resources

Goal 2: Increase public awareness of hazards and their mitigation

Goal 3: Strengthen communication and coordination among public agencies, non-governmental organizations (NGOs), businesses and private citizens

Goal 4: Coordinate and integrate hazard mitigation activities with local land development planning activities and emergency operations planning

Goal 5: Reduce costs of disaster response and recovery

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1 INTRODUCTION

1.1 Purpose

Douglas County, five other jurisdictions, and one special district prepared this Local Hazard Mitigation Plan (LHMP) update to the 2010 Federal Emergency Management Agency (FEMA) Denver Regional Natural Hazards Mitigation Plan (Regional Plan), of which Douglas County and the Town of Castle Rock were participants. The purpose of this plan update is to guide hazard mitigation planning to better protect the people and property of the County from the effects of hazard events. This plan demonstrates the community's commitment to reducing risks from hazards and serves as a tool to help decision makers direct mitigation activities and resources. This plan was also developed, among other things, to ensure Douglas County and participating jurisdictions' continued eligibility for certain federal disaster assistance: specifically, the FEMA Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation Program (PDM), and the Flood Mitigation Assistance Program (FMA). Completion also earns credits for the National Flood Insurance Program's Community Rating System (CRS) which provides for lower flood insurance premiums in CRS communities.

1.2 Background and Scope

Each year in the United States, natural disasters take the lives of hundreds of people and injure thousands more. Nationwide, taxpayers pay billions of dollars annually to help communities, organizations, businesses, and individuals recover from disasters. These monies only partially reflect the true cost of disasters, because additional expenses incurred by insurance companies and nongovernmental organizations are not reimbursed by tax dollars. Many natural disasters are predictable, and much of the damage caused by these events can be reduced or even eliminated.

Hazard mitigation is defined by FEMA as "any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event." The results of a three-year, congressionally mandated independent study to assess future savings from mitigation activities provides evidence that mitigation activities are highly cost-effective. On average, each dollar spent on mitigation saves an average of $4 in avoided future losses in addition to saving lives and preventing injuries (National Institute of Building Science Multi-Hazard Mitigation Council, 2005).

Hazard mitigation planning is the process through which hazards are identified, likely impacts determined, mitigation goals set, and appropriate mitigation strategies determined, prioritized, and implemented. This plan documents Douglas County's hazard mitigation planning process and identifies relevant hazards and vulnerabilities and strategies the County and participating jurisdictions will use to decrease vulnerability and increase resiliency and sustainability in the community.

The Douglas County Local Hazard Mitigation Plan (LHMP) update is a multi-jurisdictional plan that geographically covers the entire area within Douglas County's jurisdictional boundaries (hereinafter referred to as the planning area). The following jurisdictions participated in the planning process and are seeking approval of this LHMP plan update:

- Douglas County*
- City of Castle Pines
- City of Lone Tree
- Town of Castle Rock*
- Town of Larkspur
- Town of Parker
- Denver Water

* Participated in 2010 Plan

This plan update was prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 (Public Law 106-390) and the implementing regulations set forth by the Interim Final Rule published in the Federal Register on February 26, 2002, (44 CFR §201.6) and finalized on October 31, 2007. (Hereafter, these requirements and regulations will be referred to collectively as the Disaster Mitigation Act (DMA) or DMA 2000.) While the act emphasized the need for mitigation plans and more coordinated mitigation planning and implementation efforts, the regulations established the requirements that local hazard mitigation plans must meet in order for a local jurisdiction to be eligible for certain federal disaster assistance and hazard mitigation funding under the Robert T. Stafford Disaster Relief and Emergency Act (Public Law 93-288). This planning effort also follows FEMA's 2008 Plan Preparation Guidance. Because the Douglas County Planning Area is subject to many kinds of hazards, access to these programs is vital.

Information in this plan will be used to help guide and coordinate mitigation activities and decisions for local land use policy in the future. Proactive mitigation planning will help reduce the cost of disaster response and recovery to communities and their residents by protecting critical community facilities, reducing liability exposure, and minimizing overall community impacts and disruptions. The planning area has been affected by hazards in the past and is thus committed to reducing future impacts from hazard events and maintaining eligibility for mitigation-related federal funding.

1.2.1 Plan Organization

The Douglas County Local Hazard Mitigation Plan update is organized in alignment with the DMA 2000 planning requirements and the FEMA Plan Review Tool, as follows:

- Chapter 1: Introduction
- Chapter 2: County Profile
- Chapter 3: Planning Process
- Chapter 4: Risk Assessment
- Chapter 5: Mitigation Strategy
- Chapter 6: Plan Adoption
- Chapter 7: Plan Implementation and Maintenance
- Jurisdictional Annexes
- Appendices

Jurisdictional Annexes

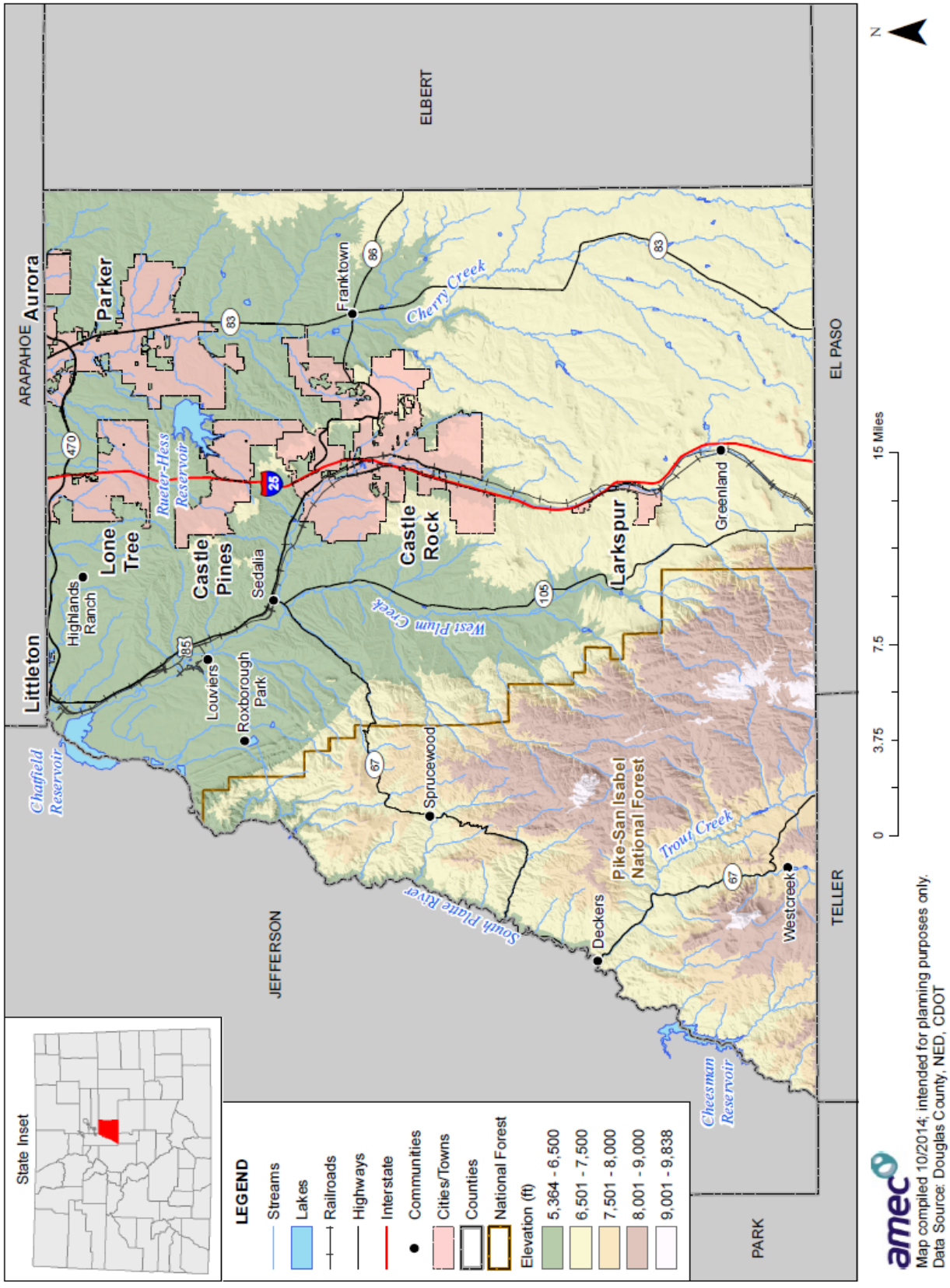
Each jurisdiction participating in this plan developed its own annex, which provides a more detailed assessment of the jurisdiction's unique risks as well as their mitigation strategy to reduce long-term losses. Each jurisdictional annex contains the following:

- Community profile summarizing geography and climate, history, economy, and population
- Hazard information on location, previous occurrences, probability of future occurrences, and magnitude/severity for geographically specific hazards
- Hazard map(s) at an appropriate scale for the jurisdiction, if available
- Number and value of buildings, critical facilities, and other community assets located in hazard areas, if available
- Vulnerability information in terms of future growth and development in hazard areas
- A capability assessment describing existing regulatory, administrative, technical, and fiscal resources and tools as well as outreach efforts and partnerships and past mitigation projects
- Mitigation actions specific to the jurisdiction

2.1 County Profile

Douglas County, Colorado lies close to the center of the state along the I-25 Corridor between the major urban activity centers of Denver and Colorado Springs. It encompasses over 540,000 acres of mountain vistas, dramatic ridgelines, hills, and grass covered plains. Elevations can range from a low of 5,400 feet in the northeastern areas to the high point of 9,836 feet at Thunder Butte in the Pike National Forest. The county seat is Castle Rock, named after a prominent castle tower-shaped butte just north of the Town. A map of the County is shown in Figure 2.1.

Figure 2.1. Douglas County Base Map



2.1.1 History

Douglas County was one of the original 17 counties created in the Colorado Territory by the Colorado Territorial Legislature on November 1, 1861. The County was named in honor of U.S. Senator Stephen A. Douglas of Illinois, who died five months before the County was created. The county seat was originally Franktown, but was moved to California Ranch in 1863, and then to Castle Rock in 1874. Although the County's boundaries originally extended eastward to the Kansas state border, in 1874 most of the eastern portion of the county became part of Elbert County.

2.1.2 Geography and Climate

Douglas County benefits from a sunny and moderate climate, without the extremes of temperature seen in the Rocky Mountains immediately to the west. The County averages over 300 days of sunshine a year. The County can have cold and snowy weather in the winter, but it is usually of short duration. The average high temperature in July is 84° F, and in January is 41° F. (January lows can be in the teens). Average annual precipitation is 16.96 inches and average annual snowfall is 58.3 inches. Low humidity makes for a pleasant climate with typical winter days being sunny, with temperatures in the 40s.

2.1.3 Economy and Tax Base

U.S. Census estimates show economic characteristics for the County. These are shown in Table 2.1.

Table 2.1 Douglas County Civilian Employed Population 16 years and Over

Industry	Estimated Employment	Percent
Agriculture, forestry, fishing and hunting, and mining	1,643	1.1%
Construction	8,776	5.8%
Manufacturing	11,400	7.5%
Wholesale trade	4,486	2.9%
Retail trade	15,997	10.5%
Transportation and warehousing, and utilities	5,041	3.3%
Information	7,810	5.1%
Finance and insurance, and real estate and rental and leasing	17,078	11.2%
Professional, scientific, and management, and administrative and waste management services	23,652	15.5%
Educational services, and health care and social assistance	32,506	21.3%
Arts, entertainment, and recreation, and accommodation and food services	11,579	7.6%
Other services, except public administration	6,144	4.0%
Public administration	6,452	4.2%

Source: US Census Bureau American Community Survey 2012 Estimates

The County has a wide and varied tax base. Table 2.2 shows the breakdown of the County's property tax base.

Table 2.2 Unincorporated Douglas County Property Types and Values

Property Use	Total Parcel Count	Improved Parcel Count	Improved Value	Total Land	Total Value
Agricultural	3,527	1,011	$408,387,527	$24,891,100	$433,278,627
Commercial	835	700	$2,120,214,546	$711,957,157	$2,832,171,703
Exempt	5,386	346	$943,117,742	$879,583,701	$1,822,701,443
HOA	1,307	1	$2,522,088	$360,000	$2,882,088
Industrial	140	137	$164,583,796	$57,464,699	$222,048,495
Producing Mine	20	0	$0	$1,221,200	$1,221,200
Residential	58,087	55,948	$16,026,843,365	$5,243,000,700	$21,269,844,065
Utilities	148	0	$0	$197,376	$197,376
Vacant Land	4,609	17	$2,865,919	$326,606,683	$329,472,602
Total	**74,059**	**58,160**	**$19,668,534,983**	**$7,245,282,616**	**$26,913,817,599**

Source: Douglas County GIS and Assessors Office

The largest employers in the County are shown in Table 2.3.

Table 2.3 Douglas County Largest Employers

Company Name	Product/Service	Industry Cluster
Baxa Corp	Medical Technology	Medical
Avaya	Telecommunications Software	Telecom
Centura Health: Parker Adventist Hospital	Healthcare	Medical
CH2M HILL	Engineering & Architectural Services	Professional/Technical Services
DISH Network	Satellite TV & Equipment	Telecom
HealthONE: Sky Ridge Medical Center	Healthcare	Medical
Information Handling Services Group Inc.	Indexed Technical Data	Software
Liberty Media	Telecommunications Holding Company	Telecom
Sprint Nextel Corporation	Cellular and Wireless phones	Telecom
TeleTech	Call Center Management	Professional/Technical Services
tw telecom	Telecommunications	Telecom
Western Union	Financial Services	Financial Services

Source: Douglas County

2.1.4 Population

The Douglas County population estimate for January 1, 2014 is 302,464 persons, a 2.3% increase from the previous year's estimate of 295,682. Between 2000 and 2010, the population of Douglas County increased 62.4%, which made Douglas County the fastest growing county in Colorado, and the 16th fastest growing county in the nation. The population age 65 and over increased 177.8% during the same time. Seniors now make up 7.1% of the population, compared to 4.2% in 2000. By the year 2030, seniors are expected to be 20% of the total County population.

Douglas County Community Planning and Sustainable Development 2013 estimates for population of the County and its jurisdictions are shown in Table 2.4.

Table 2.4 Douglas County Population by Jurisdiction - 2013

Jurisdiction	Total Population
Douglas County (unincorporated)	174,949
Aurora	299
Castle Pines	10,477
Castle Rock	51,337
Larkspur	191
Littleton	103
Lone Tree	11,385
Parker	46,941
Total	**295,682**

Source: Douglas County Community Planning and Sustainable Development

Requirements §201.6(b) and §201.6(c)(1): An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

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 nonprofit interests to be involved in the planning process; and
3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

[The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

3.1 Background on Mitigation Planning in Douglas County

Douglas County and the Town of Castle Rock previously participated in a regional hazard mitigation planning process with Denver Regional Council of Governments, ending in 2010. The Denver Regional Council of Governments was one of the first governmental entities in FEMA Region VIII to pursue a regional Mitigation Plan. In 2014, Douglas County recognized the need and importance of having a more detailed, county-specific plan update with greater jurisdictional participation. AMEC Environment and Infrastructure (AMEC) was selected through a competitive process to facilitate the update of the plan in 2014-2015. AMEC's role was to:

- Assist in establishing the Hazard Mitigation Planning Committee (HMPC), as defined by the Disaster Mitigation Act (DMA);
- Meet the DMA requirements as established by federal regulations and FEMA's planning guidance;
- Support objectives under the National Flood Insurance Program's Community Rating System and the Flood Mitigation Assistance program;
- Facilitate the planning process;
- Identify the data requirements that HMPC participants could provide, and conduct the research and documentation necessary to augment that data,
- Assist in facilitating the public input process;
- Provide project management and professional planning services;
- Produce the draft and final plan documents; and

- Coordinate with the Colorado Division of Homeland Security and Emergency Management (DHSEM) and FEMA Region VIII on plan reviews.

The remainder of this chapter provides a narrative description of the steps taken to prepare and update the hazard mitigation plan.

3.2 What's New in the Plan Update

Requirements §201.6(d)(3): A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within 5 years in order to continue to be eligible for mitigation project grant funding.

As noted previously, Douglas County and the Town of Castle Rock chose to separate out from the DRCOG Region plan in order to develop a plan with more specific risk assessment, goals, objectives, and action items. In addition to these two jurisdictions that participated in the DRCOG plan, five additional jurisdictions were included in the planning process in 2014-2015. While the development of this plan was approached as an update per the DMA regulations, it effectively required a rewrite of most of the Douglas County and Castle Rock specific information in the 2010 DRCOG plan. This is considered a new mitigation plan for the remaining jurisdictions of Castle Pines, Lone Tree, Larkspur, Parker and Denver Water. See section 3.3 for details on participating jurisdictions. This LHMP update involved a comprehensive review and update of each section of the 2010 DRCOG plan, and includes an assessment of the success of the participating communities in evaluating, monitoring and implementing the mitigation strategy outlined in the initial plan for the County and Castle Rock.

The 2010 Regional Plan contained a risk assessment of identified hazards for Douglas County and Parker and a mitigation strategy to address the risk and vulnerability from these hazards. The risk assessment discussed in Chapter 4 is thoroughly revised to reflect the current hazards and vulnerabilities for all jurisdictions. Chapter 5 addresses progress in local mitigation efforts and changes in priorities for the County and Castle Rock, in addition to the new mitigation actions identified for all jurisdictions. Additional jurisdictional specific details on hazards, risks, capabilities and progress on local mitigation efforts can be referenced in the jurisdictional annexes.

Also to be noted, Section 7 Implementation and Maintenance of this plan identifies key requirements for updating future plans:

- Consider changes in vulnerability due to action implementation;
- Document success stories where mitigation efforts have proven effective;
- Document areas where mitigation actions were not effective;
- Document any new hazards that may arise or were previously overlooked;
- Incorporate new data or studies on hazards and risks;

- Incorporate new capabilities or changes in capabilities;
- Incorporate growth and development-related changes to inventories; and
- Incorporate new action recommendations or changes in action prioritization.

These requirements and others as detailed throughout this plan were also addressed during this Plan update process.

3.3 Local Government Participation

This multi-jurisdictional LHMP update included the active participation of Douglas County and all incorporated jurisdictions including Castle Rock, Castle Pines, Larkspur, Lone Tree, and Parker. Denver Water also participated in the effort as a special district who has a portion of their service area in Douglas County. The DMA planning regulations and guidance stress that each local government seeking FEMA approval of their mitigation plan must participate in the planning effort in the following ways:

- Participate in the process as part of the HMPC;
- Detail where within the planning area the risk differs from that facing the entire area;
- Identify potential mitigation actions; and
- Formally adopt the plan.

For the Douglas County Planning Area's HMPC, "participation" meant the following:

- Providing facilities for meetings;
- Attending and participating in the HMPC meetings;
- Completing and returning the AMEC Data Collection Guide;
- Collecting and providing other requested data (as available);
- Managing administrative details;
- Making decisions on plan process and content;
- Identifying mitigation actions for the plan;
- Reviewing and providing comments on plan drafts; including annexes
- Informing the public, local officials, and other interested parties about the planning process, and providing opportunity for them to comment on the plan;
- Coordinating, and participating in the public input process; and
- Coordinating the formal adoption of the plan by the governing boards.

The County and all jurisdictions with annexes to this plan seeking FEMA approval met all of these participation requirements. In most cases one or more representatives for each jurisdiction attended the HMPC meetings described in Table 3.3 and also brought together a local planning team to help collect data, identify mitigation actions and implementation strategies, and review and provide data on plan drafts. Appendix A provides additional information and documentation of the planning process.

3.4 The 10-Step Planning Process

AMEC established the planning process for updating the 2010 Regional Plan (which was part of the using the DMA planning requirements and FEMA's associated guidance. This guidance is structured around a four-phase process:

1) Organize Resources;
2) Assess Risks;
3) Develop the Mitigation Plan; and
4) Implement the Plan and Monitor Progress.

Into this process, AMEC integrated a more detailed 10-step planning process used for FEMA's Community Rating System (CRS) and Flood Mitigation Assistance programs. Thus, the modified 10-step process used for this plan meets the funding eligibility requirements of the Hazard Mitigation Assistance grants (including Hazard Mitigation Grant Program - HMGP, Pre-Disaster Mitigation program - PDM, Flood Mitigation Assistance - FMA), Community Rating System, and the flood control projects authorized by the U.S. Army Corps of Engineers (USACE). Both the County and the Town of Parker participate in the CRS and could earn additional CRS credits by following the 10-step process.

Table 3.1 shows how the modified 10-step process fits into FEMA's four-phase process. The sections that follow describe each planning step in more detail.

Table 3.1. Mitigation Planning Processes Used to Develop the Douglas County Local Hazard Mitigation Plan

DMA Process	Modified CRS Process
1) Organize Resources	
201.6(c)(1)	1) Organize to Prepare the Plan
201.6(b)(1)	2) Involve the Public
201.6(b)(2) and (3)	3) Coordinate with Other Departments and Agencies
2) Assess Risks	
201.6(c)(2)(i)	4) Assess the Hazard
201.6(c)(2)(ii)	5) Assess the Problem
3) Develop the Mitigation Plan	
201.6(c)(3)(i)	6) Set Goals
201.6(c)(3)(ii)	7) Review Possible Activities
201.6(c)(3)(iii)	8) Draft an Action Plan
4) Implement the Plan and Monitor Progress	
201.6(c)(5)	9) Adopt the Plan
201.6(c)(4)	10) Implement, Evaluate, and Revise the Plan

This LHMP update involved a comprehensive review and update of each section of the 2010 Regional Plan, and includes an assessment of the success of the participating communities in evaluating, monitoring and implementing the mitigation strategy outlined in the initial plan. The process followed to update the plan is detailed in the above table and the sections that follow and is the same process that was used to prepare the 2010 plan. As part of this plan update, all sections of the plan were reviewed and updated to reflect new data, processes, participating jurisdictions, and resulting mitigation strategies. Based on the fact that the 2010 Regional Plan included minimal amounts of data relevant to Douglas County, the 2010 Regional Plan has been reorganized, updated and rewritten in its entirety. Only the information and data still valid from the 2010 plan was carried forward as applicable into this LHMP update.

3.4.1 Phase 1: Organize Resources

Planning Step 1: Organize the Planning Effort

With Douglas County's commitment to participate in the DMA planning process, AMEC worked with the Douglas County Fleet, Facilities, and Emergency Support Services (FFESS) in conjunction with the County Office of Emergency Management (OEM) to establish the framework and organization for development of the plan. Organizational efforts were initiated with the County and participating jurisdictions to inform and educate the plan participants of the purpose and need for updating the countywide hazard mitigation plan. An initial meeting was held with the County taking the lead on this project to discuss the organizational aspects of this plan update process. Invitations to the kickoff meeting for this plan update were extended to key County departments, the five incorporated communities, and representatives from special districts for the County and municipalities, as well as to other federal, state, and local stakeholders, including representatives from the public, that might have an interest in participating in the planning process. Representatives from participating jurisdictions and HMPC members to the 2010 Regional Plan were used as a starting point for the invite list, with additional invitations extended as appropriate throughout the planning process. The list of initial invitees is included in Appendix A.

Hazard Mitigation Planning Committee

The HMPC was established as a result of this effort, as well as through interest generated through outreach conducted for this project. The HMPC, comprising key County, city, special district, and other government and stakeholder representatives, developed the plan with leadership from the County OEM and facilitation by AMEC. Each participating jurisdiction seeking FEMA approval of the plan had representation on the HMPC. Participating jurisdictions also indicated their commitment to participate as evidenced by executing a letter of commitment at the beginning of the planning process. The County also passed a resolution (R-014-137 on December 16, 2014) regarding the plan update and formally recognized the establishment of the HMPC. The resolution and letters of commitment for participating jurisdictions are included in Appendix A. In addition to representation by participating jurisdictions, the HMPC also

included other agency and public stakeholders with an interest in hazard mitigation. The following participated on the HMPC:

Douglas County

- Facilities, Fleet, and Emergency Support Services
- Emergency Management
- Public Works Operations
- Public Works Engineering
- Human Resources
- County Administration
- Clerk and Recorder
- Finance
- Open Space
- Building Developmental Services
- Planning Services
- Sheriff's Office
- Fire Districts
- Treasurer
- Information Technology

Incorporated Jurisdictions

- City of Castle Pines
- City of Lone Tree
- Town of Castle Rock
- Town of Larkspur
- Town of Parker

Denver Water participated as a special district.

A list of participating HMPC representatives for each jurisdiction is included in Appendix A. Each jurisdiction also utilized the support of many other staff in order to collect and provide requested data and to conduct timely reviews of the draft documents. Additional personnel supporting the plan update efforts for each jurisdiction are identified in the jurisdictional annexes to this plan.

Steering Committee: A steering committee for the HMPC was formed during the planning process. The steering committee membership was one half government and one half public representation. The purpose of the steering committee was to guide the plan update process with input from public and non-governmental stakeholders and ensure that floodplain management issues were taken into account. The steering committee members are listed below in Table 3.2.

Table 3.2. Steering Committee Members

Name	Jurisdiction/Position
Becky Barnes	Citizen
Bill Sparkman	Citizen
Don Bammes	Citizen
Doug Barnes	Citizen
Lee Abbott	Citizen
Robert Wareham	Citizen
Virginia Scally	Citizen
Brad Meyering	Castle Pines Public Works
Art Morales	Castle Rock Fire Chief
Jason Finehout	Denver Water Floodplain Manager
Garth Englund	Douglas County Floodplain Manager
Matt Krimmer	Larkspur Town Manager
Greg Weeks	Lone Tree Floodplain Administrator
Mike Waid	Parker Floodplain Manager

The planning process officially began with a kick-off meeting held at the Douglas County Events Center in Castle Rock, on August 19, 2014. The meeting covered the scope of work and an introduction to the DMA requirements. Participants were provided with a Data Collection Guide, which included worksheets to facilitate the collection of information necessary to support development of the plan. Using FEMA guidance, AMEC designed these worksheets to capture information on past hazard events, identify hazards of concern to each of the participating jurisdictions, quantify values at risk to identified hazards, inventory existing capabilities, and record possible mitigation actions. Copies of AMEC's Data Collection Guide for this project are included in Appendix A. Because this is a plan update, another worksheet was developed, the Mitigation Action Status Summary Worksheet, to capture information on the current status of mitigation action items included in the 2010 Regional Plan. This worksheet is also included in Appendix A. The County and each jurisdiction seeking FEMA approval of this plan update completed and returned the worksheets to AMEC for incorporation into the plan document.

During the planning process, the HMPC communicated through face-to-face meetings, email, telephone conversations, a file transfer protocol (ftp) website, the file sharing service WeTransfer, and through the Douglas County Sheriff's Office webpage and the Douglas County website. Both websites were used to post public notices and meeting information for the HMPC, the public and all other stakeholders on the LHMP process. Draft documents were shared with HMPC and steering committee members through the ftp site and WeTransfer. The public was able to access and review documents through Douglas County Sheriff's Office webpage: http://www.dcsheriff.net/emergencymanagement/.

The HMPC met four times during the planning period (August 2014-May 2015). The purposes of these meetings are described in Table 3.3. Agendas for each of the meetings are included in Appendix A.

Table 3.3. HMPC Meetings

Meeting Type	Meeting Topic	Meeting Date(s)	Meeting Location(s)
HMPC #1 Kick-off Meeting	1) Introduction to DMA and the planning process 2) Overview of current LHMP; 3) Organize Resources: the role of the HMPC, planning for public involvement, coordinating with other agencies/stakeholders 4) Introduction to Hazard Identification	August 19, 2014	Douglas County Events Center Castle Rock, CO
HMPC #2 Risk Assessment	1) Risk assessment overview and work session 2) Development of mitigation goals and objectives;	February 5, 2015	Justice Center – OEM Castle Rock, CO
HMPC #3 Goals	1) Development of mitigation goals	February 5, 2015	Justice Center – OEM Castle Rock, CO
HMPC #4 Mitigation Strategy	1) Finalization of mitigation goals and objectives; Development of mitigation action strategy and review of alternatives.	March 5th, 2015	Douglas County Events Center Castle Rock, CO

Planning Step 2: Involve the Public

Early discussions with the Douglas County FFESS, OEM, and AMEC established the initial plan for public involvement. Public outreach for this plan update began initially during the plan development process with a press release to inform the public of the purpose of the DMA and the hazard mitigation planning process for the Douglas County Planning Area as well as to invite citizens to a public education/outreach kickoff meeting. At the planning team kick-off meeting, the HMPC discussed additional strategies for public involvement and agreed to an approach using established public information mechanisms and resources within the community. Public involvement activities for this plan update included: utilization of members of the public on the HMPC steering committee; attendance at HMPC meetings; press releases; LHMP postings on the Douglas County Sheriff's Office website and the Douglas County website; stakeholder and public meetings; engagement of the Public Safety Advisory Council (PSAC), and the collection of public and stakeholder comments on the draft plan which was posted on the County website.

Meetings

Four public meetings were hosted during the planning process as detailed in the following table. The first meeting on July 16, 2014 was held for the Partnership of Douglas County Governments (PDCG) to educate the municipalities about the plan update initiative. This group is one of the more important methods of communication with the high level elected officials representing the major municipalities, Highlands Ranch Metro District, library district and the school district.

Once the plan update process officially began, a second meeting was held to educate the public about the plan update and how they could participate and provide input into its development. The third public meeting coincided with the Public Safety Advisory Committee meeting in December 2014. A fourth public meeting was held when the draft plan was available for public review and comment. Information provided to the public included an overview of the mitigation status and successes resulting from implementation of the 2010 Regional Plan as well as information on the processes, new risk assessment data, and proposed mitigation strategies for the plan update. Castle Rock was chosen as a central location for the meetings.

Table 3.4. Public and Stakeholder Meetings

Meeting Topic	Meeting Date	Meeting Locations
Partnership of Douglas County Governments 1) Introduce LHMP initiative	July 16, 2014	Highlands Ranch Metro District, Highlands Ranch, CO
1) Intro to DMA and mitigation planning 2) LHMP plan overview and public comments	September 18, 2014	Castle Rock, CO
Public Safety Advisory Committee Meeting 1) Introduce LHMP process 2) Discussed steering committee formation	December 11,2014	Castle Rock, CO
Presentation of Draft LHMP	May 14, 2015	Castle Rock, CO

Public Safety Advisory Committee (PSAC)

In between the early and late public meetings, a meeting of the PSAC was used to discuss the plan update process and solicit interest in the involvement of members of the public on a steering committee on the HMPC. The PSAC was established in 2007 and includes approximately 30 members that are involved in Sheriff's Office functions and in their local communities. Representation includes Highlands Ranch, Franktown, Roxborough, Castle Pines North, Parker, Littleton, Sedalia, Castle Rock, Lone Tree, and Larkspur. The PSAC meets monthly to hear about issues from Sheriff's Office staff and to provide citizen feedback about the issues discussed.

Steering Committee

The steering committee previously described was another way the public was directly involved in the plan update process. The steering committee comprised 14 people, half of whom were members of the public. The remaining seven members included the floodplain managers from the County, Parker, Castle Pines, Castle Rock, Lone Tree, Larkspur, and Denver Water. The committee was represented at every planning meeting and reviewed draft documents. Members also provided mitigation actions related to floodplain management, localized stormwater issues, and ongoing NFIP compliance. The names of the steering committee members are listed in Appendix A and Table 3.2.

Outreach

A press release was provided during the plan development process to solicit public input for the plan update. In addition, a formal public meeting was held to solicit public and stakeholder input prior to finalizing the updated plan. Where appropriate, stakeholder and public comments and recommendations were incorporated into the final plan, including the sections that address mitigation goals and strategies. All press releases and website postings are on file with the Douglas County FFESS (see Figure 3.1 for an example of a press release). The Public meeting was advertised in a variety of ways to maximize outreach efforts to both targeted groups and to the public at large. Advertisement mechanisms for these meetings and for involvement in the overall LHMP development process include:

- Providing press releases to the County's current media distribution list through local newspapers, television stations, and radio stations, along with the City of Lone Tree website and support from Castle Pines;
- Posting meeting announcements and soliciting feedback on draft documents on the Douglas County Sheriff's Office website and Douglas County Newsroom website, along with the City of Lone Tree website and support from Castle Pines;
- Postings on Douglas County website with a hard copy of the plan update available in the OEM office;
- Information on the plan update disseminated at Public Safety Advisory Committee meeting on December 11, 2014;
- Email to established email lists;
- Social media blasts to the County's current media distribution list, along with assistance from Castle Pines;
- Personal phone calls

The public meeting on May 14th, 2015 formally kicked off a 19 day public comment period. A public questionnaire was distributed at the meeting to gather feedback on the plan update initiative. No questionnaires were returned. Comments were received from a developer associated with Lone Tree's growth who had some minor comments and clarifications on the Lone Tree Annex.

The LHMP is available online on the Douglas County website at http://www.dcsheriff.net/emergencymanagement/.

The public outreach activities described here were conducted with participation from and on behalf of all jurisdictions participating in this plan.

Figure 3.1. Example Press Release Used to Involve the Public

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PUBLIC INPUT OPPORTUNITY ON DOUGLAS COUNTY MULTI-HAZARD MITIGATION PLAN UPDATE

Posted on April 22, 2015

FOR IMMEDIATE RELEASE

April 22, 2015

Contact: Anne Walton

Douglas County Emergency Support Services

303-814-4356

PUBLIC INPUT OPPORTUNITY ON DOUGLAS COUNTY MULTI-HAZARD MITIGATION PLAN UPDATE

DOUGLAS COUNTY, CO – Douglas County Emergency Management is hosting an open house and workshop. The open house is part of the Douglas County Multi-Hazard Mitigation Planning Project. Douglas County, Castle Pines, Castle Rock, Larkspur, Lone Tree, Parker, and the Denver Water Board are developing a comprehensive Multi-Hazard Mitigation Plan Update to reduce the vulnerability of people and impact to property in the County. All interested parties are invited. The Multi-Hazards Planning Open House will be held on **Thursday, May 14, 2015 between 6:00 and 7:30pm at the Douglas County Events Center (500 Fairgrounds Drive, Castle Rock, CO).** For more information on this project, contact Anne Walton at 303-814-4356 or alwalton@douglas.co.us.

‹ Fraudulent Money Scams Continue in Douglas County

Posted in 2015 News, Archives

Planning Step 3: Coordinate with Other Departments and Agencies

Early in the planning process, the HMPC determined that data collection, mitigation strategy development, and plan approval would be greatly enhanced by inviting other local, state and federal agencies and organizations to participate in the process. Based on their involvement in hazard mitigation planning, their landowner status in the County, and/or their interest as a neighboring jurisdiction, representatives from the following groups were invited to participate on the HMPC:

- Douglas County School District
- Douglas County Public Library District
- Parker Water and Sanitation District
- Castle Pines North Metropolitan District
- Highlands Ranch Metropolitan District
- Neighboring county emergency management
    - Arapahoe County

    - Jefferson County
    - Elbert County
    - Teller County
    - El Paso County
- Business and Industry including major private sector employers
    - Ridgegate Investments, Inc.
    - CH2M Hill
    - Teletech
    - Western Union
    - TW Telecom
- Infrastructure
    - Xcel Energy
    - Black Hills Energy
    - IREA
    - Century Link
    - Union Pacific Railroad
    - Burlington Northern/Sante Fe Railroad
- Health and Social Services
    - Sky Ridge Medical Center
    - Tri-County Health Department
    - Parker Adventist Hospital
    - Castle Rock Adventist Hospital
    - Salvation Army
    - Red Cross
    - Colorado Volunteer Agencies Active in Disasters (COVOAD)
    - PetAid Colorado
    - Victims Assistance
- Local Chambers of Commerce
- Urban Drainage and Flood Control District
- State Agencies
    - Colorado Division of Homeland Security and Emergency Management
    - Colorado Water Conservation Board
    - Colorado Department of Parks and Wildlife
    - Colorado State Forest Service
    - Division of Fire Prevention and Control
    - CDOT
    - Colorado State Veterinarian
- Federal Agencies
    - FEMA Region VIII
    - National Weather Service
    - US Army Corps of Engineers
    - US Forest Service

The previously listed stakeholders were invited to participate through an email from the Douglas County Emergency Support Services Coordinator on July 16, 2015, which included an invitation to the kickoff meeting. A complete list of agencies and persons invited to the kick off meeting, plus the invitation itself, can be referenced in Appendix A.

Coordination with key agencies, organizations, and advisory groups throughout the planning process allowed the HMPC to review common problems, development policies, and mitigation strategies as well as identifying any conflicts or inconsistencies with regional mitigation policies, plans, programs and regulations. Phone calls and emails were used during plan development to directly coordinate with key individuals representing other regional programs.

As part of the public review and comment period for the draft plan, key agencies and were again specifically solicited to provide any final input to the draft plan document. This input was solicited both through membership on the LHMP committee and by direct emails to key groups and associations to review and comment on the plan. As part of this targeted outreach, these key stakeholders were also specifically invited to attend the public meeting to discuss any outstanding issues and to provide input on the draft document and final mitigation strategies.

The HMPC also used technical data, reports, and studies from the following agencies and groups, just to name a few:

- Colorado Water Conservation Board
- Colorado Geological Survey
- FEMA

Appendix B References provides a detailed list of references used in the preparation of this plan update. Specific references relied on in the development of this plan are also sourced throughout the document as appropriate.

Several opportunities were provided for the groups listed above to participate in the planning process. At the beginning of the planning process, invitations were extended to these groups to actively participate on the HMPC. Specific participants from these groups are detailed in Appendix A. Others assisted in the process by providing data directly as requested in the Data Collection Guide or through data contained on their websites or as maintained by their offices. Further as part of the public outreach process, all groups were invited to attend the public meetings and to review and comment on the plan prior to submittal to DHSEM and FEMA. In addition, as part of the review of the draft plan, key agency stakeholders were contacted and their comments specifically solicited.

Other Community Planning Efforts and Hazard Mitigation Activities

Coordination with other community planning efforts is paramount to the success of this plan. Hazard mitigation planning involves identifying existing policies, tools, and actions that will reduce a community's risk and vulnerability to hazards. Douglas County uses a variety of

comprehensive planning mechanisms, such as general plans and ordinances, to guide growth and development. Integrating existing planning efforts and mitigation policies and action strategies into this plan establishes a credible and comprehensive plan that ties into and supports other community programs. The development of this plan incorporated information from the following existing plans, studies, reports, and initiatives as well as other relevant data from neighboring communities and other jurisdictions.

Table 3.5. Incorporated Planning Mechanisms

Plan	How Incorporated
2010 Denver Regional Council of Governments Natural Hazard Mitigation Plan	Used as baseline for update and incorporated into Community Profile, Planning Process, Risk and Vulnerability Assessment, Mitigation Strategy, and Implementation
Douglas County Community Wildfire Protection Plan	Incorporated into Risk and Vulnerability Assessment and Mitigation Strategy
Douglas County Recovery Plan	Incorporated into Risk and Vulnerability Assessment and Mitigation Strategy
Douglas County Emergency Operations Plan	Incorporated into Risk and Vulnerability Assessment and Mitigation Strategy
Douglas County Demographics Summary	Incorporated into Community Profile and Risk and Vulnerability Assessment
Douglas County Economic Development Profile	Incorporated into Community Profile and Risk and Vulnerability Assessment
Douglas County Growth and Development Profile for 2012 and 2013	Incorporated into Community Profile and Risk and Vulnerability Assessment
Douglas County Comprehensive Plan 2014	Informed Risk and Vulnerability Assessment and goals update in Chapter 5
Castle Rock Comprehensive Master Plan	Incorporated into Castle Rock Annex
Castle Pines Comprehensive Plan	Incorporated into Castle Pines Annex
Lone Tree Comprehensive Plan	Incorporated into Lone Tree Annex
Parker 2035: Changes and Choices Plan	Incorporated into Parker Annex

A key example of coordinating with other planning efforts is the coordination of this LHMP with stormwater master plans and community wildfire protection plans. This is critical for two important reasons. First, flooding and wildfire problems don't stop at corporate or jurisdictional boundaries and evaluating flood and wildfire problems on a regional basis provides a comprehensive approach to understanding and addressing identified flood and wildfire issues. Second, a successful mitigation strategy requires that these planning efforts be coordinated.

Other documents were reviewed and considered, as appropriate, during the collection of data to support Planning Steps 4 and 5, which include the hazard identification, vulnerability assessment, and capability assessment.

3.4.2 Phase 2: Assess Risks

Planning Steps 4 and 5: Identify the Hazards and Assess the Risks

AMEC led the HMPC in an exhaustive research effort to identify, document, and profile all the hazards that have, or could have, an impact the planning area. Data collection worksheets and jurisdictional annexes were developed and used in this effort to aid in determining hazards and vulnerabilities and where the risk varies across the planning area. Geographic information systems (GIS) were used to display, analyze, and quantify hazards and vulnerabilities. The HMPC also conducted a capability assessment to review and document the planning area's current capabilities to mitigate risk from and vulnerability to hazards. By collecting information about existing government programs, policies, regulations, ordinances, and emergency plans, the HMPC could assess those activities and measures already in place that contribute to mitigating some of the risks and vulnerabilities identified. A more detailed description of the risk assessment process, methodologies, and results are included in Chapter 4 Risk Assessment.

3.4.3 Phase 3: Develop the Mitigation Plan

Planning Steps 6 and 7: Set Goals and Review Possible Activities

AMEC facilitated brainstorming and discussion sessions with the HMPC that described the purpose and process of developing planning goals and objectives, a comprehensive range of mitigation alternatives, and a method of selecting and defending recommended mitigation actions using a series of selection criteria. This information is included in Chapter 5 Mitigation Strategy. Additional documentation on the process the HMPC used to develop the goals and strategy is in Appendix C.

Planning Step 8: Draft an Action Plan

Based on input from the HMPC regarding the draft risk assessment and the goals and activities identified in Planning Steps 6 and 7, AMEC produced a complete first draft of the plan. This complete draft was posted for HMPC review and comment on the project file transfer protocol (ftp) website. Other agencies were invited to comment on this draft as well. HMPC and agency comments were integrated into the second public review draft, which was advertised and distributed to collect public input and comments. AMEC integrated comments and issues from the public, as appropriate, along with additional internal review comments and produced a final draft for the DHSEM and FEMA Region VIII to review and approve, contingent upon final adoption by the governing boards of each participating jurisdiction.

3.4.4 Phase 4: Implement the Plan and Monitor Progress

Planning Step 9: Adopt the Plan

In order to secure buy-in and officially implement the plan, the plan was adopted by the governing boards of each participating jurisdiction using the sample resolution contained in Appendix A.

Planning Step 10: Implement, Evaluate, and Revise the Plan

The true worth of any mitigation plan is in the effectiveness of its implementation. Up to this point in the planning process, all of the HMPC's efforts have been directed at researching data, coordinating input from participating entities, and developing appropriate mitigation actions. Each recommended action includes key descriptors, such as a lead agency and possible funding sources, to help initiate implementation. An overall implementation strategy is described in Chapter 7 Plan Implementation and Maintenance.

Finally, there are numerous organizations within the Douglas County Planning Area whose goals and interests interface with hazard mitigation. Coordination with these other planning efforts, as addressed in Planning Step 3, is paramount to the ongoing success of this plan and mitigation in Douglas County and is addressed further in Chapter 7. A plan update and maintenance schedule and a strategy for continued public involvement are also included in Chapter 7.

Implementation and Maintenance Process: 2010

The 2010 Regional Plan included a process for implementation and maintenance which is excerpted below. This process as set forth in the 2010 Regional Plan was generally followed, with some variation. An updated implementation and maintenance chapter can be referenced in Chapter 7.

2010 Implementation & Maintenance Process

In order to track progress and update the Mitigation Strategies identified in the Action Plan, the County will revisit the Hazard Mitigation Plan annually. The 2010 Regional Plan should be evaluated prior to the five-year point following any significant disaster or after unexpected changes in land use or demographics in or near hazard areas. The plan should be evaluated on an annual basis to determine the effectiveness of programs, and to reflect changes in land development or programs that may affect mitigation priorities. This annual maintenance process should occur at the local government level. At the local level, the responsibility for plan monitoring and maintenance will be delegated differently in each community but will most often be the purview of the local office of emergency management. This office will be assisted by and consult with members of the planning and community development, utilities and public works, and public information departments.

The 2010 plan encouraged the incorporation of the requirements of the mitigation plan into other local government planning mechanisms such as comprehensive or capital improvement plans, when appropriate. The integration and incorporation of natural hazard risk assessment, hazard analysis and mitigation strategies into local emergency operations, recovery, land use and comprehensive plans is a key implementation strategy.

Reviews of the plan took place on an annual basis by the County and Town of Castle Rock, and the 2010 Regional Plan was integrated into other planning mechanisms in the County. The risk assessment portion of the 2010 Regional Plan was integrated into the other planning mechanisms listed in Table 3.6. The table lists the jurisdiction and what planning mechanism the 2010 Regional Plan was integrated into. In addition to plans the 2010 Regional Plan also provided a basis for increasing the County's wildland fire mitigation capabilities. A wildland fire coordinator position was created in 2014 and a wildland fire hand crew is being added in 2015 to assist with wildland fire hazard mitigation activities. This group will also assist with all-hazard response where needed.

Table 3.6. 2010 Mitigation Plan Inclusion in Other Planning Mechanisms

Jurisdiction	Planning Mechanism
Douglas County	Local Emergency Operations Plan – used to inform Hazard Vulnerability Assessment
	Recovery Plan – completed in 2015; Helped in formation of plan based on risk.
Town of Castle Rock	Covered by County Emergency Operations Plan noted above

4 RISK ASSESSMENT

Requirement §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.

As defined by the Federal Emergency Management Agency (FEMA), risk is a combination of hazard, vulnerability, and exposure. It is the impact that a hazard would have on people, services, facilities, and structures in a community and refers to the likelihood of a hazard event resulting in an adverse condition that causes injury or damage.

The risk assessment process identifies and profiles relevant hazards and assesses the exposure of lives, property, and infrastructure to these hazards. The process allows for a better understanding of a jurisdiction's potential risk to hazards and provides a framework for developing and prioritizing mitigation actions to reduce risk from future hazard events.

This risk assessment followed the methodology described in the FEMA publication *Understanding Your Risks—Identifying Hazards and Estimating Losses* (FEMA 386-2, 2002), which breaks the assessment down to a four-step process:

1) Identify Hazards;
2) Profile Hazard Events;
3) Inventory Assets; and
4) Estimate Losses.

Data collected through this process has been incorporated into the following sections of this chapter:

- **Section 4.1**: Hazard Identification identifies the natural and human-caused hazards that threaten the Planning Area and describes why some hazards have been omitted from further consideration.
- **Section 4.2**: Hazard Profiles discusses the threat to the Planning Area and describes previous occurrences of hazard events and the likelihood of future occurrences.
- **Section 4.3**: Vulnerability Assessment assesses the Planning Areas' exposure to hazards; considering assets at risk, critical facilities, and future development trends.
- **Section 4.4**: Capability Assessment inventories existing mitigation activities and policies, regulations, and plans that pertain to mitigation and can affect net vulnerability.

This risk assessment covers the entire geographical extent of the Douglas County Planning Area (Planning Area), including the incorporated communities and other participating jurisdictions. Since this plan is a multi-jurisdictional plan, the Hazard Mitigation Planning Committee (HMPC) is required to evaluate how the hazards and risks vary from jurisdiction to jurisdiction. While these differences are noted in this chapter, they are expanded upon in the annexes of the participating jurisdictions. If no additional data is provided in an annex, it should be assumed that the risk and

potential impacts to the affected jurisdiction are similar to those described here for the entire Douglas County Planning Area.

This Local Hazard Mitigation Plan (LHMP) update involved a comprehensive review and update of each section of the 2010 regional risk assessment in the Denver Regional Council of Governments Hazard Mitigation Plan. As part of the risk assessment update, new data was used, where available, and new analyses were conducted. Refinements, changes, and new methodologies used in the development of this risk assessment update are summarized in Chapter 3 Planning Process and detailed in this Risk Assessment portion of the plan.

4.1 Hazard Identification

Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the type…of all natural hazards that can affect the jurisdiction.

The Douglas County HMPC conducted a hazard identification study to determine the hazards that threaten the Planning Area. This section details the methodology and results of this effort.

4.1.1 Methodology and Results

Using existing hazards data and input gained through planning meetings, the HMPC agreed upon a list of hazards that could affect Douglas County. Hazards data from the Colorado Department of Homeland Security and Emergency Management (DHSEM), FEMA, the National Oceanic and Atmospheric Administration (NOAA), and many other sources were examined to assess the significance of these hazards to the Planning Area. Significance of each identified hazard was measured in general terms and focused on key criteria such as frequency and resulting damage, which includes deaths and injuries, as well as property and economic damage. The hazards evaluated as part of this plan include those that have occurred historically or have the potential to cause significant human and/or monetary losses in the future.

The following hazards in Table 4.1, listed alphabetically were identified and investigated for this plan update. As a starting point, the updated 2013 Colorado State Hazard Mitigation Plan was consulted to evaluate the applicability of new hazards of concern to the State to the Planning Area. Building upon this effort, hazards from the 2010 Denver Regional Council of Governments (DRCOG) hazard mitigation plan were also identified. Hazards in the DRCOG plan were initially identified in 2003 by surveying the Steering Committee. Survey recipients indicated which hazards were most applicable to their jurisdiction. According to the 2010 DRCOG plan, "[e]ach of the natural hazards identified by the Steering Committee in 2003 was again reviewed by the 2009 Steering Committee on August 5, 2009. Each of the hazards were reevaluated and new profiles were prepared for each hazard by county that identified the estimated frequency and severity and then added an overall significance rating for each hazard" (pg. 25-26).

All hazards from the 2010 DRCOG plan were profiled in this plan, with the exception of pandemic flu/West Nile Virus. Pandemic flu and West Nile Virus were not profiled in this plan because these

hazards are discussed in other planning mechanisms such as the Douglas County Emergency Preparedness and Prevention Guide (2011) and the Tri-County Health Department's Public Health Annex. Localized stormwater was added as a new hazard in 2015 to Section 4.2.13 Flood: 100/500-year and Localized Flooding. The affects, locations, and management of stormwater flooding in Douglas County differ somewhat from 100/500-year flooding, so localized flooding merits its own discussion within the larger flood hazard profile. Erosion and deposition, expansive soils, and hazardous materials were also added as new hazards in 2015; the HMPC felt that these hazards were significant enough to the Planning Area to warrant inclusion in the hazard mitigation plan update. The Comment column in Table 4.1 explains how hazards were updated from the previous plan.

Table 4.1. Hazard Identification and Comparison

2015 Hazards	2010 Hazards	Comment
Avalanche	Avalanche	Similar analysis performed.
Drought	Drought	
Earthquake	Earthquake	
Flood: Dam Failure	Flood	
Flood: 100/500 year	Flood	
Flood: Localized/ Stormwater	–	New hazard, profiled in 100/500 year flood section.
Landslides/ Mud & Debris Flows /Rockfalls	Landslide	
Severe Weather: Extreme Heat	Heat Wave	
Severe Weather: Hail	Severe Storm/Wind	This was broken out as a separate hazard in the Plan update.
Severe Weather: High Winds	Severe Storm: Wind	This was broken out as a separate hazard in the Plan update.
Severe Weather: Lightning	Thunderstorm (lightning)	
Severe Weather: Thunderstorms/Heavy Rains	Severe Storm: Wind	This was broken out as a separate hazard in the Plan update.
Severe Weather: Tornado	Tornado	
Severe Weather: Winter Weather (includes snow/ice/extreme cold)	Winter Storm/Freezing	
Soil Hazards: Erosion & Deposition	–	New hazard.
Soil Hazards: Expansive Soils	–	New hazard.
Soil Hazards: Subsidence	Land Subsidence	
Wildfire	Wildland Fire	
Hazardous Materials: Transportation Incidents	–	New hazard.
	Pandemic Flu/West Nile Virus	Not profiled in this plan.

The worksheet below was completed by the HMPC to identify, profile, and rate the significance of identified hazards. Only the more significant (or priority) hazards have a more detailed hazard profile and are analyzed further in Section 4.3 Vulnerability Assessment. Table 4.35 through Table

4.40 in Section 4.2.20 Hazards Summary give more detail about these significant hazards.

Table 4.2. Douglas County Hazard Identification Worksheet

Hazard	Spatial Extent	Likelihood of Future Occurrences	Magnitude/Severity	Significance
Avalanche	Limited	Low	Low	Low
Drought	Significant	Medium	Medium	Medium
Earthquake	Significant	Low	Low	Low
Flood: Dam Failure	Limited	Low	Medium	Medium
Flood: 100/500 year	Significant	Low	Medium	Medium
Flood: Localized/ Stormwater	Significant	Medium	Low	Medium
Landslides/ Mud & Debris Flows /Rockfalls	Limited	High	Low	Medium
Severe Weather: Extreme Heat	Extensive	High	Low	Low
Severe Weather: Hail	Significant	High	Low	Low
Severe Weather: High Winds	Significant	High	Low	Low
Severe Weather: Lightning	Significant	High	Medium	Low
Severe Weather: Thunderstorms/Heavy Rains	Extensive	High	Medium	Medium
Severe Weather: Tornado	Limited	High	Low	Low
Severe Weather: Winter Weather (includes snow/ice/extreme cold)	Extensive	High	Low	Medium
Soil Hazards: Erosion & Deposition	Limited	High	Low	Medium
Soil Hazards: Expansive Soils	Limited	High	Low	Low
Soil Hazards: Subsidence	Limited	Medium	Low	Low
Wildfire	Extensive	High	High	High
Hazardous Materials: Transportation Incidents	Significant	Medium	High	High

Spatial Extent
Limited: Less than 10% of Planning Area
Significant: 10-50% of Planning Area
Extensive: 50-100% of Planning Area

Likelihood of Future Occurrences
Low: Occurs less than once every 10 years or more
Medium: Occurs less than once every 5 to 10 years
High: Occurs once every year or up to once every five years

Magnitude/Severity
Low: Negligible property damages (less than 5% of all buildings and infrastructure) Negligible loss of quality of life. Local emergency response capability is sufficient to manage the hazard.
Medium: Moderate property damages (15% to 50% of all buildings and infrastructure) Some loss of quality of life. Emergency response capability, economic and geographic effects of the hazard are of sufficient magnitude to involve one or more counties.
High: Property damages to greater than 50% of all buildings and infrastructure. Significant loss of quality of life, emergency response capability; economic and geographic effects of the hazard are of sufficient magnitude to require federal assistance.

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

Source: Amec Foster Wheeler Data Collection Guide, Douglas County

4.1.2 Disaster Declaration History

One method to identify hazards based upon past occurrence is to look at what events triggered federal and/or state disaster declarations within the Planning Area. Disaster declarations are granted when the severity and magnitude of the event's impact surpass the ability of the local government to respond and recover. Disaster assistance is supplemental and sequential. When the local government's capacity has been surpassed, a state disaster declaration may be issued, allowing for the provision of state assistance. Should the disaster be so severe that both the local and state government's capacity is exceeded, a federal disaster declaration may be issued allowing for the provision of federal disaster assistance.

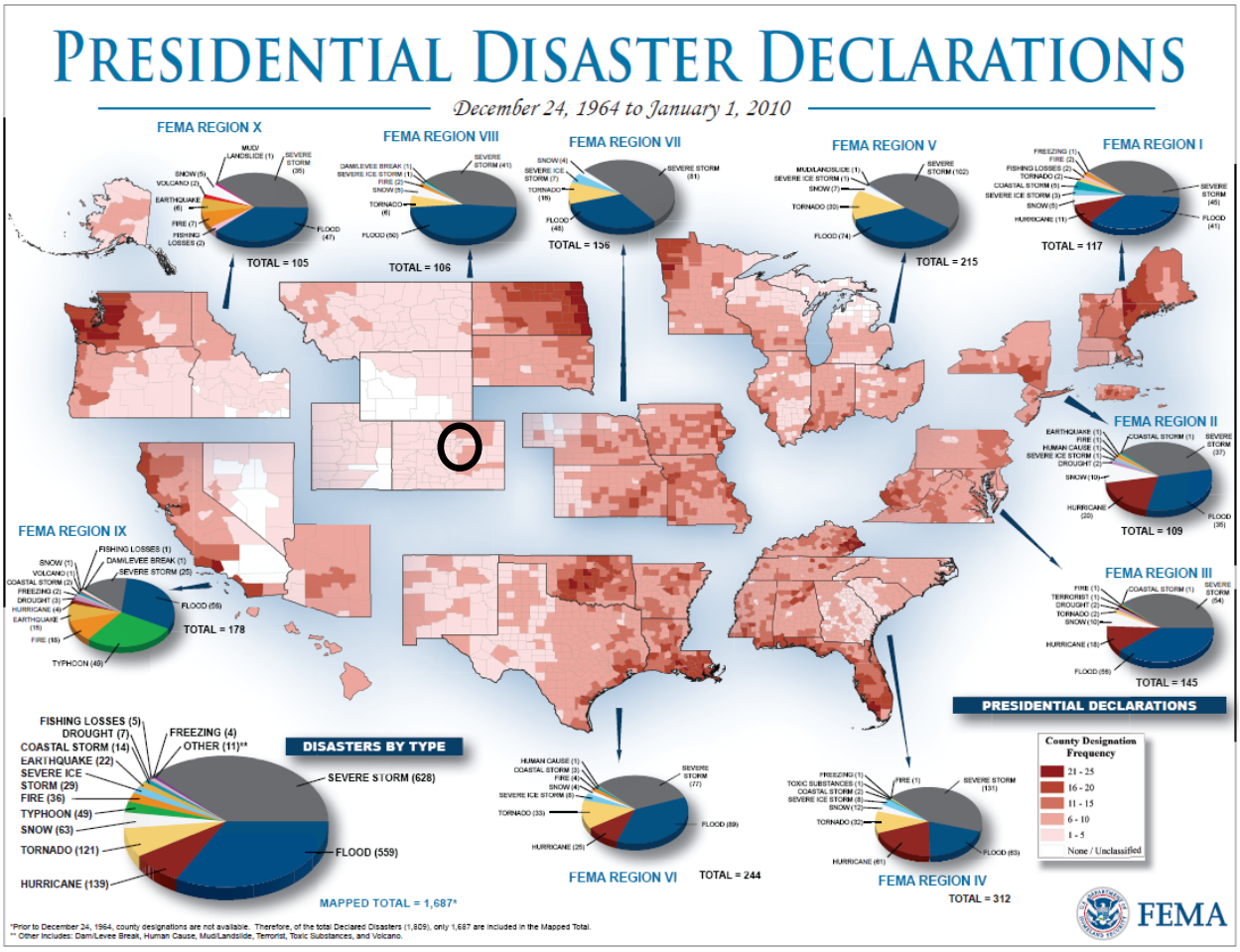
Generally, the federal government issues disaster declarations through FEMA. However, federal assistance may also come from the U.S. Department of Agriculture (USDA) and the Small Business Administration (SBA), and other government agencies such as the Fire Management Assistance Grant Program. FEMA also issues emergency declarations, which are more limited in scope and without the long-term federal recovery programs of major disaster declarations. The quantity and types of damage are the determining factors.

A USDA declaration will result in the implementation of the Emergency Loan Program through the Farm Services Agency. This program enables eligible farmers and ranchers in the affected counties as well as contiguous counties to apply for low interest loans. A USDA declaration will automatically follow a major disaster declaration for counties designated major disaster areas and those that are contiguous to declared counties, including those that are across state lines. As part of an agreement with the USDA, the SBA offers low interest loans for eligible businesses that suffer economic losses in declared and contiguous counties that have been declared by the USDA. These loans are referred to as Economic Injury Disaster Loans.

The Fire Management Assistance Grant Program provides funding "for the mitigation, management, and control of fires on publicly or privately owned forests or grasslands, which threaten such destruction as would constitute a major disaster." The quantity and types of damages, as well as the type of event, determine the source of federal aid.

Figure 4.1, from the FEMA website, displays the number of Presidential (FEMA) Disaster Declarations from 1964 to 2010 by FEMA Region. Colorado is located in Region VIII. This map indicates that Douglas County falls in the 6-10 disaster declaration category.

Figure 4.1. Presidential Disaster Declarations, December 24, 1964 – January 1, 2010



Douglas County has experienced 20 federal and 10 state declarations since 1950. There have been 12 USDA Secretarial Disaster Designations in Douglas County (whether as a primary or contiguous county) related to agricultural losses from natural hazards. A summation of federal and state disaster declarations is shown in Table 4.3.

Table 4.3. Douglas County Federal and State Disaster Declaration History

Hazard Type	Disaster #*	Year	State Declaration	Federal Declaration
Drought	USDA S-3627 (Contiguous)	2014		Y
Drought	USDA S-3548 (Contiguous)	2013		Y
Drought	USDA S--3456 (Primary)	2013		Y
Severe storms, flooding, landslides, mudslides	DR-4145	2013	Y	Y
Severe storms, flooding, landslides, mudslides	DR-4145, Amendment 2	2013	Y	Y
Wildfires	DR-4134	2013	Y	Y

Hazard Type	Disaster #*	Year	State Declaration	Federal Declaration
Drought	USDA S-3260 (Primary)	2012		Y
Wildfires	DR-4067	2012	Y	Y
Drought	USDA S-2750 (Primary)	2009		Y
Snowstorm, blizzard	USDA N-870 (Contiguous)	2007		Y
Drought, fire, high winds, heat	USDA S-2327 (Primary)	2006		Y
Drought, wind, heavy rain, hail	USDA S-2188 (Contiguous)	2006		Y
Flooding	N/A	2006	Y	
Drought	USDA S-1797 (Contiguous)	2003		Y
Snow	DR -3185	2003	Y	Y
Drought	USDA S-1643 (Primary)	2002	Y	Y
Wildfires	DR-1421	2002	Y	Y
Severe Weather	USDA S-1552 (Contiguous)	2001		Y
Severe storms, flooding	DR-1276	1999	Y	Y
Severe snow storm	USDA S-1187 (Contiguous)	1998		Y
Wildfire	FM-2099	1994	Y	Y

Source: Colorado DHSEM, USDA, FEMA

*USDA Disasters are given for the primary county(ies), and for the contiguous counties bordering any primary county.

4.2 Hazard Profiles

Requirement §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.

The hazards identified in Section 4.1 Hazard Identification Natural Hazards, are profiled individually in this section. In general, information provided by planning team members is integrated into this section with information from other data sources. These profiles set the stage for Section 4.3 Vulnerability Assessment, where the vulnerability is quantified for each of the priority hazards.

Each hazard is profiled in the following format:

- **Hazard/Problem Description**—This section gives a description of the hazard and associated issues followed by details on the hazard specific to the Douglas County Planning Area. Where known, this includes information on the hazard extent, seasonal patterns, speed of onset/duration, and magnitude and/or any secondary effects.

- **Past Occurrences**—This section contains information on historical incidents, including impacts where known. The extent or location of the hazard within or near the Douglas County Planning Area is also included here. Available hazard data and historical incident worksheets were used to capture information from participating jurisdictions on past occurrences.

- **Frequency/Likelihood of Future Occurrence**—The frequency of past events is used in this section to gauge the likelihood of future occurrences. Where possible, frequency was calculated based on existing data. It was determined by dividing the number of events observed by the number of years on record and multiplying by 100. This gives the percent chance of the event happening in any given year (e.g., three droughts over a 30-year period equates to a 10% chance of a experiencing a drought in any given year). The likelihood of future occurrences is categorized into one of the following classifications:

  - **High**—Occurs once every year or up to once every five years
  - **Medium**—Occurs less than once every 5 to 10 years
  - **Low**—Occurs less often than once every 10 years or more

Section 4.2.20 Hazards Summary provides an initial assessment of the profiles and assigns a level of significance or priority to each hazard. Those hazards determined to be of medium or high significance were characterized as priority hazards that required further evaluation in Section 4.3 Vulnerability Assessment. Those hazards that occur infrequently or have little or no impact on the Planning Area were determined to be of low significance and not considered a priority hazard. Significance was determined based on the hazard profile and risk assessment, focusing on key criteria such as frequency and resulting damage, including deaths/injuries and property, crop, and economic

damage. This assessment was used by the HMPC to prioritize those hazards of greatest significance to the Planning Area, enabling the County to focus resources where they are most needed.

The following sections provide profiles of the hazards that the HMPC identified in Section 4.1 Hazard Identification. Given that most disasters that affect the Planning Area are directly or indirectly related to severe weather events, severe weather hazards begin this section, with the individual hazard profiles following alphabetically.

4.2.1 Severe Weather: General

Severe weather is generally any destructive weather event, but usually occurs in the Douglas County Planning Area as localized storms that bring heavy rain, hail, lightning, and strong winds.

The National Oceanic and Atmospheric Administration's National Climatic Data Center (NCDC) has been tracking severe weather since 1950. Their Storm Events Database contains data on the following: all weather events from 1993 to current (except from 6/1993-7/1993); and additional data from the Storm Prediction Center, which includes tornadoes (1950-1992), thunderstorm winds (1955-1992), and hail (1955-1992). This database contains 926 severe weather events that occurred in Douglas County between January 1, 1950, and March 31, 2014. Table 4.4 summarizes these events.

Table 4.4. NCDC Severe Weather Reports for Douglas County 1950 – March 31, 2014*

Type	# of Events	Deaths	Injuries	Property Damage	Crop Damage
Blizzard	17	0	2	$34,100,000	$0
Cold/Wind Chill	2	4	15	$0	$0
Drought	9	0	0	$0	$0
Extreme Cold/Wind Chill	1	0	0	$0	$0
Flash Flood	38	0	0	$13,498,000	$125,000
Flood	2	0	0	$0	$0
Funnel Cloud	1	0	0	$0	$0
Hail	247	0	0	$30,000,000	$0
Heat	5	0	0	$0	$0
Heavy Rain	3	0	0	$5,000	$0
Heavy Snow	139	0	0	$0	$0
High Wind	161	0	16	$44,010,000	$5,000
Lightning	21	0	7	$2,725,000	$0
Strong Wind	2	0	0	$11,000	$0
Thunderstorm Winds	29	0	0	$15,500	$0
Tornado	59	0	6	$991,150	$0
Wildfire	2	3	0	$22,000,000	$0
Winter Storm	144	0	0	$15,500,000	$0
Winter Weather	44	0	0	$0	$0
Total	**926**	**7**	**46**	**$162,855,650**	**$130,000**

Source: NCDC
*Note: Losses reflect totals for all impacted areas

The HMPC supplemented NCDC data with data from SHELDUS (Spatial Hazard Events and Losses Database for the United States). SHELDUS is a county-level data set for the United States that tracks 18 types of natural hazard events along with associated property and crop losses, injuries, and fatalities for the period 1960-2012. Produced by the Hazards Research Lab at the University of South Carolina, this database combines information from several sources (including the NCDC). The database includes every loss causing and/or deadly event between 1960 through 1979 and from 1995 onward. Between 1980 and 1995, SHELDUS reflects only events that caused at least one fatality or more than $50,000 in property or crop damages. For events that covered multiple counties, the dollar losses, deaths, and injuries were equally divided among the affected counties (e.g., if four counties were affected, then a quarter of the dollar losses, injuries, and deaths were attributed to each county). Because these numbers are averaged, the data from SHELDUS may differ from that of NCDC. From 1995 to 2008 all events that were reported by the NCDC with a specific dollar amount are included in SHELDUS.

SHELDUS contains information of 284 severe weather events that occurred in Douglas County between 1960 and 2011. These events are shown and summarized in Table 4.5.

Table 4.5. SHELDUS Severe Weather Report for Douglas County 1960-2012

Type	# of Events	Deaths	Injuries	Property Damage	Crop Damage
Drought	1	0	0	$0	$1,746,759
Flooding/ Severe Storm/Thunder Storm/ Winter Weather	1	0	0	$2,510	$0
Hail	12	0	4.44	$128,824,051	$8,227
Hail/ Lightning/ Severe Storm/Thunder Storm	1	0	0	$10,669	$0
Hail/ Lightning/ Wind	1	0	0	$11,998	$119,980
Hail/ Severe Storm/Thunder Storm	9	0	0	$510,397	$65,672
Hail/ Severe Storm/Thunder Storm/ Wind	2	0	0	$568,259	$147,739
Hail/ Severe Storm/Thunder Storm/ Winter Weather	2	0	0	$15,097	$330
Lightning	34	4	13.1	$3,535,370	$0
Lightning/ Severe Storm/Thunder Storm/ Wind	1	0	0	$292,775	$0
Severe Storm/Thunder Storm	26	1.41	0.73	$3,968,325	$2,561,380
Severe Storm/Thunder Storm/ Winter Weather	8	1	2	$224,127	$3,456
Severe Storm/Thunder Storm/ Winter Weather	5	0	0	$66,365	$0
Tornado	19	0	9	$907,254	$0
Wind	98	1	2.36	$5,205,799	$81,481

Type	# of Events	Deaths	Injuries	Property Damage	Crop Damage
Wind/ Winter Weather	17	0.18	0.03	$467,617	$53,976
Winter Weather	47	3.01	3.7	$14,224,046	$239,766
Total	**284**	**10.6**	**35.36**	**$158,834,658**	**$5,028,768**

Source: SHELDUS

*Events may have occurred over multiple counties, so damage may represent only a fraction of the total event damage and may be not specific to Douglas County

The NCDC and SHELDUS tables above summarize severe weather events that occurred in Douglas County. Only a few of the events actually resulted in state and federal disaster declarations. It is further interesting to note that different data sources capture different events during the same time period, and often display different information specific to the same events. While the HMPC recognizes these inconsistencies, they see the value this data provides in depicting the County's big picture hazard environment.

As previously mentioned, most all of Douglas County's state and federal disaster declarations have been a result of severe weather. For this plan, severe weather is further discussed in the following subsections:

- Extreme Heat
- Hail
- High Winds
- Lightning
- Thunderstorms/Heavy Rains
- Tornado
- Winter Weather (includes snow/ice/extreme cold)

4.2.2 Severe Weather: Extreme Heat

Hazard/Problem Description

According to information provided by FEMA, extreme heat is defined as temperatures that hover 10°F or more above the average high temperature for the region and last for several weeks. Heat kills by taxing the human body beyond its abilities. In a normal year, about 175 Americans succumb to the demands of summer heat. According to the National Weather Service (NWS), among natural hazards, only the cold of winter—not lightning, hurricanes, tornados, floods, or earthquakes—takes a greater toll. In the 40-year period from 1936 through 1975, nearly 20,000 people were killed in the United States by the effects of heat and solar radiation. In the heat wave of 1980, more than 1,250 people died.

Heat disorders generally have to do with a reduction or collapse of the body's ability to shed heat by circulatory changes and sweating or a chemical (salt) imbalance caused by too much sweating. When heat gain exceeds the level the body can remove, or when the body cannot compensate for fluids and salt lost through perspiration, the temperature of the body's inner core begins to rise and heat-related

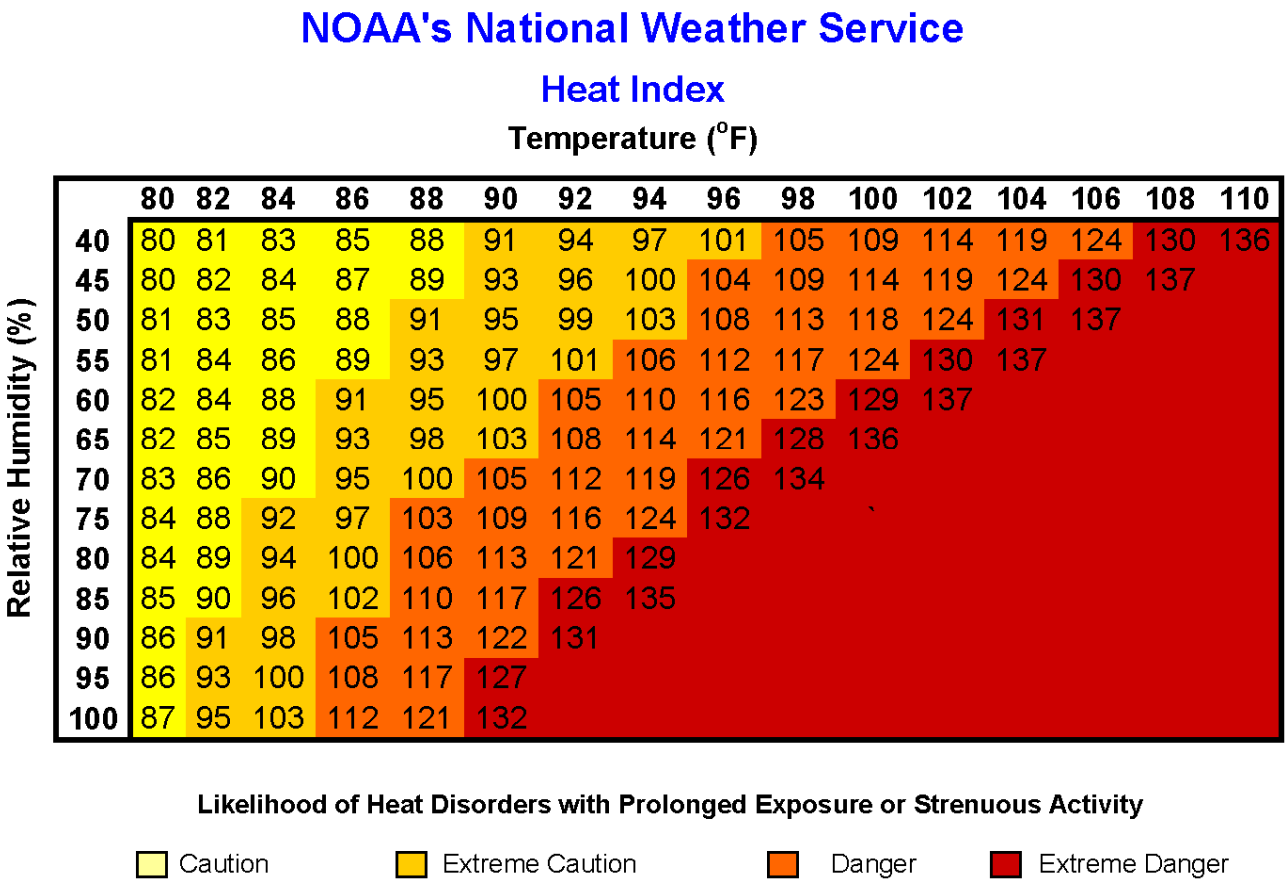
illness may develop. Elderly persons, small children, people with chronic illnesses, those on certain medications or drugs, and persons with weight and alcohol problems are particularly susceptible to heat reactions, especially during heat waves in areas where moderate climate usually prevails.

Heat emergencies are often slower to develop, taking several days of continuous, oppressive heat before a significant or quantifiable impact is seen. Heat waves do not strike victims immediately, but rather their cumulative effects slowly take the lives of vulnerable populations. Heat waves do not cause damage or elicit the immediate response of floods, fires, earthquakes, or other more "typical" disaster scenarios. While heat waves are obviously less dramatic, they are potentially more deadly.

Figure 4.2 and Figure 4.3 show the Heat Index (HI) as a function of heat and relative humidity. The Heat Index describes how hot the heat-humidity combination makes it feel. As relative humidity increases, the air seems warmer than it actually is because the body is less able to cool itself via evaporation of perspiration. As the HI rises, so do health risks.

- When the HI is 90°F, heat exhaustion is possible with prolonged exposure and/or physical activity.
- When it is 90°-105°F, heat exhaustion is probable with the possibility of sunstroke or heat cramps with prolonged exposure and/or physical activity.
- When it is 105°-129°F, sunstroke, heat cramps or heat exhaustion is likely, and heatstroke is possible with prolonged exposure and/or physical activity.
- When it is 130°F and higher, heatstroke and sunstroke are extremely likely with continued exposure. Physical activity and prolonged exposure to the heat increase the risks.

Figure 4.2. Heat Index



Source: National Weather Service
Note: Since HI values were devised for shady, light wind conditions, exposure to full sunshine can increase HI values by up to 15°F. Also, strong winds, particularly with very hot, dry air, can be extremely hazardous.

Figure 4.3. Possible Heat Disorders by Heat Index Level

Heat Index	Category	Possible heat disorders for people in high risk groups
130°F or higher	Extreme Danger	Heatstroke risk extremely high with continued exposure.
105° - 129°F	Danger	Sunstroke, Heat Cramps and Heat Exhaustion likely, Heatstroke possible with prolonged exposure and/or physical activity.
90° - 105°F	*Extreme Caution*	*Sunstroke, Heat Cramps and Heat Exhaustion possible with prolonged exposure and or physical activity.*
80° - 90 °F	Caution	Fatigue possible with prolonged exposure and/or physical activity.

Source: National Weather Service

The NWS has in place a system to initiate alert procedures (advisories or warnings) when the Heat Index is expected to have a significant impact on public safety. The expected severity of the heat determines whether advisories or warnings are issued. A common guideline for the issuance of

excessive heat alerts is when the maximum daytime high is expected to equal or exceed 105°F and a nighttime minimum high of 80°F or above is expected for two or more consecutive days. The NWS office in Denver can issue the following heat-related advisory as conditions warrant.

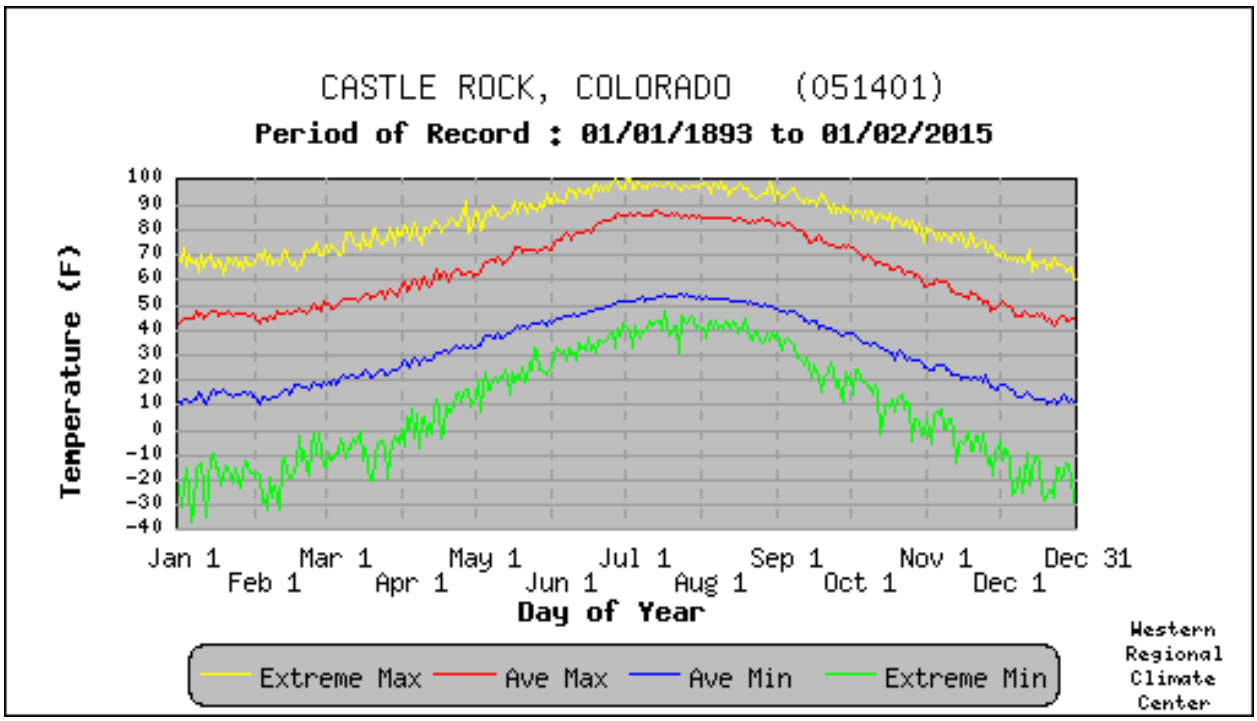
- **Excessive Heat Outlook**: issued when the potential exists for an excessive heat event in the next 3-7 days. An Outlook provides information to Heat Index forecast map for the contiguous United States for those who need considerable lead time to prepare for the event, such as public utilities, emergency management and public health officials.
- **Excessive Heat Watch**: issued when conditions are favorable for an excessive heat event in the next 12 to 48 hours. A Watch is used when the risk of a heat wave has increased, but its occurrence and timing is still uncertain. A Watch provides enough lead time so those who need to prepare can do so, such as cities that have excessive heat event mitigation plans.
- **Excessive Heat Warning/Advisory:** issued when an excessive heat event is expected in the next 36 hours. These products are issued when an excessive heat event is occurring, is imminent, or has a very high probability of occurring. The warning is used for conditions posing a threat to life or property. An advisory is for less serious conditions that cause significant discomfort or inconvenience and, if caution is not taken, could lead to a threat to life and/or property.

The County experiences temperatures in excess of 100°F during the summer and fall months. The temperature moves to 105°F in rather extreme situations (see Figure 4.4). Many months see a high number of days where daily high temperatures exceed 90°F (see Table 4.6). Generally, people who live and work in this weather are prepared to cope with the extremes in that they dress appropriately and stay in air conditioned buildings during the peak temperature periods of the day. Information from the Castle Rock weather station is summarized below.

Castle Rock Station - Period of Record 1/1/1893 to 3/27/2013

In Douglas County, monthly average maximum temperatures in the warmest months (June through September) range from the upper 70's to the upper 80's. Monthly average minimum temperatures from October through May range from the low 10's to the low 40's. The highest recorded daily extreme in Douglas County is 100°F on June 27, 2012. Average and high temperatures are shown in Figure 4.4. Details of monthly high temps are shown in Table 4.6.

Figure 4.4. Castle Rock Station Extreme Temperatures 1893 to 2013



Source: Western Regional Climate Center

Table 4.6. Record High Temperatures – Castle Rock Station

Month	Temperature	Date	Month	Temperature	Date
January	73°	1/17/2009	July	100°	7/23/2006
February	75°	2/04/2009	August	99°	8/5/1998
March	80°	3/30/2004	September	96°	9/4/1998
April	91°	4/28/2004	October	91°	10/1/2001
May	94°	5/17/2008	November	80°	11/6/2010
June	100°	6/16/2012	December	72°	12/7/2000

Source: Western Regional Climate Center

Past Occurrences

The NCDC data shows five extreme heat incidents for Douglas County from 1996. This is shown in Table 4.7. SHELDUS data shows no extreme heat incidents for Douglas County since 1960.

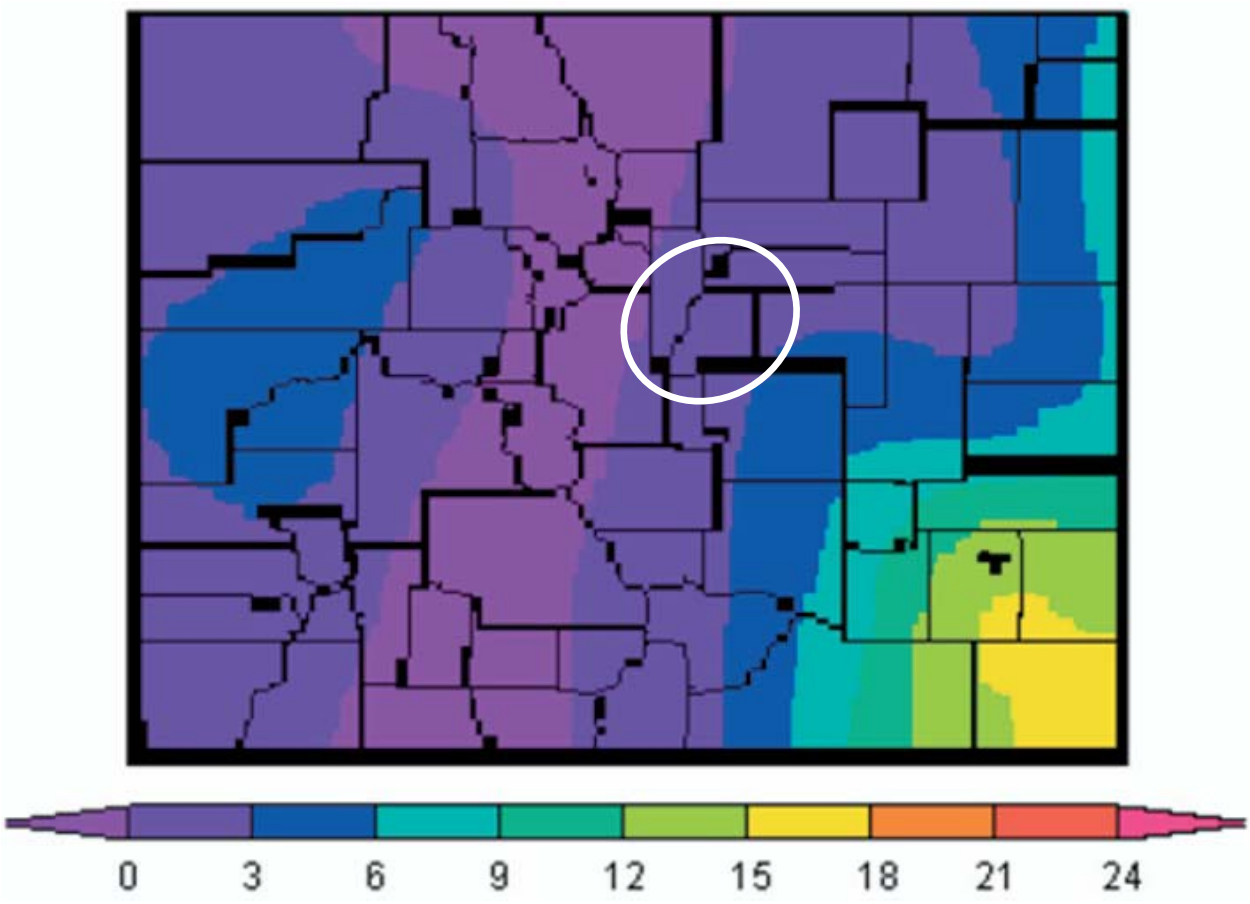
Table 4.7. NCDC Heat Events in Douglas County 1996 to 3/31/2014

Location	Date	Type	Deaths	Injuries	Property Damage	Crop Damage
North Douglas County Below 6,000 feet	6/1/2012	Heat	0	0	$0	$0
Denver Metropolitan Area	6/29/2000	Heat	0	0	$0	$0
Denver Metropolitan Area	7/1/2000	Heat	0	0	$0	$0
Denver Metropolitan Area	9/16/2000	Heat	0	0	$0	$0
Denver Metropolitan Area	9/17/2000	Heat	0	0	$0	$0
Total			**0**	**0**	**$0**	**$0**

Source: NCDC

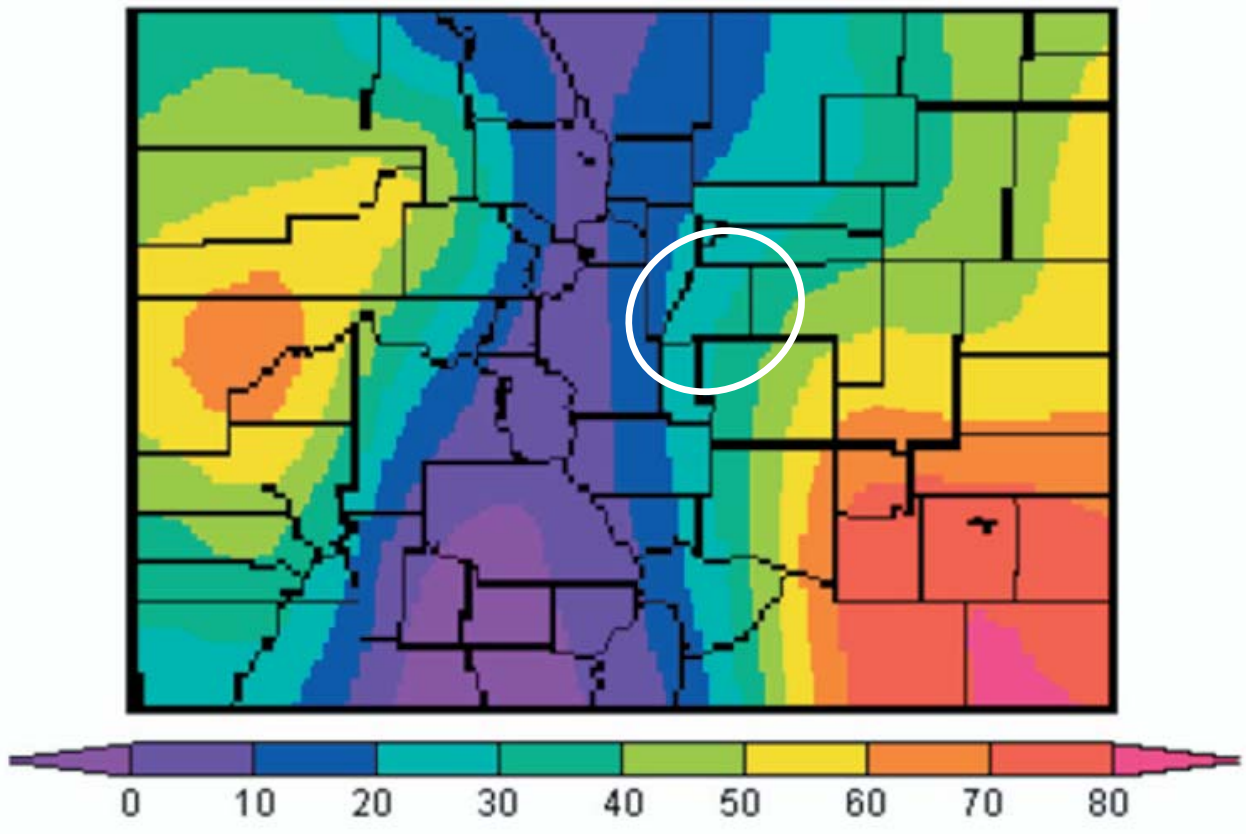
The 2013 State Hazard Mitigation Plan contains two maps, shown here as Figure 4.5 and Figure 4.6, that show average numbers of days per year exceeding 90° and 100°F. According to these maps, Douglas County often exceeds 90°F but rarely exceeds 100°F.

Figure 4.5. Number of Days with Temperatures Exceeding 100°F in the Planning Area



Source: 2013 Colorado State Hazard Mitigation Plan

Figure 4.6. Number of Days with Temperatures Exceeding 90°F in the Planning Area



Source: 2013 Colorado State Hazard Mitigation Plan

Likelihood of Future Occurrences

High—Five excessive heat events occurred in Douglas County over 18 years (1996-2014) of record keeping which equates to one event every 3.6 years, on average, and a 27.8% chance of excessive heat occurring in any given year. However, as shown in Figure 4.4 and Table 4.6, high temperatures will continue to occur in the Planning Area on an annual basis; thus the likelihood of future occurrence is highly likely.

4.2.3 Severe Weather: Hail

Hazard/Problem Description

Hail is formed when water droplets freeze and thaw as they are thrown high into the upper atmosphere by the violent internal forces of thunderstorms. Hail is sometimes associated with severe storms within the Douglas County Planning Area. Hailstones are usually less than 2" in diameter and can fall at speeds of 120 miles per hour (mph). Severe hailstorms can be quite destructive, causing damage to roofs, buildings, automobiles, vegetation, and crops.

The National Weather Service classifies hail by diameter size, and corresponding everyday objects to

help relay scope and severity to the population. Table 4.8 indicates the hailstone measurements utilized by the National Weather Service.

Table 4.8. Hailstone Measurements

Average Diameter (inches)	Corresponding Household Object
0.25	Pea
0.5	Marble/Mothball
0.75	Dime/Penny
0.875	Nickel
1.0	Quarter
1.5	Ping-pong ball
1.75	Golf-Ball
2.0	Hen Egg
2.5	Tennis Ball
2.75	Baseball
3.00	Teacup
4.00	Grapefruit
4.5	Softball
4.75	Computer CD/DVD

Source: National Weather Service

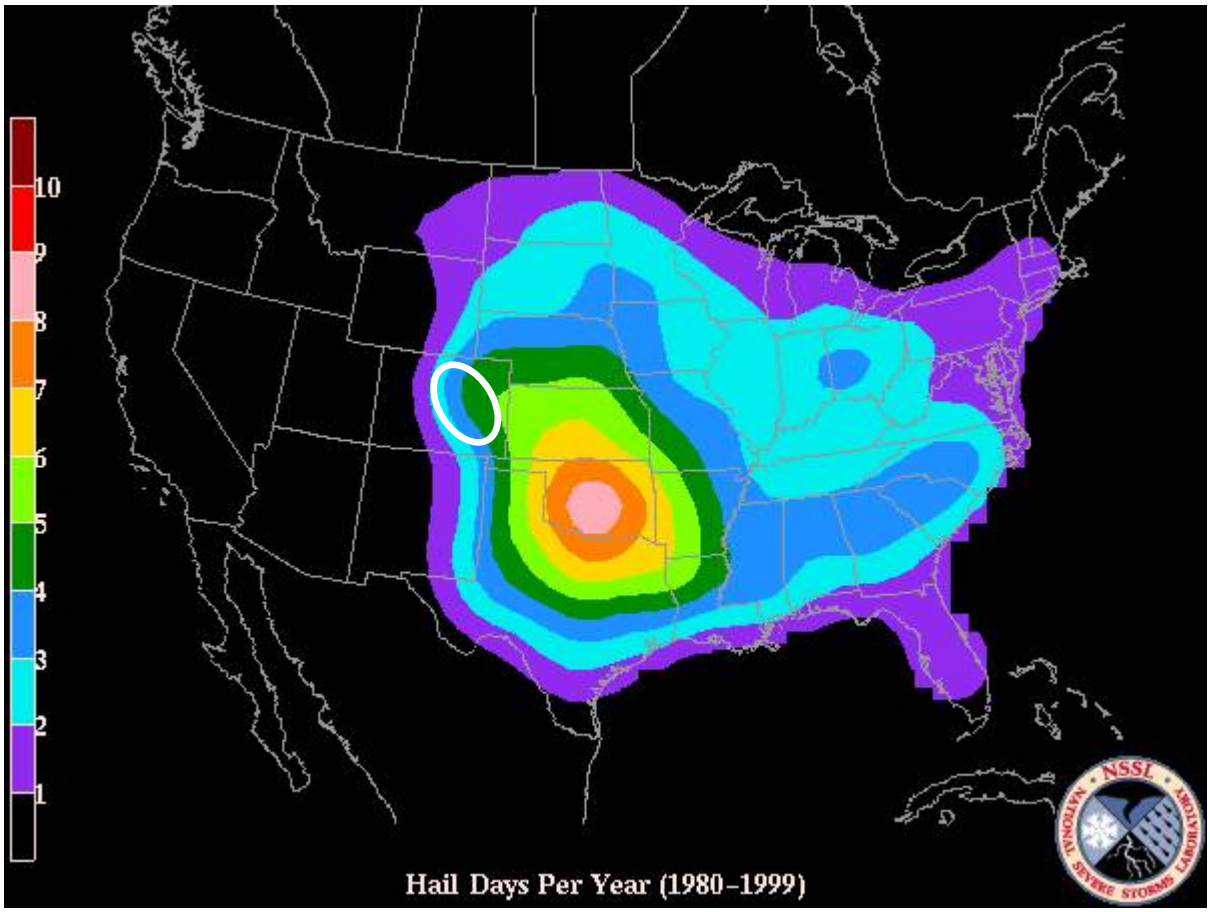
There is no clear distinction between storms that do and do not produce hailstones. Nearly all severe thunderstorms probably produce hail aloft, though it may melt before reaching the ground. Multi-cell thunderstorms produce many hailstones, but not usually the largest hailstones. In the life cycle of the multi-cell thunderstorm, the mature stage is relatively short so there is not much time for growth of the hailstone. Supercell thunderstorms have sustained updrafts that support large hail formation by repeatedly lifting the hailstones into the very cold air at the top of the thunderstorm cloud. In general, hail 2" (5 cm) or larger in diameter is associated with supercells (a little larger than golf ball size which the NWS considers to be 1.75"). Non-supercell storms are capable of producing golf ball size hail.

In all cases, the hail falls when the thunderstorm's updraft can no longer support the weight of the ice. The stronger the updraft the larger the hailstone can grow. Nebraska, Colorado, and Wyoming usually have the most hail storms in the United States. The area where these three states meet – "hail alley," averages seven to nine hail days per year. The reason why this area gets so much hail is that the freezing levels (the area of the atmosphere at 32°F or less) in the high plains are much closer to the ground than they are at sea level, where hail has plenty of time to melt before reaching the ground.

When viewed from the air, it is evident that hail falls in paths known as hail swaths. They can range in size from a few acres to an area 10 miles wide and 100 miles long. Piles of hail in hail swaths

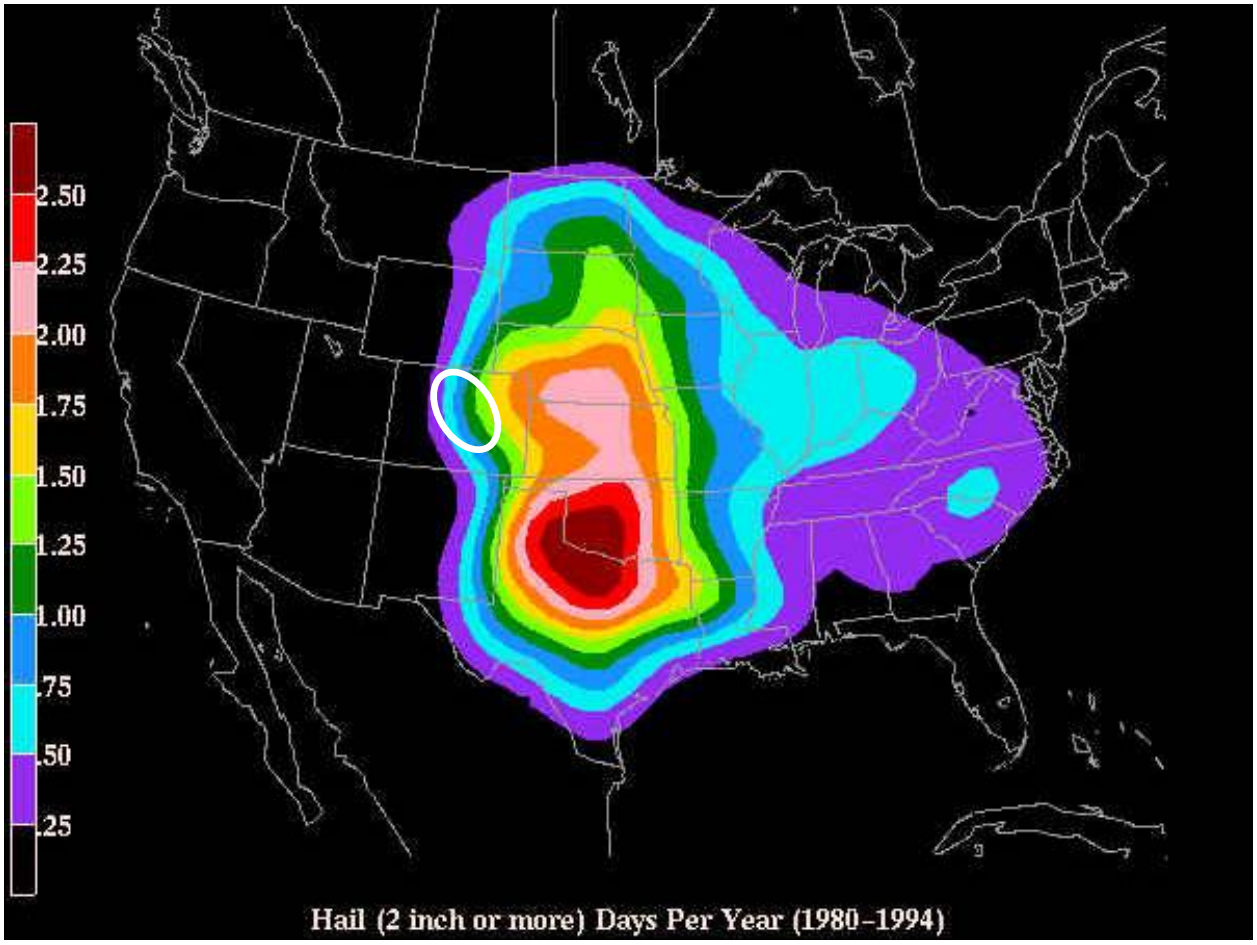
have been so deep, a snow plow was required to remove them, and occasionally, hail drifts have been reported. Figure 4.7 shows the average number of days of hail per year in the United States, with the Planning Area outlined in a white oval. Figure 4.8 shows the average number of days of severe hail (over 2" in diameter) per year in the United States, with the Planning Area outlined in a white oval.

Figure 4.7. Average Number of Days of Hail per Year



Source: NOAA National Severe Weather Laboratory

Figure 4.8. Average Days of Large Hail in the Planning Area



Source: NOAA National Severe Weather Laboratory

Past Occurrences

There were 247 reported hail occurrences for Douglas County, as recorded in the NCDC database. Because hailstorms are so frequent, and the majority of hailstorms cause negligible damage, the search parameters were limited to hail events producing hailstones at least 2" in diameter. Results of these limited search parameters are found in Table 4.9.

Table 4.9. Hail Occurrences Greater than 2" in Douglas County: 1955-March 31, 2014

Location	Date	Hail Size	Property Damage	Crop Damage
Douglas County	6/19/1977	2.75"	$0	$0
Douglas County	6/13/1988	2.00"	$0	$0
Douglas County	6/21/1991	2.00"	$0	$0
Douglas County	6/19/1992	2.00"	$0	$0
Douglas County	6/19/1992	2.00"	$0	$0
Parker	7/10/2002	3.00"	$0	$0

Location	Date	Hail Size	Property Damage	Crop Damage
Sedalia	8/18/2003	2.75”	$0	$0
Castle Rock	8/10/2004	3.00”	$0	$0
Larkspur	8/15/2007	2.00”	$0	$0
Greenland	6/11/2010	2.00”	$0	$0
Castle Rock	6/11/2010	2.00”	$0	$0
Total			$0	$0

Source: National Climatic Data Center

The SHELDUS database aggregates hazard by type. Hail events in Douglas County in the SHELDUS database are shown in Table 4.10.

Table 4.10. SHELDUS Hail Events by Type – 1960-2012

Hazard	Crop Damage	Property Damage	Injuries	Fatalities	Records
Hail	$1,106	$74,045,147	4.44	0	12
Hail/ Lightning/ Severe Storm/Thunder Storm	$0	$5,000	0	0	1
Hail/ Lightning/ Wind	$15,625	$1,563	0	0	1
Hail/ Severe Storm/Thunder Storm	$9,017	$70,387	0	0	9
Hail/ Severe Storm/Thunder Storm/ Wind	$19,233	$73,280	0	0	2
Hail/ Severe Storm/Thunder Storm/ Winter Weather	$139	$2,062	0	0	2
Total	**$45,120**	**$74,197,439**	**4.44**	**0**	**27**

Source: SHELDUS

Specific incidents of hail have caused large amounts of damage in the Planning Area. Only those incidents with reported damage of more than $50,000 are reported below.

June 19, 1992 – Thunderstorms produced hail up to 2" in diameter in southern and central Douglas County. Hail was 3" deep on I-25 south of Castle Rock. No injuries or fatalities were reported. Damage estimates were unavailable.

August 15, 2007 – Severe thunderstorms produced large hail, up to 2” in diameter. The most severe weather occurred over southeastern Douglas and southwestern Elbert County, from around Larkspur to Elbert. Large hail in this location caused extensive damage to vehicles.

June 11, 2010 – A large complex of thunderstorms swept across northeast Colorado (including Douglas County) producing very large damaging hail, intense thunderstorm winds as well as a couple of weak tornadoes. Large hail, from 1” to 3” in diameter, caused extensive damage to cropland, homes and vehicles. No injuries or fatalities were reported. Damage estimates were unavailable.

Likelihood of Future Occurrences

High–Hailstorms occur in every jurisdiction in the Planning Area. Based on the NCDC database, the Planning Area has experienced an average of 4.1 hailstorms per year (247 events from 1953-2014), which equates to a 100% probability of future occurrence in any given year. This corresponds to an occurrence rating of **high**.

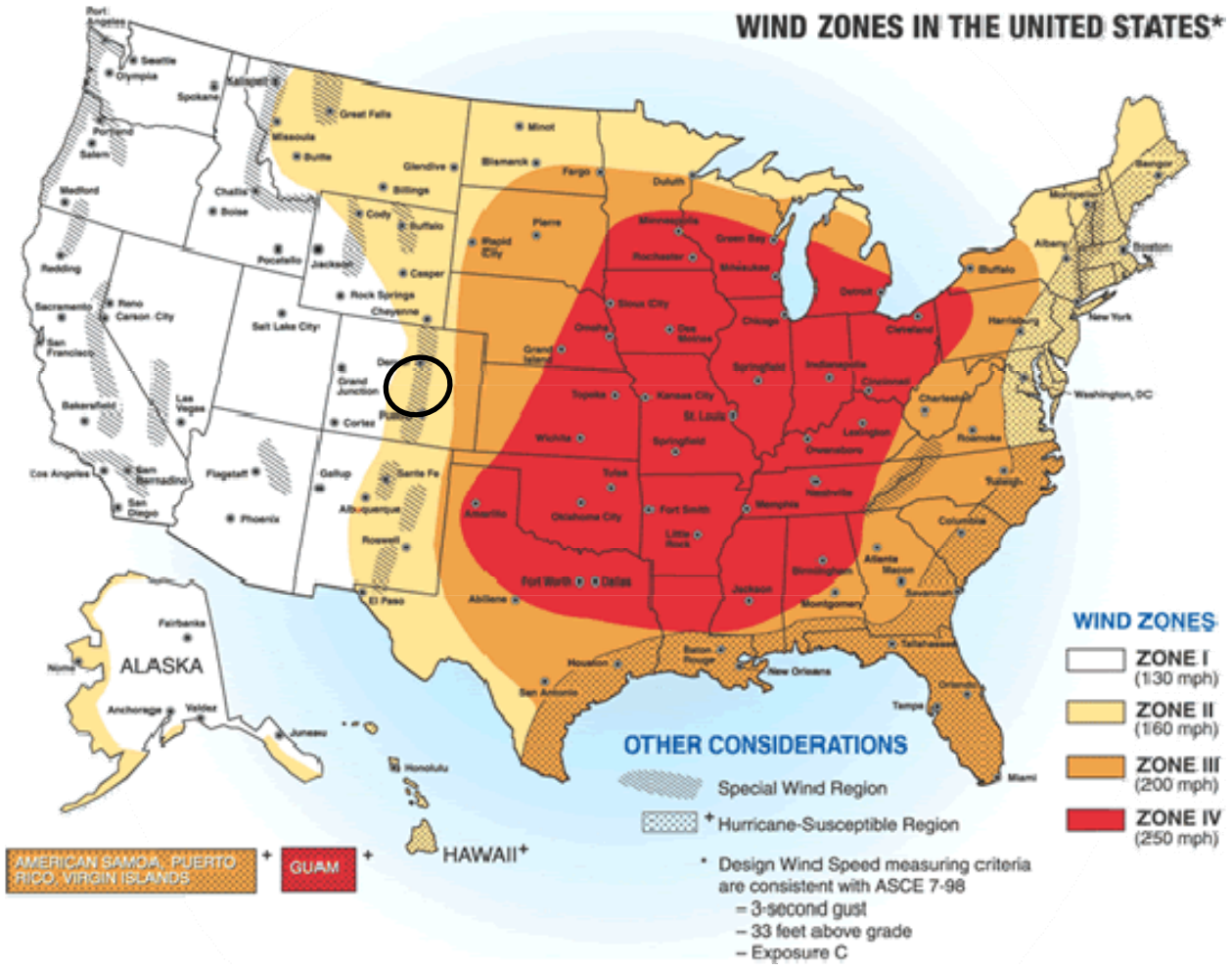
4.2.4 Severe Weather: High Winds

Hazard/Problem Description

High winds, often accompanying severe thunderstorms, can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. Winds in Douglas County are typically straight-line winds. Straight-line winds are generally any thunderstorm wind that is not associated with rotation (i.e., is not a tornado). These winds can overturn mobile homes, tear roofs off of houses, topple trees, snap power lines, shatter windows, and sandblast paint from cars. Other associated hazards include utility outages, arcing power lines, debris blocking streets, dust storms, and an occasional structure fire.

Figure 4.9 depicts wind zones for the United States. The approximate location of Douglas County is circled in black. The map denotes that the majority of the Planning Area falls into Zone I, which is characterized by high winds of up to 130 mph. Portions of the County are also located in a special wind hazard region.

Figure 4.9. Wind Zones in the United States



Source: Federal Emergency Management Agency

Special Wind Hazards

Two main causes of high winds in Colorado during the cold season are the air pressure difference between strong low pressure and cold high pressure systems, and Chinook winds developing along the Front Range and mountains in the eastern half of the state.

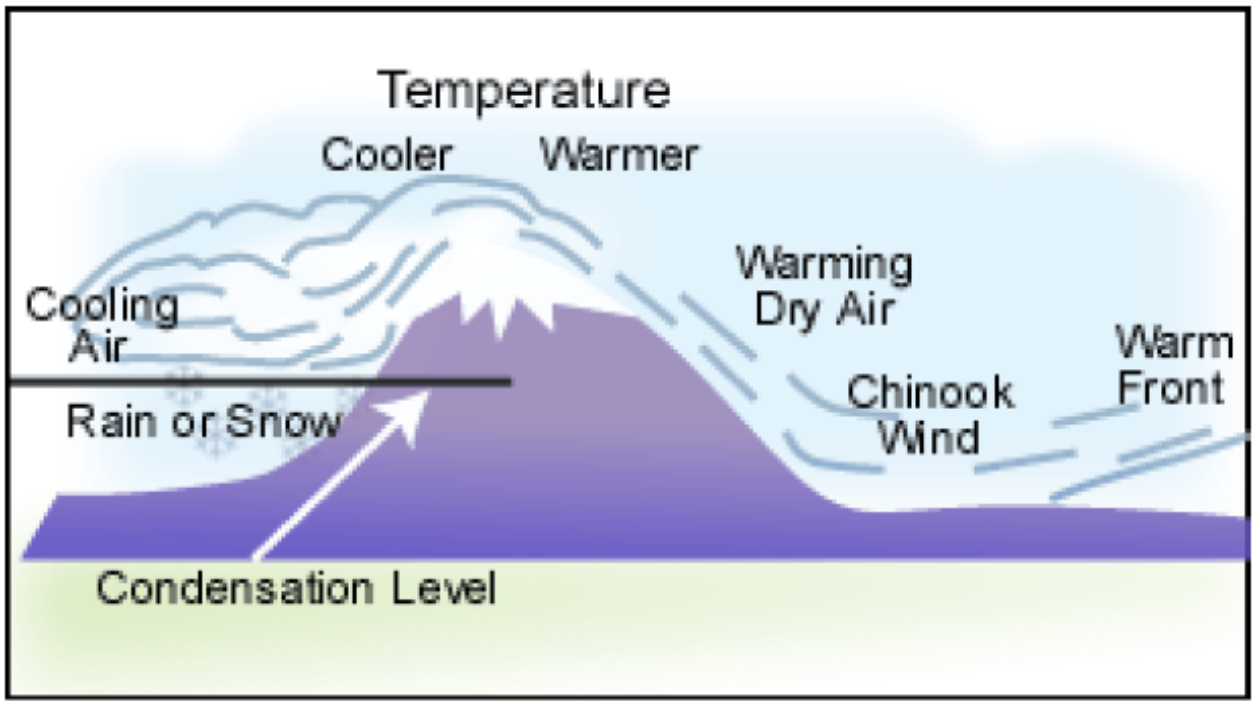
A strong low pressure system in Colorado, coupled with a high pressure system to the west, can send a cold wind, called a Bora, through the western part of the state and down the slopes of the eastern mountains. The result can be a cascade of high winds from the west or northwest into the adjacent plains at speeds over 100 mph. The damage caused by this event is usually much more widespread than that caused by a severe thunderstorm in the warm season.

Jet stream winds over Colorado are much stronger in the winter than in the warm season, because of the big difference in temperature from north to south across North America. Very swift west winds, under certain conditions, can bring warm, dry Chinook winds plowing down the slopes of the eastern mountains. These winds can also exceed 100 mph in extreme cases, again bringing the potential for

widespread damage.

The Chinook wind cycle that impacts Douglas County is shown in Figure 4.10. Chinook winds can raise temperatures 25°F to 35°F within a short time. Chinook winds greatly moderate average winter temperatures in areas near enough to the mountains to experience them frequently. Due to these wind patterns, some locations in the eastern foothills are warmer than adjacent areas on the eastern plains on many days during the winter.

Figure 4.10. Chinook Wind Cycle



Source: University of Calgary

Dangers from high winds include flying debris, collapsed structures, and overturned vehicles. The National Weather Service will issue a high wind watch when there is a 50% or greater chance for high winds to develop in the next few days. When the threat becomes more certain in a specific area, a high wind warning will be issued. Cold strong winds can also bring dangerously low wind chill values, prompting a wind chill advisory or wind chill warning.

Past Occurrences

There have been 192 past occurrences of high winds in the Planning Areas reported to the NCDC between 1955 and 2014. This is shown in Table 4.11. Only the years with reported events are shown.

Table 4.11. NCDC Wind Events in Douglas County 1955-March 31, 2014

Year	Deaths	Injuries	Property Damage*	Crop Damage*
1981	0	0	$0	$0
1982	0	0	$0	$0
1983	0	0	$0	$0
1987	0	0	$0	$0
1988	0	0	$0	$0
1989	0	0	$0	$0
1990	0	0	$0	$0
1993	0	0	$500	$0
1996	0	5	$0	$0
1997	0	0	$120,000	$0
1998	0	2	$50,000	$0
1999	0	0	$43,800,000	$0
2000	0	4	$0	$0
2001	0	0	$0	$0
2002	0	0	$0	$0
2003	0	0	$0	$0
2004	0	0	$15,000	$0
2005	0	0	$0	$0
2006	0	0	$0	$0
2007	0	1	$0	$0
2008	0	1	$15,000	$5,000
2009	0	0	$35,000	$0
2010	0	0	$1,000	$0
2011	0	3	$0	$0
2012	0	0	$0	$0
2013	0	0	$0	$0
2014	0	0	$0	$0
Total	**0**	**16**	**$44,036,500**	**$5,000**

Source: NCDC

* Damages estimated by zone rather than individual county

The SHELDUS database aggregates hazard by type. Table 4.12 depicts the total number of high wind events reported and recorded by SHELDUS in the County. A total of 127 events have been recorded since 1960.

Table 4.12. SHELDUS Wind Events in Douglas County 1960 to 2013

Hazard	Crop Damage*	Property Damage*	Injuries	Fatalities	Records
Hail/ Lightning/ Wind	$15,625	$1,563	0	0	1
Hail/ Severe Storm/Thunder Storm/ Wind	$19,233	$73,280	0	0	2
Lightning/ Severe Storm/Thunder Storm/ Wind	$0	$166,667	0	0	1
Severe Storm/Thunder Storm/ Wind	$455	$166,601	2	1	8
Wind	$28,231	$3,060,766	2.36	1	98
Wind/ Winter Weather	$12,391	$103,464	0.03	0.18	17
Total	**$75,934**	**$3,572,341**	**4.39**	**2.18**	**127**

Source: SHELDUS
*Damages may be spread across multiple zones

Where available, specific events from Table 4.11 that caused damages to people or property in the County are detailed below.

September 10, 1993 – Thunderstorm winds blew over power lines which caused a power outage in Castle Rock.

November 23, 1998 – High winds caused several wood trusses installed in the roof of a police station under construction in Castle Rock to collapse. A construction worker on the roof received minor injuries when he was struck by one of the trusses.

April 4, 1999 – A round of damaging winds buffeted eastern Colorado, in and near the foothills from Fort Collins south to Pueblo, as well as portions of the adjacent plains. Several homes were damaged as shingles were blown off roofs. More trees, power poles and power lines were downed causing scattered outages throughout the area. This event caused an estimated $43,800,000 in damages across the Southern Front Range Foothills zone.

July 31, 2004 – Strong thunderstorm winds downed a 65-ft blue spruce in Parker. The tree landed onto a home, damaging the roof of the residence. Dozens of holes were poked into the shingles and the gutters were damaged.

Likelihood of Future Occurrences

High –As shown in Table 4.11 above, high winds are an annual occurrence in Douglas County.

4.2.5 Severe Weather: Lightning

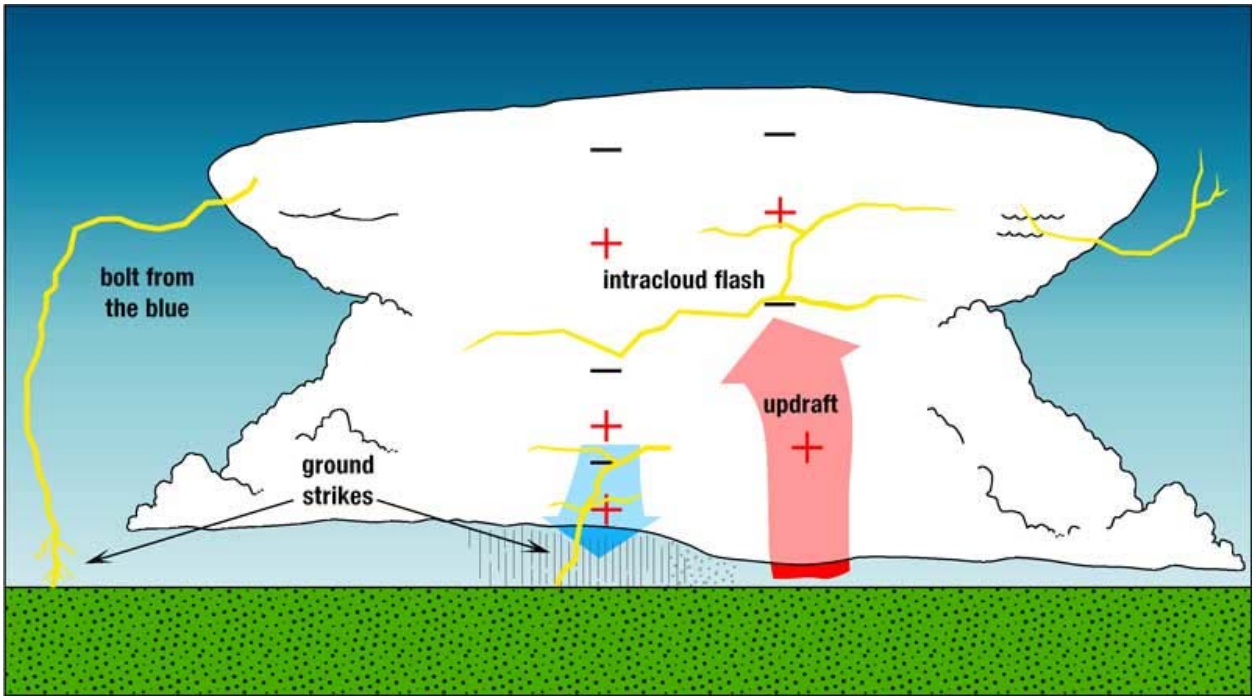
Hazard/Problem Description

Lightning is defined as any and all of the various forms of visible electrical discharge caused by thunderstorms. Thunderstorms and lightning are usually (but not always) accompanied by rain. Cloud-to-ground lightning can kill or injure people by direct or indirect means. Objects can be struck directly, which may result in an explosion, burn, or total destruction. Or, damage may be indirect, when the current passes through or near an object, which generally results in less damage.

Intra-cloud lightning is the most common type of discharge. This occurs between oppositely charged centers within the same cloud. Usually it takes place inside the cloud and looks from the outside of the cloud like a diffuse brightening that flickers. However, the flash may exit the boundary of the cloud, and a bright channel, similar to a cloud-to-ground flash, can be visible for many miles.

Cloud-to-ground lightning is the most damaging and dangerous type of lightning, though it is also less common. Most flashes originate near the lower-negative charge center and deliver negative charge to earth. However, a large minority of flashes carry positive charge to earth. These positive flashes often occur during the dissipating stage of a thunderstorm's life. Positive flashes are also more common as a percentage of total ground strikes during the winter months. This type of lightning is particularly dangerous for several reasons. It frequently strikes away from the rain core, either ahead or behind the thunderstorm. It can strike as far as 5 or 10 miles from the storm in areas that most people do not consider to be a threat (see Figure 4.11). Positive lightning also has a longer duration, so fires are more easily ignited. And, when positive lightning strikes, it usually carries a high peak electrical current, potentially resulting in greater damage.

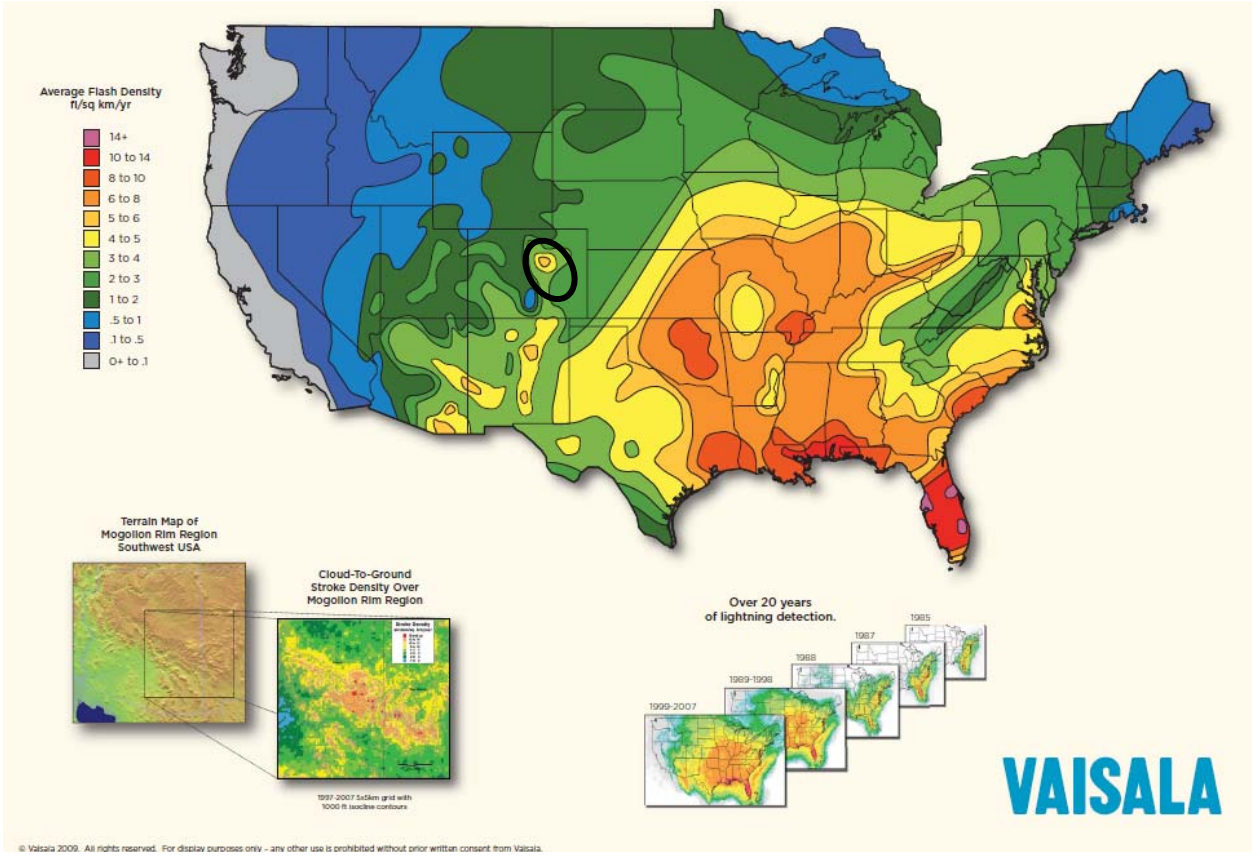
Figure 4.11. Cloud to Ground Lightning



Source: National Weather Service

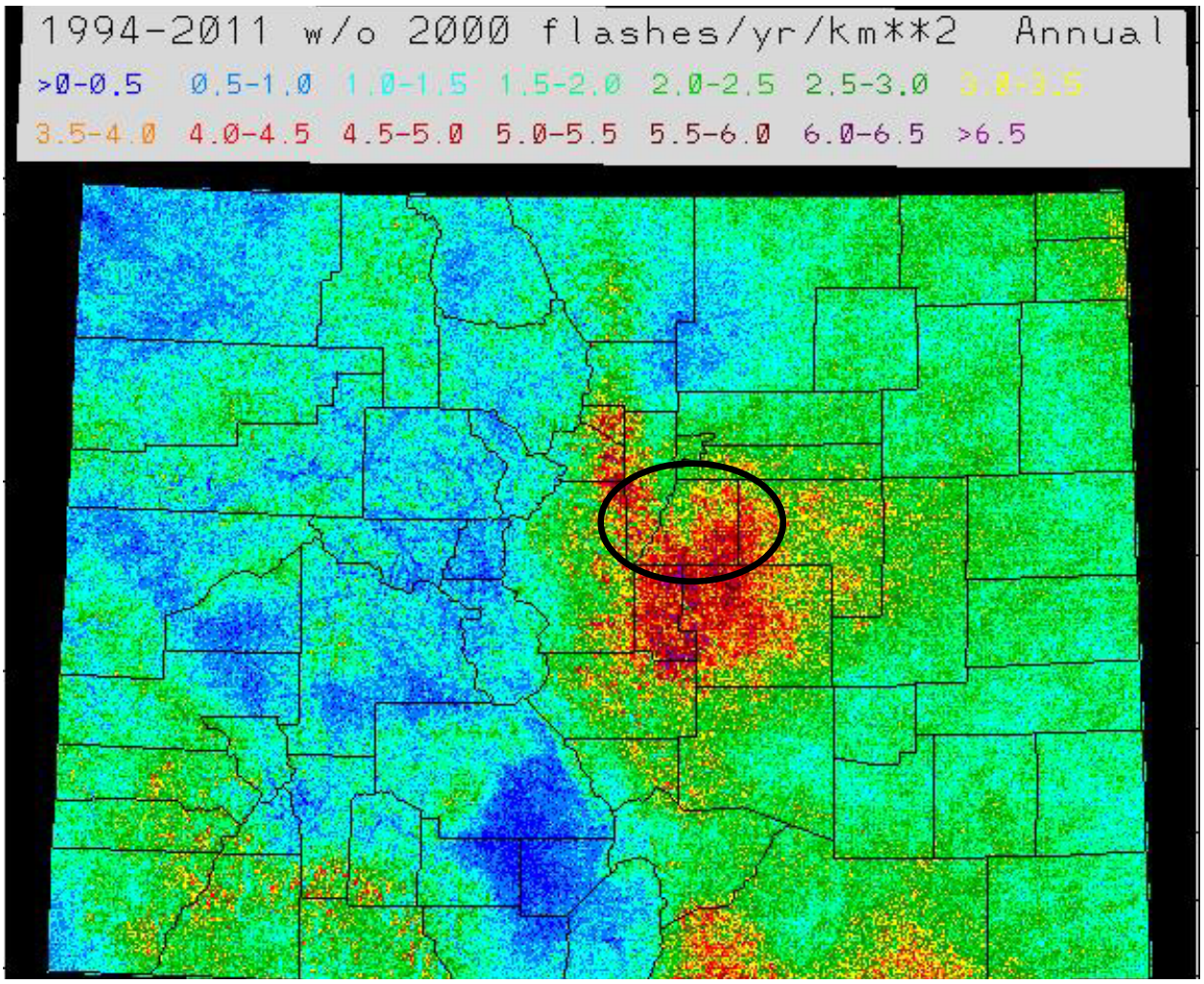
The ratio of cloud-to-ground and intra-cloud lightning can vary significantly from storm to storm. Depending upon cloud height above ground and changes in electric field strength between cloud and earth, the discharge stays within the cloud or makes direct contact with the earth. If the field strength is highest in the lower regions of the cloud, a downward flash may occur from cloud to earth. Using a network of lightning detection systems, the United States monitors an average of 25 million strikes of lightning from the cloud-to-ground every year. Figure 4.12 depicts cloud to ground lightning in the United States and the Planning Area (circled in black). Figure 4.13, from the National Weather Service in Pueblo, depicts a more detailed lightning flash density map for the State of Colorado and the Planning Area (circled in black).

Figure 4.12. Lightning Flash Density Map 1997-2007



Source: Vaisala's US National Lightning Detection Network

Figure 4.13. Colorado Lightning Flash Map 1989-2005



Source: National Weather Service Pueblo Office.

Past Occurrences

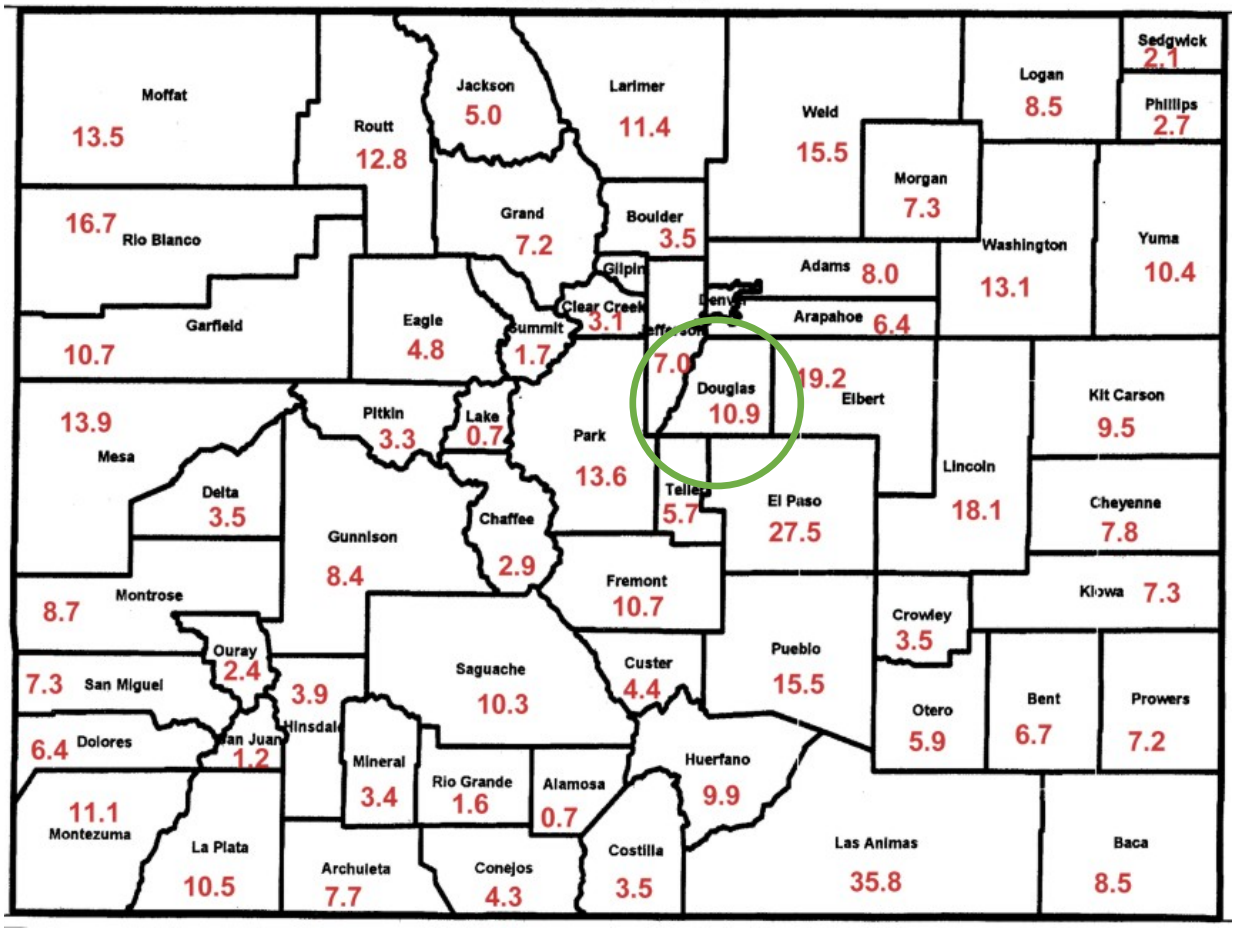
Tracking lightning events is not simple. Table 4.13, drawn from the National Weather Service in Pueblo, depicts the average number of cloud-to-ground lightning strikes, per year, for Douglas County. It also shows lightning related deaths in the County. Figure 4.14 gives a visual depiction of this and allows comparison to other counties in the State. The NWS in Pueblo reports that Colorado ranks 18th for most lightning strikes overall, and 3rd for the most lightning-related deaths.

Table 4.13. Average Cloud-to-Ground Lightning Strikes (in thousands) Per Year

County	Strikes (in thousands)	Reported Injures/Deaths 1980-2012
Douglas	10.9	1/12

Source: National Weather Service Pueblo

Figure 4.14. Colorado County by County Lightning Flashes (x1,000) per year



Source: National Weather Service Pueblo

Table 4.14 details lightning events captured in the NCDC database for Douglas County from 1996 to 2014.

Table 4.14. NCDC Lightning Events for Douglas County 1996-March 31, 2014

Location	Date	Type	Deaths	Injuries	Property Damage	Crop Damage
Parker	6/12/1996	Lightning	0	0	$0	$0
Parker	6/21/1996	Lightning	0	0	$30,000	$0
Franktown	9/14/1996	Lightning	0	1	$0	$0
Castle Rock	6/10/1997	Lightning	0	1	$0	$0
Castle Rock	8/17/1997	Lightning	0	0	$20,000	$0
Castle Rock	7/12/2000	Lightning	0	0	$100,000	$0
Sedalia	8/22/2000	Lightning	0	0	$2,000,000	$0
Castle Rock	5/14/2001	Lightning	0	1	$0	$0
Sedalia	6/12/2003	Lightning	0	0	$0	$0

Location	Date	Type	Deaths	Injuries	Property Damage	Crop Damage
Castle Rock	6/14/2004	Lightning	0	1	$0	$0
Castle Rock	8/4/2004	Lightning	0	2	$0	$0
Castle Rock	8/27/2005	Lightning	0	0	$15,000	$0
Castle Rock	7/2/2006	Lightning	0	0	$125,000	$0
Castle Rock	7/2/2006	Lightning	0	1	$0	$0
Parker	8/1/2006	Lightning	0	0	$0	$0
Parker	8/15/2007	Lightning	0	0	$100,000	$0
Castle Rock	8/15/2008	Lightning	0	0	$10,000	$0
Castle Rock	8/15/2008	Lightning	0	0	$10,000	$0
Douglas Co.	5/19/2009	Lightning	0	0	$200,000	$0
Acequia	7/11/2011	Lightning	0	0	$100,000	$0
Parker	6/6/2012	Lightning	0	0	$15,000	$0
Total			**0**	**7**	**$2,725,000**	**$0**

Source: NCDC

The SHELDUS database aggregates hazard by type. Hail events in Douglas County in the SHELDUS database are shown in Table 4.15.

Table 4.15. SHELDUS Lightning Events for Douglas County 1960-2012

Hazard	Crop Damage	Property Damage	Injuries	Fatalities	Records
Hail/ Lightning/ Severe Storm/Thunder Storm	$0	$5,000	0	0	1
Hail/ Lightning/ Wind	$15,625	$1,563	0	0	1
Lightning	$0	$2,747,550	13.1	4	34
Lightning/ Severe Storm/Thunder Storm/ Wind	$0	$166,667	0	0	1
Total	**$15,625**	**$2,920,779**	**13.1**	**4**	**37**

Source: SHELDUS

Specific instances of lightning in the County caused damages to people or property. The following gives detail to individual events that were shown in Table 4.14.

June 12, 1996 – Lightning struck a house in Parker which sparked a fire. The bolt was strong enough to blow nails out of the dry wall in one room. Approximately 85% of the home was damaged but no dollar estimate of the damage was available.

June 21, 1996 – Three homes were struck by lightning in Parker, southeast of Denver. Lightning struck the garage of the first home, a small fire developed which burned some siding and spread into the attic. Another home sustained damage in the attic from a small fire while a third home was hit but received only minor damage. Lightning also sparked two small grassfires in the area.

September 14, 1996 – A 54-year old woman was struck by lightning as she was preparing a

barbeque. The woman was knocked unconscious but received only minor injuries.

June 10, 1997 – Lightning struck a security guard at the Castle Pines Golf Course. He received minor injuries.

August 17, 1997 - Lightning struck a home sparking a fire.

July 12, 2000 – Lightning struck a home is Castle Rock causing extensive damage. The majority of the damage was confined to the roof, attic and second floor.

August 22, 2000 – Lightning sparked a blaze which gutted a 10-unit apartment building in Highlands Ranch. Twenty-eight people were left homeless.

May 14, 2001 – A construction worker received minor injuries when he took an indirect lightning strike.

June 12, 2003 – Lightning blew a hole in the roof of a home in Highlands Ranch. The bolt knocked several holes in the bedroom ceilings and damaged the home's electrical system.

June 14, 2004 – Lightning struck a power pole in Castle Rock igniting a small fire and injuring a 12-year old girl standing nearby. The girl received minor injuries from the electrical shock. Lightning also sparked a small brush fire. The fire was quickly extinguished without incident.

August 4, 2004 – Two men were shocked when lightning hit the ground nearby, as they were golfing the eighth green at Castle Pines. The two golfers suffered only minor injuries.

August 27, 2005 – Lightning struck an unoccupied home in Parker. The fire caused damage to the roof, attic and second floor bedroom.

July 2, 2006 – Lightning struck a residence causing extensive damage to the roof as well as the side of the home. Lightning also struck a teenager as he was mowing his lawn and listening to an iPod. The teen suffered burns to his hands and feet, and had blood running from his ear when he was found. The victim's eardrums were ruptured and his hearing was damaged.

August 1, 2006 – Lightning sparked a fire at a home in Lone Tree.

August 15, 2007 – In Parker, lightning struck a home, causing extensive damage. The bolt entered the house's electrical system and started a fire when sparks from an overloaded outlet fell into a nearby trash can. The ensuing fire damaged the attic and top floor. The strike caused $100,000 in damage and rendered the home uninhabitable for the next three months.

August 15, 2008 –At least three homes were hit by lightning during the early morning hours in Arapahoe County. Lightning also struck two homes in Castle Rock, damaging the roofs.

May 19, 2009 – Lightning struck the roof of a residence in Highlands Ranch causing a fire. The

home was not a total loss, but the fire caused extensive damage.

July 11, 2011 – Lightning was cited as the probable cause of a fire that heavily damaged a home in Lone Tree.

June 6, 2012 – Severe thunderstorms broke late in the evening, striking areas hardest from Denver southward. Locations impacted by the storms included but were not limited to: Aurora, Castle Rock, Centennial, Highlands Ranch, Lone Tree, Parker, and Surrey Ridge. The storms produced a barrage of large hail, damaging straight line winds, flash flooding and several short lived tornadoes. The hail ranged in size from 1" to 2" in diameter, and caused extensive damage to homes and automobiles. The hail inundated the roadways with several inches of hail in Douglas County. Consequently, snow plows had to be called out to clear the roadways.

Likelihood of Future Occurrences

High– As shown on Figure 4.13, Douglas County experiences lightning many times per year.

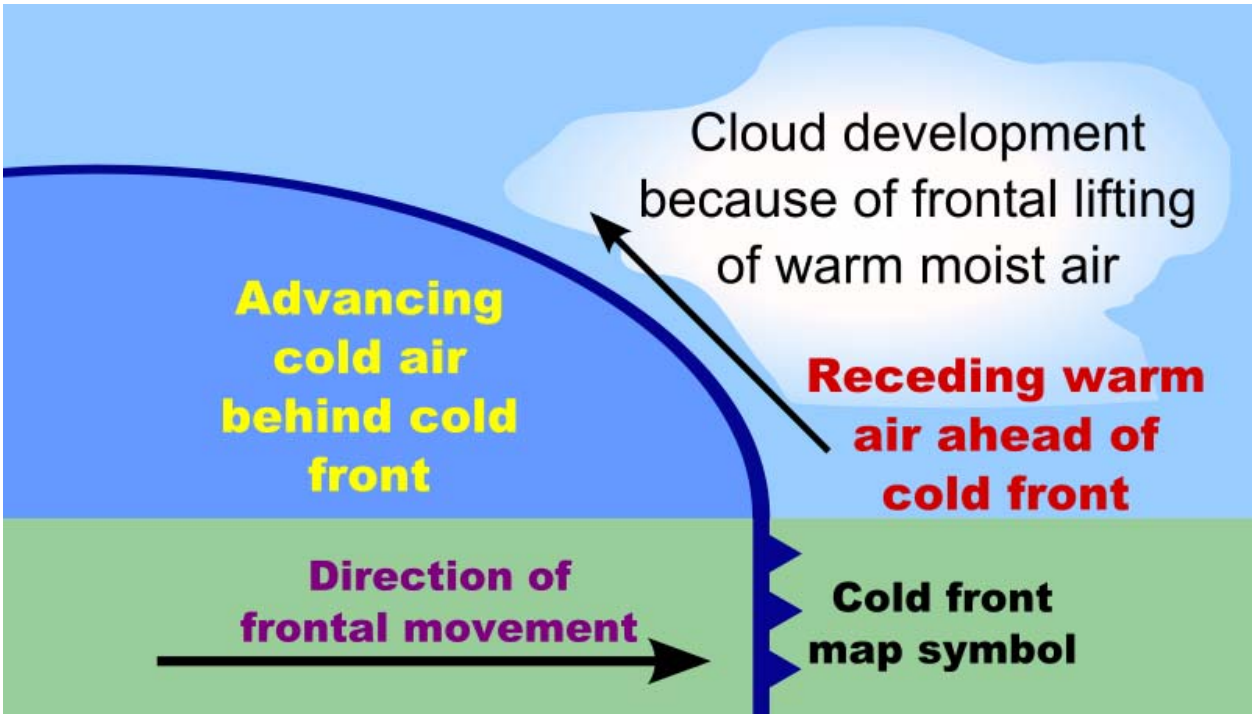
4.2.6 Severe Weather: Heavy Rain and Thunderstorms

Hazard/Problem Description

Storms in the Douglas County Planning Area are generally characterized by heavy rain often accompanied by strong winds and sometimes lightning and hail. Approximately 10% of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots (57.5 mph), or a tornado. Heavy precipitation in the Douglas County area falls mainly between April and August.

Thunderstorms result from the rapid upward movement of warm, moist air (see Figure 4.15). They can occur inside warm, moist air masses and at fronts. As the warm, moist air moves upward, it cools, condenses, and forms cumulonimbus clouds that can reach heights of greater than 35,000 ft. As the rising air reaches its dew point, water droplets and ice form and begin falling the long distance through the clouds towards Earth's surface. As the droplets fall, they collide with other droplets and become larger. The falling droplets create a downdraft of air that spreads out at Earth's surface and causes strong winds associated with thunderstorms.

Figure 4.15. Formation of a Thunderstorm



Source: NASA. http://rst.gsfc.nasa.gov/Sect14/Sect14_1c.html

There are four ways in which thunderstorms can organize: single cell, multicell cluster, multicell lines (squall lines), and supercells. Even though supercell thunderstorms are most frequently associated with severe weather phenomena, thunderstorms most frequently organize into clusters or lines. Warm, humid conditions are favorable for the development of thunderstorms. The average single cell thunderstorm is approximately 15 miles in diameter and lasts less than 30 minutes at a single location. However, thunderstorms, especially when organized into clusters or lines, can travel intact for distances exceeding 600 miles.

Thunderstorms are responsible for the development and formation of many severe weather phenomena, posing great hazards to the population and landscape. Damage that results from thunderstorms is mainly inflicted by downburst winds, large hailstones, and flash flooding caused by heavy precipitation. Stronger thunderstorms are capable of producing tornadoes and waterspouts.

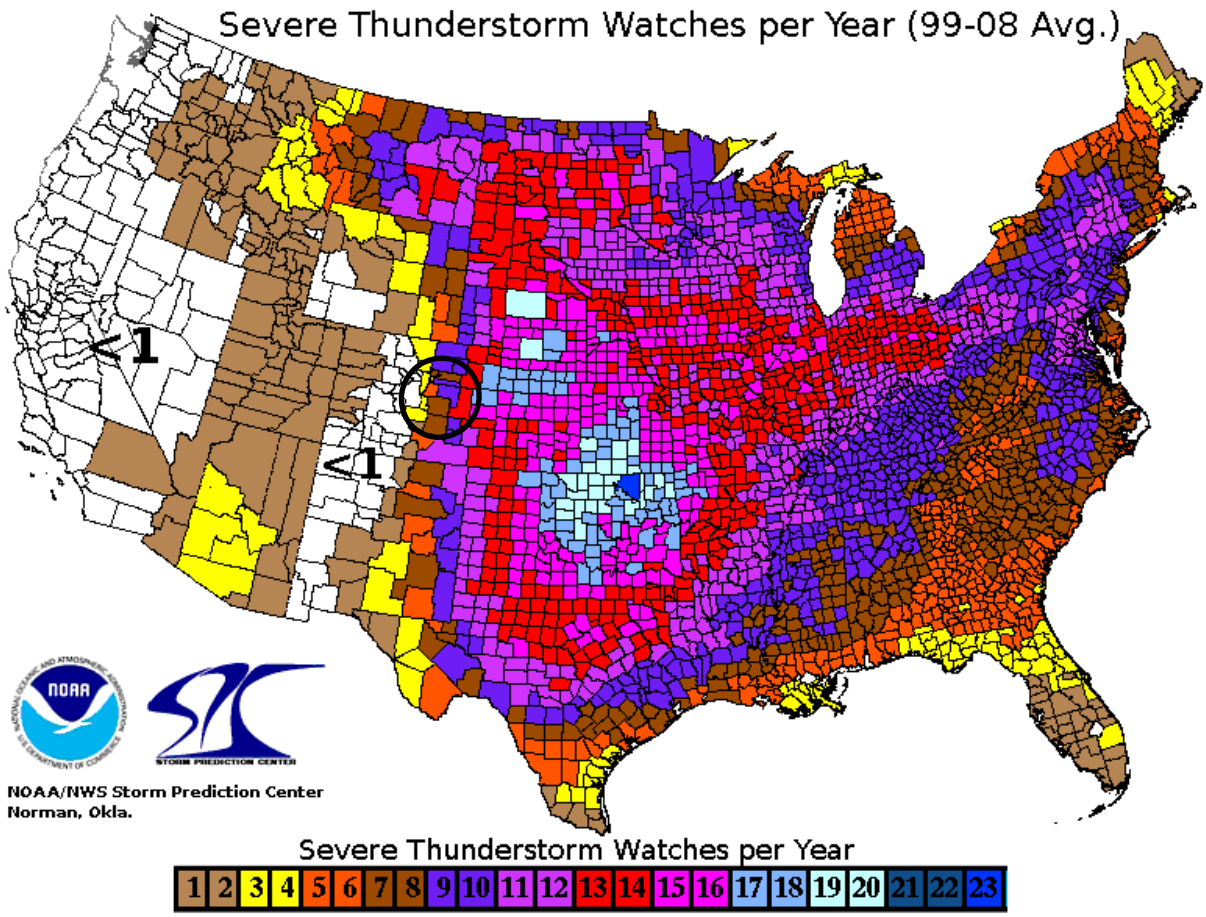
The National Weather Service issues two types of alerts for severe thunderstorms:

- A Severe Thunderstorm Watch indicates when and where severe thunderstorms are likely to occur. Citizens are urged to watch the sky and stay tuned to NOAA Weather Radio, commercial radio, or television for information. Severe Thunderstorm Watches are issued by the Storm Prediction Center in Norman, Oklahoma.
- A Severe Thunderstorm Warning is issued when severe weather has been reported by spotters or indicated by radar. Warnings indicate imminent danger to life and property to those in the path of the storm. Severe Thunderstorm Warnings are issued by the National Weather Service in Pueblo,

Colorado.

The Planning Area sees 13-14 severe thunderstorm watches per year. This can be seen in Figure 4.16.

Figure 4.16. Severe Thunderstorm Watches per Year in the Planning Area

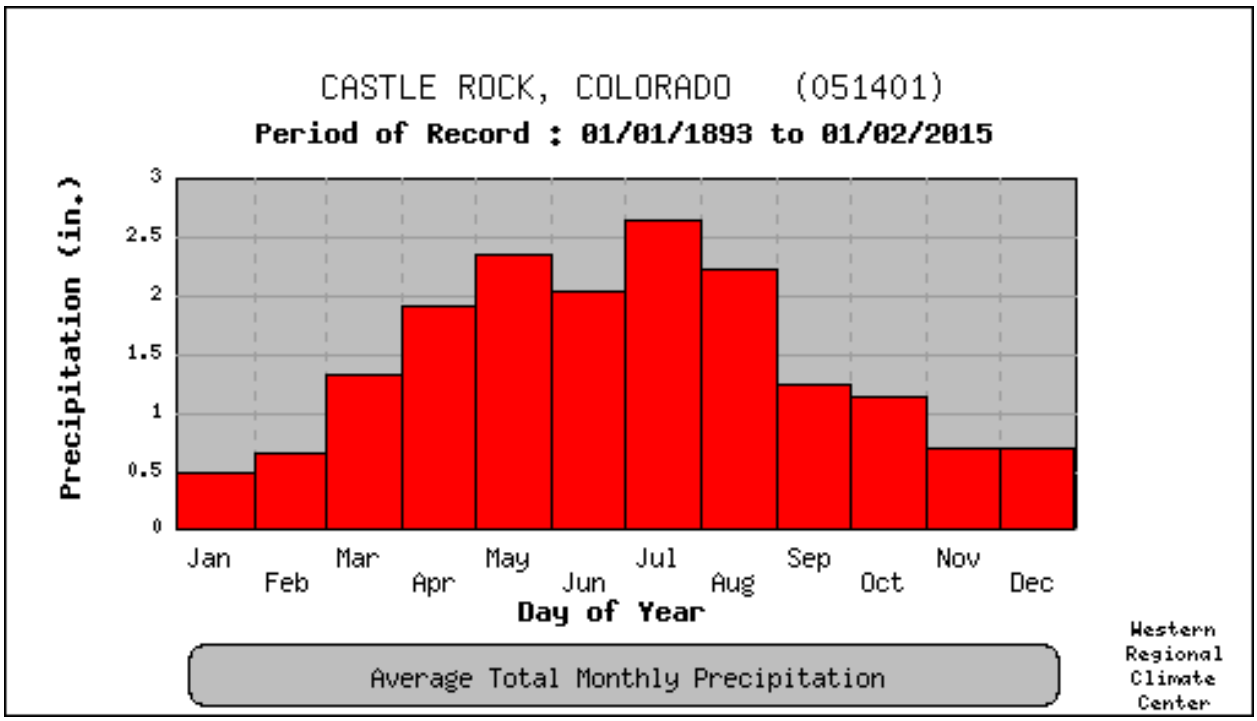


Source: NOAA/NWS Storm Prediction Center

Castle Rock Station - Period of Record 1/1/1893 to 3/27/2013

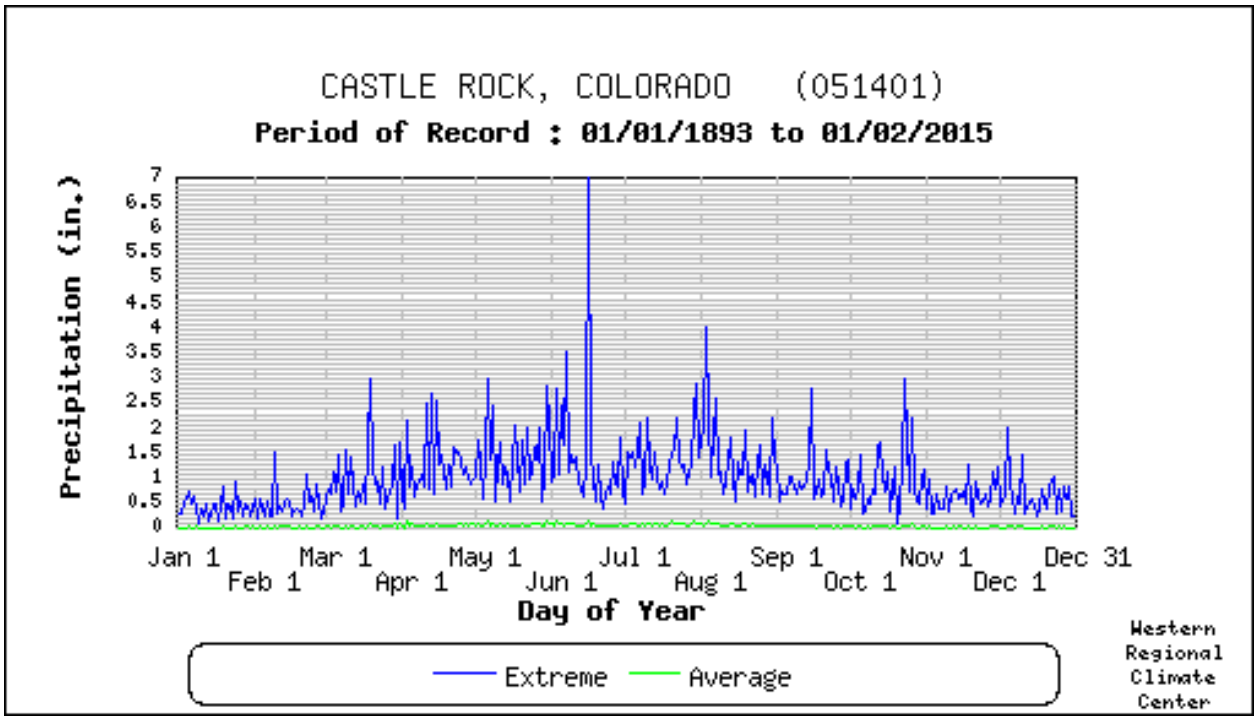
Average annual precipitation in Douglas County is 17.14" per year. The highest recorded annual precipitation was 30.39" in 1965. The lowest recorded annual precipitation was 11.4" in 1966. The greatest amount of rain to fall in one day was 7" on June 16, 1965. Average monthly precipitation totals for Douglas County are shown in Figure 4.17. Precipitation extremes for Douglas County are shown in Figure 4.18.

Figure 4.17. Douglas County Monthly Average Total Precipitation



Source: Western Regional Climate Center

Figure 4.18. Douglas County Daily Precipitation Average and Extremes



Source: Western Regional Climate Center

Related Hazards

High winds, often accompanying severe thunderstorms, can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. Winds are discussed in more detail in Section 4.2.4. Tornadoes (see Section 4.2.7 Tornado) and funnel clouds can also occur during these types of storms.

Past Occurrences

Heavy rains and severe storms occur in the Planning Area mainly between May and August. Major events are summarized in Table 4.16. More events of heavy rains that caused flash flooding can be found in Table 4.30 in Section 4.2.13.

Table 4.16. NCDC Heavy Rain and Thunderstorm Events for Douglas County 1996 – March 31, 2014

Location	Date	Type	Deaths	Injuries	Property Damage	Crop Damage
Acequia	7/30/2010	Heavy Rain	0	0	$0	$0
Castle Rock	6/1/2009	Heavy Rain	0	0	$5,000	$0
Westcreek	8/5/2009	Heavy Rain	0	0	$0	$0

Source: NCDC

The SHELDUS database aggregates hazard by type. Specific thunderstorm related events detailed by the SHELDUS database are shown in Table 4.17.

Table 4.17. SHELDUS Incidences of Heavy Rain and Thunderstorms in Douglas County from 1960 to 2012

Hazard	Crop Damage	Property Damage	Injuries	Fatalities	Records
Flooding/ Severe Storm/Thunder Storm/ Winter Weather	$0	$794	0	0	1
Hail/ Lightning/ Severe Storm/Thunder Storm	$0	$5,000	0	0	1
Hail/ Severe Storm/Thunder Storm	$9,017	$70,387	0	0	9
Hail/ Severe Storm/Thunder Storm/ Wind	$19,233	$73,280	0	0	2
Hail/ Severe Storm/Thunder Storm/ Winter Weather	$139	$2,062	0	0	2
Lightning/ Severe Storm/Thunder Storm/ Wind	$0	$166,667	0	0	1
Severe Storm/Thunder Storm	$1,247,751	$1,452,513	0.73	1.41	26
Severe Storm/Thunder Storm/ Wind	$455	$166,601	2	1	8
Severe Storm/Thunder Storm/ Winter Weather	$0	$28,714	0	0	5
Total	**$1,276,594**	**$1,966,018**	**2.73**	**2.41**	**55**

Source: SHELDUS

June 1, 2009 – Heavy rain caused significant trail damage in Castlewood Canyon. A couple of wooden walkways over the creek were also washed out. A severe thunderstorm over Phillips County produced very heavy rain, which resulted in flash flooding near Holyoke. Heavy rain and minor flooding was also observed in Castlewood Canyon, east of Castle Rock.

July 30, 2010 – Severe thunderstorms produced strong winds and very heavy rainfall, up to 2" in 30 minutes.

Likelihood of Future Occurrences

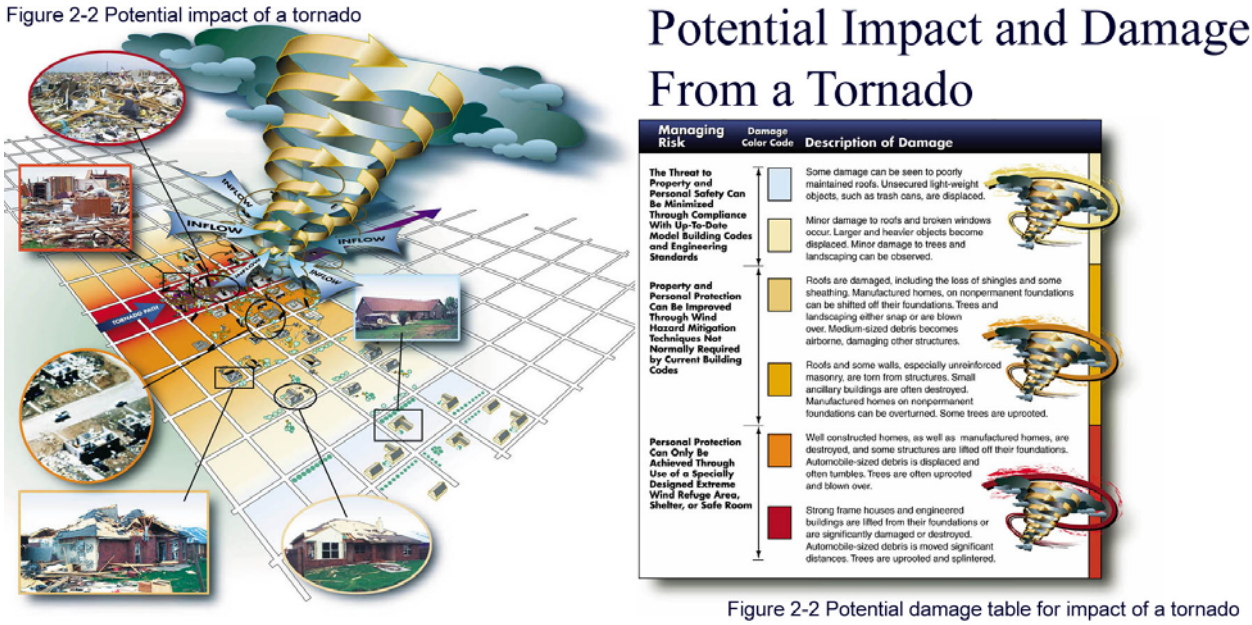
High – Severe weather, including heavy rain, thunderstorms, hail, and lightning is a well-documented seasonal occurrence that will continue to occur in the Douglas County Planning Area.

4.2.7 Severe Weather: Tornado

Hazard/Problem Description

Tornadoes are another severe weather hazard that can affect the Douglas County Planning Area, primarily during the rainy season in the late fall and early spring. Tornadoes form when cool, dry air sits on top of warm, moist air. Tornadoes are rotating columns of air marked by a funnel-shaped downward extension of a cumulonimbus cloud whirling at destructive speeds of up to 300 mph, usually accompanying a thunderstorm. Tornadoes are the most powerful storms that exist. They can have the same pressure differential across a path only 300 yards wide or less as 300 mile-wide hurricanes. Figure 4.19 illustrates the potential impact and damage from a tornado.

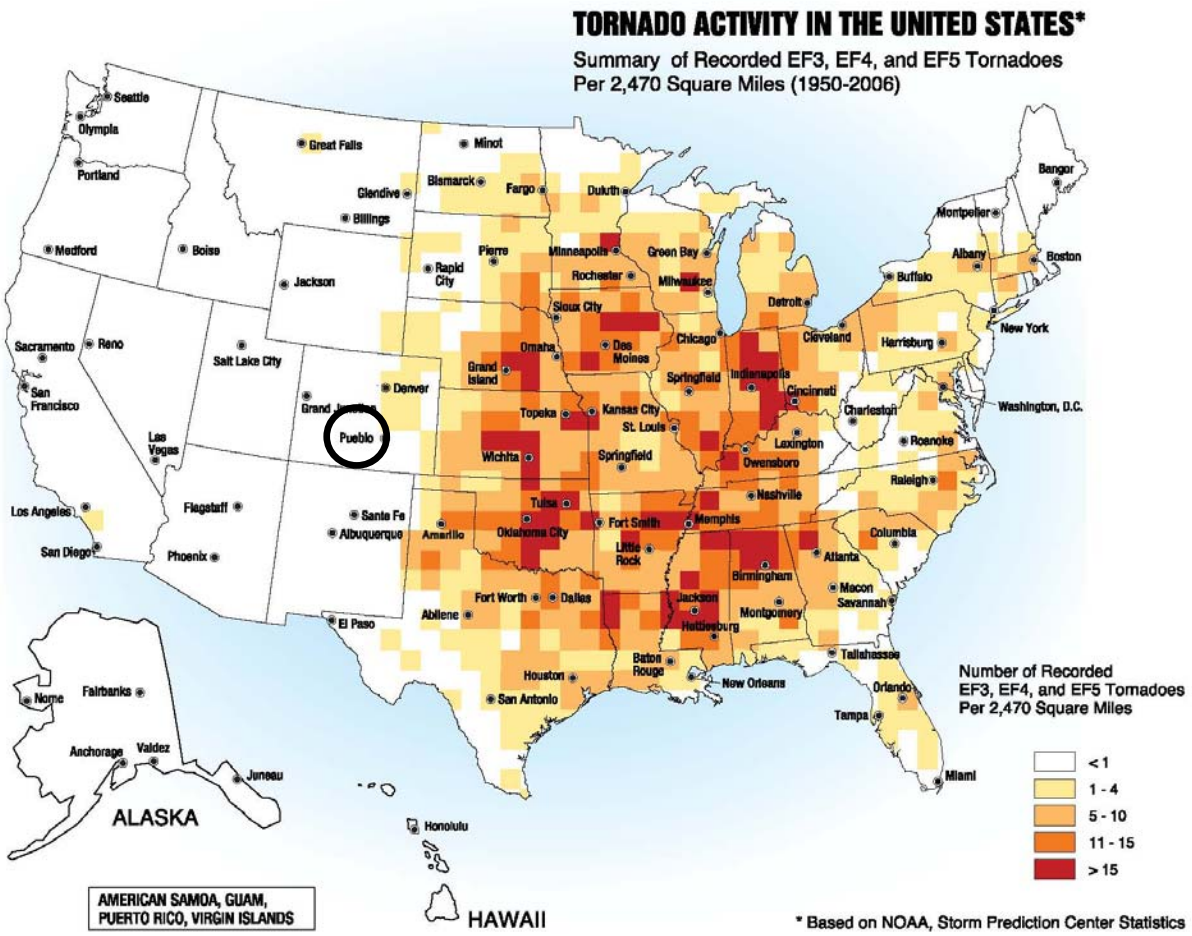
Figure 4.19. Potential Impact and Damage from a Tornado



Source: FEMA: Building Performance Assessment: Oklahoma and Kansas Tornadoes

According to the National Oceanic and Atmospheric Administration, each year approximately 1,200 tornadoes are reported in the United States. Figure 4.20 shows the number of severe Colorado tornadoes per 3,700 square miles in comparison with the rest of the country.

Figure 4.20. Tornado Activity in the United States



Source: NOAA

As a result of the frequency and destructiveness, over the past 30 years more than 100 federal disaster declarations across the U.S. included damage associated with tornadoes. The path of a single tornado can be miles long, but tornadoes rarely last longer than 30 minutes. A tornado can move as fast as 125 mph with internal wind speeds that can exceed 300 mph. Powerful tornadoes have lifted and moved objects weighing more than 300 tons a distance of 30 feet and tossed homes greater than 300 feet away from their foundations.

Prior to February 1, 2007, tornado intensity was measured by the Fujita (F) scale. This scale was revised and is now the Enhanced Fujita scale. Both scales are sets of wind estimates (not measurements) based on damage. The new scale provides more damage indicators (28) and associated degrees of damage, allowing for more detailed analysis and better correlation between damage and wind speed. It is also more precise because it takes into account the materials affected

and the construction of structures damaged by a tornado. Table 4.18 shows the wind speeds associated with the original Fujita scale ratings and the damage that could result at different levels of intensity. Table 4.19 shows the wind speeds associated with the Enhanced Fujita Scale ratings.

Table 4.18. Original Fujita Scale

Fujita (F) Scale	Fujita Scale Wind Estimate (mph)	Typical Damage
F0	< 73	Light damage. Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; sign boards damaged.
F1	73-112	Moderate damage. Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads.
F2	113-157	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
F3	158-206	Severe damage. Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.
F4	207-260	Devastating damage. Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated.
F5	261-318	Incredible damage. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters (109 yards); trees debarked; incredible phenomena will occur.

Source: National Oceanic and Atmospheric Administration Storm Prediction Center, www.spc.noaa.gov/faq/tornado/f-scale.html

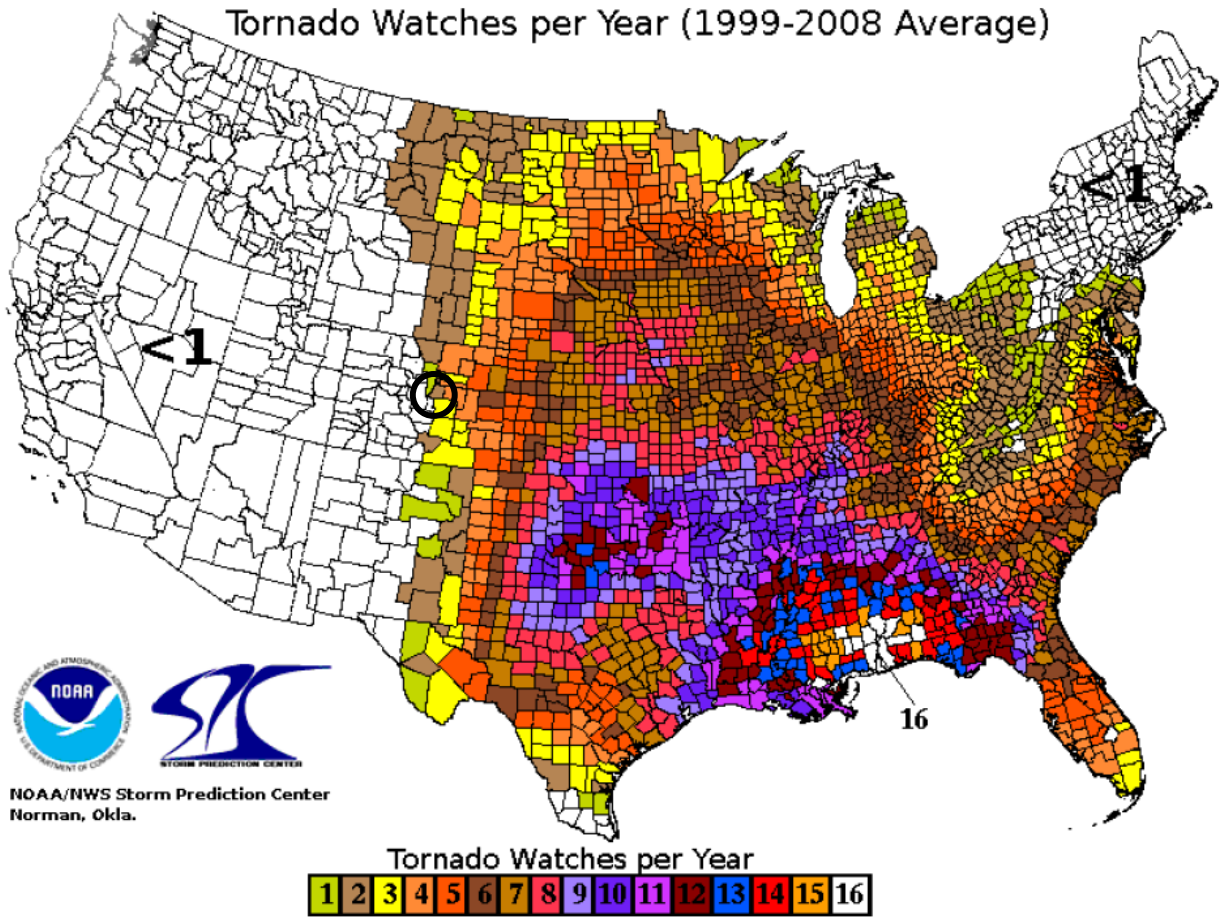
Table 4.19. Enhanced Fujita Scale

Enhanced Fujita (EF) Scale	Enhanced Fujita Scale Wind Estimate (mph)
EF0	65-85
EF1	86-110
EF2	111-135
EF3	136-165
EF4	166-200
EF5	Over 200

Source: National Oceanic and Atmospheric Administration Storm Prediction Center, www.spc.noaa.gov/faq/tornado/ef-scale.html

The Planning Area sees six tornado watches per year. This can be seen in Figure 4.21

Figure 4.21. Tornado Watches per Year in the Planning Area



Source: NOAA

Tornadoes can cause damage to property and loss of life. While most tornado damage is caused by violent winds, the majority of injuries and deaths generally result from flying debris. Property damage can include damage to buildings, fallen trees and power lines, broken gas lines, broken sewer and water mains, and the outbreak of fires. Agricultural crops and industries may also be damaged or destroyed. Access roads and streets may be blocked by debris, delaying necessary emergency response.

Past Occurrences

There have been 59 past occurrences of tornado touchdown in the Planning Areas reported to the NCDC. This is shown in Table 4.20.

Table 4.20. NCDC Tornado Events for Douglas County 1950-March 31, 2014

Location	Date	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Douglas Co.	8/17/1953	F0	0	0	$25,000	$0
Douglas Co.	6/6/1954	F1	0	0	$250	$0
Douglas Co.	5/20/1961	F2	0	2	$25,000	$0
Douglas Co.	6/5/1961	F0	0	0	$0	$0
Douglas Co.	5/25/1965	F0	0	0	$0	$0
Douglas Co.	6/16/1965	F1	0	4	$2,500	$0
Douglas Co.	7/27/1965	F0	0	0	$0	$0
Douglas Co.	8/22/1965	F0	0	0	$0	$0
Douglas Co.	6/14/1967	F0	0	0	$0	$0
Douglas Co.	6/14/1967	F0	0	0	$0	$0
Douglas Co.	5/5/1969	F0	0	0	$0	$0
Douglas Co.	7/21/1973	F0	0	0	$250,000	$0
Douglas Co.	5/17/1978	F0	0	0	$2,500	$0
Douglas Co.	7/13/1978	F0	0	0	$2,500	$0
Douglas Co.	7/29/1978	F0	0	0	$0	$0
Douglas Co.	8/1/1978	F1	0	0	$2,500	$0
Douglas Co.	3/29/1979	F0	0	0	$0	$0
Douglas Co.	7/17/1979	F0	0	0	$250	$0
Douglas Co.	7/17/1979	F0	0	0	$250	$0
Douglas Co.	6/3/1981	F1	0	0	$0	$0
Douglas Co.	7/27/1981	F0	0	0	$0	$0
Douglas Co.	5/23/1982	F1	0	0	$0	$0
Douglas Co.	7/13/1982	F1	0	0	$300	$0
Douglas Co.	8/10/1982	F1	0	0	$300	$0
Douglas Co.	6/13/1983	F0	0	0	$300	$0
Douglas Co.	6/3/1984	F1	0	0	$0	$0
Douglas Co.	6/3/1984	F1	0	0	$0	$0
Douglas Co.	6/16/1984	F1	0	0	$0	$0
Douglas Co.	6/2/1985	F1	0	0	$0	$0
Douglas Co.	6/9/1985	F1	0	0	$0	$0
Douglas Co.	7/15/1985	F1	0	0	$25,000	$0
Douglas Co.	7/19/1985	F2	0	0	$250,000	$0
Douglas Co.	6/9/1987	F1	0	0	$2,500	$0
Douglas Co.	6/18/1987	F1	0	0	$0	$0
Douglas Co.	6/20/1987	F1	0	0	$0	$0
Douglas Co.	7/7/1987	F1	0	0	$0	$0
Douglas Co.	7/7/1987	F1	0	0	$0	$0

Location	Date	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Douglas Co.	7/7/1987	F1	0	0	$0	$0
Douglas Co.	7/11/1990	F1	0	0	$250,000	$0
Douglas Co.	8/1/1990	F0	0	0	$0	$0
Douglas Co.	5/16/1991	F0	0	0	$0	$0
Douglas Co.	5/16/1991	F0	0	0	$0	$0
Douglas Co.	5/22/1991	F0	0	0	$0	$0
Douglas Co.	6/10/1991	F0	0	0	$0	$0
Parker	7/15/1994	F1	0	0	$50,000	$0
Parker 2 S	5/12/1995	F0	0	0	$0	$0
Parker	6/12/1997	F1	0	0	$0	$0
Parker	7/28/1997	F1	0	0	$0	$0
Parker	8/29/2002	F0	0	0	$100,000	$0
Castle Rock	6/15/2004	F0	0	0	$0	$0
Castle Rock	6/15/2004	F0	0	0	$0	$0
Franktown	6/22/2006	F0	0	0	$0	$0
Westcreek	8/23/2008	EF1	0	0	$2,000	$0
Parker	8/24/2008	EF0	0	0	$0	$0
Castle Rock	8/24/2008	EF0	0	0	$0	$0
Douglas Co.	5/24/2009	EF0	0	0	$0	$0
Castle Rock	7/20/2009	EF0	0	0	$0	$0
Franktown	6/6/2012	EF0	0	0	$0	$0
Greenland	9/27/2012	EF0	0	0	$0	$0
Total			**0**	**6**	**$991,150**	**$0**

Source: NCDC

The SHELDUS database aggregates hazard by type. SHELDUS reports 19 tornadoes or funnel clouds. This is shown in Table 4.21.

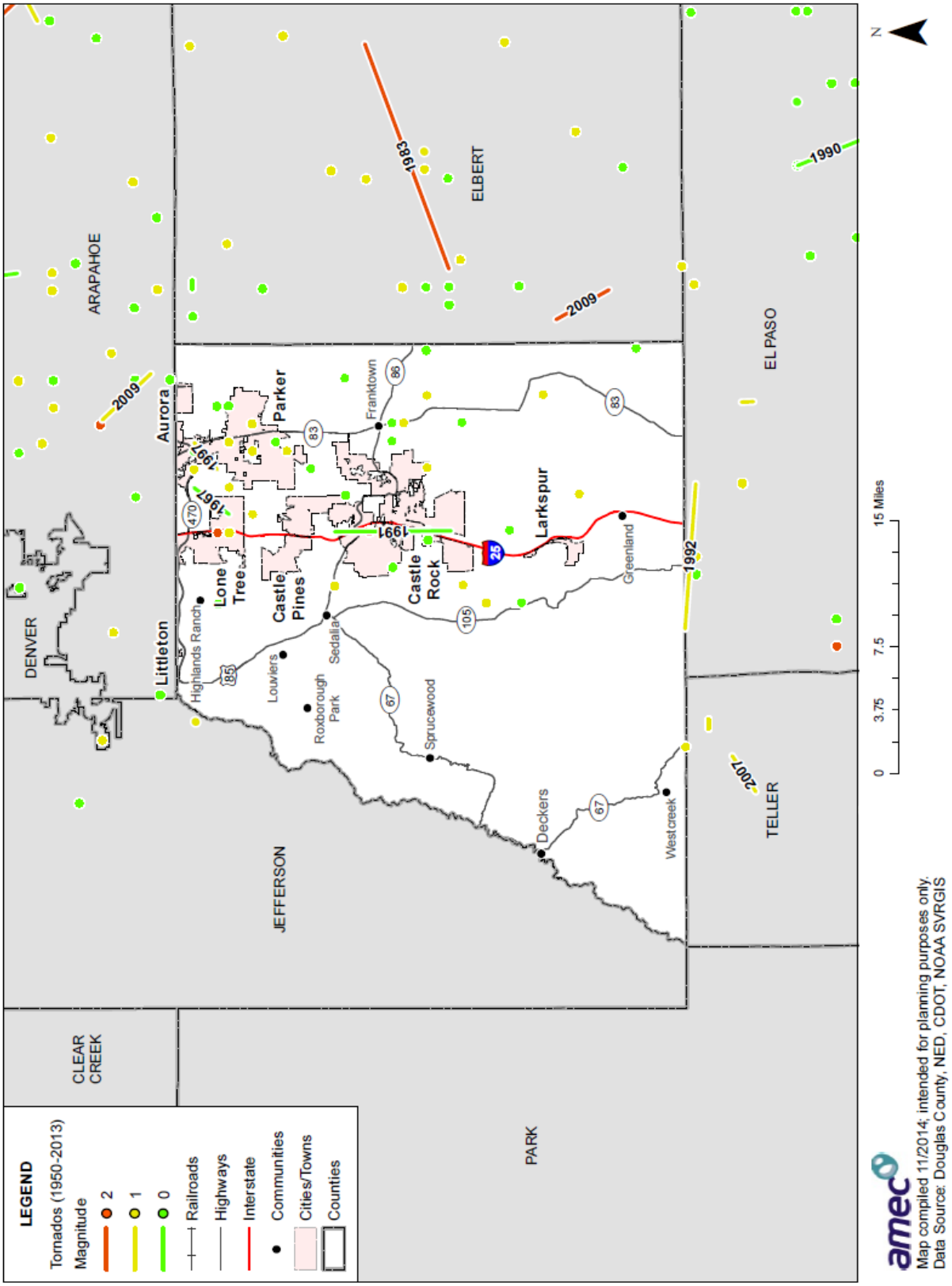
Table 4.21. SHELDUS Tornado Events for Douglas County 1960-2013

Hazard	Crop Damage	Property Damage	Injuries	Fatalities	Records
Tornado	$0	$373,641	9	0	19

Source: SHELDUS

Figure 4.22 displays reported tornado touchdowns and paths across the Planning Area.

Figure 4.22. Map of Tornado Activity in Planning Region



The map only shows a representative sample of the tornadoes that have occurred within the Planning Area. Tornado analysis indicates that nearly half of the tornadoes in the 1950-2005 archived NCDC database were either brief touchdowns or do not have a recorded tornado end point. Therefore, tornado track studies have inherent limitations to determining geographical distributions of tornado path length and associated tornado incidence. Tornadoes have occurred across the Planning Area frequently and are possible in all areas of the region.

Likelihood of Future Occurrences

High—There were 59 tornadoes reported in Douglas County over 64 years (1950-2014) of record keeping which equates to one event every 1.1 years, on average, and a 90.9% chance of tornadoes occurring in any given year.

4.2.8 Severe Weather: Winter Weather (includes Heavy Snow / Ice / Extreme Cold)

Hazard/Problem Description

Heavy Snow and Ice

Heavy snow, ice, severe winter storms, and blizzards are common occurrences in Colorado. The size of such events varies and may range in size from isolated (impacting only a portion of a county) to statewide. Generally, severe winter storm events are considered to be a regional occurrence, impacting multiple counties simultaneously and for extended time periods.

The National Weather Service Glossary defines common winter storm characteristics as follows:

- **Blizzard**: A blizzard means that the following conditions are expected to prevail for a period of three hours or longer:
  - Sustained wind or frequent gusts to 35 miles an hour or greater; and
  - Considerable falling and/or blowing snow (i.e., reducing visibility frequently to less than ¼ mile).
- **Heavy Snow**: This generally means:
  - snowfall accumulating to 4" or more in depth in 12 hours or less; or
  - snowfall accumulating to 6" or more in depth in 24 hours or less.
  - In forecasts, snowfall amounts are expressed as a range of values, e.g., “8” to 12”.” However, in heavy snow situations where there is considerable uncertainty concerning the range of values, more appropriate phrases are used, such as “up to 12”” or alternatively “8” or more”
- **Ice Storm**: An ice storm is used to describe occasions when damaging accumulations of ice are expected during freezing rain situations. Significant accumulations of ice pull down trees and utility lines resulting in loss of power and communication. These accumulations of ice make walking and driving extremely dangerous. Significant ice accumulations are usually accumulations of 0.25" or greater.

Heavy snow can immobilize a region, stranding commuters, stopping the flow of supplies, and disrupting emergency and medical services. Accumulations of snow can collapse roofs and knock down trees and power lines. In rural areas, homes and farms may be isolated for days, and unprotected livestock may be lost. The cost of snow removal, damage repair, and business losses can have a tremendous impact on cities and towns. Heavy accumulations of ice can bring down trees, electrical wires, telephone poles and lines, and communication towers. Communications and power can be disrupted for days until damages are repaired. Even small accumulations of ice may cause extreme hazards to motorists.

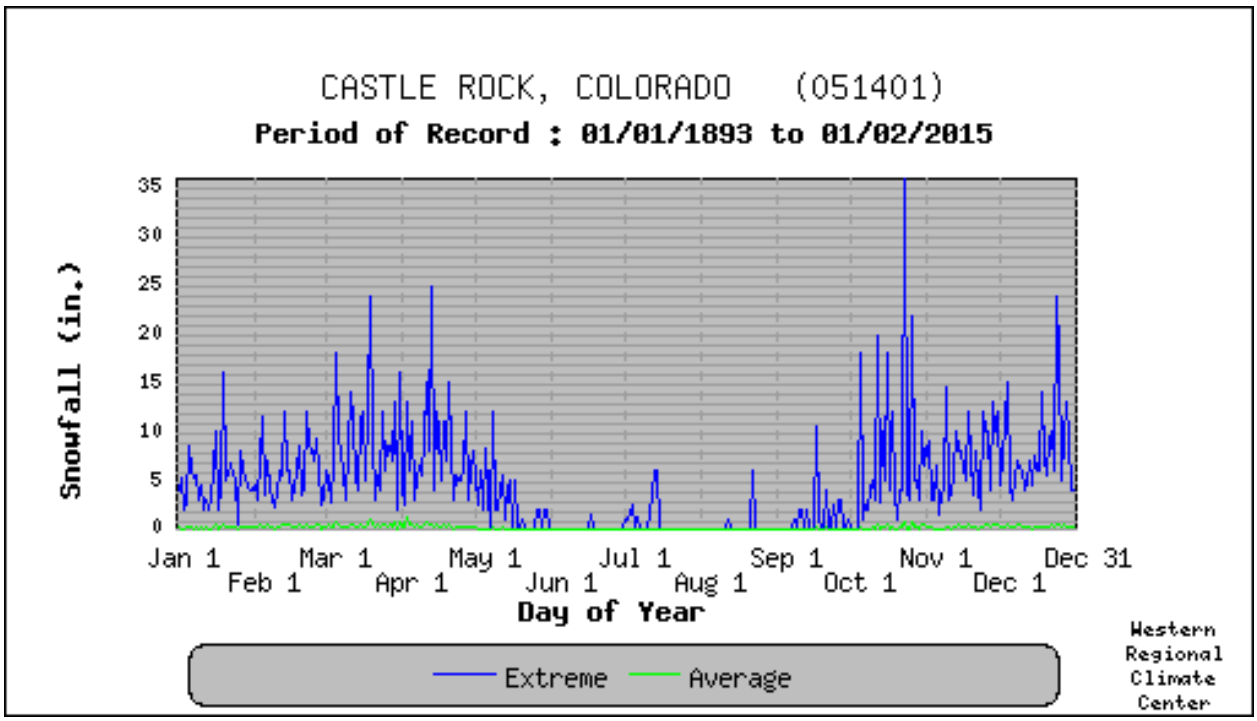
Some winter storms are accompanied by strong winds, creating blizzard conditions with blinding wind-driven snow, severe drifting, and dangerous wind chills. Strong winds with these intense storms and cold fronts can knock down trees, utility poles, and power lines. Blowing snow can reduce visibilities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

Heavy snowfall during winter can also lead to flooding or landslides during the spring if the area snowpack melts too quickly.

Castle Rock Station—Period of Record 1/1/1893 to 3/27/2013

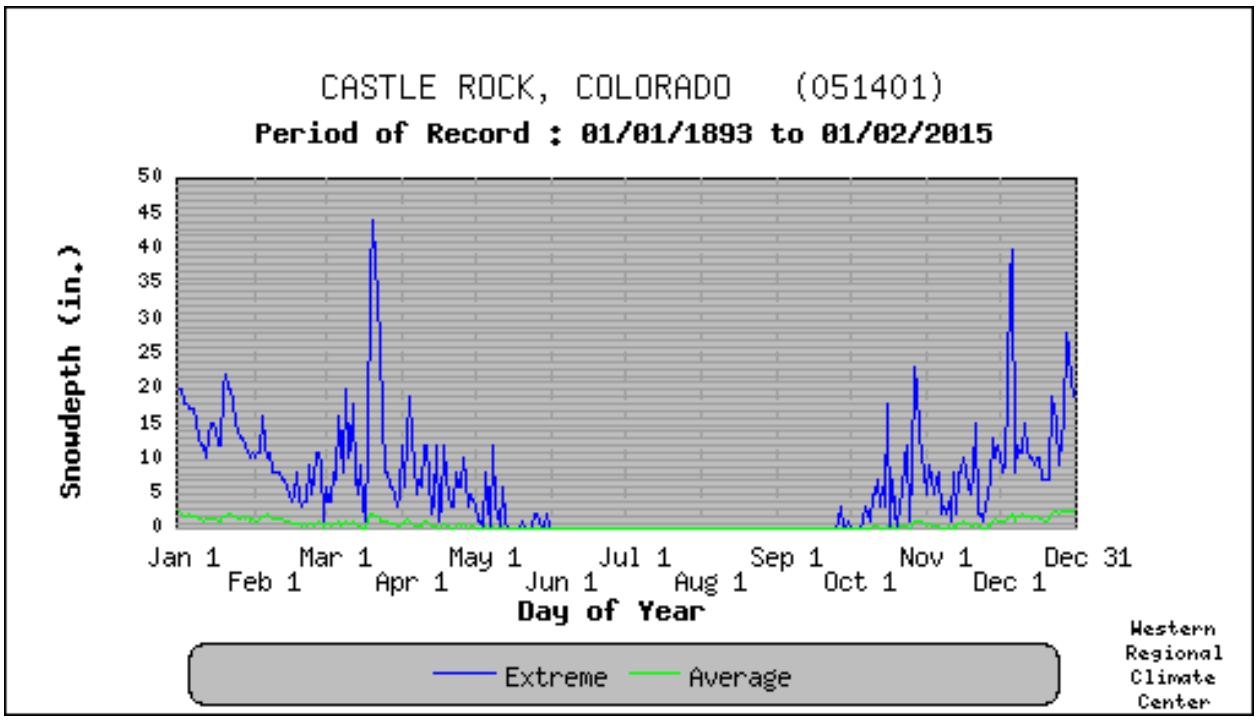
Between the period from 1893 to 2013 Douglas County received an annual average of 60.8” of snow per year. The maximum recorded snowfall for the county was 117.3” in 1983. Figure 4.23 shows daily snowfall averages and extremes for the County. Figure 4.24 shows average snowdepths for the County.

Figure 4.23. Douglas County Daily Snowfall Average and Extreme



Source: Western Regional Climate Center

Figure 4.24. Douglas County Daily Snowdepth Average and Extreme



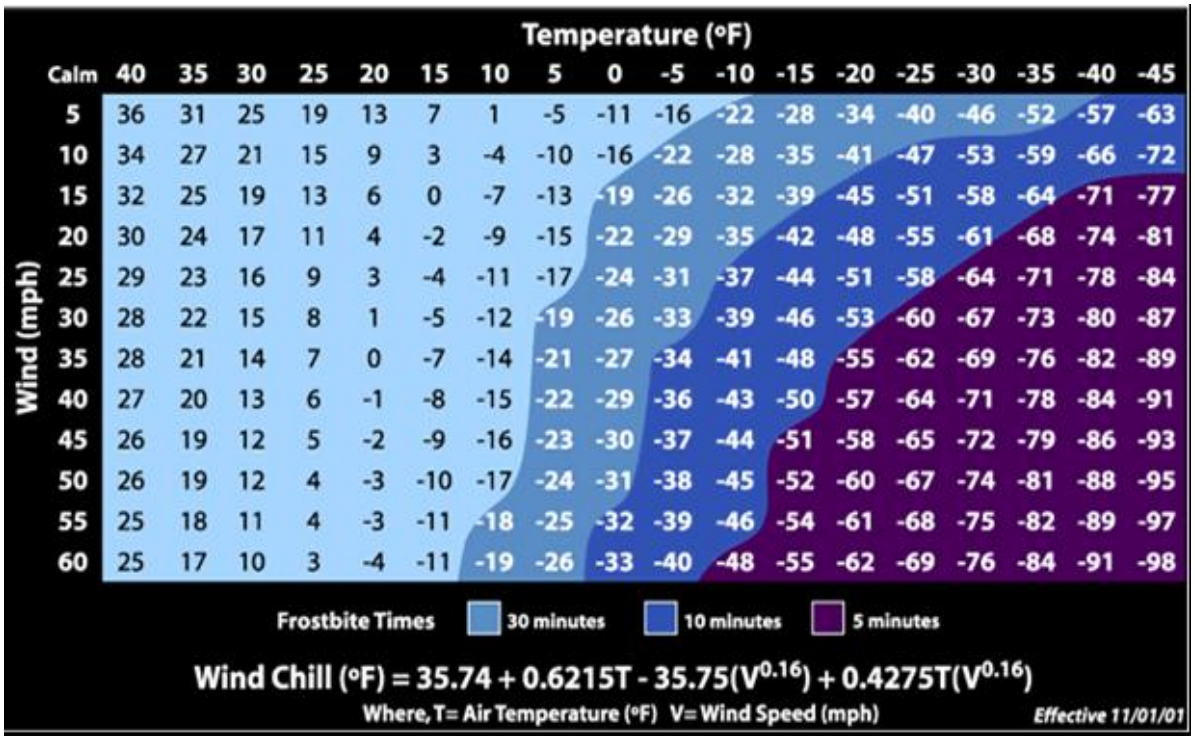
Source: Western Regional Climate Center

Freeze

Extreme cold often accompanies a winter storm or is left in its wake. It is most likely to occur in the winter months of December, January, and February. Prolonged exposure to the cold can cause frostbite or hypothermia and can become life-threatening. Infants and the elderly are most susceptible. Pipes may freeze and burst in homes or buildings that are poorly insulated or without heat. Extreme cold can disrupt or impair communications facilities. Extreme cold can also affect any crops grown in Douglas County.

In 2001, the NWS implemented an updated Wind Chill Temperature index, which is reproduced below in Figure 4.25. This index was developed to describe the relative discomfort/danger resulting from the combination of wind and temperature. Wind chill is based on the rate of heat loss from exposed skin caused by wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature and eventually the internal body temperature.

Figure 4.25. Wind Chill Temperature Index

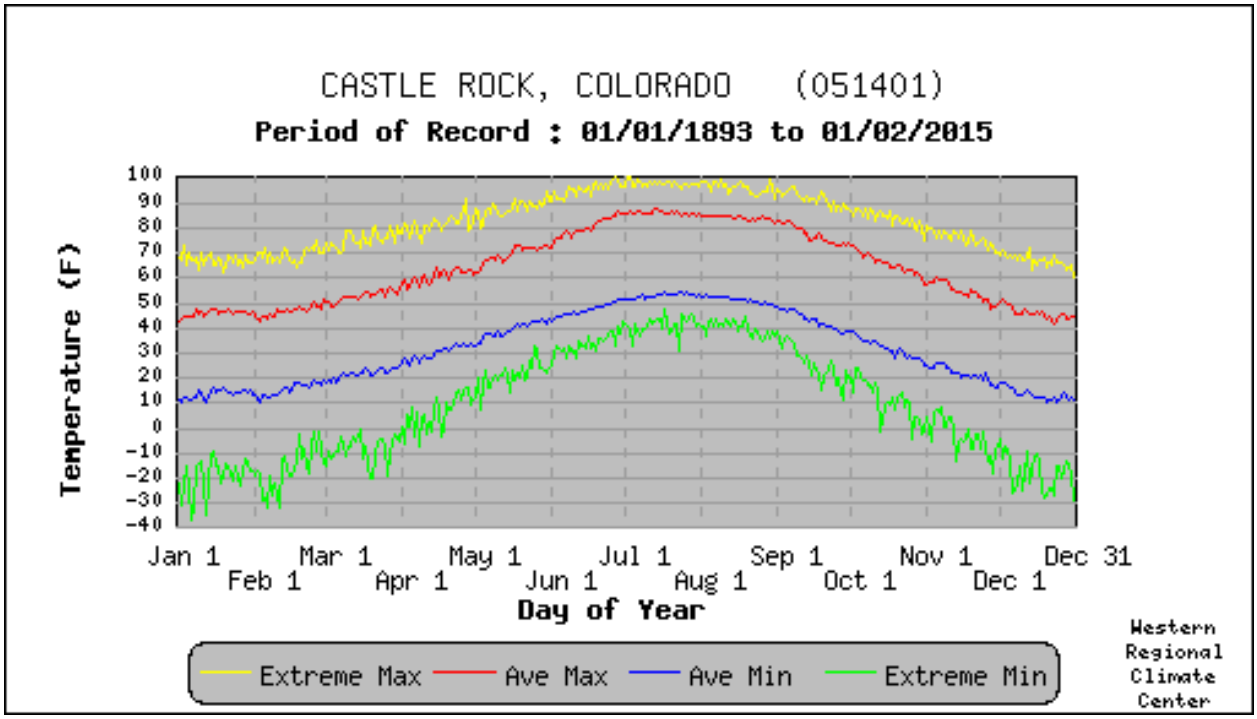


Source: National Weather Service

Castle Rock Station—Period of Record 1/1/1893 to 3/27/2013

In Douglas County, monthly average minimum temperatures from November through April range from the low 10's to the upper 20's. The lowest recorded daily extreme was -37°F on January 6, 1913. In a typical year, minimum temperatures fall below 32°F on 187.0 days with 14.8 days falling below 0°F. Temperature extremes for Douglas County are shown in Figure 4.26.

Figure 4.26. Douglas County Temperature Averages and Extremes



Source: Western Regional Climate Center

Past Occurrences

The NCDC records many instances of winter weather in Douglas County. In fact, there are 307 events recorded for the County since 1996. Table 4.22 summarizes these events by year, number of deaths and injuries, property damage, and crop damage. Many of the winter storms in Douglas County did not result in any casualties or damages. The most significant or damaging events are described in further detail after Table 4.23.

Table 4.22. NCDC Douglas County Winter Storm and Freeze Events 1996 – March 31, 2014

Year	Deaths	Injuries	Property Damage	Crop Damage
1996	1	0	$0	$0
1997	0	0	$0	$0
1998	3	15	$0	$0
1999	0	0	$0	$0
2000	0	0	$0	$0
2001	0	0	$3,100,000	$0
2002	0	0	$0	$0
2003	0	2	$31,000,000	$0
2004	0	0	$0	$0
2005	0	0	$0	$0

Year	Deaths	Injuries	Property Damage	Crop Damage
2006	0	0	$0	$0
2007	0	0	$0	$0
2008	0	0	$0	$0
2009	0	0	$0	$0
2010	0	0	$0	$0
2011	0	0	$0	$0
2012	0	0	$0	$0
2013	0	0	$0	$0
2014	0	0	$0	$0
Total	**4**	**17**	**$34,100,000**	$0

Source: NCDC

The SHELDUS database aggregates hazard by type. The SHELDUS database contains the following winter storm and freeze events shown in Table 4.23.

Table 4.23. SHELDUS Douglas County Winter Storm and Freeze Events 1960-2012

Hazard	Crop Damage	Property Damage	Injuries	Fatalities	Records
Flooding/ Severe Storm/Thunder Storm/ Winter Weather	$0	$794	0	0	1
Hail/ Severe Storm/Thunder Storm/ Winter Weather	$139	$2,062	0	0	2
Severe Storm/Thunder Storm/ Winter Weather	$0	$28,714	0	0	5
Wind/ Winter Weather	$12,391	$103,464	0.03	0.18	17
Winter Weather	$97,885	$10,578,861	3.7	3.01	47
Total	**$110,415**	**$10,713,895**	**3.73**	**3.19**	**72**

Source: SHELDUS

Specific winter storms that caused large amounts of damage or substantial impacts in the Planning Area are described in further detail below.

October 24-25, 1997—The October 1997 blizzard "buried nearly all of eastern Colorado under deep and drifted snow, brought transportation to a standstill, killed thousands of livestock, and resulted in the deaths of close to ten Coloradoans. For much of eastern Colorado, particularly the Arkansas Valley, the combined effects of heavy snow, very strong winds and the extreme cold temperatures for so early in the season, created what appears to be the most severe October Colorado blizzard in recorded history. This followed just two weeks after a vicious round of thunderstorms brought hail and a tornado to southeast Colorado late on the 11th."[1] The state declared an emergency for severe snowfalls.

[1] Colorado Climate Center, Atmospheric Science Department, Colorado State University. "October 1997." http://ccc.atmos.colostate.edu/~odie/climsum/oct97.html, accessed February 16, 2015.

April 2001—The state incurred severe winter storms including high winds and ice, snapping power poles and downing lines, leaving many residents and businesses without power. The state requested and received a presidential disaster declaration (DR-1374) for severe winter storms. Over $550,000 was received in hazard mitigation funds.

March 17-20, 2003—The blizzard of March 2003 was a major winter storm which paralyzed most of the communities in the Denver Metro region for five or more days with some areas receiving over 90" of snow during that period. Estimated insurance claims were over $33 million, making it the most expensive winter storm from snow and ice damage in state history. The main damage was the result of wet, heavy snow that caused many roofs, porches, awnings, carports, and outbuildings to collapse and significant damage from downed trees and limbs. Colorado received an emergency declaration (EM-3185) for this blizzard. Twenty-nine counties requested assistance. The state and communities received $6.2 million in federal funds through the public assistance program. No hazard mitigation funds were included with the emergency declaration.

December 2006—Two federal and state emergencies were declared as a result of two major snowstorms that occurred on December 20-21, 2006 (EM-3270) and December 28-30, 2006 (EM-3271). According to NWS records, "…large, slow-moving storms dropped heavy snow along with strong winds to produce blizzard conditions on the plains. Total cost of lost revenue, snow removal and livestock losses for both storms was estimated in the tens of millions of dollars. The residual effects of the storms included huge ruts on local streets in the Denver Metro area for weeks, and the heavy snowpack created an extremely cold winter into early springs followed by a flood threat over southeast Colorado."[2]

Likelihood of Future Occurrences

High—Winter storms and freeze are likely to occur annually in Douglas County.

4.2.9 Avalanche

Hazard/Problem Description

Avalanches occur when loading of new snow increases stress at a rate faster than strength develops, and the slope fails. Critical stresses develop more quickly on steeper slopes and where deposition of wind-transported snow is common. The vast majority of avalanches occur during and shortly after storms. This hazard generally affects a small number of people, such as snowboarders, skiers, and hikers who venture into backcountry areas during or after winter storms. Roads and highway closures, damaged structures, and destruction of forests are also a direct result of avalanches. The combination of steep slopes, abundant snow, weather, snowpack, and an impetus to cause movement create an avalanching episode. The potential for avalanche hazards exists in western Douglas

[2] National Weather Service Weather Forecast Office, Denver/Boulder, CO. "The Top 10 Colorado Weather Events over the Past 10 Years (2001-2010)." http://www.crh.noaa.gov/bou/?n=top10cowxevents, accessed February 16, 2015.

County, where combinations of the above criteria occur.

Past Occurrences

A search of the NCDC, SHELDUS, and the Colorado Avalanche Information Center yielded no avalanche events for Douglas County. This is not to say that avalanches have not occurred, but that no damages to people or property from avalanche have been reported to these databases. The HMPC could also not recall any avalanche events in the Planning Area.

Likelihood of Future Occurrences

Low —No damages to people or property from avalanches has been reported in the County. Given the topography and amount of snow falling on an annual basis in western Douglas County there is some potential risk to avalanche, but the lack of historical events indicates that avalanches are unlikely to occur in the Planning Area. Avalanche warnings are posted after winter storms; therefore, information is available to reduce the risk to those in avalanche prone areas.

4.2.10 Drought

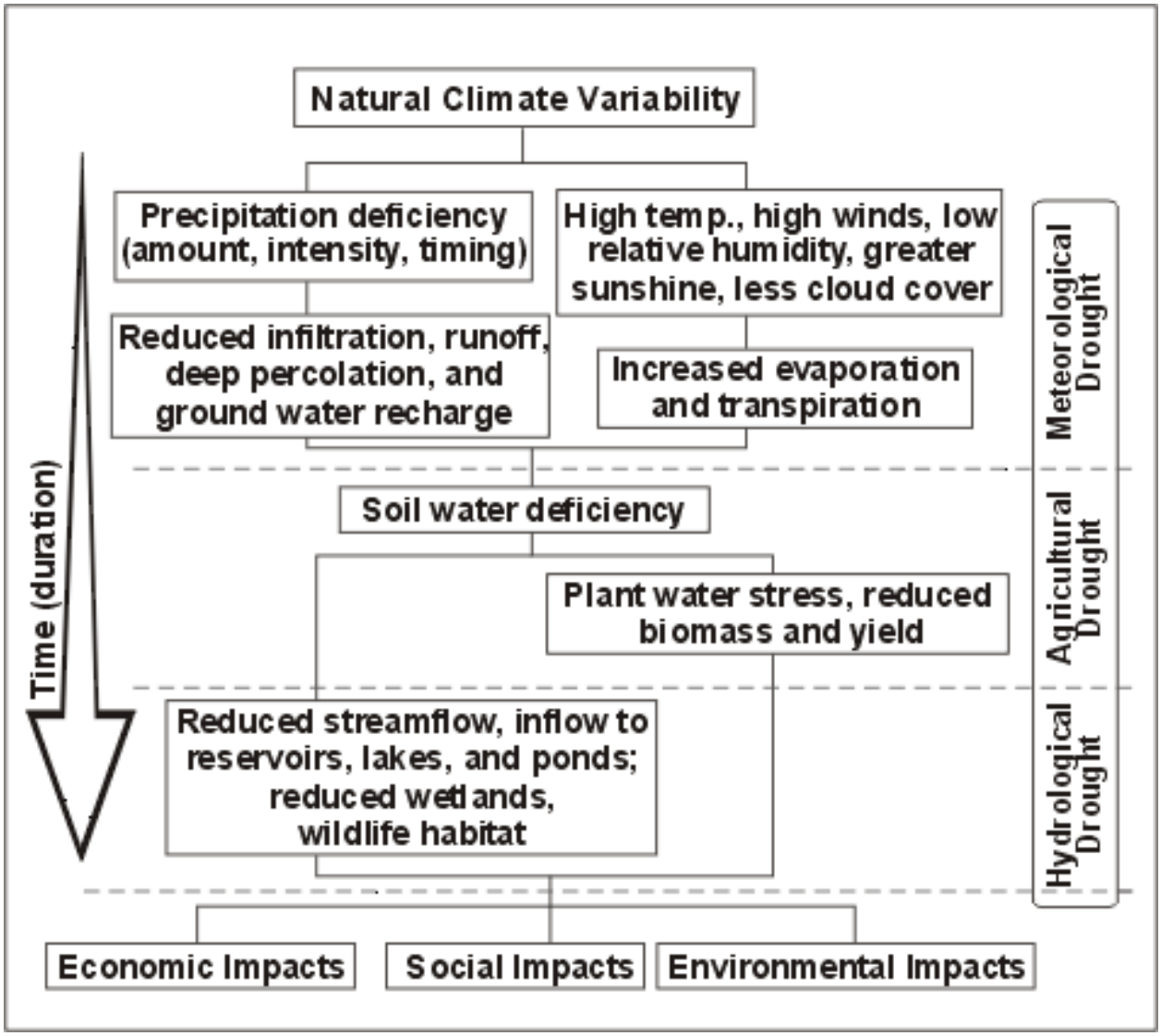
Hazard/Problem Description

Drought is a gradual phenomenon. Although droughts are sometimes characterized as emergencies, they differ from typical emergency events. Most natural disasters, such as floods or forest fires, occur relatively rapidly and afford little time for preparing for disaster response. Droughts occur slowly, over a multi-year period, and it is often not obvious or easy to quantify when a drought begins and ends.

Drought is a complex hazard (see Figure 4.27) involving many factors—it occurs when a normal amount of moisture is not available to satisfy an area's usual water-consuming activities. Drought can often be defined regionally based on its effects:

- **Meteorological drought** is usually defined by a period of below average water supply.
- **Agricultural drought** occurs when there is an inadequate water supply to meet the needs of the state's crops and other agricultural operations such as livestock.
- **Hydrological drought** is defined as deficiencies in surface and subsurface water supplies. It is generally measured as streamflow, snowpack, and as lake, reservoir, and groundwater levels.
- **Socioeconomic drought** occurs when a drought impacts health, well-being, and quality of life, or when a drought starts to have an adverse economic impact on a region.

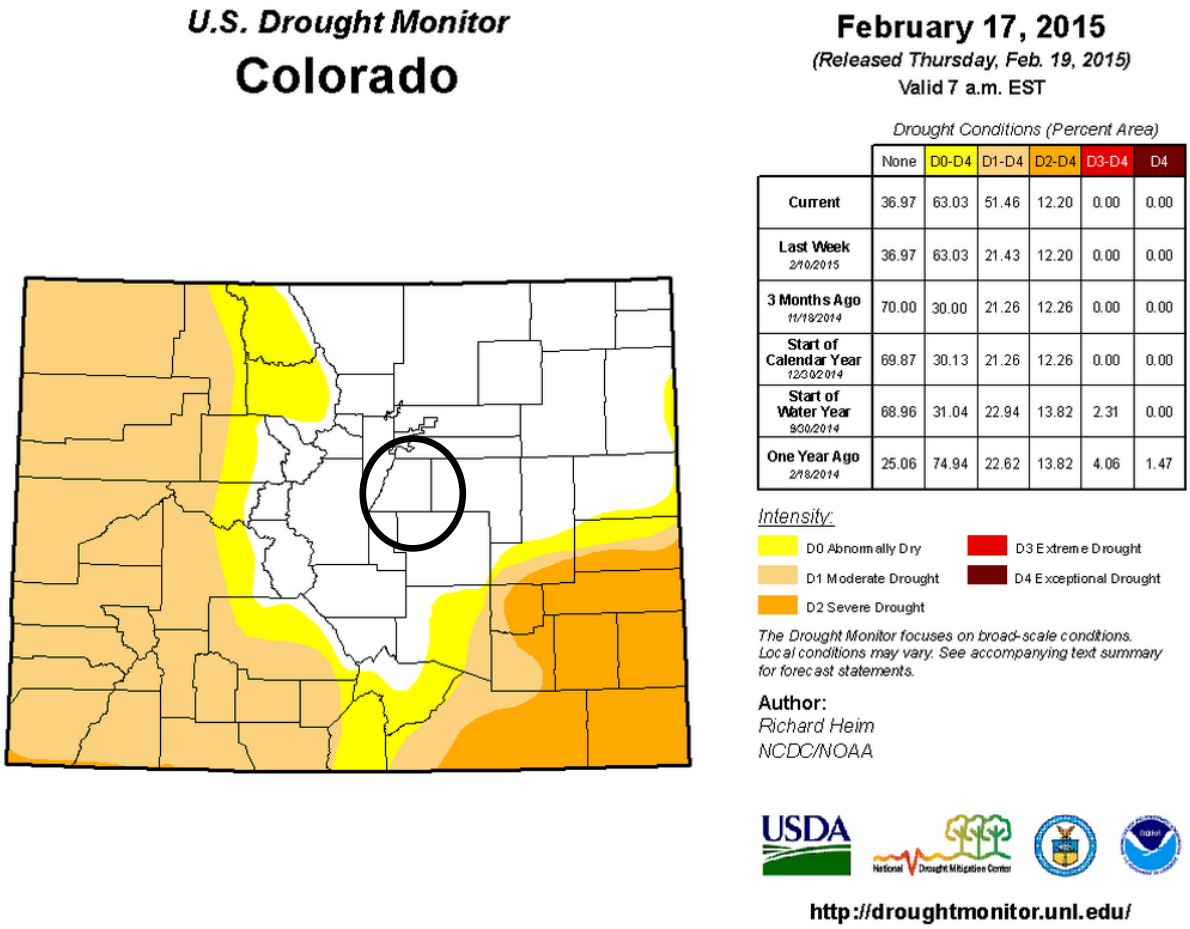
Figure 4.27. Causes and Impact of Drought



Source: National Drought Mitigation Center

Drought in the United States is monitored by the National Integrated Drought Information System (NIDIS). A major component of this portal is the U.S. Drought Monitor. The Drought Monitor concept was developed jointly by the NOAA's Climate Prediction Center, the NDMC, and the USDA's Joint Agricultural Weather Facility in the late 1990s as a process that synthesizes multiple indices, outlooks and local impacts, into an assessment that best represents current drought conditions. The final outcome of each Drought Monitor is a consensus of federal, state, and academic scientists who are intimately familiar with the conditions in their respective regions. A snapshot of the drought conditions in Colorado and the Planning Area can be found in Figure 4.28.

Figure 4.28. Current Drought Status in Douglas County – February 17, 2015



Source: U.S. Drought Monitor

Drought impacts are wide-reaching and may be economic, environmental, and/or societal. The most significant impacts associated with drought in the Planning Area are those related to water intensive activities such as agriculture, wildfire protection, municipal usage, commerce, tourism, recreation, and wildlife preservation. Also, during a drought, allocations go down, which results in reduced water availability. Voluntary conservation measures are typically implemented during extended droughts. A reduction of electric power generation and water quality deterioration are also potential problems. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding.

Past Occurrences

Several times since the late 1800s, Colorado has experienced conditions of drought. The most dramatic occurred in the 1930s and 1950s when many states, Colorado included, were affected for several years at a time. Table 4.24, drawn from a study done by McKee, Pielke, and Doesken, shows six multi-year droughts experienced in Colorado since 1893. The 2002 drought occurred after the study was published, but the table has been modified to reflect Colorado's most recent and intense drought from 2002 to 2006.

Table 4.24. Historical Dry and Wet Periods in Colorado

Date	Dry	Wet	Duration (years)
1893-1905	X		12
1905-1931		X	26
1931-1941	X		10
1941-1951		X	10
1951-1957	X		6
1957-1959		X	2
1963-1965	X		2
1965-1975		X	10
1975-1978	X		3
1979-1999*		X	20
2000-2006*	X		6
2007-2010*		X	3
2010-2012*	X		2

Source: McKee, et al. *modified for the Colorado State Drought Plan in 2013 based on input from the Colorado Climate Center

The following is a summary of information on major droughts that have affected Colorado.

The 1930s Drought – The Dust Bowl drought severely affected much of the United States during the 1930s. Figure 4.29 illustrates the extent of the Dust Bowl as defined by the Soil Conservation Service.

Figure 4.29. Extent of the Dust Bowl

Source: Public Broadcasting System American Experience "Surviving the Dust Bowl" www.pbs.org/wgbh/amex/dustbowl/maps/index.html

The drought came in three waves, 1934, 1936, and 1939-40, but some regions of the High Plains experienced drought conditions for as many as eight consecutive years. The soil, depleted of moisture, was lifted by the wind into great clouds of dust and sand which were so thick they concealed the sun for several days at a time. They were referred to as "black blizzards." The period itself is known as the Dust Bowl. The "black blizzards" were caused by sustained drought conditions compounded by years of land management practices that left topsoil susceptible to the forces of the wind.

The agricultural and economic damage devastated residents of the Great Plains. The Dust Bowl drought worsened the already severe economic crises that many Great Plains farmers faced. In the early 1930s, many farmers were trying to recover from economic losses suffered during the Great Depression. To compensate for these losses, they began to increase their crop yields. High production drove prices down, forcing farmers to keep increasing their production to pay for both their equipment and their land. When the drought hit, farmers could no longer produce enough crops to pay off loans or even pay for essential needs. Even with federal emergency aid, many Great Plains farmers could not withstand the economic impacts of the drought. The agricultural and economic damage devastated residents of the Great Plains.

Many factors contributed to the severe impact of this drought, and in its aftermath a better

understanding of the interactions between the natural elements (climate, plants, and soil) and human-related elements (agricultural practices, economics, and social conditions) of the Great Plains developed. As a result, farmers adopted new cultivation methods to help control soil erosion in dry land ecosystems; consequently, subsequent droughts in the region have not had the same impact.

The 1950s Drought – During the 1950s, the Great Plains and the southwestern U.S. withstood a five-year drought, and in three of these years, drought conditions stretched coast to coast. The 1950s drought was characterized by both decreased rainfall and excessively high temperatures. The first effects of the drought were felt in the southwestern U.S. in 1950 and by 1953 conditions had spread to Oklahoma, Kansas, and Nebraska. By 1954, the drought encompassed a ten-state area reaching from the mid-west to the Great Plains, and southward into New Mexico. The area from the Texas panhandle to central and eastern Colorado, western Kansas, and central Nebraska experienced severe drought conditions. The drought maintained a stronghold in the Great Plains, reaching a peak in 1956. The drought devastated the region's agriculture, with crop yields in some areas decreased as much as 50%. Excessive temperatures and minimal rainfall scorched grasslands typically used for grazing. With grass scarce, hay prices rose, forcing some ranchers to feed their cattle a mixture of prickly pear cactus and molasses. By the time the drought subsided in 1957, many counties across the region were declared federal drought disaster areas.

The 1977 Drought – During 1976 and 1977, the State experienced record-low stream flows at two-thirds of the major stream gages, records that held until the 2002 drought. Agriculture producers had to incur higher crop production costs due to short water supplies; and numerous municipalities were forced to impose water use restrictions on their customers. The State's agriculture producers and municipalities received over $110 million in federal drought aid as a result of the 1976-1977 drought.

1994 Drought – On August 1st, in response to extremely arid conditions, the Governor activated, by memorandum, several Task Forces to assess impacts. Significant impacts reported included an increase in wildfires statewide, loss of the winter wheat crops, difficulties with livestock feeding, and impacts to the State's fisheries.

1996 Drought – July 29th, the Governor issued an Executive Order (D000996) proclaiming a Drought Disaster Emergency Declaration.

2002 Drought – According to the 2010 Colorado Drought Mitigation Plan, in 2002 Colorado experienced the worst drought in the State's history. These conditions were rated 'exceptional' by the U.S. Drought Monitor and were the most severe drought experienced in the region since the Dust Bowl. Indeed, based on studies of tree rings and archaeological evidence from aboriginal cultures, the Colorado drought was arguably the worst in the recorded history of the State.

The drought of 2002 had its roots in the autumn of 1999. After a very wet spring and a soggy August, precipitation patterns reversed and the fall of 1999 was very dry across most of Colorado. The winter of 1999-2000 followed with below average snow fall and above average temperatures. Dryness continued into spring and early summer over northeast Colorado and the South Platte watershed and drought conditions quickly emerged. A persistently hot summer with

evapotranspiration rates higher than average deteriorated conditions. The 2001 water year, although less extreme continued to trend on the dry side.

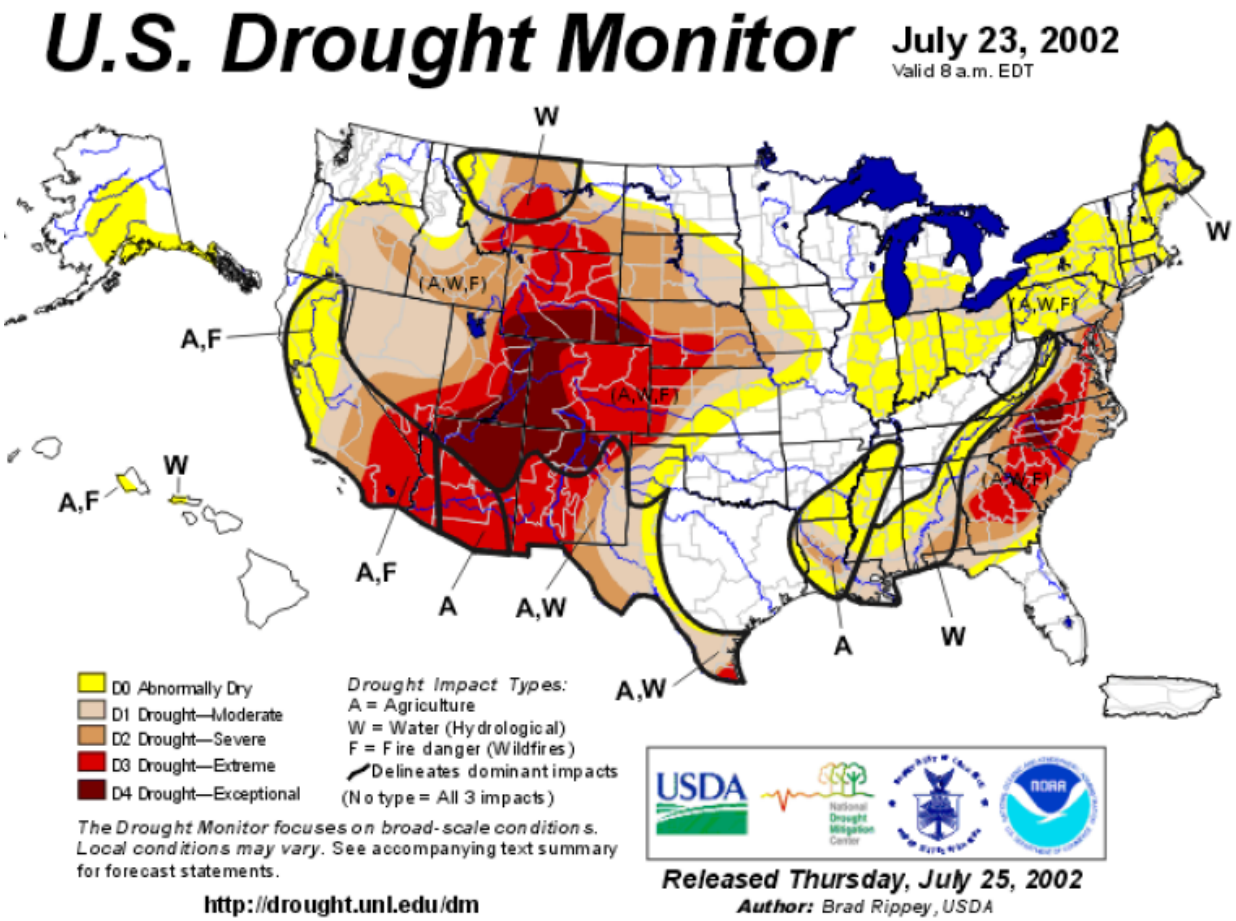
October 2001 weather patterns appeared more favorable as a variety of storm systems crossed the region. However the storms resulted in little moisture and when the month was over precipitation totaled again less than 50% of average over the majority of the State. November and December brought some snow accumulation but snow water content remained below average, and January's above average snowfall came down in the Front Range urban corridor and the southeastern plains, contributing very little to overall water supplies. February and March, despite cooler temperatures and numerous storm systems, did not see the copious wet snows that Colorado spring snowstorms typically produce. By the end of March 2002, the statewide snow water equivalent was a mere 52% of average and portions of Colorado's mountains were even further below average.

The spring storms that sometimes dump heavy and widespread precipitation were nonexistent in April and temperatures soared to record highs. In the mountains snow melted or evaporated at an alarming rate. Relative humidity on several afternoons fell to below 10%. Fire danger, which typically stays low to moderate through early June, was already high by mid-April. May was even drier. At a time of year when Colorado's rivers and streams are normally churning with snowmelt runoff, there were only mere glimpses of snowmelt flows. Irrigation water demand was high, and it was soon obvious that supplies would not last through the growing season. Municipalities began to face the possibility that available water supplies might not be sufficient to meet typical summertime demand. Many areas implemented strict water conservation restrictions. Forest fires erupted and each new blaze seemed to spread faster than the one before.

June arrived accompanied by relentless summer heat, temperatures routinely climbed above 90°F at lower elevations east and west of the mountains. Vegetation that normally grows lush and tall with spring moisture barely greened up. Relative humidity often dropped to less than 10%, and bans on outside burning were enforced statewide. Little or no precipitation fell for the entire month over western Colorado. Winter wheat crop conditions continued rapid deterioration, and ranchers quickly sold or relocated their herds in response to the poor range conditions and high cost of feed. The most severe fires of the season erupted in June, including the Hayman fire southwest of Denver which quickly grew to be the largest documented forest fire in Colorado (217 mi^2) on record .

July brought few changes. Below average precipitation persisted statewide and temperatures were above average for the fourth consecutive month. By late July, the entire state of Colorado was in a serious drought (see Figure 4.30).

Figure 4.30. 2002 Drought – Drought Monitor from July 23, 2002



Source: U.S. Drought Monitor

The first several days of August brought some hope for a respite but the monsoon moisture surge was brief. By mid-August, 100°F+ temperatures led media reports to liken conditions to the great Dust Bowl of the 1930s. As the month neared its end, a subtle change in weather patterns brought a round of spring-like thunderstorms loaded with hail and high winds to portions of eastern Colorado. Humid and stormy weather continued into September and for the first time since August 2001, the majority of Colorado received above average rainfall.

2011-2013 Drought – Even though 2011 was very wet across northern Colorado, the extreme drought during this time in Texas, New Mexico and Oklahoma was also felt in the Rio Grande and Arkansas Basins in Colorado. This trend continued in those basins as 2012 began but also increased in breadth across the rest of Colorado. Based on the U.S. Drought Monitor, approximately 50% of Colorado was already under drought conditions at the beginning of 2012. Drought conditions and a period of extremely hot temperatures in June 2012 contributed to very dry forests, contributing to the conditions that led to the High Park fire in northern Colorado and the Waldo Canyon fire near Colorado Springs, two of Colorado's most destructive wildfires. Reservoir levels in many portions of the State helped abate some of the drought impacts seen in 2011-2013. Had they not been at levels

sufficient for carryover storage into 2012 due to record breaking high snowpacks in 2011 in many river basins, many of the impacts discussed above may have been worse.

Likelihood of Future Occurrences

Medium—Historical drought data for the Planning Area (shown in Table 4.24) indicates there have been seven significant droughts in the last 121 years (1893-2014). This equates to a drought every 17.2 years on average or a 5.8% chance of a drought in any given year. Based on this data, droughts will likely affect the Planning Area.

4.2.11 Earthquake

Hazard/Problem Description

An earthquake is caused by a sudden slip on a fault. Stresses in the Earth's outer layer push the sides of the fault together. Stress builds up, and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and cause the shaking that is felt during an earthquake. The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. An earthquake's magnitude is expressed in whole numbers and decimals (e.g., 6.8). Seismologists have developed several magnitude scales. One of the first was the Richter Scale, developed in 1932 by the late Dr. Charles F. Richter of the California Institute of Technology. The Richter Magnitude Scale is used to quantify the magnitude or strength of the seismic energy released by an earthquake as recorded on seismographs. Richter magnitude is summarized in Table 4.25.

Table 4.25. Richter Scale Magnitudes

Richter Magnitudes	Description	Earthquake effects	Frequency of occurrence
Less than 2.0	Micro	Microearthquakes, not felt.	About 8,000 per day
2.0-2.9	Minor	Generally not felt, but recorded	About 1,000 per day
3.0-3.9		Often felt, but rarely causes damage.	49,000 per year (est.)
4.0-4.9	Light	Noticeable shaking of indoor items, rattling noises. Significant damage unlikely.	6,200 per year (est.)
5.0-5.9	Moderate	Can cause major damage to poorly constructed buildings over small regions. At most slight damage to well-designed buildings.	800 per year
6.0-6.9	Strong	Can be destructive in areas up to about 160 kilometers (100 mi) across in populated areas.	120 per year
7.0-7.9	Major	Can cause serious damage over larger areas.	18 per year
8.0-8.9	Great	Can cause serious damage in areas several hundred miles across.	1 per year
9.0-9.9		Devastating in areas several thousand miles across.	1 per 20 years

Source: US Geological Survey Earthquake Hazards Program FAQ - http://earthquake.usgs.gov/learn/faq/?categoryID=2

Another measure of earthquake severity is intensity. Intensity is an expression of the amount of

shaking at any given location on the ground surface (see Table 4.26). Seismic shaking is typically the greatest cause of losses to structures during earthquakes.

Table 4.26. Modified Mercalli Intensity (MMI) Scale

MMI	Felt Intensity
I	Not felt except by a very few people under special conditions. Detected mostly by instruments.
II	Felt by a few people, especially those on upper floors of buildings. Suspended objects may swing.
III	Felt noticeably indoors. Standing automobiles may rock slightly.
IV	Felt by many people indoors; by a few outdoors. At night, some people are awakened. Dishes, windows, and doors rattle.
V	Felt by nearly everyone. Many people are awakened. Some dishes and windows are broken. Unstable objects are overturned.
VI	Felt by everyone. Many people become frightened and run outdoors. Some heavy furniture is moved. Some plaster falls.
VII	Most people are alarmed and run outside. Damage is negligible in buildings of good construction, considerable in buildings of poor construction.
VIII	Damage is slight in specially designed structures, considerable in ordinary buildings, and great in poorly built structures. Heavy furniture is overturned.
IX	Damage is considerable in specially designed buildings. Buildings shift from their foundations and partly collapse. Underground pipes are broken.
X	Some well-built wooden structures are destroyed. Most masonry structures are destroyed. The ground is badly cracked. Considerable landslides occur on steep slopes.
XI	Few, if any, masonry structures remain standing. Rails are bent. Broad fissures appear in the ground.
XII	Virtually total destruction. Waves are seen on the ground surface. Objects are thrown in the air.

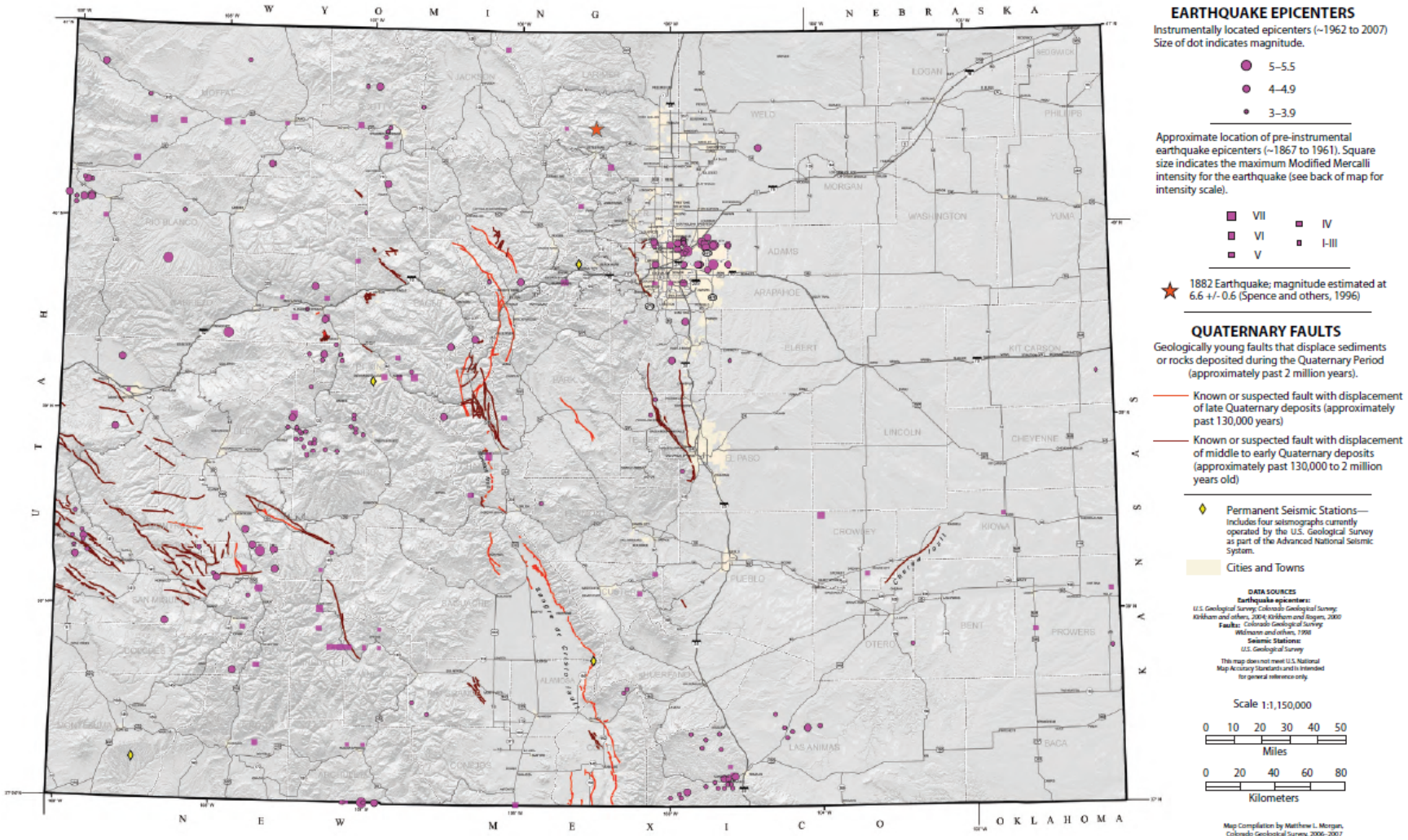
Source: Multi-Hazard Identification and Risk Assessment, FEMA 1997

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. 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, seiches, liquefaction, fires, and dam failure. Seismic shaking is typically the greatest cause of losses to structures during earthquakes.

Faults

Colorado is considered a region of minor earthquake activity. Geologic studies indicate there are about 90 potentially active faults in Colorado with documented movement within the last 1.6 million years. Potentially active faults, which represent the highest earthquake hazard, are those that have ruptured to the ground surface during the Holocene period (about the last 15,000 years). Faults with evidence of movement during the past 130,000 years are often considered active faults. These faults are shown in red on Figure 4.31. Faults that last moved between 130,000 and 2 million years ago may be considered potentially active. Locations of these faults are depicted on the map by the dark red-brown lines. Thousands of other faults exist in Colorado, but few have been studied in sufficient detail to determine their activity during the recent geologic past. Some of these faults also may be a potential concern. Figure 4.31 shows the location of faults and earthquake epicenters in Colorado.

Figure 4.31. Colorado's Earthquake and Fault Map



In the 2013 State Hazard Mitigation Plan, discussion about earthquake hazards indicates that the historical assumption about earthquake vulnerability in the State (namely, that said vulnerability is low) may be false. The "Earthquake Evaluation Report" issued by the Colorado Geological Survey (CGS) is included as an annex in the 2013 State Plan. This report extensively reviews the history of earthquake analysis in the State, and indicates that significant funding and time investments are required to determine a more realistic evaluation of the earthquake threat to the State. As part of the report, the CGS ran HAZUS (FEMA's HAZards United States software) to perform several different loss prediction analyses by county. Table 4.27 summarizes this information for regional faults that could impact Douglas County.

Table 4.27. Colorado Faults that Could Affect Douglas County

County	Fault	Magnitude	Default Attenuation Function	Estimated Fatalities	Estimated Total Damages	Loss Ratio of Total Building Stock
Douglas	Chase Gulch	M6.75	WUS	0	$15.3 million	0.1%
	Cheraw	M7.0	CEUS	0	$32.3 million	0.22%
	Frontal	M7.0	WUS	0	$10 million	0.07%
	Golden	M6.5	Reverse WUS	4	$323.4 million	2.2%
		M6.5	Normal CEUS	5	$484.6 million	3.3%
		M5.5	Reverse WUS	0	$28.7 million	0.2%
		M5.5	Normal CEUS	0	$6.5 million	0.04%
	Rampart	M7.0	WUS	59	906.5 million	6.1%
		M7.0	CEUS	145	$2.84 billion	19.2%
		M6.5	WUS	10	$231 million	1.6%
		M6.5	CEUS	33	$901.4 million	6.1%
		M6.0	WUS	1	$61.4 million	0.4%
		M6.0	CEUS	4	$280.8 Million	1.9%
		M5.5	CEUS	0	$81.6 million	0.55%
	N Sawatch	M7.0	WUS	0	$4.8 million	0.03%
	Ute Pass	M7.0	WUS	10	$292.6 Million	1.8%
		M7.0	CEUS	41	$1.15 Billion	7.8%
		M6.5	WUS	1	$83.2 million	0.56%
		M6.5	CEUS	5	$346 million	2.3%
		M5.5	WUS	0	$6.2 million	0.04%
		M5.5	CEUS	0	$26 million	0.2%

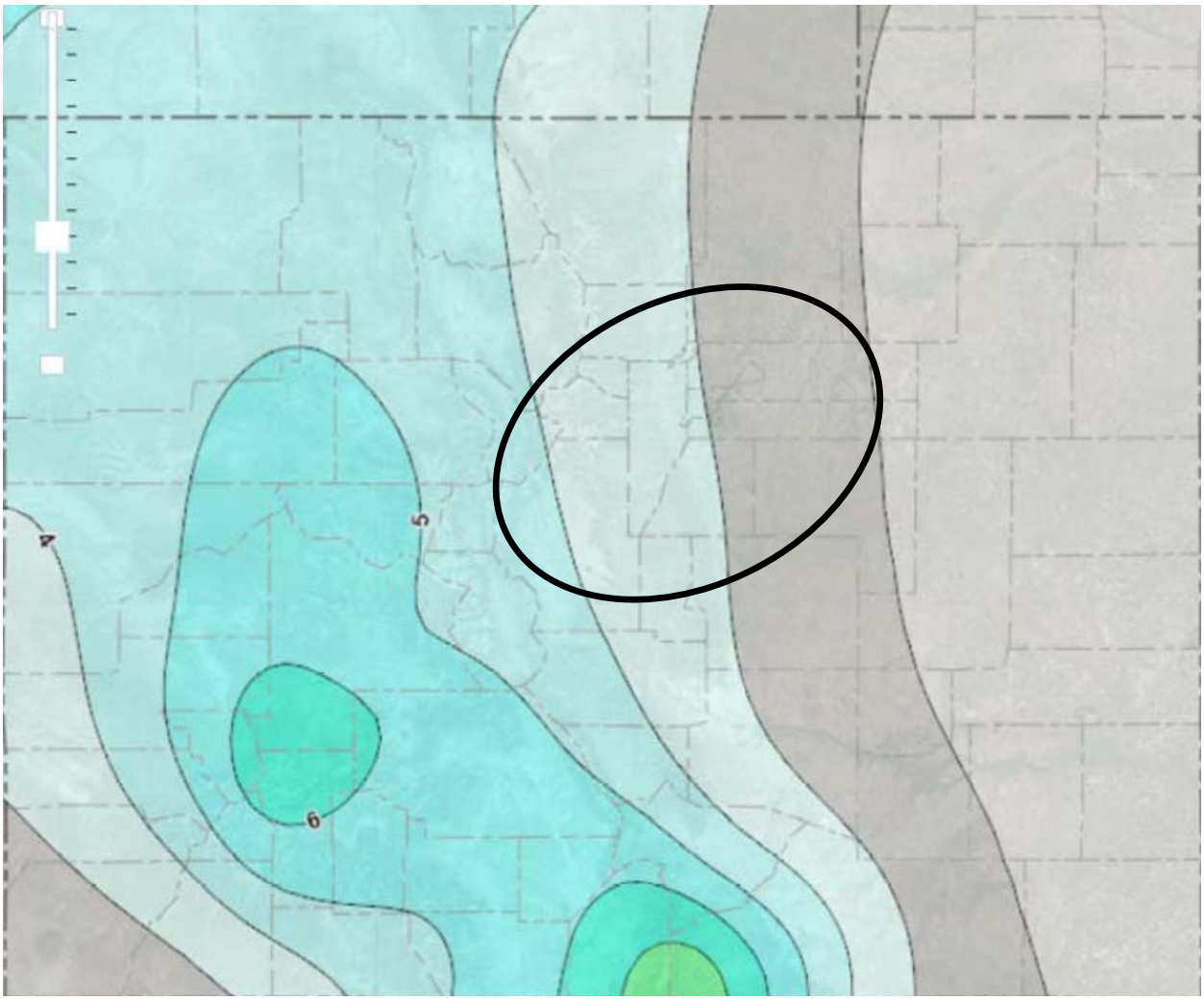
WUS: Western U.S. Attenuation Function
CEUS: Central U.S. Attenuation Function
Loss Ratio of Total Building Stock: This refers to the percentage of total building stock value damaged. The higher the ratio, the more difficult it is to restore a community to viability.

Source: 2008 Colorado Geological Society Earthquake Evaluation Report

Based on the history of previous occurrences, as documented below, there is also indication that counties without known, active faults are at risk for earthquakes. No geographically extensive earthquakes have occurred in the Planning Area, but the potential remains.

The U.S. Geological Survey (USGS) issues National Seismic Hazard Maps as reports every few years. These maps provide various acceleration and probabilities for time periods. Figure 4.32 depicts the peak horizontal acceleration (%g) with 10% probability of exceedance in 50 years for the planning region (500-year return interval). Figure 4.32 demonstrates that the County falls in the 3 to 4%g area. This data indicates that the expected severity of earthquakes in the region is somewhat limited, as damage from earthquakes typically occurs at peak accelerations of 30%g or greater.

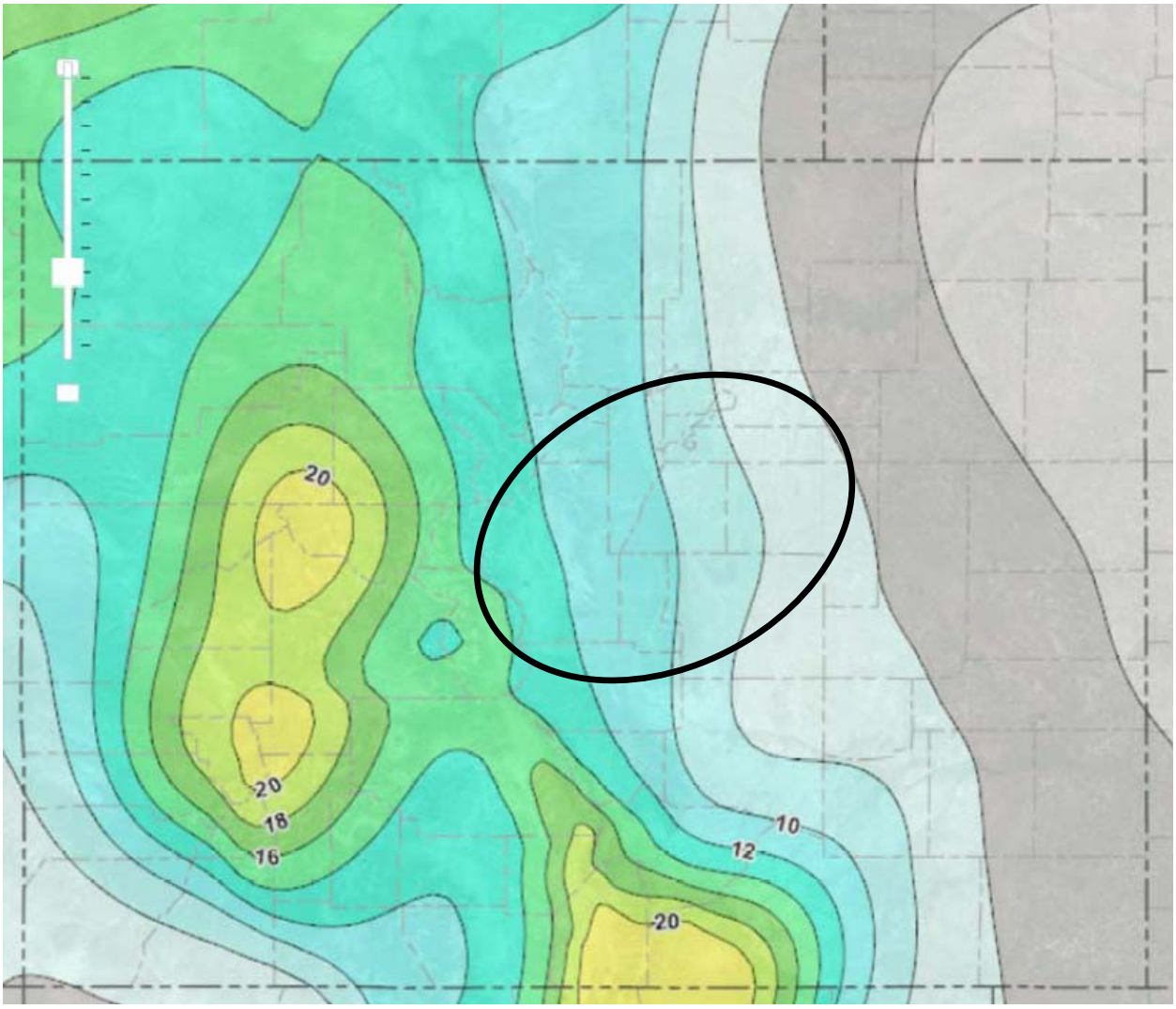
Figure 4.32. Peak Horizontal Acceleration with 10% Probability of Occurrence in 50 Years



Source: USGS National Seismic Hazard Maps - 2008 Interactive Tool. Available online at http://gldims.cr.usgs.gov/nshmp2008/viewer.htm

Figure 4.33 depicts the peak horizontal acceleration (%g) with 2% probability of exceedance in 50 years for the County (2,500-year return interval). Figure 4.33 demonstrates that the County falls in the 10-12%g area. This data indicates that the expected severity of earthquakes in the region is somewhat limited, as damage from earthquakes typically occurs at peak accelerations of 10-15%g or greater.

Figure 4.33. Peak Horizontal Acceleration with 2% Probability of Occurrence in 50 Years



Source: USGS National Seismic Hazard Maps - 2008 Interactive Tool. http://gldims.cr.usgs.gov/nshmp2008/viewer.htm.

Past Occurrences

Based on historical data, Douglas County is located within a region with faults that are capable of producing maximum credible earthquakes of up to magnitude 6.5. Although the County has felt ground shaking from earthquakes with epicenters located elsewhere, no major earthquakes have been recorded within the County. There have been no disaster declarations in the County for earthquakes.

Notable regional earthquake events include those detailed below. It is unknown whether damages occurred within Douglas County and to what extent these events were actually felt by County residents.

- The largest earthquake recorded along the Front Range occurred on November 7, 1882. The epicenter of this 6.2 magnitude (estimated) earthquake is thought to have been located in northern Colorado near Estes Park. Shaking was felt throughout Colorado and into southern Wyoming and northeastern Utah. An aftershock occurred the next day and was mostly felt in northern Colorado along the Front Range.
- December 4, 1962: The Denver area experienced an earthquake on December 4, 1962 that was felt over approximately 12,000 km^2. Major and Simon (1968) calculated the magnitude of this event at ML 3.5.[3]
- April 10, 1967: The April 10, 1967 earthquake caused damage over part of the Denver Metro area…Intensity VI damage was reported in 20 locations. Plaster cracked, foundations cracked, chimneys cracked, concrete and asphalt parking lot surfaces cracked, water pipes broke, and many windows, including 118 at the Rocky Mountain Arsenal, were broken." The earthquake was felt at Intensity V in Castle Rock, and the magnitude was estimated at roughly 4.8.[4]
- April 2, 1981, Thornton: On April 2, 1981 at 9:10 a.m. MST, a sharp earthquake, magnitude 4.1, occurred that was centered approximately 20 km north of downtown Denver in the Thornton area. Some slight damage (MM VI) was observed at Commerce City and Thornton. The quake was felt in other parts of Adams County and in parts of Arapahoe, Boulder, Clear Creek, Denver, Douglas, Jefferson, Gilpin, and Weld Counties. This earthquake was preceded by a small tremor located in the same area on March 24 at 6:04 a.m. MST with magnitude 2.8. It was felt in the Commerce City and Northglenn-Thornton area. The north-central part of Colorado experienced a small earthquake on September 16, 1981 at 1:59 p.m. MDT. The magnitude 2.1 tremor was located in the Commerce City-Thornton area and was felt by a few people in that area. A minor but alarming earthquake occurred in the north-central part of Colorado on November 1, 1981, at 8:03 p.m. MST. The magnitude 3.1 tremor was centered in the Evergreen area about 22 miles southwest of Denver. The effects registered MM V, and were experienced in the Conifer, Evergreen, and Pine Junction areas. It was also felt in other parts of Jefferson County and in parts of Clear Creek and Park Counties (Colorado Earthquake History, http://earthquake.usgs.gov/earthquakes/states/colorado/history.php, accessed January 28, 2015).
- Dec. 25, 1994 Palmer Lake: On Christmas Day of 1994, Palmer Lake and Larkspur experienced intensity V shaking during a magnitude Mn 4.0 earthquake. The NEIC database reported an epicentral location about nine kilometers southeast of Castle Rock.[5]

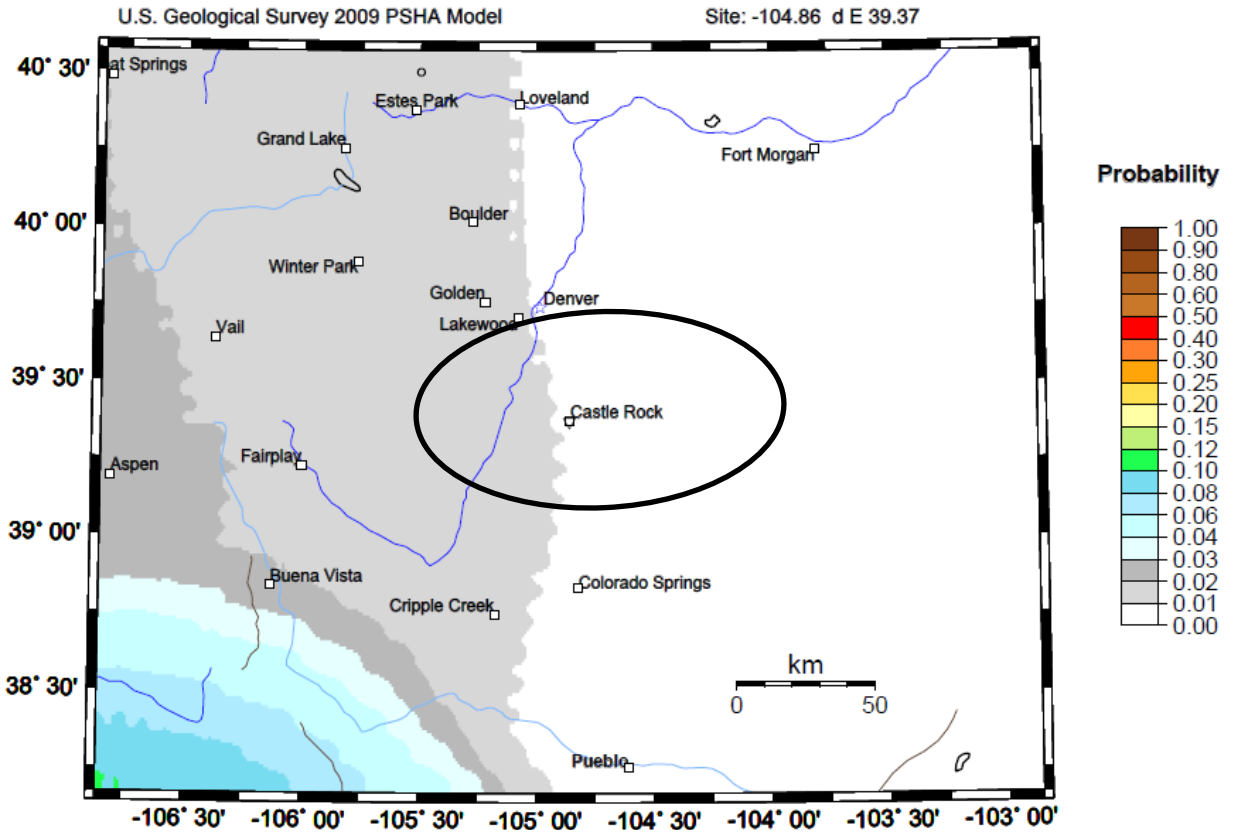
[3] Kirkman, Robert M. and William P. Rogers. Colorado Geological Survey. Colorado Earthquake Information, 1867-1996. Colorado Geological Survey Bulletin 52, pg. 71.
[4] Ibid, pg. 84-88.
[5] Kirkman, Robert M. and William P. Rogers. Colorado Geological Survey. Colorado Earthquake Information,

- July 22, 2001 Teller County: A 3.1 magnitude earthquake was recorded in Teller County, just to the south of Douglas County, on July 22, 2001.

Likelihood of Future Occurrences

Low—No major earthquakes have been recorded within the County; although the County has felt ground shaking from earthquakes with epicenters located elsewhere. Figure 4.34, from the 2008 National Seismic Hazard Mapping Project, indicates that Douglas County has a lower risk of earthquake occurrence, which coincides with the likelihood of future occurrence rating of **low**.

Figure 4.34. Probability of Earthquake Magnitudes Occurring in 30 Year Time Frame



Source: United States Geological Survey

4.2.12 Flood: Dam Failure

Hazard/Problem Description

Dams are manmade structures built for a variety of uses including flood protection, power generation, agriculture, water supply, and recreation. When dams are constructed for flood

1867-1996. Colorado Geological Survey Bulletin 52, pg. 116.

protection, they are usually engineered to withstand a flood with a computed risk of occurrence. For example, a dam may be designed to contain a flood at a location on a stream that has a certain probability of occurring in any one year. If prolonged periods of rainfall and flooding occur that exceed the design requirements, that structure may be overtopped and fail. Overtopping is the primary cause of earthen dam failure in the United States.

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

- Earthquake;
- Inadequate spillway capacity resulting in excess overtopping flows;
- Internal erosion caused by embankment or foundation leakage, or piping or rodent activity;
- Improper design;
- Improper maintenance;
- Negligent operation; and/or
- Failure of upstream dams on the same waterway.

Water released by a failed dam generates tremendous energy and can cause a flood that is catastrophic to life and property. A catastrophic dam failure could challenge local response capabilities and require evacuations to save lives. Impacts to life safety will depend on the warning time and the resources available to notify and evacuate the public. Major loss of life could result as well as potentially catastrophic effects to roads, bridges, and homes. Electric generating facilities and transmission lines could also be damaged and affect life support systems in communities outside the immediate hazard area. Associated water supply, water quality and health concerns could also be an issue. Factors that influence the potential severity of a full or partial dam failure are the amount of water impounded; the density, type, and value of development and infrastructure located downstream; and the speed of failure.

In general, there are three types of dams: concrete arch or hydraulic fill, earth and rockfill, and concrete gravity. Each type of dam has different failure characteristics. A concrete arch or hydraulic fill dam can fail almost instantaneously; the flood wave builds up rapidly to a peak then gradually declines. An earth-rockfill dam fails gradually due to erosion of the breach; a flood wave will build gradually to a peak and then decline until the reservoir is empty. And, a concrete gravity dam can fail instantaneously or gradually with a corresponding buildup and decline of the flood wave.

Dams and reservoirs have been built throughout Colorado to supply water for agriculture and domestic use, to allow for flood control, as a source of hydroelectric power, and to serve as recreational facilities. The storage capacities of these reservoirs range from a few thousand acre feet to millions of acre-feet. The water from these reservoirs eventually makes its way to the Gulf of Mexico by way of several river systems.

The Colorado Division of Water Resources Dam Safety Branch assigns hazard ratings to large dams within the State. Two factors are considered when assigning hazard ratings: existing land

use and land use controls (zoning) downstream of the dam. Dams are classified in three categories that identify the potential hazard to life and property:

- High hazard indicates that a failure would most probably result in the loss of life
- Significant hazard indicates that a failure could result in appreciable property damage
- Low hazard indicates that failure would result in only minimal property damage and loss of life is unlikely

According to data provided by Colorado Division of Water Resources Dam Safety Branch and Douglas County, there are 41 dams in Douglas County constructed for flood control, storage, electrical generation, and recreational purposes. Of the 41 dams located inside the County, 5 are rated as high hazard, 5 as significant hazard, and 31 as low hazard. Figure 4.35 identifies the dams located in the Douglas County Planning Area.

Figure 4.35. Location of High and Significant Hazard Dams in Douglas County

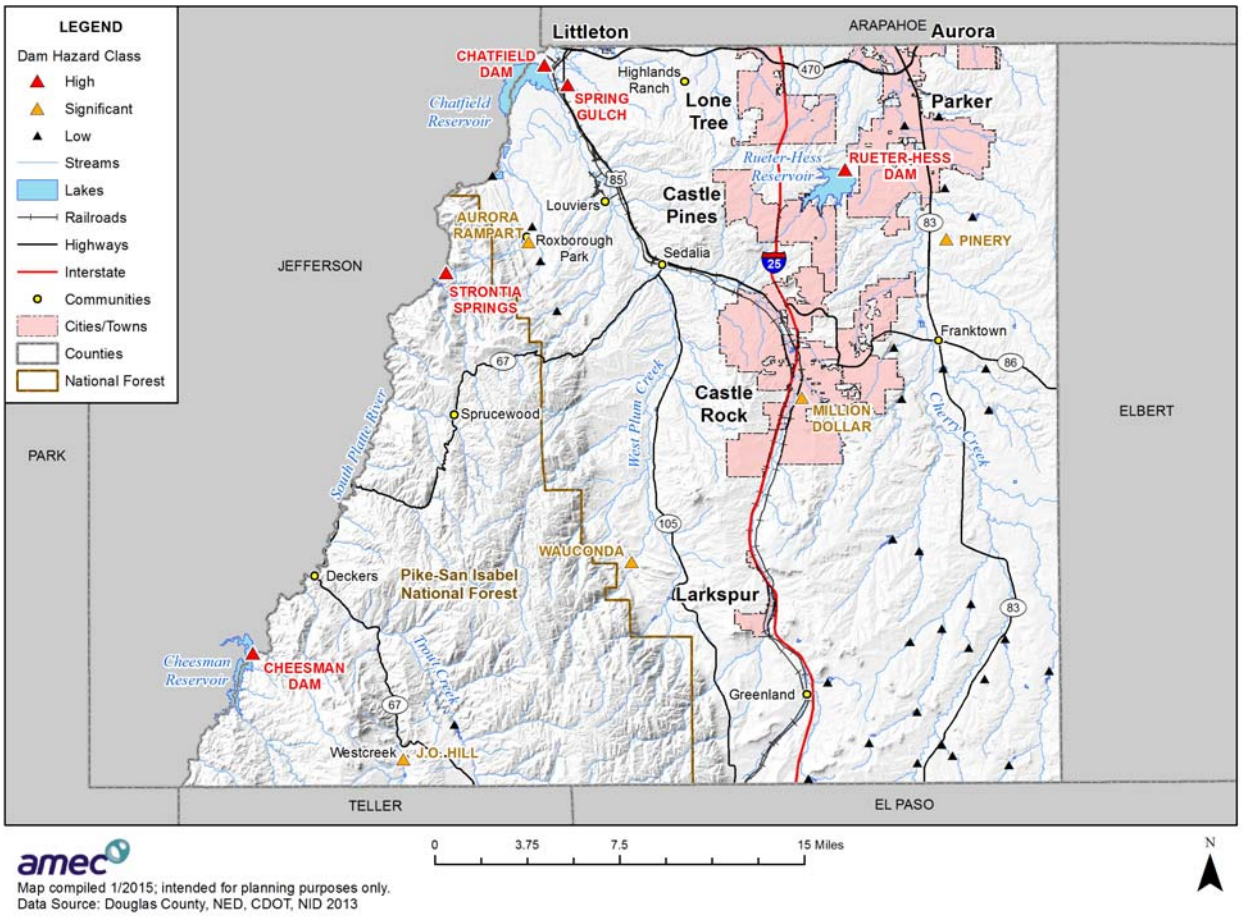


Table 4.28. Douglas County Dam Inventory

Name of Dam	Stream	Nearest City	Distance (in miles)	Hazard Class	Capacity (acre-feet)*	Dam Height (ft)	Year Built	EAP
Chatfield Dam	South Platte River	Denver	8	High	355,000	148	1973	Y
Cheesman	South Platte River	Deckers	5	High	87,227	221	1905	Y
Rueter-Hess	Newlin Gulch	Parker	3	High	72,000	196	2012	Y
Spring Gulch	Spring Gulch	Denver	8	High	1,752	68	1973	Y
Strontia Springs	South Platte River	Kassler	8	High	10,945	300	1982	Y
Aurora-Rampart	Willow Creek	Kassler	3	Significant	1,596	62	1964	Y
J. O. Hill	West Creek	Deckers	7	Significant	253	44	1977	Y
Million Dollar	E. Plum Creek	Castle Rock	1	Significant	61	10	1984	Y
Pinery	Cherry Creek	Parker	5	Significant	440	70	1970	Y
Wauconda	Bear Creek	Sedalia	11	Significant	606	45	1974	Y
Allis	Carpenter Creek-Tributary	Castle Rock	21	Low	225	45	1906	N
Baird #1	Russellville Gulch-Os	Franktown	2	Low	90	18	1907	N
Circle 2 Ranch Det. #1	Kinney Creek	Parker	6	Low	115	29	1964	N
Foothills Holding Pond	Willow Creek	Littleton	14	Low	62	30	1982	N
Franktown Parker FPA-1	Antelope Creek-Tributary	Elizabeth	9	Low	45	32	1963	N
Franktown Parker FPA-2	Antelope Creek-Tributary	Franktown	10	Low	131	25	1963	N
Franktown Parker FPA-4	Antelope Creek	Franktown	17	Low	192	30	1963	N
Franktown Parker FPA-5	Antelope Creek	Franktown	15	Low	334	30	1963	N
Franktown Parker FPA-6	Haskel Creek	Franktown	7	Low	399	26	1963	N
Franktown Parker FPB-1	Cherry Creek-Tributary	Denver	12	Low	219	27	1963	N
Franktown Parker FPE-7	Iron Gulch	Franktown	21	Low	178	32	1964	N

Name of Dam	Stream	Nearest City	Distance (in miles)	Hazard Class	Capacity (acre-feet)*	Dam Height (ft)	Year Built	EAP
Franktown Parker FPE-8	East Cherry Creek	Franktown	15	Low	953	52	1965	N
Franktown Parker FPLG-1	Lake Gulch	Franktown	9	Low	281	38	1962	N
Franktown Parker FPLG-2	Upper Lake Gulch	Franktown	9	Low	735	42	1962	N
Franktown Parker FPM-1	Mitchell Gulch-Tributary	Franktown	2	Low	184	44	1962	N
Franktown Parker FPP-1	Baldwin Gulch	Denver	13	Low	91	37	1963	N
Franktown Parker FPR-1	Wildcat Canyon	Franktown	3	Low	482	51	1964	N
Franktown Parker FPR-2	Reed Hollow	Franktown	3	Low	195	39	1964	N
Franktown Parker FPS-1	Cherry Creek-Tributary	Denver	25	Low	64	37	1963	N
Franktown Parker FPW-1	Willow Creek-Tributary	Franktown	3	Low	434	55	1963	N
Greenland L&C Stockwater	Carpenter Creek-Tributary	Larkspur	4	Low	100	18	1983	N
Nelson	Rainbow Creek	Louviers	6	Low	22	30	1953	N
Parker Bar CCC	Sulpher Gulch	Aurora	12	Low	228	25	1984	N
Platte Canyon	Little Willow Creek	Littleton	11	Low	1248	32	1904	N
Rainbow Falls #5	Trout Creek	Deckers	9	Low	200	20	1957	N
Stillwater	Antelope Creek	Franktown	20	Low	326	27	1999	N
W. Cherry Creek Det. #10	West Cherry Creek-Tributary	Franktown	16	Low	45	25	1961	N
W. Cherry Creek Det. #11	West Cherry Creek-Tributary	Franktown	15	Low	418	40	1961	N
W. Cherry Creek Det. #7	West Cherry Creek	Franktown	21	Low	799	44	1959	N
W. Cherry Creek Det. #8	Elk Creek	Franktown	20	Low	141	30	1960	N
W. Cherry Creek Det. #9	Elk Creek	Franktown	20	Low	186	35	1960	N

Name of Dam	Stream	Nearest City	Distance (in miles)	Hazard Class	Capacity (acre-feet)*	Dam Height (ft)	Year Built	EAP
Wakeman	Willow Creek	Littleton	16	Low	175	29	1959	N

Source: Colorado Division of Water Resources Dam Safety Branch
*One Acre Foot=326,000 gallons

The possibility of flood damage in the upper Cherry Creek area has been reduced somewhat by the construction of 32 floodwater retarding structures. The Soil Conservation Service (SCS) completed construction of these structures in 1965 as part of an overall plan. These structures were designed for a rural agricultural community with design floods having a 25-year recurrence interval.

Chatfield Dam, completed in 1976 and currently being expanded, provides flood protection, recreation, and water supply facilities for the City of Denver and its environs. The dam is located downstream of the mouth of Plum Creek. Impacts from a failure on Chatfield would mostly be outside of the County.

The recently completed Rueter-Hess Dam was primarily built to meet water supply needs for the Parker Water and Sanitation District but also provides flood control. The service spillway can pass the 100-year flood, and the auxiliary spillway can safely pass the probable maximum flood.[6] During the September 2013 floods along the Front Range, a diversion dam on Cherry Creek directed floodwaters into Rueter-Hess Reservoir. Douglas County was largely spared from the damages caused by the September 2013 disaster, but "if the storm had hit farther south, [the Cherry Creek diversion structure and Rueter-Hess Reservoir] would have had a major benefit."[7]

Past Occurrences

Reports of three dam incidents are detailed below. The Castlewood Dam was the only incident that involved complete structural failure.

- J.O. Hill Dam in Douglas County experienced a storm that generated 100 year rainfall on 15% of the basin which generated the 100-year runoff of a 56-square-mile basin.
- Stillwater Dam in Douglas County experienced a crack in the outlet/spillway.
- The Castlewood Dam failed in 1933 following heavy rainfall and caused massive flooding on Cherry Creek. The Parker area, which was mostly farmland at the time, experienced the most damage in Douglas County.

[6] RJH Consultants, Inc. "Rueter-Hess Dam and Reservoir, Douglas County, Colorado." http://www.rjh-consultants.com/core-services/rueter-hess-dam-and-reservoir-0, accessed February 25, 2015.

[7] Michlewicz, Chris. "Dam diverts floodwater to Rueter-Hess Reservoir." *Parker Chronicle.* http://parkerchronicle.net/stories/Dam-diverts-floodwater-to-Rueter-Hess-Reservoir,50412, accessed February 25, 2015.

Likelihood of Future Occurrences

Low—The Castlewood Dam event was the only complete dam failure in Douglas County. However, Castlewood Dam had repeated structural issues due to poor construction standards, and therefore, may not be indicative of dam safety issues elsewhere in the County. Further, based on input from the HMPC, it is unlikely that a major dam failure event will occur in Douglas County.

4.2.13 Flood: 100/500-year and Localized Flooding

Hazard/Problem Description

Flooding is the rising and overflowing of a body of water onto normally dry land. Floods are among the most costly natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even 6" of moving water can knock over a person given a strong current. A car will float in less than two feet of moving water and can be swept downstream into deeper waters. This is one reason floods kill more people trapped in vehicles than anywhere else. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utilities lines and interrupt services. Standing water can cause damage to crops, road, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Where flooding occurs in populated areas, warning and evacuation will be of critical importance to reduce life and safety impacts from any type of flooding.

Health Hazards from Flooding

Certain health hazards are also common to flood events. While such problems are often not reported, three general types of health hazards accompany floods. The first comes from the water itself. Floodwaters carry anything that was on the ground that the upstream runoff picked up, including dirt, oil, animal waste, and lawn, farm and industrial chemicals. Pastures and areas where cattle and hogs are kept or their wastes are stored can contribute polluted waters to the receiving streams.

Floodwaters also saturate the ground, which leads to infiltration into sanitary sewer lines. When wastewater treatment plants are flooded, there is nowhere for the sewage to flow. Infiltration and lack of treatment can lead to overloaded sewer lines that can back up into low-lying areas and homes. Even when it is diluted by flood waters, raw sewage can be a breeding ground for bacteria such as E. coli and other disease causing agents.

The second type of health problem arises after most of the water has gone. Stagnant pools can

become breeding grounds for mosquitoes, and wet areas of a building that have not been properly cleaned breed mold and mildew. A building that is not thoroughly cleaned becomes a health hazard, especially for small children and the elderly.

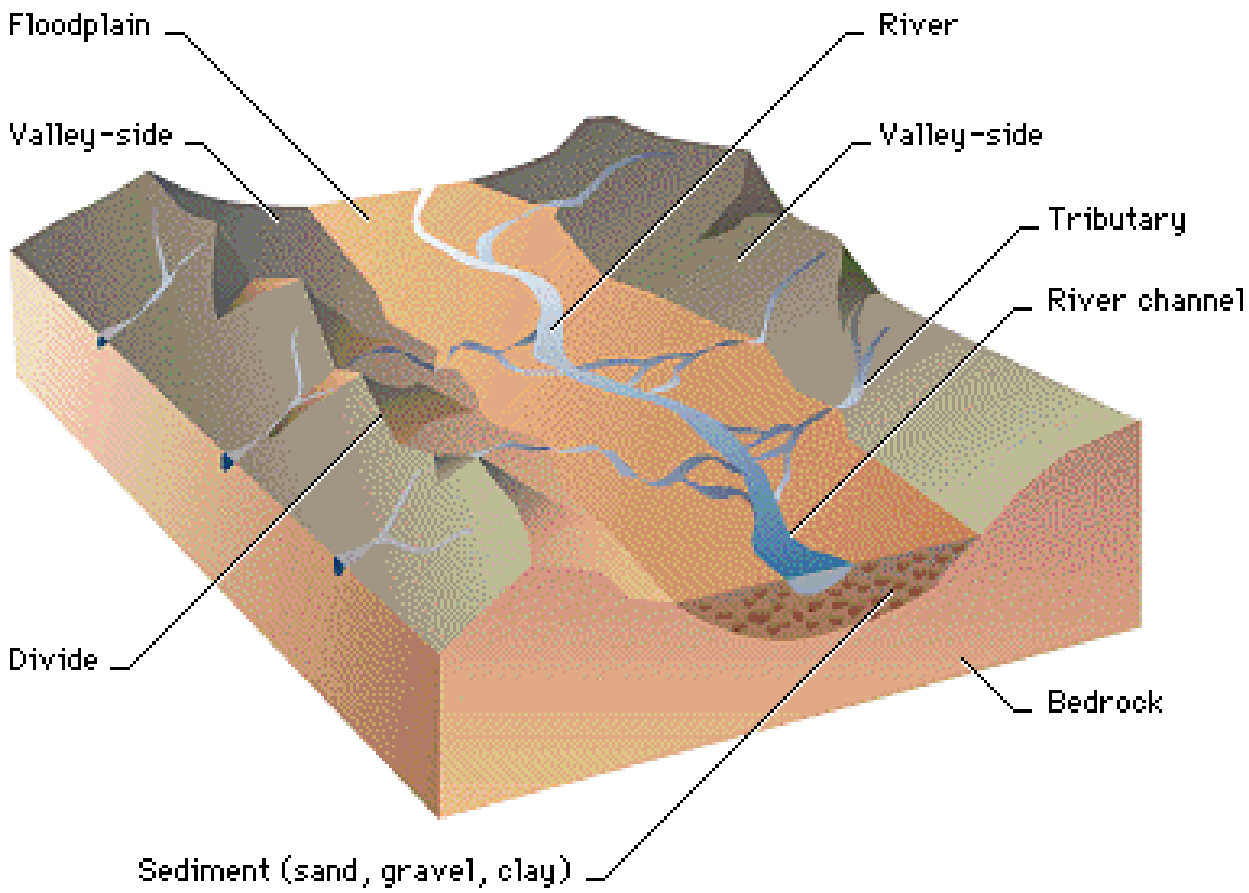
Another health hazard occurs when heating ducts in a forced air system are not properly cleaned after inundation. When the furnace or air conditioner is turned on, the sediments left in the ducts are circulated throughout the building and breathed in by the occupants. If a water system loses pressure, a boil order may be issued to protect people and animals from contaminated water.

The third problem is the long-term psychological impact of having been through a flood and seeing one's home damaged and irreplaceable keepsakes destroyed. The cost and labor needed to repair a flood-damaged home puts a severe strain on people, especially the unprepared and uninsured. There is also a long-term problem for those who know that their homes can be flooded again. The resulting stress on floodplain residents takes its toll in the form of aggravated physical and mental health problems.

Floodplains

The area adjacent to a channel is the floodplain, as shown in Figure 4.36. In its common usage, the floodplain most often refers to that area that is inundated by the 100-year flood, the flood that has a 1% chance in any given year of being equaled or exceeded. A floodplain is flat or nearly flat land adjacent to a stream or river that experiences occasional or periodic flooding. It includes the floodway, which consists of the stream channel and adjacent areas that carry flood flows, and the flood fringe, which are areas covered by the flood, but which do not experience a strong current. Floodplains are made when floodwaters exceed the capacity of the main channel or escape the channel by eroding its banks. When this occurs, sediments (including rocks and debris) are deposited that gradually build up over time to create the floor of the floodplain. Floodplains generally contain unconsolidated sediments, often extending below the bed of the stream.

Figure 4.36. Floodplain Topography



Source: FEMA

Regulated floodplains are illustrated on inundation maps called Flood Insurance Rate Maps (FIRMs). FIRMs are currently being replaced with Digital Flood Insurance Rate Maps (DFIRMs) as part of FEMA's map modernization project. It is the official map of a community on which FEMA has delineated both the special flood hazard areas and the risk premium zones applicable to the community. Private citizens and insurance agents use FIRMs to determine whether or not specific properties are located within flood hazard areas. Community officials use FIRMs to administer floodplain management regulations and to mitigate flood damage. Lending institutions and federal agencies use FIRMs to locate properties and buildings in relation to mapped flood hazards, and to determine whether flood insurance is required when making loans or providing grants following a disaster for the purchase or construction of a building.

The 100-year flood, which is the minimum standard used by most federal and state agencies, is used by the National Flood Insurance Program (NFIP) as the standard for floodplain management and to determine the need for flood insurance. Most of the flood prone counties

and incorporated communities within the Planning Area participate in the NFIP. Participation in the NFIP requires adoption of a local floodplain management ordinance and its enforcement within a mapped Special Flood Hazard Area. A jurisdiction's eligibility to participate is premised on their adoption and enforcement of state and community floodplain management regulations intended to prevent unsafe development in the floodplain, thereby reducing future flood damages. Thus, participation in the NFIP is based on an agreement between communities and the federal government. If a community adopts and enforces a floodplain management ordinance to reduce future flood risk to new construction in floodplains, the federal government will make flood insurance available within the community as a financial protection against flood losses. Since floods have an annual probability of occurrence, have a known magnitude, depth and velocity for each event, and in most cases, have a map indicating where they will occur, they are in many ways often the most predictable and manageable hazard.

According to the September 2005 Flood Insurance Study, Douglas County is located in an area that is prone to very intense rainfall, sometimes of cloudburst magnitude. Floods have resulted from storms covering large areas with heavy general rainfall as well as from storms covering small area with extremely intense rainfall. Floods generally occur from May through August. The upland areas are characterized by dissected topographic relief with steep stream slopes. Rapid rises, high maximum discharges, short durations, and comparatively low volumes of total runoff characterize the floods.

The roadways that cross the streams and obstruct flood flows are the most significant factor affecting flooding in the area. Other manmade objects, such as building, cars, and fences, as well as the natural vegetation of the flood plains, cause flow obstruction.

The Planning Area is susceptible to various types of flood events: riverine, flash, and localized stormwater flooding. The area is also at risk to flooding resulting from dam failures. Dam failure flooding is discussed separately in Section 4.2.12. Levee failure was considered but was ultimately excluded from this plan due to an absence of levees and lack of evidence of historical events associated with levees in the County. Regardless of the type of flood, the cause is often the result of severe weather and excessive rainfall, either in the flood area or upstream reach.

- Riverine flooding – Riverine flooding, defined as when a watercourse exceeds its "bank-full" capacity, generally occurs as a result of prolonged rainfall, or rainfall that is combined with snowmelt and/or already saturated soils from previous rain events.. This type of flood occurs in river systems whose tributaries may drain large geographic areas and include one or more independent river basins. The onset and duration of riverine floods may vary from a few hours to many days and is often characterized by high peak flows combined with a large volume of runoff. Factors that directly affect the amount of flood runoff include precipitation amount, intensity and distribution, the amount of soil moisture, seasonal variation in vegetation, snow depth, and water-resistance of the surface due to urbanization. In the Douglas County Planning Area, riverine flooding can occur anytime from May to October and is largely caused by heavy and continued rains, sometimes combined with

snowmelt, increased outflows from upstream dams, and heavy flow from tributary streams. These intense storms can overwhelm the local waterways as well as the integrity of flood control structures. Flooding is more severe when antecedent rainfall has resulted in saturated ground conditions. The warning time associated with slow rise riverine floods assists in life and property protection.

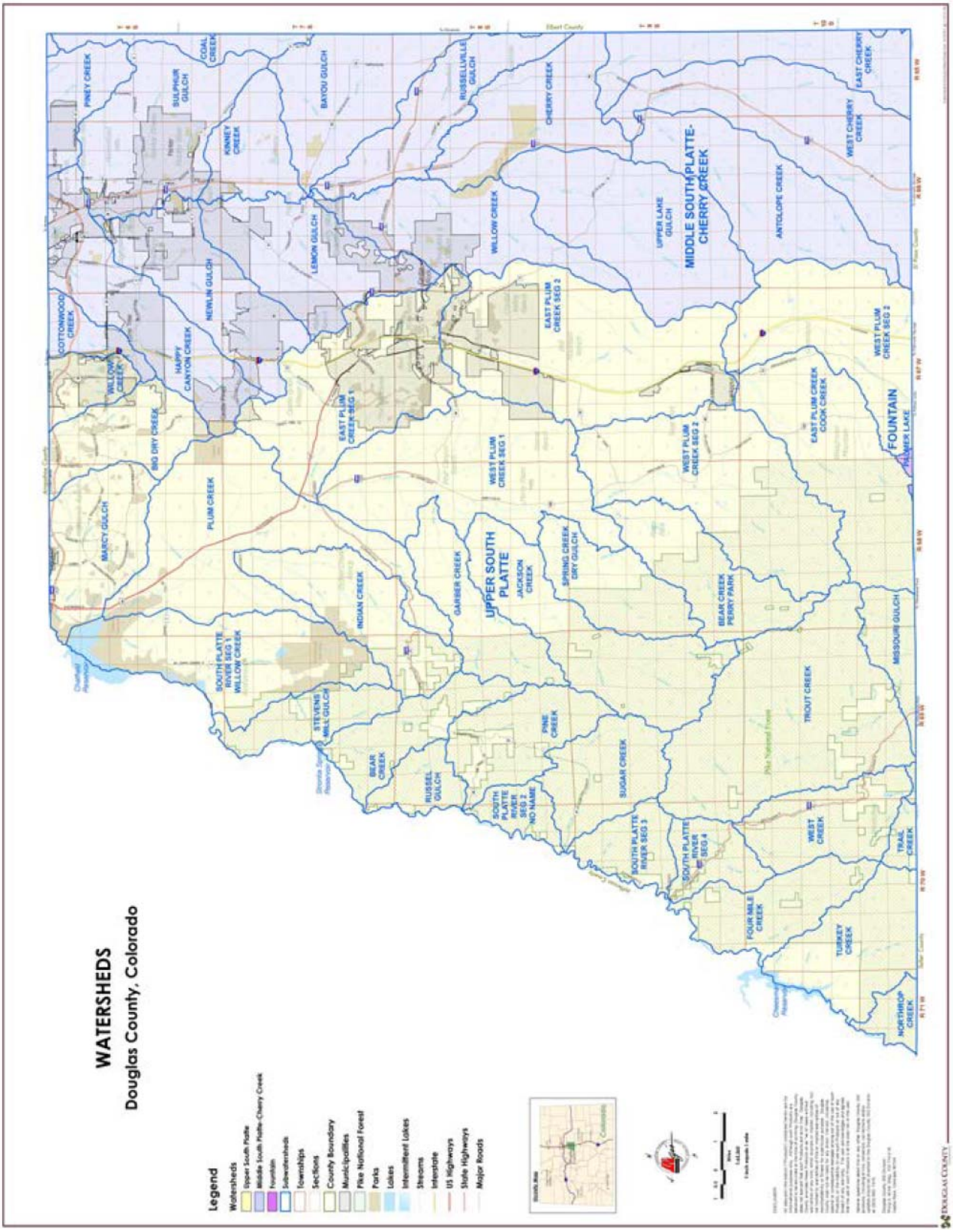
- Flash flooding – Flash flooding describes localized floods of great volume and short duration. This type of flood usually results from a heavy rainfall on a relatively small drainage area. Precipitation of this sort usually occurs in the winter and spring. Flash floods may require immediate evacuation within the hour.
- Localized flooding – Localized, stormwater flooding problems are often caused by flash flooding, severe weather, or an unusual amount of rainfall. Flooding from these intense weather events usually occurs in areas experiencing an increase in runoff from impervious surfaces associated with development and urbanization as well as inadequate storm drainage systems.

The Watershed System

There is one major river, the South Fork of the South Platte, in the western portion of the County. The Upper South Platte Watershed encompasses approximately 1,000 square miles and supplies the Denver metropolitan area with 80% of its water via Strontia Springs Reservoir. This area is well known for its vast recreation opportunities and has been severely impacted by sedimentation following major wildfires in the watershed since the Buffalo Creek Fire in 1996. Two major creeks run through Douglas County, Cherry Creek and Plum Creek. Plum Creek has two tributaries, East and West Plum Creek, which are part of the Chatfield drainage basin and empty into Chatfield Reservoir. Cherry Creek drains into the Cherry Creek basin and empties into Cherry Creek Reservoir.

Douglas County crosses three primary watersheds: Upper South Platte, Middle South Platte, and Fountain. The Upper and Middle South Platte are the primary sources of flooding within the County. Douglas County watersheds are illustrated in Figure 4.37.

Figure 4.37. Watersheds of Douglas County



Source: 2010 Douglas County CWPP

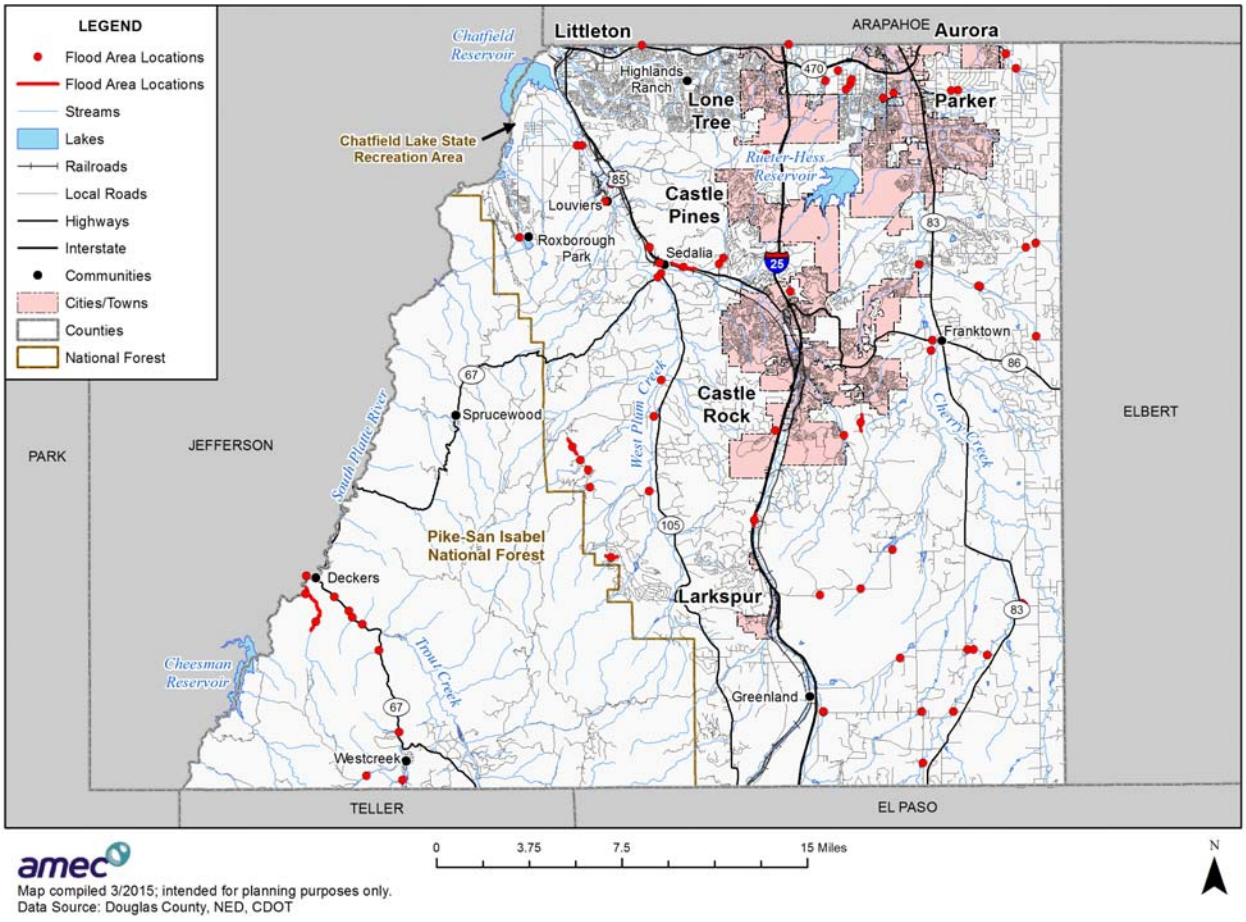
Localized Flooding

Localized stormwater flooding also occurs throughout the County. Urban storm drainpipes and pump stations have a finite capacity. When rainfall exceeds this capacity, or the system is clogged, water accumulates in the street until it reaches a level of overland release. This type of flooding may occur when intense storms occur over areas of development.

According to Douglas County, numerous parcels and roads throughout the County not included in the FEMA 100- and 500-year floodplains are subject to flooding in heavy rains. In addition to flooding, damage to these areas during heavy storms includes pavement deterioration, washouts, mudslides, debris areas, and downed trees. The frequency and type of damage or flooding that occurs varies from year to year, depending on the quantity of runoff.

Figure 4.38 and Table 4.29 identify the roads affected by localized flooding throughout the unincorporated County.

Figure 4.38. Douglas County Localized Flooding/Drainage Problem Areas Map



Source: Douglas County

Table 4.29. Douglas County Road List Of Problem Localized Flooding Areas

No.	Road Name*	Flooding	Pavement Deterioration	Washouts	High Water/ Creek Crossing	Landslides/ Mudslides	Debris	Downed Trees
	Apache Dr							
28	Bayou Gulch Rd	X	X	X	X			
	Bayou Gulch Road @ Cherry Creek							
	Bayou Gulch Road @ Moonshine Gulch							
75	Best Road 1	X		X	X			
	Best Road 2							
	Best Road & Carpenter Creek							
	Birch Avenue							
	Challenger Park	X		X	X			
	Cherry Creek Trail	X	X	X	X	X	X	X
	Cherry Creek Trail @ Castlewood Canyon Road							
	Cherry Creek Trail @ SH 86							
	Clay Street							
	Cottonwood Avenue							
	County Highway 67							
22	Dakan Rd	X			X			
	Dakan Road @ W. Plum Creek							
	Democrat Road							
	Dogwood Avenue							
	E. County Line Road							
	E. County Line Road							
	E. Greenland Road 1							

No.	Road Name*	Flooding	Pavement Deterioration	Washouts	High Water/ Creek Crossing	Landslides/ Mudslides	Debris	Downed Trees
	E. Greenland Road 2							
	E. Greenland Road 3							
	E. Greenland Road @ W. Cherry Creek							
	Elm Street							
	First Street							
	Flintwood Road 1							
	Flintwood Road 2							
	Garton Road							
74	Greenland Rd	X		X	X			
	Hidden Valley Road 1							
	Hidden Valley Road 2							
	Hidden Valley Road 3							
	Home Street							
	I-25 East Frontage north of Faraway Place	X	X	X	X			
	Inspiration Drive							
38	Jackson Creek Rd	X			X			
80	Jones Road @ W. Cherry Creek	X		X	X			
	Jordan Road & Lincoln Road, Challenger Park							
	Lake Gulch Road							
	Lucas Avenue							
	Macom Drive 1							
	Macom Drive 2							
16	Main Street & Plum Creek	X			X			
	Peoria Street							
12	Pine Cliff Rd	X	X	X	X			

No.	Road Name*	Flooding	Pavement Deterioration	Washouts	High Water/ Creek Crossing	Landslides/ Mudslides	Debris	Downed Trees
	Ponderosa Drive 1							
	Ponderosa Drive 2							
	Recreation Drive 3							
	Ridge Road							
	Roxborough Park Road							
	Sorrel Road							
	Spring Valley Road @ W. Cherry Creek							
	State Highway 67 -1	X	X	X	X	X	X	X
	State Highway 67 -2							
	State Highway 67 - Haymann Fire Area -3							
61	Spring Valley	X			X			
	Stump Road							
	Territorial Road							
7	Titan Rd	X	X	X	X			
	Titan Road @ Plum Creek							
	Upper Lake Gulch Road 1							
	Upper Lake Gulch Road 2							
	US Highway 85 -1							
	US Highway 85 -2							
	West Creek Road							
	Winchester Way							
	Y Camp Rd	X	X	X	X	X	X	X

Source: Douglas County

*Road names in bold are designated with lines in Figure 4.38

Flood Maps

As part of ongoing efforts to identify and manage their flood prone areas, Douglas County relies on a variety of different mapping efforts. What follows is a brief description of FEMA mapping

efforts covering the Douglas County Planning Area.

FEMA Floodplain Mapping

FEMA established standards for floodplain mapping studies as part of the National Flood Insurance Program (NFIP). The NFIP makes flood insurance available to property owners in participating communities adopting FEMA-approved local floodplain studies, maps, and regulations. Floodplain studies that may be approved by FEMA include federally funded studies; studies developed by state, city, and regional public agencies; and technical studies generated by private interests as part of property annexation and land development efforts. Such studies may include entire stream reaches or limited stream sections depending on the nature and scope of a study. A general overview of floodplain mapping and associated products is provided in the following paragraphs. Details on the NFIP and mapping specific to participating jurisdictions are in Section 4.3 Vulnerability Assessment and in the jurisdictional annexes.

Flood Insurance Study (FIS)

The FIS develops flood-risk data for various areas of the community that will be used to establish flood insurance rates and to assist the community in its efforts to promote sound floodplain management. The current Douglas County FIS is dated September 30, 2005. This study covers both the unincorporated County and the incorporated jurisdictions

Flood Insurance Rate Map (FIRM)

The FIRM is designed for flood insurance and floodplain management applications. For flood insurance, the FIRM designates flood insurance rate zones to assign premium rates for flood insurance policies. For floodplain management, the FIRM delineates 100- and 500-year floodplains, floodways, and the locations of selected cross sections used in the hydraulic analysis and local floodplain regulations. The County FIRMs have recently been replaced by new digital flood insurance rate maps (DFIRMs) as part of FEMA's Map Modernization program, which is discussed further below.

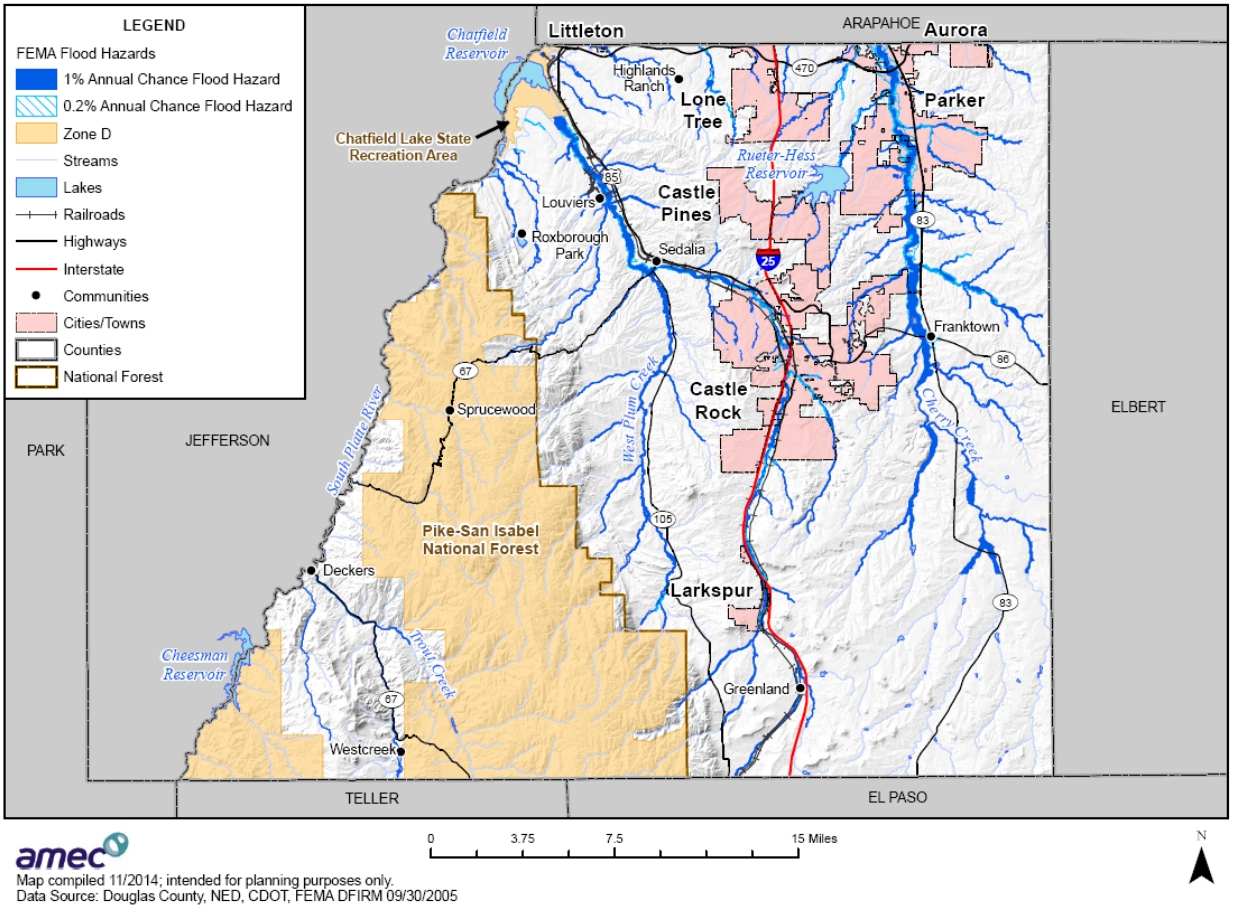
Digital Flood Insurance Rate Maps (DFIRM)

As part of its Map Modernization program, FEMA is converting paper FIRMs to digital FIRMs, DFIRMs. These digital maps:

- Incorporate the latest updates (LOMRs and LOMAs);
- Utilize community supplied data;
- Verify the currency of the floodplains and refit them to community supplied basemaps;
- Upgrade the FIRMs to a GIS database format to set the stage for future updates and to enable support for GIS analyses and other digital applications; and
- Solicit community participation.

DFIRMs, dated September 30, 2005 for Douglas County, were used for this plan's flood hazard analysis. The Douglas County DFIRM is depicted in Figure 4.39.

Figure 4.39. Douglas County DFIRM



Past Occurrences

Historically, portions of Douglas County have always been at risk to flooding because of its high average annual rainfall (compared to the average annual rainfall for Colorado), the number of watercourses that traverse the County, and the location of development adjacent to flood-prone areas. Flooding has occurred both within the 100-year floodplain and in other localized areas.

The following accounts of flooding from the FIS on the South Platte River, Plum Creek, and Cherry Creek area are representative of typical floods for which information is available.

Three separate floods occurred during **May and June 1864**. The first originated in the Cherry Creek and Plum Creek basins, occurring during the night of May 19-20, 1864, and was caused primarily by a cloudburst in the upper part of those basins. On the morning of May 20, the flood inundated the lower portions of Denver at a depth of one to five feet, leaving great deposits of sand and gravel.

Records indicate that 2.08" of rain occurred during a two hour period on **July 14, 1912**. The heaviest precipitation occurred between Franktown and a point about five miles north of Denver; the center was located near Parker. The rainfall started around 3pm and continued until around 5pm. Cherry Creek crested around 10pm and had a peak discharge of 25,000 cubic feet per second (cfs) in Denver. The Cherry Creek Flood Commission estimated that runoff occurred from an area of approximately 200 square miles. Flood damages in the reach between Franktown and the site of the existing Cherry Creek Dam and Reservoir totaled $554,000.

In **June 1921**, the rainfall extended east of the mountains for a considerable distance, and the plains tributaries as well as those in the mountains contributed flow into the South Platte River. No gaging stations were being maintained at the mouths of the tributaries. This flood caused the South Platte River to rise approximately seven feet in Denver. The local press estimated that approximately 500 houses were inundated and many families were forced to seek higher ground. Three large packing plants and practically all of the lower feeding pens at the Denver Union Stockyards were flooded. Ten acres of railroad yards were flooded to a depth of one foot (U.S. Department of the Interior, 1943).

A severe storm centered over the Bayou Gulch Basin, a tributary to Cherry Creek, during the afternoon of **July 28, 1922**. Heavy rainfall was reported to have occurred in an area bounded by lines three miles north of Parker, four miles west of Cherry Creek, and one mile south of Franktown, and by the Douglas-Elbert County line on the east. Unofficial rainfall amounts varied from 1" – 3.5" and occurred in approximately two hours. An estimated peak flow of 8,700 cfs discharged out of Bayou Gulch. The discharge on Cherry Creek, three miles north of Parker, was estimated to be 17,000 cfs. Although no damage was experienced in Denver, this was considered a major flood for the upstream part of the basin.

The storm of **August 2 and 3, 1933**, occurred over a 175 square mile area upstream from Franktown. Unofficial rainfall amounts varied from 3" to 9" and occurred over a nine hour period between 6pm on August 2 and 3am on August 3. The most intense activity of the storm occurred between 9pm and 10pm. Waters in the existing Castlewood Dam and Reservoir reached the spillway crest around 11pm. The inflow was estimated at 35,000 cfs. Water overtopped the crest of the dam and the structure failed around 12am. The sudden release of water caused a flood wave to move down the valley. The peak discharge is estimated to have ranged from 126,000 cfs downstream of the dam to approximately 16,500 cfs near the confluence with the South Platte River. The Cherry Creek Flood Commission estimated the damages to be approximately $1 million; approximately $200,000 of this total occurred upstream from Denver. This flood caused additional economic damage to the Cherry Creek basin. Loss of the dam cut off water supply to approximately 3,000 acres of land. The basin suffered a severe recession and many families moved from the area.

On **September 9 and 10, 1933**, a flood was caused by heavy rain on the divide separating Cherry Creek from Plum Creek, Big Dry, and Little Dry Creeks, which enter the South Platte River between the mouth of the South Platte River canyon and Denver. In an investigation of

this flood, the office of the State Engineer made a slope-area determination of the flow in Plum Creek and found it to be 5,500 cfs.

A large storm front moved into southeastern Colorado on **August 25, 1945**, and extended over the Cherry Creek Basin. Unofficial rainfall amounts varied from 2" to 5". Severe flooding occurred along Cherry Creek in the Franktown/Parker area. The gaging station at Melvin recorded a peak discharge of 107,000 cfs. Total damages were estimated at $200,000.

High intensity, heavy rains occurred at three locations in the Plum Creek Basin on the afternoon of **June 16, 1965**. Over 12" fell near Castle Rock and over 14" fell near Palmer Lake and near Larkspur in approximately four hours. East and West Plum Creeks crested at 126,000 cfs and 38,000 cfs, respectively, during the afternoon. The unit run off above the site on East Plum Creek just downstream from Castle Rock was 1,170 cfs per square mile for a drainage area of approximately 108 square miles. Western tributaries of West Plum Creek and all tributaries of Plum Creek downstream of Sedalia were out of the high rainfall areas and contributed little or no runoff during the flood.

The combination of steep slopes, sand and gravel streambed, and relatively open and straight reaches of Plum Creek near Louviers was conductive to high velocities and standing waves. The computed mean velocities in seven cross sections surveyed after the flood were near 15 cfs, which implies maximum velocities of approximately 20 to 22 cfs. The amount of scour and fill, the size of the cottonwood trees that were uprooted or bent over, and the matted condition of the debris on trees confirmed the computed velocities.

The damage in rural areas of Plum Creek basin was extensive. The heavy runoff deposited all kinds of debris, from sand to huge boulders and trees, on fields and pastures. Road embankments were severely eroded and bridges on County, State and Interstate highways were destroyed. Large-cut banks, particularly along East Plum Creek, were left after land had been washed away. Much of the Town of Castle Rock was inundated, and service to approximately 100 telephones in town was disrupted. Seven homes, a church, the Grand Hall, and the lower part of the main street in Sedalia vanished during the flood.

The Denver and Rio Grande Western Railroad between Denver and Palmer Lake, built in 1871 - 72, had never been damaged as extensively as it was in 1965. Five bridges, many culverts, and about four miles of track were damaged. The track was out of service for approximately six weeks after the flood. Repairs to the facilities cost $468,000. The Atchison, Topeka, and Santa Fe Railway also follows the South Platte River and Plum Creek, and repairs, primarily to one bridge, cost approximately $500,000. Although the Plum Creek gaging station near Louviers was destroyed, observations indicated that the flow increased from about 150 to 154,000 cfs in less than three hours. The recurrence interval of this flood was estimated as greater than 500 years. Prior to the 1965 event, the maximum discharge was 7,700 cfs, in August 1945 (U.S. Department of the Interior, 1969).

The NCDC recorded the following flooding events for Douglas County, as shown in Table 4.30.

Table 4.30. NCDC Flood Events for Douglas County, 1993 – March 31, 2014

Location	Date	Type	Deaths	Injuries	Property Damage	Crop Damage
Castle Rock	7/30/1998	Flash Flood	0	0	$0	$0
Eastern Douglas And Western Elbert	4/28/1999	Flood	0	0	$0	$0
Southwest Portion	6/20/2002	Flash Flood	0	0	$0	$0
Southwest Portion	6/27/2002	Flash Flood	0	0	$0	$0
Larkspur	7/3/2002	Flash Flood	0	0	$0	$0
Southwest Portion	7/4/2002	Flash Flood	0	0	$0	$0
West Portion	7/10/2002	Flash Flood	0	0	$0	$0
West Portion	7/21/2002	Flash Flood	0	0	$0	$0
Southwest Portion	5/30/2003	Flash Flood	0	0	$0	$0
Southwest Portion	6/19/2003	Flash Flood	0	0	$0	$0
Southwest Portion	7/27/2003	Flash Flood	0	0	$0	$0
Southwest Portion	8/2/2003	Flash Flood	0	0	$0	$0
Southwest Portion	6/9/2004	Flash Flood	0	0	$0	$0
Northwest Portion	6/27/2004	Flash Flood	0	0	$0	$0
Southwest Portion	6/27/2004	Flash Flood	0	0	$0	$0
Southwest Portion	7/15/2004	Flash Flood	0	0	$0	$0
Northeast Portion	8/4/2004	Flash Flood	0	0	$0	$0
Southwest Portion	8/5/2004	Flash Flood	0	0	$0	$0
Southwest Portion	8/18/2004	Flash Flood	0	0	$0	$0
North Central Portion	8/18/2004	Flash Flood	0	0	$0	$0
Franktown	7/2/2006	Flash Flood	0	0	$0	$0
Southwest Portion	7/7/2006	Flash Flood	0	0	$13,300,000	$0
Southwest Portion	7/25/2006	Flash Flood	0	0	$0	$0
North Portion	8/1/2006	Flash Flood	0	0	$0	$0
Southwest Portion	8/14/2006	Flash Flood	0	0	$0	$0
Westcreek	7/26/2007	Flash Flood	0	0	$1,000	$0
Westcreek	7/27/2007	Flash Flood	0	0	$1,000	$0
Westcreek	8/6/2007	Flash Flood	0	0	$1,000	$0
Westcreek	8/24/2008	Flash Flood	0	0	$10,000	$0
Westcreek	8/24/2008	Flash Flood	0	0	$10,000	$0
Westcreek	7/21/2009	Flash Flood	0	0	$50,000	$0
Westcreek	7/29/2011	Flash Flood	0	0	$25,000	$10,000
Parker	6/6/2012	Flash Flood	0	0	$50,000	$50,000
Sedalia	6/6/2012	Flash Flood	0	0	$0	$15,000
Castle Rock	8/22/2013	Flash Flood	0	0	$50,000	$50,000
Acequia	9/12/2013	Flood	0	0	$0	$0

Location	Date	Type	Deaths	Injuries	Property Damage	Crop Damage
Franktown	9/14/2013	Flash Flood	0	0	$0	$0
Parker	9/14/2013	Flash Flood	0	0	$0	$0
Shamballa	9/14/2013	Flash Flood	0	0	$0	$0
Castle Rock	9/14/2013	Flash Flood	0	0	$0	$0
Totals			**0**	**0**	**$13,498,000**	**$125,000**

Source: NCDC

SHELDUS recorded the following events of flooding for Douglas County, as shown in Table 4.31.

Table 4.31. SHELDUS Flood Event for Douglas County 1960-2012

Start Date	End Date	Hazard	Crop Damage	Property Damage	Injuries	Fatalities	Records
6/7/1979	6/9/1979	Flooding/ Severe Storm/Thunder Storm/ Winter Weather	$0	$794	0	0	1

Source: SHELDUS

The HMPC also provided more detailed information on the following flood events from various sources (personal recollections, the NCDC, and SHELDUS):

July 30, 1998 – Heavy rain, up to 3" in an hour, caused flash flooding problems from Castle Rock to Parker. Interstate 25, north of Castle Rock, was closed as high waters covered sections of the highway. Some cars were left floating in the floodwaters

April 28, 1999 – Flooding problems developed across Larimer, western Weld and southern Elbert Counties as a steady southeasterly upslope flow brought heavy snow, above 7,500 feet, and steady rainfall below 7,500 feet. The combination of a persistent upslope and increased runoff allowed for several creeks, rivers and streams to jump their banks. Rainfall totals over four days ranged from 4" to over 6" in the hardest hit areas. No injuries or deaths were reported. Damage estimates for Douglas County were unavailable.

June 20, 2002 – Heavy rain fell near the Hayman wildfire, along the Jefferson and Douglas County lines. Flash flooding washed out a 40-ft section of the access road to Cheesman Reservoir. Some debris was washed up against a gate, blocking the road. The debris had to be removed before the gate could be opened.

June 27, 2002 – Heavy rain, up to 0.75", fell across sections of the Hayman burn area near Cheesman Reservoir. Several forest service roads were washed out and many culverts plugged by debris. Road maintenance had to be brought in to repair the road damage.

July 3-4, 2002 – Heavy rain washed out a frontage road. The Mountain Ranch subdivision was also flooded. Heavy rain again caused flooding problems in the Hayman burn area. In Douglas

County, high water washed out some smaller access roads as well, east of a line extending from Signal Butte to Deckers.

July 21, 2002 – Heavy rain caused flash flooding problems in the Hayman burn area. South Deckers Road, State Highway 126, had to be closed as four feet of water inundated a section of the roadway. The forest service had to remove 40 truckloads of sediment from the area. Also, in southwest Douglas County, a secondary service road was washed out by heavy debris flow.

June 19, 2003 – Heavy rain caused flash flooding problems near the Hayman burn area. Flooding occurred at the YMCA Shady Brook Camp south of Deckers. The only access road to the camp site was washed out by floodwaters and closed temporarily.

July 27, 2003 – A thunderstorm producing heavy rain caused flash flooding and mudslides in the Hayman burn area in southwestern Douglas County. Storm spotters reported washouts in and around the Westcreek area. South of Deckers, approximately three miles of State Highway 67 was closed by a flow of decomposed granite and forest debris, making the roadway impassable. Several newly installed drainage culverts were inundated with debris. Runoff along the fire damaged slopes, about nine miles south of Deckers, uprooted 200 to 300 trees and washed them into the drainage system. In all, seven mudslides were reported, some ranging from 5-7 feet deep. Sixty-foot spruce trees slid onto the highway along with boulders up to three feet in diameter. The Colorado Department of Transportation hauled 70 truckloads of debris from the highway.

August 2, 2003 – Heavy rain producing thunderstorms triggered flash flooding at the confluence of Westcreek and Trail Creek in the Hayman burn area. Significant erosion was observed along the Trail Creek drainage. Vegetation along the drainage was flattened with mud and silt.

June 9, 2004 – Locally heavy rain caused flash flooding in the Hayman burn area. Up to a foot of water covered a portion of Westcreek Road. Debris also washed onto State Highway 67.

June 27, 2004 – In Douglas County, water up to a foot deep, covered to the roadways at Roxborough Park. Water Canyon Road also had to be closed due to high water. In southwest Douglas County, heavy rain caused flooding and flash flooding over parts of the Hayman Burn area. Most of the flooding occurred above the Shady Brook YMCA camp. Several man made ponds were washed out above the camp. The cost of repairing the dams was estimated to be $3,000. Flooding was also reported along Fourmile Creek.

July 15, 2004 – Heavy rain caused flooding and flash flooding problems in the Hayman burn area in southwest Douglas County. Several private roads suffered significant damage from floodwaters. Several dirt roads were washed out at Pine Lake Estates. One resident had his driveway replaced with a six-foot gulley. West Trail Creek Road near the Douglas/Teller County border was also washed out.

August 4, 2004 – Heavy rain caused flash flooding in northeast Douglas County. Floodwaters

rushed across parts of U.S. Highway 85, near the entrance of the Castle Pines Golf Club. The traffic lanes were covered with up to 6" of running water.

August 5, 2004 – Heavy rain caused flash flooding in the Hayman burn area. Several county and private roads, in the Westcreek subdivision, were damaged by floodwaters. Floodwaters, up to 8" deep, covered the roadways. Erosion of roads and culverts were reported in the vicinity of the Shady Brook YMCA Camp. Mudslides also forced the closure of U.S. Highway 67 for several hours.

August 18, 2004 – Heavy rain caused Trail Creek to jump its banks. As a result, the ensuing flash floods washed out several county roads and private driveways along the creek. Heavy rain also caused additional flash flooding south of Denver. Floodwaters forced the closure of Stonegate Parkway near Jordan Road and Lincoln Avenue. Flooding was also reported on Meridion Blvd., near I-25.

July 2, 2006 – A trained observer reported that a culvert and several to roads were washed out. In addition law enforcement officials reported that two driveways crossing Cherry Creek in and near Prairie Canyon Ranch were washed out. Heavy rains caused flash flooding at Castlewood Canyon State Park near Franktown. The floodwaters wiped out four footbridges along the high trail.

July 7, 2006 – Up to 3" of heavy rain in the Hayman burn area caused destructive flash flooding along West Creek, between Deckers and Westcreek. Horse Creek, which drains into West Creek, swelled from a normally small creek, into a raging torrent, 25 to 30 feet deep and 300 feet wide. The wall of water damaged or destroyed approximately 30 sections of a five-mile stretch of State Highway 67, which parallels West Creek. Several homes were extensively damaged or destroyed. In all 86 homes had no access to the highway, resulting in a 125-mile detour for residents of the West Creek subdivision. The sheriff's office used reverse 911 to warn residents to evacuate the area surrounding the subdivision. Campsites near Deckers were also evacuated. No injuries were reported, but several people had to be rescued, due to extensive damage to the access roads and bridges in the area. Reconstruction was estimated to be $13.3 million.

July 25, 2006 – Heavy rain caused flash flooding one mile north of Westcreek. Several maintenance roads were washed out by floodwaters.

August 1, 2006 – Heavy rain caused flooding in Highlands Ranch, Lone Tree, and Parker. Water up to 6" deep was reportedly running over the roads.

August 14, 2006 – Heavy rain fell two miles southeast of Deckers. Some of the banks along State Highway 67, between Deckers and Westcreek washed out, as did several driveways on both sides of the highway.

July 26, 2007 – Heavy rain in the Hayman burn area caused localized flash flooding in southwest Douglas County. Heavy rain, up to 1.25", caused partial washouts in the North

Rainbow Falls subdivision.

July 27, 2007 – More thunderstorms brought heavy rain and localized flash flooding in the Hayman burn area. Close to 1" of rain reportedly fell in the area. A rock and mudslide occurred along Trout Ranch Road. In addition, Westcreek jumped its banks with floodwaters, up to 6" in depth, running across Westcreek Road south of the town of Westcreek.

August 6, 2008 – Heavy rain caused localized flash flooding in southwest Douglas County, in the Hayman burn area. Westcreek overflowed with a half foot of running water, over Westcreek Road on the south side of the town of Westcreek.

August 24, 2008 – Severe thunderstorms produced very heavy rain and hail, up to the size of quarters. In Douglas County, heavy rain caused flash flooding near the town of Westcreek. Private drives to residences in the Trail Creek subdivision were washed out. A mudslide closed State Highway 67, near Rainbow Falls Road. The road in the YMCA Camp Shady Brook was also washed out and bridges were damaged. In the camp, the gullies carved by the floodwaters were six feet wide by five feet deep.

July 21, 2009 – Heavy rain, mud and debris came down onto State Highway 67, about five miles south of Deckers, completely closing the highway. Due to the amount of debris, the creek was rerouted onto the highway, damaging the road. Storm totals up to 1.75" were reported. Several motorists were reportedly stranded in the area and had to be rescued.

July 29, 2011 – A thunderstorm producing heavy rain produced flash flooding in the Hayman burn scar. Two separate driveways were washed out. Several logs and debris were discovered along Camp Creek. Debris also washed across State Highway 67.

June 6, 2012 - Severe thunderstorms broke late in the evening, striking areas hardest from Denver southward. Heavy rain allowed Plum Creek to exceed flood stage by nearly a foot at Sedalia which resulted in lowland flooding. Thunderstorms brought up to 3.35" of rain to some areas within 90 minutes. In Parker, several roads were washed out from The Pinery to three miles west of The Pinery.

August 22, 2013 – Flash flooding occurred in central Douglas County with numerous road closures reported. One of those closures occurred at the Tomah Road exit along I-25. Traffic was reportedly backed up all the way to Castle Rock.

September 2, 2013 – A deep southerly flow over Colorado, ahead of a near stationary low pressure system over the Great Basin, pumped copious amounts of monsoonal moisture into the area. In addition, a weak stationary front stretched along the Front Range Foothills and Palmer Divide. As a result, a prolonged period of moderate to heavy rain developed across the Front Range Foothills, Palmer Divide, and Urban Corridor. By the 14th, storm totals ranged from 6" to 18", highest in the foothills of Boulder County. The headwaters then moved down the South Platte River and caused widespread flooding with record flood stages at several locations as it

made its way downstream into Nebraska. After little rainfall on Friday, September 13th, the flash flood threat returned for Saturday. This time, storms with heavy rainfall were concentrated in Douglas County, but also extended northeast into the Aurora area once again. Up to 3" of rain fell in one hour. Plum Creek and other small creeks and streams flooded, along with significant street flooding. The last day of this prolonged period of very heavy rainfall was on Sunday, September 15th. Another weak front had pushed through the area Saturday night, leaving the atmosphere unseasonably moist and unstable. Heavy rain developed by mid-morning and then became more widespread and peaked in intensity by the noon hour. The devastating flood damage encompassed 4,500 square miles of the Colorado Front Range, left seven dead, forced thousands to evacuate, and destroyed thousands of homes and farms. Record amounts of rainfall generated flash floods that tore up roads and lines of communication, leaving many stranded. Nearly 19,000 homes were damaged, and over 1,500 destroyed. The Colorado Department of Transportation estimated that at least 30 state highway bridges were destroyed and an additional 20 seriously damaged. A preliminary assessment of the State's infrastructure showed damage of $40 million to roads and $112 million to bridges. Repair costs for state and county roads were likely to run into the hundreds of millions of dollars.

Likelihood of Future Occurrences

100-Year Flood

Low—The term "100-year flood" is misleading. It is not the flood that will occur once every 100 years. Rather, it is the flood elevation (or depth) that has a 1% chance of being equaled or exceeded each year. Thus, the 100-year flood could occur more than once in a relatively short period of time. In short, the 100-year flood is the flood that has a 1% chance in any given year of being equaled or exceeded.

500-Year Flood

Low—The 500-year flood is the flood elevation or depth that has a 0.2% chance of being equaled or exceeded each year.

<100-Year Flood/Localized Flooding

Medium—Based on historical data, flooding events less severe than a 100-year flood and those outside of the 100-year floodplain occur during periods of heavy rains.

4.2.14 Landslide/Mud and Debris Flow/Rockfall

Hazard/Problem Description

Landslides refer to a wide variety of processes that result in the perceptible downward and outward movement of soil, rock, and vegetation under gravitational influence. Common names for landslide types include slump, rockslide, debris slide, lateral spreading, debris avalanche,

earth flow, and soil creep. Landslides may be triggered by both natural and human-induced changes in the environment that result in slope instability.

A landslide is the breaking away and gravity-driven downward movement of hill slope materials, which can travel at speeds ranging from fractions of an inch per year to tens of miles per hour depending on the slope steepness and water content of the rock/soil mass. Landslides range from the size of an automobile to a mile or more in length and width and, due to their sheer weight and speed, can cause serious damage and loss of life. Their secondary effects can be far-reaching; such as catastrophic flooding due to the sudden release of river water impounded by landslide debris or slope failure of an earthen dam.

Landslide problems can be caused by land mismanagement, particularly in mountain, canyon, and coastal regions. In areas burned by forest and brush fires, a lower threshold of precipitation may initiate landslides. Land use zoning, professional inspections, and proper design can minimize many landslide, mudflow, and debris flow problems.

The susceptibility of an area to landslides depends on many variables including steepness of slope, type of slope material, structure and physical properties of materials, water content, amount of vegetation, and proximity to areas undergoing rapid erosion or changes caused by human activities. These activities include mining, construction, and changes to surface drainage areas.

Another type of landslide, mud and debris flows, may also occur in some areas of the County. Debris and mud flows are a combination of fast moving water and a great volume of sediment and debris that surges down slope with tremendous force. The consistency is like that of pancake batter. They are similar to flash floods and can occur suddenly without time for adequate warning. When the drainage channel eventually becomes less steep, the liquid mass spreads out and slows down to form a part of a debris fan or a mud flow deposit. In the steep channel itself, erosion is the dominant process as the flow picks up more solid material. Any given drainage may have several mud flows a year, or none for several years or decades. They are common events in the steep terrain of Colorado and vary widely in size and destructiveness. Cloudbursts provide the usual source of water for a mud flow in Colorado.

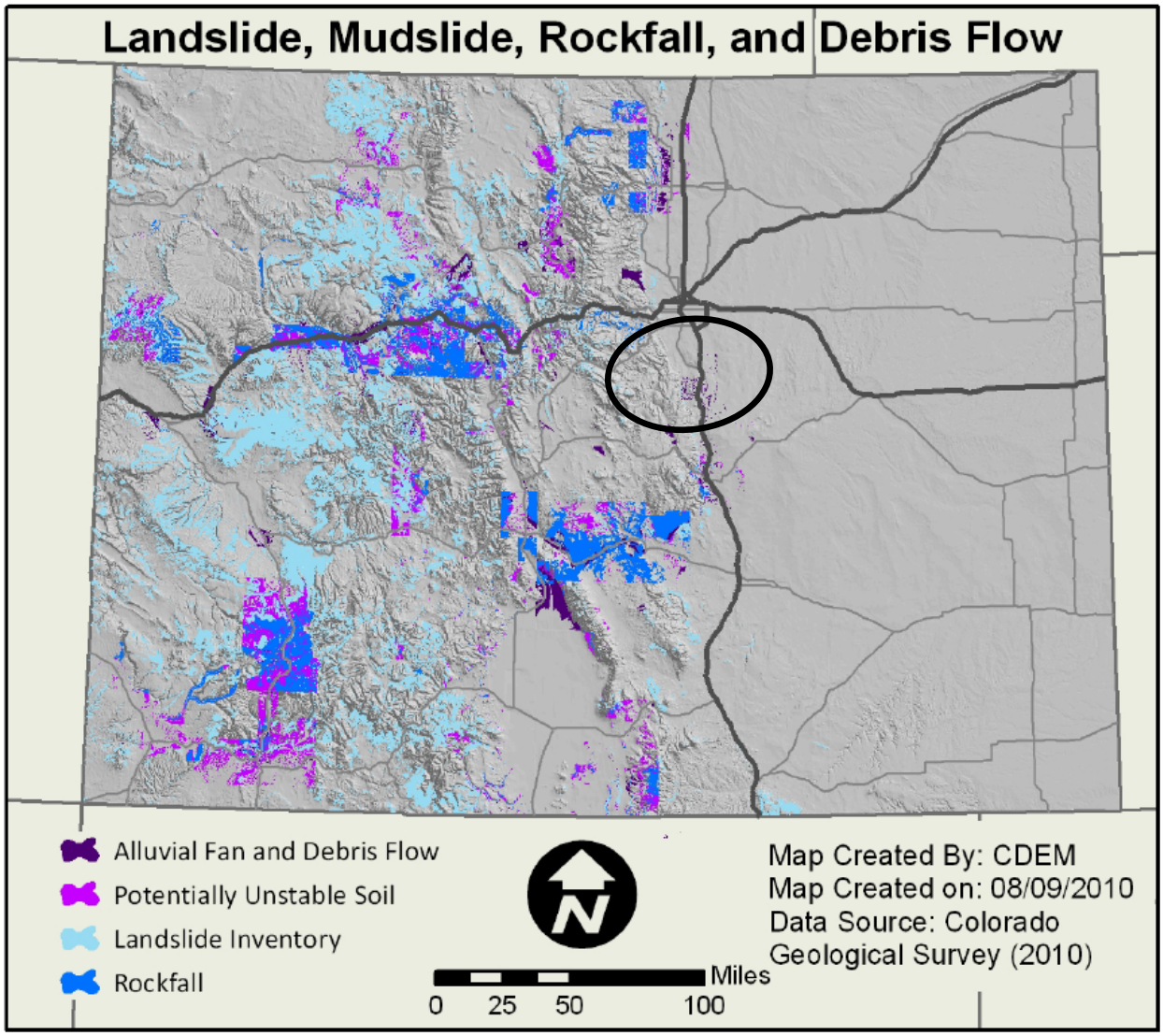
Rockfalls are the fastest type of landslide and occur most frequently in mountains or other steep areas during early spring when there is abundant moisture and repeated freezing and thawing. The rocks may freefall or carom down in an erratic sequence of tumbling, rolling and sliding. When a large number of rocks plummet downward at high velocity, it is called a rock avalanche. Rockfalls are caused by the loss of support from underneath or detachment from a larger rock mass. Ice wedging, root growth, or ground shaking, as well as a loss of support through erosion or chemical weathering may start the fall.

Landslides often accompany other natural hazard events, such as floods, wildfires, or earthquakes. Landslides can occur slowly or very suddenly and can damage and destroy

structures, roads, utilities, and forested areas, and can cause injuries and death.

Land movement related to landslides, mud and debris flows, and rockfalls occurs naturally across Colorado on an ongoing basis. Figure 4.40 shows areas prone to this hazard. Because this hazard is correlated with elevation change, this hazard largely occurs in the mountainous region from the Front Range to the West Slope. It indicates that most areas throughout Douglas County are at low risk for landslides, mudslide, rockfall, and debris flow; however, there are areas within Douglas County that do have moderate risk.

Figure 4.40. Landslide Risk in Colorado and the Planning Area



Source: Colorado DHSEM

Landslides directly damage buildings in two general ways: 1) disruption of structural foundations caused by differential movement and deformation of the ground upon which the structure sits; and 2) physical impact of debris moving down slope against structures located in the travel path.

In addition to buildings, other types of engineered structures are vulnerable to the impact and ground deformation caused by slope failures, particularly utilities and transportation structures. These belong to a category of structures called lifelines. Transmission lines such as telephone lines, electric power, gas, water, sewage, roadways, etc., are necessary for today's functioning society. They present a particular vulnerability because of their geographic extent and susceptibility to physical distress. Lifelines are generally linear structures that, because of their geographic extent, have a greater opportunity for impact by ground failure.

Past Occurrences

August 5, 2004 – Heavy rain caused flash flooding in the Hayman burn area. Several county and private roads, in the Westcreek subdivision, were damaged by floodwaters. Floodwaters, up to 8" deep, covered the roadways. Erosion of roads and culverts were reported in the vicinity of the Shady Brook YMCA Camp. Mudslides also forced the closure of U.S. Highway 67 for several hours.

July 27, 2007 – More thunderstorms brought heavy rain and localized flash flooding in the Hayman burn area. Close to 1" of rain reportedly fell in the area. A rock and mudslide occurred along Trout Ranch Road. In addition, West Creek jumped its banks with floodwaters, up to 6" in depth, running across Westcreek Road south of the town of Westcreek.

There are certain areas within the County that are susceptible to slope failure resulting in localized landslides, mud and debris flows, and rockfall. The Hayman burn area is particularly prone to mud and debris flows. Other areas identified by the County with historic problems include those listed below.

Likelihood of Future Occurrences

High—Although there are some areas within the County susceptible to slope failure, primarily as a result of severe weather, the risk map (see Figure 4.40) developed for the 2013 Colorado State Hazard Mitigation Plan identifies most of Douglas County at low risk for landslides, mud and debris flows, and rockfall. Based on data provided by the HMPC, landslides have occurred locally in the past. With significant rainfall (especially over wildfire burn scars), additional failures are likely. Given the nature of localized problems identified within the County, landslides, mud and debris flows, and rockfall will likely continue to impact the area when heavy precipitation occurs, as they have in the past.

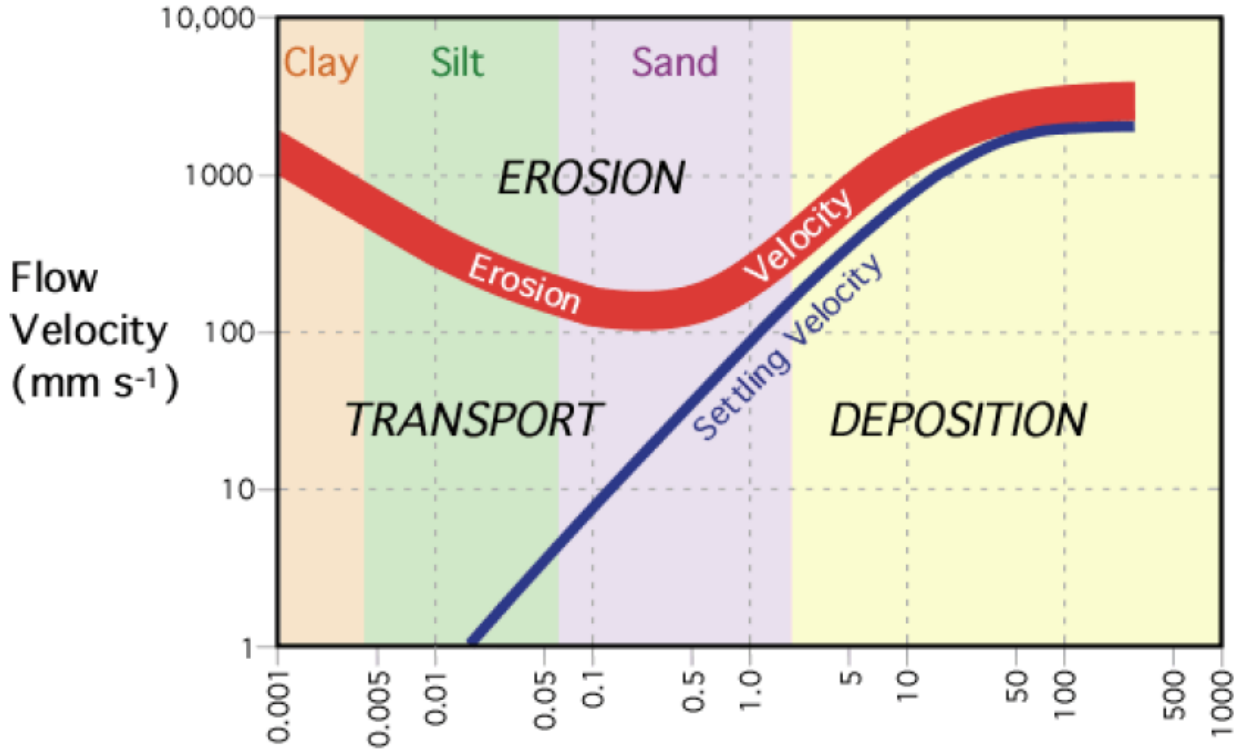
4.2.15 Soil Hazards: Erosion and Deposition

Hazard/Problem Description

Erosion is the removal and simultaneous transportation of earth materials from one location to another by water, wind, waves, or moving ice. Deposition is the placing of the eroded material in a new location. All material that is eroded is later deposited in another location.

Erosion and deposition is typically initiated by water or wind in Colorado. Riverine erosion is the long-term process whereby river banks and riverbeds are worn away. This process is best described as a river's tendency for constant course alteration, shape and depth change, and the balancing act between the water's sediment transport capacity and its sediment supply. Swiftly moving floodwaters cause rapid local erosion as the water carries away earth materials. Deposition occurs where flood waters slow down, pool or lose energy in other ways and the materials settle out. Figure 4.41 describes the relationship between stream flow velocity and particle erosion, transport, and deposition.

Figure 4.41. Erosion and Transport Characteristics of Streamflow Velocity



Source: physicalgeography.net

Wind erosion is when wind is responsible for land removal, movement, and deposition. Wind erosion most commonly occurs from exposed areas such as fields, tailings and desert areas when the wind is strong and the materials are deposited when the wind diminishes. Another factor that controls the amount of erosion is the ease with which material can be dislodged. Hard granites erode very slowly while soft silts and sands erode very quickly.

Grus soils are extensive in the foothills of Douglas County and are susceptible to erosion. Grus soils form when crystalline rocks, such as Pikes Peak Granite, crumble due to chemical or mechanical weathering. The granite breaks down into small particles which can then be carried away by wind or water. These soils are particularly susceptible to erosion following wildfires and have contributed to sedimentation problems on roads and reservoirs in the western county.

Erosion and deposition are occurring continually at varying rates all over Colorado. Point sources of erosion are common to construction sites or other areas where human interaction with the earth results in exposed soil or removal of vegetation. Natural waterways perpetually remove and carry soil from the earth to locations downstream. Erosion and deposition issues are also exacerbated in wildfire burn areas and can contribute to debris flows.

In Douglas County, erosion creates problems for the construction of roads, utilities, and structures. Gullies created by eroding soils can undercut unstable slopes, causing slope failures, and the accompanying soil deposition alters streambeds and degrades water quality within streams and reservoirs. Measures to mitigate these potential problem situations must be addressed early in the development process.

Past Occurrences

August 2, 2003 – Heavy rain producing thunderstorms triggered flash flooding at the confluence of Westcreek and Trail Creek in the Hayman burn area. Significant erosion was observed along the Trail Creek drainage. Vegetation along the drainage was flattened with mud and silt.

August 5, 2004 – Heavy rain caused flash flooding in the Hayman burn area. Several county and private roads, in the Westcreek subdivision, were damaged by floodwaters. Floodwaters, up to 8" deep, covered the roadways. Erosion of roads and culverts were reported in the vicinity of the Shady Brook YMCA Camp. Mudslides also forced the closure of U.S. Highway 67 for several hours.

Likelihood of Future Occurrences

High – Erosion is a natural process, and will continue to occur in the future. Erosion and deposition is a hazard event aggravated by natural events such as heavy rain or streamflow, high wind, wildfires, or human activities that disturb the land. These natural and human activities are expected to continue as in the past resulting in ongoing erosion and deposition.

4.2.16 Soil Hazards: Expansive Soils

Hazard/Problem Description

Swelling soils and swelling bedrock contain clay which causes the material to increase in volume when exposed to moisture and shrink as it dries. They are also commonly known as expansive, shrinking and swelling, bentonitic, heaving, or unstable soils and bedrock. In general, the term refers to both soil and bedrock contents although the occurrence of the two materials may occur concurrently or separately. The difference between the materials is that swelling soil contains clay, while swelling bedrock contains claystone. In this profile, the term is used to refer to both materials, as they are both relevant to the Planning Area.

The clay materials in swelling soils are capable of absorbing large quantities of water and

expanding 10% or more as the clay becomes wet. The force of expansion is capable of exerting pressures of 15,000 pounds per square foot or greater on foundations, slabs, and other confining structures. The amount of swelling (or potential volume of expansion) is linked to five main factors: the type of mineral content, the concentration of swelling clay, the density of the materials, moisture changes in the environment, and the restraining pressure exerted by materials on top of the swelling soil. Each of these factors impact how much swelling a particular area will experience, but may be modified, for better or worse, by development actions in the area.

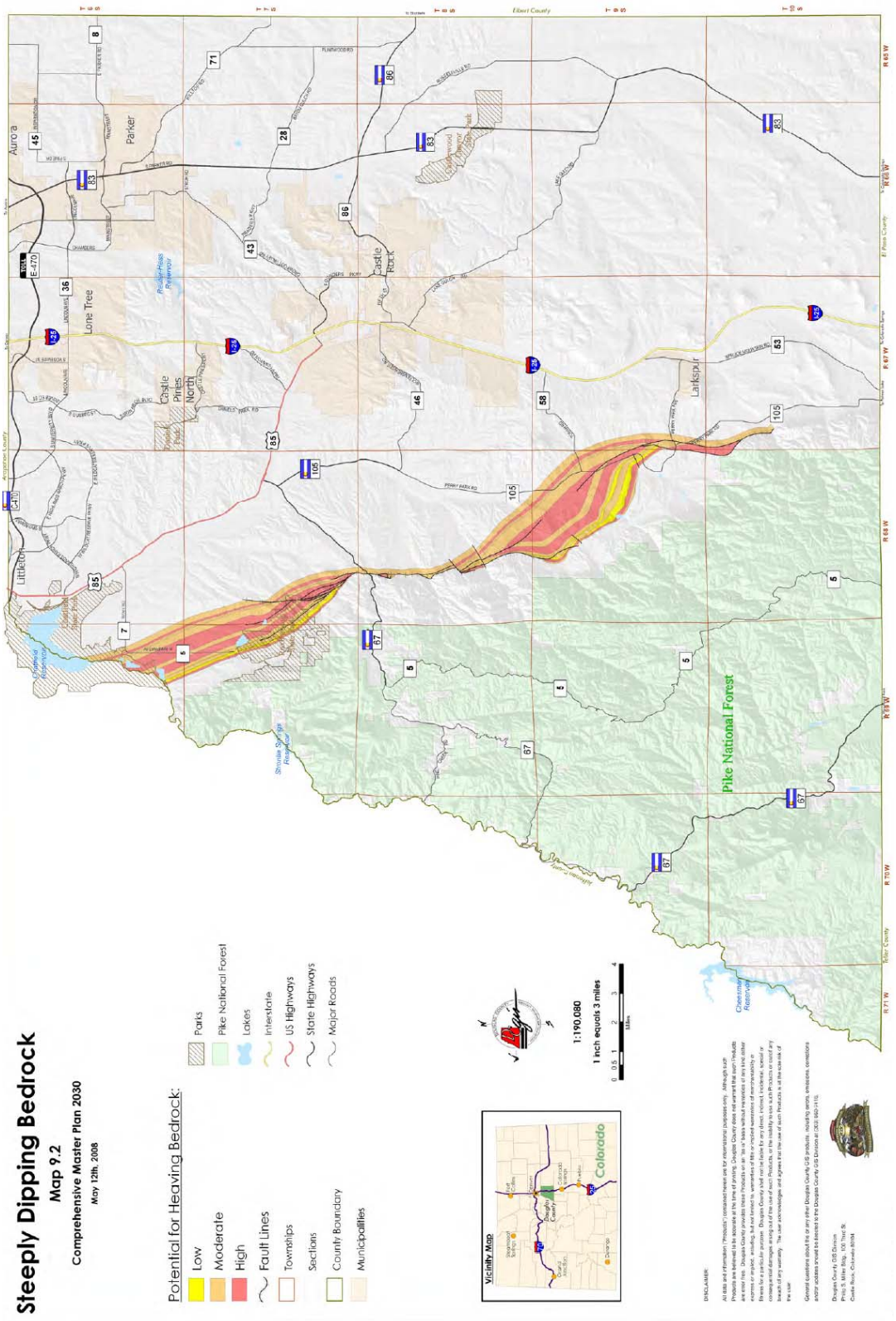
In Colorado, swelling soils expand and contract naturally during seasonal wetting (winter and spring) and drying (summer and fall) conditions and in their natural, undeveloped state they cause little damage. However, exposure to additional water sources, such as lawn and garden irrigation or precipitation drainage from houses, and reduced evaporation properties caused by the development of roads, sidewalks, buildings and parking lots, may cause the swelling soils to expand more than they would if they remained undeveloped. In addition, the re-grading of development areas may expose more swelling soil to moisture than the natural state, causing a more widespread swelling event.

Heaving bedrock is a geological hazard that is related to expansive soils, but it is more complex in terms of its uplift morphologies, deformation mechanisms, and regional distribution. It is common along Colorado's Front Range piedmont where steeply dipping sedimentary bedrock containing zones of expansive claystone is encountered near the surface of the ground.

The heave features associated with heaving bedrock are distinctly linear and are caused by differential swelling and/or rebound movements within the bedrock. Heaving bedrock has caused exceptional damage to houses, roads, and utilities along the Front Range piedmont since suburban-type development began in the early 1970s. Much of this damage may be attributed to the longstanding tendency to assume that the bedrock may be treated, for site-exploration and design purposes, as an expansive soil having essentially uniform properties. This approach ignores the strong heterogeneity that is often present in the bedrock.

A significant area of mostly undeveloped land in Douglas County is characterized by potential heaving bedrock conditions. Heaving bedrock is delineated in Figure 4.42. This map is based upon the coincidence of steeply dipping (tilted or upturned) layers of sedimentary expansive bedrock having dip angles of greater than 30° from horizontal. Individual heave features may attain sizes as large as two feet high, tens of feet wide, and hundreds of feet long.

Figure 4.42. Douglas County Steeply Dipping Bedrock



Source: Colorado Geological Survey Special Publication 42

All shrink-swell soils can become a problem when structures are built upon them and owners irrigate landscaping, causing soils to swell, thus cracking foundations.

Swelling soils are one of the nation's most prevalent causes of damage to buildings. According to the 2013 Colorado State Hazard Mitigation Plan, annual losses nationwide are estimated in the range of $2 billion. Potential damages include severe structural damage; cracked driveways, sidewalks, and basement floors; heaving of roads and highway structures; condemnation of buildings; and disruption of pipelines and other utilities. Destructive forces may be upward, horizontal, or both. Buildings designed with lightly loaded foundations and floor systems often incur the greatest damage and costly repairs from expansive soils. Building in and on swelling soils can be done successfully, although more expensively, as long as appropriate construction design and mitigation measures are followed. In some cases avoidance may be the best mitigation policy.

Past Occurrences

Damage of varying degrees of severity occurs on an ongoing and seasonal basis. The frequency of damage from expansive soils is associated with the cycles of drought and heavy rainfall and also reflects changes in moisture content based on typical seasonal patterns. Building codes and structure ages also contribute to overall damages, as newer structures are usually built with more resistant techniques or as development restrictions in vulnerable areas minimize expansion and exposure. Published data summarizing damages specific to Douglas County is not available, but it is acknowledged that a certain degree of damage to property and infrastructure occurs annually, as noted above. A 1999 Colorado Geological Survey report indicated that "several million dollars worth of damage [from expansive soils] has been incurred since suburban-type development began in the mid-1980s" in Douglas County.[8]

Likelihood of Future Occurrences

High—The Planning Area has extensive development regulations to minimize the damages incurred by dipping bedrock and other geologic hazards in the County. As such, while previous occurrences are certainly commonly known, it is reasonable to assume that damages and future occurrences should be decreasing.

4.2.17 Soil Hazards: Land Subsidence

Hazard/Problem Description

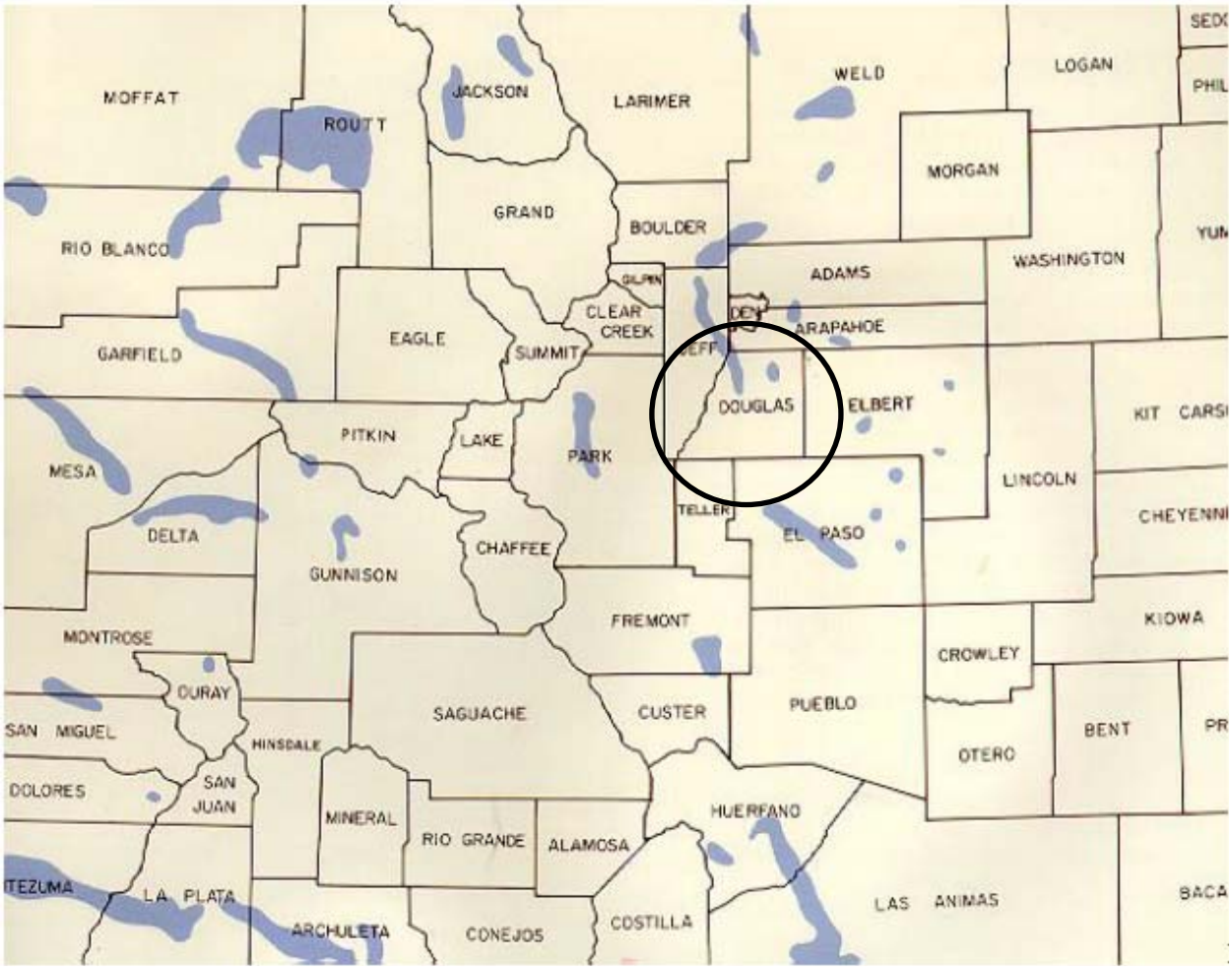
Land subsidence is defined as the sinking of the land over man-made or natural underground voids. Subsidence can result in serious structural damage to buildings, roads, irrigation ditches,

[8] Noe, David C. and Marilyn D. Dodson. Heaving-Bedrock Hazards Associated with Expansive, Steeply Dipping Bedrock in Douglas County, Colorado. Colorado Geological Survey Department of Natural Resources, 1999, pg. 1.

underground utilities, and pipelines. It can disrupt and alter the flow of surface or underground water. Weight, including surface developments such as roads, reservoirs, and buildings and manmade vibrations from such activities as blasting or heavy truck or train traffic can accelerate the natural processes of subsidence. Fluctuations in the level of underground water caused by pumping or by injecting fluids into the earth can initiate sinking to fill the empty space previously occupied by water or soluble minerals. The consequences of improper use of land subject to ground subsidence can be excessive economic losses, including the high costs of repair and maintenance for buildings, irrigation works, highways, utilities, and other structures. This results in direct economic losses to citizens as well as indirect economic losses through increased taxes and decreased property values.

In Colorado, land subsidence often occurs in areas where development takes place above or near abandoned coal mines. According to maps in the 2013 State of Colorado Hazard Mitigation Plan, there are abandoned mines in the Planning Area. These are shown on Figure 4.43.

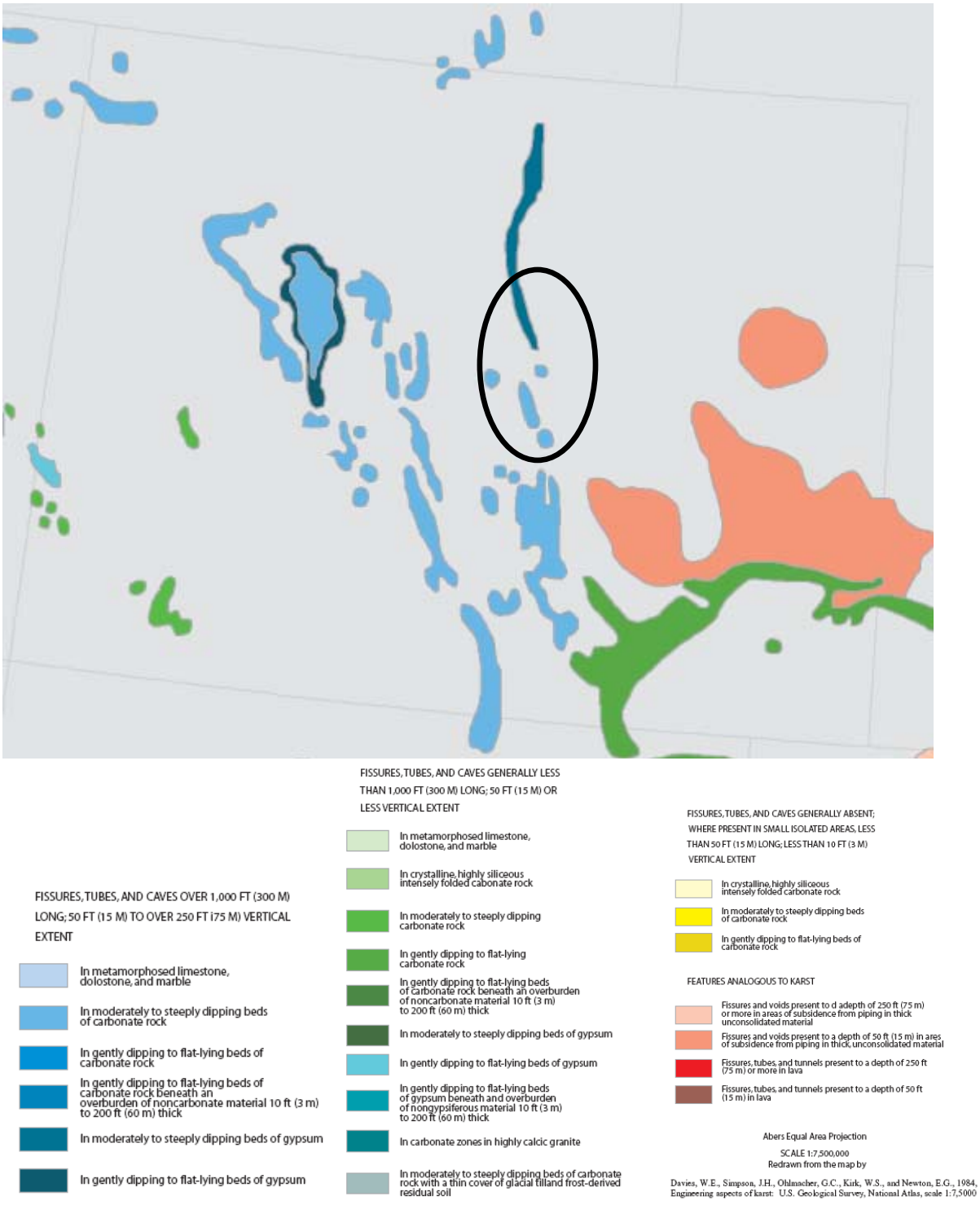
Figure 4.43. General Location of Inactive Coal Mines in Colorado and the Planning Area (circled in black)



Source: Colorado Geological Survey

In addition to the subsidence above coal mines, Douglas County is at risk to subsidence from karst. Distinctive surficial and subterranean features developed by solution of carbonate and other rocks and characterized by closed depressions, sinking streams, and cavern openings are commonly referred to as karst. Originally the term defined surface features derived by solution of carbonate rocks, but subsequent use has broadened the definition to include sulfates, halides, and other soluble rocks. Most of the problems created by karst pertain to subterranean karst and pseudokarst features that affect foundations, tunnels, reservoir tightness, and diversion of surface drainage. Figure 4.44 shows an excerpt of the national karst map for Colorado with the approximate location of Douglas County circled in black.

Figure 4.44. Karst Map for Colorado and the Planning Area



Source: National Karst Map. Davies, W.E., Simpson, J.H., Ohlmacher, G.C., Kirk, W.S., and Newton, E.G., 1984.

Past Occurrences

Records of previous subsidence occurrences are difficult to track, as there are no coordinating or monitoring agencies for this hazard. Small incidents of subsidence have occurred in the Castle Meadows area, including damage to a sidewalk in 2013. These incidents were associated with abandoned clay mines.

Likelihood of Future Occurrences

Medium—Historically, land subsidence issues in the County have been minimal. However, given the history of mining activity within Douglas County, the potential exists for subsidence to occur. If properly identified and managed, it is unlikely to be a significant concern.

4.2.18 Wildfire

Hazard/Problem Description

Wildfire is an ongoing concern for the Douglas County Planning Area, particularly fires that occur in the wildland/urban interface (WUI). The National Fire Protection Association (NFPA) defines the WUI as "the presence of structures in locations in which the [authority having jurisdiction] determines that topographical features, vegetation fuel types, local weather conditions, and prevailing winds result in the potential for ignition of the structures within the area from flames and firebrands of a wildfire."[9] Douglas County's WUI contains heavily populated areas with many people and structures at risk. The wildland/urban intermix is also of concern to the County. The intermix is defined as "an area where improved property and wildland fuels meet with no clearly defined boundary."[10] The intermix is distinguished from the interface by more abundant vegetation, closer proximity of structures to vegetation, and lower housing density.

Fires that occur in the WUI are the most damaging. Even relatively small acreage fires may result in disastrous damages. The damages are primarily reported as damage to infrastructure, built environment, loss of socio-economic values and injuries to people.

Fires can occur year-round in Douglas County given the right conditions, which include a combination of high temperatures, low moisture content in the air and fuel, accumulation of vegetation, and high winds. The impact of these conditions on wildfire severity is explained in further detail below.

Fuel. Fuel is the material that feeds a fire and is a key factor in wildfire behavior. Fuel is generally classified by type and by volume. Fuel sources are diverse and include everything from dead tree needles and leaves, twigs, and branches to dead standing trees, live trees, brush,

[9] NFPA 1144 Standard for Reducing Structure Ignition Hazards from Wildland Fire, 2013 Edition, pg. 1144-7.
[10] Ibid.

and cured grasses. Also to be considered as a fuel source, are man-made structures and other associated combustibles. The type of prevalent fuel directly influences the behavior of wildfire. Light fuels such as grasses burn quickly and serve as a catalyst for fire spread. Current vegetative conditions consist of overstocked forest stands that contain a high number of small, suppressed and poorly formed trees. They also contain a higher level of both live and dead fuels accumulations. Many areas are in need of significant thinning and restorative efforts to reduce hazardous fuels loads, promote tree vigor, increase stand diversity, increase forest sustainability and ecosystem health. Many areas also contain unnatural accumulations of Gambel oak. The oak is dead, decadent, and contiguous. Fuel is the only factor that is under human control. A greater discussion of fuel types by area in Douglas County can be found in the Douglas County Community Wildfire Protection Plan (CWPP).

Topography. An area's terrain and land slopes affect its susceptibility to wildfire spread. Fire intensities and rates of spread increase as slope increases due to the tendency of heat from a fire to rise via convection. The natural arrangement of vegetation throughout a hillside can also contribute to increased fire activity on slopes. Land characteristics in Douglas County are diverse and include grassy plains and gently rolling hills, to steep slopes and sharply rising scenic buttes. Many areas are characterized by undulating terrain and deep arroyos. Elevations, range from roughly 5,360 feet to over 9,835 feet in areas of the Pike National Forest. A greater discussion of topography by area in Douglas County can be found in the Douglas County CWPP.

Weather. Weather components such as temperature, relative humidity, wind, and lightning also affect the potential for wildfire. High temperatures and low relative humidity dry out the fuels that feed the wildfire creating a situation where fuel will more readily ignite and burn more intensely. Wind, which can be significant at times in Douglas County, enables fire to quickly spread over a larger area. Winds can also make fire behavior unpredictable; wind shifts can occur suddenly due to temperature changes or the interaction of wind with topographical features such as slopes or steep hillsides. A greater discussion of weather types and problems by area in Douglas County can be found in the Douglas County CWPP.

Lightning also ignites wildfires, often in difficult-to reach terrain for firefighters. Related to weather is the issue of recent drought conditions contributing to concerns about wildfire vulnerability. During periods of drought, the threat of wildfire increases.

The current make up of hazardous fuels accumulations and structures in Douglas County's WUI is a result of several factors, including a fire suppression policy dating back to the early 1900's, limited forest management, forest fragmentation, and development. These practices have significantly altered the forest dynamics. Many citizens move to these areas in search of a peaceful, tranquil setting amongst what they consider a natural setting; however, under present vegetative conditions, nothing could be further from the truth. Douglas County citizens who reside in the WUI should understand that the vegetative environment they reside in evolved with periodic wildfires and is prone to burn again. Future fires may be more intense than historical fires because the vegetation is denser and the built environment is denser than a century ago.

Property owners must be aware of the situation, and take responsibility for the condition on their properties, and work to maximize the health of their ecosystem. Landowners who recognize the wildfire component of their ecosystems often become interested in learning about the programs and management initiatives that are being implemented across the Front Range to restore forest and ecosystem health. Resource professionals can provide information on collaborative opportunities and program initiatives that work to make communities safer from wildfire and restore a more natural and healthier ecosystem.

Potential losses from wildfire include human life, structures and other improvements, natural and cultural resources, quality and quantity of water supplies, cropland, timber, and recreational opportunities. Smoke (and its related effects) and air pollution from wildfires can be a severe health hazard. In addition, catastrophic wildfire can create favorable conditions for other hazards such as flooding, landslides, and erosion during the rainy season.

Past Occurrences

Wildfires are of significant concern throughout Colorado and Douglas County. According to the Douglas County CWPP, vegetation fires occur within the Planning Area on a regular basis; most are controlled and contained early with limited damage. For those ignitions that are not readily contained and become wildfires, damage can be extensive. There are many causes of wildfire, from naturally caused lightning fires to human-caused fires linked to activities such as smoking, campfires, debris burning, equipment use, and arson. Recent studies conclude that the greater the population density in an area, the greater the chance of an ignition. With population (and ignition densities) continuing to grow throughout the Douglas County Planning Area, combined with increased fuel loads, the risk posed by wildfire also continues to grow.

Douglas County is susceptible to wildfires year-round. Over the past 30 years population growth and development in the WUI have placed many additional homes and businesses at risk - now small fires often create fire protection problems previously only found in the more densely populated areas of the County.

Wildfire history is represented in Figure 4.45 from two sources. Douglas County provided a GIS polygon layer showing major wildfires in and around Douglas County. This layer has 12 fire burn areas with the June 2002 Hayman Fire being the largest fire burning 138,238 acres (37,748 acres within Douglas County). The most comprehensive fire data was available from the Federal Wildfire Occurrence website maintained by the U.S. Departments of Agriculture and Interior as processed by the USGS (http://wildfire.cr.usgs.gov/firehistory/data.html). An analysis of historic fire records helps to define the area's fire season and patterns of fire occurrence over time and by jurisdiction. The Federal Wildfire Occurrence data recorded 259 wildfires in Douglas County between 1980 and 2012. All but 36 of these wildfires were over 10 acres in size, and five of the fires were over 50 acres in size. The largest wildfire in Douglas County was the 2002 Hayman fire at a total size of 138,114 acres, including 37,748 acres in the Planning Area. Figure 4.45 depicts the location of the wildfires in the County between 1980 and 2012.

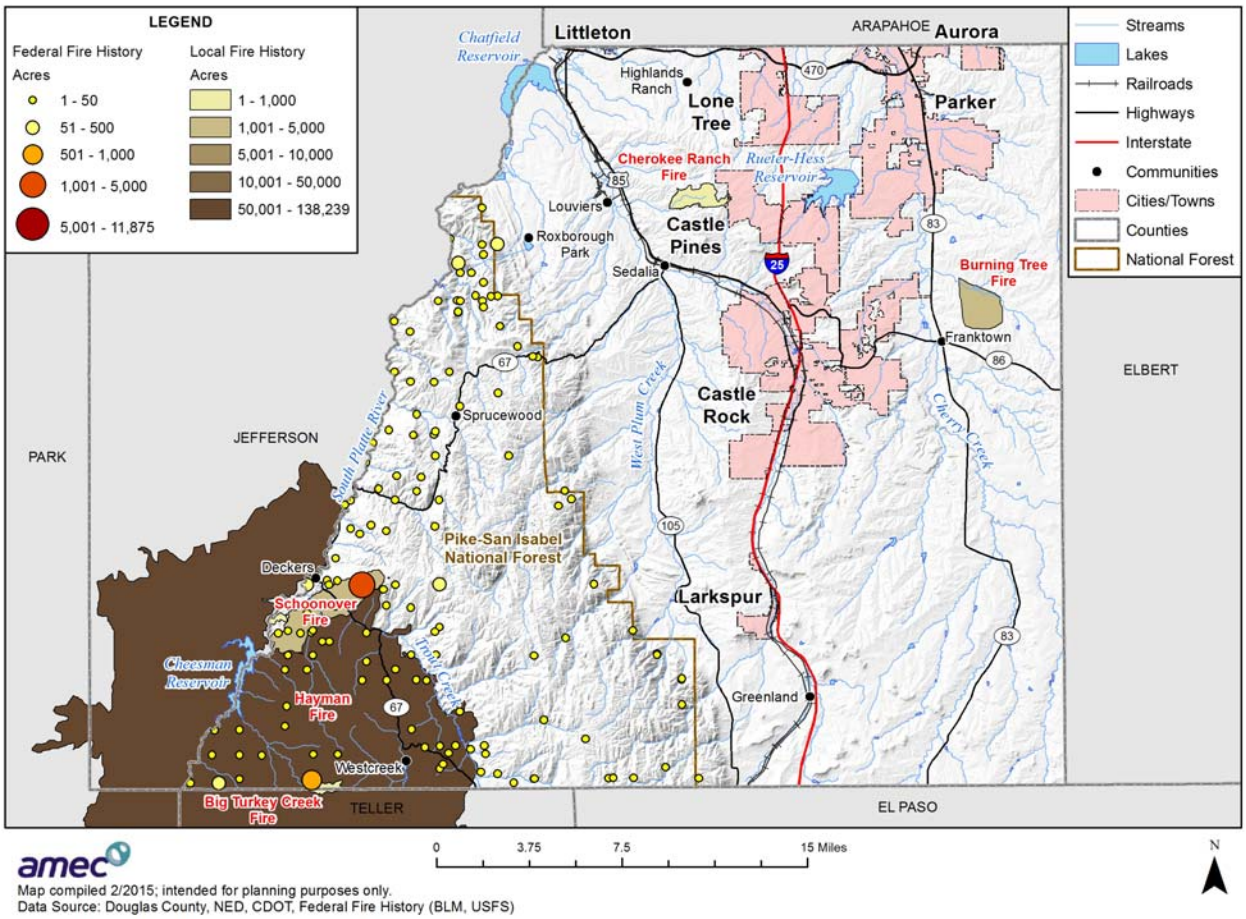
The data provides a reasonable view of the spatial distribution of past large fires in Douglas County. Using GIS, fire perimeters for events over 50 acres in size that intersected Douglas County were extracted and are listed in Table 4.32 and shown in Figure 4.45. Table 4.32 lists each fire's cause, name, agency, year, calculated acreage and containment date. Figure 4.45 shows fires, color-coded by the size of the acreage burned.

Table 4.32. Douglas County Local Fire History*

Fire/Treatment Name	Date	Acres
Big Turkey Fire	5/17/1998	312
Schoonover Fire	5/21/2002	3,864
Hayman Fire	6/8/2002	37,748
Cherokee Ranch Fire	10/29/2003	985
Burning Tree Fire	3/24/2011	1,600

*Fires intersecting with Doulas County statutory limits that were greater than 50 acres in size.

Figure 4.45. Douglas County Fire History 1980-2012



It is important to note that in addition to the Douglas County fire history detailed above, there are

numerous smaller fires that occur in the area year after year. These smaller fires have the ability to quickly get out of hand and become significant fires. Also, depending on the area, small fires in acreage can result in large losses.

The HMPC and CWPP provided the following details on recent fire history in Douglas County.

- **May 17, 1998**: the Big Turkey fire occurred in the Turkey Rock area, burning 312 acres.
- **May 21, 2002**: the Schoonover fire began in Schoonover Gulch southwest of Deckers. The fire burned nearly 4,000 acres in Pike National Forest and 23 acres of Denver Water property. Several housing and five YMCA camping cabins were also destroyed. A Fire Management Assistance Declaration was issued on May 23, 2002. The fire was fully contained by May 30, 3002.
- **June 8, 2002**: the Hayman fire, which was started by arson, burned from June 8, 2002 until July 18, 2002. It burned a total of 138,114 acres, including 37,748 acres in Douglas County and 4,245 acres of Denver Water property. Over 5,000 people had to evacuate, 133 homes were destroyed, and 6 people died as a result of the fire. Property losses were estimated at $40.4 million, and suppression efforts cost $39.1 million.
- **October 29, 2003**: the Cherokee Ranch fire occurred partially within South Metro Fire Rescue Authority's service area in October 2003. The fire burned 985 acres.
- **2005**: A fire burned 40 acres in Castle Rock's urban interface area, causing damage to open space.
- **April 1, 2010**: a small (20' x 20') wildfire on Trailway Circle threatened a home
- **April 12, 2010**: a wildfire burned three acres and threatened a home on Saguaro Ridge Road.
- **April 28, 2010**: a wildfire burned less than an acre on the bluffs south of Chatfield Drive.
- **June 29, 2010**: a small fire burned less than one acre on private property in the 10400 block of Inspiration Drive.
- **August 21, 2010**: six separate wildfires burned about two acres between I-25 and the homes east of the interstate. A bird that landed on an electrical line south of Arrowhead Lane caused an arc that ignited a small wildfire. Driven by a southwest wind up a slight slope, the fire scorched the yard of the property owner but forked around the house when it encountered defensible space. A quick response from firefighter and neighboring agencies contained that fire to that property.
- **August 27, 2010**: a wildfire burned a half acre and threatened a home on Cardinal Drive.
- **September 22, 2010**: a wildfire burned about an acre surrounding a house on North Sixth Street.
- **October 10, 2010**: a wildfire burned 1.2 acres and threatened private property on Travois Trail.
- **October 28, 2010**: a two-acre wildfire that threatened another house on Trailway Circle.
- **October 30, 2010**: a wildfire burned over an acre and threatened homes.
- **March 24, 2011**: the Burning Tree fire burned approximately 1,600 acres between Parker and Franktown. Roughly 8,500 people had to evacuate.
- **March 2012**: small grass fires damaged open space areas, blackened trees, scorched fences,

and burned grasses and shrubs in the Cottonwood Subdivision Open Space and southeast of Villages of Parker Filing 16B.

- **July 4, 2014**: the Foothills Fire burned four acres of Denver Water property.

Likelihood of Future Occurrences

High –Douglas County faces a wildfire threat throughout the year. Fires will continue to occur on an annual basis in the County. The threat of wildfire and potential losses constantly increase as human development and population increase in the wildland urban interface area in the County. This results in a **high** rating of future occurrence.

4.2.19 Hazardous Materials: Transportation Incidents

Hazard/Problem Description

A hazardous material is any item or agent (biological, chemical, physical) which has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors. Hazardous materials can be present in any form; gas, solid, or liquid. Environmental or atmospheric conditions can influence hazardous materials if they are uncontained.

The U.S. Occupational Safety and Health Administration's (OSHA) definition of hazardous material includes any substance or chemical which is a "health hazard" or "physical hazard," including: chemicals which are carcinogens, toxic agents, irritants, corrosives, sensitizers; agents which act on the hematopoietic system; agents which damage the lungs, skin, eyes, or mucous membranes; chemicals which are combustible, explosive, flammable, oxidizers, pyrophorics, unstable-reactive or water-reactive; and chemicals which in the course of normal handling, use, or storage may produce or release dusts, gases, fumes, vapors, mists or smoke which may have any of the previously mentioned characteristics.

The Environmental Protection Agency (EPA), through various regulations such as the Resource Conservancy and Recovery Act, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and others, provide a series of definitions depending on the applicable regulation. A release or spill of bulk hazardous materials could result in fire, explosion, toxic cloud, or direct contamination of people and property. The effects may involve a local site or many square miles. Health problems may be immediate, such as corrosive effects on skin and lungs, or be gradual, such as the development of cancer from a carcinogen. Damage to property could range from immediate destruction by explosion to permanent contamination by a persistent hazardous material.

Accidents involving the transportation of hazardous materials could be just as catastrophic as accidents involving stored chemicals, possibly more so, since the location of a transportation accident is not predictable. The U.S. Department of Transportation divides hazardous materials into nine major hazard classes. A hazard class is a group of materials that share a common major

hazardous property (e.g., radioactivity, flammability, etc.). These hazard classes include:

- Class 1 – Explosives
- Class 2 – Compressed Gases
- Class 3 – Flammable Liquids
- Class 4 – Flammable Solids; Spontaneously Combustible Materials; Dangerous When Wet Materials/Water-Reactive Substances
- Class 5 – Oxidizing Substances and Organic Peroxides
- Class 6 – Toxic Substances and Infectious Substances
- Class 7 – Radioactive Materials
- Class 8 – Corrosives
- Class 9 – Miscellaneous Hazardous Materials/Products, Substances, or Organisms

Hazardous materials are everywhere, and spills or releases occur in the U.S. on a daily basis. According to FEMA, the impact to life and property from any given release depends on a number of factors:

- Application Mode describes the human act(s) or unintended event(s) necessary to cause the hazard to occur.
- Duration is the length of time the hazard is present on the target.
- The dynamic/static characteristic of a hazard describes its tendency, or that of its effects, to either expand, contract, or remain confined in time, magnitude, and space.
- Mitigating conditions are characteristics of the target and its physical environment that can reduce the effects of a hazard.
- Exacerbating conditions are characteristics that can enhance or magnify the effects of a hazard.

Transportation incidents can occur during the transportation of hazardous materials to and from storage facilities. The most likely routes for the transportation of hazardous materials are major roadways and railroads. Only one highway (Interstate 25) within the Planning Area has been designated as Hazardous Materials Routes by CDOT's Department of Safety. Interstate 25 runs through some of the major population portions of the Planning Area where much of the County's industrial and residential activities are positioned. The portion of Colorado Highway 470 that lies west of Interstate-25 is also a designated hazardous materials route. People living in Lone Tree and the unincorporated community of Highlands Ranch are at the most immediate risk to hazardous materials incidents on this stretch of Highway 470.

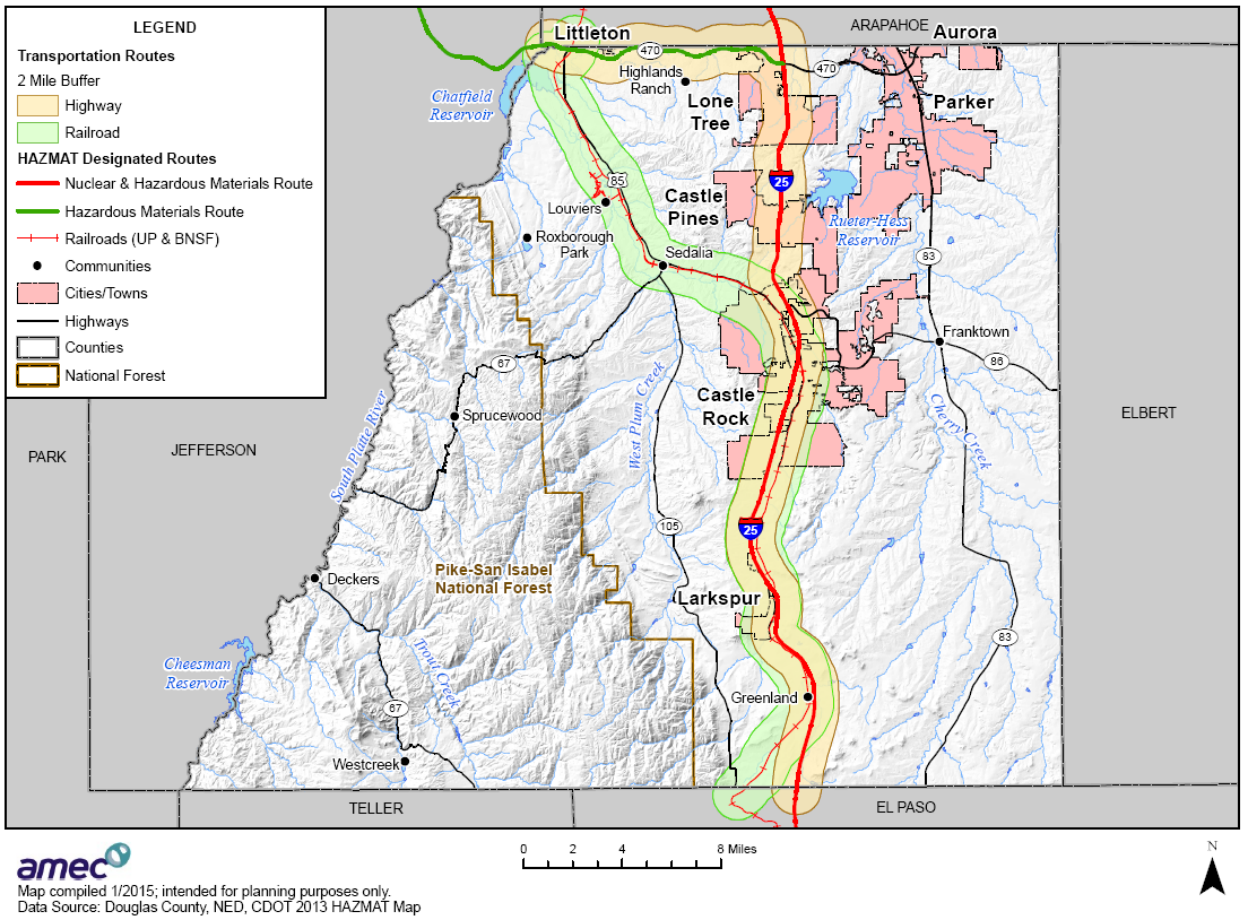
Two major railways run through the Planning Area: the Atchison, Topeka, and Santa Fe (AT&SF) Railroad and the Denver and Rio Grande Western Railroad. The major transportation corridors and rail lines are listed in Table 4.33 and shown in Figure 4.46.

Table 4.33. Douglas County Hazardous Materials Transportation Corridors

Major Roadways
Interstate 25
Highway 470
Rail Lines/Operations
AT & SF Railroad
Denver and Rio Grande Western Railroad

Source: CDOT Department of Safety 2013

Figure 4.46. Hazardous and Nuclear Materials Routes in Douglas County



Past Occurrences

The U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA) tracks hazardous materials spills and occurrences. A list of incidents can be found in Table 4.34.

Table 4.34. Hazardous Material Incidents in the Planning Area

Date	Incident City	Incident Route	Failure Cause Description	Total Amount of Damages	Description of Events
8/26/1987	Parker	N/A	Vehicular Crash or Accident Damage	$0	N/A
10/2/1989	Larkspur	County Road 105	Rollover Accident; Vehicular Crash or Accident Damage	$51,700	Vehicle not hauling any gasoline at time of accident. Vehicle #1 was southbound on County Road 105. It drove off the right side of the road for 97' and collided with a delineator post. Vehicle #1 then continued for 130.2' before coming back onto the road spinning around and sliding broadside across the road for 71.6' then going off the left side of the road and rolling over 1 3/4 times in 83.5'. Vehicle #1 came to rest on its left side 70.1' from the road. The driver was ejected.
11/8/1989	Parker	6222 E. Pine Lane	N/A	$60	The unload site is on an extreme grade (approx. 12%). In such circumstances the product in the cargo tank will go to the rear of the compartment and when the fire valve is opened to unload product some will run into the vap or recovery line due to the angle the unit is on. The driver's failure to have his vapor recovery hose connected when he opened the fire valves allowed the liquid to spill onto the drive. It is estimated that there was approximately 15 gallons of gasoline was released. All the spill was contained and none left the premises. Ward transport responded to the incident and made the cleanup using vermiculite and absorbent pads.
6/19/1990	Littleton	1205 S Platte River Dri	Dropped;	$165	While loading the trailer one carton was found leaking. The carton (containing acetic anhydride) was inspected and one bottle inside was found cracked and leaking. The bottle and carton were recooped and placed into a DOT approved recovery drum which was properly marked labeled and forwarded to the destination. The spillage was neutralized with soda ash and cleansed from the trailer floor
5/21/1996	Parker	11402 S Parker Dr	Improper Preparation for Transportation	$330	Driver was making a city delivery at the consignee's location and found a lid on one pail of calcium hypoclorite was damaged. Consignee handled clean up and accepted the freight.
7/17/1997	Castle Rock	I-25 M.M. 186	Rollover Accident; Vehicular Crash or Accident Damage;	$38,000	Single vehicle accident rollover with release of 6000 gallons of elevated temperature liquid product from the dome lid.

Date	Incident City	Incident Route	Failure Cause Description	Total Amount of Damages	Description of Events
8/3/1998	Parker	10270 S. Dransfeldt	Dropped	$21	Driver trainee was moving a portable tank into position to unload from trailer. The tank was inadvertently pushed too hard and fell off the back end of the van trailer. The weight of the portable tank hitting the forklift caused the forklift operator to bounce and hit his head on the roll over protection. The tank then fell to the ground on its side. Out of panic the forklift operator hastily tried to pick up the tank but punctured the tank with the forks from the forklift. A small amount of isopropyl (10-15 gal.) spilled out prior to getting the tank upright in position and preventing any more leakage to occur.
4/23/1999	Parker	10610 S Longs Way	Vehicular Crash or Accident Damage	$3,287	While backing into position to unload, driver backed into a telephone pole. The pole broke the load/unload valves off of #1 and #2 compartments; allowing the spillage of gasoline from the bottom loading manifolds. No spillage from cargo tank vessel.
5/16/2001	Highlands Ranch	8663 S Quebec St	Overfilled; Defective Component or Device	$230	While driver was unloading from transport, a line was missing and when tank filled it pushed gasoline out of vapor line. Driver called fire department when fire dept showed up determined approx. 20 to 30 gallon spill they applied 5 gallons of neutralizing agent scrubbed area and flushed.
12/5/2004	Aurora	14700 Smith Road	N/A	$500	While unloading trailer dockman punctured pail of corrosive liquid basic with forklift. Recooped into a properly marked and labeled dot approved recovery drum with a chemical liner and held for shipper disposition. Spilled material neutralized with amphomag and properly disposed of.
7/15/2005	Palmer Lake	Palmer Divide Rd I25 Exit163	Rollover Accident	$92,771	To avoid an oncoming vehicle crossing the center lane, driver moved over to the right while going around a curve. Trailer tires got off the road surface. Tractor and trailer rolled over and slid into the ditch damaging both tractor and trailer releasing liquid NOS. Emergency crews and clean up crews were notified at the scene to minimize damage to property and environment.
7/17/2005	Aurora	19550 Smith Rd	Human Error	$550	While unloading the trailer a drum of magnesium phosphide was discovered damaged by other freight that had shifted in transit and released about (one gallon) in volume of the solid. The damaged drum was overpacked into a salvage recovery drum with a chemical liner and held pending disposition from the shipper.
7/18/2005	Aurora	15950 Smith Rd	Human Error	$0	While unloading the trailer a drum of methyl methacrylate monomer (stabilized) was discovered with a puncture on the upper rim. It appears that a forklift while loading a pallet behind the drum punctured it. The drum was overpacked into a salvage recovery drum with a chemical liner and held in the hazardous materials bay pending disposition from the shipper.

Date	Incident City	Incident Route	Failure Cause Description	Total Amount of Damages	Description of Events
9/8/2005	Aurora	19550 Smith Rd	Impact with Sharp or Protruding Object (e.g. nails)	$0	While unloading it was discovered that one 5-gallon pail of adhesives had been punctured by adjacent freight. The spill was absorbed and disposed of properly. The damaged pail was placed into a lined salvage drum pending disposition from the shipper.
7/16/2006	Highlands Ranch	2020 E County Line Rd	Human Error	$0	A spill of 10 gallons of diesel fuel was reported. Driver training thought hoses were hooked up-but were not-driver error.
8/8/2007	Littleton	12249 N. Mead Way	N/A	$28,625	A service driver was filling an above ground storage tanks with diesel fuel. Upon completion of the service work the driver shut off the valve and disconnected the hoses for storage. After removing the hose it was discovered that the valve was still releasing product and spilling onto the concrete parking lot. Several attempts to close the valve failed and the driver called the operations manager who immediately left for the site. Driver collecting as much product in buckets as he could. Spill duration was probably several minutes. While in route to the site the operations manager called for support from their emergency response hazardous material company. While awaiting the arrival the hazmat company driver operations manager and others built temporary dykes with sand.
7/15/2010	Littleton	6996 W. Titan Rd.	Over-pressurized; Human Error	$0	A driver was delivering transmixed fuel into an above-ground storage tank. In the process of doing so he forgot to open a valve on the pump causing it to overpressurize and eventually crack. As a result approximately 5 gallons of transmixed fuel was able to escape. The driver was able to remediate the spill without any further assistance.
7/7/2011	Highlands Ranch	2020 E. County Line Rd.	Impact with Sharp or Protruding Object (e.g. nails)	$0	Driver unloaded 36 non-bulk packages for delivery to convenience store. One non-bulk package rolled underneath delivery vehicle. Driver did not notice non-bulk package underneath truck and attempted to drive away after delivery. Non-bulk package wedged between asphalt and real axle U bolt of vehicle. U bolt punctured non-bulk package causing release of 3.5 gallons of propane which readily dispersed to atmosphere.
11/9/2013	Castle Rock	7284 Lagae Rd	Human Error	$0	During unloading process, a driver had just opened a valve when product hose cam-lock fitting at trailer disconnected which allowed product to be released. The driver immediately shut down unloading and notified the store. The driver did not properly tighten the cap.
Total				**$216,239**	

Source: PHMSA Incident Reports Database

Likelihood of Future Occurrences

Medium—due to the amount of past occurrences and the number of hazardous materials routes that cross the Planning Area, the likelihood of future occurrence is medium.

4.2.20 Hazards Summary

Table 4.35 summarizes the results of the hazard identification and hazard profile for the Douglas County Planning Area based on the hazard identification data and input from the HMPC. For each hazard profiled in Section 4.2, this table includes the likelihood of future occurrence and whether the hazard is considered a priority hazard for the Douglas County Planning Area.

Table 4.35. Hazard Identification/Profile Summary and Determination of Priority Hazard: Douglas County Planning Area

Hazard	Spatial Extent	Likelihood of Future Occurrences	Magnitude/Severity	Significance
Avalanche	Limited	Low	Low	Low
Drought	Significant	Medium	Medium	Medium
Earthquake	Significant	Low	Low	Low
Flood: Dam Failure	Limited	Low	Medium	Medium
Flood: 100/500 year	Significant	Low	Medium	Medium
Flood: Localized/ Stormwater	Significant	Medium	Low	Medium
Landslides/ Mud & Debris Flows /Rockfalls	Limited	High	Low	Medium
Severe Weather: Extreme Heat	Extensive	High	Low	Low
Severe Weather: Hail	Significant	High	Low	Low
Severe Weather: High Winds	Significant	High	Low	Low
Severe Weather: Lightning	Significant	High	Medium	Low
Severe Weather: Thunderstorms/Heavy Rains	Extensive	High	Medium	Medium
Severe Weather: Tornado	Limited	High	Low	Low
Severe Weather: Winter Weather (includes snow/ice/extreme cold)	Extensive	High	Low	Medium
Soil Hazards: Erosion & Deposition	Limited	High	Low	Medium
Soil Hazards: Expansive Soils	Limited	High	Low	Low
Soil Hazards: Subsidence	Limited	Medium	Low	Low
Wildfire	Extensive	High	High	High
Hazardous Materials: Transportation Incidents	Significant	Medium	High	High

Spatial Extent
Limited: Less than 10% of Planning Area
Significant: 10-50% of Planning Area
Extensive: 50-100% of Planning Area

Likelihood of Future Occurrences

Magnitude/Severity
Low: Negligible property damages (less than 5% of all buildings and infrastructure) Negligible loss of quality of life. Local emergency response capability is sufficient to manage the hazard.
Medium: Moderate property damages (15% to 50% of all

Low: Occurs less than once every 10 years or more ***Medium***: Occurs less than once every 5 to 10 years ***High***: Occurs once every year or up to once every five years	buildings and infrastructure) Some loss of quality of life. Emergency response capability, economic and geographic effects of the hazard are of sufficient magnitude to involve one or more counties. ***High***: Property damages to greater than 50% of all buildings and infrastructure. Significant loss of quality of life, emergency response capability; economic and geographic effects of the hazard are of sufficient magnitude to require federal assistance. **Significance** **Low**: minimal potential impact **Medium**: moderate potential impact **High**: widespread potential impact

Hazard risk and vulnerability varies across the communities in Douglas County. The following tables summarize the results of the hazard profiles for incorporated communities that are participating jurisdictions in the hazard mitigation plan, based on initial input from the HMPC and adjusted to reflect the updated hazards and risk analysis. Additional details on risk and loss estimates for these jurisdictions are available in the next section and the jurisdictional annexes.

Table 4.36. Hazard Identification/Profile Summary and Determination of Priority Hazard: Castle Pines

Hazard	Spatial Extent	Likelihood of Future Occurrences	Magnitude /Severity	Significance
Avalanche	Limited	Low	Low	Low
Drought	Extensive	Medium	Low	Low
Earthquake	Extensive	Low	Low	Low
Flood: Dam Failure	Limited	Low	Low	Low
Flood: 100/500 year	Limited	Low	Medium	Medium
Flood: Localized/ Stormwater	Limited	High	Medium	High
Flood: Levee Failure	Limited	Low	Low	Low
Landslides/ Mud & Debris Flows /Rockfalls	Limited	Medium	Medium	Medium
Severe Weather: Extreme Heat	Extensive	Low	Low	Low
Severe Weather: Hail	Significant	Medium	Medium	Medium
Severe Weather: High Winds	Extensive	Medium	Medium	Medium
Severe Weather: Lightning	Limited	Medium	Medium	Medium
Severe Weather: Thunderstorms/Heavy Rains	Extensive	High	Medium	Medium
Severe Weather: Tornado	Limited	Medium	Medium	Medium
Severe Weather: Winter Weather (includes snow/ice/extreme cold)	Extensive	High	High	High
Soil Hazards: Erosion & Deposition	Limited	Medium	Low	Low
Soil Hazards: Expansive Soils	Limited	Low	Low	Low
Soil Hazards: Subsidence	Limited	Low	Low	Low

Hazard	Spatial Extent	Likelihood of Future Occurrences	Magnitude /Severity	Significance
Wildfire	Extensive	Low	Low	High
Hazardous Materials: Transportation Incidents	Significant	Low	Low	Low

Table 4.37. Hazard Identification/Profile Summary and Determination of Priority Hazard: Castle Rock

Hazard	Spatial Extent	Likelihood of Future Occurrences	Magnitude/Severity	Significance
Avalanche	Limited	Low	Low	Low
Drought	Extensive	Low	Medium	Low
Earthquake	Extensive	Low	Medium	High
Flood: Dam Failure	Limited	Low	Low	Low
Flood: 100/500 year	Limited	High	Low	Low
Flood: Localized/ Stormwater	Limited	High	Medium	Medium
Landslides/ Mud & Debris Flows /Rockfalls	Limited	Medium	Low	Low
Severe Weather: Extreme Heat	Extensive	High	Low	Low
Severe Weather: Hail	Extensive	High	Medium	High
Severe Weather: High Winds	Significant:	High	Medium	Medium
Severe Weather: Lightning	Limited	High	Low	Low
Severe Weather: Thunderstorms/Heavy Rains	Extensive	High	Medium	High
Severe Weather: Tornado	Limited	Medium	Medium	Medium
Severe Weather: Winter Weather (includes snow/ice/extreme cold)	Extensive	High	High	High
Soil Hazards: Erosion & Deposition	Limited	High	Low	Low
Soil Hazards: Expansive Soils	Limited	High	Low	Low
Soil Hazards: Subsidence	Limited	Medium	Low	Low
Wildfire	Limited	High	Medium	Medium
Hazardous Materials: Transportation Incidents	Limited	Medium	Medium	Medium

Table 4.38. Hazard Identification/Profile Summary and Determination of Priority Hazard: Larkspur

Hazard	Spatial Extent	Likelihood of Future Occurrences	Magnitude/Severity	Significance
Avalanche	Limited	Low	Low	Low
Drought	Extensive	Medium	Low	High
Earthquake	Extensive	Low	Low	Low
Flood: Dam Failure	Limited	Low	Low	Low
Flood: 100/500 year	Extensive	Low	High	High
Flood: Localized/ Stormwater	Significant	Medium	Low	Low
Landslides/ Mud & Debris Flows /Rockfalls	Limited	Low	Low	Low
Severe Weather: Extreme Heat	Extensive	Medium	Low	High
Severe Weather: Hail	Significant	Medium	Medium	Medium
Severe Weather: High Winds	Extensive	Medium	Medium	High
Severe Weather: Lightning	Extensive	High	Low	High
Severe Weather: Thunderstorms/Heavy Rains	Extensive	High	Medium	High
Severe Weather: Tornado	Extensive	Low	High	High
Severe Weather: Winter Weather (includes snow/ice/extreme cold)	Extensive	High/Medium	Medium	High
Soil Hazards: Erosion & Deposition	Significant	Low	Medium	Medium
Soil Hazards: Expansive Soils	Significant	Low	Low	Low
Soil Hazards: Subsidence	Limited	Low	Low	Low
Wildfire	Extensive	High	High	High
Hazardous Materials: Transportation Incidents	Extensive	Low	High	High

Table 4.39. Hazard Identification/Profile Summary and Determination of Priority Hazard: Lone Tree

Hazard	Spatial Extent	Likelihood of Future Occurrences	Magnitude/Severity	Significance
Avalanche	Limited	Low	Low	Low
Drought	Significant	Medium	Medium	Medium
Earthquake	Significant	Low	Low	Low
Flood: Dam Failure	Limited	Low	Low	Low
Flood: 100/500 year	Limited	Low	Low	Low
Flood: Localized/ Stormwater	Limited	Medium	Low	Low

Hazard	Spatial Extent	Likelihood of Future Occurrences	Magnitude/Severity	Significance
Landslides/ Mud & Debris Flows /Rockfalls	Significant	Medium	Medium	Low
Severe Weather: Extreme Heat	Extensive	Medium	Low	Low
Severe Weather: Hail	Extensive	High	Low	Low
Severe Weather: High Winds	Extensive	High	Low	Low
Severe Weather: Lightning	Extensive	Medium	Low	Low
Severe Weather: Thunderstorms/Heavy Rains	Extensive	High	Medium	Medium
Severe Weather: Tornado	Extensive	Medium	Low	Low
Severe Weather: Winter Weather (includes snow/ice/extreme cold)	Extensive	Medium	High	Medium
Soil Hazards: Erosion & Deposition	Significant	Medium	Low	Low
Soil Hazards: Expansive Soils	Significant	Medium	Low	Low
Soil Hazards: Subsidence	Limited	Medium	Low	Low
Wildfire	Significant/Extensive	High	Medium	Medium
Hazardous Materials: Transportation Incidents	Significant	High	Medium	Medium

Table 4.40. Hazard Identification/Profile Summary and Determination of Priority Hazard: Parker

Hazard	Spatial Extent	Likelihood of Future Occurrences	Magnitude/Severity	Significance
Avalanche	None	None	None	None
Drought	Extensive	Low/Med	Med	Med
Earthquake	Significant	Low	Low	Low
Flood: Dam Failure	Significant	Low	Med	Med
Flood: 100/500 year	Limited	Med	Low/High*	Low/High*
Flood: Localized/ Stormwater	Significant	Med	Low	Low
Landslides/ Mud & Debris Flows /Rockfalls	Limited	Low	Low	Low
Severe Weather: Extreme Heat	Extensive	High	Low	Low
Severe Weather: Hail	Significant	High	Med	Med
Severe Weather: High Winds	Extensive	High	Low	Low
Severe Weather: Lightning	Significant	High	Low	Low
Severe Weather: Thunderstorms/Heavy Rains	Extensive	High	Low	Low

Hazard	Spatial Extent	Likelihood of Future Occurrences	Magnitude/Severity	Significance
Severe Weather: Tornado	Limited	Low	Low	Med
Severe Weather: Winter Weather (includes snow/ice/extreme cold)	Extensive	High	Med	Low
Soil Hazards: Erosion & Deposition	Limited	Med	Low	Low
Soil Hazards: Expansive Soils	Limited	Med	Low	Low
Soil Hazards: Subsidence	Limited	Low	Low	Low
Wildfire	Limited	Med	Low	Low
Hazardous Materials: Transportation Incidents	Limited	Low	Med	Med

*Low for 100-year and High for 500-year

Table 4.41. Hazard Identification/Profile Summary and Determination of Priority Hazard: Denver Water

Hazard	Spatial Extent	Likelihood of Future Occurrences	Magnitude /Severity	Significance
Avalanche	Limited	Low	Low	Low
Drought	Significant	High	Low	High
Earthquake	Significant	Low	Low	High
Flood: Dam Failure	Limited	Low	High	High
Flood: 100/500 year	Significant	Low	Medium	Medium
Flood: Localized/ Stormwater	Significant	Low	Low	Low
Landslides/ Mud & Debris Flows /Rockfalls	Limited	Low	Low	Low
Severe Weather: Extreme Heat	Extensive	Medium	Low	Low
Severe Weather: Hail	Significant	Medium	Medium	Low
Severe Weather: High Winds	Significant	Medium	Low	Low
Severe Weather: Lightning	Significant	Medium	Low	Low
Severe Weather: Thunderstorms/Heavy Rains	Extensive	Medium	Medium	Low
Severe Weather: Tornado	Limited	Medium	Low	Low
Severe Weather: Winter Weather (includes snow/ice/extreme cold)	Extensive	Medium	Low	Low
Soil Hazards: Erosion & Deposition	Limited	Medium	Low	Low
Soil Hazards: Expansive Soils	Limited	Medium	Low	Low
Soil Hazards: Subsidence	Limited	Medium	Low	Low
Wildfire	Extensive	High	Low	Low
Hazardous Materials: Transportation Incidents	Significant	Medium	Medium	Low

4.3 Vulnerability Assessment

Requirement §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) of this section. This description shall include an overall summary of each hazard and its impact on the community.

Requirement §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 areas.

Requirement §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) of this section and a description of the methodology used to prepare the estimate.

Requirement §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.

With Douglas County's hazards identified and profiled, the HMPC conducted a vulnerability assessment to describe the impact that each priority hazard would have on the County. The vulnerability assessment quantifies, to the extent feasible using best available data, assets at risk to hazards and estimates potential losses. This section focuses on the risks to the County as a whole. Where available, data from the individual participating jurisdictions was evaluated and integrated here and in the jurisdictional annexes, and noted where the risk differs for a particular jurisdiction within the Planning Area.

This vulnerability assessment followed the methodology described in the FEMA publication Understanding Your Risks—Identifying Hazards and Estimating Losses. The vulnerability assessment first describes the total vulnerability and values at risk and then discusses vulnerability by hazard.

Data used to support this assessment included the following:

- County GIS data (hazards, base layers, and assessor's data);
- Statewide GIS datasets compiled by the Colorado DHSEM to support mitigation planning;
- County CWPP GIS datasets;
- FEMA's HAZUS-MH 2.1 GIS-based inventory data
- Written descriptions of inventory and risks provided by participating jurisdictions;
- Existing plans and studies; and
- Personal interviews with planning team members and staff from the County and participating jurisdictions.

4.3.1 Douglas County Vulnerability and Assets at Risk

As a starting point for analyzing the Planning Area's vulnerability to identified hazards, the HMPC used a variety of data to define a baseline against which all disaster impacts could be compared. This section describes significant assets at risk if a catastrophic disaster was to occur in the Planning Area. Data used in this baseline assessment included:

- Total values at risk;
- Critical facility inventory;
- Cultural, historical, and natural resources; and
- Growth and development trends.

Total Values at Risk

The following data from the Douglas County Assessor's Office is based on joins and relates of assessor data to the 2014 parcel layer in GIS. This data should only be used as a guideline to overall values in the County, as the information has some limitations. It is also important to note, in the event of a disaster, it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a loss.

Methodology

The 2014 Assessor inventory data was joined to the parcel layer by the parcel number to get a complete inventory of values by property type. By performing this process assessor data was associated with the parcel layer for further analysis. An analysis that was performed is shown in the following tables to show the number of structures, land value and total improved structure value for each parcel by occupancy type and by jurisdiction. The structure count was derived from a building footprint GIS layer. Each parcel record was attributed with its jurisdiction name (Castle Pines, Larkspur, Parker, etc.) based on whether its geographic center fell in or out of those jurisdictional boundaries. For the purposes of tabulating data, the unincorporated county was considered a jurisdiction and is listed in the table as such. A relationship table within the assessor database was used to categorize the property types or Account Types and was summarized into simpler groups for this analysis. One hundred forty six parcels did not have a parcel number or did not join between the parcel and assessor database join; these were put in the Vacant Land category. Nine hundred seventy-one of the parcel records did not have associated improved assessor values, and were therefore left at $0 and treated as unimproved parcels.

Douglas County has a total land value of $11,063,233,441. There are 126,767 parcels in the County with a total improved value of $32,402,076,962. Castle Rock has the most structures and value of the County's jurisdictions; there are 24,519 structures with a total value of $4.9 billion. Parker is close behind with 18,510 structures totaling $4 billion of improved values. Table 4.42 shows the 2014 parcel values for the entire Douglas County Planning Area (i.e., the total values at risk) by jurisdiction. The values for unincorporated Douglas County are provided in Table 4.43 by

property type showing that residential structures dominate with a count of 81,561 and a total value including improvements and land values of $26.9 billion.

Table 4.42. Douglas County Assessor's Inventory: By Jurisdiction

Jurisdiction	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Land Value	Total Value
Aurora*	637	152	536	$46,384,067	$25,761,714	$72,145,781
Castle Pines	4,195	3,338	4,320	$1,281,263,802	$376,824,415	$1,658,088,217
Castle Rock	24,619	17,656	24,519	$4,897,702,996	$1,269,202,509	$6,166,905,505
Larkspur	151	74	204	$13,662,695	$9,603,287	$23,265,982
Littleton*	42	4	111	$3,583,664	$12,347,389	$15,931,053
Lone Tree	4,615	3,596	6,282	$2,439,308,867	$791,236,306	$3,230,545,173
Parker	18,449	14,662	18,510	$4,051,635,888	$1,332,975,205	$5,384,611,093
Unincorporated	74,059	58,160	81,561	$19,668,534,983	$7,245,282,616	$26,913,817,599
Total	**126,767**	**97,642**	**136,043**	**$32,402,076,962**	**$11,063,233,441**	**$43,465,310,403**

Source: 2014 Douglas County Assessor and Parcel
*Aurora and Littleton are not participating in this plan.

Table 4.43. Douglas County Assessor's Inventory of Unincorporated County by Property Type

Property Type	Total Parcel Count	Improved Parcel Count	Total Structures Count	Improved Value	Land Value	Total Value
Agricultural	3,527	1,011	2,351	$408,387,527	$24,891,100	$433,278,627
Commercial	835	700	9,855	$2,120,214,546	$711,957,157	$2,832,171,703
Exempt	5,386	346	1,767	$943,117,742	$879,583,701	$1,822,701,443
HOA	1,307	1	435	$2,522,088	$360,000	$2,882,088
Industrial	140	137	261	$164,583,796	$57,464,699	$222,048,495
Producing Mine	20	0	6	$0	$1,221,200	$1,221,200
Residential	58,087	55,948	61,681	$16,026,843,365	$5,243,000,700	$21,269,844,065
Utilities	148	0	71	$0	$197,376	$197,376
Vacant Land	4,609	17	5,134	$2,865,919	$326,606,683	$329,472,602
Total	**74,059**	**58,160**	**81,561**	**$19,668,534,983**	**$7,245,282,616**	**$26,913,817,599**

Source: 2014 Douglas County Assessor and Parcel

Critical Facility Inventory

For the purposes of this plan, a critical facility is defined as:

> Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in

severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.

A critical facility is classified by the following categories: (1) Essential Services Facilities; (2) High Potential Loss Facilities; and (3) At-Risk Populations Facilities:

- **Essential Services Facilities** include, without limitation, public safety, emergency response, emergency medical, designated emergency shelters, communications, public utility plant facilities and equipment, and government operations. Sub-Categories:
  - **Public Safety** – Police stations, fire and rescue stations, emergency operations centers
  - **Emergency Response** – Emergency vehicle and equipment storage and essential governmental work centers for continuity of government operations.
  - **Emergency Medical** – Hospitals, emergency care, urgent care, ambulance services.
  - **Designated Emergency Shelters**.
  - **Communications** – Main hubs for telephone, main broadcasting equipment for television systems, radio and other emergency warning systems.
  - **Public Utility Plant Facilities** – including equipment for treatment, generation, storage, pumping and distribution (hubs for water, wastewater, power and gas).
  - **Essential Government Operations** – Public records, courts, jails, building permitting and inspection services, government administration and management, maintenance and equipment centers, and public health.
  - **Transportation Lifeline Systems** – Airports, helipads, and critical highways, roads, bridges and other transportation infrastructure (Note: Critical highways, roads, etc. will be determined during any hazard-specific evacuation planning and are not identified in this plan).
- **High Potential Loss Facilities** include those facilities that would have a high loss or impact on the community:
  - **Dams**
  - **Hazardous Material Facilities** that include, without limitation, any facility that could, if adversely impacted, release hazardous material(s) in sufficient amounts during a hazard event that would create harm to people, the environment and property.
- **At Risk Population Facilities** include, without limitation, pre-schools, public and private primary and secondary schools, before and after school care centers with 12 or more students, daycare centers with 12 or more children, group homes, and assisted living residential or congregate care facilities with 12 or more residents

A fully detailed list of all critical facilities in the planning area can be found in Appendix E. A summary of critical facilities in the County can be found in Table 4.44.

Table 4.44. Douglas County Critical Facilities Summary Table

Category	Type	Facility Count

Category	Type	Facility Count
At-Risk Population Facilities	Assisted Living	34
	Group Home	5
	School	99
Essential Services Facilities	Administration and Management	1
	Bridge	70
	Cell Tower	138
	Commercial Airports	3
	Courts	1
	EOC	3
	Fire Department	34
	Hospital	3
	IT Infrastructure	3
	Jail	1
	Maintenance/Equipment Center	9
	Microwave	232
	Police	6
	Public Health	2
	Radio Tower	8
	Water Hub/Treatment	103
High Potential Loss Facilities	Dam	3
	Hazardous Material	753
Total		**1,511**

Source: Douglas County GIS

Cultural, Historical, and Natural Resources

Assessing Douglas County's vulnerability to disaster also involves inventorying the natural, historical, and cultural assets of the area. This step is important for the following reasons:

- The community may decide that these types of resources warrant a greater degree of protection due to their unique and irreplaceable nature and contribution to the overall economy.
- In the event of a disaster, an accurate inventory of natural, historical and cultural resources allows for more prudent care in the disaster's immediate aftermath when the potential for additional impacts is higher.
- The rules for reconstruction, restoration, rehabilitation, and/or replacement are often different for these types of designated resources.
- Natural resources can have beneficial functions that reduce the impacts of natural hazards, for example, wetlands and riparian habitat which help absorb and attenuate floodwaters and thus support overall mitigation objectives.

Cultural and Historical Resources

Douglas County has a large stock of historically significant homes, public buildings, and landmarks. To inventory these resources, the HMPC collected information from the following sources.

- The **National Register of Historic Places** is the nation's official list of cultural resources worthy of preservation. The National Register is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect historic and archeological resources. Properties listed include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archeology, engineering, and culture. The National Register is administered by the National Park Service, which is part of the U.S. Department of the Interior.
- **The Colorado State Register** contains listings for buildings, structures, sites, objects, or districts designated through the Colorado State Register nomination process. The State Register includes the following:
  - National Register Multiple Resource Areas
  - National Register Thematic Resources
  - State Historical Landmarks
  - Certified Local Districts
  - World Heritage Sites

Historical resources included in the programs above are identified in Table 4.45.

Table 4.45. Douglas County Historical Resources in the State and Federal Register

Name (Landmark Plaque Number)	National Register	Date Listed	State Landmark	State Designation	City
Castle Rock Depot	Y	10/11/1974	Y	5DA.216	Castle Rock
Castle Rock Elementary School	Y	9/20/1984	Y	5DA.342	Castle Rock
First National Bank of Douglas County	Y	4/14/1995	Y	5DA.661	Castle Rock
Benjamin Hammer House	Y	2/3/1993	Y	5DA.645	Castle Rock
Keystone Hotel	Y	6/20/1997	Y	5DA.681	Castle Rock
Castlewood Dam	Y	9/13/1995	Y	5DA.567	Franktown
Cherry Creek Bridge	Y	10/15/2002	Y	5DA1519	Franktown
Evans Homestead Rural Historic Landscape	Y	4/25/2012	Y	5DA.2841	Franktown
Franktown Cave	Y	2/1/2006	Y	5DA.272	Franktown
Pike's Peak Grange No. 163	Y	10/1/1990	Y	5DA.341	Franktown
Rock Ridge Ranch Barn	Y	11/9/1994	Y	5DA.1010	Franktown
American Federation of Human Rights Headquarters	Y	3/19/1998	Y	5DA.1097	Larkspur
Ben Quick Ranch & Fort	Y	10/1/1974	Y	5DA.215	Larkspur

Name (Landmark Plaque Number)	National Register	Date Listed	State Landmark	State Designation	City
Glen Grove School	Y	11/5/1974	Y	5DA.214	Larkspur
John Kinner House	Y	10/11/1974	Y	5DA.213	Larkspur
Lone Tree School	Y	3/8/1995	Y	5DA.344	Larkspur
Reginald Sinclair House	Y	9/20/1991	Y	5DA.966	Larkspur
Spring Valley School / The School House	Y	12/18/1978	Y	5DA.219	Larkspur
Lamb Spring	Y	11/9/1994	Y	5DA.83	Littleton
Louviers Village	Y	7/2/1999	Y	5DA.1391	Louviers
Louviers Village Club	Y	9/22/1995	Y	5DA.1016	Louviers
Ruth Memorial Methodist Episcopal Church	Y	5/1/1989	Y	5DA.890	Parker
Tallman-Newlin House	Y	12/10/1997	Y	5DA.1090	Parker
Bear Cañon Agricultural District	Y	10/29/1975	Y	5DA.212	Sedalia
Cherokee Ranch	Y	10/21/1994	Y	5DA.708	Sedalia
Church of St. Philip-in-the-Field / Bear Cañon Cemetery	Y	4/11/1973	Y	5DA.217	Sedalia
Daniels Park	Y	6/30/1995	Y	5DA.1009	Sedalia
Devils Head Lookout	Y	4/22/2003	Y	5DA.960	Sedalia
Indian Park School	Y	2/8/1978	Y	5A.211	Sedalia
Santa Fe Railway Water Tank / Sedalia Water Tank	Y	4/18/2003	Y	5DA.1385	Sedalia
Roxborough State Archaeological District	Y	1/27/1983	Y	5DA.343	Waterton

Source: Colorado Office of Historical Preservation

It should be noted that these lists may not be complete, as they may not include those currently in the nomination process and not yet listed. Additionally, as defined by the National Environmental Policy Act (NEPA), any property over 50 years of age is considered a historic resource and is potentially eligible for the National Register. Thus, in the event that the property is to be altered, or has been altered, as the result of a major federal action, the property must be evaluated under the guidelines set forth by CEQA and NEPA. Structural mitigation projects are considered alterations for the purpose of this regulation.

Douglas County also maintains a Registry of Landmarks designated by the Board of County Commissioners. The landmarks included in the County's registry are listed below in Table 4.46. Three additional sites are slated to be designated between April and June 2015.

Table 4.46. Historical Resources in the Douglas County Registry of Landmarks

Name (Landmark Plaque Number)	Date Listed	City
Abbe Ranch House	2/3/2004	Larkspur
American Federation of Human Rights	5/6/2008	Larkspur

Name (Landmark Plaque Number)	Date Listed	City
Blackfoot Cave	4/14/2015	Cherry Valley
Cedar Hill Cemetery	12/21/2004	Castle Rock
Devil's Head Lookout	2/28/2006	Sedalia
Fletcher Ranch	3/18/2003	Sedalia
Franktown Cemetery	12/27/2005	Franktown
Freedom School	3/24/2015	Larkspur
Friendly-Manhart House	11/7/2000	Sedalia
Frink House	1/6/2009	Larkspur
Gideon Pratt Homestead and Harry C. Pratt Grave	12/12/2000	Franktown
Greenland Townsite	9/13/2011	South of Larkspur, west of I-25
Hilltop School	3/18/2003	Parker
Horace Persse Homestead	9/30/2008	Roxborough
Kleinert Homestead	2/24/2014	Franktown
Kreutzer Homestead	4/11/2000	Sedalia
Loraine Ranch	4/14/2015	Spring Valley
Louviers Village Clubhouse	4/15/2008	Louviers
Lowell's OV Ranch	3/30/2010	South of Castle Rock
Lucas Dairy/Shady Spring Ranch	6/30/2009	Cherry Valley
Manhart House	11/18/2014	Sedalia
Pikes Peak Grange #163	5/22/2012	Franktown
Prairie Canyon Ranch	10/3/2000	South of Franktown along Highway 83
Pretty Woman Ranch	4/4/2006	Sedalia
Rock Ridge Cemetery	6/29/1999	Cherry Valley
Rock Ridge Ranch	12/12/2000	Cherry Valley
Russellville Ranch	2/3/2004	Franktown
Schweiger Ranch	3/16/2004	Lone Tree
Sedalia Fire Station	3/13/1999	Sedalia
Sedalia School House	11/7/2000	Sedalia
Sedalia Water Tank	2/3/2004	Sedalia
Silicated Brick Company	6/19/2007	Southdowns at Roxborough
Spring Valley School District No. 3	3/17/2009	Spring Valley
Twin Creek Ranch	2/9/1999	Castle Rock
YMCA Camp Shady Brook	1/6/2009	Deckers

Source: Douglas County Landmarks Program

Natural Resources

Natural resources are important to include in benefit/cost analyses for future projects and may be used to leverage additional funding for mitigation projects that also contribute to community goals for protecting sensitive natural resources. Awareness of natural assets can lead to opportunities

for meeting multiple objectives. For instance, protecting wetlands areas protects sensitive habitat as well as reducing the force of and storing floodwaters.

Due to Douglas County's unique topography, climate, and location on the Colorado Piedmont, the flora and fauna are representative of both the High Plains and the southern Rocky Mountains. This diverse mixture of geography, geology, and biology, or ecotones, contributes to Douglas County's unique ecological character. Transition zones like these tend to support higher levels of biological diversity than other "non-transitional" areas.

No vertebrates and few invertebrates at the species level are endemic solely to Douglas County; however, there are some species endemic to the Colorado Piedmont that are found in the County, such as Preble's meadow jumping mouse. In some ways, the vegetation of the County is typical of the foothills/prairie ecotone on Colorado's Front Range. Grasslands of the northern County are on well drained sandy soils and receive less moisture than those to the south near the Palmer Divide. The resulting composition of grasslands generally follows this north/south hydrological gradient, with typical shortgrass prairie species such as blue grama (*Bouteloua gracilis*) dominating in the north, and midgrass species such as western wheatgrass (*Agropyron smithii*), needle-and-thread grass (*Stipa comata*), and little bluestem (*Schizachyrium scoparium*) becoming more common to the south. Tallgrass species such as big bluestem (*Andropogon gerardii*) are not uncommon in the uplands.

Gambel oak (*Quercus gambelii*) shrublands are a dominant feature of the Douglas County flora, creating a mosaic of shrubs and grassland that covers the rolling hills of most of the central regions of the County. These shrublands also occur in areas of mixed woodland with ponderosa pine. Riparian areas consist of dense shrubs, especially hawthorn and coyote willow, with some stands of small cottonwoods. Wetlands comprise a small but important portion of the County and are comprised mainly of graminoid types at springs or seeps, or shrub-dominated riparian areas. Coniferous forests of ponderosa pine dominate the mountainous western portions of the County and extend eastward on the higher mesas and along the Palmer Divide. Cooler microhabitats on north-aspect slopes contain mostly Douglas-fir forests with patches of aspen.

Special Status Species

To further understand natural resources that may be particularly vulnerable to a hazard event, as well as those that need consideration when implementing mitigation activities, it is important to identify at-risk species (i.e., endangered species) in the Planning Area. The U.S. Fish and Wildlife Service (USFWS) maintains a list of threatened and endangered species in Colorado. State and federal laws protect the habitat of these species through the environmental review process. Several additional species are of special concern or candidates to make the protected list.

Table 4.47 summarizes Douglas County's special status animal species in the USFWS database.

Table 4.47. Threatened and Endangered Animals in Douglas County

Name	Scientific Name	Status
Whooping crane	*Grus americana*	Experimental Population, Non-Essential
Bald eagle	*Haliaeetus leucocephalus*	Recovery
American peregrine falcon	*Falco peregrinus anatum*	Recovery
Mexican spotted owl	*Strix occidentalis lucida*	Threatened
Piping Plover	*Charadrius melodus*	Threatened
Least tern	*Sterna antillarum*	Endangered
Greenback Cutthroat trout	*Oncorhynchus clarki stomias*	Threatened
Pawnee montane skipper	*Hesperia leonardus montana*	Threatened
Black-footed ferret	*Mustela nigripes*	Experimental Population, Non-Essential
Preble's meadow jumping mouse	*Zapus hudsonius preblei*	Threatened

Source: U.S. Fish and Wildlife Service

Table 4.48. Threatened and Endangered Plants in Douglas County

Name	Scientific Name	Status
Colorado Butterfly plant	*Gaura neomexicana var. coloradensis*	Threatened
Ute ladies'-tresses	*Spiranthes diluvialis*	Threatened

Source: U.S. Fish and Wildlife Service

Natural and Beneficial Functions

Floodplains can have natural and beneficial functions. Wetlands function as natural sponges that trap and slowly release surface water, rain, snowmelt, groundwater and flood waters. Trees, root mats, and other wetland vegetation also slow the speed of floodwaters and distribute them more slowly over the floodplain. This combined water storage and braking action lowers flood heights and reduces erosion. Wetlands within and downstream of urban areas are particularly valuable, counteracting the greatly increased rate and volume of surface- water runoff from pavement and buildings. The holding capacity of wetlands helps control floods and prevents water logging of crops. Preserving and restoring wetlands, together with other water retention, can often provide the level of flood control otherwise provided by expensive dredge operations and levees.

Figure 4.39 in Section 4.2.13 illustrates the locations of floodplains. These areas, as well as areas of riparian habitat along the rivers and streams in the County may accommodate floodwaters for purposes of groundwater recharge and stormwater management.

Growth and Development Trends

As part of the planning process, the HMPC looked at changes in growth and development, both past and future, and examined these changes in the context of hazard-prone areas, and how the

changes in growth and development affect loss estimates and vulnerability.

More specific information on growth and development for each participating jurisdiction can be found in the jurisdictional annexes.

Current Status and Past Development

The U.S. Census Bureau estimated the population of Douglas County for January 1, 2010 was 287,465, representing an almost thirty-fold increase from just over 8,400 people in 1970. Douglas County's 2014 Demographic Summary states that "between 2000 and 2010, the population of Douglas County increased 62.4%, which made Douglas County the fastest growing county in Colorado, and the 16th fastest growing county in the nation" (http://www.douglas.co.us/documents/douglas-county-demographics-summary.pdf). Table 4.49 illustrates the pace of population growth in Douglas County (for both incorporated and unincorporated areas) dating back to 1940. Table 4.50 shows more recent population trends for each jurisdiction.

Table 4.49. Historical Population of Douglas County

	1930	1940	1950	1960	1970	1980	1990	2000	2010
Population	3,498	3,496	3,507	4,816	8,407	25,153	60,391	175,776	285,465
Change	-	-0.1%	0.3%	37.3%	74.6%	199.2%	140.1%	191.0%	62.4%

Source: U.S. Census Bureau

Table 4.50. Population Growth for Jurisdictions in Douglas County from 1990-2010

	1990	2000	2010	Growth 1990-2000	Growth 2000-2010
Castle Pines*	–	–	10,360	–	–
Castle Rock	8,708	20,224	48,231	132.2%	138.5%
Larkspur	232	234	183	0.1%	-21.8%
Lone Tree**	–	4,873	10,218	–	109.7%
Parker	5,450	53,558	45,297	332.3%	92.3%

Source: U.S. Census Bureau
*Castle Pines did not become a city until 2008.
**Lone Tree was not incorporated until 1996.

Future Population Growth

The 2035 Douglas County Comprehensive Master Plan estimated future population growth for the County. Between 2014 and 2040, the County's population will increase by over 196,000 people as a result of both natural growth through childbirths and in-migration from other parts of the state and nation. Future population projections for Douglas County are shown in Table 4.51.

Table 4.51. Douglas County Population Projections

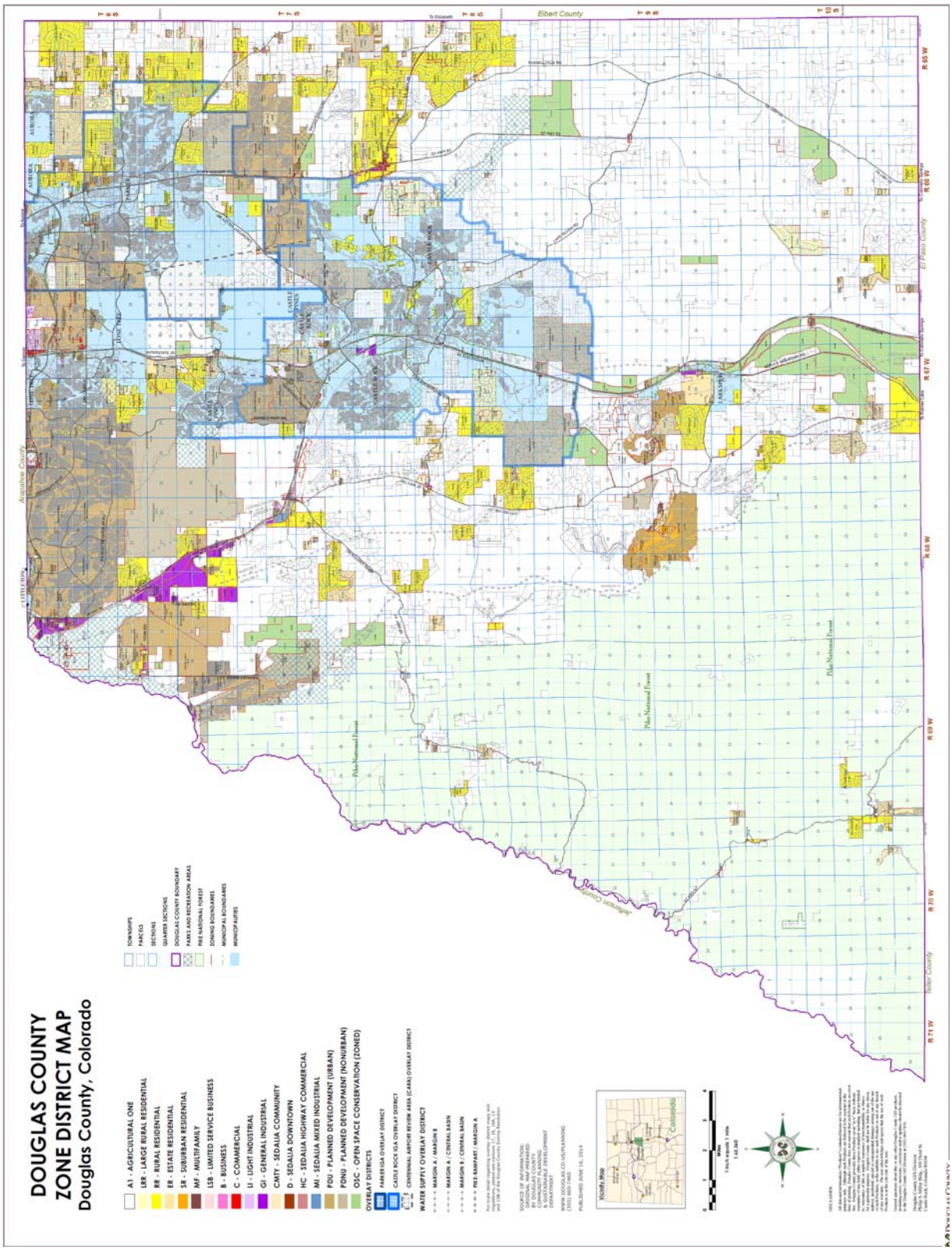
Projections	2010	2020	2030	2040
Douglas County	285,465	352,000	418,000	484,000

Source: 2035 Douglas County Comprehensive Master Plan

Current Land Use/Zoning

Land use and growth management strategies in Douglas County aim to concentrate future development into and toward existing communities through various policies relating to zoning and minimum development standards and requirements. Zoning designations prescribe allowed land uses and minimum lot sizes for the purpose of supporting efficient infrastructure design, conservation of natural resources, and to avoid conflicting uses. The Zoning Resolution (discussed further in Section 4.4.1) governs the use of land for residential and non-residential purposes, limits the height and bulk of buildings and other structures, limits lot occupancy and determines the setbacks and provides for open spaces, by establishing standards of performance and design. Figure 4.47 shows current land use designations in Douglas County.

Figure 4.47. Douglas County Zoning Map



Source: Douglas County Department of Community Development

Future Growth Areas

New Growth Areas

A major new growth area is the planned Sterling Ranch development in the Chatfield Urban Area. Sterling Ranch comprises 3,400 acres south of Chatfield Reservoir and Chatfield State Park, west of Highway 85. The Sterling Ranch website describes the community as follows:

> "This mixed-use, master planned community of authentic Colorado architecture and treasured natural surroundings will be vitalized by mindful, sustainable resources and forward-thinking technologies. All brought together in a shared experience – the quality of nature and the quality of a promising new day come together as one. Sterling Ranch, Colorado will soon be home to over 12,000 new residences, spaciously sweeping across nine unique villages all radiating outward from an amenity-rich town center and grand civic gathering place. Pedestrian friendly planning and design focused on connectivity offers 30 miles of trails, beautiful open space, 2 state parks and 3 regional parks."[11]

Development since 2010 Plan

Douglas County has been one of the fastest growing counties by rate of growth in the nation for roughly the last 20 years. Development in Douglas County is encouraged to occur in existing designated urban areas. This is well-illustrated in Table 4.53, which shows that most permits for new housing in 2013 were issued for urban rather than non-urban units. The number of housing permits issued receded sharply in 2008 and 2009 during the collapse of the U.S. housing bubble (Table 4.54). Housing development in the County began to climb in 2010 and continued to experience positive growth through 2014.

Table 4.52. Annual Housing Growth Rates

Year	Total Housing Units	Annual Growth Rate (%)
2007	102,737	
2008	104,864	2.1%
2009	106,071	1.2%
2010	107,200	1.1%
2011	108,185	0.9%
2012	109,884	1.6%
2013	112,354	2.2%
2014	114,379	1.8%

Source: Douglas County Growth and Development Profile 2013 and 2014 Summary

[11] "The Nature of Sterling Ranch, Colorado." http://sterlingranchcolorado.com/, accessed February 17, 2015

Table 4.53. 2013 Permits for Housing Units

Unit Type	Amount*	% of Total
Single-family residential	1,833	68%
Condos and townhouses	233	9%
Apartments	613	23%
Unincorporated	1,291	48%
Incorporated	1,388	52%
Urban	2,585	96%
Non-Urban	94	4%

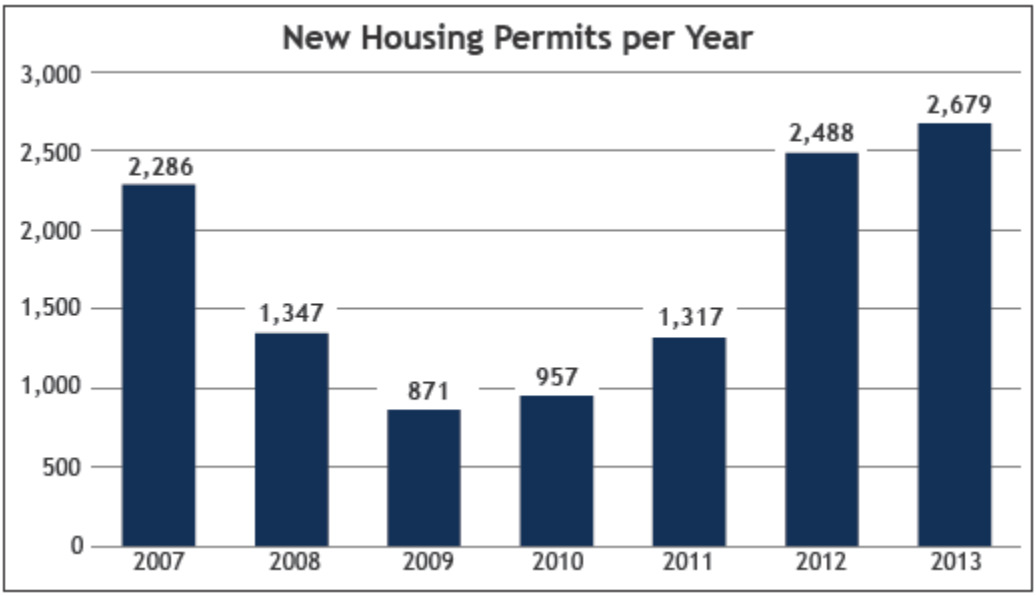
Source: Douglas County Growth and Development Profile 2013
*2,679 total new permits for housing units in 2013

Table 4.54. New Housing Permits

Year	Permits	% Change
2007	2,286	
2008	1,347	-41.1%
2009	871	-35.3%
2010	957	9.9%
2011	1,317	37.6%
2012	2,488	88.9%
2013	2,679	7.7%
2014	3,357	25.3%

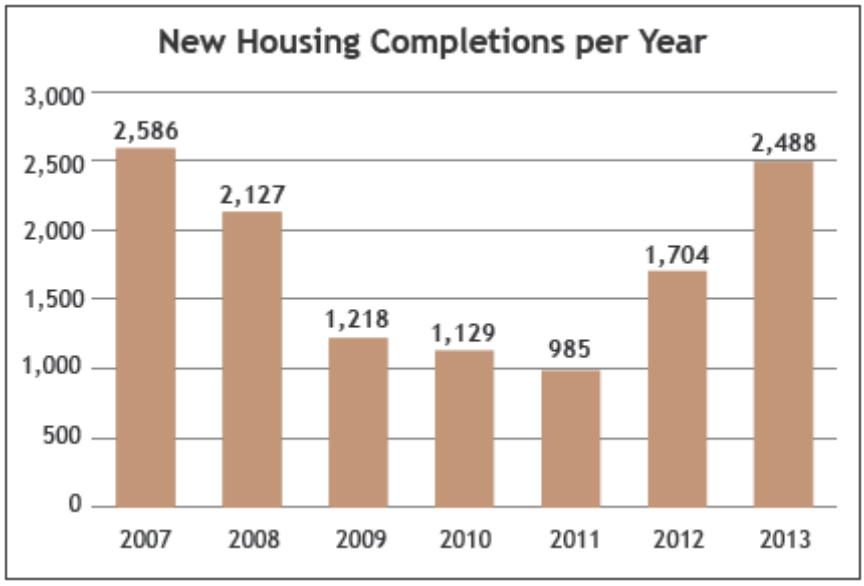
Source: Douglas County Growth and Development Profile 2013 and 2014 Summary

Figure 4.48. Douglas County New Housing Permits per Year



Source: Douglas County Growth and Development Profile 2013

Figure 4.49. Douglas County New Housing Permits per Year



Source: Douglas County Growth and Development Profile 2013

Table 4.55 and Table 4.56 summarize the number and value of structures built in Douglas County from 2010 to 2014 based on a query of the 'year built' values in the parcel database. Over 6,000 structures, with a total value greater than $2.1 billion, were built in that short period of time. The vast majority of these structures were residential, built to accommodate the County's rapidly

growing population. The jurisdictional annexes examine the property type analysis for each participating community. Additional countywide analysis on recent development in mapped hazard areas is discussed in the vulnerability assessments for flood (Section 4.3.6), landslide (Section 4.3.7), erosion (Section 4.3.10), and wildfire (Section 4.3.11).

Table 4.55. Douglas County Structures Built from 2010 to 2014: Total Assets by Jurisdiction

Jurisdiction	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Land Value	Total Value
Aurora*	10	10	10	$3,009,235	$720,000	$3,729,235
Castle Pines	194	193	205	$74,621,727	$20,129,244	$94,750,971
Castle Rock	960	959	1,109	$260,594,463	$58,858,521	$319,452,984
Larkspur	8	7	10	$922,215	$336,000	$1,258,215
Lone Tree	216	216	280	$119,009,158	$47,412,203	$166,421,361
Parker	791	791	864	$182,211,133	$56,753,690	$238,964,823
Unincorporated	3,148	3,147	3,692	$1,008,625,520	$303,066,747	$1,311,692,267
Total	**5,327**	**5,323**	**6,170**	**$1,648,993,451**	**$487,276,405**	**$2,136,269,856**

Source: Douglas County
*The City of Aurora is not participating in this plan

Table 4.56. Douglas County Structures Built from 2010 to 2014: Total Assets by Property Type

Jurisdiction	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Land Value	Total Value
Agricultural	66	66	65	$24,311,429	$648,699	$24,960,128
Commercial	29	29	319	$81,005,028	$23,792,546	$104,797,574
Exempt	19	19	33	$27,699,059	$13,066,887	$40,765,946
HOA	1	0	1	$0	$0	$0
Industrial	10	10	40	$6,664,955	$3,957,784	$10,622,739
Residential	3,021	3,021	3,232	$868,197,359	$261,163,481	$1,129,360,840
Vacant Land	2	2	2	$747,690	$437,350	$1,185,040
Total	**3,148**	**3,147**	**3,692**	**$1,008,625,520**	**$303,066,747**	**$1,311,692,267**

Source: Douglas County

The completion of the Rueter-Hess reservoir has had a significant impact on development in Douglas County. The construction of the reservoir lasted from 2004 to 2012, and Parker Water and Sanitation District began gradually filling it in 2012. Rueter-Hess is primarily supplied by surface water from Cherry Creek, Newlin Gulch, and return flows from nearby water districts.[12]

[12] Town of Castle Rock, Colorado website. "Rueter-Hess Reservoir." http://www.crgov.com/index.aspx?NID=1277,

The reservoir is primarily used for drinking water storage to supply current and future development in Parker, Castle Rock, Castle Pines, and other local jurisdictions. Recreational uses for the reservoir are under consideration.

4.3.2 Douglas County Vulnerability to Specific Hazards

The Disaster Mitigation Act regulations require that the HMPC evaluate the risks associated with each of the medium and high significance hazards identified in the planning process. This section summarizes the possible impacts and quantifies, where data permits, the County's vulnerability to each of the hazards identified as a priority hazard in Section 4.2.20 Hazards Summary. Where specific hazards vary across the County, additional information can be found in the jurisdictional annexes. The hazards evaluated further as part of this vulnerability assessment include:

- Drought
- Earthquake
- Flood: Dam Failure
- Flood: 100/500 year and Localized Stormwater
- Landslides/ Mud & Debris Flows /Rockfalls
- Severe Weather: Thunderstorms/Heavy Rains
- Severe Weather: Winter Weather
- Soil Hazards: Erosion and Deposition
- Wildfire
- Hazardous Materials: Transportation Incidents

The hazards that were not evaluated include: avalanche, extreme heat, hail, high winds, lightning, tornado, expansive soils, and subsidence. These hazards were all ranked low significance due to a lack of notable past events and damages or low probabilities of occurrence. Earthquake was profiled, despite being ranked low significance, due to the occurrence of damaging and/or widespread earthquakes in the Denver Metro area in the past and the potential, while less likely, for damaging events.

An estimate of the vulnerability of the County to each identified hazard, in addition to the estimate of risk of future occurrence, is provided in the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.

accessed February 17, 2015.

- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.

Vulnerability can be quantified in those instances where there is a known, identified hazard area, such as a mapped floodplain. In these instances, the numbers and types of buildings subject to the identified hazard can be counted and their values tabulated. Other information can be collected in regard to the hazard area, such as the location of critical community facilities (e.g., a fire station), historic structures, and valued natural resources (e.g., an identified wetland or endangered species habitat). Together, this information conveys the impact, or vulnerability, of that area to that hazard.

The HMPC identified five hazards in the Planning Area for which specific geographical hazard areas have been defined and for which sufficient data exists to support a quantifiable vulnerability analysis. These five hazards are: earthquake; flood; hazardous materials: transport incidents; landslide/mud and debris flow/rockfalls; and wildfire. Because these hazards have discrete hazard risk areas, their risk varies by jurisdiction. For flood, landslide, and wildfire, the HMPC inventoried the following for each community, to the extent possible, to quantify vulnerability in identified hazard areas:

- General hazard-related impacts, including impacts to life, safety, and health
- Insurance coverage, claims paid, and repetitive losses (if available)
- Values at risk (i.e., types, numbers, and value of land and improvements)
- Identification of critical facilities at risk
- Identification of cultural and natural resources at risk
- Development trends within the identified hazard area

The HMPC used FEMA's loss estimation software, HAZUS-MH, to analyze the County's vulnerability to earthquakes.

The vulnerability and potential impacts from priority hazards that do not have specific mapped areas nor the data to support additional vulnerability analysis are discussed in more general terms. These include:

- Drought
- Flood: Localized/Stormwater
- Severe Weather: Heavy Rain and Storms
- Severe Weather: Winter Weather

Dam failure does have specific mapped areas; however, the information is deemed too sensitive to

be discussed in this public document. Inundation mapping is included in the Emergency Action Plans (EAPs) of each high hazard dam in the County and kept on file with the dam owners.

4.3.3 Drought Vulnerability Assessment

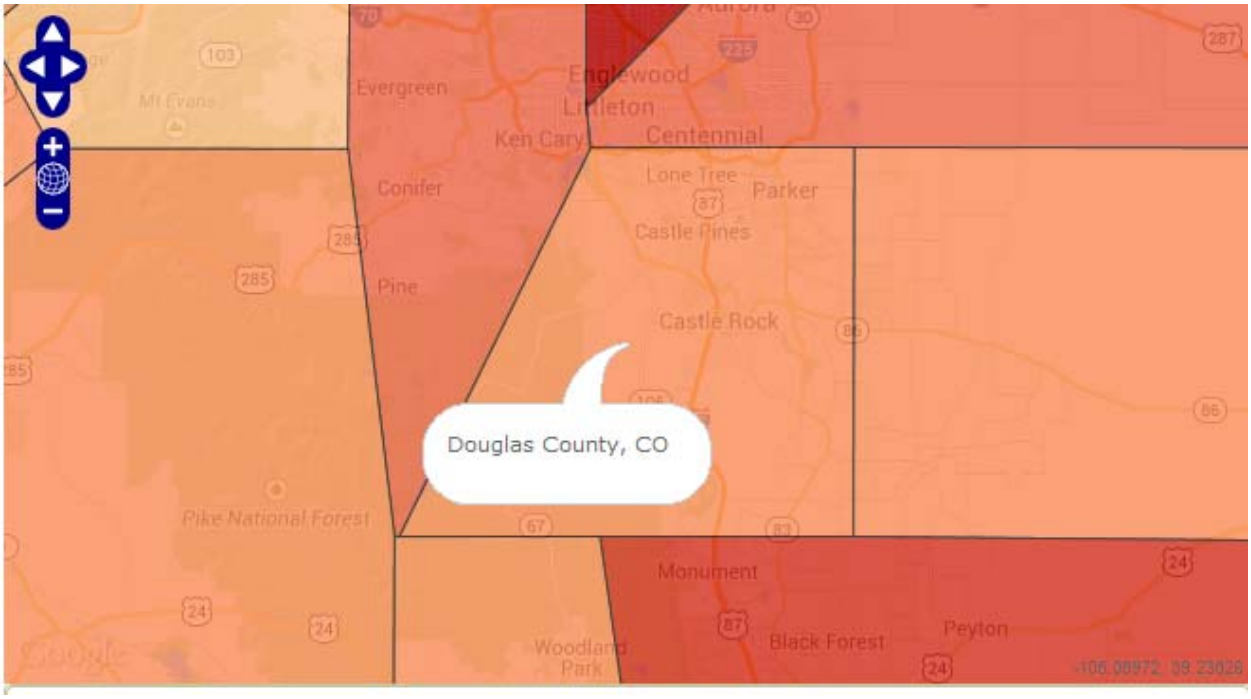
Likelihood of Future Occurrence—Medium
Potential Magnitude—Medium
Overall Vulnerability—Medium

Drought is different than many of the other natural hazards in that it is not a distinct event and usually has a slow onset. Drought can severely impact a region both physically and economically. Drought affects different sectors in different ways and with varying intensities. Adequate water is the most critical issue for agricultural, manufacturing, tourism, recreation, and commercial and domestic use. As the population in the area continues to grow, so too will the demand for water.

Based on historical information, the occurrence of drought in Colorado, including Douglas County, is cyclical, driven by weather patterns. Drought has occurred in the past and will occur in the future. Periods of actual drought with adverse impacts can vary in duration, and the period between droughts is often extended. Although an area may be under an extended dry period, determining when it becomes a drought is based on impacts to individual water users. The vulnerability of Douglas County to drought is countywide, but impacts may vary and include reduction in water supply, agricultural losses, and an increase in dry fuels.

Drought impacts are wide-reaching and may be economic, environmental, and/or societal. Tracking drought impacts can be difficult. The Drought Impact Reporter from the NDMC is a useful reference tool that compiles reported drought impacts nationwide. Figure 4.50 and Table 4.57 show drought impacts for the Douglas County Planning Area from 1850 to November 2014. The data represented is skewed, with the majority of these impacts from records within the past ten years.

Figure 4.50. Drought Impact Reporter for Douglas County Planning Area (1850 to 2013)



Source: National Drought Mitigation Center

Table 4.57. Douglas County Drought Impacts

Category	Number
Agriculture	381
Business and Industry	28
Energy	5
Fire	134
Plans & Wildlife	174
Relief, Response, and Restrictions	214
Society and Public Health	138
Tourism and recreation	41
Water Supply and Quality	191
Total	**1306**

Source: National Drought Mitigation Center

The most significant qualitative impacts associated with drought in the Planning Area are those related to water intensive activities such as agriculture, wildfire protection, municipal usage, commerce, tourism, recreation, and wildlife preservation. Mandatory conservation measures are typically implemented during extended droughts. A reduction of electric power generation and water quality deterioration are also potential problems. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding.

It is difficult to quantitatively assess drought impacts to Douglas County. Some factors to consider include: the impacts of fallowed agricultural land, habitat loss and associated effects on wildlife, and the drawdown of the groundwater table. The most direct and likely most difficult drought impact to quantify is to local economies, especially agricultural economies. It can be assumed, however, that the loss of production in one sector of the economy would affect other sectors.

Few county-specific drought studies have been conducted, apart from the State of Colorado Drought Mitigation and Response Plan, last updated in 2013. The Colorado Drought Plan evaluated each county's drought vulnerability in seven different sectors, including state assets, agriculture, energy, environment, municipal and industrial, recreation and tourism, and socioeconomics. Each sector examined multiple impact categories. For example, the agricultural sector included three impact categories: livestock, crops, and green industry. The vulnerability of every county was evaluated and given a numerical score for each impact category. A county's overall vulnerability score in a particular sector was based on the combined scores of each impact category. The Colorado Drought Plan results found that Douglas County was highly vulnerable to drought in the agricultural sector and moderately vulnerable in the recreation/tourism and socioeconomic sectors. Specific details for each sector are provided below:

- Agriculture: overall vulnerability score of 3-3.39. Douglas County was in the highest impact score group for livestock inventory and vulnerability and middle group for crop inventory and vulnerability.
- Recreation and tourism: overall vulnerability score of 2-2.9. The County had a high vulnerability score for boating which contributed to its moderate overall vulnerability score, despite having only low or moderate vulnerability scores in other recreation areas such as golf or camping.
- Socioeconomic: overall vulnerability score of 2-2.9. The County was given a score of three out of four in the population growth impact ranking which contributed to its moderate overall vulnerability score.

Development Trends

Drought vulnerability will increase with future development as there will be increased demands for limited water resources. The Douglas County Comprehensive Master Plan discusses this issue in Section 8 Water Quality. Refer to Section 4.4.1 of this plan for additional information on the County's capabilities, goals, and policies regarding drought vulnerability and water resources.

4.3.4 Earthquake Vulnerability Assessment

Likelihood of Future Occurrence—Low
Potential Magnitude—Low
Overall Vulnerability—Low

Although the HMPC feels this is a low significance hazard, due to the existing faults in the County and the potential significance of an earthquake in Colorado, analysis of earthquake is included here.

Earthquake vulnerability is primarily based on population and the built environment. Urban areas in high seismic hazard zones are the most vulnerable, while uninhabited areas are less vulnerable.

Ground shaking is the primary earthquake hazard. Many factors affect the survivability of structures and systems from earthquake-caused ground motions. These factors include proximity to the fault, direction of rupture, epicenter location and depth, magnitude, local geologic and soils conditions, types and quality of construction, building configurations and heights, and comparable factors that relate to utility, transportation, and other network systems. Ground motions become structurally damaging when average peak accelerations reach 10 to 15% of gravity, average peak velocities reach 8 to 12 centimeters per second, and when the Modified Mercalli Intensity Scale is about VII (18-34% peak ground acceleration), which is considered to be very strong (general alarm; walls crack; plaster falls).

Earthquake losses will vary across the Douglas County Planning Area depending on the source and magnitude of the event. The earthquake scenario provides a good estimate of loss to the Planning Area based on a realistic earthquake scenario. The results of this scenario are described below.

2015 Earthquake Scenarios

HAZUS-MH 2.1 was utilized to model earthquake losses for Douglas County. Level 1 analyses were run, meaning that only the default data was used and not supplemented with local building inventory or hazard data. There are certain data limitations when using the default data, so the results should be interpreted accordingly; this is a planning level analysis.

The methodology for running the probabilistic earthquake scenario used probabilistic seismic hazard contour maps developed by the U.S. Geological Survey (USGS) for the 2008 update of the National Seismic Hazard Maps that are included with HAZUS-MH. The USGS maps provide estimates of potential ground acceleration and spectral acceleration at periods of 0.3 second and 1.0 second, respectively. The 2,500 year return period analyzes ground shaking estimates with a 2% probability of being exceeded in 50 years from the various seismic sources in the area. The International Building Code uses this level of ground shaking for building design in seismic areas and is considered more of a worst-case scenario.

The results of the probabilistic scenario are captured in Table 4.58. Key losses included the following:

- Total economic loss estimated for the earthquake was $211.87 million, which includes building losses and lifeline losses based on the HAZUS-MH inventory.
- Building-related losses, including direct building losses and business interruption losses,

totaled $191.86 million.

- Over 4% of the buildings in the County were at least moderately damaged. Eleven buildings were completely destroyed.
- Over 68% of the building- and income-related losses were residential structures. Eighteen percent of the estimated losses were related to business interruptions.
- The early evening earthquake scenario caused the most casualties, though the number is still quite low with one fatality, one life-threatening injury, and four injuries requiring hospitalization.

Table 4.58. Douglas County HAZUS-MH 2,500-year Earthquake Scenario Results

Impacts/Earthquake	Model Results
Residential Buildings Damaged (Based upon 66,000 buildings)	Slight: 6,470 Moderate: 2,182 Extensive: 293 Complete: 11
Building Related Loss	$191,860,000
Total Economic Loss	$211,870,000
Injuries (Based upon 2am time of occurrence)	Without requiring hospitalization: 32 Requiring hospitalization: 3 Life Threatening: 0 Fatalities: 0
Injuries (Based upon 2pm time of occurrence)	Without requiring hospitalization: 28 Requiring hospitalization: 3 Life Threatening: 0 Fatalities: 0
Injuries (Based upon 5pm time of occurrence)	Without requiring hospitalization: 28 Requiring hospitalization: 4 Life Threatening: 1 Fatalities: 1
Essential Facility Damage (Based upon 98 buildings)	None with at least moderate damage
Transportation and Utility Lifeline Damage	None with at least moderate damage
Households w/out Power & Water Service (Based upon 60,924 households)	Power loss @ Day 1: 0 Water loss @ Day 1: 0 Power loss @ Day 3: 0 Water loss @ Day 3: 0 Power loss @ Day 7: 0 Water loss @ Day 7: 0 Power loss @ Day 30: 0 Water loss @ Day 30: 0
Displaced Households	29
Shelter Requirements	15
Debris Generation	60,000 tons

Source: HAZUS-MH 2.1

Development Trends

Although new growth and development corridors would fall in the area potentially affected by earthquake, given the small chance of major earthquake and the building codes in effect, development in the earthquake area will continue to occur.

4.3.5 Flood: Dam Failure

Likelihood of Future Occurrence—Low
Potential Magnitude—Medium
Overall Vulnerability—Medium

Douglas County has 41 dams, 5 of which are rated as high hazard, 5 as significant hazard, and 31 as low hazard. Douglas County has had some minor dam incidents but no complete failures. The potential impacts from a dam failure in the County are largely dependent on the specific dam or jurisdiction in question. Small dams in the County would only cause localized damage in rural areas. Rueter-Hess Dam is only partially full and poses a low risk to Parker. Failure of Cheesman Dam would have a significant impact with floodwaters cascading to Strontia Springs and Chatfield Dam. A catastrophic dam failure of this magnitude would challenge local response capabilities and require timely evacuations to save lives in the western portions of the county. Impacts to life safety would depend on the warning time available and the resources to notify and evacuate the public. Major loss of life could result as well as potentially catastrophic effects to roads, bridges, and homes. Associated water quality and health concerns could also be an issue. Due to homeland security concerns specific impacts are not included here.

Development Trends

Flooding due to a dam failure event is likely to exceed the special flood hazard areas regulated through local floodplain ordinances. The County and towns should consider the dam failure hazard when permitting development downstream of the high and significant hazard dams. Low hazard dams could become significant or high hazard dams if development occurs below them. Regular monitoring of dams, exercising and updating of EAPs, and rapid response to problems when detected at dams are ways to mitigate the potential impacts of these rare, but potentially catastrophic, events.

4.3.6 Flood: 100/500-year and Localized Stormwater Vulnerability Assessment

Likelihood of Future Occurrence—Low for 100/500-year and Medium for localized stormwater
Potential Magnitude—Medium for 100/500-year and Low for localized stormwater
Overall Vulnerability—Medium for both 100/500-year and localized stormwater

Douglas County is located in an area that is prone to very intense rainfall, sometimes of cloudburst magnitude. Floods have resulted from storms covering large areas with heavy general rainfall as well as from storms covering small area with extremely intense rainfall. This section quantifies the vulnerability of the Planning Area to floods.

Historically, the Planning Area has been at risk to stormwater flooding primarily during the spring and summer months when river systems in the County swell with heavy rainfall. Localized flooding also occurs throughout the Planning Area at various times throughout the year with

several areas of primary concern unique to the County and each jurisdiction.

Methodology

Unincorporated Douglas County and its incorporated jurisdictions have mapped FEMA flood hazard areas. GIS was used to determine the possible impacts of flooding within the County and how the risk varies across the Planning Area by jurisdiction. The following methodology was followed in determining improved parcel counts and values at risk to the 1% and 0.2% annual chance flood events.

Douglas County's parcel and associated 2014 assessor data was used as the basis for the countywide inventory of developed parcels, acres, and structure value. The FEMA DFIRM, effective date September 30, 2005, was used as the flood hazard layer for this analysis.

GIS was used to create a centroid, or point representing the center of the parcel polygon. DFIRM flood data was then overlaid on the parcel centroids. For the purposes of this analysis, the flood zone that intersected a parcel centroid was assigned the flood zone for the entire parcel. The model assumes that every parcel with a structure value greater than zero is improved in some way. Specifically, an improved parcel assumes there is a building on it. This approach was used to support the parcel layer analysis as there was no associated building layer available for this analysis. In addition to the centroid analysis, parcel boundary analysis was performed to get total acres and flooded acres by flood zone for each parcel. The parcel layer was intersected with the FEMA DFIRM to obtain the acres flooded values. Once completed the parcel boundary layer was joined to the centroid layer and flooded acre values were transferred based on parcel number.

It is important to note that there could be more than one structure or building on an improved parcel (i.e., condo complex occupies one parcel but might have several structures). Only improved parcels and the value of their improvements were analyzed. The end result is an inventory of the number and types of parcels and buildings subject to the hazards. Results are presented by unincorporated county and incorporated jurisdictions. Detailed tables show counts of parcels by jurisdictions and land use type (Agriculture, Commercial, Exempt, HOA, Industrial, Producing Mine, Residential, Utilities and Vacant Land) within each flood zone.

Each of the flood zones that begins with the letter 'A' depict the Special Flood Hazard Area, or the 1% annual chance flood event (commonly referred to as the 100-year flood). Table 4.59 explains the difference between mapped flood zones. These zones are shown on Figure 4.39.

Table 4.59. Flood Hazard Zones in Douglas County

Flood Zone	Description
1% Annual Chance	100-year Flood: Also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year.
Zone A	100-year Flood: No base flood elevations provided
Zone AE	100-year Flood: Base flood elevations provided

Flood Zone	Description
Zone AO	100-year Flood: Sheet flow areas, base flood depths provided
0.2% Annual Chance	500-year Flood
Zone D	Areas in which flood hazards are undetermined, but possible
Zone X	No flood hazard

Source: HAZUS

Values at Risk

The methodology described previously produced loss estimates for this vulnerability assessment. The methodology and results should be considered 'reasonable' and should be used for flood risk mitigation, emergency preparedness, and response and recovery . Uncertainties are inherent in any loss estimation methodology, and losses will vary depending on the magnitude of the flood event. Other limitations may include incomplete or inaccurate inventories of the built environment. The assessed values, for example, are well below the actual market values; thus, the actual value of assets at risk may be significantly higher than those included therein. Also, this loss estimation assumes no mitigation and does not account for buildings that may have been elevated above the 1% annual chance event according to local floodplain management regulations.

Douglas County Planning Area

Table 4.60 and Table 4.61 contain flood analysis results for the entire Douglas County Planning Area. This includes unincorporated Douglas County and the incorporated communities. These tables show the number of parcels and values exposed to the 1% annual chance and 0.2% annual chance flood events by jurisdiction and land use type for the entire Douglas County Planning Area. Figure 4.51 shows the location of properties in FEMA flood zones.

Table 4.60. Douglas County Exposure to 1% Annual Chance Flood Zone by Jurisdiction and Property Type

Jurisdiction	Property Type	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Land Value	Total Value
Castle Rock	Commercial	5	4	14	$3,015,500	$1,578,076	$4,593,576
	Exempt	81	1	11	$4,480	$4,881,361	$4,885,841
	HOA	1	0	1	$0	$0	$0
	Residential	39	34	48	$1,763,415	$933,678	$2,697,093
	Utilities	1	0	0	$0	$0	$0
	Vacant Land	14	1	5	$17,836	$1,002,333	$1,020,169
	Total	**141**	**40**	**79**	**$4,801,231**	**$8,395,448**	**$13,196,679**
Larkspur	Commercial	7	3	9	$974,510	$632,188	$1,606,698
	Exempt	12	2	5	$772,897	$1,142,901	$1,915,798

Jurisdiction	Property Type	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Land Value	Total Value
	Residential	9	9	10	$808,222	$455,000	$1,263,222
	Utilities	1	0	0	$0	$0	$0
	Vacant Land	4	0	2	$0	$327,868	$327,868
	Total	**33**	**14**	**26**	**$2,555,629**	**$2,557,957**	**$5,113,586**
Lone Tree	Agricultural	2	0	1	$0	$1,797	$1,797
	Exempt	4	0	1	$0	$89,556	$89,556
	Total	**6**	**0**	**2**	**$0**	**$91,353**	**$91,353**
Parker	Agricultural	1	0	0	$0	$1,190	$1,190
	Commercial	2	0	0	$0	$17,700	$17,700
	Exempt	98	6	11	$691,591	$12,531,887	$13,223,478
	HOA	11	0	0	$0	$0	$0
	Residential	5	3	4	$653,552	$207,705	$861,257
	Utilities	1	0	0	$0	$0	$0
	Vacant Land	7	0	0	$0	$743,741	$743,741
	Total	**125**	**9**	**15**	**$1,345,143**	**$13,502,223**	**$14,847,366**
Unincorporated	Agricultural	104	46	65	$13,789,952	$949,030	$14,738,982
	Commercial	13	11	15	$2,017,855	$2,295,072	$4,312,927
	Exempt	240	13	99	$3,581,017	$26,063,528	$29,644,545
	HOA	22	0	13	$0	$0	$0
	Industrial	6	6	7	$624,040	$1,511,492	$2,135,532
	Residential	125	110	120	$24,861,032	$15,928,416	$40,789,448
	Utilities	4	0	0	$0	$0	$0
	Vacant Land	38	0	11	$0	$2,890,243	$2,890,243
	Total	**552**	**186**	**330**	**$44,873,896**	**$49,637,781**	**$94,511,677**
	Grand Total	**857**	**249**	**452**	**$53,575,899**	**$74,184,762**	**$127,760,661**

Source: Douglas County 2014 Assessor & Parcel Data; Douglas County DFIRM

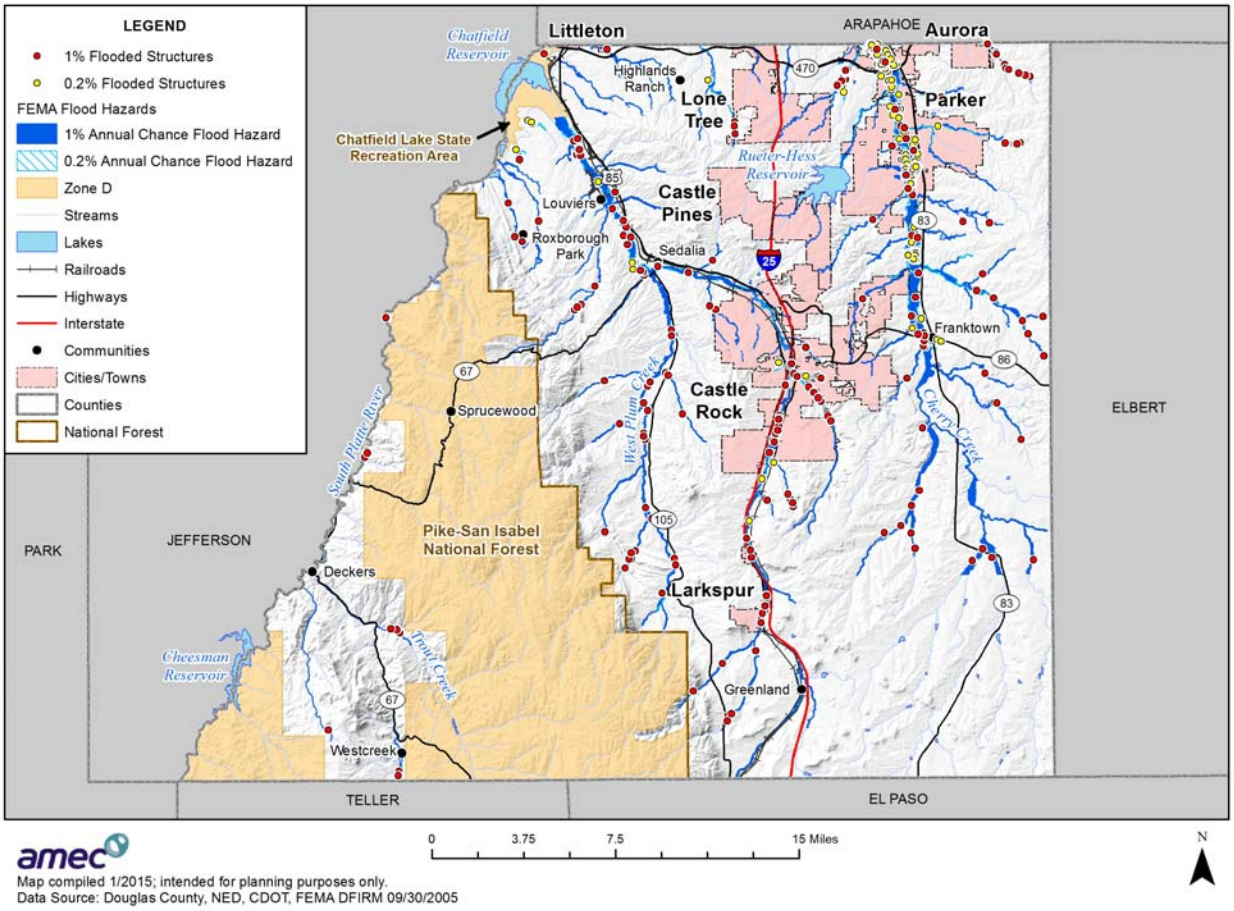
Table 4.61. Douglas County Exposure to 0.2% Annual Chance Flood Zone by Jurisdiction and Property Type

Jurisdiction	Property Type	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Land Value	Total Value
Castle Rock	Agricultural	14	0	18	$0	$2,741	$2,741
	Commercial	2	2	16	$1,402,310	$391,090	$1,793,400
	Exempt	17	0	3	$0	$74,668	$74,668
	HOA	1	0	0	$0	$0	$0
	Industrial	1	1	1	$490,335	$262,665	$753,000
	Residential	9	9	9	$1,069,946	$170,250	$1,240,196
	Vacant Land	5	0	3	$0	$908,582	$908,582

Jurisdiction	Property Type	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Land Value	Total Value
	Total	**49**	**12**	**50**	**$2,962,591**	**$1,809,996**	**$4,772,587**
Larkspur	Commercial	2	1	5	$362,177	$213,870	$576,047
	Exempt	1	1	1	$147,670	$40,000	$187,670
	Residential	1	1	1	$124,985	$80,000	$204,985
	Total	**4**	**3**	**7**	**$634,832**	**$333,870**	**$968,702**
Parker	Agricultural	1	0	0	$0	$810	$810
	Commercial	18	10	62	$28,897,896	$17,554,185	$46,452,081
	Exempt	125	15	21	$23,698,806	$5,404,382	$29,103,188
	HOA	6	0	0	$0	$0	$0
	Residential	758	757	846	$131,232,921	$39,094,720	$170,327,641
	Vacant Land	36	0	22	$0	$5,827,345	$5,827,345
	Total	**944**	**782**	**951**	**$183,829,623**	**$67,881,442**	**$251,711,065**
Unincorporated	Agricultural	11	6	7	$872,623	$137,162	$1,009,785
	Commercial	4	4	13	$3,198,128	$2,297,812	$5,495,940
	Exempt	30	3	14	$54,553	$3,191,908	$3,246,461
	HOA	6	0	6	$0	$0	$0
	Industrial	3	3	5	$416,106	$891,198	$1,307,304
	Residential	307	305	640	$89,380,034	$21,258,054	$110,638,088
	Utilities	1	0	1	$0	$0	$0
	Vacant Land	14	1	11	$318	$626,093	$626,411
	Total	**376**	**322**	**697**	**$93,921,762**	**$28,402,227**	**$122,323,989**
Grand Total		**1,373**	**1,119**	**1,705**	**$281,348,808**	**$98,427,535**	**$379,776,343**

Source: Douglas County 2014 Assessor & Parcel Data; Douglas County DFIRM

Figure 4.51. Douglas County Flood Hazards and Floodprone Improved Properties



According to the flood analysis represented in Table 4.60; Castle Rock and Larkspur have the highest total values exposed in the 1% annual chance flood zone with Castle Rock having 40 improved parcels and total value of improvements at $4.8 million at risk, not including contents. Larkspur has 14 improved parcels with an improved value of $2.6 million at risk, not including contents, in the 1% annual chance flood zone.

Loss Estimates

Table 4.62 shows improved values at risk in the 1% annual chance flood zone and Table 4.63 summarizes improved values at risk in the 0.2% annual chance flood zone. Contents values were estimated as a percentage of building value based on their property type, using FEMA/HAZUS estimated content replacement values. This includes 100% of the structure value for agricultural, commercial, exempt, HOA and utility, 50% for residential, 150% for industrial and 0% for vacant land use classifications. A 20% damage factor was applied to each flood zone's total value of improvements and estimated content to obtain a loss estimate. This analysis is based on a FEMA depth damage function which assumes a two foot deep flood. Land value was not included in this analysis as the land itself is usually not a loss. The unincorporated County has the largest loss

estimate of $15.5 million with Castle Rock having the second highest loss estimate of $1.7 million for the 1% annual chance flood. Parker has the largest loss estimate for the 0.2% annual chance flood at $60.4 million, and the unincorporated County has the second highest loss estimate at over $28.6 million.

Table 4.62. Douglas County Estimated Loss Estimate to 1% Annual Chance Flood Zone Summary

Jurisdiction	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Estimated Content Value	Total Value	Loss Estimate
Castle Rock	141	40	79	$4,801,231	$3,901,688	$8,702,919	$1,740,584
Larkspur	33	14	26	$2,555,629	$2,151,518	$4,707,147	$941,429
Lone Tree	6	0	2	$0	$0	$0	$0
Parker	125	9	15	$1,345,143	$1,018,367	$2,363,510	$472,702
Unincorporated	552	186	330	$44,873,896	$32,755,400	$77,629,296	$15,525,859
Total	**857**	**249**	**452**	**$53,575,899**	**$39,826,973**	**$93,402,872**	**$18,680,574**

Source: Douglas County 2014 Assessor & Parcel Data; Douglas County DFIRM

Table 4.63. Douglas County Estimated Loss Estimate to 0.2% Annual Chance Flood Zone Summary

Jurisdiction	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Estimated Content Value	Total Value	Loss Estimate
Castle Rock	49	12	50	$2,962,591	$2,672,786	$5,635,377	$1,127,075
Larkspur	4	3	7	$634,832	$572,340	$1,207,172	$241,434
Lone Tree	0	0	0	$0	$0	$0	$0
Parker	944	782	951	$183,829,623	$118,213,163	$302,042,786	$60,408,557
Unincorporated	376	322	697	$93,921,762	$49,439,480	$143,361,242	$28,672,248
Total	**1,373**	**1,119**	**1,705**	**$281,348,808**	**$170,897,768**	**$452,246,576**	**$90,449,315**

Source: Douglas County 2014 Assessor & Parcel Data; Douglas County DFIRM

Flooded Acres

Also of interest is the land area affected by the various flood zones. The following is an analysis of flooded acres in the County in comparison to total area within the unincorporated county and city limits of each jurisdiction.

Methodology

GIS was used to calculate acres flooded by FEMA flood zones and property type categories. The Douglas County parcel layer and effective DFIRM data were intersected, and each segment divided by the intersection of flood zone and parcels was calculated for acres. This process was conducted for 1% flood chance areas, with each segment being defined by zone type (A, AE, AO)

and acres, and the process repeated for 0.2% flood chance areas. The resulting data tables with flooded acreages were then imported into a database and linked back to the original parcels, including total acres and land/improvement values, by parcel number. Once this was completed, each parcel contained acreage values for flooded acre by zone type within the parcel. In some cases, a single parcel had multiple flooded acres values (e.g., parcels overlapping a 1%-0.2% flood chance boundary). In the tables below each flood zone is represented and then split out by property type, their total flooded acres, total improved acres, and percent of improved acres that are flooded.

Limitations

One limitation of this analysis is that the parcel layer does not contain right-of-ways. Due to this there are voids of land that are not calculated; thus the analysis only represents total parcel acres. The other limitation created by this type of analysis is that improvements are uniformly found throughout the parcel, while in reality, only portions of the parcel are improved, and improvements may or may not fall within the flood zone portion of a parcel; thus, areas of improvements flooded calculated through this method may be higher or lower than those actually seen in a similar real world event.

Table 4.64 represent a detailed and summary analysis of total acres for each FEMA DFIRM flood zone. Table 4.64 gives detailed information for the Planning Area. This information is available for each jurisdiction in their respective annexes.

Table 4.64. Douglas County Planning Area – Flooded Acres by Jurisdiction

Flood Zone	Jurisdiction	Total Parcels Count	Improved Parcel Count	Total Structures Count	Total Acres	Total Flooded Acres	Total Acres with Improvements	Total Flood Acres with Improvements
Zone A	Castle Rock	47	2	18	257	147	0	0
	Lone Tree	6	0	2	70	20	0	0
	Parker	9	0	0	74	30	0	0
	Unincorporated	259	90	152	6,198	1,750	2,963	756
	Total Zone A	**321**	**92**	**172**	**6,599**	**1,947**	**2,964**	**757**
Zone AE	Castle Rock	94	38	61	272	142	6	4
	Larkspur	33	14	26	148	96	64	38
	Parker	116	9	15	1,069	829	119	90
	Unincorporated	284	92	173	4,605	2,504	1,732	890
	Total Zone AE	**527**	**153**	**275**	**6,095**	**3,571**	**1,922**	**1,022**
Zone AO	Unincorporated	9	4	5	57	17	30	8
	Total Zone AO	**9**	**4**	**5**	**57**	**17**	**30**	**8**

Flood Zone	Jurisdiction	Total Parcels Count	Improved Parcel Count	Total Structures Count	Total Acres	Total Flooded Acres	Total Acres with Improvements	Total Flood Acres with Improvements
0.2% Annual Chance	Castle Rock	49	12	50	134	16	5	1
	Larkspur	4	3	7	7	2	6	1
	Parker	944	782	951	749	490	394	264
	Unincorporated	376	322	697	1,329	300	819	155
	Total 0.2%	**1,373**	**1,119**	**1,705**	**2,219**	**808**	**1,224**	**422**
	Grand total	**2,230**	**1,368**	**2,157**	**14,970**	**6,343**	**6,140**	**2,209**

Source: Douglas County 2014 Assessor & Parcel Data; Douglas County DFIRM

Insurance Coverage, Claims Paid, and Repetitive Losses

Unincorporated Douglas County joined the NFIP on September 3, 1980. Castle Rock, Larkspur, Parker, and Lone Tree also participate in the NFIP. Table 4.65 summarizes NFIP insurance data as of November 30, 2014. Table 4.66 lists the number of total losses, closed losses, open losses, closed-without-pay (CWOP) losses, and total payments for the participating communities in Douglas County.

Table 4.65. NFIP Policy Summary

Jurisdiction	Join Date	# of Policies	Insurance In Force
Douglas County	9/3/1980	283	$69,933,300
Castle Rock	8/15/1978	81	$19,880,500
Larkspur	9/30/1987	1	$144,100
Lone Tree	4/8/2005	24	$6,001,000
Parker	9/30/1987	71	$18,144,000
Total	**-**	**460**	**$114,102,900**

Source: FEMA

Table 4.66. NFIP Loss Summary

Jurisdiction	Total Losses	Closed Losses	Open Losses	CWOP Losses	Total Payments
Douglas County	31	21	0	10	$487,024.36
Castle Rock	1	0	0	1	$0.00
Larkspur	-	-	-	-	-
Lone Tree	1	1	0	0	$2,471.80
Parker	1	0	0	1	$0.00
Total	**34**	**22**	**0**	**12**	**$489,496.16**

Source: FEMA

Repetitive Loss Data

Douglas County's vulnerability to flooding is further indicated by its number of Repetitive Loss properties. According to the June 30, 2014 data from FEMA on NFIP communities, there are no

repetitive loss (RL) buildings in the unincorporated County or municipalities.

Populations at Risk

A separate analysis was performed to determine population in flood zones. Using GIS, the DFIRM Flood dataset was overlaid on the improved residential parcel data. Those parcel centroids that intersect a flood zone were counted and multiplied by the Census Bureau Douglas County household factor; results were tabulated by jurisdiction and flood zone (see Table 4.67). According to this analysis, there is a population of 433 in the 1% annual chance flood event, and 2,930 in the 0.2% annual chance flood event.

Table 4.67. Douglas County Planning Area - Improved Residential Parcels and Population in Floodplain

	1% Annual Chance		0.2% Annual Chance	
Jurisdiction	**Improved Residential Parcels**	**Population**	**Improved Residential Parcels**	**Population**
Castle Pines	-	-	-	-
Castle Rock	34	97	9	26
Larkspur	9	20	1	2
Lone Tree	-	-	-	.
Parker	3	8	757	2,051
Unincorporated	110	307	305	851
Total	**156**	**433**	**1,072**	**2,930**

Source: DFIRM, US Census Bureau, 2014 Douglas County Assessor & Parcel Data
* Census Bureau 2010 average household sizes are: Castle Pines – 2.70; Castle Rock – 2.86; Larkspur – 2.26;Lone Tree – 2.54; Parker – 2.71; Unincorporated County – 2.79.

Critical Facilities at Risk

Fifty-two critical facilities in unincorporated Douglas County are located in the 1% annual chance or 0.2% annual chance flood zone, as shown in Table 4.69. Specifics on the other jurisdictions' critical facilities in flood zones are listed in their respective annexes.

Table 4.68. Douglas County Planning Area – Critical Facilities Exposure to FEMA Floodplains

Jurisdiction	1% Annual Chance	0.2% Annual Chance	Total Facility Count
Castle Rock	2	-	2
Lone Tree	1	-	1
Parker	1	28	29
Unincorporated County	45	7	52
Total	**49**	**35**	**84**

Source: Douglas County GIS

Table 4.69. Unincorporated Douglas County Critical Facilities At Risk to FEMA Floodplains

Zone	Category	Type	Facility Count
Zone A	Essential Services Facilities	Bridge	17
Zone A	Essential Services Facilities	Water Hub/Treatment	1
Zone A	High Potential Loss Facilities	Dam	1
Zone A	High Potential Loss Facilities	Hazardous Material	1
Zone AE	Essential Services Facilities	Bridge	19
Zone AE	Essential Services Facilities	Cell Tower	1
Zone AE	Essential Services Facilities	Water Hub/Treatment	1
Zone AE	High Potential Loss Facilities	Dam	1
Zone AE	High Potential Loss Facilities	Hazardous Material	1
Zone AO	Essential Services Facilities	Fire Department	1
Zone AO	Essential Services Facilities	Water Hub/Treatment	1
0.2% Annual Chance	Essential Services Facilities	Fire Department	2
0.2% Annual Chance	Essential Services Facilities	Microwave	3
0.2% Annual Chance	Essential Services Facilities	Water Hub/Treatment	1
0.2% Annual Chance	High Potential Loss Facilities	Hazardous Material	1
Total			**52**

Source: 2014 Douglas County Assessor & Parcel Data

Cultural and Natural Resources at Risk

The Douglas County Planning Area has significant cultural and natural resources located throughout the County as previously described. Risk analysis of these resources was not possible due to data limitations. However, natural areas within the floodplain often benefit from periodic flooding as a naturally recurring phenomenon. These natural areas often reduce flood impacts by allowing absorption and infiltration of floodwaters.

Development Trends

The County's zoning regulations prohibit various types of development within the floodplain overlay district:

1805.01 Habitable structures, or commercial/industrial structures, except fish hatcheries, water-related recreational facilities, single-family dwellings on nonconforming lots, and reconstruction of nonconforming structures as allowed by a Floodplain Development Permit

1805.02 Storage or processing of materials that are buoyant, flammable, explosive, or could be dangerous or cause injury in the time of flooding

1805.03 Junk or salvage yards, or solid waste disposal facilities or landfills

Section 4.4.1 discusses the County's floodplain regulations in more depth.

Through these regulations the County has minimized, but not eliminated, development in flood zones. Table 4.70 and Table 4.71 summarize development in the 1% and 0.2% annual chance flood zones between 2010 and 2014.

Table 4.70. Douglas County Structures Built from 2010 to 2014: Assets Exposed to the 1% Annual Chance Flood Zone

Jurisdiction	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Estimated Content Value	Land Value	Total Value
Castle Rock	3	3	4	$110,764	$55,382	$30,000	$196,146
Larkspur	2	2	2	$242,884	$121,442	$92,000	$456,326
Unincorporated	8	8	10	$1,454,476	$512,781	$649,435	$2,616,692
Total	**13**	**13**	**16**	**$1,808,124**	**$689,605**	**$771,435**	**$3,269,164**

Source: Douglas County GIS

Table 4.71. Douglas County Structures Built from 2010 to 2014: Assets Exposed to the 0.2% Annual Chance Flood Zone

Jurisdiction	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Estimated Content Value	Land Value	Total Value
Castle Rock	1	1	1	$490,335	$735,503	$262,665	$1,488,503
Larkspur	1	1	1	$147,670	$0	$40,000	$187,670
Parker	38	38	57	$7,284,984	$3,642,160	$1,954,246	$12,881,390
Unincorporated	16	16	28	$4,232,229	$2,116,274	$1,224,550	$7,573,053
Total	**56**	**56**	**87**	**$12,155,218**	**$6,493,936**	**$3,481,461**	**$22,130,615**

Source: Douglas County GIS

While the County has done an excellent job minimizing development in the 100-year floodplain, there are a significant number of structures in the 500-year floodplain, including several that were built in the last five years (see Table 4.61 and Table 4.71). Much of this development has occurred in Parker in particular. The 0.2% annual chance flood zone is less regulated; while these floods are a fairly rare occurrence, people and structures in this zone are still at risk.

The risk of stormwater/localized flooding to future development can be minimized by accurate recordkeeping of repetitive localized storm activity. Mitigating the root causes of the localized stormwater or choosing not to develop in areas that often are subject to localized flooding will reduce future risks of losses due to stormwater/localized flooding.

4.3.7 Landslide/Mud and Debris Flow/Rockfalls Vulnerability Assessment

Likelihood of Future Occurrence—High
Potential Magnitude—Low
Overall Vulnerability—Medium

Landslides in Douglas County include a wide variety of processes resulting in downward and outward movement of soil, rock, and vegetation. Common names for landslide types include slumps, rockslides, debris slides, lateral spreading, debris avalanches, earth flows, and soil creep. Although landslides are primarily associated with slopes greater than 15%, they can also occur in relatively flat areas and as cut-and-fill failures, river bluff failures, lateral spreading landslides, failures associated with quarries, and open-pit mines. Landslides may be triggered by both natural- and human-caused activity.

Methodology

The landslide hazard is made up of these attributes: debris-flow, rockfall-rockslide/debris and slope-failure. The County's parcel layer was used as the basis for the inventory of all parcels within Douglas County. GIS was used to overlay the landslide hazard layer with the parcel layer centroids and where the zones intersected a parcel centroid, it was assigned with that hazard zone for the entire parcel.

Values at Risk

The landslide, debris-flow, rockfall-rockslide/debris and slope-failure layers were intersected with the county parcel layer in GIS to obtain results. This is shown in Figure 4.52. Table 4.72 summarizes the parcels and values exposed to landslides hazards in the jurisdictions and unincorporated Douglas County. The unincorporated County has the most area exposed to landslide with 2,028 total parcels and 1,053 improved parcels with an improved value of $367,441,524 and a total value of $778,835,562. Castle Rock follows with 931 total and 543 improved parcels with and improved value of $198,464,752 and a total value of $361,228,304 exposed to landslides. Table 4.73 shows the unincorporated County's exposure by property type and landslide hazard. Additional details for the jurisdictions are available in their individual annexes.

Figure 4.52. Douglas County Planning Area - Landslide Hazards

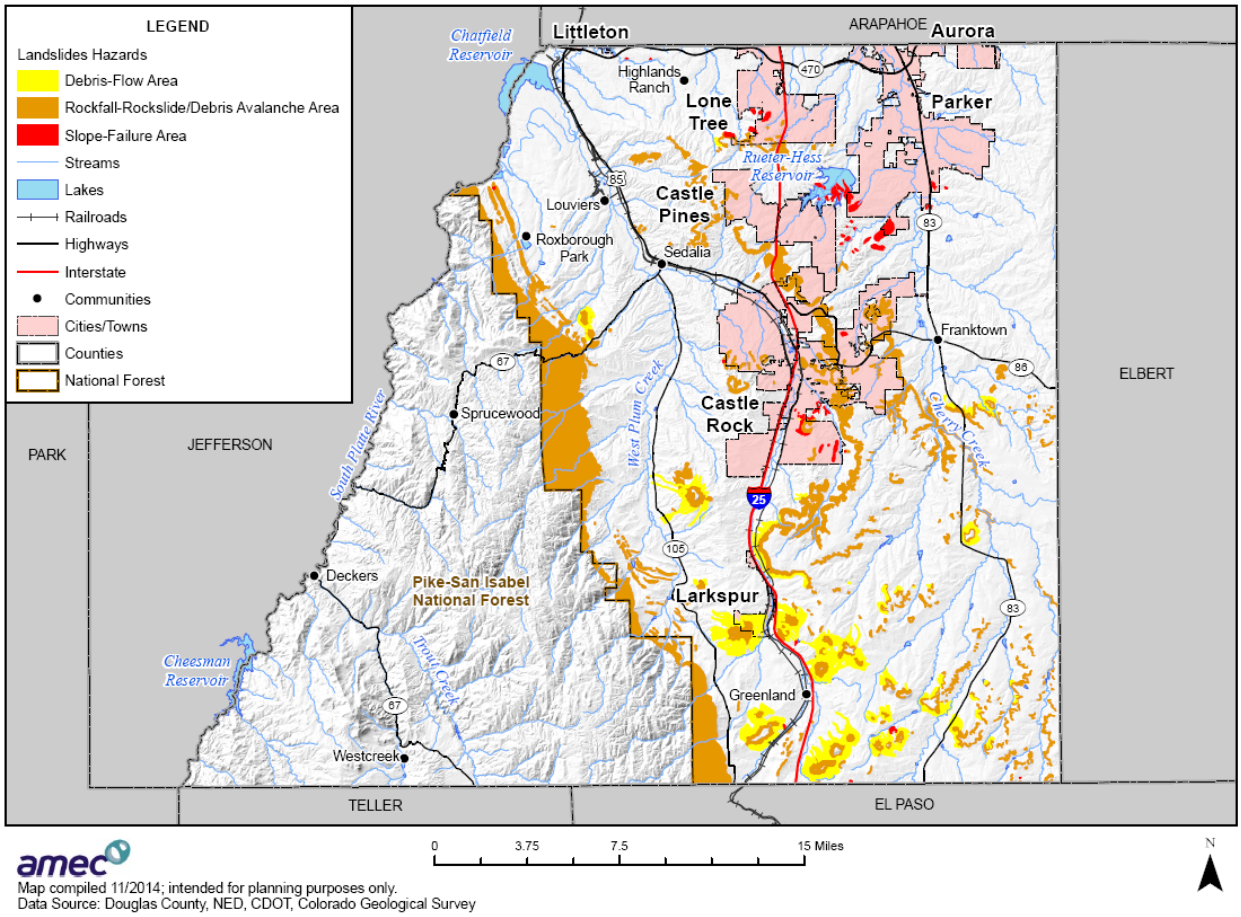


Table 4.72. Douglas County Planning Area – Assets Exposed to Landslide

Jurisdiction	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Estimated Content Value	Land Value	Total Value
Castle Pines	128	97	109	$61,466,476	$30,377,296	$18,008,656	$109,852,428
Castle Rock	931	543	826	$198,464,752	$104,951,045	$57,812,507	$361,228,304
Larkspur	42	26	82	$4,742,998	$3,441,257	$2,094,585	$8,907,340
Lone Tree	60	18	46	$12,960,972	$10,075,852	$7,312,406	$30,349,230
Parker	11	10	11	$3,773,733	$1,886,867	$1,751,139	$7,411,739
Unincorporated	2,028	1,053	1,738	$367,441,524	$202,777,717	$218,333,950	$778,835,562
Total	**3,200**	**1,747**	**2,812**	**$648,850,455**	**$353,510,032**	**$305,313,243**	**$1,296,584,601**

Source: Douglas County assessors data

Table 4.73. Unincorporated Douglas County – Assets Exposed to Landslide by Property Type

Property Type	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Estimated Content Value	Land Value	Total Value
Debris Flow Area							
Agricultural	62	28	44	$12,047,092	$12,047,092	$453,397	$24,547,581
Exempt	42	2	17	$1,168,701	$1,168,701	$12,955,995	$15,293,397
Residential	71	62	70	$18,917,251	$9,458,626	$8,165,388	$28,375,877
Utilities	3	0	0	$0	$0	$0	$0
Vacant Land	15	0	8	$0	$0	$1,552,241	$0
Total	**193**	**92**	**139**	**$32,133,044**	**$22,674,419**	**$23,127,021**	**$68,216,855**
Rockfall/Rockslide/Debris Avalanche Area							
Agricultural	184	47	83	$18,195,145	$18,195,145	$1,695,060	$38,085,350
Commercial	7	4	4	$3,532,649	$3,532,649	$1,397,675	$8,462,973
Exempt	142	19	46	$2,821,821	$2,821,821	$45,273,319	$50,916,961
HOA	40	0	4	$0	$0	$0	$0
Producing Mine	1	0	1	$0	$0	$9,207	$9,207
Residential	925	840	927	$287,755,333	$143,877,667	$116,593,013	$548,226,013
Vacant Land	454	7	469	$20,003	$0	$22,191,153	$22,211,156
Total	**1,753**	**917**	**1,534**	**$312,324,951**	**$168,427,282**	**$187,159,427**	**$667,911,660**
Slope-Failure Area							
Agricultural	4	1	1	$294,397	$294,397	$6,459	$595,253
Commercial	3	1	2	$74,107	$74,107	$116,496	$264,710
Exempt	18	0	8	$0	$0	$429,788	$429,788
Residential	46	42	44	$22,615,025	$11,307,513	$6,720,283	$40,642,821
Vacant Land	11	0	10	$0	$0	$774,476	$774,476
Total	**82**	**44**	**65**	**$22,983,529**	**$11,676,017**	**$8,047,502**	**$42,707,048**
Grand Total	**2,028**	**1,053**	**1,738**	**$367,441,524**	**$202,777,718**	**$218,333,950**	**$778,835,563**

Source: Douglas County Assessor's data

Populations at Risk

GIS analysis was performed to determine population in the landslide areas. Using GIS, the Douglas County landslide layer was overlaid on the entire parcel layer. Those parcel centroids that intersect the landslide areas were counted and multiplied by the 2010 Census Bureau average household factors for each jurisdiction and the unincorporated County; results were tabulated by jurisdiction (see Table 4.74). According to this analysis, the unincorporated County has the most people exposed to landslides, followed by Castle Rock.

Table 4.74. Douglas County Planning Area – Population Exposed to Landslide

Jurisdiction	Debris-Flow Area		Rockfall-Rockslide/Debris Avalanche Area		Slope-Failure Area	
	Improved Residential Parcels	Population	Improved Residential Parcels	Population	Improved Residential Parcels	Population
Castle Pines	-	-	95	257	-	-
Castle Rock	2	6	445	1,273	89	255
Larkspur	18	41	-	-	-	-
Lone Tree	-	-	-	-	-	-
Parker	-	-	-	-	10	27
Unincorporated	62	173	840	2,344	42	117
Total	**82**	**219**	**1,380**	**3,873**	**141**	**399**

Source: Douglas County Assessor's data

Critical Facilities at Risk

Landslide analysis was performed on the critical facility inventory in Douglas County and all jurisdictions. GIS was used to determine whether the facility locations intersect the landslide hazard areas provided by Douglas County, and if so, which zones they intersect. There are 58 facilities in the Planning Area in landslide zones, as shown in Table 4.75. Castle Rock and the unincorporated County are the only areas with critical facilities in landslide hazard areas. More details on landslide issues in Castle Rock may be found in the town's annex. Table 4.76 summarizes the critical facilities at risk to landslides in the unincorporated County by hazard area, critical facility category, facility type, and facility count. Details of critical facility definition, type, name and address and jurisdiction by landslide zone are listed in Appendix E.

Table 4.75. Douglas County Planning Area – Critical Facilities at Risk from Landslide

Jurisdiction	Facility Count
Castle Rock	18
Unincorporated County	40
Total	**58**

Source: Douglas County GIS

Table 4.76. Unincorporated Douglas County– Critical Facilities at Risk from Landslide

Landslide Hazard	Category	Type	Facility Count
Debris-Flow Area	Essential Services Facilities	Bridge	1
Debris-Flow Area	Essential Services Facilities	Fire Department	1
Total			**2**
Rockfall/Avalanche Area	At Risk Population Facilities	School	1
Rockfall/Avalanche Area	Essential Services Facilities	Bridge	1
Rockfall/Avalanche Area	Essential Services Facilities	Cell Tower	2
Rockfall/Avalanche Area	Essential Services Facilities	Fire Department	1
Rockfall/Avalanche Area	Essential Services Facilities	Microwave	28
Rockfall/Avalanche Area	Essential Services Facilities	Radio Tower	2
Rockfall/Avalanche Area	At Risk Population Facilities	Hazardous Material	1
Total			**36**
Slope-Failure Area	Essential Services Facilities	Bridge	1
Slope-Failure Area	Essential Services Facilities	Water Hub/Treatment	1
Total			**2**
Grand Total			**40**

Source: Douglas County GIS

Development Trends

Landslide hazard areas are located in every participating jurisdiction in this plan. Development in Douglas County is primarily encouraged in existing urban areas, and because landslide hazard areas are present in every jurisdiction in this plan, new structures in any of the jurisdictions could be at risk. Fortunately, the landslide hazard area in most jurisdictions is fairly small. Castle Rock and the unincorporated County have the most land at risk.

A total of 83 structures were built in landslide hazard areas in the unincorporated County, Castle Rock, Castle Pines, and Larkspur between 2010 and 2014. The large majority of these structures are located in rockfall hazard areas in the unincorporated County. Results of this analysis are shown in Table 4.77 and Table 4.78.

Table 4.77. Douglas County Structures Built from 2010 to 2014: Summary of Assets Exposed to Landslide Hazard Areas

Jurisdiction	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Estimated Content Value	Land Value	Total Value
Castle Pines	6	6	7	$4,728,514	$2,364,257	$1,209,000	$8,301,771
Larkspur	2	2	2	$118,254	$53,651	$76,000	$247,905
Castle Rock	19	19	19	$6,852,926	$3,426,463	$1,236,200	$11,515,589
Unincorporated	54	54	55	$21,003,852	$10,816,843	$7,234,834	$39,055,529
Total	**81**	**81**	**83**	**$32,703,546**	**$16,661,214**	**$9,756,034**	**$59,120,794**

Source: Douglas County GIS

Table 4.78. Douglas County Structures Built from 2010 to 2014: Assets Exposed to Landslide/Debris Flows/Rockfall Hazard Areas

Property Type	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Estimated Content Value	Land Value	Total Value
Debris Flow Area							
Castle Rock	1	1	1	$354,228	$177,114	$52,000	$583,342
Larkspur	2	2	2	$118,254	$53,651	$76,000	$247,905
Unincorporated	4	4	4	$1,410,552	$1,020,193	$244,925	$2,675,670
Total	**7**	**7**	**7**	**$1,883,034**	**$1,250,958**	**$372,925**	**$3,506,917**
Rockfall/Rockslide/Debris Avalanche Area							
Castle Pines	6	6	7	$4,728,514	$2,364,257	$1,209,000	$8,301,771
Castle Rock	16	16	16	$6,289,724	$3,144,862	$1,054,200	$10,488,786
Unincorporated	49	49	50	$19,015,834	$9,507,917	$6,905,909	$35,429,660
Total	**71**	**71**	**73**	**$30,034,072**	**$15,017,036**	**$9,169,109**	**$54,220,217**
Slope-Failure Area							
Castle Rock	2	2	2	$208,974	$104,487	$130,000	$443,461
Unincorporated	1	1	1	$577,466	$288,733	$84,000	$950,199
Total	**3**	**3**	**3**	**$786,440**	**$393,220**	**$214,000**	**$1,393,660**
Grand Total	**81**	**81**	**83**	**$32,703,546**	**$16,661,214**	**$9,756,034**	**$59,120,794**

Source: Douglas County GIS

4.3.8 Severe Weather: Thunderstorms and Heavy Rains Vulnerability Assessment

Likelihood of Future Occurrence—High
Potential Magnitude—Medium
Overall Vulnerability—Medium

According to historical hazard data, severe weather is an annual occurrence in Douglas County.

Damage and disaster declarations related to severe weather have occurred and will continue to occur in the future. Heavy rain and thunderstorms are the most frequent type of severe weather occurrences in the County. Lightning often accompanies these storms and has caused damage in the past. However, actual damage associated with the primary effects of severe weather has been limited. It is the secondary hazards caused by weather, such as floods, fire, and agricultural losses that have had the greatest impact on the County. The risk and vulnerability associated with these secondary hazards are discussed in other sections (Section 4.3.6 Flood: 100/500-year and Localized Stormwater).

Development Trends

New critical facilities such as communications towers should be built to withstand heavy rains and thunderstorms. While damages have occurred in the Planning Area in the past due to this kind of severe weather, it is difficult to quantify future deaths, injuries, or damages due to heavy rains or thunderstorms. Future development projects should consider severe weather hazards at the planning, engineering and architectural design stage with the goal of reducing vulnerability. Development trends in the County are not expected to increase vulnerability to the hazard.

4.3.9 Severe Weather: Winter Weather

Likelihood of Future Occurrence—High
Potential Magnitude—Low
Overall Vulnerability—Medium

Douglas County typically experiences multiple winter storms in any given year. This hazard has been critical in its magnitude and severity in the past, as seen during the blizzards of March 2003 and December 2006. Vulnerability is high along busy roadways, particularly on Interstate 25 and Highway 470, where severe winter weather conditions may cause traffic related deaths and injuries. Road closures due to winter weather conditions also restrict or prevent the movement of people and goods and services (including food and gas), which can create the need for emergency sheltering for travelers. Poor road conditions can also delay emergency response.

It is difficult to identify specific winter weather hazard areas within Douglas County. Data was not available to identify specific structures at risk or estimate potential losses to these structures. NCDC data did not provide enough details on past damages and casualties to obtain an average annual loss assessment. If the March 2003 blizzard is used as the event of record, then the Denver Metro area could expect over $31 million in property damages from a severe winter storm. Note that this damage estimate is spread over the entire Denver Metro area; Douglas County's share of the damage would be smaller.

Development Trends

Future residential or commercial buildings built to code should be able to withstand snow loads from severe winter storms. Population growth in the County and growth in visitors will increase

problems with road, business, and school closures and increase the need for snow removal and emergency services related to severe winter weather events.

4.3.10 Soil Hazards: Erosion and Deposition

Likelihood of Future Occurrence—High
Potential Magnitude—Low
Overall Vulnerability—Medium

Two different areas of existing development are vulnerable to erosion. Erosion of soils due to slope grade, soil content and cover, and exposure to weather conditions is fairly limited and generally falls within underdeveloped areas. This is also due to the concurrence of erosion potential with other geologic hazard areas, such as dipping bedrock, which have been mapped by the County. Areas susceptible to wildfire-driven erosion, which often result in debris flow or the erosion and deposition of soil into watersheds, also does not usually directly impact developed areas but can impact transportation and drainage infrastructure. There are some areas of variance, particularly in the wildland-urban interface, where debris flows may impact housing and commercial districts. The larger concern centers on the pollution of the watersheds by soils, which impacts wildlife balances and degrades water quality for downstream habitats. Continued erosion and movement of soils in wildfire areas usually degrade watershed quality and thus exert a larger or disproportionate impact on the larger Planning Area. In addition, recovery for the washed out areas may be prolonged or difficult, as demonstrated in the burn areas of the Hayman fire, due to the loss of nutrient-rich soil. In this sense, 'existing development' may refer to any area vulnerable to wildfire, which covers an extensive portion of the Planning Area.

In addition to the general areas of existing vulnerability, scour critical bridges are also vulnerable to the effects of erosion and deposition. Erosion around bridges may compromise the construction of the structure, making them unsafe. Deposition may also press up against the structures, causing structural strain or sweeping out the structure by debris. In this instance, the vulnerability overlaps those identified in the debris flow section that follows.

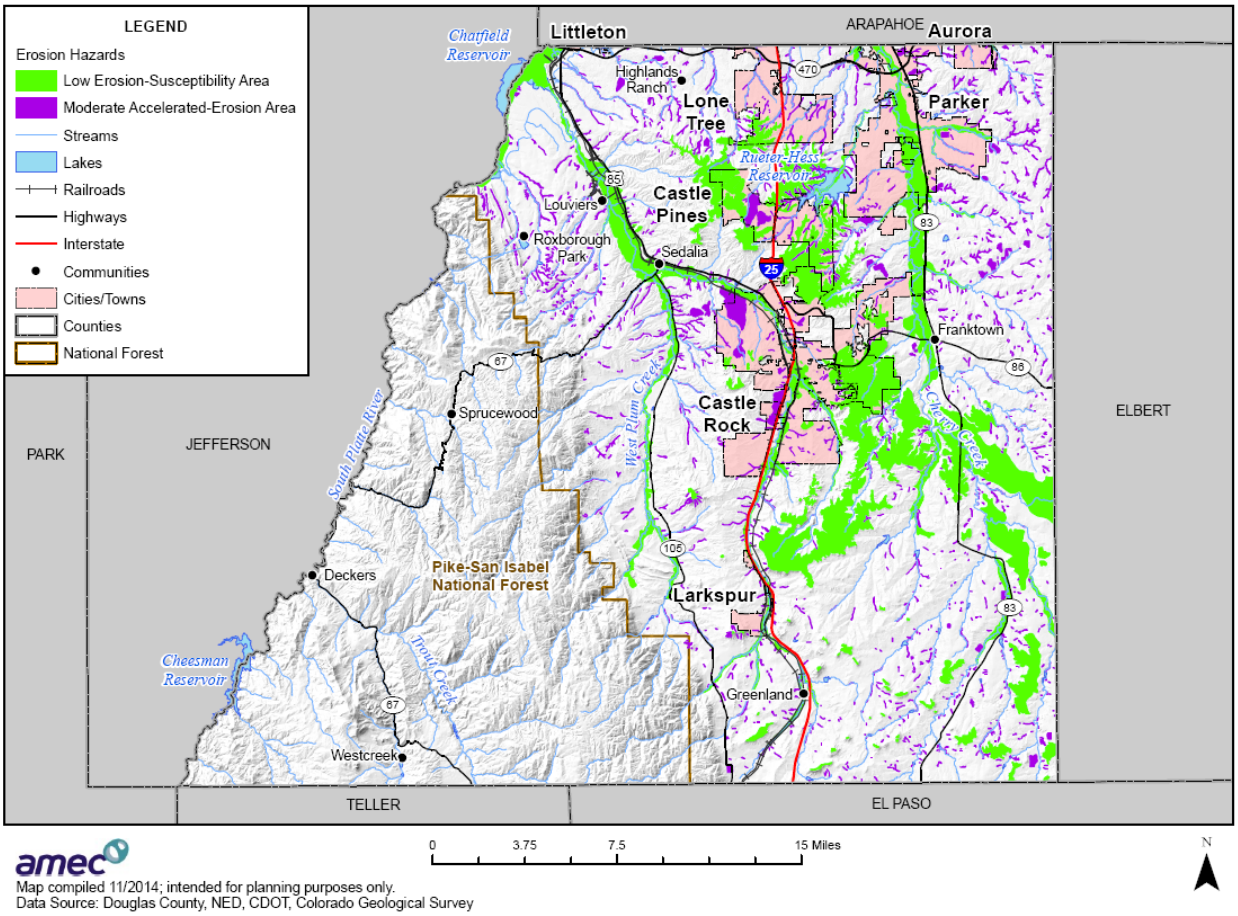
Response and recovery costs to address erosion problems from the Buffalo Creek fire in Jefferson County cost Denver Water alone over $24 million. The cost of the Buffalo Creek fire can be used as an estimate of future losses in Douglas County. However, the exact cost will vary depending on whether wildfires and resulting erosion problems affect critical watersheds. Erosion has been an ongoing issue in the Hayman burn area and will likely continue to cause problems.

Methodology

According to the geologic hazard layer obtained by Douglas County and created by the Colorado Geological Survey there are erosion hazards in the Planning Area (see Figure 4.53). The geologic hazard layer includes spatial data on low and moderate accelerated erosion susceptibility. The County's parcel layer was used as the basis for the inventory of all parcels within Douglas County. GIS was used to overlay the erosion hazard layer with the parcel layer centroids and where the

zones intersected a parcel centroid, it was assigned with that hazard zone for the entire parcel.

Figure 4.53. Douglas County Planning Area - Erosion Hazards



Values at Risk

The erosion layers, low and moderate accelerated erosion susceptibility, were intersected with the county parcel layer in GIS to obtain an estimate of property exposed to erosion hazards. Table 4.79 and Table 4.80 summarize the exposure of each jurisdiction to low erosion susceptibility areas and moderate accelerated erosion areas, respectively. Table 4.81 summarizes the exposure of jurisdictions and unincorporated Douglas County to the erosion hazard. More site specific analyses would be needed to characterize the true risk. There is significant exposure within the low erosion susceptibility areas with a total value of $3.9 billion, which is a combination of improved values and land Values. Castle Rock has the highest exposure to this hazard with a total value of $1.5 billion. Castle Rock also has the most parcels exposed with 6,568 with 4,997 being improved parcels with an improved value of $1.2 billion. Moderate accelerated erosion areas also have an impact to Douglas County with a total value of exposure of $1.6 billion. Castle Rock has the most parcels exposed to moderate accelerated erosion with 2,144 with 1,915 being improved parcels and an improved value of $384 million.

Table 4.79. Douglas County Planning Area – Summary of Assets Exposed to Low Erosion Susceptibility Areas

Jurisdiction	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Land Value	Total Value
Castle Pines	2,095	1,818	1,986	$657,534,162	$180,677,968	$838,212,130
Castle Rock	6,568	4,997	6,702	$1,203,158,081	$328,063,774	$1,531,221,855
Larkspur	56	27	79	$4,892,112	$4,233,861	$9,125,973
Lone Tree	16	1	3	$554,071	$411,624	$965,695
Parker	2,686	2,073	3,326	$583,712,863	$233,560,551	$817,273,414
Unincorporated	2,733	1,371	2,310	$468,730,634	$245,917,237	$714,647,871
Total	**14,154**	**10,287**	**14,406**	**$2,918,581,923**	**$992,865,015**	**$3,911,446,938**

Source: Douglas County Assessor's data

Table 4.80. Douglas County Planning Area – Summary of Assets Exposed to Moderate Accelerated Erosion Area

Jurisdiction	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Land Value	Total Value
Castle Pines	845	523	772	$151,911,353	$49,608,760	$201,520,113
Castle Rock	2,144	1,915	2,053	$383,897,482	$103,592,626	$487,490,108
Larkspur	3	0	1	$0	$1,030	$1,030
Lone Tree	40	14	49	$20,811,382	$12,588,747	$33,400,129
Parker	265	210	281	$167,312,517	$22,868,525	$190,181,042
Unincorporated	1,838	1,444	1,901	$542,634,425	$174,865,929	$717,500,354
Total	**5,135**	**4,106**	**5,057**	**$1,266,567,159**	**$363,525,617**	**$1,630,092,776**

Source: Douglas County Assessor's data

Table 4.81. Douglas County Planning Area – Summary of Assets Exposed to Erosion and Deposition – Low and Moderate Total

Jurisdiction	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Land Value	Total Value
Castle Pines	2,940	2,341	2,758	$809,445,515	$230,286,728	$1,039,732,243
Castle Rock	8,712	6,912	8,755	$1,587,055,563	$431,656,400	$2,018,711,963
Larkspur	59	27	80	$4,892,112	$4,234,891	$9,127,003
Lone Tree	56	15	52	$21,365,453	$13,000,371	$34,365,824
Parker	2,951	2,283	3,607	$751,025,380	$256,429,076	$1,007,454,456
Unincorporated	4,571	2,815	4,211	$1,011,365,059	$420,783,166	$1,432,148,225
Total	**19,289**	**14,393**	**19,463**	**$4,185,149,082**	**$1,356,390,632**	**$5,541,539,714**

Source: Douglas County Assessor's data

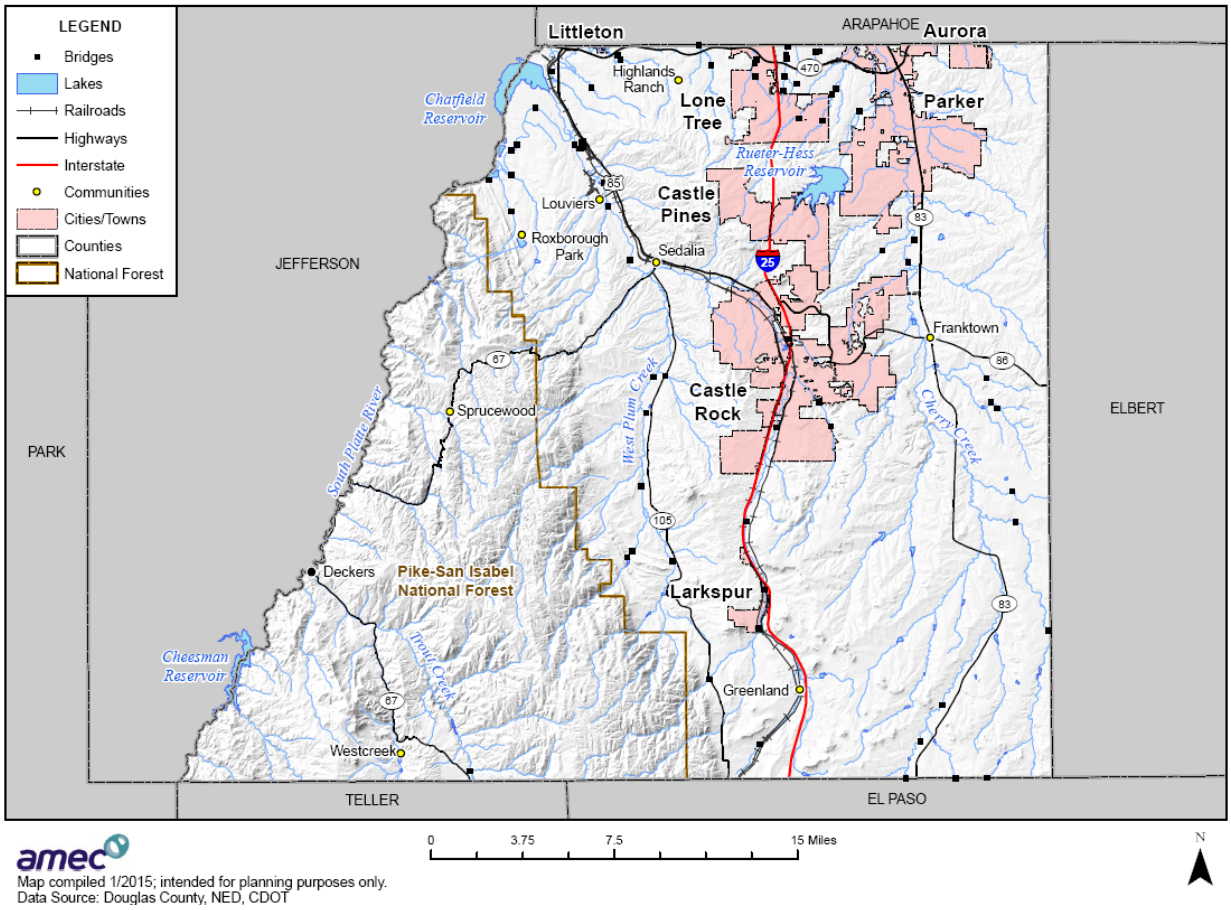
In addition to the general areas of existing vulnerability, scour critical bridges are also vulnerable to the effects of erosion and deposition. These bridges are depicted graphically in Figure 4.54. Table 4.82 lists the scour critical bridges in the Planning Area. Erosion around bridges may compromise the construction of the structure, making them unsafe. Deposition may also press up against the structures, causing structural strain or sweeping out the structure by debris.

Table 4.82. Scour Critical Bridges

Name	Road	Scour Index
Draw	SH 105	3
East Plum Creek	SH 67	3
West Cherry Creek	SH 83	3
Antelope Creek	SH 83	3

Source: Douglas County, NED, CDOT

Figure 4.54. Douglas County Bridges



Critical Facilities at Risk

Erosion analysis was performed on the critical facility inventory in Douglas County and all jurisdictions. GIS was used to determine whether the facility locations intersect erosion hazard areas provided by Douglas County, and if so, which zone they intersect. There are 294 total facilities in the Planning Area at risk in erosion zones, as shown in Table 4.83. The portion of Littleton that lies within Douglas County also has two critical facilities at risk to erosion. More details on erosion issues specific to each affected jurisdiction may be found in the individual annexes. Table 4.84 summarizes the critical facilities at risk to erosion in the unincorporated County by hazard area, critical facility category, facility type, and facility count. Details of critical facility definition, type, name and address and jurisdiction by landslide zone are listed in Appendix E.

Table 4.83. Douglas County Planning Area – Critical Facilities Exposure to Erosion

Jurisdiction	Low Erosion	Moderate Accelerated	Total Facility Count
Castle Pines	7	1	8
Castle Rock	74	7	81
Littleton	2	-	2
Lone Tree	-	3	3
Parker	52	9	61
Unincorporated County	121	18	139
Total	**256**	**38**	**294**

Source: Douglas County GIS

Table 4.84. Unincorporated Douglas County– Critical Facilities Exposure to Erosion

Erosion Hazard	Category	Type	Facility Count
Low Erosion Susceptibility Area	At Risk Population Facilities	Group Home	1
Low Erosion Susceptibility Area	At Risk Population Facilities	School	2
Low Erosion Susceptibility Area	Essential Services Facilities	Bridge	14
Low Erosion Susceptibility Area	Essential Services Facilities	Cell Tower	12
Low Erosion Susceptibility Area	Essential Services Facilities	Fire Department	4
Low Erosion Susceptibility Area	Essential Services Facilities	Microwave	25
Low Erosion Susceptibility Area	Essential Services Facilities	Radio Tower	3
Low Erosion Susceptibility Area	Essential Services Facilities	Water Hub/Treatment	6
Low Erosion Susceptibility Area	High Potential Loss Facilities	Dam	2
Low Erosion Susceptibility Area	High Potential Loss Facilities	Hazardous Material	52
Total			**121**
Moderate Accelerated Erosion Area	At Risk Population Facilities	Assisted Living	3
Moderate Accelerated Erosion Area	At Risk Population Facilities	Group Home	1
Moderate Accelerated Erosion Area	Essential Services Facilities	Bridge	8
Moderate Accelerated Erosion Area	High Potential Loss Facilities	Hazardous Material	6
Total			**18**
Grand Total			**139**

Source: Douglas County GIS

Development Trends

Development on steep slopes is discouraged in the County's Comprehensive Master Plan (Section 9); therefore, future development exposed to slope-driven erosion is unlikely. Future developments may be vulnerable to erosion exacerbated by flooding, high winds, and wildfires.

A total of 257 structures were built in moderate-accelerated erosion hazard areas in the unincorporated County, Castle Rock, Castle Pines, Parker, and Lone Tree between 2010 and 2014. Results of this analysis are shown in Table 4.85.

Table 4.85. Douglas County Structures Built from 2010 to 2014: Summary of Assets Exposed to Moderate Accelerated-Erosion Areas by Jurisdiction

Jurisdiction	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Estimated Content Value	Land Value	Total Value
Castle Pines	35	35	35	$9,346,720	$4,673,360	$2,776,250	$16,796,330
Castle Rock	105	105	105	$20,306,057	$10,153,029	$4,995,400	$35,454,486
Lone Tree	1	1	7	$4,964,468	$4,964,468	$3,372,415	$13,301,351
Parker	14	14	14	$2,907,881	$1,453,941	$848,050	$5,209,872
Unincorporated	95	95	96	$33,820,811	$17,597,547	$9,800,846	$61,219,204
Total	**250**	**250**	**257**	**$71,345,937**	**$38,842,344**	**$21,792,961**	**$131,981,242**

Source: Douglas County GIS

4.3.11 Wildfire Vulnerability Assessment

Likelihood of Future Occurrence—High
Potential Magnitude—High
Overall Vulnerability—High

Risk and vulnerability to the Douglas County Planning Area from wildfire is of significant concern, with some areas of the Planning Area being at greater risk than others as described further in this section. High fuel loads in parts of the Planning Area, along with geographical and topographical features, create the potential for both natural and human-caused fires that can result in loss of life and property. These factors, combined with natural weather conditions common to the area, including periods of drought, high temperatures, low relative humidity, and periodic winds, can result in frequent and sometimes catastrophic fires. During fire season, the dry vegetation and hot and sometimes windy weather, combined with continued growth in the WUI areas, results in an increase in the number of ignitions. Any fire, once ignited, has the potential to quickly become a large, out-of-control fire. As development continues throughout the Planning Area, especially in these interface areas, the risk and vulnerability to wildfires will likely increase.

Douglas County Community Wildfire Protection Plan

The 2011 Douglas County CWPP was developed by a Core Team derived from 11 local fire protection districts; Douglas County Emergency Management, Open Space and Natural Resources, Engineering, Public Works Operations Division, and Public Affairs; CSFS, Denver Water, and USFS South Platte Ranger District (SPRD). The full list of collaborating agencies is provided on pages 2 and 11 of the CWPP.

The Wildfire Hazard Potential Map from the CWPP, shown in Figure 4.55, was used as a basis for the quantitative wildfire vulnerability analysis. This map shows wildfire hazard across Douglas County's as a composite analysis of controllability, values, and ignition risk. The Wildfire Hazard Potential Map has detailed information making it possible to develop a more precise quantitative

vulnerability analysis. The methodology is discussed in further detail in the next section.

The Douglas County CWPP contains a second map (Figure 4.56) showing land ownership, wildfire treatment recommendations, and community hazard rankings. The community hazard rankings are based on an average of the values shown in the Wildfire Hazard Potential map. Community hazard rankings include mixed, moderate, high, very high, and extreme hazard, listed in increasing order of the severity. The mixed category is used where hazard rankings can vary within a community. It is important to note that many of the larger mixed areas are located within major urban communities such as Castle Rock and Lone Tree. Colorado has experienced devastating fires in well-developed areas, such as the High Park and Waldo Canyon fires of 2012.

Figure 4.55. Douglas County Wildfire Hazard Potential

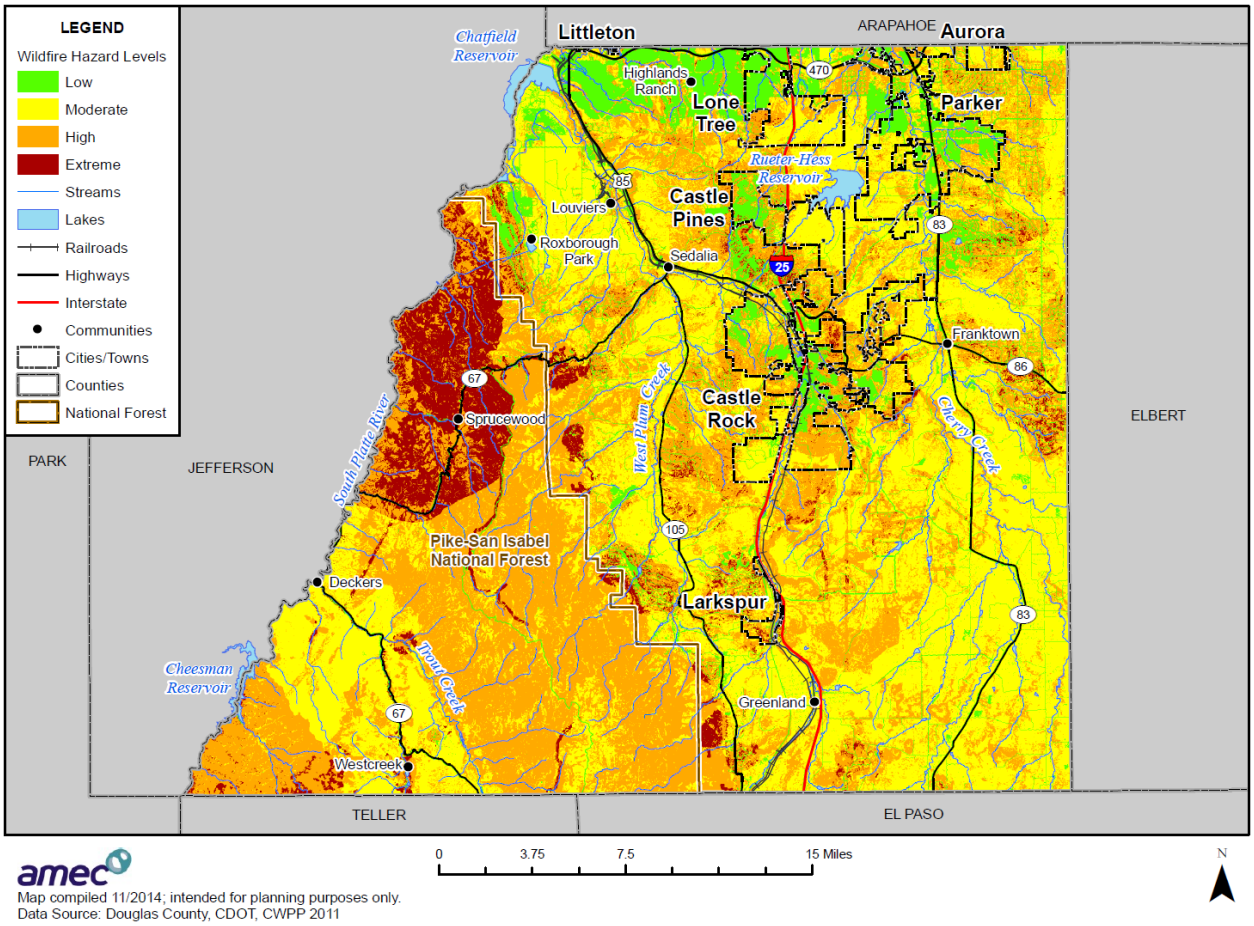
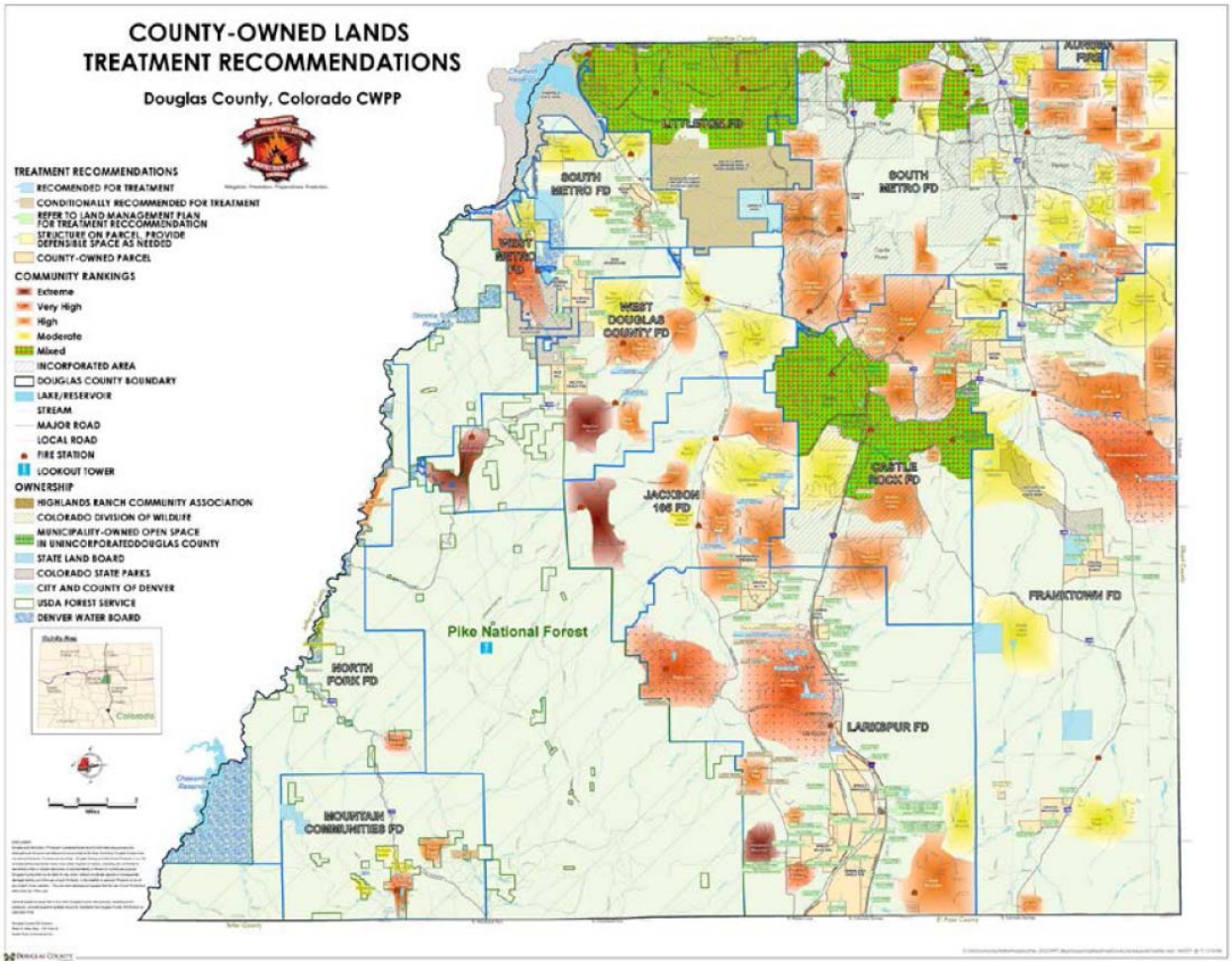


Figure 4.56. County-Owned Lands Treatment Recommendations Map



Methodology

An exposure analysis was performed to quantify risk to wildfire. Potential losses to wildfire were estimated using a countywide Wildfire Hazard Potential GIS layer (created for the Douglas County Community Wildfire Protection Plan) and assessor's data from Douglas County. Potential losses were examined in terms of structures, property value, critical facilities, and people at risk. For all analyses, the threat levels were classified as low, medium, high, and extreme. According to the CWPP, "[t]here is no absolute set of conditions that cause an area to be identified as being in a particular hazard category. Instead, the hazard category identified is a function of the combined factors that influence controllability, values, and ignition risk" (pg. 59).

GIS was used to create a centroid, or point representing the center of the parcel polygon. The CWPP's Wildfire Hazard Potential layer was then overlaid on the parcel centroids. For the purposes of this analysis, the fire hazard zone that intersected a parcel centroid was assigned the severity zone for the entire parcel. The model assumes that every parcel with a structure value greater than zero is improved in some way. Specifically, an improved parcel assumes there is a

building on it.

It is important to note that there could be more than one structure or building on an improved parcel (e.g., condo complex occupies one parcel but might have several structures). Only improved parcels and the value of their improvements were analyzed. The end result is an inventory of the number and types of parcels and buildings subject to the hazards. Results are presented by unincorporated county and incorporated jurisdictions. Detailed tables show counts of parcels by jurisdictions and land use type (Agriculture, Commercial, Exempt, HOA, Industrial, Producing Mine, Residential, Utilities and Vacant Land) within each fire zone.

Fire Severity Values at Risk

Results are represented and sorted by the unincorporated county and jurisdictions. Detailed tables show total parcel counts, improved parcel counts and their structure values by occupancy type (residential, industrial, etc.) and total land values within each fire severity zone. Table 4.86 shows the total counts and structure values of improved parcels in Douglas County.

According to the analysis represented in Table 4.86, Unincorporated Douglas County has 1,440 improved parcels and over $995 million in total value in the extreme severity zone. Of the 1,440 parcels, 1,394 are residential. There is a total of 21,134 improved parcels in the high fire severity zone, 20,514 of which are residential. The total value and loss estimate for the high fire hazard is $15.6 billion which includes estimated content, improved value and land value.

Table 4.86. Fire Risk by Jurisdiction and Property Type

Jurisdiction	Property Type	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Estimated Content Value	Land Value	Total Value/Loss Estimate
Extreme								
Castle Pines	Agricultural	1	0	0	$0	$0	$110	$110
	Commercial	2	0	0	$0	$0	$17,438	$17,438
	Exempt	6	0	4	$0	$0	$216,876	$216,876
	HOA	3	0	0	$0	$0	$0	$0
	Residential	42	39	42	$16,998,350	$8,499,175	$5,080,950	$30,578,475
	Total	**54**	**39**	**46**	**$16,998,350**	**$8,499,175**	**$5,315,374**	**$30,812,899**
Castle Rock	Agricultural	2	0	0	$0	$0	$786	$786
	Commercial	1	1	27	$11,113,512	$11,113,512	$2,836,488	$25,063,512
	Exempt	11	1	2	$8,191,530	$8,191,530	$1,286,612	$17,669,672
	HOA	12	0	2	$0	$0	$0	$0
	Residential	100	88	100	$33,284,971	$16,642,486	$5,881,772	$55,809,229
	Vacant Land	31	0	32	$0	$0	$1,802,335	$1,802,335
	Total	**157**	**90**	**163**	**$52,590,013**	**$35,947,528**	**$11,807,993**	**$100,345,534**
Larkspur	Exempt	1	0	0	$0	$0	$50,000	$50,000
	Residential	1	1	1	$408,667	$204,334	$120,000	$733,001
	Total	**2**	**1**	**1**	**$408,667**	**$204,334**	**$170,000**	**$783,001**
Lone Tree	Agricultural	1	0	0	$0	$0	$3,605	$3,605
	Commercial	1	1	39	$5,097,321	$5,097,321	$222,679	$10,417,321
	Exempt	2	0	0	$0	$0	$628,752	$628,752
	Residential	6	4	6	$1,924,323	$962,162	$652,637	$3,539,122
	Total	**10**	**5**	**45**	**$7,021,644**	**$6,059,483**	**$1,507,673**	**$14,588,800**
Parker	Exempt	3	0	0	$0	$0	$201,924	$201,924
	HOA	2	0	0	$0	$0	$0	$0
	Residential	5	5	5	$1,550,702	$775,351	$370,000	$2,696,053
	Vacant Land	1	0	1	$0	$0	$43,368	$43,368
	Total	**11**	**5**	**6**	**$1,550,702**	**$775,351**	**$615,292**	**$2,941,345**
Unincorporated	Agricultural	52	19	37	$6,416,024	$6,416,024	$208,170	$13,040,218
	Commercial	11	3	4	$808,207	$808,207	$850,640	$2,467,054
	Exempt	137	19	76	$5,130,889	$5,130,889	$48,860,971	$59,122,749
	HOA	53	0	9	$0	$0	$0	$0
	Producing Mine	1	0	1	$0	$0	$9,207	$9,207
	Residential	1,504	1,394	1,500	$476,585,766	$238,292,883	$179,488,883	$894,367,532
	Vacant Land	563	5	530	$4,753	$0	$26,618,913	$26,623,666
	Total	**2,321**	**1,440**	**2,157**	**$488,945,639**	**$250,648,003**	**$256,036,784**	**$995,630,426**
	Grand Total	**2,555**	**1,580**	**2,418**	**$567,515,015**	**$302,133,873**	**$275,453,116**	**$1,145,102,004**

Jurisdiction	Property Type	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Estimated Content Value	Land Value	Total Value/Loss Estimate
High								
Castle Pines	Agricultural	91	0	81	$0	$0	$15,506	$15,506
	Commercial	6	3	53	$10,480,397	$10,480,397	$4,669,961	$25,630,755
	Exempt	78	3	42	$14,001,304	$14,001,304	$2,216,824	$30,219,432
	HOA	60	0	20	$0	$0	$0	$0
	Residential	726	667	721	$278,070,150	$139,035,075	$78,531,194	$495,636,419
	Utilities	4	0	1	$0	$0	$0	$0
	Vacant Land	22	1	31	$719,766	$0	$3,660,247	$4,380,013
	Total	**987**	**674**	**949**	**$303,271,617**	**$163,516,776**	**$89,093,732**	**$555,882,125**
Castle Rock	Agricultural	254	2	201	$277,506	$277,506	$536,121	$1,091,133
	Commercial	40	31	131	$94,535,214	$94,535,214	$25,335,193	$214,405,621
	Exempt	462	33	134	$132,224,647	$132,224,647	$45,624,269	$310,073,563
	HOA	310	0	214	$0	$0	$0	$0
	Industrial	3	3	9	$1,950,632	$2,925,948	$1,384,097	$6,260,677
	Residential	6,146	5,671	6,339	$1,501,319,158	$750,659,579	$313,622,015	$2,565,600,752
	Utilities	3	0	1	$0	$0	$0	$0
	Vacant Land	1,631	4	1,541	$488,544	$0	$47,944,926	$48,433,470
	Total	**8,849**	**5,744**	**8,570**	**$1,730,795,701**	**$980,622,894**	**$434,446,621**	**$3,145,865,216**
Larkspur	Agricultural	3	0	3	$0	$0	$5,803	$5,803
	Commercial	13	7	62	$2,589,647	$2,589,647	$2,736,850	$7,916,144
	Exempt	22	6	10	$1,123,252	$1,123,252	$1,405,019	$3,651,523
	Industrial	1	1	5	$748,789	$1,123,184	$126,187	$1,998,160
	Residential	18	16	49	$2,630,693	$1,315,347	$1,176,113	$5,122,153
	Utilities	3	0	0	$0	$0	$0	$0
	Vacant Land	7	0	4	$0	$0	$758,829	$758,829
	Total	**67**	**30**	**133**	**$7,092,381**	**$6,151,429**	**$6,208,801**	**$19,452,611**
Lone Tree	Agricultural	13	0	1	$0	$0	$9,392	$9,392
	Commercial	20	16	513	$80,388,930	$80,388,930	$20,747,847	$181,525,707
	Exempt	71	6	27	$10,742,121	$10,742,121	$3,905,144	$25,389,386
	HOA	31	0	7	$0	$0	$0	$0
	Residential	586	471	734	$234,949,940	$117,474,970	$61,363,582	$413,788,492
	Vacant Land	44	0	14	$0	$0	$5,172,525	$5,172,525
	Total	**765**	**493**	**1,296**	**$326,080,991**	**$208,606,021**	**$91,198,490**	**$625,885,502**
Parker	Agricultural	13	1	1	$3,942	$3,942	$12,096	$19,980
	Commercial	60	41	205	$79,048,137	$79,048,137	$32,299,144	$190,395,418
	Exempt	208	16	24	$69,031,437	$69,031,437	$42,672,922	$180,735,796
	HOA	165	0	12	$0	$0	$0	$0
	Industrial	1	1	1	$246,834	$370,251	$152,460	$769,545
	Producing Mine	1	0	0	$0	$0	$58,292	$58,292

Jurisdiction	Property Type	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Estimated Content Value	Land Value	Total Value/Loss Estimate
	Residential	1,971	1,851	2,073	$474,077,857	$237,038,929	$139,668,558	$850,785,344
	Utilities	2	0	0	$0	$0	$0	$0
	Vacant Land	515	0	502	$0	$0	$32,858,315	$32,858,315
	Total	**2,936**	**1,910**	**2,818**	**$622,408,207**	**$385,492,696**	**$247,721,787**	**$1,255,622,690**
Unincorporated	Agricultural	853	254	549	$120,519,044	$120,519,044	$7,962,593	$249,000,681
	Commercial	123	83	977	$292,815,314	$292,815,314	$87,033,084	$672,663,712
	Exempt	1,158	85	476	$259,127,986	$259,127,986	$355,746,449	$874,002,421
	HOA	388	0	103	$0	$0	$0	$0
	Industrial	15	15	55	$35,655,210	$53,482,815	$8,607,296	$97,745,321
	Producing Mine	8	0	0	$0	$0	$121,339	$121,339
	Residential	12,415	11,838	13,844	$4,220,933,381	$2,110,466,691	$1,624,930,848	$7,956,330,920
	Utilities	33	0	12	$0	$0	$197,376	$197,376
	Vacant Land	1,686	8	1,491	$2,531,254	$0	$132,971,553	$135,502,807
	Total	**16,679**	**12,283**	**17,507**	**$4,931,582,189**	**$2,836,411,850**	**$2,217,570,538**	**$9,985,564,577**
	Grand Total	**30,283**	**21,134**	**31,273**	**7,921,231,086**	**4,580,801,665**	**3,086,239,969**	**15,588,272,720**
Moderate								
Castle Pines	Agricultural	36	0	27	$0	$0	$81,846	$81,846
	Commercial	11	8	412	$50,457,223	$50,457,223	$14,185,679	$115,100,125
	Exempt	20	2	6	$8,200,874	$8,200,874	$4,104,896	$20,506,644
	HOA	17	0	5	$0	$0	$0	$0
	Residential	139	129	139	$65,623,575	$32,811,788	$18,367,843	$116,803,206
	Utilities	1	0	0	$0	$0	$0	$0
	Vacant Land	3	0	1	$0	$0	$884,722	$884,722
	Total	**227**	**139**	**590**	**$124,281,672**	**$91,469,885**	**$37,624,986**	**$253,376,543**
Castle Rock	Agricultural	939	0	817	$0	$0	$94,130	$94,130
	Commercial	40	33	167	$62,343,982	$62,343,982	$29,676,239	$154,364,203
	Exempt	226	15	101	$124,658,072	$124,658,072	$37,942,118	$287,258,262
	HOA	169	0	57	$0	$0	$0	$0
	Industrial	1	1	2	$3,783,814	$5,675,721	$956,186	$10,415,721
	Residential	3,313	2,910	3,467	$695,396,201	$347,698,101	$148,062,762	$1,191,157,064
	Utilities	5	0	0	$0	$0	$0	$0
	Vacant Land	694	2	624	$553,199	$0	$29,130,296	$29,683,495
	Total	**5,387**	**2,961**	**5,235**	**$886,735,268**	**$540,375,876**	**$245,861,731**	**$1,672,972,875**
Larkspur	Agricultural	2	0	0	$0	$0	$289	$289
	Commercial	2	1	2	$201,920	$201,920	$267,612	$671,452
	Exempt	7	2	3	$266,615	$266,615	$379,702	$912,932
	Residential	14	13	16	$1,330,019	$665,010	$675,000	$2,670,029
	Utilities	1	0	0	$0	$0	$0	$0
	Vacant Land	4	0	4	$0	$0	$146,000	$146,000

Jurisdiction	Property Type	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Estimated Content Value	Land Value	Total Value/Loss Estimate
	Total	**30**	**16**	**25**	**$1,798,554**	**$1,133,545**	**$1,468,603**	**$4,400,702**
Lone Tree	Agricultural	33	0	13	$0	$0	$77,609	$77,609
	Commercial	47	30	442	$373,391,194	$373,391,194	$109,645,101	$856,427,489
	Exempt	91	6	23	$27,708,768	$27,708,768	$8,961,283	$64,378,819
	HOA	33	0	5	$0	$0	$0	$0
	Residential	448	397	493	$177,195,414	$88,597,707	$40,626,251	$306,419,372
	Vacant Land	48	0	16	$0	$0	$11,961,947	$11,961,947
	Total	**700**	**433**	**992**	**$578,295,376**	**$489,697,669**	**$171,272,191**	**$1,239,265,236**
Parker	Agricultural	11	1	2	$86,185	$86,185	$162,992	$335,362
	Commercial	100	72	407	$307,127,785	$307,127,785	$72,655,017	$686,910,587
	Exempt	291	21	56	$91,363,483	$91,363,483	$32,749,203	$215,476,169
	HOA	190	0	17	$0	$0	$0	$0
	Industrial	3	3	17	$3,610,095	$5,415,143	$612,585	$9,637,823
	Residential	3,223	3,112	3,389	$780,282,226	$390,141,113	$224,286,253	$1,394,709,592
	Utilities	12	0	4	$0	$0	$0	$0
	Vacant Land	714	2	561	$117,696	$0	$32,258,760	$32,376,456
	Total	**4,544**	**3,211**	**4,453**	**$1,182,587,470**	**$794,133,709**	**$362,724,810**	**$2,339,445,989**
Unincorporated	Agricultural	2,474	688	1,685	$266,017,677	$266,017,677	$16,093,927	$548,129,281
	Commercial	109	85	1,383	$357,467,930	$357,467,930	$106,350,371	$821,286,231
	Exempt	1,181	115	453	$180,464,428	$180,464,428	$291,244,814	$652,173,670
	HOA	300	1	149	$2,522,088	$2,522,088	$360,000	$5,404,176
	Industrial	33	32	54	$29,588,590	$44,382,885	$14,142,056	$88,113,531
	Producing Mine	11	0	5	$0	$0	$1,090,654	$1,090,654
	Residential	8,550	7,253	9,665	$2,554,513,763	$1,277,256,882	$990,120,854	$4,821,891,499
	Utilities	58	0	32	$0	$0	$0	$0
	Vacant Land	1,745	3	2,165	$16,604	$0	$115,525,270	$115,541,874
	Total	**14,461**	**8,177**	**15,591**	**$3,390,591,080**	**$2,128,111,890**	**$1,534,927,946**	**$7,053,630,916**
	Grand Total	**25,349**	**14,937**	**26,886**	**$6,164,289,420**	**$4,044,922,572**	**$2,353,880,267**	**$12,563,092,259**
Low								
Castle Pines	Agricultural	42	0	40	$0	$0	$6,826	$6,826
	Commercial	26	18	66	$19,796,264	$19,796,264	$8,539,880	$48,132,408
	Exempt	135	4	20	$14,145,527	$14,145,527	$9,888,687	$38,179,741
	HOA	161	0	43	$0	$0	$0	$0
	Residential	2,501	2,464	2,532	$802,770,372	$401,385,186	$224,606,689	$1,428,762,247
	Vacant Land	62	0	34	$0	$0	$1,748,241	$1,748,241
	Total	**2,927**	**2,486**	**2,735**	**$836,712,163**	**$435,326,977**	**$244,790,323**	**$1,516,829,463**
Castle Rock	Agricultural	112	2	87	$7,313	$7,313	$13,038	$27,664
	Commercial	372	353	1,408	$352,019,144	$352,019,144	$142,783,657	$846,821,945
	Exempt	702	70	242	$299,398,569	$299,398,569	$31,304,730	$630,101,868

Jurisdiction	Property Type	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Estimated Content Value	Land Value	Total Value/Loss Estimate
	HOA	221	0	85	$0	$0	$0	$0
	Industrial	21	21	37	$14,849,052	$22,273,578	$10,582,039	$47,704,669
	Residential	8,508	8,415	8,543	$1,561,307,936	$780,653,968	$376,602,295	$2,718,564,199
	Utilities	10	0	7	$0	$0	$0	$0
	Vacant Land	280	0	142	$0	$0	$15,800,405	$15,800,405
	Total	**10,226**	**8,861**	**10,551**	**$2,227,582,014**	**$1,454,352,572**	**$577,086,164**	**$4,259,020,750**
Larkspur	Agricultural	1	0	0	$0	$0	$16	$16
	Commercial	12	8	15	$2,298,636	$2,298,636	$631,181	$5,228,453
	Exempt	12	1	5	$325,137	$325,137	$90,686	$740,960
	Residential	23	18	23	$1,739,320	$869,660	$932,000	$3,540,980
	Vacant Land	4	0	2	$0	$0	$102,000	$102,000
	Total	**52**	**27**	**45**	**$4,363,093**	**$3,493,433**	**$1,755,883**	**$9,612,409**
Lone Tree	Commercial	127	122	1,236	$524,505,980	$524,505,980	$238,606,599	$1,287,618,559
	Exempt	291	17	99	$46,915,488	$46,915,488	$15,285,622	$109,116,598
	HOA	110	0	36	$0	$0	$0	$0
	Residential	2,538	2,526	2,563	$956,489,388	$478,244,694	$265,375,780	$1,700,109,862
	Vacant Land	74	0	15	$0	$0	$7,989,951	$7,989,951
	Total	**3,140**	**2,665**	**3,949**	**$1,527,910,856**	**$1,049,666,162**	**$527,257,952**	**$3,104,834,970**
Parker	Agricultural	5	0	1	$0	$0	$2,668	$2,668
	Commercial	294	265	1,362	$378,914,244	$378,914,244	$146,887,190	$904,715,678
	Exempt	876	48	68	$100,234,459	$100,234,459	$45,519,221	$245,988,139
	HOA	348	0	11	$0	$0	$0	$0
	Industrial	20	20	48	$13,547,597	$20,321,396	$5,183,245	$39,052,238
	Residential	9,240	9,203	9,678	$1,752,393,209	$876,196,605	$509,783,148	$3,138,372,962
	Utilities	4	0	0	$0	$0	$0	$0
	Vacant Land	171	0	65	$0	$0	$14,537,844	$14,537,844
	Total	**10,958**	**9,536**	**11,233**	**$2,245,089,509**	**$1,375,666,703**	**$721,913,316**	**$4,342,669,528**
Unincorporated	Agricultural	148	50	80	$15,434,782	$15,434,782	$626,410	$31,495,974
	Commercial	592	529	7,491	$1,469,123,095	$1,469,123,095	$517,723,062	$3,455,969,252
	Exempt	2,910	127	762	$498,394,439	$498,394,439	$183,731,467	$1,180,520,345
	HOA	566	0	174	$0	$0	$0	$0
	Industrial	92	90	152	$99,339,996	$149,009,994	$34,715,347	$283,065,337
	Residential	35,618	35,463	36,672	$8,774,810,455	$4,387,405,228	$2,448,460,115	$15,610,675,798
	Utilities	57	0	27	$0	$0	$0	$0
	Vacant Land	615	1	948	$313,308	$0	$51,490,947	$51,804,255
	Total	**40,598**	**36,260**	**46,306**	**$10,857,416,075**	**$6,519,367,538**	**$3,236,747,348**	**$20,613,530,961**
	Grand Total	**67,901**	**59,835**	**74,819**	**$17,699,073,710**	**$10,837,873,385**	**$5,309,550,986**	**$33,846,498,081**

Analysis results for the entire Douglas County Planning Area are summarized in Table 4.87 which summarizes total parcel counts, improved parcel counts, structure counts and their structure and land values.

Table 4.87. Summary of Fire Risk by Jurisdiction

Jurisdiction	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Estimated Content Value	Land Value	Total Value/Loss Estimate
Extreme							
Castle Pines	54	39	46	$16,998,350	$8,499,175	$5,315,374	$30,812,899
Castle Rock	157	90	163	$52,590,013	$35,947,528	$11,807,993	$100,345,534
Larkspur	2	1	1	$408,667	$204,334	$170,000	$783,001
Lone Tree	10	5	45	$7,021,644	$6,059,483	$1,507,673	$14,588,800
Parker	11	5	6	$1,550,702	$775,351	$615,292	$2,941,345
Unincorporated	2,321	1,440	2,157	$488,945,639	$250,648,003	$256,036,784	$995,630,426
Total	**2,555**	**1,580**	**2,418**	**$567,515,015**	**$302,133,873**	**$275,453,116**	**$1,145,102,004**
High							
Castle Pines	987	674	949	$303,271,617	$163,516,776	$89,093,732	$555,882,125
Castle Rock	8,849	5,744	8,570	$1,730,795,701	$980,622,894	$434,446,621	$3,145,865,216
Larkspur	67	30	133	$7,092,381	$6,151,429	$6,208,801	$19,452,611
Lone Tree	765	493	1,296	$326,080,991	$208,606,021	$91,198,490	$625,885,502
Parker	2,936	1,910	2,818	$622,408,207	$385,492,696	$247,721,787	$1,255,622,690
Unincorporated	16,679	12,283	17,507	$4,931,582,189	$2,836,411,850	$2,217,570,538	$9,985,564,577
Total	**30,283**	**21,134**	**31,273**	**$7,921,231,086**	**$4,580,801,665**	**$3,086,239,969**	**$15,588,272,720**
Moderate							
Castle Pines	227	139	590	$124,281,672	$91,469,885	$37,624,986	$253,376,543
Castle Rock	5,387	2,961	5,235	$886,735,268	$540,375,876	$245,861,731	$1,672,972,875
Larkspur	30	16	25	$1,798,554	$1,133,545	$1,468,603	$4,400,702
Lone Tree	700	433	992	$578,295,376	$489,697,669	$171,272,191	$1,239,265,236
Parker	4,544	3,211	4,453	$1,182,587,470	$794,133,709	$362,724,810	$2,339,445,989
Unincorporated	14,461	8,177	15,591	$3,390,591,080	$2,128,111,890	$1,534,927,946	$7,053,630,916
Total	**25,349**	**14,937**	**26,886**	**$6,164,289,420**	**$4,044,922,572**	**$2,353,880,267**	**$12,563,092,259**
Low							
Castle Pines	2,927	2,486	2,735	$836,712,163	$435,326,977	$244,790,323	$1,516,829,463
Castle Rock	10,226	8,861	10,551	$2,227,582,014	$1,454,352,572	$577,086,164	$4,259,020,750
Larkspur	52	27	45	$4,363,093	$3,493,433	$1,755,883	$9,612,409
Lone Tree	3,140	2,665	3,949	$1,527,910,856	$1,049,666,162	$527,257,952	$3,104,834,970
Parker	10,958	9,536	11,233	$2,245,089,509	$1,375,666,703	$721,913,316	$4,342,669,528
Unincorporated	40,598	36,260	46,306	$10,857,416,075	$6,519,367,538	$3,236,747,348	$20,613,530,961
Total	**67,901**	**59,835**	**74,819**	**$17,699,073,710**	**$10,837,873,385**	**$5,309,550,986**	**$33,846,498,081**

Populations at Risk

Wildfire risk is greatest to those individuals residing in identified hazard areas. GIS analysis was performed to determine population in the different fire hazard areas. Using GIS, the Douglas County wildfire layers were overlaid on the entire parcel layer. Those parcel centroids that intersect the wildfire hazard potential areas were counted and multiplied by the 2010 Census Bureau average household factors for each jurisdiction and unincorporated area: Castle Pines (2.70), Castle Rock (2.86), Larkspur (2.26), Lone Tree (2.54), Parker (2.71) and Unincorporated areas (2.79); results were tabulated by jurisdiction (see Table 4.88). According to this analysis, there is a total population of 99,947 at risk to moderate, high and extreme wildfire hazards with a total population of 4,272 in the extreme area, 57,297 in the high area, and 38,378 in the moderate hazard area. The Castle Rock jurisdiction has the highest population of potential risk for fire hazards. There is an estimated population of 252 in Castle Rock at risk in the extreme area, 16,219 in the high area, and 8,323 in the moderate area.

Table 4.88. Population at Risk to Wildfire

	Extreme		High		Moderate		Low	
Jurisdiction	**Improved Residential Parcels**	**Population**	**Improved Residential Parcels**	**Population**	**Improved Residential Parcels**	**Population**	**Improved Residential Parcels**	**Population**
Castle Pines	39	105	667	1,801	129	348	2,464	6,653
Castle Rock	88	252	5,671	16,219	2,910	8,323	8,415	24,067
Larkspur	1	2	16	36	13	29	18	41
Lone Tree	4	10	471	1,196	397	1,008	2,526	6,416
Parker	5	14	1,851	5,016	3,112	8,434	9,203	24,940
Unincorporated	1,394	3,889	11,838	33,028	7,253	20,236	35,463	98,942
Total	**1,531**	**4,272**	**20,514**	**57,297**	**13,814**	**38,378**	**58,089**	**161,058**

Critical Facilities at Risk

Wildfire analysis was performed on the critical facility inventory in Douglas County and all jurisdictions. GIS was used to determine whether the facility locations intersect a wildfire hazard area. There are 15 facilities in the extreme fire severity zone, 513 facilities in the high fire severity zone, 301 facilities in the moderate fire severity zone, and 682 facilities in the low fire severity zones, as shown in Table 4.89. Details of critical facility definition, type, name and address and jurisdiction by wildfire zone are listed in Appendix E.

Table 4.89. Douglas County Planning Area – Critical Facilities at Risk to Wildfire Summary

Jurisdiction	Extreme	High	Moderate	Low
Castle Rock	-	79	31	113
Littleton*	-	1	-	2
Lone Tree	-	13	6	44
Parker	-	78	70	107
Unincorporated County	15	342	194	416
Total	**15**	**513**	**301**	**682**

Source: Douglas County GIS

*Littleton is not a participating jurisdiction in this plan, but a portion of the city lies in Douglas County

Table 4.90. Unincorporated Douglas County– Critical Facilities at Risk to Wildfire Detail

Fire Risk	Category	Type	Facility Count
Extreme	At Risk Population Facilities	Assisted Living	1
	Essential Services Facilities	Bridge	2
	Essential Services Facilities	Cell Tower	1
	Essential Services Facilities	Fire Department	1
	Essential Services Facilities	Microwave	3
	Essential Services Facilities	Radio Tower	2
	High Potential Loss Facilities	Dam	1
	High Potential Loss Facilities	Hazardous Material	4
	TOTAL		**15**
High	At Risk Population Facilities	Assisted Living	4
	At Risk Population Facilities	Group Home	3
	At Risk Population Facilities	School	23
	Essential Services Facilities	Bridge	29
	Essential Services Facilities	Cell Tower	38
	Essential Services Facilities	Fire Department	12
	Essential Services Facilities	Maint/Equip Center	1
	Essential Services Facilities	Microwave	91
	Essential Services Facilities	Radio Tower	3
	Essential Services Facilities	Water Hub/Treatment	31
	High Potential Loss Facilities	Hazardous Material	107
	TOTAL		**342**
Moderate	At Risk Population Facilities	Assisted Living	3
	At Risk Population Facilities	School	11
	Essential Services Facilities	Bridge	11
	Essential Services Facilities	Cell Tower	19
	Essential Services Facilities	Commercial Airports	3
	Essential Services Facilities	Fire Department	4
	Essential Services Facilities	IT Infrastructure	1
	Essential Services Facilities	Maint/Equip Center	2
	Essential Services Facilities	Microwave	53
	Essential Services Facilities	Police	1
	Essential Services Facilities	Radio Tower	3
	Essential Services Facilities	Water Hub/Treatment	18
	High Potential Loss Facilities	Dam	1
	High Potential Loss Facilities	Hazardous Material	64
	TOTAL		**194**
Low	At Risk Population Facilities	Assisted Living	9
	At Risk Population Facilities	School	27

Fire Risk	Category	Type	Facility Count
	Essential Services Facilities	Bridge	23
	Essential Services Facilities	Cell Tower	48
	Essential Services Facilities	Fire Department	9
	Essential Services Facilities	Maint/Equip Center	6
	Essential Services Facilities	Microwave	23
	Essential Services Facilities	Water Hub/Treatment	9
	High Potential Loss Facilities	Dam	1
	High Potential Loss Facilities	Hazardous Material	261
	TOTAL		**416**
GRAND TOTAL			**967**

Source: Douglas County GIS

Cultural and Natural Resources at Risk

The Douglas County Planning Area has substantial cultural and natural resources located throughout the County as previously described. In addition, there are other natural resources at risk when wildland-urban interface fires occur. One is the watershed and ecosystem losses that occur from wildfires. This includes impacts to water supplies and water quality as well as air quality. Another is the aesthetic value of the area. Major fires that result in visible damage detract from that value. Other assets at risk include wildland recreation areas, wildlife and habitat areas, rangeland, and timber resources. The loss to these natural resources can be significant.

Other Assets at Risk

In addition to the vulnerability of the County and its jurisdictions, many other stakeholders reside or have significant assets in the area that should be considered in a vulnerability analysis. These stakeholders include individuals, agencies or business entities that could be directly impacted by a catastrophic wildfire. Impacts to stakeholders could range from increased demands on administrative and firefighting resources, to direct loss of life and assets.

Development Trends

The pattern of increased damages is directly related to increased urban growth spread into historical forested areas that have wildfire as part of the natural ecosystem. Many historical wildfires burned only vegetation in the past. However, with new development, a wildfire following a historical pattern now burns developed areas. The Douglas County CWPP identified this trend as well, stating that "[f]uture fires may be more intense than historical fires because the vegetation is denser and the built environment is denser than a century ago…Older developed areas of the County may be at more risk to potential loss from wildfire because of the increased amount of vegetation around homes and the construction materials of the structures" (pg. 25-27). Wildfire risk to new development can be mitigated through building and construction codes and defensible space activities.

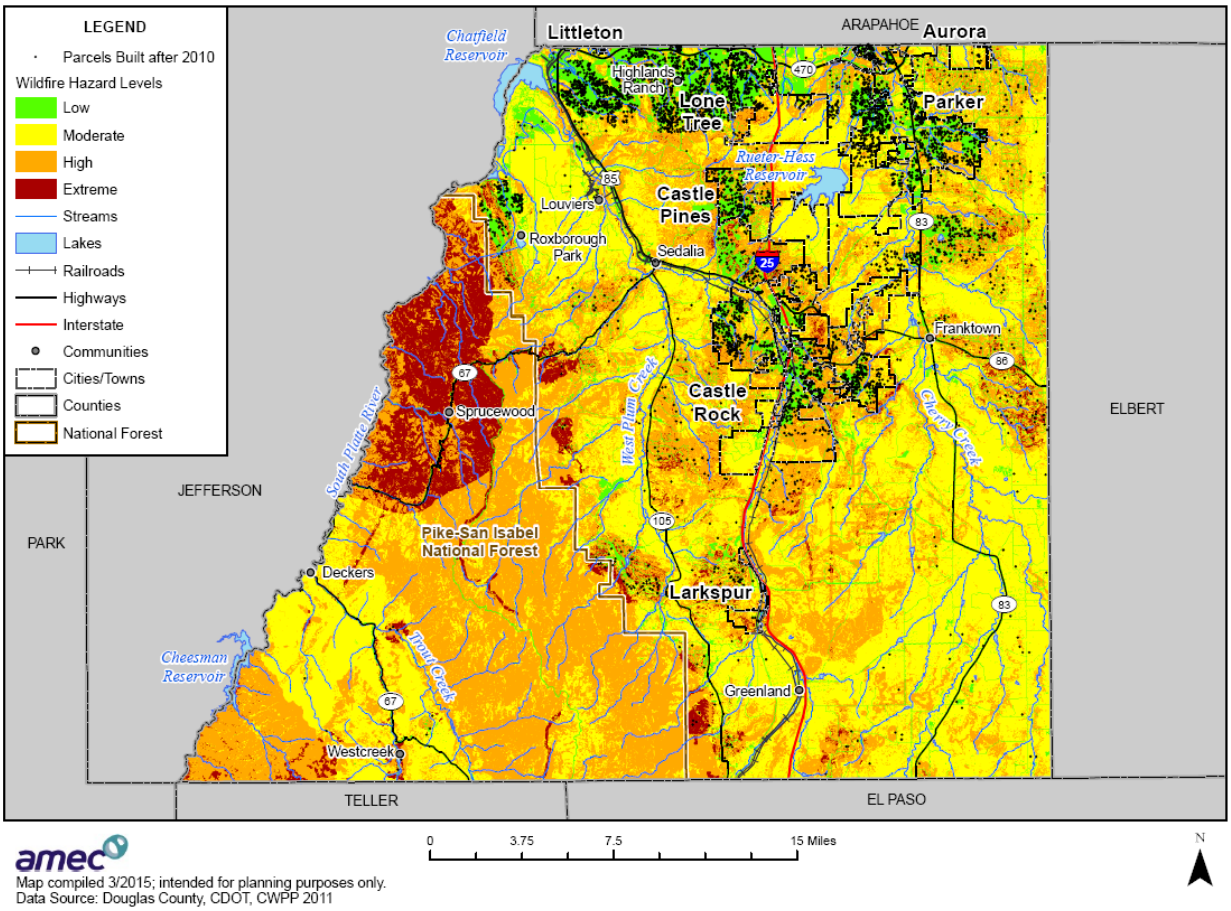
A total of 2,348 structures were built in extreme, high, and moderate wildfire hazard areas in the Planning Area between 2010 and 2014. The total value of these structures is $1,304,881,645, with the majority located in the high wildfire hazard area. The unincorporated County and Castle Rock have the highest number of structures and highest total value at risk. Results of this analysis are shown in Table 4.91 and depicted in Figure 4.57.

Table 4.91. Douglas County Structures Built from 2010 to 2014: Assets Exposed to Wildfire by Hazard Level

Hazard Level	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Estimated Content Value	Land Value	Total Value
Extreme							
Castle Pines	1	1	1	$643,717	$321,859	$115,000	$1,080,576
Castle Rock	1	1	1	$268,821	$134,411	$80,500	$483,732
Unincorporated	80	80	82	$26,649,148	$13,347,703	$9,189,438	$49,186,289
Total	**82**	**82**	**84**	**$27,561,686**	**$13,803,972**	**$9,384,938**	**$50,750,596**
High							
Castle Pines	35	34	36	$15,190,338	$7,595,169	$4,411,000	$27,196,507
Castle Rock	323	322	350	$103,939,580	$43,744,447	$19,380,042	$167,064,069
Larkspur	6	6	7	$832,715	$413,522	$264,000	$1,510,237
Lone Tree	21	21	23	$10,321,154	$5,160,577	$2,121,700	$17,603,431
Parker	108	108	132	$27,991,428	$14,121,352	$7,881,790	$49,994,570
Unincorporated	684	683	807	$262,481,604	$138,148,866	$88,257,868	$488,888,338
Total	**1,177**	**1,174**	**1,355**	**$420,756,819**	**$209,183,931**	**$122,316,400**	**$752,257,150**
Moderate							
Castle Pines	9	9	10	$4,259,014	$2,129,507	$1,223,000	$7,611,521
Castle Rock	161	161	161	$36,895,395	$18,657,313	$7,381,328	$62,934,036
Lone Tree	27	27	34	$14,239,466	$7,815,629	$5,221,588	$27,276,683
Parker	170	170	208	$51,157,664	$29,880,540	$15,390,939	$96,429,143
Unincorporated	443	443	496	$164,271,724	$91,618,377	$51,732,416	$307,622,517
Total	**810**	**810**	**909**	**$270,823,263**	**$150,101,366**	**$80,949,271**	**$501,873,900**
Grand Total	**2,069**	**2,066**	**2,348**	**$719,141,768**	**$373,089,268**	**$9,384,938**	**$1,304,881,645**

Source: Douglas County GIS

Figure 4.57. Douglas County Build-Out in Wildfire Hazard Areas:2010-2014



4.3.12 Hazardous Material: Transport Incidents Vulnerability Assessment

Likelihood of Future Occurrence—Medium
Potential Magnitude—High
Overall Vulnerability—High

Several major transportation routes cross through Douglas County, including Interstate 25, Highway 470, the Union Pacific railroad, and the Burlington Northern Santa Fe (BNSF) railroad. Hazardous materials are transported along these corridors regularly, if not every day. Residential areas are located in the immediate vicinity of the corridors, potentially presenting a serious public health and safety concern if a hazardous materials incident were to occur in a populated area. GIS analysis was used to determine the number of people potentially at risk to hazardous materials transportation incidents in Douglas County.

Populations at Risk to Hazardous Materials from Transportation Corridors

To determine an estimate of populations at risk from a transportation-related hazardous materials

release within identified transportation corridors, an analysis was performed using GIS. A one-mile buffer was applied to both sides of Highway 470 and Interstate 25 and the Union Pacific and Burlington Northern Santa Fe (BNSF) Railroads, creating a two-mile buffer zone around each corridor. The buffer distance was based on guidelines in the U.S. Department of Transportation's Emergency Response Guidebook that suggest distances useful to protect people from vapors resulting from spills involving dangerous goods considered toxic if inhaled. The recommended buffer distance referred to in the guide as the "protective action distance" is the area surrounding the incident in which people are at risk of harmful exposure. For purposes of this plan, an average buffer distance of one mile was used on either side of the transportation corridor. Actual buffer distances will vary depending on the nature and quantity of the release, whether the release occurred during the night or daytime, and prevailing weather conditions.

Since there is overlapping of the corridors in many locations throughout the County and jurisdictions, individual population analysis was performed for each transportation corridor. In Table 4.92, each buffered transportation corridor was intersected with improved residential parcels and therefore parcels could be counted more than once within this table due to the individual analysis of each corridor. It is important to note that populations associated with commercial, industrial and other property types may also be affected by a hazardous materials release, but no census/population data is associated with these property types and are therefore excluded from this analysis. It is also important to note that the population at risk to a specific incident could vary greatly and would be dependent on accident location, severity and weather conditions.

The two railroads that go through Douglas County are adjacent to each other so the majority of the population in this analysis is duplicated for each railroad. There are 28,853 people that live within the one-mile buffer of the Union Pacific Railroad that passes through Castle Rock and Larkspur. The BNSF Railroad (Burlington Northern Santa Fe Railroad) follows the same corridor through Castle Rock and Larkspur with an estimated population of 30,710. There are 27,560 total people that live within the proximity of Highway 470 that passes through the northern portion Douglas County (which included the Highlands Ranch community) and Lone Tree. A population of 23,081 is within the proximity of Interstate 25 that passes through the Castle Pines, Castle Rock, Larkspur and Lone Tree.

Table 4.92. Populations Exposed by Transportation Corridor

Transportation Corridor	Corridor Length (mi.)	Population*		
		Cities	Unincorporated	Total
Interstate 25	31.7	17,194	5,887	**23,081**
Highway 470	9.6	2,233	25,328	**27,560**
Union Pacific Railroad	43.4	15,458	13,395	**28,853**
BNSF Railroad*	42.5	17,008	13,702	**30,710**

Source: Douglas County GIS, NED, CDOT 2013 HAZMAT Map

*A grand total is not given for affected population because some people may be counted more than once due to the fact that some parcels are intersected by multiple transportation corridors.

Development Trends

Development in the County largely occurs in existing urban areas, many of which lie along transportation corridors. As development in these areas continues to grow, more people will be at risk to hazardous materials transportation incidents.

4.4 Douglas County's Mitigation Capabilities

Thus far, the planning process has identified the hazards posing a threat to the Planning Area and described, in general, the vulnerability of the County to these risks. The next step is to assess what loss prevention mechanisms are already in place. This part of the planning process is the mitigation capability assessment. Combining the risk assessment with the mitigation capability assessment results in the County's net vulnerability to disasters, and more accurately focuses the goals, objectives, and proposed actions of this plan.

The HMPC used a two-step approach to conduct this assessment for the County. First, an inventory of common mitigation activities was made through the use of a matrix. The purpose of this effort was to identify policies and programs that were either in place, needed improvement, or could be undertaken if deemed appropriate. Second, the HMPC conducted an inventory and review of existing policies, regulations, plans, and programs to determine if they contributed to reducing hazard-related losses or if they inadvertently contributed to increasing such losses.

This section presents Douglas County's mitigation capabilities and discusses select state and federal mitigation capabilities that are applicable to Douglas County. Information about capabilities specific to the other participating jurisdictions can be found in the annexes.

Similar to the HMPC's effort to describe hazards, risks, and vulnerability of Douglas County, this mitigation capability assessment describes the County's existing capabilities, programs, and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This assessment is divided into four sections: regulatory mitigation capabilities are discussed in Section 4.4.1; administrative and technical mitigation capabilities are discussed in Section 4.4.2; fiscal mitigation capabilities are discussed in Section 4.4.3; and mitigation outreach and partnerships are discussed in Section 4.4.4.

4.4.1 Douglas County's Regulatory Mitigation Capabilities

Table 4.93 lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities, and indicates those that are in place in Douglas County. Excerpts from applicable policies, regulations, and plans and program descriptions follow to provide more detail on existing mitigation capabilities.

Table 4.93. Douglas County Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Y/N	Date	Comments
Comprehensive Plan	Y	2014	
Zoning Ordinance	Y		Planning
Subdivision Ordinance	Y		Planning
Growth Management Ordinance	Y		Planning
Floodplain Ordinance	Y		http://www.douglas.co.us/engineering/
Other Special Purpose Ordinance (stormwater, steep slope, wildfire)	Y		http://www.douglas.co.us/engineering/
Building Code	Y		Building
BCEGS Rating	N		Building
Fire Department ISO Rating	N		Building/planning
Erosion or Sediment Control Program	Y		http://www.douglas.co.us/engineering/
Stormwater Management Program	Y		http://www.douglas.co.us/engineering/
Site Plan Review Requirements	Y		http://www.douglas.co.us/engineering/
Capital Improvements Plan	Y		http://www.douglas.co.us/engineering/
Economic Development Plan	Y		Planning
Local Emergency Operations Plan	Y		http://www.douglas.co.us/engineering/
Community Wildfire Protection Plans	Y		Planning
Flood insurance Study or other engineering study for streams	Y		http://www.douglas.co.us/engineering/
Elevation Certificates	Y		http://www.douglas.co.us/engineering/
Other	Y		

Source: Amec Foster Wheeler Data Collection Guide

As indicated in the table above, Douglas County has several plans and programs that guide the County's mitigation of development in hazard-prone areas. Starting with the Douglas County 2035 Comprehensive Master Plan, some of these are described in more detail below.

Douglas County 2035 Comprehensive Master Plan (2014)

The Douglas County Comprehensive Master Plan (CMP or Plan) reflects, acknowledges and balances the common values, rights, and needs of all County residents and landowners, and honors and protects its unique, diverse communities and resources. This intent is most effectively realized through citizen understanding of, and participation in, land-use review processes and public forums.

The CMP clearly states the desired community vision for the future and establishes the guiding policies needed to achieve sustainable growth over a twenty to thirty year period. The CMP has been developed as the foundation for the County's future growth and development, and as such, is intended to provide decision makers with guidance on how to maintain and improve identified community values. It is broken into the following sections:

- Urban Land Use
- Nonurban Land Use
- Rural Communities
  - Franktown
  - Louviers
  - Sedalia
- Community Resources
- Community Services
- Transportation
- Water Supply
- Environmental Quality
- Wildlife

Goals and policies related to mitigation of hazards can be found in the section below.

Urban Land Use, Section 2

The Land Use Element sets forth the County's vision for future land uses, and identifies how the physical environment will be shaped. This element defines the future location, type, and intensity of land uses, and the desired mix and relationship between them. Land use designations presented in this element identify the types and nature of development permitted throughout the unincorporated area of the County. Related mitigation goals and policies include:

Goal 2-5	**Design development to complement both the natural and man-made historic landscape.**
Policy 2-5A.3	Design drainage ways to reflect or complement the natural landscape, incorporate and enhance natural vegetation, minimize hard improvements, and to provide wildlife habitat and recreational amenities.

Goal 2-15	**Preserve the integrity of the Separated Urban Areas.**
Policy 2-15B.7:	Encourage wildfire mitigation measures by the County, the fire protection district, and individual property owners.

Rural Communities, Section 4

Section 4 of the Comprehensive Master Plan lays out the goals, objectives, and policies for development in Franktown, Louviers, and Sedalia in the unincorporated County. Section 4 goals and policies related to hazard mitigation include:

Goal 4-1	**Maintain Franktown's historically rural character through logically-defined land use areas to manage growth, a sensitive "crossroads" transportation plan, protection of open space and scenic view sheds, preservation and protection of the Cherry Creek alluvium and riparian complex, additional community services and passive recreational opportunities.**
Policy 4-1Q.7	Avoid development (including driveways) on slopes in excess of 20%.

Goal 4-1	**Maintain Franktown's historically rural character through logically-defined land use areas to manage growth, a sensitive "crossroads" transportation plan, protection of open space and scenic view sheds, preservation and protection of the Cherry Creek alluvium and riparian complex, additional community services and passive recreational opportunities.**
Policy 4-1T.1	Promote natural stream restoration of Cherry Creek, maintaining shallow, stable, base flow channels with wide, vegetated floodplains, as opposed to stabilizing eroded channels in place.
Policy 4-1T.2	Promote stream stabilization projects along the mainstream of Cherry Creek that mitigate the impacts of increased runoff; are natural in appearance and function; and that preserve and enhance Cherry Creek's inherent ability to improve water quality.
Policy 4-1T.3	Encourage development design near Cherry Creek tributaries to control the delivery of high sediment and nutrient loads to mainstream Cherry Creek; to reduce loading to the Cherry Creek Reservoir; and create healthy, natural stream environments within the watershed. This may include reduction of fertilizer application and sludge that may impact runoff loads into the Creek.

Community Resources, Section 5

The Community Resources section discusses essential services including educational facilities, emergency services, utilities, and waste disposal. Some of the emergency services goals and policies concern hazard mitigation, particularly wildfire:

Goal 5-5	**Provide quality emergency services to County residents in the most efficient and cost-effective manner possible.**
Policy 5-5B.1	Require district service plans proposing fire protection to include provisions for technical rescue, emergency services, and environmental hazard response.
Policy 5-5B.2	Require new development to be within a fire district with adequate fire protection facilities, equipment and service capabilities, unless determined impractical.

Water Supply, Section 8

The Water Supply Element delves into the County's concerns regarding reliance on groundwater and the need for long-term, renewable water supply. This issue is compounded by Douglas County's high population growth rate. Section 8 (page 8-1) states that:

> "Water supply was identified as a top priority of the residents of Douglas County throughout the public outreach process for the 2030 Comprehensive Master Plan. Reliance on the use of groundwater and the need for a sustainable water supply were identified as specific concerns. Although Douglas County is not a water provider, elected officials, appointed officials, and County staff are working closely with several groups to seek County-wide solutions.
>
> Historically, neither Douglas County nor the State of Colorado has required new developments to utilize renewable water resources; therefore, a majority of the water providers in the County rely on groundwater (a non-renewable resource) as their primary source of water supply. It is projected that at some time in the future the cost of surfacewater supplies will be equal to, or less than, the expense of continued groundwater usage.
>
> The Douglas County Water Resource Authority (DCWRA, www.dcwater.org) was

established in 1992 to bring together Douglas County water providers to address long-term water needs. The DCWRA has worked diligently on extending groundwater supplies by promoting water conservation and water use efficiency to the residents of Douglas County.

In 2000, the South Metro Water Supply Study Board was created by the DCWRA. It was from this group that the South Metro Water Supply Authority (SMWSA, www.southmetrowater.org) was created in 2004. The formation of SMWSA has demonstrated a cooperative regional approach in finding sustainable water for both Douglas and Arapahoe Counties.

The need for renewable water became even more apparent with the drought of 2002, which prompted Douglas County to form the Douglas County Water Team. This group, led by Douglas County's Board of County Commissioners, has been working with key water groups to find ways to effectively manage water resources and to extend groundwater supplies.

The Rural Water User Group has been working with Douglas County since 2005 in an effort to bring together individual well users and smaller water districts. The focus of this group has been on extending groundwater supplies and ensuring that their water supply can be sustained.

Sustainable water is imperative to the future of Douglas County. This Plan incorporates stringent water policies, because the County's future hinges on ensuring its residents a safe, reliable, and sufficient water supply. Unlike other natural resources, such as gas or coal, there is no substitute for water."

Section 8 of the Comprehensive Master Plan does not identify goals, objectives, or policies related specifically to drought and the effect on water resources, though the connection is clear in the preceding paragraphs. Rather, the section focuses on encouraging sustainable, low-impact development through the use of community planning, water supply standards, water supply plans, conservation measures, and the identification of additional water resources. Perhaps the most significant recent effort to supplement water resources in Douglas County was the construction of the Rueter-Hess Reservoir, which supplies water to the Parker Water and Sanitation District service area. The creation of the various water teams and user groups also demonstrate the Planning Area's commitment to mitigating water resource supply issues.

Environmental Quality, Section 9

Section 9 is closely related to hazard mitigation in Douglas County. Several goals and policies concern development, land use, and mitigation practices in geologic hazard areas, floodplains, and the wildland-urban interface:

Geologic Hazards

Goal 9-1	Recognize and respect natural geologic conditions.
Policy 9-1A.1	Development on slopes shall be based upon the proposed level of intensity of site disturbance and types of resulting impacts. Substantial impacts, such as overlot grading, shall generally be limited to areas with slopes less than 20 percent in grade. Development that demonstrates sensitive site design, results in minor visual impacts, protects significant existing resources and provides appropriate mitigation of impacts may generally exceed 25 percent.
Policy 9-1A.2	Development within geologic-hazard areas posing a threat of injury, loss of life, or property damage is inconsistent with this Plan.
Policy 9-1A.3	Class 3 Environmental Hazards Areas should be limited to low-intensity land uses such as agriculture, grazing, open space, and certain recreational uses. These uses shall not conflict with identified hazards or increase the severity of on-site or adjacent off-site conditions.
Policy 9-1A.4	Discourage development within areas of high potential for heaving bedrock, as identified on the Steeply Dipping/Heaving Bedrock Map, unless adequate mitigation can be assured.
Policy 9-1A.5	Locate development in areas with minimal geologic hazards, and mitigate impacts associated with development in Class 1 and Class 2 constraint areas
Policy 9-1A.6	Early in the planning process require detailed site investigations and mitigation measures by an engineering geologist or soils engineer for land-use proposals located in Class 2 constraint areas. Mitigation measures shall meet other goals of this Plan, such as preservation of views, grades, and landforms.
Policy 9-1A.7	Engineering designs for mitigation of geologic hazards affecting such improvements as roads and utilities will be required during the subdivision review process.

Floodplains

Goal 9-2	Limit land uses in floodplains.
Policy 9-2A.1	Ensure land uses allowed in floodplains are compatible with Douglas County floodplain regulations.
Policy 9-2A.2	Discourage land uses within the 100-year floodplain unless associated with wildlife management, nonpolluting recreational uses, agricultural uses, or as otherwise specified within the Zoning Resolution.
Policy 9-2A.3	Locate shallow wells, solid-waste disposal sites, septic systems, and sewage-treatment plants away from floodplains.
Policy 9-2A.4	Appropriate dredge and fill operations within the floodway site shall be remediated to enhance and re-establish natural conditions.
Policy 9-2A.5	Require the landowner to provide access to Douglas County and the Urban Drainage and Flood Control District into floodplains for floodplain and floodway maintenance, as necessary.
9-2B.1	Protect and preserve riparian and wildlife management corridors to link habitat.

Wildfire

Goal 9-3	Reduce the risks of loss from wildfire hazard.
Policy 9-3A.1	Residential development in severe-wildfire areas, where mitigation methods are determined impractical or excessive, is generally inconsistent with this Plan.
Policy 9-3A.2	Locate facilities with high concentrations of people (churches, schools, employment centers, residential development and recreation facilities, etc.) away from severe wildfire hazard areas where mitigation is impractical or excessive.

Goal 9-3	Reduce the risks of loss from wildfire hazard.
Policy 9-3B.1	Require two or more access points for emergency vehicles for residential development in wildfire areas when road lengths exceed adopted standards.
Policy 9-3B.2	Link existing development to new development to provide multiple access points, where practical.
Policy 9-3B.3	Ensure that wildfire mitigation practices and policies are implemented throughout the development review process.

Douglas County Zoning Resolution

A Resolution of the Board of County Commissioners of Douglas County, Colorado that establishes land use classifications within zone districts. The health, safety, convenience, aesthetics and welfare of the present and future residents of Douglas County are assured through the regulations, prohibitions and procedures described within the document.

This Zoning Resolution governs the use of land for residential and non-residential purposes, limits the height and bulk of buildings and other structures, limits lot occupancy and determines the setbacks and provides for open spaces, by establishing standards of performance and design. Douglas County is currently working on an update for Section 18 Floodplain Overlay District, which is excerpted below after Section 17 Wildfire Hazard Overlay District.

Section 17 Wildfire Hazard Overlay District

1701 Intent (Amended 10/31/07)

To identify Wildfire Hazard Areas and to protect the health, safety, and welfare of residents by minimizing the potential for the loss of life and property by the ignition and spread of wildfires in the Wildland/Urban Interface and the Wildland/Urban Intermix. Douglas County is very diverse in character with land areas ranging from grasslands and shrublands, to steep, forested Slopes. These areas are often viewed as highly desirable development sites due to their unique scenic qualities. By identifying potential hazard areas, and requiring mitigation measures as part of the land planning and development process, the current and future risk of wildfires can be reduced. Specific purposes are as follows:

- To develop and maintain a map of Douglas County that allows for preliminary identification of Wildfire Hazard Areas.
- To identify the process for assessing and mitigating the Wildfire Hazard concurrent with the land planning process.
- To identify specific types of development to be subject to wildfire mitigation measures and the provisions of the Douglas County Wildfire Mitigation Standards.
- To identify the standards with which development proposed in Wildfire Hazard Areas must comply.
- To set forth the procedures for identifying, describing, and mitigating wildfire risk during the land development process.

- To design wildfire mitigation prescriptions which facilitate overall stewardship by the landowner or other appropriate entity.

1703 Applicability (Amended 10/31/07)

Upon the adoption of the Wildfire Hazard - Overlay District, the regulations contained in this Section shall apply to all land areas identified on the Douglas County Wildfire Hazard - Overlay Map and any land areas field-verified as potential hazard areas.

1705 Wildfire Hazard Rating Inspection (Amended 10/31/07)

Land proposed for development shall be subject to on-site inspection by the Douglas County Professional Foresters for the purpose of determining a Wildfire Hazard rating in accordance with Section 1707.

1706 General Standards (Amended 10/31/07)

Development determined to be subject to the provisions of the Wildfire Hazard - Overlay District shall be required to mitigate identified hazards through compliance with and utilization of the Douglas County Wildfire Mitigation Standards, and may require the implementation of a Wildfire Mitigation or Forest Management Plan. Additional measures aimed at reducing the risk of Wildfire may be imposed at the discretion of the Chief Building Official.

Section 18 Floodplain Overlay District

1801 Intent

To minimize flood-related losses in areas subject to flooding, to protect the health, safety, and welfare of the residents, and to minimize hazards due to flooding and flood related erosion in addition to the following:

- to ensure that landowners of areas of special flood hazards assume responsibility for their actions;
- to minimize damage to public facilities and utilities such as water, gas, electric, telephone and sewer lines, roads and bridges located in areas of special flood hazard;
- to minimize expenditure of public money for costly flood control projects and the need for rescue and relief efforts associated with flooding;
- to minimize prolonged business interruption;
- to protect the hydraulic characteristics of the drainageways, the storage capacity of floodplains, and to assure retention of floodway area to convey flood flows which can reasonably be expected to occur; and
- to comply with the program requirements of the Federal Emergency Management Agency (FEMA) in order that national flood insurance is available to County residents.

In order to accomplish the intent, this Section includes methods and provisions for:

- restricting uses or prohibiting certain uses which would be hazardous to the public health, safety and property;
- requiring permitted floodplain uses to be protected against flooding by providing general flood protection at the time of initial construction or reconstruction;
- requiring water supply and sanitation systems to be protected against flood damage at the time of initial construction so as to prevent disease, contamination and unsanitary conditions;
- delineating areas that could be inundated by flooding thereby protecting individuals from purchasing floodplain land for purposes which are not suitable;
- regulating excavation, filling, dumping, dredging, and channelization which may increase flood damage; and
- preventing or regulating the construction of flood barriers which will unnaturally divert floodwater or which may increase flood hazards in other areas.

1802 Definitions

1802.14 Floodplain Administrator – The Douglas County Engineer or designated representative.

1803 Nature of District

The Floodplain Overlay District shall be applied a s supplemental regulation on existing zoned areas containing flood hazard areas, including planned developments (PDs). The Floodplain Overlay District is superimposed on the existing zoning and the restrictions and requirements herein are in addition to those of the underlying zone. All land use review processes that apply to the underlying zoning district shall remain in full force and effect. In the case of overlapping or conflicting requirements, the most restrictive provision shall apply.

1804 Boundary

The Floodplain Overlay District is composed of the 100-year floodplain and a subarea within the floodplain called the floodway which must be reserved in order to discharge the 100-year flood without increasing the water surface elevation more than one half foot at any point.

1805 Uses Prohibited

The following are strictly prohibited within the floodplain overlay district:

1805.01 Habitable structures, or commercial/industrial structures, except fish hatcheries, water-related recreational facilities, single-family dwellings on nonconforming lots, and reconstruction of nonconforming structures as allowed by a Floodplain Development Permit

1805.02 Storage or processing of materials that are buoyant, flammable, explosive, or could be dangerous or cause injury in the time of flooding

1805.03 Junk or salvage yards, or solid waste disposal facilities or landfills

1809 Development Standards

When development is proposed adjacent to floodplains, or contains floodplain, or to the extent that physical improvements occur and these improvements raise the land above the base flood elevation, applicants shall be required to:

1809.01 Locate new construction or substantial improvements of any residential, commercial, industrial or other nonresidential structure so that the lowest floor, including basement, lies one foot above the base flood elevation subject to 1815 herein

1809.02 Locate new on-site sewage systems (including leach fields) in areas above the base flood elevation; (except the replacement of a failing system where no alternate location outside the 100-year floodplain is available.)

1810 Administration

The County Engineer, or designated representative, shall administer and implement the Floodplain Development Permits in accordance with the provisions of this Section.

1815 Conditions of Approval

Any of the following conditions of approval may be required by the Floodplain Administrator when granting a development permit:

1815.06 Elevation of structures and uses to the base flood elevation plus one foot - (this shall not be construed to allow accessory structures in floodway)

Douglas County Plans/Studies

Community Wildfire Protection Plans

National, state, and local policies have focused efforts on reducing the threat of wildfire, particularly in the wildland urban interface. Community wildfire protection plans assist communities in defining priorities for the protection of assets in the wildland urban interface areas. To date, there exist the following CWPPs in the County:

- Douglas County CWPP (2011)
- Burning Tree Ranch CWPP (2008)
- Greater Sage Port CWPP (2014)
- Happy Canyon CWPP (2008)
- Hidden Village CWPP (2008)
- Perry Park CWPP (2005)
- Perry Pines and Park Ridge Pines CWPP (2012)

- Pine Ridge CWPP (2007)
- Roxborough Park CWPP (2007)
- South Metro Fire Rescue Authority CWPP (2010)
- Castle Pines North CWPP (2010)
- Greater Surrey Ridge CWP (2012)
- Misty Pines CWPP (2011)
- South Platte CWPP (2007)
- Valley Park CWPP (2012)
- Woodlands Escavera CWPP (2007)
- Woodmoor Mountain CWPP (2007)

The Douglas County CWPP assesses county-owned lands and provides wildfire mitigation recommendations on a programmatic, landscape scale. The recommendations include defensible space for homeowners, county-owned land treatments, and USFS treatments. The Core Team that developed the CWPP "identified where hazardous fuels reduction treatments would have significant benefit in slowing an advancing wildfire by reducing fire behavior."[13] The County CWPP can be used to provide guidance for local-level CWPPs, but it does not identify fuels treatment priorities at the level of individual communities or parcels.

Douglas County Emergency Operations Plan (2012)

The Douglas County Emergency Operations Plan (Plan) provides an overview of how Douglas County public safety partners collaborate, plan, and prepare for a hazardous incident that threatens lives, property, and natural resources. The Plan describes the policies, planning assumptions, concept of operations, and response when a disaster or emergency challenges local government's ability to respond. While there are some responsibilities for recovery that will occur during the response phase, the Recovery Plan is a more detailed plan, separate from the Emergency Operations Plan, that is included in the Douglas County Comprehensive Emergency Management Plan (CEMP). The Recovery Plan details responsibilities of Douglas County Government and other agencies that have significant responsibilities associated with recovery from a disaster.

Douglas County Disaster Recovery Plan (2014)

The Douglas County Disaster Recovery Plan is a comprehensive, all-hazard plan that establishes a comprehensive framework for managing recovery efforts within the county. This plan assigns roles and responsibilities to departments and agencies.

This document is a result of the collaborative efforts between the Douglas County Office of Emergency Management (OEM) and the many other county departments and agencies that have assigned emergency roles and responsibilities. The final plan incorporates comments and

[13] Douglas County CWPP, pg. 18.

suggestions received from a variety of stakeholders including many partner agencies and organizations that provide critical support to the County during times of disaster. This plan fulfills Douglas County's commitment to maintain readiness capabilities for all phases of emergency management, and thus to be able to respond to, and recover from, disasters or large-scale emergencies. It also incorporates the National Incident Management System (NIMS) as the county standard for emergency response operations, as adopted by Douglas County resolution on September 21, 2004.

This plan establishes the overall roles and responsibilities for emergency recovery operations, as well as the concept of operations for the County. It is intended to be used in conjunction with established operational procedures, plans, and protocols.

Although this plan was written for Douglas County Government, it is encouraged that other agencies and levels of government within Douglas County adapt it for their own needs, or adopt it for their use. In either case, it is important that recovery plans be coordinated between agencies, so as to mitigate any conflicting actions and to avoid duplication of efforts.

County Departments/Agencies

Douglas County has structured its governmental organization to mitigate and respond to hazards. The discussion below highlights offices that have either direct or indirect responsibility for planning for or responding to natural and human-caused hazards.

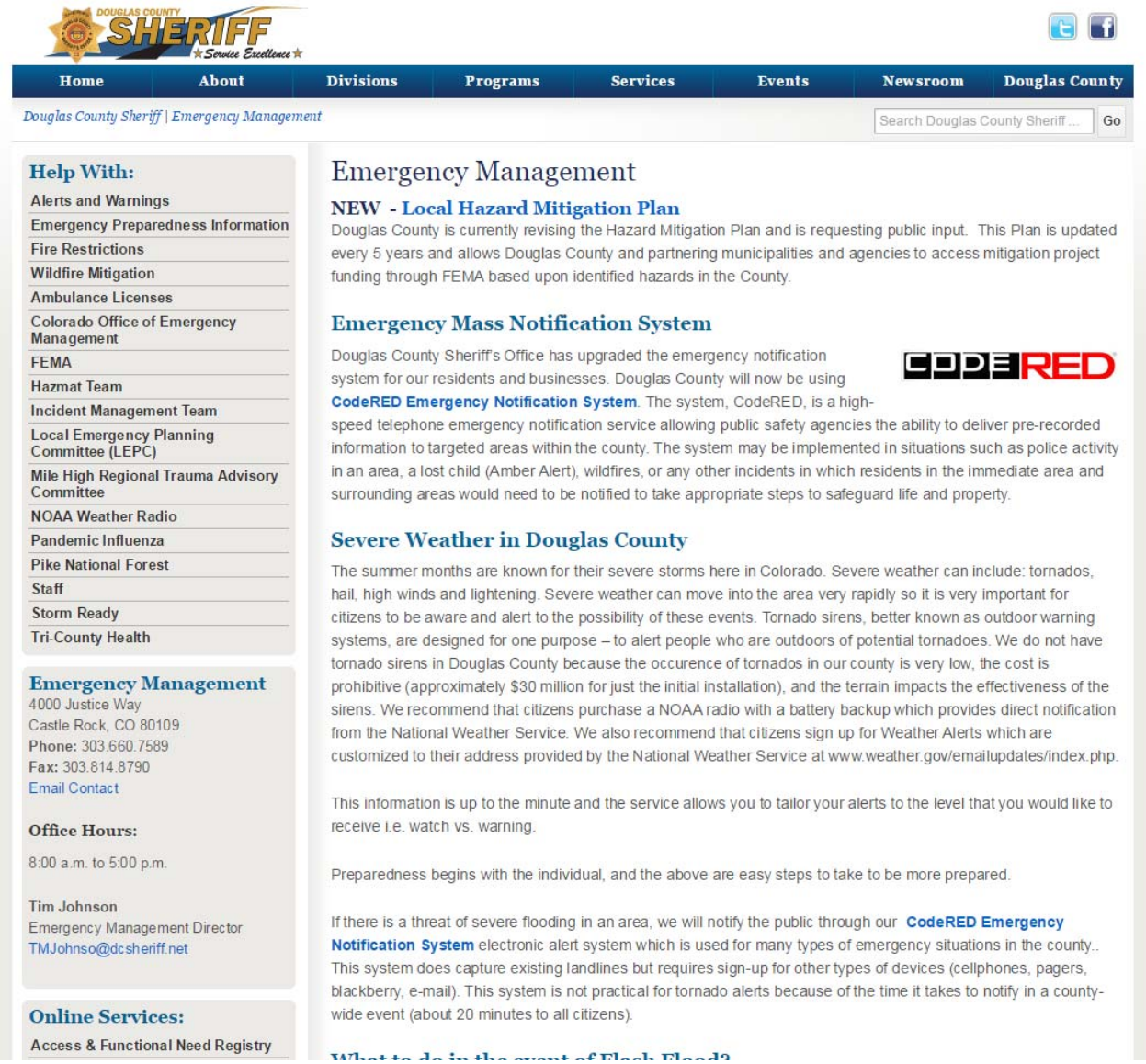
Douglas County Sheriff's Division of Emergency Management

The Douglas County Office of Emergency Management is the main hub for the coordination of disaster management and training; homeland security; emergency preparedness and education; multi-agency cooperation; and emergency medical and trauma system coordination within the County.

The County works in cooperation with other agencies including the Douglas County Sheriff's Office, Tri-County Health, Public Works, and various municipal and district Fire/Rescue and Police Departments.

Douglas County Emergency Management also provides updated emergency-related information to the public on their website (shown in Figure 4.58). This site provides weather and flooding information, as well as information on wildfire mitigation and pandemic influenza. Also provided are links to national, state, and local emergency information.

Figure 4.58. Douglas County Emergency Management Homepage



Source: http://www.dcsheriff.net/emergencymanagement/

Community Development

The Department of Community Development (DCD) has a pivotal role in managing and protecting the County's resources (land, water, minerals), environment and quality of life. The Department assists the Board of County Commissioners with recommendations to ensure that the County grows in a manner that is fiscally sound and economically beneficial to the County and its taxpayers and businesses. Meeting both responsibilities in a growing environment presents considerable challenges and opportunities.

DCD consists of Parks, Trails and Building Grounds, Community Service and Resources, Economic Development, Historic Preservation, Planning Services, Water and Zoning.

Douglas County Public Works Engineering

The Department of Public Works Engineering works in accordance with sound engineering principles and practices providing oversight, design, construction, operation, maintenance, and implementation of infrastructure and program needs for Douglas County in compliance with adopted criteria, policies, and procedures. This includes review and approval of construction plans and reports for new development of subdivisions and commercial site plans, as well as all capital improvement projects. All road construction and grading permits *(excluding building permits)* are issued by Public Works Engineering. In addition, all inspection of the construction of public infrastructure is performed by the Department of Public Works Engineering.

The Department of Public Works Engineering is responsible for:

- Building
- Capital Improvement Projects
- Development Review
- Grading, Erosion and Sediment Control (GESC) / Drainage, Erosions and Sediment Control (DESC)
- Permits, Inspections And Utilities
- Stormwater Management
- Transportation Engineering and Traffic Operations

Douglas County Public Works Operations

Because every snowstorm has varying characteristics – temperature, moisture content, wind velocity and storm duration, etc. – Public Works Operations (PW Ops) initiates a snow removal plan that is unique to each individual storm. The primary focus is always on public safety.

In the case of major blizzards, Public Works Operations will develop a plan and place the information on the Douglas County website home page. The information is updated as necessary to keep the website current with changing conditions.

Snow removal planning efforts for a snow storm begin as soon as forecasts of impending weather events are received from the National Weather Service and Skyview Weather. Snow forecasts are continually monitored to determine when the storm will arrive, what snow accumulations can be expected, storm intensity, and what air temperatures can be anticipated.

Douglas County Facilities, Fleet and Emergency Support Services

Facilities currently manages 25 buildings/sites totaling 1,317,018 square feet, across 844 square miles. Our facilities house multiple functions, supporting all County departments and a current County population of 302,464. One of our core missions is to provide safe, secure, comfortable, efficient and sustainable environments for citizens and employees.

The Fleet Division manages and maintains approximately 700 vehicles, plus attachments. The

fleet contains vehicles ranging from motorcycles to heavy construction equipment. Light equipment accounts for approximately one-third of the fleet and consists of sedans and pickup trucks operated by various County departments. Heavy equipment operated by Public Works staff accounts for approximately one-third of the fleet which consists of heavy construction and snow removal equipment. Law enforcement accounts for the remaining third of the fleet and consists of marked/unmarked patrol units, investigation vehicles and special purpose vehicles.

Provide a safe, secure, comfortable, efficient sustainable environment for citizens and employees.

- Manage all Douglas County Facilities including the Douglas County Fairgrounds and Events Center
- Manage County building construction projects
- Prepare and implement annual budget and continue implementation and updates of the Facilities Master Plan
- Facilities Maintenance – planned and unplanned maintenance
- Procure supplies, equipment, materials and services to protect our capital investments
- Address environmental concerns for Facilities by developing policies and procedures pertaining to environmental and sustainable initiatives

Emergency Support Services responsibilities include:

- Citizen Preparedness Guide
- Plan Development and Management (EOP, COOP, Recovery, Hazard Mitigation Plan, Debris Management Annex)
- Budget Management and Reconciliation for 19275 and 890045
- Local Emergency Planning Committee Administrative Support
- LEPC/EMCG Representative for BOCC
- DECART Coordination
- Policy Group Support
- PILT Funding for Fire Districts
- Building Safety and Security Committee Coordination (Emergency Drills, Workplace Safety Guide)
- ICS Training Plan (for non-DCSO Departments)
- Balanced Scorecard Tier One
- 3.7 Monitoring Report

4.4.2 Douglas County's Administrative/Technical Mitigation Capabilities

Table 4.94 identifies the County personnel responsible for activities related to mitigation and loss prevention in Douglas County.

Table 4.94. Douglas County Administrative/Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/Engineer with knowledge of land development/land management practices	Y	Assistant Director of Planning Services	
Engineer/Professional trained in construction practices related to buildings and/or infrastructure	Y	Deputy Chief Building Official	
Planner/Engineer/Scientist with an understanding of natural hazards	Y	Special Projects Engineer/Manager	
Personnel skilled in GIS	Y	Geographic Information Systems/ GIS Manager	
Full time building official	Y	Building Department/Chief Building Official	
Floodplain Manager	Y	County Engineer	
Emergency Manager	Y	Sheriff's Office Division of Emergency Management/Emergency Manager	
Grant writer			
Other personnel			
GIS Data – Hazard areas	Y	Geographic Information Systems/ GIS Manager	
GIS Data - Critical facilities	Y	Geographic Information Systems/ GIS Manager	
GIS Data – Building footprints	Y	Geographic Information Systems/ GIS Manager	
GIS Data – Land use	Y	Geographic Information Systems/ GIS Manager	
GIS Data – Links to Assessor's data	Y	Geographic Information Systems/ GIS Manager	
Warning Systems/Services (Reverse 9-11, cable override, outdoor warning signals)	Y		CodeRED
Other			

Source: Amec Foster Wheeler Data Collection Guide

Douglas County uses CodeRED for emergency mass notifications for emergency events such as wildfires and floods, as well as non-natural hazard events such as Amber Alerts. The notifications are sent via phone, email, and/or text message, depending on user preference. CodeRED automatically calls landlines; users must register with CodeRED to receive the notifications via cell phone, text, and email. Douglas County uses PSAs and other outreach methods to encourage people to sign up for the system.

4.4.3 Douglas County's Fiscal Mitigation Capabilities

Table 4.95 identifies financial tools or resources that the County could potentially use to help fund mitigation activities.

Table 4.95. Douglas County Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Y/N)	Comments
Community Development Block Grants	N	The Douglas County Board of County Commissioners would likely request money through the budget process for mitigation projects conducted/needed in the unincorporated County.
Capital improvements project funding	N	
Authority to levy taxes for specific purposes	N	
Fees for water, sewer, gas, or electric services	N	
Impact fees for new development	N	
Incur debt through general obligation bonds	N	
Incur debt through special tax bonds	N	
Incur debt through private activities	N	
Withhold spending in hazard prone areas	N	
Other	N	

Source: Amec Foster Wheeler Data Collection Guide

4.4.4 Mitigation Outreach and Partnerships

The County, including its various jurisdictions and special districts conduct a variety of hazard preparedness and response training and drill sessions. The training and drill sessions are focused on familiarizing the trainees with established department procedures and equipment to improve overall hazard preparedness and response throughout the County. There are also agencies throughout the County that perform mitigation related work. The County partners with these organizations on a case by case basis. Douglas County's preparedness and mitigation partners include:

- American Red Cross
- Arapahoe/Douglas Mental Health Network
- Arapahoe County OEM
- Aurora Fire Department
- Black Hills Energy
- Burlington Northern/Santa Fe Railroad
- Castle Rock Fire Rescue
- Centura
- CDOT
- City of Castle Pines
- City of Colorado Springs
- City of Littleton
- City of Lone Tree
- Colorado Division of Homeland Security and Emergency Management

- Colorado State Forest Service
- Denver Water
- Denver Dumb Friends League
- Division of Fire Prevention and Control
- DC BOCC
- DC Administration
- DC Assessor
- DC Building Services
- DC Clerk & Recorder
- DC Coroner
- DC Engineering Services
- DC Facilities Fleet and Emergency Support Services
- DC Finance
- DC Human Services
- DC OEM
- DC Open Space
- DC Planning Services
- DC Sheriff's Office
- DC Treasurer
- Douglas County Library District
- Douglas County School District
- Developmental Pathways
- Elbert County OEM
- El Paso County OEM
- Franktown Fire Protection District
- Highlands Ranch Metro District
- HealthOne
- Humane Society of the Pikes Peak Region
- IREA
- Jackson 105 Fire Protection District
- Jefferson County OEM
- Littleton Fire Rescue
- Mountain Communities Volunteer Fire Protection District
- North Fork Fire Protection District
- Larkspur Fire Protection District
- Local Emergency Planning Committee
- NOAA
- Parker Water & Sanitation
- Rampart Helicopter
- Salvation Army

- South Metro Fire Rescue
- Teller County OEM
- Town of Castle Rock
- Town of Larkspur
- Town of Parker
- Tri-County Health Department
- Union Pacific Railroad
- United States Forest Service
- Urban Drainage
- West Douglas Fire Protection District
- West Metro Fire Rescue
- XCEL Energy

Requirement §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.

This section describes the mitigation strategy process and mitigation action plan for the Douglas County Local Hazard Mitigation Plan update. It describes how the County and participating jurisdictions met the following requirements from the 10-step planning process:

- Planning Step 6: Set Goals
- Planning Step 7: Review Possible Activities
- Planning Step 8: Draft an Action Plan

5.1 Mitigation Strategy: Overview

The results of the planning process, the risk assessment, the goal setting, the identification of mitigation actions, and the hard work of the HMPC led to the mitigation strategy and mitigation action plan for this LHMP update. As part of the plan update process, a comprehensive review and update of the mitigation strategy portion of the plan was conducted by the HMPC. Some of the initial goals and objectives from the 2010 Regional Plan were refined and reaffirmed, some goals were deleted, and others were added. The end result was a new set of goals, reorganized to reflect the completion of 2010 actions, the updated risk assessment and the new priorities of this plan update. The mitigation actions from 2010 Regional Plan were reviewed and assessed for progress and evaluated for their inclusion in this plan update. Section 5.1.1 below identifies the updated goals of this plan and Section 5.3 details the new mitigation action plan.

5.1.1 Goals

Requirement §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.

Up to this point in the planning process, the HMPC has organized resources, assessed hazards and risks, and documented mitigation capabilities. The resulting goals and mitigation actions were developed based on these planning tasks. The HMPC held a series of meetings and group exercises designed to achieve a collaborative mitigation strategy as described further throughout this section.

During the initial goals update meeting, the HMPC reviewed the results of the hazard identification, vulnerability assessment, and capability assessment. This analysis of the risk assessment identified areas where improvements could be made and provided the framework for

the HMPC to formulate updated planning goals and a mitigation strategy for the Douglas County Planning Area.

The HMPC developed goals to provide direction for reducing hazard-related losses in Douglas County. Goals were defined for the purpose of this mitigation plan as broad-based public policy statements that:

- Represent basic desires of the community;
- Encompass all aspects of community, public and private;
- Are nonspecific, in that they refer to the quality (not the quantity) of the outcome;
- Are future-oriented, in that they are achievable in the future; and
- Are time-independent, in that they are not scheduled events.

Goals are stated without regard to implementation. Implementation cost, schedule, and means are not considered. Goals are defined before considering how to accomplish them so that they are not dependent on the means of achievement. Goal statements form the basis for objectives and actions that will be used as means to achieve the goals. Objectives define strategies to attain the goals and are more specific and measurable. Mitigation Actions are specific actions that help achieve goals and objectives.

To facilitate the goals update of this plan HMPC members were provided a worksheet with the list of goals from the 2010 DRCOG plan and other state and local plans, specifically, the Colorado State Natural Hazard Mitigation Plan (2013), Douglas County Comprehensive Plan (2014), and Douglas County Community Wildfire Protection Plan (2011) (see worksheet in Appendix C). This review was to ensure that this plan's mitigation strategy was integrated with existing plans and policies. They were told that they could use, combine, or revise the statements provided or develop new ones, keeping the risk assessment in mind. The group felt that both the DRCOG plan goals and the State Natural Hazard Mitigation Plan goals were very comprehensive. The group changed the DRCOG goals slightly and added Goal 5 to align with the State Plan goals. The following goals are a result of this process which provide the direction for reducing future hazard-related losses within the Douglas County Planning Area.

Goal 1: Reduce impacts and damages from hazard events to people, property, local government assets, economy and natural resources

Goal 2: Increase public awareness of hazards and their mitigation

Goal 3: Strengthen communication and coordination among public agencies, non-governmental organizations (NGOs), businesses and private citizens

Goal 4: Coordinate and integrate hazard mitigation activities with local land development planning activities and emergency operations planning

Goal 5: Reduce costs of disaster response and recovery

5.2 Identification and Analysis of Mitigation Actions

Requirement §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.

At the mitigation strategy meeting of the HMPC representatives from the participating jurisdictions met to update, identify and analyze potential mitigation actions. AMEC provided the HMPC with a packet of materials at its third meeting and via email with information on types of mitigation actions, key issues from Chapter 4 Risk Assessment, and a worksheet of the plan's goals. The intent of the process was to update, identify, and analyze potential mitigation actions to achieve the mitigation goals. The group discussed different types and categories of mitigation actions. During the 2014-2015 planning process, the HMPC was provided with the following list of categories of mitigation actions, which originated from the National Flood Insurance Program's Community Rating System (CRS), as well as definitions and examples for each category:

- **Prevention**: Administrative or regulatory actions or processes that influence the way land and buildings are developed and built.
- **Property protection**: Actions that involve the modification of existing buildings or structures to protect them from a hazard or remove them from the hazard area.
- **Structural**: Actions that involve the construction of structures to reduce the impact of a hazard.
- **Natural resource protection**: Actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems.
- **Emergency services**: Actions that protect people and property during and immediately after a disaster or hazard event.
- **Public information/education and awareness**: Actions to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigate them.

Next, the HMPC discussed the key issues for each priority hazard that emerged from the Risk Assessment and brainstormed potential mitigation alternatives to address these. To facilitate the brainstorming process, the HMPC referred to a matrix of typical mitigation alternatives organized by CRS category for the hazards identified in the plan. This matrix is included in Appendix C. HMPC members discussed possible new mitigation actions that would work toward mitigating the specific hazards. Each proposed action was written on a large sticky note and posted on flip charts in meeting room underneath the hazard it addressed.

Based upon the key issues identified in the risk assessment, including the existing capabilities of jurisdictions, and the overall political, technical, and financial feasibility of the potential actions, the HMPC came to consensus on new mitigation actions for each hazard. Certain hazards were best addressed through multi-hazard actions. A lead for each new action was identified. The

leads were responsible for filling out worksheets with additional details on the project so they could be captured in the plan. Additional discussion on proposed mitigation actions took place within individual jurisdictional planning teams.

5.2.1 Prioritization Process

Once the mitigation actions were identified, the HMPC was provided with several decision-making tools, including FEMA's recommended prioritization criteria, STAPLEE sustainable disaster recovery criteria and others, to assist in deciding why one recommended action might be more important, more effective, or more likely to be implemented than another. STAPLEE stands for the following:

- Social: Does the measure treat people fairly? (e.g., different groups, different generations)
- Technical: Is the action technically feasible? Does it solve the problem?
- Administrative: Are there adequate staffing, funding, and other capabilities to implement the project?
- Political: Who are the stakeholders? Will there be adequate political and public support for the project?
- Legal: Does the jurisdiction have the legal authority to implement the action? Is it legal?
- Economic: Is the action cost-beneficial? Is there funding available? Will the action contribute to the local economy?
- Environmental: Does the action comply with environmental regulations? Will there be negative environmental consequences from the action?

In accordance with the DMA requirements, an emphasis was placed on the importance of a benefit-cost analysis in determining action priority. Other criteria used to assist in evaluating the benefit-cost of a mitigation action includes:

- Does the action address hazards or areas with the highest risk?
- Does the action protect lives?
- Does the action protect infrastructure, community assets or critical facilities?
- Does the action meet multiple objectives (Multiple Objective Management)?

The mitigation categories, multi-hazard actions, and criteria are included in Appendix C: Mitigation Strategy.

At the mitigation strategy meeting the HMPC used STAPLEE to determine which of the identified actions were most likely to be implemented and effective. Each member used STAPLEE to identify his or her top four mitigation actions and then voted for these actions by sticking a colored dot on the sticky note on which the action was written. The number of dots next to each action was totaled as an indication of relative priority and translated into 'high,' 'medium' and 'low.' The results of the STAPLEE evaluation process produced prioritized mitigation actions for implementation within the planning area.

During the STAPLEE evaluation emphasis was placed on the importance of a benefit-cost analysis in determining project priority; however, this was not a quantitative analysis. The Disaster Mitigation Act regulations state that benefit-cost review is the primary method by which mitigation projects should be prioritized. Recognizing the federal regulatory requirement to prioritize by benefit-cost, and the need for any publicly funded project to be cost-effective, the HMPC decided to pursue implementation according to when and where damage occurs, available funding, political will, jurisdictional priority, and priorities identified in the Colorado Natural Hazards Mitigation Plan. Cost-effectiveness will be considered in additional detail when seeking FEMA mitigation grant funding for eligible projects identified in this plan.

Each action developed for this plan contains a description of the problem and proposed project, the entity with primary responsibility for implementation, any other alternatives considered, a cost estimate, expected project benefits, potential funding sources, and a schedule for implementation. Development of these project details for each action led to further refinement of a high, medium, or low priority for each.

5.3 Mitigation Action Plan

Requirement §201.6(c)(3)(iii): [The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

This section outlines the development of the updated mitigation action plan. The action plan consists of the specific projects, or actions, designed to meet the plan's goals. Over time the implementation of these projects will be tracked as a measure of demonstrated progress on meeting the plan's goals.

5.3.1 Progress on Previous Mitigation Actions

Douglas County and Castle Rock have been very successful in implementing actions identified in the 2010 LHMP Mitigation Strategy, thus, working diligently towards meeting the 2010 DRCOG plan goals. Table 5.1 indicates the details for each 2010 mitigation action item indicating whether a given action item has been completed, deleted, or deferred.

The 2010 mitigation strategy contained seven separate mitigation actions benefiting Douglas County and three for the City of Castle Rock. Of the County's seven actions, all have been completed or are ongoing. Castle Rock has also has completed all three. Table 5.1 provides a status summary of the mitigation action projects from the 2010 Regional Plan. Following the table are more detailed descriptions of the status and outcome of each project.

Table 5.1. Douglas County's 2010 LHMP Update: Mitigation Action Status

Jurisdiction/Hazard/Action	Complete	Ongoing	Project in Update
Douglas County			
Roxborough Park Common area mitigation	X		
Grandview Tributary Improvements and Storm Sewer Project	X	X	X
Special Flood Hazard Area Structure Inventory	X		
Piney Creek MDP and Flood Hazard Area Delineation Study	X		
Hayman burn mitigation project	X	X	X
Flood Hazard Prediction Tool	X	X	X
Kinney Creek Tributary C Spillway Improvement Project	X		
Quantify Special Flood Hazard Areas in Open Space/Conservation	X		
Continue to participate in the National Flood Insurance Program by implementing and improving upon effective floodplain and stormwater management practices.	X	X	
Coordinate with local water providers to continually identify and promote water conservation measures, including but not limited to, incentive programs, water efficient appliances, xeriscaping and the use of recycled water where feasible.	X	X	
Monitor proceedings of the Colorado Water Availability Task Force. When necessary, support water providers in the implementation of conservation measures.	X	X	
Provide the DRCOG Hazard Mitigation Plan to other departments for possible integration into various planning efforts.	X	X	
City of Castle Rock			
Adoption of current International Code Council Fire Codes in the Town and the County	X		
Re-write of our Incident Management Guidelines and Standards (IMGS) to match Douglas County's newly adopted Emergency Operations Plan.	X		
Escavera Community Wildfire Protection Plan (implementation)	X	X	X
Continue to participate in the National Flood Insurance Program by implementing and improving upon effective floodplain and stormwater management practices.	X	X	
Coordinate with local water providers to continually identify and promote water conservation measures, including but not limited to, incentive programs, water efficient appliances, xeriscaping and the use of recycled water where feasible.	X	X	
Monitor proceedings of the Colorado Water Availability Task Force. When necessary, support water providers in the implementation of conservation measures.	X	X	
Provide the DRCOG Hazard Mitigation Plan to other departments for possible integration into various planning efforts.	X	X	

Douglas County Completed Actions and Successes

Roxborough Park Common area mitigation

Progress to Date: Complete. This was a wildfire mitigation project to create a buffer between the State Park and an adjacent wildland interface community. Approximately 2000 homes are now better protected from wildland fire as a result of 2009-2010 projects.

Grandview Tributary Improvements and Storm Sewer Project

Progress to Date: Phase 1 complete with implementation ongoing. This was a master planning study to address conveyance problems in the Grandview Estates area and was completed in late 2014. Design and build of improvements are in progress in 2015 which will provide flood protection benefits to approximately 15 properties and 10 structures.

Special Flood Hazard Area Structure Inventory

Progress to Date: Inventory is complete. This project provides exposure data to the flood hazard prediction tool to aid in mitigation and response planning efforts.

Piney Creek Master Drainage Plan and Flood Hazard Area Delineation Study

Progress to Date: Completed in 2012. This project resulted in detailed floodplain analysis for four miles of Piney Creek and includes updated hydrology, stabilization plan, and floodplain delineation.

Hayman Burn Mitigation Project

Progress to Date: Completed channel restoration study, channel restoration and debris removal. The Hayman burn has increased the occurrence of debris flow, erosion, and flooding. This project was done in coordination with the USFS, NRCS and a local non-profit organization. There is still some ongoing work to do in future to address ongoing erosion and sedimentation issues.

Flood Hazard Prediction Tool

Progress to Date: Phase 1 completed in 2012. This tool was developed so that Douglas County Emergency Management can anticipate where problem areas will be during severe weather so appropriate response actions can occur. The tool is GIS based and available online and is designed to indicate flood inundation levels associated with various storm events. This is a state of the art system that has received national attention. The next phase of this project is to develop flood response plans with UDFCD for various watersheds.

Kinney Creek Tributary C Spillway Improvement Project

Progress to Date: Completed in 2012. This project reduced flood hazards in this area and reduced risk to two properties.

Quantify Special Flood Hazard Areas in Open Space/Conservation

Progress to Date: This was completed for CRS purposes in 2011.

Continue to participate in the National Flood Insurance Program

Progress to Date: This is an ongoing priority but is a capability that is discussed in Section 5.3.2 and not as a specific project moving forward.

Coordinate with local water providers to continually identify and promote water conservation measures

Progress to Date: This is an ongoing priority but is a capability ongoing through the Douglas County Water Resource Authority and not carried forward as a project.

Monitor proceedings of the Colorado Water Availability Task Force

Progress to Date: This is ongoing but not carried forward as a specific project. These reports are received by County OEM and sent out to all emergency managers in the jurisdictions.

Provide the DRCOG Hazard Mitigation Plan to other departments for possible integration into various planning efforts

Progress to Date: This is ongoing but not carried forward as a specific project as it is part of the Plan's overall implementation strategy in Section 7.2.3. See Table 3.6 for discussion on how this plan has been integrated and informed the County EOP.

City of Castle Rock

Adoption of current International Code Council Fire Codes in the Town and the County

Progress to Date: Completed.

Re-write of our Incident Management Guidelines and Standards (IMGS) to match Douglas County's newly adopted Emergency Operations Plan.

Progress to Date: Completed.

Escavera Community Wildfire Protection Plan (implementation)

Progress to Date: Completed.

Continue to participate in the National Flood Insurance Program

Progress to Date: This is an ongoing priority but is a capability that is discussed in Annex B and not as a specific project moving forward.

Coordinate with local water providers to continually identify and promote water conservation measures

Progress to Date: This is an ongoing priority but is a capability ongoing in the City's Water Conservation Master Plan and not carried forward as a project.

Monitor proceedings of the Colorado Water Availability Task Force

Progress to Date: This is ongoing but not carried forward as a specific project. These reports are periodically received through County OEM.

Provide the DRCOG Hazard Mitigation Plan to other departments for possible integration into various planning efforts

Progress to Date: This is ongoing but not carried forward as a specific project as it is part of the Plan's overall implementation strategy in Section 7.2.3. See Table 3.6 for discussion on how this plan has been integrated.

5.3.2 Continued Compliance with NFIP

Given the importance of the NFIP in mitigating flood losses, an emphasis will be placed on continued compliance with the NFIP by all NFIP participating jurisdictions including Douglas County, Castle Rock, Larkspur, Lone Tree, and Parker. As NFIP participants, these communities have and will continue to make every effort to remain in good standing with NFIP. This includes continuing to comply with the NFIP's standards for updating and adopting floodplain maps and maintaining and updating the floodplain zoning ordinance. Other details related to NFIP participation are discussed in the community capabilities section of each jurisdictional annex and the flood vulnerability discussion in Section 4.3. Summarized below is a description of the County's flood management program. Also to be considered are the numerous flood mitigation actions contained in this LHMP that support the ongoing efforts by the County to minimize the risk and vulnerability of the community to the flood hazard and to enhance their overall floodplain management program.

Douglas County's Flood Management Program

Douglas County has participated in the NFIP since September 3, 1980. Since then, the County has administered floodplain management regulations that meet the minimum requirements of the NFIP. Under that arrangement, residents and businesses paid the same flood insurance premium rates as most other communities in the country.

The Community Rating System (CRS) was created in 1990. It is designed to recognize floodplain management activities that are above and beyond the NFIP's minimum requirements. The County participates in the CRS, which affirms continued participation in the NFIP, and is rated as a CRS Class 8. Policy holders located in special flood hazard areas in Class 8 communities receive a 10% discount on flood insurance, which is a benefit of the County's effort to participate in the CRS. See additional discussion on this topic in the capability assessment in Chapter 4. Parker's CRS program participation is discussed in its jurisdictional annex.

5.3.3 Updated Mitigation Action Plan

This action plan was developed to present the recommendations developed by the HMPC for how the Douglas County Planning Area can reduce the risk and vulnerability of people, property, infrastructure, and natural and cultural resources to future disaster losses. Emphasis was placed on reducing losses to both future and existing development. The action plan summarizes who is responsible for implementing each of the prioritized actions as well as when and how the actions will be implemented. Table 5.2 identifies the mitigation actions and lead jurisdiction for each action. Only those actions where the County is the lead jurisdiction are detailed further in this section. Actions specific to other participating jurisdictions, or where other jurisdictions are taking the lead, are detailed in each respective jurisdictional annex to this plan.

The action plan detailed below contains both new action items developed for this plan update as well as old actions that are ongoing from the 2010 Regional Plan. It is important to note that Douglas County and the participating jurisdictions have numerous existing, detailed action descriptions, which include benefit-cost estimates, in other planning documents, such as watershed plans, stormwater plans, community wildfire protection plans, and capital improvement budgets and reports. These actions are considered to be part of this plan, and the details, to avoid duplication, should be referenced in their original source document. The HMPC also realizes that new needs and priorities may arise as a result of a disaster or other circumstances and reserves the right to support new actions, as necessary, as long as they conform to the overall goals of this plan.

Further, it should be noted that many of the participating jurisdictions have significant regulatory, personnel, technical, and financial resources and capabilities that are described in more detail in their respective jurisdictional annexes. The communities have been very proactive about mitigating risk to natural hazards when the need is identified and guiding new development away from hazard areas. Also, many of the action items included in this plan are a collaborative effort among participating jurisdictions and other local, state, and federal agencies and stakeholders in the Douglas County planning area. Table 5.2 identifies the lead jurisdiction. The individual worksheets for each mitigation action item identify other mitigation partners. In addition, many of the more regional actions where the County or other jurisdictions are identified as the lead, such as the citizen disaster preparedness guide, will provide a mitigation benefit to all jurisdictions.

Table 5.2. Douglas County Planning Area Mitigation Action Summary

Jurisdiction-Action Number	Action Title	Priority	Hazard	Address Current or Future Development	CRS Category*
Multi-jurisdictional-1	Public awareness – citizen disaster preparedness guide	Medium	Thunderstorms, lightning, winter storms & extreme cold, floods, tornadoes, wildfires, hazardous materials, earthquake	Both	PI
Douglas County-1	Environmental assessments for small NRCS dams	Medium	Flood: dam failure	Both	NR
Douglas County-2	Flood hazard inventory tool	Medium	Flood	Existing	PP
Douglas County-3	Highline Canal studies for stormwater runoff and improvement	Medium	Flood: localized stormwater	Existing	PP
Douglas County-4	Plum Creek geomorphological assessment	Medium	Erosion and deposition/flood	Existing	PP, NR
Douglas County-5	Continue to implement fuels management strategies identified on Douglas County properties	High	Wildfire	Both	PR, PP
Douglas County-6	Use prescribed fires to protect and enhance resource values	High	Wildfire	Both	PR, PP
Douglas County-7	Commodity flow along major highways in Douglas County	High	Hazardous materials	Both	PI
Douglas County-8	Hazardous materials public education TV PSA	Medium	Hazardous materials	Both	PI
Douglas County-9	Debris management plan development	High	Erosion and deposition, flood, wildfire, tornado	Both	PR, PP, NR

Jurisdiction-Action Number	Action Title	Priority	Hazard	Address Current or Future Development	CRS Category*
Douglas County-10	Facility retrofit for generator back-up	Low	Flood, wildfire, severe winter weather, hail, lightning, tornado, thunderstorms	Existing	S, ES
Douglas County-11	Evacuation plan revision and execution	High	Flood, dam failure, wildfire, thunderstorms, tornado, hazardous materials	Both	ES, PI
Douglas County-12	Horse Creek stream stabilization	Medium	Erosion and deposition, flood	Existing	PP, NR
Douglas County-13	120,000 gallon Water Cistern installed at the USFS Work Station at Hwy 67 and Rampart Range Road	Medium	Wildfire	Existing	PR,PP,NR
City of Castle Pines-1	Repair flooding hazard at Monarch Blvd. and Stonemont Dr.	High	Flood: localized stormwater	Existing	PP
City of Castle Pines-2	Wildfire prevention and preparation	Medium	Wildfire	Both	PR, PP
Town of Castle Rock-1	Supporting development and distribution of Douglas County citizen disaster preparedness guide	Medium	Thunderstorms, lightning, winter storms & extreme cold, floods, tornadoes, wildfires, hazardous materials, earthquake	Both	PI
Town of Castle Rock-2	Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS) Update	High	Flood	Both	PR
Town of Castle Rock-3	Stream Stabilization and Flood Control on Major Drainageways	High	Flood/Soil Hazards: Erosion & Deposition	Both	ST. NR

Jurisdiction-Action Number	Action Title	Priority	Hazard	Address Current or Future Development	CRS Category*
Town of Castle Rock-4	Plum Creek /North Meadows Extension Flood Erosion Protection-Storm Drainage System	High	Flood/Soil Hazards: Erosion & Deposition	Both	ST. NR
Town of Castle Rock-5	Crystal Valley Stormwater Collection Re-design	High	Flood/Soil Hazards: Erosion & Deposition	Both	ST. NR
Town of Castle Rock-6	Woodlands/Escavera Wildland Mitigation Program	High	Wildfire	Both	PR, PP
Town of Larkspur-1	Create an east-west fire break along the pipeline construction	High	Wildfire	Both	PR, PP
Town of Larkspur-2	Establishing a fire break along the new Town of Larkspur water line (East-West fire break) crossing the property of the American Federation of Human Rights	High	Wildfire	Both	PR,PP
Town of Larkspur-3	Mitigation Along East Plum Creek from north end to the south end of the Town of Larkspur	Medium	Flood Wildfire	Future	PR, PP, NR
Town of Larkspur-4	Mitigation Along East town limits of the Town of Larkspur	Medium	Wildfire	Future	PR
Town of Larkspur-5	Complete Wildfire Mitigation on the south side of Perry Park Ave from center of Town to the Larkspur Elementary	Low	Wildfire	Current	PR, PP
Town of Larkspur-6	Complete Wildfire Mitigation from Fox Farm Rd to Spruce Mountain Rd	Low	Wildfire	Future	PR, PP
Town of Larkspur-7	Complete Wildfire Mitigation from Spruce Mountain Rd to Fox Farm Rd	Low	Wildfire	Current	PR, PP
Town of Larkspur-8	Establishing a fire break along the new Town of Larkspur water line and water tanks	High	Wildfire	Both	S, ES
Town of Larkspur-9	Assessment of Yogi Bear's Jellystone Park and RV Camp to determine mitigation needs and to establish evacuation routes	High	Wildfire/Flood	Current	ES, PP
Town of Larkspur-10	Water share with the U. S. Forest Service, Pike National Forest, Rampart Range Area	High	Wildfire	Both	S, ES

Jurisdiction-Action Number	Action Title	Priority	Hazard	Address Current or Future Development	CRS Category*
Town of Larkspur-11	Supporting development and distribution of Douglas County citizen disaster preparedness guide	Medium	Thunderstorms, lightning, winter storms & extreme cold, floods, tornadoes, wildfires, hazardous materials, earthquake	Both	PI
City of Lone Tree-1	Drought mitigation development management techniques	Medium	Drought	Both	PR, NR
City of Lone Tree-2	Implementation of zoning and development regulations and grading/drainage plans to mitigate flooding	Medium	Flood	Both	PR, PP
City of Lone Tree-3	Implement winter storm management plans	Medium	Winter storm	Both	PR, PP
City of Lone Tree-4	Wildfire prevention and preparation	Medium	Wildfire	Both	PR, PP
City of Lone Tree-5	Hazardous materials cross training for first responders	Medium	Hazardous materials	Both	ES
Town of Parker-1	Create emergency action plan for contamination of water stored in Reuter-Hess Reservoir	High	Hazardous materials	Existing	NR
Town of Parker-2	Storm Ready designation	Medium	Flood, thunderstorms, lightning, hail, severe winter storms	Both	PR, PP, ES
Denver Water-1	Flood inundation maps	High	Flood: dam failure	Both	PR, PP
Denver Water-2	Watershed protection	High	Wildfire	Both	PR, PP, NR
Denver Water-3	Training/exercising at Foothills Treatment Plant	Medium	Wildfire	Existing	ES
Denver Water-4	Public education and outreach	Medium	Dam failure, drought	Both	PI
Denver Water-5	Sediment removal from Strontia Springs Reservoir	Low to Medium	Flood: dam failure	Both	PR, PP

Jurisdiction-Action Number	Action Title	Priority	Hazard	Address Current or Future Development	CRS Category*
Denver Water-6	Defensible space in Waterton Canyon	Low to medium	Wildfire	Both	PR, PP

*PR = prevention, PP = property protection, S = structural, NR = natural resource protection, ES = emergency services, PI = public information

Multi-jurisdictional Action #1

Action Title:	**Public awareness – citizen disaster preparedness guide**
Jurisdiction:	Multi-jurisdictional
Hazard:	Thunderstorms/lightning/winter storms & extreme cold/floods/tornadoes/wildfires/hazardous materials/earthquake
Priority:	Medium, Ongoing
Project Description, Issue & Background:	Revise and Update the Citizen Preparedness Guide using a new format with a focus on disaster preparedness for all Douglas County Citizens. Components include Warning systems, Citizen Information, Preparing a Family Disaster Plan, Stockpile Checklist, Shelter & Recovery, Access & Functional Needs, Pet Preparedness and Evacuation, Thunderstorms & Lightning, Winter Storms & Extreme Cold, Floods, Tornadoes, Wildfires, Terrorism, Active Shooter, Public Health Emergency, Pandemic Flu, Hazardous Materials, and Helpful Resources. Printed and electronic versions available as well as an application for smart phones.
Ideas for Implementation:	Production and distribution of 5000 printed copies and 5000 smartphone copies summer of 2015. Continue standard order of 5000 printed versions and 5000 smartphone versions annually over subsequent 4 years.
Other Alternatives:	No action
Responsible Agency:	DC OEM
Partners:	DC FFESS, DC Public Affairs, DCSO Community Resources
Potential Funding:	Douglas County
Cost Estimate:	$52,906.91 annually
Benefits: (Losses Avoided)	Informative preparedness piece for citizens of Douglas County and other participating jurisdictions
Timeline:	Q2 2015 distribution and annually thereafter
Status:	New in 2015

Douglas County Action #1

Action Title:	**Environmental assessments for small NRCS dams**
Jurisdiction:	Douglas County
Hazard:	Dam failure
Priority:	Medium
Project Description, Issue & Background:	There are about 30 small dams owned by the NRCS in the County. Most are over 50 years old and are located on Cherry Creek. This project would develop Environmental Assessments of the dams to determine if they still function as intended or need repair or rehabilitation.
Ideas for Implementation:	Part of Franktown project
Other Alternatives:	No action
Responsible Agency:	Douglas County Engineering
Partners:	NRCS
Potential Funding:	County and NRCS funds already in hand for EA Design Construction
Cost Estimate:	$1.2 million
Benefits: (Losses Avoided)	Reduce erosion, flooding, improve water quality, mostly unincorporated Parker downstream; could also benefit areas of potential new development
Timeline:	Implement 2015 – 2025
Status:	New in 2015

Douglas County Action #2

Action Title:	**Flood hazard inventory tool**
Jurisdiction:	Douglas County
Hazard:	Flooding
Priority:	Medium
Project Description, Issue & Background:	Connect flood response to Inventory Tool and develop a flood response plan for the County. The Inventory Tool will connect to the County's GIS system.
Ideas for Implementation:	
Other Alternatives:	No action
Responsible Agency:	Douglas County Public Works
Partners:	Urban Drainage and Flood Control District (UDFCD)
Potential Funding:	UDFCD
Cost Estimate:	$150,000
Benefits: (Losses Avoided)	Provide early notice to the public for flood events
Timeline:	2015 – 2020
Status:	New in 2015

Douglas County Action #3

Action Title:	**Highline Canal studies for stormwater runoff and improvement**
Jurisdiction:	Douglas County
Hazard:	Localized stormwater flooding
Priority:	High
Project Description, Issue & Background:	The Highline Canal is being decommissioned by Denver Water as infrastructure for water transport in the metro area. Fifteen miles of the canal traverses the County. A feasibility study has been completed that shows it could be repurposed for stormwater quality and quantity enhancements. There is a need for a Douglas County specific study to assess stormwater and recreational benefits and who would be responsible for managing and maintaining the repurposed canal.
Ideas for Implementation:	
Other Alternatives:	No action
Responsible Agency:	Douglas County Public Works
Partners:	Denver Water, UDFCD, developers
Potential Funding:	Denver Water, UDFCD, developers
Cost Estimate:	$200k for design
Benefits: (Losses Avoided)	Water quality enhancement Reduce flooding in unincorporated Douglas County. It would also benefit new development in the area of Roxborough near US 85
Timeline:	2015 – 2018
Status:	New in 2016

Douglas County Action #4

Action Title:	**Plum Creek geomorphological assessment**
Jurisdiction:	Douglas County
Hazard:	Erosion and deposition/flood
Priority:	Medium
Project Description, Issue & Background:	Plum Creek has a history of problems with aggradation and erosion. This project entails a geomorphological study to identify stability problems with Plum Creek and recommend alternatives for stream restoration/stabilization.
Ideas for Implementation:	
Other Alternatives:	No action
Responsible Agency:	Douglas County Public Works
Partners:	UDFCD
Potential Funding:	UDFCD
Cost Estimate:	$100,000
Benefits: (Losses Avoided)	Reduced potential for infrastructure damage; improved flood flow capacity.
Timeline:	2015 – 2017
Status:	New in 2015

Douglas County Action #5

Action Title:	**Continue to implement fuels management strategies identified on Douglas County properties**
Jurisdiction:	Multi-jurisdictional
Hazard:	Wildfire
Priority:	High
Project Description, Issue & Background:	The management strategies for County-Owned lands categorized as forested properties include a hazardous fuels reduction component as part of a larger forest management /forest restoration strategy for protection of the property, the financial investment of tax payers, the natural resources values as well as social, recreational, and intrinsic values. Management strategies for smaller properties in hazardous subdivisions contain a hazardous fuels reduction component where appropriate. Implementation projects are guided by hazard analysis, the Douglas County CWPP and the current process for approval and implementation with Douglas County Open Space and Natural Resources. The County maintains a spreadsheet of county-owned properties that have the potential for mitigation action. Mitigation actions may include hand work, equipment work, County work, contractor work, and prescribed fire.
Ideas for Implementation:	Tie project to existing planning mechanisms and resources such as the Douglas County CWPP and other CWPPs in the planning area; Other related plans include: • County Forest Management Plan for Spruce Mountain Open Space • County Forest Management Plan for Dawson Butte Ranch Open Space (in development) • Annual work plan
Other Alternatives:	No action
Responsible Agency:	Douglas County Open Space and Natural Resources Douglas County Sheriff's Office
Partners:	CSFS, USFS, Denver Water
Cost Estimate:	Variable depending on the treatment type and extent
Benefits: (Losses Avoided)	Reduced wildland fire susceptibility, public safety
Timeline:	Ongoing
Status:	Ongoing

Douglas County Action #6

Action Title:	**Use prescribed fires to protect and enhance resource values**
Jurisdiction:	Douglas County
Hazard:	Wildfire
Priority:	High
Project Description, Issue & Background:	Douglas County can use prescribed fires as a management tool to protect and enhance resource values where appropriate and in concert with additional resource management tools that guide the management activities to meet the goals of the property in question. Prescribed fires implemented by Douglas County have been limited to areas with grass fuels. Prescribed fires in forested areas have been implemented by CSFS and USFS.
Ideas for Implementation:	Tie project to existing planning mechanisms and resources such as the Douglas County CWPP and other CWPPs in the planning area Collaborate with CSFS, USFS, Denver Water, and neighboring counties when prescribed burns are implemented on or near their property.
Other Alternatives:	No action
Responsible Agency:	Douglas County Open Space and Natural Resources, fire protection districts
Partners:	CSFS, USFS, Denver Water, neighboring counties, CDPHE Air Pollution Control Division
Potential Funding:	CSFS/DFPC, Denver Water, USFS
Cost Estimate:	Variable depending on specific project
Benefits: (Losses Avoided)	Protects life and property by mitigating risk and potential magnitude of wildfires in Douglas County and hazardous subdivisions identified in the Douglas County CWPP. Provides wildland firefighting training to fire service personnel.
Timeline:	Ongoing
Status:	Ongoing

Douglas County Action #7

Action Title:	**Commodity flow along major highways in Douglas County**
Jurisdiction:	Douglas County
Hazard:	Hazardous materials
Priority:	High
Project Description, Issue & Background:	This project would request and obtain a hazardous materials commodity flow study to determine what is being transported along Douglas County roadways. This study would read placards on vehicles along I-25, E-470, C-470, Highway 85, and Highway 83 for a designated period of time.
Ideas for Implementation:	There are consultants that specialize in Hazardous Materials reporting; RFP would be posted.
Other Alternatives:	No action
Responsible Agency:	DCSO
Partners:	CSP, local law enforcement, local fire departments, LEPC
Potential Funding:	Douglas County
Cost Estimate:	$20,000
Benefits: (Losses Avoided)	Information would be shared with first responders within Douglas County Fire Districts and Municipalities so training can be developed for response to specific hazardous materials.
Timeline:	2018
Status:	Ongoing

Douglas County Action #8

Action Title:	**Hazardous materials public education TV PSA**
Jurisdiction:	Douglas County
Hazard:	Hazardous materials
Priority:	Medium
Project Description, Issue & Background:	Develop a series of Hazardous Materials Public Service Announcements. PSA Topics: #1 - Reassurance for DC citizens that while this is a topic to be mindful of, there is no need for alarm. DC local, State & Federal agencies and first responders as well as area businesses and railroads are working together to enhance preparedness and response for any hazardous materials release. #2 – Railroad, Water Treatment Safety & Preparedness Overview #3 – Sheltering In Place
Ideas for Implementation:	
Other Alternatives:	No action
Responsible Agency:	DCSO
Partners:	DC Public Affairs, LEPC
Potential Funding:	Douglas County
Cost Estimate:	$15,000
Benefits: (Losses Avoided)	Public Education
Timeline:	Develop one annually between 2016 and 2018
Status:	New in 2015

Douglas County Action #9

Action Title:	**Debris management plan development**
Jurisdiction:	Douglas County
Hazard:	Erosion and deposition/flood/wildfire/tornado
Priority:	High
Project Description, Issue & Background:	The Debris Management Plan will be developed beginning Q3 2015, completion scheduled for Q2 2016. The Debris Management Plan is used following a large scale disaster such as flooding or a tornado. These events tend to have an extraordinary amount of debris and trash associated with them to the extent that a plan is needed for managing the waste.
Ideas for Implementation:	Collaborative effort between numerous agencies and Douglas County departments.
Other Alternatives:	No action
Responsible Agency:	DC OEM
Partners:	DC FFESS, DC PW Operations, DC Open Space, TCHD, DC Waste Management Provider, Utilities, DC PIO, DC County Administration, DC Planning & Zoning, DC Finance.
Potential Funding:	Douglas County
Cost Estimate:	$10,000
Benefits: (Losses Avoided)	Detailing in advance a coordinated and collaborative effort between all parties reduces response time and enhances recovery.
Timeline:	2016
Status:	New in 2015

Douglas County Action #10

Action Title:	**Facility retrofit for generator back-up**
Jurisdiction:	Douglas County
Hazard:	Flood/wildfire/severe winter weather/hail/lightning/tornado/thunderstorms
Priority:	Low
Project Description, Issue & Background:	Douglas County has identified three facilities that provide critical support for the overall response and continuation of DC Government mission essential services. These designated facilities would be retro-fit to allow for emergency generator power. This project includes the purchase of two 50 kw generators on trailers so the generators can be transported and "plugged" in at all facilities equipped with the appropriate receptacles.
Ideas for Implementation:	Installation of receptacles in 3 facilities by Facilities electricians and purchase of 2 portable 50kw generators.
Other Alternatives:	No action
Responsible Agency:	Facilities, Fleet & Emergency Support Services
Partners:	DC OEM
Potential Funding:	Douglas County
Cost Estimate:	$215,000
Benefits: (Losses Avoided)	Support for ongoing critical infrastructure/facilities in Douglas County. Continuity of government mission essential functions.
Timeline:	2016
Status:	New in 2015

Douglas County Action #11

Action Title:	**Evacuation plan revision and execution**
Jurisdiction:	Douglas County
Hazard:	Flood/dam failure/wildfire/thunderstorms/tornado/hazardous materials
Priority:	High
Project Description, Issue & Background:	DCSO began development on the Emergency Operations Plan Evacuation Annex in 2012 as a response to lessons learned by Colorado Springs PD during the Waldo Canyon Fire. The Evacuation Annex is partially complete and will be completed in phases over the next 3 years.
Ideas for Implementation:	Revisions and updates annually.
Other Alternatives:	No action
Responsible Agency:	DC OEM
Partners:	Fire Districts, Law Enforcement
Potential Funding:	Douglas County
Cost Estimate:	$10,000
Benefits: (Losses Avoided)	Efficient evacuation enhances public safety and the safety of the first responders.
Timeline:	Annually
Status:	Ongoing

Douglas County Action #12

Action Title:	**Horse Creek stream stabilization**
Jurisdiction:	Douglas County
Hazard:	Erosion and deposition/flood
Priority:	Medium
Project Description, Issue & Background:	Horse Creek is a tributary of the South Platte River that drains the Hayman Burn area. Stream stability and erosion has been an issue for many years. The erosion and deposition affects Denver Water supply, including Strontia Springs reservoir, and fish habitat. Newer private driveway culverts are inadequate and prone to washout, complicating erosion problems.
Ideas for Implementation:	Education A geomorphological study was completed by Dr. Rosgen to identify stability problems with creek. The study recommend alternatives for stream restoration/stabilization. The stream stabilization project will build off the recommended alternatives.
Other Alternatives:	No action
Responsible Agency:	Douglas County Public Works
Partners:	Douglas County, National Forest Foundation, Denver Water, USFS
Potential Funding:	NFF, EPA, Denver Water
Cost Estimate:	$250,000
Benefits: (Losses Avoided)	Stream habitat / fisheries Public safety
Timeline:	2017 – 2020
Status:	New in 2015

Douglas County Action #13

Action Title:	**120,000 gallon Water Cistern installed at the USFS Work Station at Hwy 67 and Rampart Range Road**
Jurisdiction:	Douglas County
Hazard:	Wildfire
Priority:	Medium
Project Description, Issue & Background:	Douglas County would like to put a 120,000 gallon water cistern at the USFS Work Station to assist the West Douglas Fire Protection District in fire suppression along Highway 67. A significant water source located at this workstation would help with fire suppression in this heavily wooded area of the Pike National Forest. There are numerous homes and businesses located in the area, including those located in Moon Ridge, Sprucewood, the Round-up Ranch (which has 1400 children visit annually) and the Silverstate Youth Camp (which has 3000 children visit annually). Water supply is always limited in this area, and an ISO-approved water tank could also have a positive impact on insurance costs for the residents and businesses in that area.
Ideas for Implementation:	Collaborate with USFS and West Douglas Fire Protection District to improve water supply for fire suppression in this remote area.
Other Alternatives:	No action
Responsible Agency:	Douglas County Facilities, Fleet & Emergency Support Services.
Partners:	Douglas County OEM, West Douglas Fire Protection District and the USFS.
Potential Funding:	Douglas County, USFS, PILT funding.
Cost Estimate:	$200,000
Benefits: (Losses Avoided)	Protects life and property by providing a year-round water supply strategically located in an area that traditionally doesn't have a natural supply.
Timeline:	Ongoing (2015 – 2019)
Status:	Ongoing

6 PLAN ADOPTION

Requirement §201.6(c)(5): [The local hazard mitigation plan shall include] documentation that the plan has been formally approved by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, county commissioner, Tribal Council).

The purpose of formally adopting this plan is to secure buy-in from Douglas County and participating jurisdictions, raise awareness of the plan, and formalize the plan's implementation. The adoption of this plan completes Planning Step 9 of the 10-step planning process: Adopt the Plan, in accordance with the requirements of DMA 2000. The governing board for each participating jurisdiction has adopted this Local Hazard Mitigation Plan by passing a resolution. A copy of the generic resolution and the executed copies are included in Appendix D: Adoption Resolutions.

7 PLAN IMPLEMENTATION AND MAINTENANCE

Requirement §201.6(c)(4): [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.

Implementation and maintenance of the plan is critical to the overall success of hazard mitigation planning. This is Planning Step 10 of the 10-step planning process. This chapter provides an overview of the overall strategy for plan implementation and maintenance, and outlines the method and schedule for monitoring, updating, and evaluating the plan. The chapter also discusses incorporating the plan into existing planning mechanisms, and how to address continued public involvement.

Section 3.0 Planning Process includes information on the implementation and maintenance process since the 2010 Regional Plan was adopted. This section includes information on the implementation and maintenance process for this plan update.

7.1 Implementation

Implementation and maintenance are critical to the mitigation plan's overall success. While this plan contains many worthwhile actions, the participating jurisdictions will need to decide which action(s) to undertake first. Two factors will help with making that decision: the priority assigned the actions in the planning process, and funding availability. Low or no-cost actions most easily demonstrate progress toward successful plan implementation.

An important implementation mechanism that is highly effective and low-cost is incorporation of the hazard mitigation plan recommendations and their underlying principles into other plans and mechanisms, such as the comprehensive plans and community wildfire protection plans for Douglas County and participating jurisdictions. The County and participating jurisdictions implement policies and programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through these other program mechanisms.

Mitigation is most successful when it is incorporated into the day-to-day functions and priorities of government and development. Implementation will be accomplished by adhering to the schedules identified for each action and through constant, pervasive, and energetic efforts to network and highlight the multi-objective, win-win benefits to each program and the Douglas County community and its stakeholders. This effort is achieved through the routine actions of monitoring agendas, attending meetings, and promoting a safe, sustainable community. Additional mitigation strategies could include consistent and ongoing enforcement of existing

policies and vigilant review of programs for coordination and multi-objective opportunities. Simultaneous to these efforts, it is important to maintain a constant monitoring of funding opportunities that can be leveraged to implement some of the more costly recommended actions.

This will include creating and maintaining a bank of ideas on how to meet local match or participation requirements. When funding does become available, the participating jurisdictions will be in a position to capitalize on the opportunity. Funding opportunities to be monitored include special pre- and post-disaster funds, state and federal earmarked funds, benefit assessments, and other grant programs, including those that can serve or support multi-objective applications.

7.1.1 Role of Hazard Mitigation Planning Committee in Implementation and Maintenance

By virtue of adopting this plan, the participating jurisdictions are responsible for plan implementation and maintenance. The participating jurisdictions, led by the Douglas County Fleet Services and OEM, will reconvene the HMPC for plan implementation and maintenance. This HMPC will be the same committee (in form and function, if not actual individuals) that developed this LHMP Update, and will also be responsible for the next formal update to the plan in five years. The HMPC will:

- Act as a forum for hazard mitigation issues;
- Disseminate hazard mitigation ideas and activities to all participants;
- Pursue the implementation of high-priority, low/no-cost recommended actions;
- Ensure hazard mitigation remains a consideration for community decision makers;
- Maintain regular monitoring of multi-objective cost-share opportunities to help the community implement the plan's recommended actions for which no current funding exists;
- Monitor and assist in implementation and update of this plan;
- Report on plan progress and recommended changes to the various governing boards or councils of all participating jurisdictions; and
- Inform and solicit input from the public.

The primary duty of the participating jurisdictions is to see the plan successfully carried out, and to report to their community governing boards and the public on the status of plan implementation and mitigation opportunities. Other duties include reviewing and promoting mitigation proposals, considering stakeholder concerns about hazard mitigation, passing concerns on to appropriate entities, and posting relevant information on the County website (and others as appropriate).

7.2 Maintenance

Plan maintenance implies an ongoing effort to monitor and evaluate plan implementation and to update the plan as progress, roadblocks, or changing circumstances are recognized.

7.2.1 Maintenance Schedule

Douglas County Fleet Services and OEM is responsible for initiating plan reviews and consulting with the other participating jurisdictions. In order to monitor progress and update the mitigation strategies identified in the action plan, Douglas County Fleet Services, OEM, and the standing HMPC will conduct an annual review of this plan and/or following a hazard event. The recommended timing of the annual review is each October. An annual evaluation report will be prepared by the HMPC. Further, the HMPC will submit a five-year written update to the State DHSEM and FEMA Region VIII, unless disaster or other circumstances (e.g., changing regulations) require a change to this schedule.

7.2.2 Maintenance Evaluation Process

Evaluation of progress can be achieved by monitoring changes in vulnerabilities identified in the plan. Changes in vulnerability can be identified by noting:

- Decreased vulnerability as a result of implementing recommended actions;
- Increased vulnerability as a result of failed or ineffective mitigation actions; and/or
- Increased vulnerability as a result of new development (and/or annexation).

Updates to this plan will:

- Consider changes in vulnerability due to action implementation;
- Document success stories where mitigation efforts have proven effective;
- Document areas where mitigation actions were not effective;
- Document any new hazards that may arise or were previously overlooked;
- Incorporate new data or studies on hazards and risks;
- Incorporate new capabilities or changes in capabilities;
- Incorporate growth and development-related changes to infrastructure inventories; and
- Incorporate new action recommendations or changes in action prioritization.

In order to best evaluate any changes in vulnerability as a result of plan implementation, the participating jurisdictions will adhere to the following process:

- A representative from the responsible office identified in each mitigation measure will be responsible for tracking and reporting on an annual basis to the jurisdictional lead on action status and provide input on whether the action as implemented meets the defined objectives and is likely to be successful in reducing vulnerabilities.
- If the action does not meet identified objectives, the jurisdictional lead will determine what additional measures may be implemented, and an assigned individual will be responsible for defining action scope, implementing the action, monitoring success of the action, and making any required modifications to the plan.

Changes will be made to the plan to accommodate for actions that have failed or are not considered feasible after a review of their consistency with established criteria, time frame, community priorities, and/or funding resources. Actions that were not ranked high but were identified as potential mitigation activities will be reviewed as well during the monitoring and update of this plan to determine feasibility of future implementation. Plan updates will be by written changes and submissions, as the HMPC deems appropriate and necessary, and as approved by the appropriate governing boards or councils of the other participating jurisdictions. In keeping with the five-year update process, the HMPC will convene public meetings to solicit public input on the plan and its routine maintenance and the final product will be adopted by the governing boards or councils.

7.2.3 Incorporation into Existing Planning Mechanisms

Another important implementation mechanism that is highly effective and low-cost is incorporation of the hazard mitigation plan recommendations and their underlying principles into other County and city plans and mechanisms. Where possible, plan participants will use existing plans and/or programs to implement hazard mitigation actions. As previously stated in Section 7.1 of this plan, mitigation is most successful when it is incorporated into the day-to-day functions and priorities of government and development. This point is re-emphasized here. As described in this plan's capability assessment, the County and participating jurisdictions already implement policies and programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through these other program mechanisms. These existing mechanisms include:

- County and city/town Comprehensive and master plans
- County and city/town emergency operations plans
- County and city/town ordinances
- Flood/stormwater management/master plans
- Community Wildfire Protection plans
- Capital improvement plans and budgets
- Other plans and policies outlined in the capability assessments in the jurisdictional annexes
- Other plans, regulations, and practices with a mitigation focus

HMPC members involved in these other planning mechanisms will be responsible for integrating the findings and recommendations of this plan with these other plans, programs, etc, as appropriate. As described in Section 7.1 Implementation, incorporation into existing planning mechanisms will be done through the routine actions of:

- Monitoring other planning/program agendas;
- Attending other planning/program meetings;
- Participating in other planning processes; and

- Monitoring community budget meetings for other community program opportunities.

The successful implementation of this mitigation strategy will require constant and vigilant review of existing plans and programs for coordination and multi-objective opportunities that promote a safe, sustainable community.

Examples of how the Local Hazard Mitigation Plan has already been incorporated into existing planning mechanisms is discussed in Section 3.0 Planning Process. Other examples include:

1) Integration of flood actions identified in this mitigation strategy with the actions and implementation priorities established in existing Stormwater Drainage Plans.
2) Integration of Wildfire actions identified in this mitigation strategy with the actions and implementation priorities established in existing Community Wildfire Protection Plans.
3) Inform the development of debris management plans and resource mobilization plans.
4) Using the risk assessment information to continue to update the hazard analysis in the Douglas County Emergency Operations Plan.

Efforts should continuously be made to monitor the progress of mitigation actions implemented through these other planning mechanisms and, where appropriate, their priority actions should be incorporated into updates of this hazard mitigation plan.

7.2.4 Continued Public Involvement

Continued public involvement is imperative to the overall success of the plan's implementation. The update process provides an opportunity to solicit participation from new and existing stakeholders and to publicize success stories from the plan implementation and seek additional public comment. The plan maintenance and update process will include continued public and stakeholder involvement and input through attendance at designated committee meetings, web postings, press releases to local media, and through public hearings. The regular Public Safety Advisory Committee meetings will be another avenue to continue public involvement and discourse related to this plan, which includes participation from all communities. Public outreach and involvement related to the County's and Parker's CRS program participation is another example.

When the HMPC reconvenes for the update, they will coordinate with all stakeholders participating in the planning process—including those that joined the committee since the planning process began—to update and revise the plan. In reconvening, the HMPC plans to identify a public outreach subcommittee, which will be responsible for coordinating the activities necessary to involve the greater public. The subcommittee will develop a plan for public involvement and will be responsible for disseminating information through a variety of media channels detailing the plan update process. As part of this effort, a series of public meetings will be held, and public comments will be solicited on the plan update draft. The steering committee of the HMPC, which is made up of seven members of the public and floodplain managers from each community, will also be reconvened during the next update.

Annex A CITY OF CASTLE PINES

A.1 Introduction

This annex details the hazard mitigation planning elements specific to the City of Castle Pines, a participating jurisdiction to the Douglas County LHMP Update. This annex is not intended to be a standalone document, but appends to and supplements the information contained in the base plan document. As such, all sections of the base plan, including the planning process and other procedural requirements apply to and were met by the City. This annex provides additional information specific to the City of Castle Pines, with a focus on providing additional details on the risk assessment and mitigation strategy for this community.

A.2 Planning Process

As described above, the City of Castle Pines followed the planning process detailed in Section 3.0 of the base plan. In addition to providing representation on the Douglas County Hazard Mitigation Planning Committee (HMPC), the City formulated their own internal planning team to support the broader planning process requirements. Internal planning participants included staff from the following City departments:

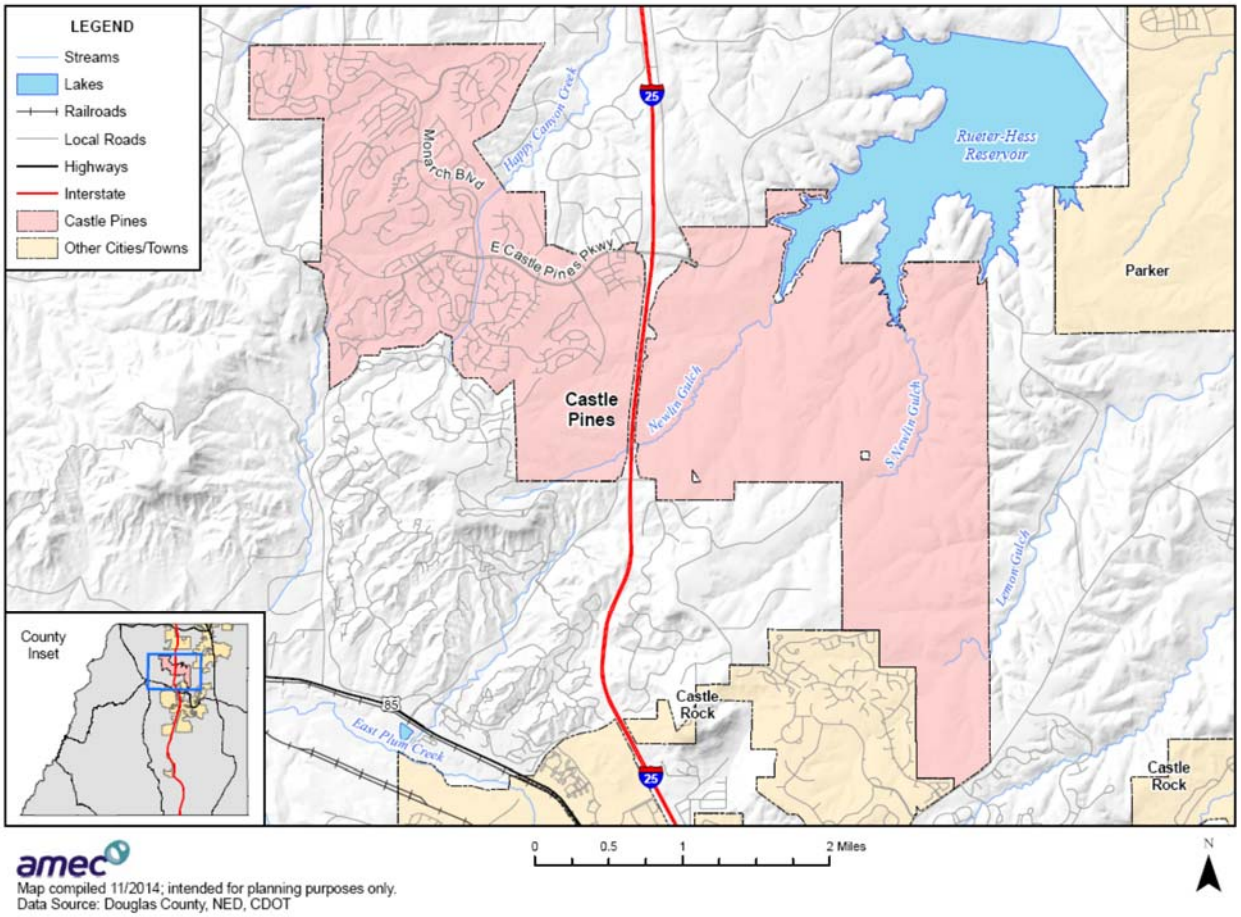
- Brad Meyering, Public Works
- Don Van Wormer, City Manager

Additional details on plan participation and City representatives are included in Appendix A.

A.3 Community Profile

The community profile for the City of Castle Pines is detailed in the following sections. Figure A.1 displays a map and the location of the City of Castle Pines within Douglas County.

Figure A.1. City of Castle Pines Base Map



A.3.1 Geography and Location

The City of Castle Pines is set at the base of Daniels Park and situated on 2,433 acres of upland Ponderosa Pine, shrub lands, and grassy plains. The City is bisected by Interstate 25. The land consists of a wide range of topography encompassing mountain vistas, dramatic ridgelines, hills, and grass covered plains.

Because of the City's close proximity to the Denver metro area and multi-modal transportation facilities, the area is attractive to new residents. The lands surrounding Castle Pines include Cherokee Ranch and Daniels Park primarily to the west, Highlands Ranch Open Space Conservation Area to the north, open space and agricultural lands to the east, and agricultural lands to the south, which serve as a physical boundary between the City, Castle Pines Village, and Castle Rock.

A.3.2 History

The City of Castle Pines North was incorporated in February 2008. Although the City government is fairly new, residents have been established in the area since the early 1980s, when the first subdivision was platted in unincorporated Douglas County. During this time, the area began a fast growth period during the 1980s, with an historic population of a few thousand, and then slowed down in growth during the early 1990s. In the late 1990s and early 2000s, the population began to increase as new housing and adequate infrastructure became available. In November 2010, the residents of Castle Pines voted to drop the term "North" from the City's title.

A.3.3 Economy

The City of Castle Pines supports a healthy balance of economic development and enhanced quality of life for residents. The City has a collaborative relationship with the Castle Pines Chamber of Commerce, a nonprofit organization that supports local businesses and the establishment of new businesses to the area to support the City's growing community.

The City of Castle Pines local economy consists of firms whose economic activity is dependent largely on local economic conditions. The City has a large percentage of retail and service industries located in the Business District. These local firms provide goods and services to community residents. The City of Castle Pines has over 100 established businesses located within the city boundary and a large number of these are located in the Business District. The businesses range in industry sector, with the majority of businesses falling within the service and retail industries.

U.S. Census economic statistics were unavailable for Castle Pines. This is most likely due to the fact that the City was not incorporated until 2008.

A.3.4 Population

The 2013 American Community Survey population estimate for the City (the most recent available) indicates there are 10,471 residents of Castle Pines. The population estimate for the 2010 U.S. Census was 10,360.

A.4 Hazard Identification and Summary

This section details how the risk varies across the Douglas County Planning Area. The City's planning team identified the hazards that affect the City and summarized their frequency of occurrence; spatial extent, potential magnitude, and significance specific to Castle Pines (see Table A.1). In the context of the plan's Planning Area, there are no hazards that are unique to Castle Pines.

Information on past occurrences and the likelihood of future occurrences is detailed in Section 4, Risk Assessment, of the base plan. Additional information for high and medium significant hazards for the City is included in the Vulnerability Assessment section of this Annex.

Table A.1. City of Castle Pines Hazard ID Table

Hazard	Spatial Extent	Likelihood of Future Occurrences	Magnitude /Severity	Significance
Avalanche	Limited	Low	Low	Low
Drought	Extensive	Medium	Low	Low
Earthquake	Extensive	Low	Low	Low
Flood: Dam Failure	Limited	Low	Low	Low
Flood: 100/500 year	Limited	Low	Medium	Medium
Flood: Localized/ Stormwater	Limited	High	Medium	High
Landslides/ Mud & Debris Flows /Rockfalls	Limited	Medium	Medium	Medium
Severe Weather: Extreme Heat	Extensive	Low	Low	Low
Severe Weather: Hail	Significant	Medium	Medium	Medium
Severe Weather: High Winds	Extensive	Medium	Medium	Medium
Severe Weather: Lightning	Limited	Medium	Medium	Medium
Severe Weather: Thunderstorms/Heavy Rains	Extensive	High	Medium	Medium
Severe Weather: Tornado	Limited	Medium	Medium	Medium
Severe Weather: Winter Weather (includes snow/ice/extreme cold)	Extensive	High	High	High
Soil Hazards: Erosion & Deposition	Limited	Medium	Low	Low
Soil Hazards: Expansive Soils	Limited	Low	Low	Low
Soil Hazards: Subsidence	Limited	Low	Low	Low
Wildfire	Extensive	Low	Low	High
Hazardous Materials: Transportation Incidents	Significant	Low	Low	Low

Spatial Extent
Limited: Less than 10% of Planning Area
Significant: 10-50% of Planning Area
Extensive: 50-100% of Planning Area

Likelihood of Future Occurrences
Low: Occurs less than once every 10 years or more
Medium: Occurs less than once every 5 to 10 years
High: Occurs once every year or up to once every five years

Magnitude/Severity
Low: Negligible property damages (less than 5% of all buildings and infrastructure) Negligible loss of quality of life. Local emergency response capability is sufficient to manage the hazard.
Medium: Moderate property damages (15% to 50% of all buildings and infrastructure) Some loss of quality of life. Emergency response capability, economic and geographic effects of the hazard are of sufficient magnitude to involve one or more counties.
High: Property damages to greater than 50% of all buildings and infrastructure. Significant loss of quality of life Emergency response capability, economic and geographic effects of the hazard are of sufficient magnitude to require federal assistance.

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

A.5 Vulnerability Assessment

The intent of this section is to assess Castle Pines' vulnerability separate from that of the Planning Area as a whole, which has already been assessed in Section 4.3 Vulnerability Assessment of the base plan. This vulnerability assessment provides an inventory of the population, property, and other assets located within the City and further analyzes those assets at risk to identified hazards ranked of medium or high significance (as listed in Table A.1) to the community. A brief discussion on erosion was included to compare Castle Pines' exposure to the rest of the Planning Area, despite being ranked low significance to the City. The erosion analysis is discussed in the landslide section. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the main plan.

A.5.1 Total Assets at Risk

This section identifies Castle Pines' total assets at risk, including values at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the community. This data is not hazard specific, but is representative of total assets at risk within a community.

Values at Risk

The following data from the Douglas County Assessor's Office is based on joining assessor data to the 2014 parcel layer in GIS. This data should only be used as an indicator of overall values, as the information has some limitations. Table A.2 summarizes the parcels, improved parcels, structures, improved value, land value, and total value exposed in Castle Pines. It is important to note, in the event of a disaster, it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a loss.

Table A.2. City of Castle Pines Total Exposure

Property Type	Total Parcel Count	Improved Parcel Count	Total Structures Count	Improved Value	Total Land Value	Total Value
Agriculture	170	0	148	$0	$104,288	$104,288
Commercial	45	29	531	$80,733,884	$27,412,958	$108,146,842
Exempt	239	9	72	$36,347,705	$16,427,283	$52,774,988
HOA	241	0	68	$0	$0	$0
Industrial	0	0	0	$0	$0	$0
Producing Mine	0	0	0	$0	$0	$0
Residential	3,408	3,299	3,434	$1,163,462,447	$326,586,676	$1,490,049,123
Utilities	5	0	1	$0	$0	$0
Vacant Land	87	1	66	$719,766	$6,293,210	$7,012,976
Total	**4,195**	**3,338**	**4,320**	**$1,281,263,802**	**$376,824,415**	**$1,658,088,217**

Source: Douglas County Assessor's Data

Critical Facilities and Infrastructure

For purposes of this plan, a critical facility is defined as:

> Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.

This definition was refined by separating out three categories of critical facilities as further described in Section 4.3.1 of the base plan. These categories include At-Risk Populations, Essential Services, and High Potential Loss Facilities.

The Douglas County GIS data shows 18 critical facilities in Castle Pines, summarized in Table A.3 by category, facility type, and facility count.

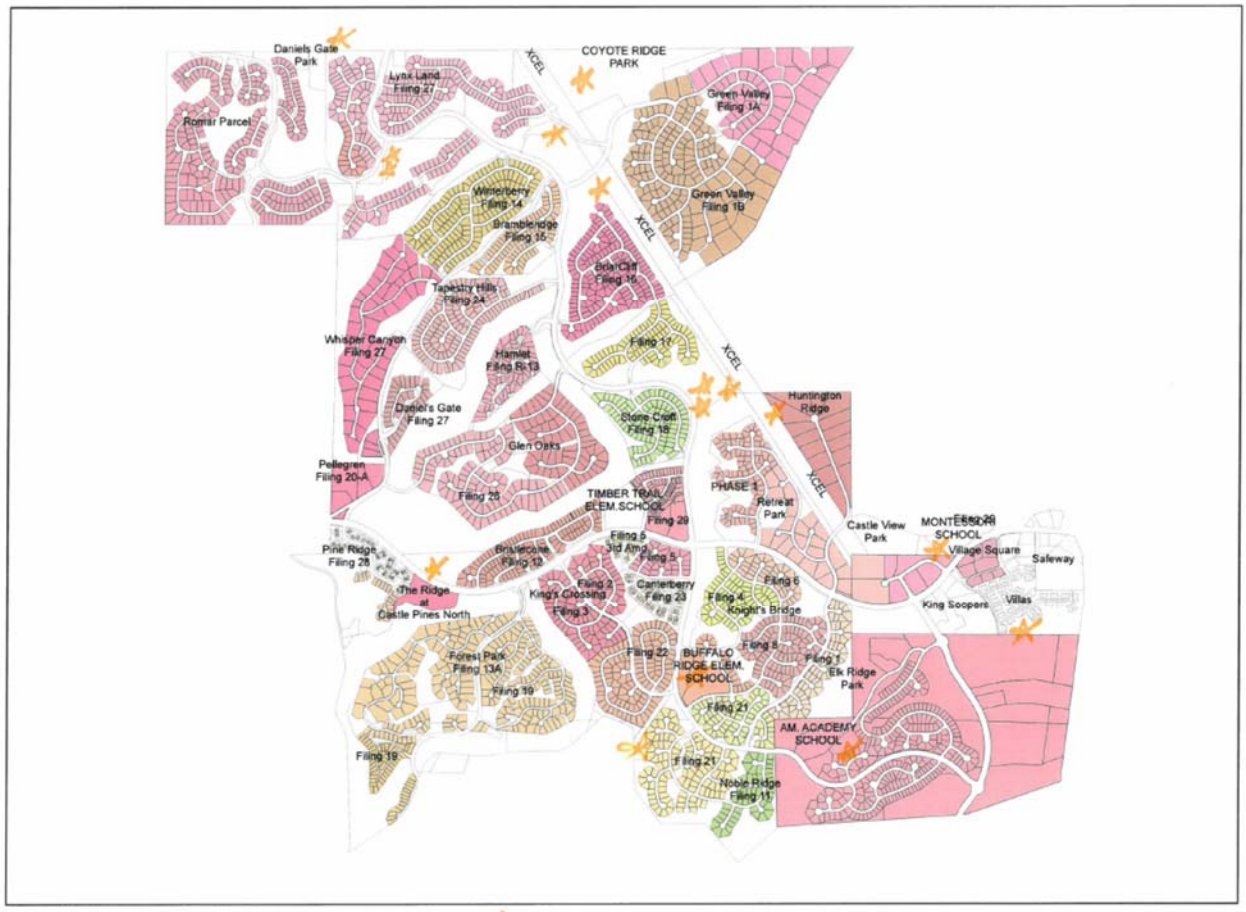
Table A.3. City of Castle Pines Critical Facilities

Category	Type	Facility Count
At-Risk Population Facilities	Assisted Living	1
	School	4
Essential Services Facilities	Cell Tower	3
	Microwave	2
	Water Hub/Treatment	1
High Potential Loss Facilities	Hazardous Material	7
Total		**18**

Source: Douglas County GIS

The approximate location of well heads and water treatment plants in Castle Pines is shown in Figure A.2.

Figure A.2. General Location of Well Heads and Treatment Plants in Castle Pines



Source: City of Castle Pines

Natural Resources

The City of Castle Pines and the areas surrounding it include a rich and diverse range of biological resources.

Vegetation

Because of the largely developed nature of the Castle Pines community, the majority of the City's sensitive resources lie within the dedicated open space areas that form the core of the City's open space system. Sensitive resources generally consist of native plant communities and habitat types, such as trees and shrubs, and natural grasses and other plant life. Another sensitive resource is wetland habitat. Castle Pines contains a number of areas that are protected by tree conservation areas. These areas were identified to protect the native Gambel oak, and other native species from development.

Wildlife Habitat

Castle Pines has two levels of wildlife habitat value. The west portion of the city boundaries contains a high habitat value, and the remaining portions of the boundary contain a moderate habitat value. Wildlife can be found in the open space areas, near watercourses or wetland areas. The neighboring areas of Daniels Park contain significant wildlife resources and are considered a high habitat value with critical habitat areas. The U.S. Fish and Wildlife Service (USFWS) has listed the following species as threatened, which may impact landowners in the City of Castle Pines - Preble's meadow jumping mouse and Ute Ladies Tresses Orchid. The Colorado Butterfly plant has been proposed by the USFWS to be listed as a threatened species.

Wildlife movement corridors are generally narrow strips of habitat that are or can be used by wildlife to move from one area of habitat to another. They are generally undeveloped as a result of floodplain restrictions, and serve as connection points between various blocks of habitat. While there are no delineated wildlife corridors within the City boundaries, the City has a variety of wildlife habitat generally located in the wetland areas, and the open space.

Historic and Cultural Resources

To inventory historic and cultural resources, the HMPC collected information from both the National Register of Historic Places and the Colorado State Register. Each program has different eligibility criteria and procedural requirements. These requirements are detailed in Section 4.3.1 of the base plan. As Castle Pines was only recently incorporated, there are no listed historic properties in the City.

Growth and Development Trends

Past Growth

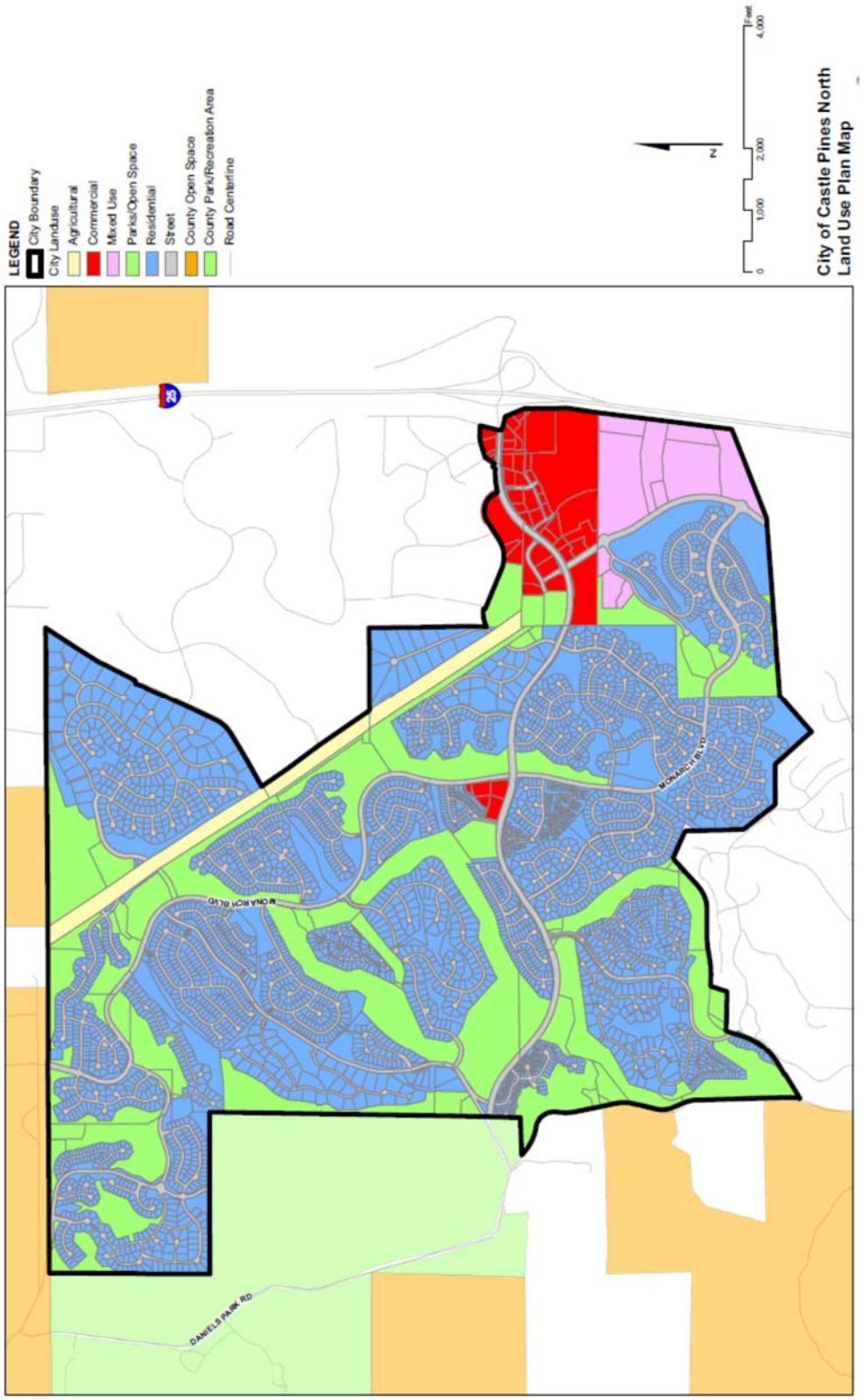
The City's development context consists of a suburban character with a variety of residential densities, mixed uses, with parks, trails, and open space. The history of the City's development and population growth periods are as follows:

- **1980s** - Development throughout the city boundary has been established since the early 1980s. Home construction activity began in the late 1980s. Shortly thereafter, the economic downturn of the late 1980's in combination with the overextension of infrastructure and the bankruptcy of the Castle Pines North Metropolitan District in the early 1990's slowed development considerably for several years
- **1990s** - Financial restructuring, new developer investments and a strong economy enabled home building to increase at a fairly rapid pace through the latter years of the 1990's, bringing the combined total of built residential lots to just over 2,000, roughly one-third of the estimated final build-out. Aggressive platting activity in Castle Pines during 1999 contributed to an inventory of 2,281 platted lots for the City of Castle Pines.

- **Early 2000s** - An additional 357 multifamily residential units were approved in early 2000 as a special use permit on land zoned Business, located south of Castle Pines Parkway near I-25.
- **2008** – The Lagae Ranch Planned Development was approved with an estimated 231 new single-family homes and 400 multi-family units. Construction had not yet been started as of May 2015.

Existing land uses within the City of Castle Pines have been generally urban development. Development within the City consists of planned development residential uses, commercial uses, mixed uses, parks and open space uses. Existing land use is shown in Figure A.3.

Figure A.3. Current Land Use in the City of Castle Pines



Source: 2009 City of Castle Pines North Comprehensive Plan

Table A.4 summarizes the number and value of structures built in Castle Pines from 2010 to 2014 based on a query of the 'year built' values in the County's parcel database. Over 200 structures, with a total value greater than $94 million, were built in that short period of time. The vast majority of these structures were residential, built to accommodate the rapidly growing population in the Planning Area. Additional analysis on recent development in Castle Pines' mapped hazard areas is discussed in the vulnerability assessments for flood, landslide/erosion, and wildfire.

Table A.4. Castle Pines Structures Built from 2010 to 2014: Total Assets by Property Type

Jurisdiction	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Land Value	Total Value
Commercial	2	2	10	$4,741,654	$738,994	$5,480,648
HOA	1	0	2	$0	$0	$0
Residential	191	191	193	$69,880,073	$19,390,250	$89,270,323
Total	**194**	**193**	**205**	**$74,621,727**	**$20,129,244**	**$94,750,971**

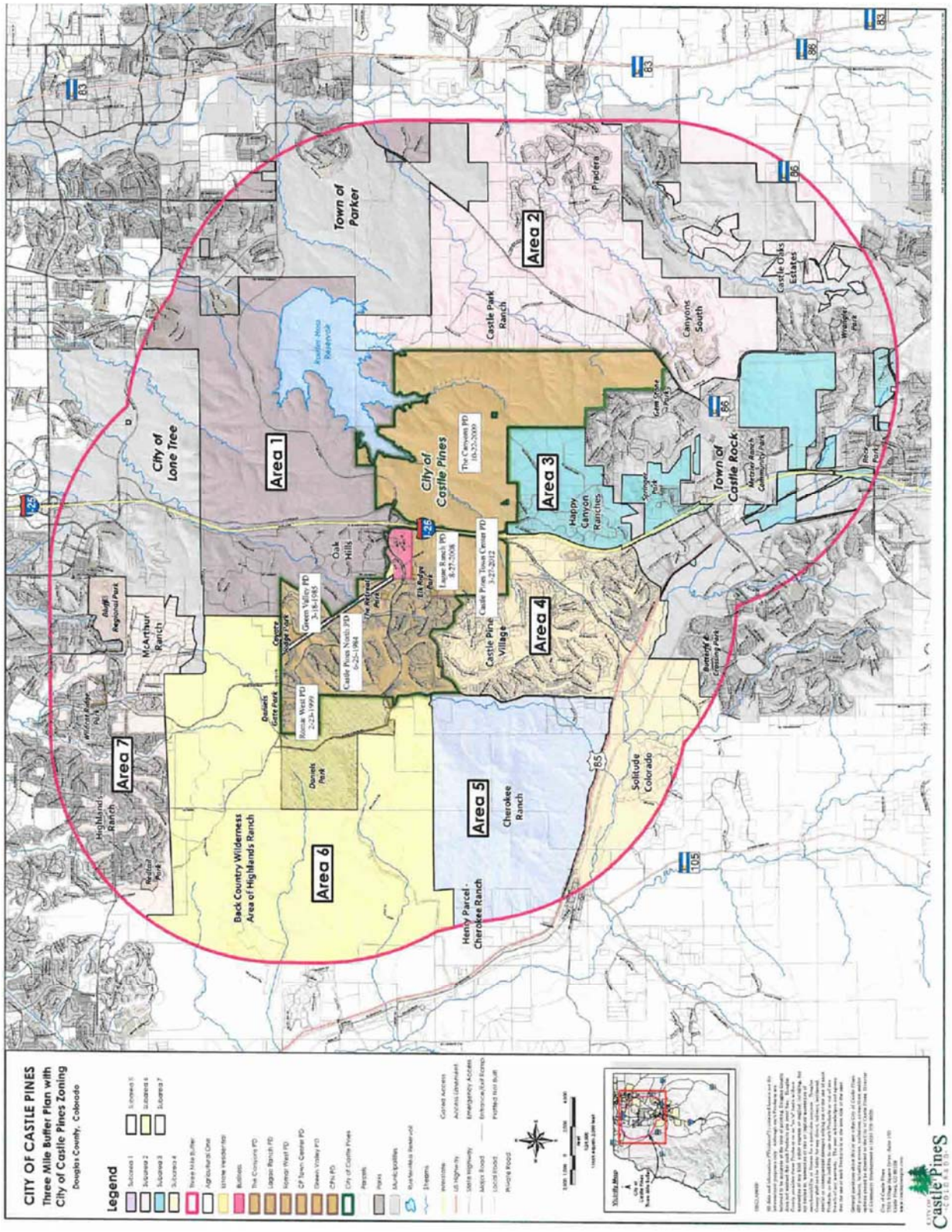
Source: Douglas County

Development Trends

Prior to 2009, it was thought that the City of Castle Pines was fully developed with the exception of Lagae Ranch and a few undeveloped platted lots located mainly in the City's Business District and immediately west at the intersection of Monarch and Castle Pines Parkway. Between 2010 and 2014, the City developed the Three-Mile Plan. The Three-Mile Plan establishes an approach to address future growth and development of land within a three-mile radius of the City's municipal boundaries. The Three-Mile Plan identifies land that may be considered for annexation and provides direction concerning land use and zoning issues, infrastructure needs and municipal services. The plan provides the existing conditions on lands outside of the City's boundaries, with the exception of incorporated lands/municipalities of the City of Lone Tree, the Town of Parker and the Town of Castle Rock. As reflected in the Three-Mile Plan, the City may annex lands subject to negotiation with individual landowners. However, it addresses the issues associated with annexation and provides guidelines, if a private landowner wishes to incorporate private property into the City of Castle Pines.

No lands in the Three-Mile Plan are specifically identified for future land uses. A map of the areas considered in the Three-Mile Plan is shown in Figure A.4.

Figure A.4. City of Castle Pines Three Mile Plan Map



Source: 2014 City of Castle Pines Three Mile Plan

A.5.2 Priority Hazards: Vulnerability Assessment

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table A.1 as high or medium significance hazards. Wildfire was also analyzed to compare Castle Pines' exposure to the rest of the Planning Area, despite being ranked low significance to the City. A brief discussion on erosion was included for the same reason. The erosion analysis is discussed in the landslide section. Impacts of past events and vulnerability of the City to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the base plan for more detailed information about these hazards and their impacts on the Douglas County Planning Area). Methodologies for calculating loss estimates are the same as those described in Section 4.3 of the base plan.

An estimate of the vulnerability of the City to each identified hazard, in addition to the estimate of risk of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.

Flood: 100/500 year

Vulnerability to Flood: 100/500 year

Likelihood of Future Occurrence—Low
Potential Magnitude—Medium
Overall Vulnerability—Medium

Castle Pines has limited mapped flood hazard areas and does not have any structures located in a flood zone. No structures or people are exposed to 100/500-year flooding within City limits. Figure A.5 through Figure A.7 depict the location of flood hazards, critical facilities, and properties affected by flooding in Castle Pines. Note that no properties or critical facilities are affected by flooding.

Figure A.5. City of Castle Pines FEMA Flood Hazard Zones

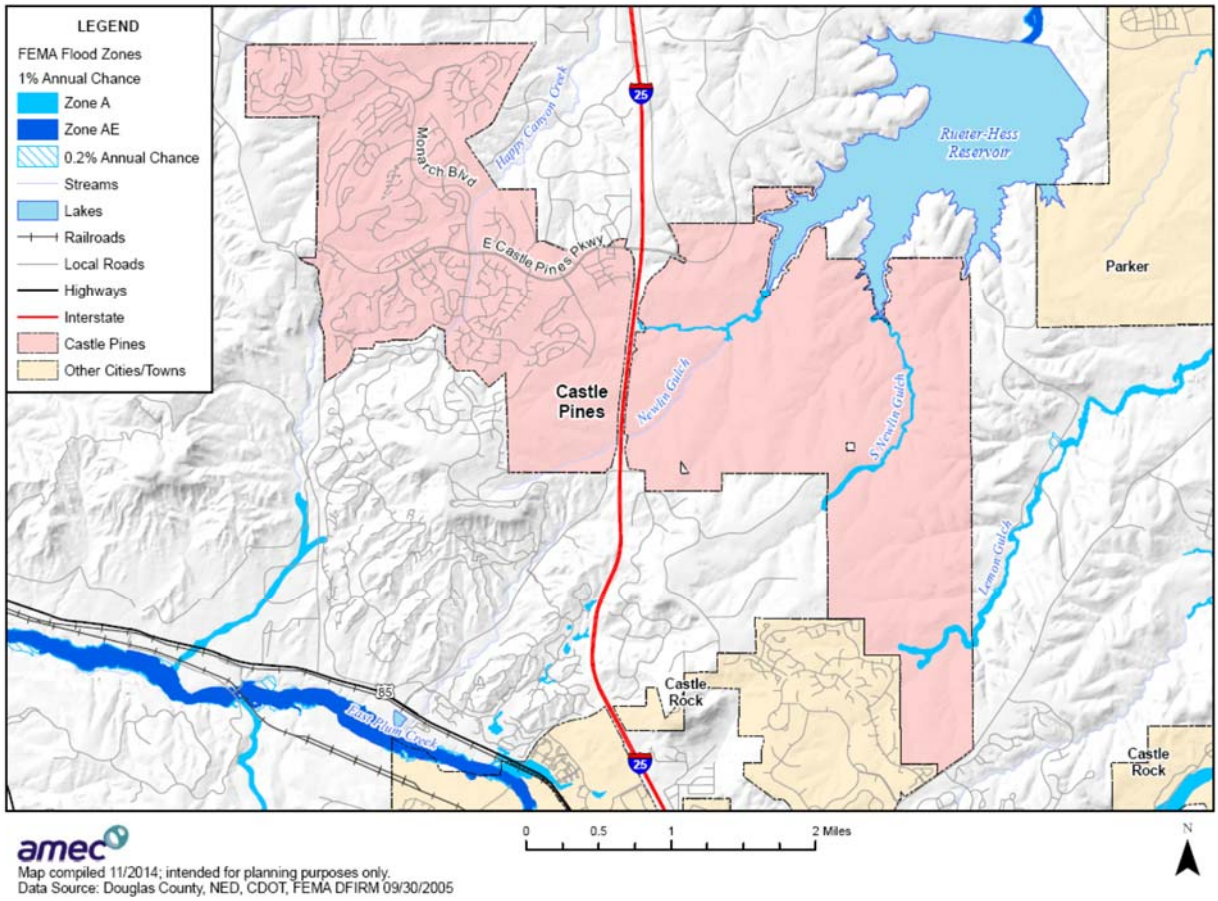
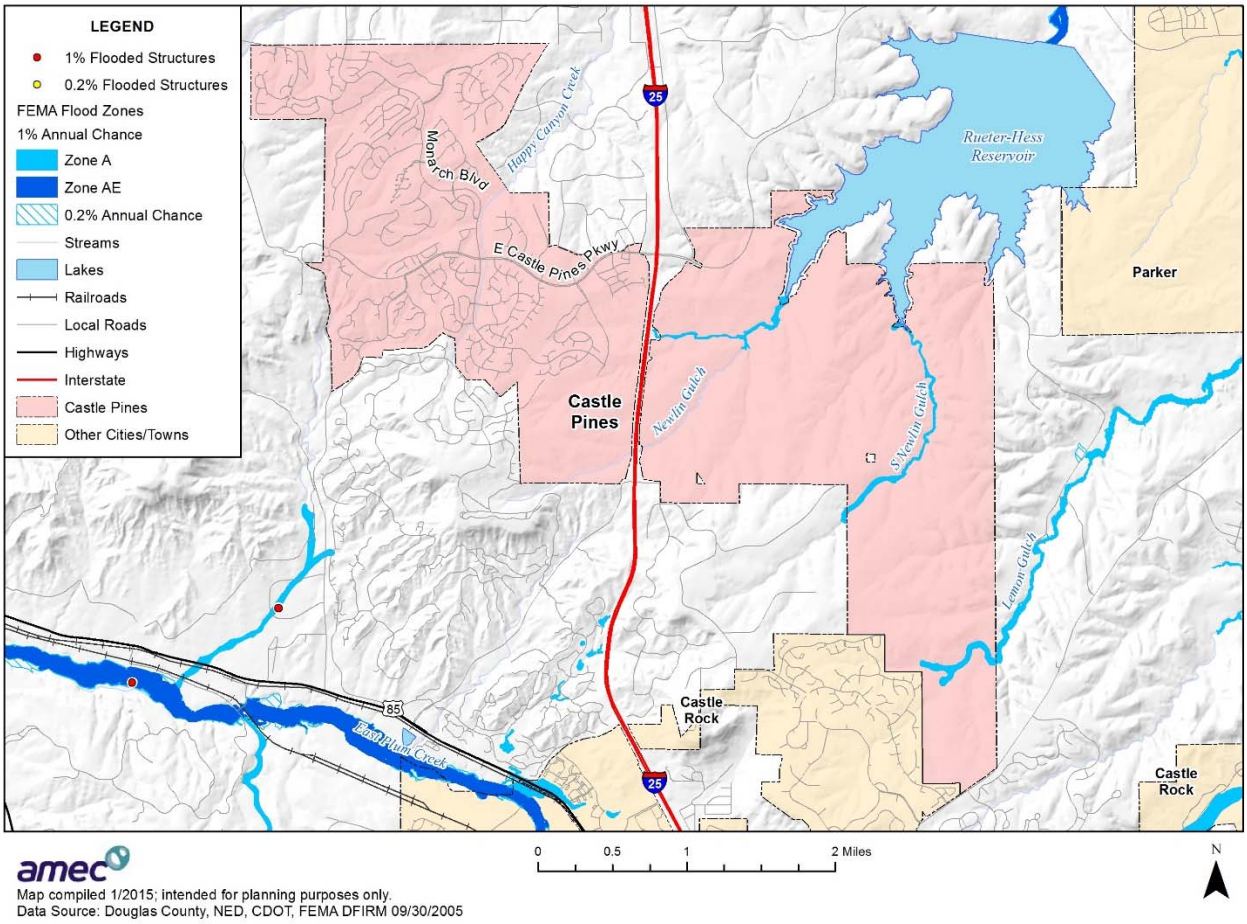


Figure A.6. City of Castle Pines Properties in FEMA Flood Hazard Zones



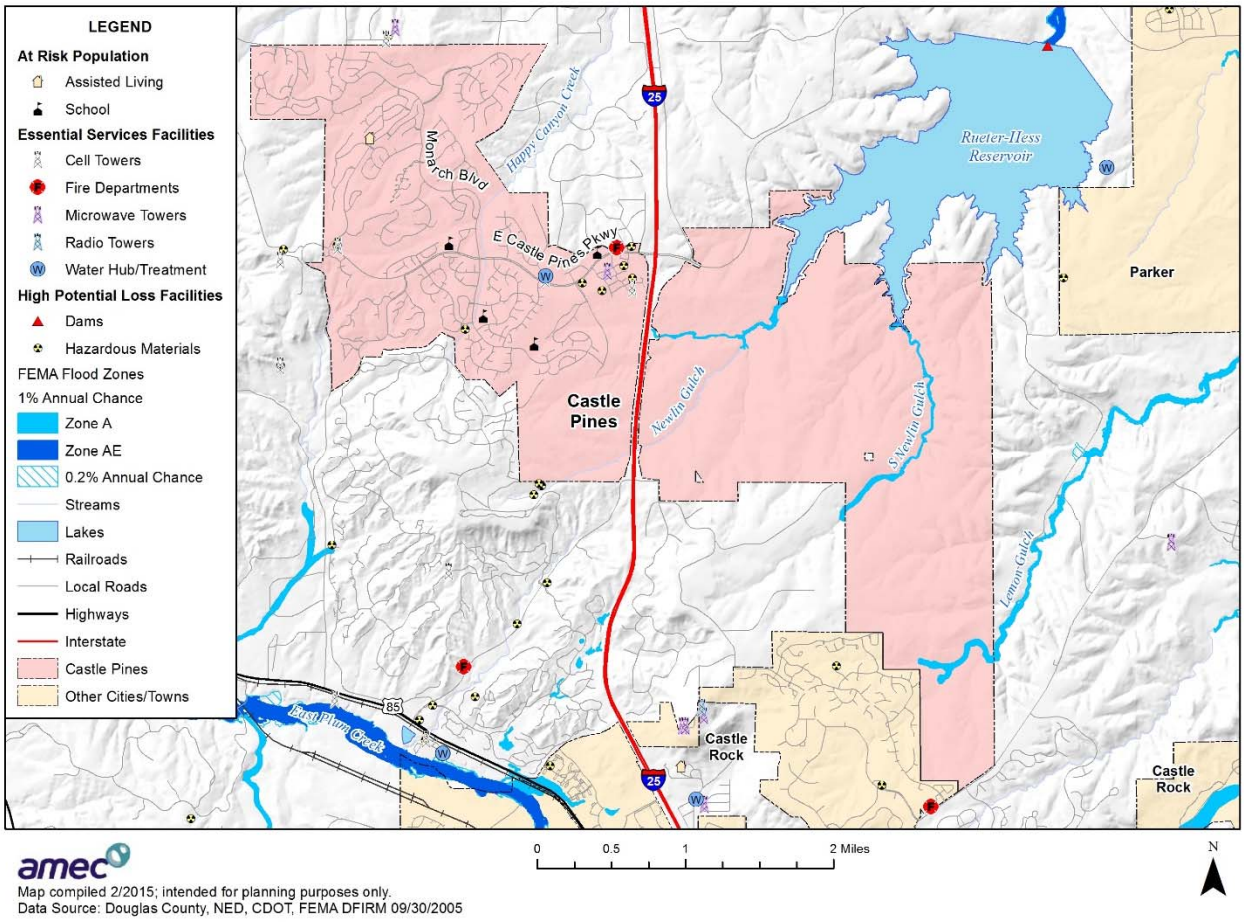
Population at Risk

No Castle Pines residents live in FEMA flood hazard zones.

Critical Facilities at Risk

Castle Pines has no critical facilities located in FEMA flood hazard zones.

Figure A.7. City of Castle Pines Critical Facilities and FEMA Flood Hazard Zones



Development Trends

Future development in Castle Pines is unlikely to be affected by flooding given the small area of 1% annual chance flood zones in the undeveloped eastern portion of the City. Should the spatial extent of this hazard ever change (after an annexation, for example) or growth in the eastern City occur, Castle Pines' continued adherence to the Douglas County Zoning and Subdivision Resolutions will help limit exposure of future development to this type of flooding.

An analysis of build-out from 2010 to 2014 in hazard areas was conducted for Castle Pines. Given the fact that Castle Pines has limited mapped flood hazard areas and does not have any structures located in a flood zone, the build-out analysis returned no results for 100/500-year flooding.

Flood: Localized/ Stormwater

Vulnerability to Flood: Localized/ Stormwater

Likelihood of Future Occurrence—High
Potential Magnitude—Medium

Overall Vulnerability—High

Castle Pines experiences localized stormwater flooding at least once per year during very heavy rain events. The City hopes to mitigate this issue in 2015 by reconstructing some stormwater pipe infrastructure for Monarch Boulevard near Stonemont Drive.

Development Trends

The City's plan to reconstruct stormwater infrastructure will mitigate localized stormwater flooding impacts to existing development along Monarch Boulevard near Stonemont Drive. No new or recent development (e.g. built within the past five years) will be affected. The City's stormwater management program follows the standards in the Douglas County Storm Drainage Design and Technical Criteria Manual, which was written with FEMA floodplain management regulations in mind. Drainage reports, analyses, and designs that impact FEMA designated floodplains must be submitted to FEMA for review. Drainage designs for future development must take these regulations into account.

Landslides/ Mud & Debris Flows /Rockfalls/Erosion

Vulnerability to Landslides/ Mud & Debris Flows /Rockfalls/Erosion

Likelihood of Future Occurrence—Medium for landslide and erosion
Potential Magnitude—Medium for landslide, Low for erosion
Overall Vulnerability—Medium for landslide, Low for erosion

The landslide hazard is made up of these attributes: debris-flow, rockfall-rockslide/debris, and slope-failure. Erosion hazards in Castle Pines are also discussed in this section, despite being ranked low significance, due to the property exposure in potential hazard areas.

The County's parcel layer was used as the basis for the inventory of all parcels within Castle Pines. GIS was used to overlay the landslide hazard layer with the parcel layer centroids and where the zones intersected a parcel centroid, it was assigned with that hazard zone for the entire parcel. Castle Pines does not have any mapped areas exposed to debris flow or slope failure (landslides). However, the City has 109 structures with a total value of over $109 million potentially exposed to rockfall hazards, as detailed in Table A.5. Table A.6 summarizes exposure to moderate accelerated erosion. Erosion analysis does not include contents value since contents of buildings are unaffected by this hazard. Figure A.8 depicts Castle Pines' mapped rockfall and erosion hazard areas, which are primarily in the northwest portion of the City and along streambeds.

Table A.5. City of Castle Pines Total Exposure to Rockfall

Property Type	Total Parcel Count	Improved Parcel Count	Total Structures Count	Improved Value	Estimated Content Value	Land Value	Total Value
Commercial	2	1	3	$7,882	$7,882	$200,111	$215,875
Exempt	7	0	1	$0	$0	$160,545	$160,545
HOA	20	0	4	$0	$0	$0	$0
Residential	95	95	97	$60,738,828	$30,369,414	$16,768,250	$107,876,492
Vacant Land	4	1	4	$719,766	$0	$879,750	$1,599,516
Total	**128**	**97**	**109**	**$61,466,476**	**$30,377,296**	**$18,008,656**	**$109,852,428**

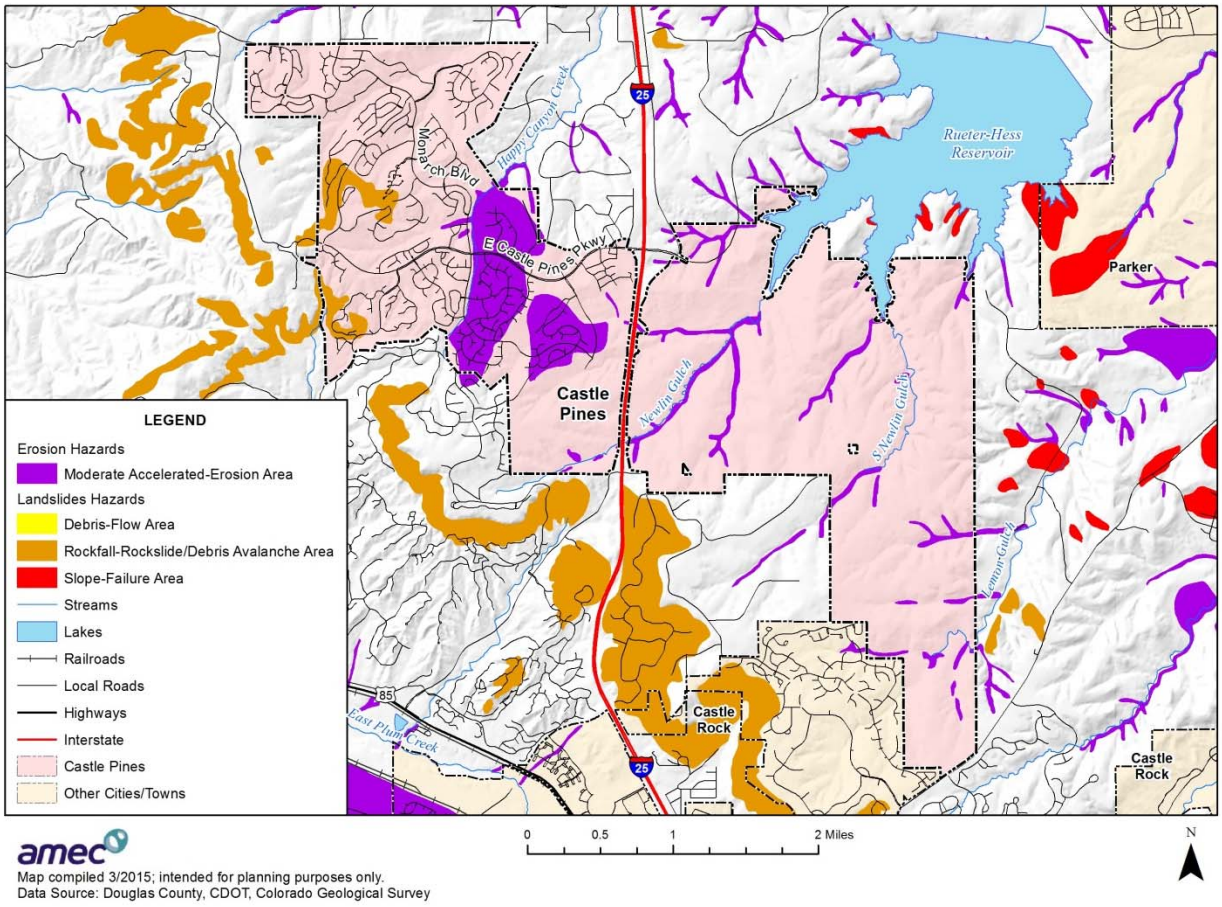
Source: Douglas County Assessor's Data

Table A.6. City of Castle Pines Total Exposure to Moderate Accelerated Erosion

Property Type	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Land Value	Total Value
Agricultural	147	0	145	$0	$872	$872
Exempt	39	1	10	$6,517,936	$4,136,563	$10,654,499
HOA	39	0	15	$0	$0	$0
Residential	609	522	601	$145,393,417	$44,151,072	$189,544,489
Utilities	1	0	0	$0	$0	$0
Vacant Land	10	0	1	$0	$1,320,253	$1,320,253
Total	**845**	**523**	**772**	**$151,911,353**	**$49,608,760**	**$201,520,113**

Source: Douglas County Assessor's Data

Figure A.8. City of Castle Pines Landslide and Erosion Hazards



Population at Risk

An estimated 257 people are potentially exposed to rockfall hazards in Castle Pines. This estimate is based on the number of exposed improved residential parcels (95) multiplied by the average household size in Castle Pines according to the 2010 U.S. Census (2.70).

Critical Facilities at Risk

Landslide and erosion analysis was performed on the critical facility inventory in Castle Pines. GIS was used to determine whether Castle Pines' facility locations intersect the landslide and erosion hazard areas provided by Douglas County, and if so, which zones they intersect. There are no critical facilities located in landslide hazard areas in Castle Pines. One at-risk population facility, a school, is located in the moderate accelerated erosion hazard area.

Development Trends

Fortunately, the landslide and erosion hazard areas in Castle Pines are fairly small. The City also adheres to the Douglas County zoning regulations which discourage development on steep or

exposed slopes. Continued adherence to these regulations will help prevent future development from being located in rockfall hazard areas or slope-driven erosion areas. Castle Pines Public Works and Castle Pines North Metropolitan District also provide erosion control through their storm drainage programs in their respective service areas.

An analysis of recent development trends in hazard areas was conducted for Castle Pines. A total of 257 structures were built in rockfall and moderate-accelerated erosion hazard areas in the City between 2010 and 2014. Results of this analysis are shown in Table A.7.

Table A.7. Castle Pines Structures Built from 2010 to 2014: Summary of Assets Exposed to Rockfall and Moderate Accelerated-Erosion Areas

Hazard	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Estimated Content Value	Land Value	Total Value
Rockfall	6	6	7	$4,728,514	$2,364,257	$1,209,000	$8,301,771
Moderate Accelerated Erosion	35	35	35	$9,346,720	$4,673,360	$2,776,250	$16,796,330
Total	**41**	**41**	**42**	**$14,075,234**	**$7,037,617**	**$3,985,250**	**$25,098,101**

Source: Douglas County GIS

Severe Weather: Hail

Vulnerability to Severe Weather: Hail

Likelihood of Future Occurrence—Medium
Potential Magnitude—Medium
Overall Vulnerability—Medium

Hail is one of the most damaging natural hazards in Colorado. It occurs in wide swaths, causing damage to large geographical areas at once. A single hailstorm could potentially impact all of Castle Pines at once. Hailstorms can also occur relatively frequently, especially in the summer, though they may not always cause significant damages. The impacts of hailstorms can vary substantially from one storm to another depending on weather conditions and the size of the hailstones. Losses are typically covered by insurance.

Development Trends

Any future development in Castle Pines will be exposed to hail. Impacts to people can be mitigated by staying indoors during a hailstorm, and some property such as cars can be protected with covered parking where available. Hail impacts are difficult to mitigate in general though, and insurance is one of the typical options for recouping property losses and reducing economic impacts.

Severe Weather: High Winds

Vulnerability to Severe Weather: High Winds

Likelihood of Future Occurrence—Medium
Potential Magnitude—Medium
Overall Vulnerability—Medium

High winds, often accompanying severe thunderstorms, can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. Winds in Castle Pines are typically straight-line winds. Straight-line winds are generally any thunderstorm wind that is not associated with rotation (i.e., is not a tornado). These winds can overturn mobile homes, tear roofs off of houses, topple trees, snap power lines, shatter windows, and sandblast paint from cars. Other associated hazards include utility outages, arcing power lines, debris blocking streets, dust storms, and an occasional structure fire.

Development Trends

The impact of high winds on future development in Castle Pines can be mitigated with building codes and design criteria.

Severe Weather: Lightning

Vulnerability to Severe Weather: Lightning

Likelihood of Future Occurrence—Medium
Potential Magnitude—Medium
Overall Vulnerability—Medium

Colorado is one of the top states in the continental U.S. for lightning strikes, which can damage property and cause injury or even death to people. People are especially at risk in Colorado if they are outside in the early afternoon during the summer monsoons, though this is not the only time or place where people can be struck by lightning.

Castle Pines has been impacted by this hazard in the past. Lightning caused a house fire in Castle Pines on July 7, 2014. Two people were home at the time, and neither were injured by the event. The roof and attic of the home were damaged. The potential exists for similar events to occur in Castle Pines in the future.

Development Trends

Future development in Castle Pines will not influence where lightning strikes occur. However, growth and development can increase the number of people and structures exposed to lightning impacts. Lightning can also impact future development by igniting wildfires. Castle Pines has nearly 1,000 buildings in high and extreme wildfire risk zones, and future development in these

areas will place additional people and structures at risk to the secondary hazards caused by lightning.

Severe Weather: Thunderstorms/Heavy Rains

Vulnerability to Severe Weather: Thunderstorms/Heavy Rains

Likelihood of Future Occurrence—High
Potential Magnitude—Medium
Overall Vulnerability—Medium

According to historical hazard data, severe weather is an annual occurrence in Castle Pines. Damage and disaster declarations related to severe weather have occurred and will continue to occur in the future. Heavy rain and thunderstorms are the most frequent type of severe weather occurrences in the City. Lightning often accompanies these storms and has caused damage to homes in Castle Pines in the past. However, actual damage associated with the primary effects of severe weather has been limited. It is the damage caused by secondary hazards such as floods and fire that have the greatest impact on Castle Pines. The risk and vulnerability associated with these secondary hazards are discussed in other sections where applicable.

Development Trends

New critical facilities such as communications towers should be built to withstand heavy rains and thunderstorms. It is difficult to quantify future deaths, injuries, or damages due to heavy rains or thunderstorms. Future development projects should consider severe weather hazards at the planning, engineering and architectural design stage with the goal of reducing vulnerability. Development in the City is regulated by zoning and subdivision regulations, and future development is not expected to increase vulnerability to hazards.

Severe Weather: Tornado

Vulnerability to Severe Weather: Tornado

Likelihood of Future Occurrence—Medium
Potential Magnitude—Medium
Overall Vulnerability—Medium

Tornadoes can cause damage to property and loss of life. While most tornado damage is caused by violent winds, the majority of injuries and deaths generally result from flying debris. Property damage can include damage to buildings, fallen trees and power lines, broken gas lines, broken sewer and water mains, and the outbreak of fires. Agricultural crops and industries may also be damaged or destroyed. Access roads and streets may be blocked by debris, delaying necessary emergency response.

Figure 4.22 in Chapter 4 indicates that tornadoes can occur anywhere in Douglas County, especially in the eastern half. One F0 tornado was reported in the very southeastern tip of Castle Pines. The lack of other historical events in the City does not indicate that future events are unlikely to occur in Castle Pines.

Development Trends

Population growth and development expose more people to tornadoes in Castle Pines. The impact to people can be mitigated through warning systems and tornado shelters. Stringent building codes for high winds can help mitigate impacts from weaker tornadoes, and property insurance can reduce economic impacts.

Severe Weather: Winter Weather (includes snow/ice/extreme cold)

Vulnerability to Severe Weather: Winter Weather (includes snow/ice/extreme cold)

Likelihood of Future Occurrence—High
Potential Magnitude—High
Overall Vulnerability—High

Castle Pines typically experiences multiple winter storms in any given year. This hazard has been critical in its magnitude and severity in the past in Douglas County, as seen during the blizzards of March 2003 and December 2006. Vulnerability is high along busy roadways, particularly on Interstate 25, which run through the center of Castle Pines. Severe winter weather conditions may cause traffic related deaths and injuries. Road closures due to winter weather conditions also restrict or prevent the movement of people and goods and services (including food and gas), which can create the need for emergency sheltering for travelers. Poor road conditions can also delay emergency response.

It is difficult to identify specific winter weather hazard areas within Castle Pines. Data was not available to identify specific structures at risk or estimate potential losses to these structures. NCDC data did not provide enough details on past damages and casualties to obtain an average annual loss assessment. If the March 2003 blizzard is used as the event of record, then the Denver Metro area could expect over $31 million in property damages from a severe winter storm. Note that this damage estimate is spread over the entire Denver Metro area; Castle Pines' share of the damage would be smaller.

Development Trends

Future residential or commercial buildings built to code should be able to withstand snow loads from severe winter storms. Population growth in Castle Pines and growth in visitors will increase problems with road, business, and school closures and increase the need for snow removal and emergency services related to severe winter weather events.

Castle Pines' Snow and Ice Control Plan establishes the procedures for the Public Works Department's response to winter storm events. City staff and Castle Pines residents can help mitigate the impacts of winter storms on people and roads by following the procedures in the Snow and Ice Control Plan. The City does not provide snow and ice removal services in some HOAs; the HOAs are responsible for this service themselves. The HOAs that are not covered by the City's snow and ice removal service include:

- Turquoise Terrace
- Amber Ridge
- Ventanna
- Esperanza
- Whisper Canyon
- Coyote Crossing
- Daniel's Ridge
- Lifestyle
- Buffalo Ridge
- Hamlet
- The Crossings
- Canterbury Park
- Broadwick
- Forest Park
- Castle Pointe

Wildfire

Vulnerability to Wildfire

Likelihood of Future Occurrence—Low
Potential Magnitude—Low
Overall Vulnerability—Low

An exposure analysis was performed to quantify risk to wildfire in Castle Pines. Potential losses to wildfire were estimated using a countywide Wildfire Hazard Potential GIS layer (created for the Douglas County Community Wildfire Protection Plan) and assessor's data from Douglas County. Potential losses were examined in terms of structures, property value, critical facilities, and people at risk. For all analyses, the threat levels were classified as low, medium, high, and extreme. According to the CWPP, "[t]here is no absolute set of conditions that cause an area to be identified as being in a particular hazard category. Instead, the hazard category identified is a function of the combined factors that influence controllability, values, and ignition risk" (pg. 59).

GIS was used to create a centroid, or point representing the center of the parcel polygon. The CWPP's Wildfire Hazard Potential layer was then overlaid on the parcel centroids. For the purposes of this analysis, the fire hazard zone that intersected a parcel centroid was assigned the

severity zone for the entire parcel. The model assumes that every parcel with a structure value greater than zero is improved in some way. Specifically, an improved parcel assumes there is a building on it.

Table A.8 shows total parcel counts, improved parcel counts and their structure values by occupancy type (residential, industrial, etc.) and total land values within each fire severity zone in Castle Pines. Table A.9 summarizes this information by wildfire severity zone. Figure A.9 illustrates the wildfire severity zones in Castle Pines and the surrounding area.

Table A.8. City of Castle Pines Total Exposure to Wildfire by Property Type

Property Type	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Estimated Content Value	Land Value	Total Value/Loss Estimate
Extreme							
Agricultural	1	0	0	$0	$0	$110	$110
Commercial	2	0	0	$0	$0	$17,438	$17,438
Exempt	6	0	4	$0	$0	$216,876	$216,876
HOA	3	0	0	$0	$0	$0	$0
Residential	42	39	42	$16,998,350	$8,499,175	$5,080,950	$30,578,475
Total	**54**	**39**	**46**	**$16,998,350**	**$8,499,175**	**$5,315,374**	**$30,812,899**
High							
Agricultural	91	0	81	$0	$0	$15,506	$15,506
Commercial	6	3	53	$10,480,397	$10,480,397	$4,669,961	$25,630,755
Exempt	78	3	42	$14,001,304	$14,001,304	$2,216,824	$30,219,432
HOA	60	0	20	$0	$0	$0	$0
Residential	726	667	721	$278,070,150	$139,035,075	$78,531,194	$495,636,419
Utilities	4	0	1	$0	$0	$0	$0
Vacant Land	22	1	31	$719,766	$0	$3,660,247	$4,380,013
Total	**987**	**674**	**949**	**$303,271,617**	**$163,516,776**	**$89,093,732**	**$555,882,125**
Moderate							
Agricultural	36	0	27	$0	$0	$81,846	$81,846
Commercial	11	8	412	$50,457,223	$50,457,223	$14,185,679	$115,100,125
Exempt	20	2	6	$8,200,874	$8,200,874	$4,104,896	$20,506,644
HOA	17	0	5	$0	$0	$0	$0
Residential	139	129	139	$65,623,575	$32,811,788	$18,367,843	$116,803,206
Utilities	1	0	0	$0	$0	$0	$0
Vacant Land	3	0	1	$0	$0	$884,722	$884,722
Total	**227**	**139**	**590**	**$124,281,672**	**$91,469,885**	**$37,624,986**	**$253,376,543**
Low							
Agricultural	42	0	40	$0	$0	$6,826	$6,826
Commercial	26	18	66	$19,796,264	$19,796,264	$8,539,880	$48,132,408
Exempt	135	4	20	$14,145,527	$14,145,527	$9,888,687	$38,179,741
HOA	161	0	43	$0	$0	$0	$0
Residential	2,501	2,464	2,532	$802,770,372	$401,385,186	$224,606,689	$1,428,762,247
Vacant Land	62	0	34	$0	$0	$1,748,241	$1,748,241
Total	**2,927**	**2,486**	**2,735**	**$836,712,163**	**$435,326,977**	**$244,790,323**	**$1,516,829,463**

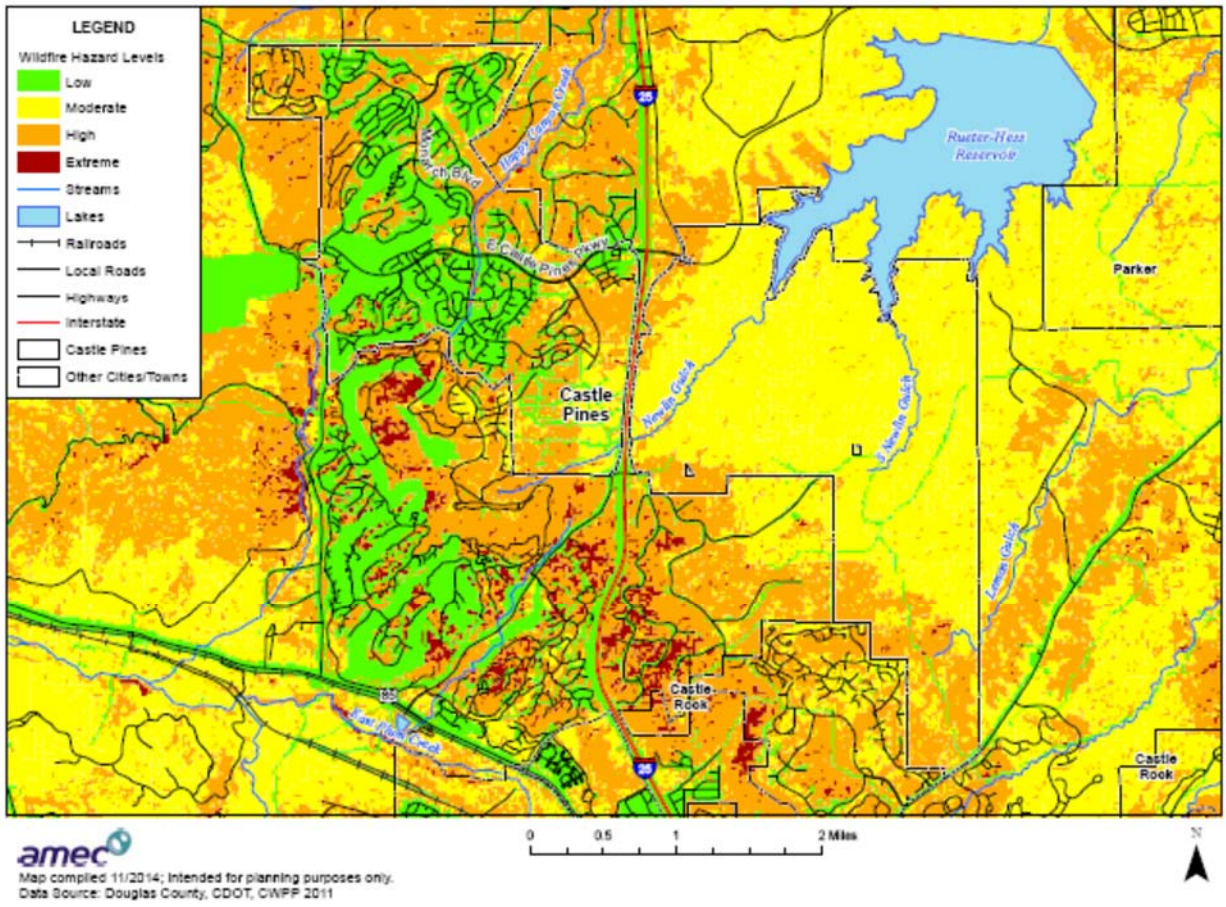
Source: Douglas County GIS

Table A.9. City of Castle Pines Total Exposure to Wildfire Summary

Wildfire Severity	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Estimated Content Value	Land Value	Total Value/Loss Estimate
Extreme	54	39	46	$16,998,350	$8,499,175	$5,315,374	$30,812,899
High	987	674	949	$303,271,617	$163,516,776	$89,093,732	$555,882,125
Moderate	227	139	590	$124,281,672	$91,469,885	$37,624,986	$253,376,543
Low	2,927	2,486	2,735	$836,712,163	$435,326,977	$244,790,323	$1,516,829,463
Total	**67,901**	**59,835**	**74,819**	**$17,699,073,710**	**$10,837,873,385**	**$5,309,550,986**	**$33,846,498,081**

Source: Douglas County GIS

Figure A.9. Castle Pines Wildfire Hazard Potential



Population at Risk

Wildfire risk is greatest to those individuals residing in identified hazard areas. GIS analysis was performed to determine population in the different fire hazard areas. Using GIS, the Douglas County wildfire hazard potential layers were overlaid on the entire parcel layer. Those parcel centroids that intersect the wildfire hazard potential areas were counted and multiplied by the 2010 Census Bureau average household size for each jurisdiction and unincorporated area, which is 2.70 in Castle Pines. Table A.10 summarizes the results of this analysis.

Table A.10. Population at Risk to Wildfire

	Extreme	High	Moderate	Low
Population	105	1,801	348	6,653
Improved Residential Parcels	39	667	129	2,464

Source: Douglas County GIS, 2010 U.S. Census

Critical Facilities at Risk

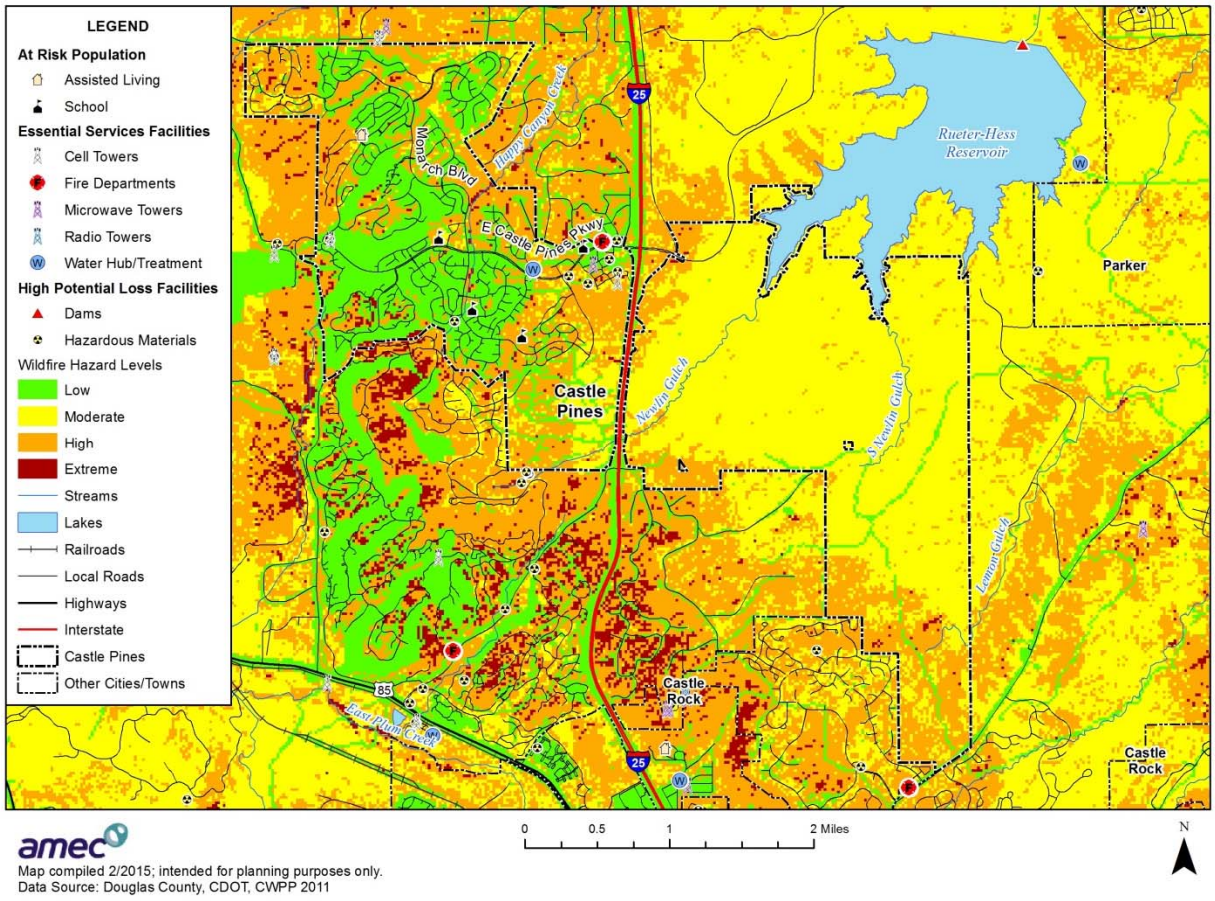
Wildfire analysis was performed on the critical facility inventory in Douglas County and all jurisdictions, including Castle Pines. GIS was used to determine whether the facility locations intersect a wildfire hazard area. Table A.11 summarizes the results of the GIS analysis for Castle Pines, and Figure A.10 depicts the location of critical facilities in relation to wildfire severity zones. Details of critical facility definition, type, name and address and jurisdiction by wildfire zone are listed in Appendix E.

Table A.11. Castle Pines– Critical Facilities at Risk to Wildfire Detail

Fire Risk	Category	Type	Facility Count
Extreme	High Potential Loss Facilities	Hazardous Material	1
	Total		**1**
High	At-Risk Population Facilities	Assisted Living	1
	At-Risk Population Facilities	School	2
	Essential Services Facilities	Cell Tower	2
	Essential Services Facilities	Microwave	2
	Essential Services Facilities	Water Hub/Treatment	1
	Total		**8**
Moderate	At-Risk Population Facilities	School	1
	High Potential Loss Facilities	Hazardous Material	2
	Total		**3**
Low	At-Risk Population Facilities	School	1
	Essential Services Facilities	Cell Tower	1
	High Potential Loss Facilities	Hazardous Material	4
	Total		**6**
GRAND TOTAL			**18**

Source: Douglas County GIS

Figure A.10. Castle Pines Wildfire Hazard Potential and Critical Facilities



Development Trends

The pattern of increased damages is directly related to increased urban growth spread into historical forested areas that have wildfire as part of the natural ecosystem. Many WUI fire areas have long histories of wildland fires that burned only vegetation in the past. However, with new development, a wildland fire following a historical pattern now burns developed areas. Population growth and development in Castle Pines could potentially expose more people and structures to wildfires.

An analysis of recent development in extreme, high, and moderate wildfire hazard areas was conducted for Castle Pines. A total of 47 structures was built between 2010 and 2014. The total value of these structures is $35,888,604, with the majority located in the high wildfire hazard area. Results of this analysis are shown in Table A.12.

Table A.12. Castle Pines Structures Built from 2010 to 2014: Assets Exposed to Wildfire by Hazard Level

Hazard Level	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Estimated Content Value	Land Value	Total Value
Extreme	1	1	1	$643,717	$321,859	$115,000	$1,080,576
High	35	34	36	$15,190,338	$7,595,169	$4,411,000	$27,196,507
Moderate	9	9	10	$4,259,014	$2,129,507	$1,223,000	$7,611,521
Total	**45**	**44**	**47**	**$20,093,069**	**$10,046,535**	**$5,749,000**	**$35,888,604**

Source: Douglas County GIS

A.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capability assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation outreach and partnerships, and other mitigation efforts.

A.6.1 Regulatory Mitigation Capabilities

Table A.13 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the City of Castle Pines.

Table A.13. City of Castle Pines Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Y/N	Date	Comments
General plan	Y	2009	
Zoning ordinance	Y	2008	Adopted Douglas County Zoning Code
Subdivision ordinance	Y	2008	Adopted Douglas County Zoning Code
Growth management ordinance	N		
Floodplain ordinance	Y	2008	Adopted Douglas County Zoning Code
Other special purpose ordinance (stormwater, steep slope, wildfire)	Y	2012	Illicit Discharge ordinance
Building code	Y	2006	
BCEGS Rating	N		
Fire department ISO rating	Y	2008	South Metro Fire
Erosion or sediment control program	Y	2008	Adopted Douglas County GESC program
Stormwater management program	Y	2008	Adopted Douglas County GESC program
Site plan review requirements	Y	2008	Currently reviewed by SafeBuilt
Capital improvements plan	Y	2013	Pavement management plan
Economic development plan	Y		

Regulatory Tool (ordinances, codes, plans)	Y/N	Date	Comments
Local emergency operations plan	N		DCSO responsible
Community Wildfire Protection Plans	Y		DCSO and South Metro Fire
Flood insurance study or other engineering study for streams	Y	2005	Included as part of unincorporated Douglas County as the City wasn't incorporated at that time.
Elevation certificates	N		
Other			

Source: Amec Foster Wheeler Data Collection Guide

Comprehensive Plan (2009)

The City of Castle Pines Comprehensive Plan represents a step in the City's on-going efforts to build and maintain a balanced, sustainable community. This Plan is the first Comprehensive Plan prepared by the City; however, community planning began during the early 1980s. The Plan is a document that sets forth the policies for the future of the community and is designed to be a flexible "living" document that can be changed as the needs change for the Castle Pines community. The planning horizon for the Plan is a focus of 20 years in the future and is a resource for community leaders to use as a guide in formulating future policies for the City and guide growth and development. The Plan is currently in the initial stages of being rewritten. The updated version will more accurately represent Castle Pines' goals and character and will include updated City boundaries.

Goals and policies related to mitigation of natural hazards are as follows:

7.1 Goal	Recognize and respect natural geologic conditions.
	Ensure development is appropriate when weighed against hazards and constraints.

7.2 Goal	Limit land uses in floodplains
	Preclude damage to life and property.
	Maintain floodplains as open space.

7.3 Goal	Reduce the risks of loss from wildfire hazard
	Discourage and avoid development in areas with high potential for wildfire, where mitigation is impractical or excessive, or other significant constraints and hazards are present.
	Identify and mitigate wildfire hazards in areas determined appropriate for development.

7.4 Goal	Avoid risk of wildfire hazards. Create compatible development in areas where allowed, and protect public safety.
	Preclude development in areas with severe wildfire potential.

7.6 Goal	Maintain high water quality and protect water resources.
	Use “best management practices” (BMP) to control soil-erosion sediments.

South Metro Fire Rescue Authority Community Wildfire Protection Plan (2009)

This document provides a comprehensive, scientifically based analysis of wildfire related hazards and risks in the Wildland-Urban Interface (WUI) areas of the South Metro Fire Rescue Authority (SMFRA) in Colorado. The City of Castle Pines contracts with SMFRA for fire services. The CWPP covers the area that includes the City of Castle Pines.

Ordinances

The City of Castle Pines has many ordinances related to mitigation. The relevant ordinances and regulations are discussed in further detail here:

Zoning

The City of Castle Pines adopted the Douglas County zoning code in 2008. County zoning codes related to hazard mitigation are discussed in Section 4.4.1.

Building Code Section (Chapter 18)

In order to provide minimum standards for the proper regulations of building construction, the following publications are hereby adopted by reference and incorporated in this Code, except as expressly amended or superseded by the provisions of this Code.

- The International Building Code, 2009 Edition, 3rd printing, as published by the International Code Council, 500 New Jersey Avenue, NW, 6th Floor, Washington, DC 20001, Chapters 1 through 35 inclusive, exclusive of any Appendices
- The International Residential Code, 2009 Edition, 3rd printing, as published by the International Code Council, 500 New Jersey Avenue, NW, 6th Floor, Washington, DC 20001, Chapters 1 through 44 inclusive and Appendices A, C, G, H and N.
- Pursuant to Title 31, Article 16, Part 2, C.R.S., there is adopted as the electrical code of the City, by reference thereto, the National Electrical Code, 2011 edition, published by the National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269, and the rules and regulations thereunder, as adopted, amended and updated to the most current edition by the Colorado State Electrical Board.
- The International Mechanical Code, 2009 Edition, 3rd printing, as published by the International Code Council, 500 New Jersey Avenue, NW, 6th Floor, Washington, DC 20001, Chapters 1 through 15 inclusive.
- The International Plumbing Code, 2009 Edition, 3rd printing, as published by the International Code Council, 500 New Jersey Avenue, NW, 6th Floor, Washington, DC 20001, Chapters 1 through 13 inclusive.

- The International Fire Code, 2009 Edition, 4th printing, as publishing by International Code Council, 500 New Jersey Avenue, NW, 6th Floor, Washington, DC 20001, Chapters 1 through 47 inclusive and Appendices B, C and J only.
- The International Fuel Gas Code, 2009 Edition, 3rd printing, as published by the International Code Council, 500 New Jersey Avenue, NW, 6th Floor, Washington, DC 20001, Chapters 1 through 8 inclusive.
- The International Energy Conservation Code, 2009 Edition, 3rd printing as published by the International Code Council, 500 New Jersey Avenue, NW, 6th Floor, Washington, DC 20001, Chapters 1 through 6 inclusive.

Storm Drainage (Chapter 11, Article 2)

The *Douglas County – Storm Drainage Design and Technical Criteria Manual*, 1986 Edition, as amended and as published by the Board of County Commissioners of Douglas County, Colorado, 100 Third Street, Castle Rock, Colorado 80104, is hereby adopted by reference as the City of Castle Pines Storm Drainage Design and Technical Criteria Manual as if fully set out in this Article. The purpose and subject matter of the Criteria is to provide minimum technical criteria for the planning, analysis and design of storm drainage systems within the boundaries of the City.

A.6.2 Administrative/Technical Mitigation Capabilities

Table A.14 identifies the City department(s) responsible for activities related to mitigation and loss prevention in Castle Pines.

Table A.14. City of Castle Pines Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/Engineer with knowledge of land development/land management practices	Y	Community Development	Sam Bishop
Engineer/Professional trained in construction practices related to buildings and/or infrastructure	Y	Public Works	On-call engineer
Planner/Engineer/Scientist with an understanding of natural hazards	Y	Public Works	On-call engineer
Personnel skilled in GIS	Y	contracted	Douglas County
Full time building official	Y	contracted	SafeBuilt
Floodplain Manager	N		
Emergency Manager	Y	DCSO	DCSO handles EM
Grant writer	N		
Other personnel	Y		
GIS Data – Hazard areas	N		
GIS Data - Critical facilities	N		
GIS Data – Building footprints	Y	contracted	Douglas County
GIS Data – Land use	Y	contracted	Douglas County

Personnel Resources	Yes/No	Department/Position	Comments
GIS Data – Links to Assessor's data	Y	contracted	Douglas County
Warning Systems/Services (Reverse 9-11, cable override, outdoor warning signals)	Y	all	CodeRED
Other			

Source: Amec Foster Wheeler Data Collection Guide

A.6.3 Fiscal Mitigation Capabilities

Table A.15 identifies financial tools or resources that the City could potentially use to help fund mitigation activities.

Table A.15. City of Castle Pines Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Y/N)	Comments
Community Development Block Grants	Y	
Capital improvements project funding	Y	
Authority to levy taxes for specific purposes	Y	
Fees for water, sewer, gas, or electric services	N	City does not provide these services
Impact fees for new development	Y	
Incur debt through general obligation bonds	Y	
Incur debt through special tax bonds	Y	
Incur debt through private activities	Y	
Withhold spending in hazard prone areas	Y	
Other		

Source: Amec Foster Wheeler Data Collection Guide

A.6.4 Mitigation Outreach and Partnerships

The City partners with South Metro Fire and Rescue for wildfire mitigation. The City partners with the County, and has adopted the County EOP.

A.7 Mitigation Strategy

This section describes the mitigation strategy process and mitigation action plan for the City of Castle Pines' inclusion with the Douglas County Local Hazard Mitigation Plan update.

A.7.1 Mitigation Goals and Objectives

The City of Castle Pines adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy of the base plan.

A.7.2 Continued Compliance with the NFIP

The City of Castle Pines does not currently participate in the NFIP, and has no future plans to join given the lack of structures within flood hazard areas in the community.

A.7.3 Mitigation Actions

The planning team for the City of Castle Pines identified and prioritized the following mitigation actions based on the risk assessment and in accordance with the process outline in Section 5, Mitigation Strategy, of the base plan. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. General processes and information on plan implementation and maintenance of this LHMP by all participating jurisdictions is included in Section 7, Plan Implementation and Maintenance, of the base plan.

City of Castle Pines Action #1

Action Title:	**Repair flooding hazard at Monarch Blvd and Stonemont Drive**
Hazard:	Localized stormwater flooding
Priority:	High
Project Description, Issue & Background:	On a yearly basis, when heavy rainfall occurs in the City, flooding occurs on the street at Monarch and Stonemont. The City's engineers have been tasked with designing a modification to fix this issue in the future. We hope to have the repair completed in FY 2015.
Ideas for Implementation:	Make modifications to the street or modifications to the infrastructure that the water runs into.
Other Alternatives:	No action
Responsible Agency:	City of Castle Pines
Partners:	N/A
Potential Funding:	N/A
Cost Estimate:	$35,000.00 +/-
Benefits: (Losses Avoided)	Decrease the amount of flooding that occurs on the street that potentially affects the safety of motorists.
Timeline:	FY 2015
Status:	New in 2015

City of Castle Pines Action #2

Action Title:	**Wildfire prevention and preparation**
Hazard:	Wildfire
Priority:	Medium
Project Description, Issue & Background:	The City of Castle Pines has identified the potential for wildfires within portions of our community as having the potential of having a medium significance. The City of Castle Pines will continue to work with South Metro Fire Rescue Authority to develop plans to mitigate the impact of future wildfires within our community. In addition, Castle Pines has put into place means of communicating with the community during the time of an actual emergency (CodeRED) as well as providing ongoing communication on fire prevention and mitigation strategies for the citizens. The City also works in conjunction with Douglas County to identify situations when the fire danger is higher and incorporate additional restrictions associated with open fires.
Ideas for Implementation:	This project will be an ongoing discussion with emergency managers within the County, City, and fire authority to ensure changes over time are adapted too.
Other Alternatives:	No action
Responsible Agency:	South Metro Fire Rescue Authority
Partners:	Douglas County, City of Castle Pines
Potential Funding:	
Cost Estimate:	Low cost due to the use of previous designed plans and communication tools
Benefits: (Losses Avoided)	Ensuring that citizens are aware of the potential for wildfires and the need for them to work to mitigate damages caused from wildfires; to take evasive action should there be a fire and to take action to prevent the events in the first place.
Timeline:	Ongoing
Status:	New in 2015

Annex B TOWN OF CASTLE ROCK

B.1 Introduction

This annex details the hazard mitigation planning elements specific to the Town of Castle Rock, a participating jurisdiction to the Douglas County LHMP Update. This annex is not intended to be a standalone document, but appends to and supplements the information contained in the base plan document. As such, all sections of the base plan, including the planning process and other procedural requirements apply to and were met by the Town. This annex provides additional information specific to the Town of Castle Rock, with a focus on providing additional details on the risk assessment and mitigation strategy for this community.

B.2 Planning Process

As described above, the Town of Castle Rock followed the planning process detailed in Section 3.0 of the base plan. In addition to providing representation on the Douglas County Hazard Mitigation Planning Committee (HMPC), the Town formulated their own internal planning team to support the broader planning process requirements. Internal planning participants included staff from the following Town departments:

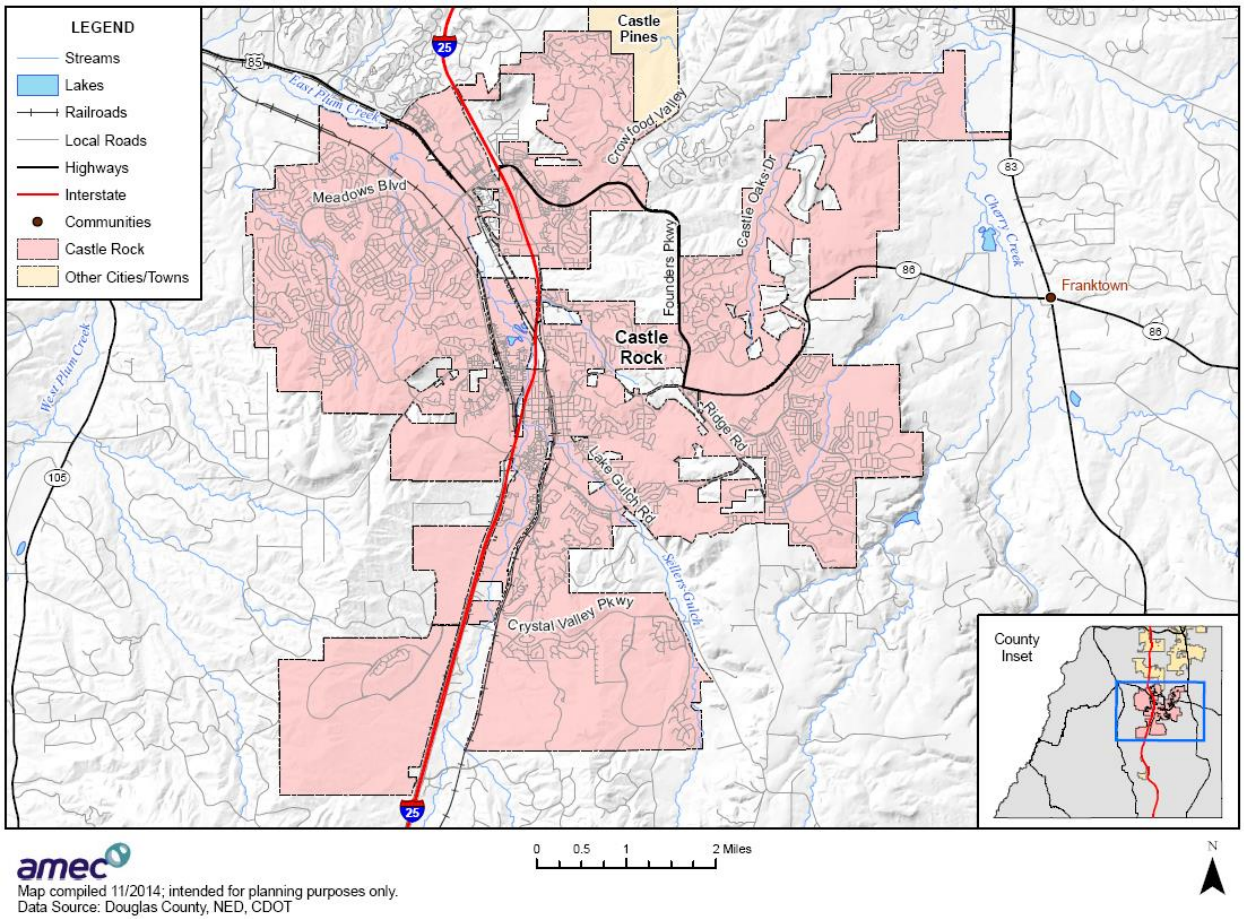
- Art Morales, Fire Chief

Additional details on plan participation and Town representatives are included in Appendix A.

B.3 Community Profile

The community profile for the Town of Castle Rock is detailed in the following sections. Figure B.1 displays a map and the location of the Town of Castle Rock within Douglas County.

Figure B.1. Town of Castle Rock Base Map



B.3.1 Geography and Location

The Town's physical setting gives it a natural shape and identity. Steeply sloping terrain, buttes and ridgelines surround the Town, rising 300 to 800 feet above the 6,200-foot average elevation. Creeks and gulches meander through the many drainage basins and ponderosa pine and scrub oak cover the landscape. Panoramic views of the Rocky Mountains extend from Pike's Peak in the south to Long's Peak to the north.

B.3.2 History

The Town of Castle Rock was incorporated in 1881, after having been selected the County seat seven years earlier. Much of the early Town was built on the availability of rail transportation and the presence of the quarries that the railroads served. Settlers, attracted by the Homestead Act of 1862, joined gold prospectors, quarry, sawmill and railroad workers and ranchers in building the new community. The Town's population initially grew slowly and steadily after its founding, topping 300 in 1900, and reaching 478 in 1930. By 1940 the Town added another 100 residents.

From 1950 to 1960, the Town grew by over 400 residents, from 741 to 1,154 persons. By the time the 1970 Census was conducted, Castle Rock's population reached 2,078 persons. This was just under 25 percent of the County's total population of 8,407.

The Denver area's rapid sub-urbanization in the 1970's strongly affected the Town as new, urban density developments were approved and began to develop. From 1970 to 1980 Castle Rock added 1,843 new residents, an increase of 88 percent to 3,921 persons. During this decade, the Town population dropped to 16 percent of the County's total of 25,153. During the 1980's the Town's population grew at a much faster rate. At the end of 1989, the population of the Town was estimated at 8,875, an increase of 126 percent from 1980. Castle Rock's population has steadily increased since 1990, growing by nearly two and one-half times during that decade from 8,612 to 20,224 persons. While the rate of annexation during the 1990's did not match that of the previous decade, the Town's incorporated limits reached approximately 31.5 square miles or just over 20,000 acres. The early 2000s saw continued growth in the Town. The Town more than doubled its population in that decade to 48,231 in 2010.

B.3.3 Economy

As the population of the Town has grown, so has its economy. Select economic characteristics and statistics for Castle Rock are shown in Table B.1.

Table B.1. Economic Characteristics for the Town of Castle Rock

Characteristic	2013
Families below Poverty Level	4.9%
Individuals below Poverty Level	6.4%
Median Home Value	$280,500
Median Household Income	$86,280
Per Capita Income	$35,173
Population in Labor Force*	26,822

Source: 2008-2013 US Census Bureau American Community Survey 5-year Estimates

B.3.4 Population

2013 population estimate for the Town (the most recent available) indicates there are 49,990 residents of Castle Rock. The population was estimated at 48,231 for the 2010 U.S. Census.

B.4 Hazard Identification and Summary

This section details how the risk varies across the Douglas County Planning Area. The Town's planning team identified the hazards that affect the Town and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to Castle Rock (see Table B.2). In the context of the entire Planning Area, there are no hazards that are unique to Castle Rock.

Information on past occurrences and the likelihood of future occurrences is detailed in Section 4, Risk Assessment, of the base plan. Additional information for high and medium significant hazards for the Town is included in the Vulnerability Assessment section of this Annex.

Table B.2. Town of Castle Rock Hazard ID Table

Hazard	Likelihood of Future Occurrence	Spatial Extent	Magnitude /Severity	Significance
Avalanche	Low	Limited	Low	Low
Drought	Low	Extensive	Medium	Low
Earthquake	Low	Extensive	Medium	High
Flood: Dam Failure	Low	Limited	Low	Low
Flood: 100/500 year	High	Limited	Low	Low
Flood: Localized/ Stormwater	High	Limited	Medium	Medium
Landslides/ Mud & Debris Flows /Rockfalls	Medium	Limited	Low	Low
Severe Weather: Extreme Heat	High	Extensive	Low	Low
Severe Weather: Hail	High	Extensive	Medium	High
Severe Weather: High Winds	High	Significant:	Medium	Medium
Severe Weather: Lightning	High	Limited	Low	Low
Severe Weather: Thunderstorms/Heavy Rains	High	Extensive	Medium	High
Severe Weather: Tornado	Medium	Limited	Medium	Medium
Severe Weather: Winter Weather (includes snow/ice/extreme cold)	High	Extensive	High	High
Soil Hazards: Erosion & Deposition	High	Limited	Low	Low
Soil Hazards: Expansive Soils	High	Limited	Low	Low
Soil Hazards: Subsidence	Medium	Limited	Low	Low
Wildfire	High	Limited	Medium	Medium
Hazardous Materials: Transportation Incidents	Medium	Limited	Medium	Medium

Spatial Extent
Limited: Less than 10% of Planning Area
Significant: 10-50% of Planning Area
Extensive: 50-100% of Planning Area

Likelihood of Future Occurrences
Low: Occurs less than once every 10 years or more
Medium: Occurs less than once every 5 to 10 years
High: Occurs once every year or up to once every five years

Magnitude/Severity
Low: Negligible property damages (less than 5% of all buildings and infrastructure) Negligible loss of quality of life. Local emergency response capability is sufficient to manage the hazard.
Medium: Moderate property damages (15% to 50% of all buildings and infrastructure) Some loss of quality of life. Emergency response capability, economic and geographic effects of the hazard are of sufficient magnitude to involve one or more counties.
High: Property damages to greater than 50% of all buildings and infrastructure. Significant loss of quality of life Emergency response capability, economic and geographic effects of the hazard are of sufficient magnitude to require federal assistance.

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

B.5 Vulnerability Assessment

The intent of this section is to assess Castle Rock's vulnerability separate from that of the Planning Area as a whole, which has already been assessed in Section 4.3 Vulnerability Assessment of the base plan. This vulnerability assessment provides an inventory of the population, property, and other assets located within the Town and further analyzes those assets at risk to identified hazards ranked of medium or high significance (as listed in Table B.2) to the community. Landslide and erosion were also analyzed to compare Castle Rock's exposure to the rest of the Planning Area, despite being ranked low significance to the Town. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the main plan.

B.5.1 Total Assets at Risk

This section identifies Castle Rock's total assets at risk, including values at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the community. This data is not hazard specific, but is representative of total assets at risk within a community.

Values at Risk

The following data from the Douglas County Assessor's Office is based on joining assessor data to the 2014 parcel layer in GIS. This data should only be used as an indicator of overall values in the County, as the information has some limitations. Table B.3 summarizes the parcels, improved parcels, structures, improved value, land value, and total value exposed in Castle Rock. It is important to note, in the event of a disaster, it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a loss.

Table B.3. Town of Castle Rock Total Exposure

Property Type	Total Parcel Count	Improved Parcel Count	Total Structures Count	Improved Value	Total Land Value	Total Value
Agricultural	1,307	4	1,105	$284,819	$644,075	$928,894
Commercial	453	418	1,733	$520,011,852	$200,631,577	$720,643,429
Exempt	1,401	119	479	$564,472,818	$116,157,729	$680,630,547
HOA	712	0	358	$0	$0	$0
Industrial	25	25	48	$20,583,498	$12,922,322	$33,505,820
Producing Mine	0	0	0	$0	$0	$0
Residential	18,067	17,084	18,449	$3,791,308,266	$844,168,844	$4,635,477,110
Utilities	18	0	8	$0	$0	$0
Vacant Land	2,636	6	2,339	$1,041,743	$94,677,962	$95,719,705
Total	**24,619**	**17,656**	**24,519**	**$4,897,702,996**	**$1,269,202,509**	**$6,166,905,505**

Source: Douglas County Assessor's Data

Critical Facilities and Infrastructure

For purposes of this plan, a critical facility is defined as:

> Any facility, including without limitation, a structure, infrastructure[1], property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.

This definition was refined by separating out three categories of critical facilities as further described in Section 4.3.1 of the base plan. These categories include At-Risk Populations, Essential Services, and High Potential Loss Facilities.

An inventory of critical facilities in the Town of Castle Rock from Douglas County GIS is provided in Table B.4. Details of critical facility definition, type, name and address and jurisdiction by hazard zone are listed in Appendix E.

Table B.4. Town of Castle Rock Critical Facilities: Summary Table

Category	Type	Facility Count
At Risk Population Facilities	Assisted Living	14
	School	17
Essential Services Facilities	Admin & Management	1
	Bridge	1
	Cell Tower	6
	Courts	1
	EOC	2
	Fire Department	5
	Hospital	1
	IT Infrastructure	2
	Jail	1
	Microwave	39
	Police	3
	Public Health	1
	Water Hub/Treatment	13
High Potential Loss Facilities	Hazardous Material	116
	Total Town of Castle Rock	**223**

Source: Douglas County GIS

[1] Essential Service Facilities include bridges, roads, power grids, and infrastructure held by private companies (e.g., utility lines and private levees) that are not mapped for security reasons and are not under the control of the County.

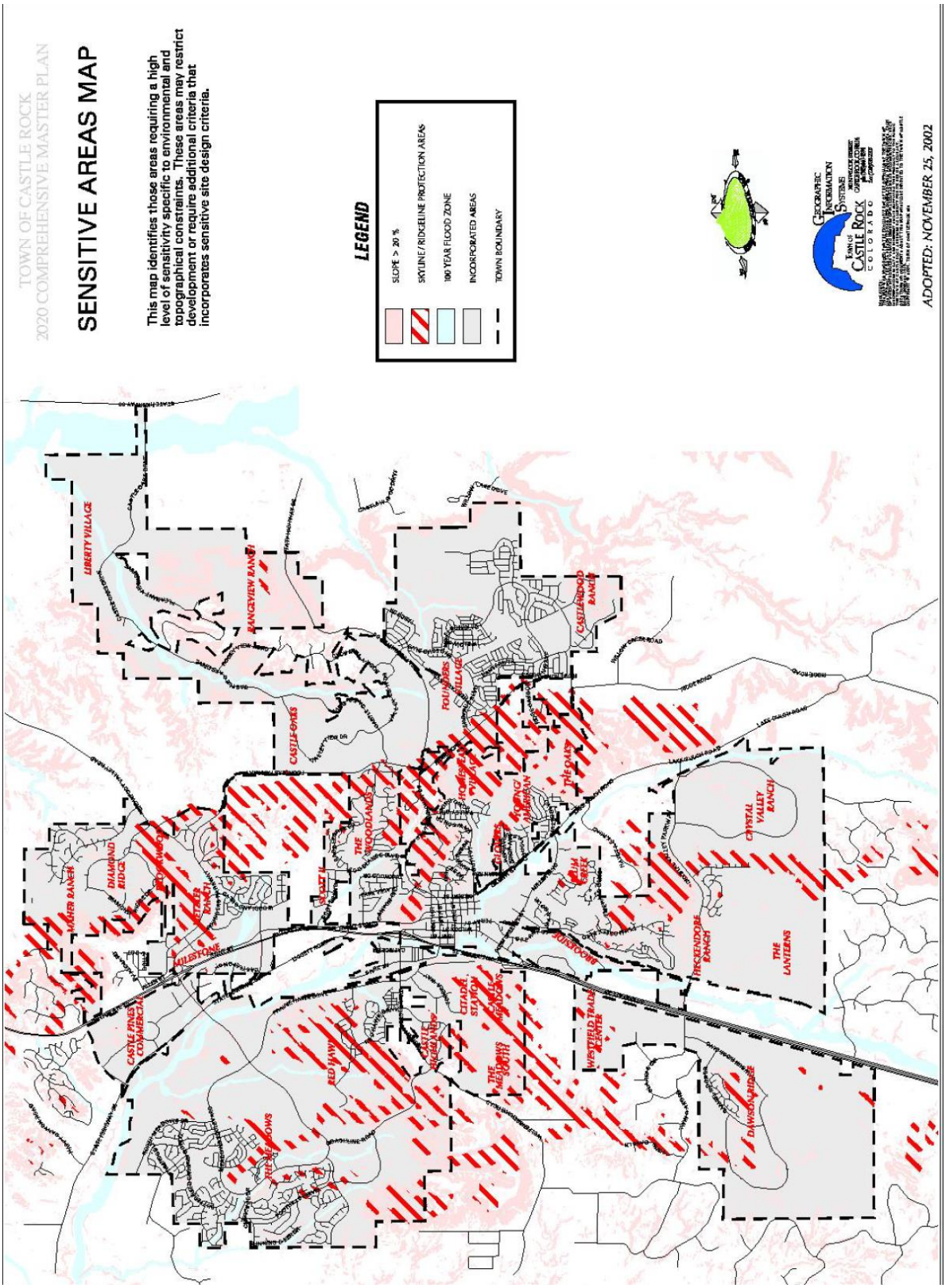
Natural Resources

The Town has undertaken a detailed environmental inventory that is depicted on the Sensitive Areas Map (see Figure B.2) from the Castle Rock Comprehensive Master Plan. Key elements identified below have been identified as critical to preserve through all appropriate means available to the Town:

- 100-year Floodplains: Shown along all drainages, streams and rivers, the 100-year floodplain is the extent of flooding which will occur in a 100-year storm event. This is a storm having a 1 percent probability of occurring in any given year. Town ordinances limit the ability to develop in the floodplain and adjacent floodway areas due to the high potential for loss of life and property.
- Areas of Geologic Hazard: Within Castle Rock, areas of subsidence, rock-fall, slope failure and debris flow are natural geologic conditions having the potential to result in loss of life, damage to property, and high public maintenance or management costs. These hazards are often associated with steep slopes and areas of former mining activities. The Town rated these hazards as having low significance in Table B.2.
- Steep Slopes (10% to 20% and 20% and Greater): Steep slopes are included as potential hazards because of their high susceptibility to erosion. This type of erosion results in increased sediment deposition in streams, and increases the potential for flooding and degraded water quality. Development on highly visible slopes can also have an undesirable visual impact.
- Ridgelines: The most central visual centerpiece in Town is undoubtedly the namesake Castle Rock. Located within the central portion of the Town, the Rock is visible from many miles around providing the Town with an unparalleled level of recognition. In addition to the Rock, several buttes dot the landscape. Strong ridgelines frame the Town and provide natural edges and gateways into the community.
- Vegetation: Significant stands of scrub oak and ponderosa pine have been identified as key elements of Castle Rock's environment worthy of preservation wherever possible. In addition to the negative visual impact that the loss of these species would cause, overlot grading and the removal of vegetation increases erosion, water quality degradation and undue loss of wildlife habitat.
- While continued development will displace much of this wildlife over time, a contiguous growth pattern emanating from existing developed areas has been shown to be the least disruptive to wildlife. In addition, the preservation of adequate open space and vegetative stands will allow a degree of wildlife to remain in the area. Riparian (stream) corridors in particular are critical to wildlife as habitat and migration routes. Over 75 percent of the species found in Colorado may be found in riparian areas, while over 50 percent of these species are dependent on riparian areas for some part of their life cycle. Connected, contiguous and preserved riparian areas are then the single most important factor in maintaining wildlife in an area. The scruboak habitat and bluff habitat are other important areas for wildlife.

- Plum Creek Watershed: This area contributes to several tributary wells that supply water to Castle Rock citizens and businesses. Alluvial (tributary) aquifers are directly supplied by surface water, and are thus extremely susceptible to surface and subsurface pollutants. An existing Town ordinance regulates uses such as underground petroleum storage tanks; hazardous waste storage; businesses utilizing any kind of chemical solvents; industrial users involved in the use, storage, or disposal of any hazardous waste; septic systems; salts and de-icing material storage; fertilizer or pesticide application; and any other use deemed a potential hazard for water quality.

Figure B.2. Town of Castle Rock Sensitive Areas Map



Source: 2020 Town of Castle Rock Comprehensive Master Plan

Historic and Cultural Resources

The Town of Castle Rock has a stock of historically significant homes, public buildings, and landmarks. To inventory these resources, the HMPC collected information from both the National Register of Historic Places and the Colorado State Register. Each program has different eligibility criteria and procedural requirements. These requirements are detailed in Section 4.3.1 of the base plan. Historical resources included in the programs above are identified in Table B.5.

Table B.5. Castle Rock Historical Resources

Name (Landmark Plaque Number)	National Register	Date Listed	State Landmark	State Designation	Town
Castle Rock Depot	Y	10/11/1974	Y	5DA.216	Castle Rock
Castle Rock Elementary School	Y	9/20/1984	Y	5DA.342	Castle Rock
First National Bank of Douglas County	Y	4/14/1995	Y	5DA.661	Castle Rock
Benjamin Hammer House	Y	2/3/1993	Y	5DA.645	Castle Rock
Keystone Hotel	Y	6/20/1997	Y	5DA.681	Castle Rock

Source: Colorado Office of Historical Preservation

Growth and Development Trends

Past Growth

Section B.3.2 gives past population growth in the Town. These numbers are captured in Table B.6.

Table B.6. Past Population Growth in the Town of Castle Rock

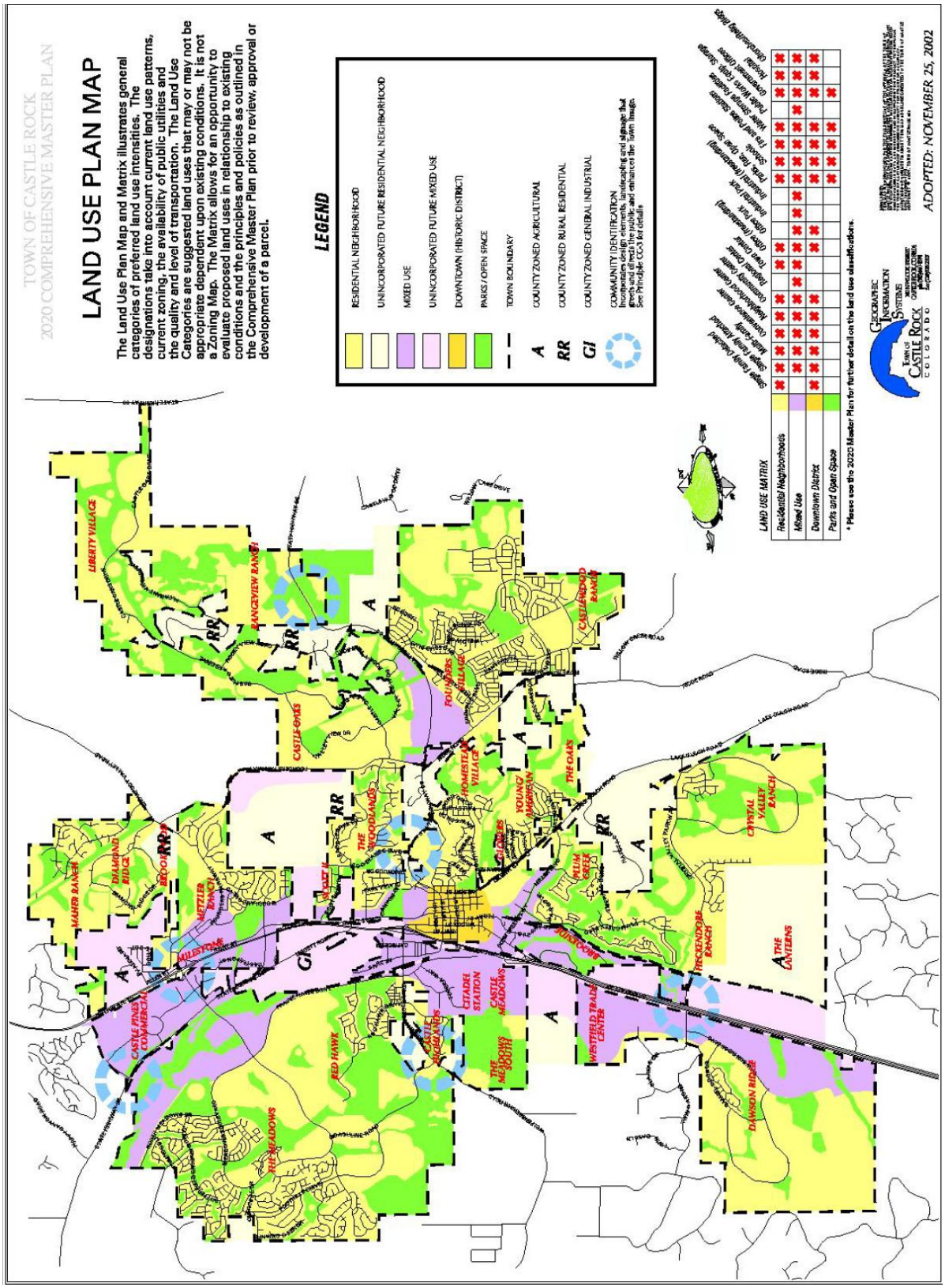
Year	Population	Population Change
1930	478	–
1940	488	100
1950	741	253
1960	1,154	413
1970	2,078	924
1980	3,921	1,843
1990	8,875	4,954
2000	20,224	11,349
2010	48,231	28,007
2013	49,990	1,759

Source: 2020 Town of Castle Rock Comprehensive Plan, U.S. Census Bureau, American Community Survey

Castle Rock's existing land use pattern features residential neighborhoods that surround a commercial and industrial core (see Figure B.3.) Defined in large part by topographic conditions, existing residential development is dispersed throughout the Town and many areas of

the community are physically separated from each other. Retail and service oriented commercial uses are beginning to develop in the outlying residential areas as the population of these areas increase. The Interstate 25 corridor serves as an anchor for the higher intensity and larger scale commercial and industrial uses. Interspersed throughout the community are large areas of public and private open spaces including parks, recreation areas and golf courses.

Figure B.3. Current Land Use in the Town of Castle Rock



Source: 2020 Town of Castle Rock Comprehensive Master Plan

Development since 2010 Plan

Table B.7 summarizes the number and value of structures built in Castle Rock from 2010 to 2014 based on a query of the 'year built' values in the County's parcel database. Over 1,100 structures, with a total value greater than $319 million, were built in that short period of time. The vast majority of these structures were residential, built to accommodate the rapidly growing population in the Planning Area. Additional analysis on recent development in Castle Rock's mapped hazard areas is discussed in the vulnerability assessments for flood, landslide/erosion, and wildfire.

Table B.7. Castle Rock Structures Built from 2010 to 2014: Total Assets by Property Type

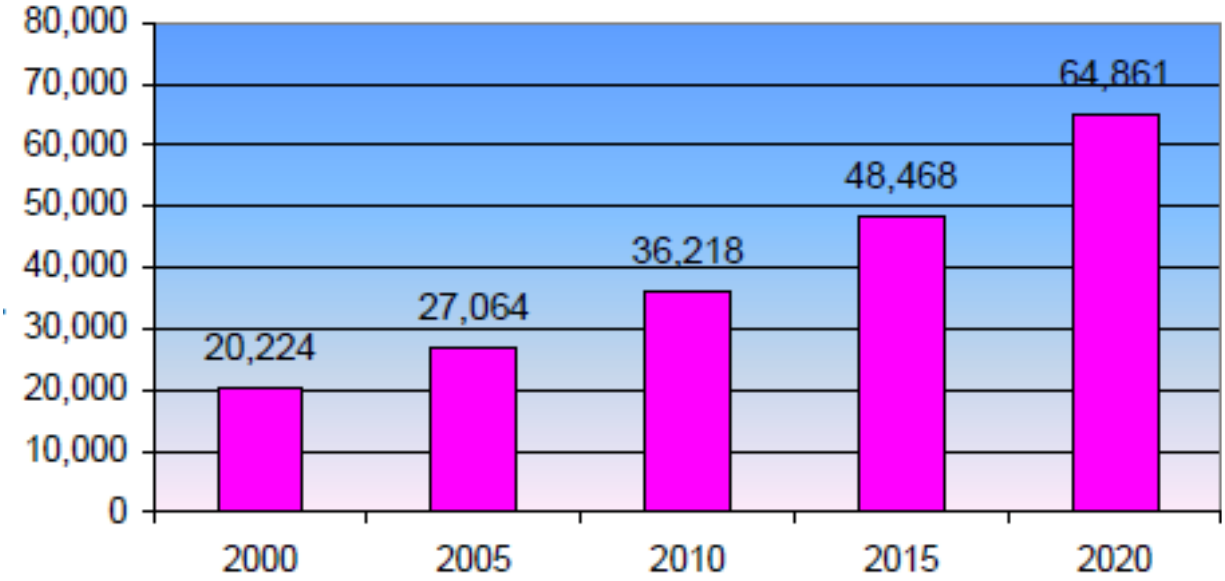
Jurisdiction	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Land Value	Total Value
Commercial	22	22	135	$14,776,953	$8,623,948	$23,400,901
Exempt	10	9	16	$41,187,563	$6,093,303	$47,280,866
Industrial	2	2	8	$1,764,935	$656,665	$2,421,600
Residential	926	926	950	$202,865,012	$43,484,605	$246,349,617
Total	**960**	**959**	**1,109**	**$260,594,463**	**$58,858,521**	**$319,452,984**

Source: Douglas County

Development Trends

In the 2020 Comprehensive Master Plan, the Town estimated future populations. The Town's population is projected to continue to increase substantially. For this effort, the Town is assuming an average annual growth rate of 6% per year through 2020. This growth rate is based on the Town's analysis of local and regional population trends. Using this assumed growth rate, the Town's population would grow to 64,861 by 2020. Projections are shown in Figure B.4. It should be noted that the 2013 American Community Survey estimate of 49,990 already exceeds the growth projections for 2015.

Figure B.4. Town of Castle Rock Population Projections 2000-2020



Source: 2020 Town of Castle Rock Comprehensive Master Plan

B.5.2 Priority Hazards: Vulnerability Assessment

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table B.2 as high or medium significance hazards. Landslide and erosion were also analyzed to compare Castle Rock's exposure to the rest of the Planning Area, despite being ranked low significance to the Town. Impacts of past events and vulnerability of the Town to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the base plan for more detailed information about these hazards and their impacts on the Douglas County Planning Area). Methodologies for calculating loss estimates are the same as those described in Section 4.3 of the base plan.

An estimate of the vulnerability of the Town to each identified hazard, in addition to the estimate of risk of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.

Earthquake

Vulnerability to Earthquake

Likelihood of Future Occurrence—Low
Potential Magnitude—Medium
Overall Vulnerability—High

Earthquake vulnerability is primarily based on population and the built environment. Urban areas in high seismic hazard zones are the most vulnerable, while uninhabited areas are less vulnerable.

Ground shaking is the primary earthquake hazard. Many factors affect the survivability of structures and systems from earthquake-caused ground motions. These factors include proximity to the fault, direction of rupture, epicenter location and depth, magnitude, local geologic and soils conditions, types and quality of construction, building configurations and heights, and comparable factors that relate to utility, transportation, and other network systems. Ground motions become structurally damaging when average peak accelerations reach 10 to 15% of gravity, average peak velocities reach 8 to 12 centimeters per second, and when the Modified Mercalli Intensity Scale is about VII (18-34% peak ground acceleration), which is considered to be very strong (general alarm; walls crack; plaster falls).

Potential earthquake impacts specific to Castle Rock were not available; the HAZUS-MH 2.1 analysis provided in Section 4.3.4 in the base plan is countywide. Impacts to Castle Rock would likely be similar in nature to the countywide impacts.

Development Trends

Although new growth and development corridors would fall in the area potentially affected by earthquake, given the small chance of major earthquake and the building codes in effect, development in the earthquake area will continue to occur.

Flood: 100/500 year

Vulnerability to Flood: 100/500-Year

Likelihood of Future Occurrence—High
Potential Magnitude—Low
Overall Vulnerability—Low

The Planning Area, including Castle Rock, is prone to very intense rainfall. Floods have resulted from storms covering large areas with heavy general rainfall as well as from storms covering small area with extremely intense rainfall. This section quantifies the vulnerability of Castle Rock to floods.

East Plum Creek and Sellers Gulch are the primary sources of 100/500-year flooding in Castle Rock. Major flooding events occurred in Castle Rock in 1965, 2012, and 2013. The strongest impacts typically occur in drainages in the Town. Minor flooding is localized to residences along drainages, and previous events have also caused roof leakage at the Castle Rock King Soopers and factory stores. The roof damages were estimated at $500,000.

The tables flood loss estimates for Castle Rock are located below. Table B.8 shows improved values at risk in the 1% annual chance flood zone, and Table B.9 shows this information for the 0.2% annual chance flood zone. Contents values were estimated as a percentage of building value based on their property type, using FEMA/HAZUS estimated content replacement values. This includes 100% of the structure value for agricultural, commercial, exempt, HOA and utility, 50% for residential, 150% for industrial and 0% for vacant land use classifications. A 20% damage factor was applied to each flood zone's total value of improvements and estimated content value to obtain a loss estimate. This analysis is based on a FEMA depth damage function which assumes a two foot deep flood. Land Value was not included in this analysis. Figure B.5 shows the FEMA flood zones in Castle Rock, and Figure B.6 shows the location of properties within those flood zones.

Table B.8. Castle Rock 1% Annual Chance Flood Loss Estimate by Property Type

Property Type	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Estimated Content Value	Total Value	Loss Estimate
Commercial	5	4	14	$3,015,500	$3,015,500	$6,031,000	$1,206,200
Exempt	81	1	11	$4,480	$4,480	$8,960	$1,792
HOA	1	0	1	$0	$0	$0	$0
Residential	39	34	48	$1,763,415	$881,708	$2,645,123	$529,025
Utilities	1	0	0	$0	$0	$0	$0
Vacant Land	14	1	5	$17,836	$0	$17,836	$3,567
Total	**141**	**40**	**79**	**$4,801,231**	**$3,901,688**	**$8,702,919**	**$1,740,584**

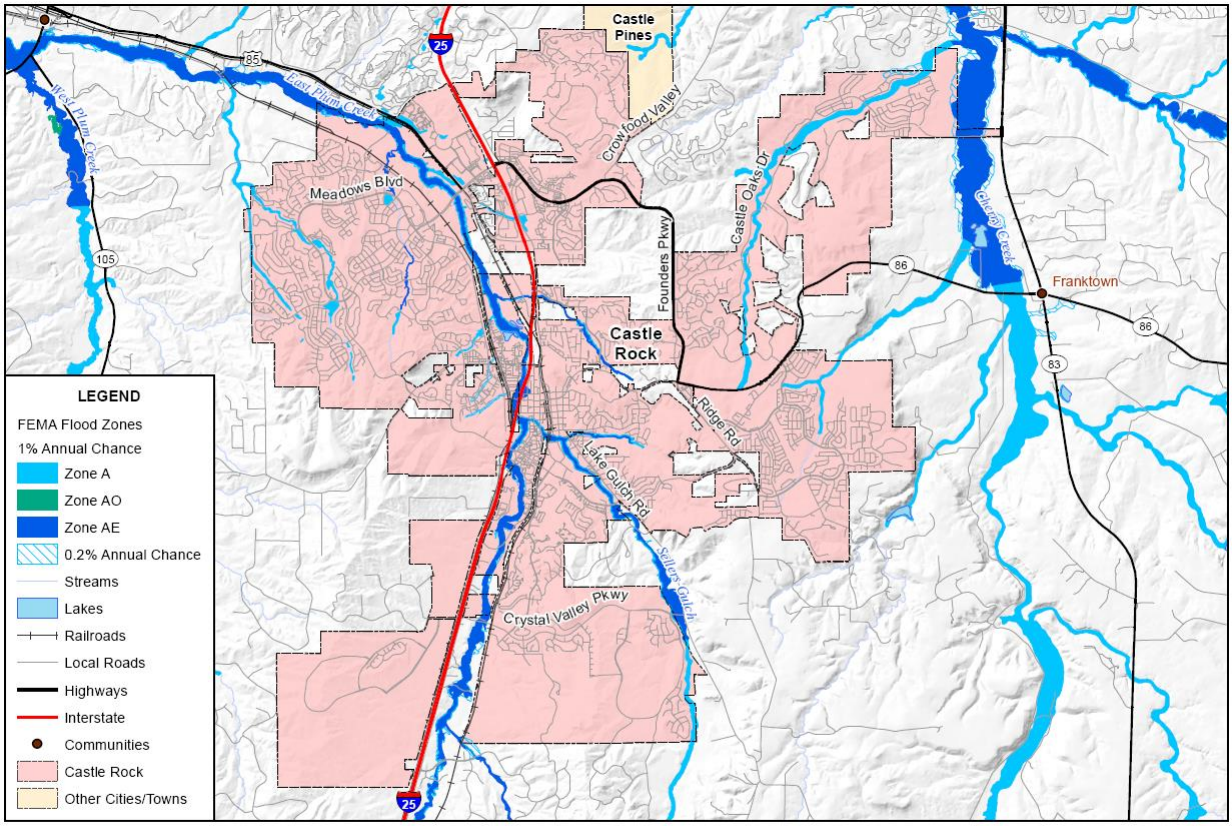
Source: Douglas County 2014 Assessor & Parcel Data; Douglas County DFIRM

Table B.9. Castle Rock 0.2% Annual Chance Flood Loss Estimate by Property Type

Property Type	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Estimated Content Value	Total Value	Loss Estimate
Agricultural	14	0	18	$0	$0	$0	$0
Commercial	2	2	16	$1,402,310	$1,402,310	$2,804,620	$560,924
Exempt	17	0	3	$0	$0	$0	$0
HOA	1	0	0	$0	$0	$0	$0
Industrial	1	1	1	$490,335	$735,503	$1,225,838	$245,168
Residential	9	9	9	$1,069,946	$534,973	$1,604,919	$320,984
Vacant Land	5	0	3	$0	$0	$0	$0
Total	**49**	**12**	**50**	**$2,962,591**	**$2,672,786**	**$5,635,377**	**$1,127,075**

Source: Douglas County 2014 Assessor & Parcel Data; Douglas County DFIRM

Figure B.5. Castle Rock FEMA Flood Hazards



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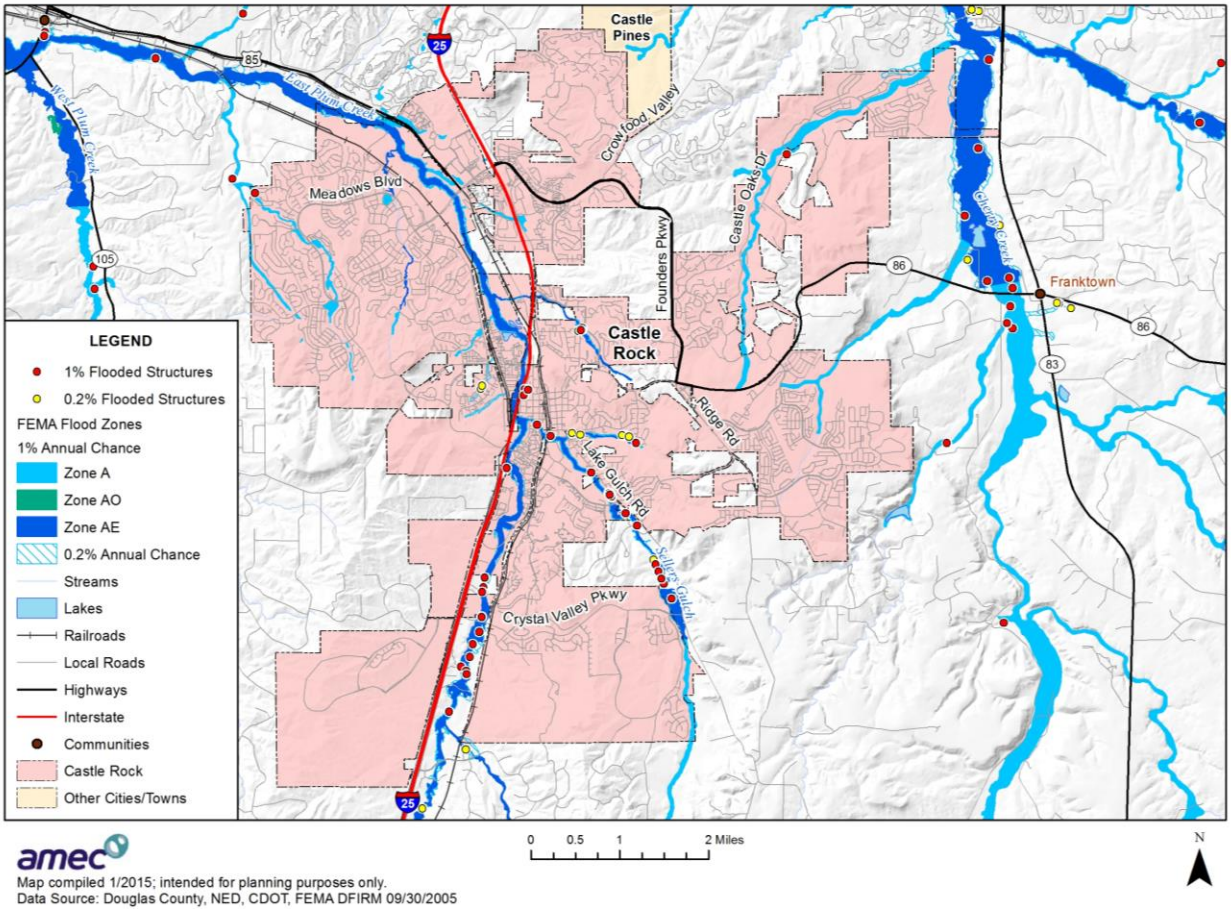
Map compiled 11/2014; intended for planning purposes only.
Data Source: Douglas County, NED, CDOT, FEMA DFIRM 09/30/2005

Figure B.6. Castle Rock FEMA Flood Hazards and Flood Prone Improved Properties



Population at Risk

A separate analysis was performed to determine population in flood zones. Using GIS, the DFIRM dataset was overlaid on the improved residential parcel data. Those parcel centroids that intersect a flood zone were counted and multiplied by the 2010 U.S. Census household factor of 2.86; results were tabulated by jurisdiction and flood zone (see Table B.10). According to this analysis, there is a population of 97 in the 1% annual chance flood zone, and 26 in the 0.2% annual chance flood zone in Castle Rock.

Table B.10. Castle Rock - Improved Residential Parcels and Population in Floodplain

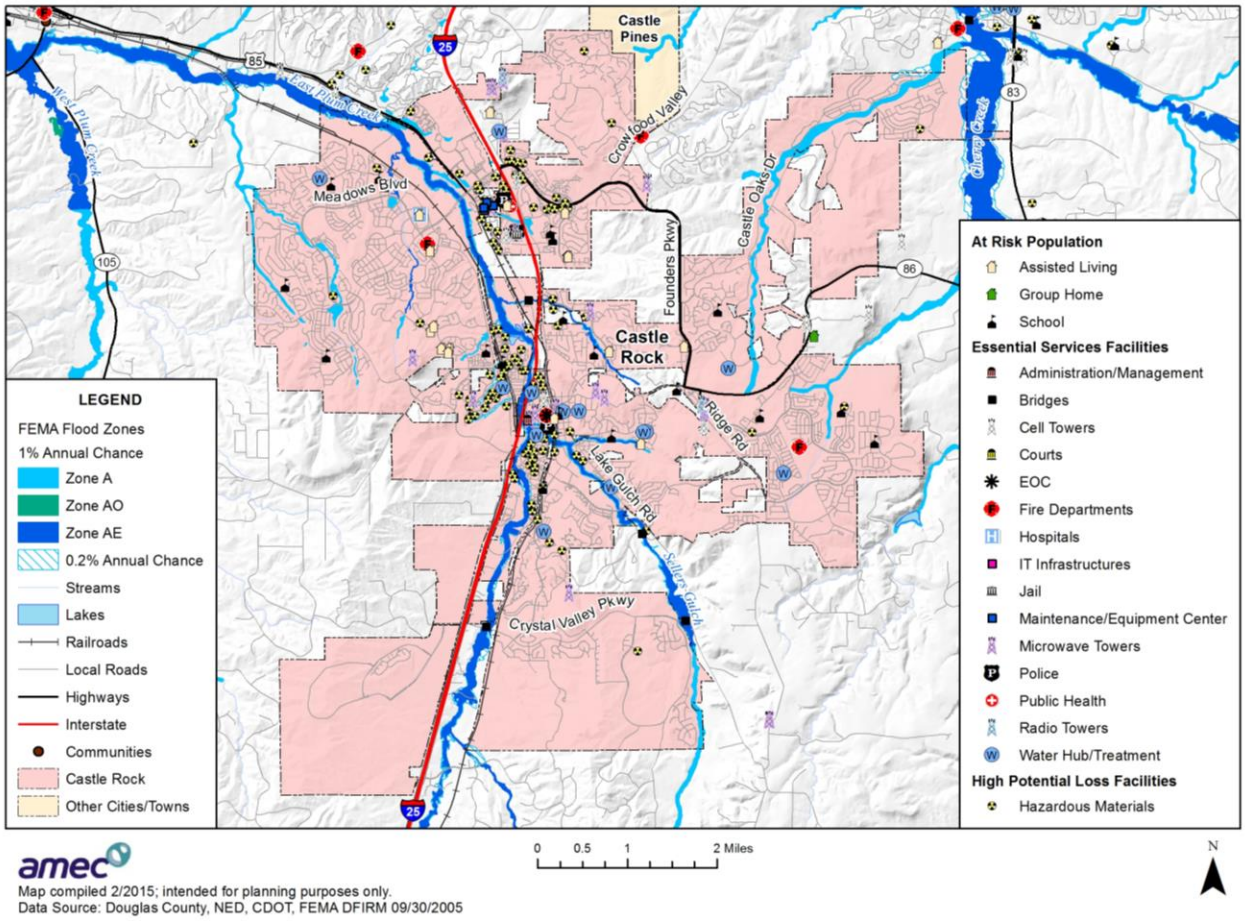
	1% Annual Chance		0.2% Annual Chance	
Jurisdiction	**Improved Residential Parcels**	**Population**	**Improved Residential Parcels**	**Population**
Castle Rock	34	97	9	26

Source: DFIRM, US Census Bureau, 2014 Douglas County Assessor & Parcel Data
* Census Bureau 2010 average household size for Castle Rock – 2.86

Critical Facilities at Risk

Two critical facilities in Castle Rock are located in the 1% annual chance flood zone, and no critical facilities are located in the 0.2% annual chance flood zone. Both are essential services facilities, specifically water hub/treatment facilities.

Figure B.7. Castle Rock FEMA Flood Hazards and Critical Facilities



Development Trends

The Town's floodplain regulations are laid out in Title 18 of the Castle Rock Municipal Code. These regulations prohibit various types of development within the floodplain overlay district. See section B.6.1 for details on Title 18.

Table B.11 summarizes development in the 1% and 0.2% annual chance flood zones between 2010 and 2014. Based on this data, Castle Rock has greatly minimized development in flood hazard areas.

Table B.11. Castle Rock Structures Built from 2010 to 2014: Assets Exposed to the 1% and 0.2% Annual Chance Flood Zone

Flood Zone	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Estimated Content Value	Land Value	Total Value
1% Annual Chance	3	3	4	$110,764	$55,382	$30,000	$196,146
0.2% Annual Chance	1	1	1	$490,335	$735,503	$262,665	$1,488,503
Total	4	4	5	$601,099	$790,885	$292,665	$1,684,649

Source: Douglas County GIS

Flood: Localized/ Stormwater

Vulnerability to Flood: Localized/ Stormwater

Likelihood of Future Occurrence—High
Potential Magnitude—Medium
Overall Vulnerability—Medium

Stormwater flooding is relatively common in Castle Rock, occurring roughly every year. Stormwater flooding is most likely to occur in the spring and summer months when the Colorado monsoons bring heavy rains. Impacts generally include ponding, intersection flooding, and basement flooding in a handful of residences.

Development Trends

The risk of stormwater/localized flooding to future development can be minimized by accurate recordkeeping of repetitive localized storm activity. Mitigating the root causes of the localized stormwater or choosing not to develop in areas that often are subject to localized flooding will reduce future risks of losses due to stormwater/localized flooding.

Landslides/ Mud & Debris Flows /Rockfalls/Erosion

Vulnerability to Landslides/ Mud & Debris Flows /Rockfalls/Erosion

Likelihood of Future Occurrence—Medium for landslides, High for erosion
Potential Magnitude—Low for landslides and erosion
Overall Vulnerability—Low for landslides and erosion

The landslide hazard is made up of these attributes: debris-flow, rockfall-rockslide/debris, and slope-failure. Erosion hazards in Castle Rock are also discussed in this section, despite being ranked low significance, due to the property exposure in potential hazard areas.

The County's parcel layer was used as the basis for the inventory of all parcels within Castle Rock. GIS was used to overlay the landslide hazard layer with the parcel layer centroids and where the zones intersected a parcel centroid, it was assigned with that hazard zone for the entire

parcel. The Town has 826 structures with a total value of over $361 million potentially exposed to landslide hazards, as detailed in Table B.12. Table B.13 summarizes exposure to moderate accelerated erosion. Erosion analysis does not include contents value since contents of buildings are unaffected by this hazard. Figure B.8 depicts Castle Rock's mapped landslide and erosion hazard areas.

Table B.12. Town of Castle Rock Total Exposure to Landslide

Property Type	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Estimated Content Value	Land Value	Total Value
Debris Flow Area							
Exempt	2	0	0	$0	$0	$7,380	$7,380
HOA	1	0	0	$0	$0	$0	$0
Residential	2	2	2	$623,841	$311,921	$104,000	$1,039,762
Vacant Land	5	0	5	$0	$0	$216,929	$216,929
Total	**10**	**2**	**7**	**$623,841**	**$311,921**	**$328,309**	**$1,264,071**
Rockfall/Rockslide/Debris Avalanche Area							
Agricultural	12	1	0	$3,344	$3,344	$12,252	$18,940
Commercial	2	2	27	$11,114,940	$11,114,940	$3,024,948	$25,254,828
Exempt	72	4	21	$319,053	$319,053	$6,456,548	$7,094,654
HOA	48	0	10	$0	$0	$0	$0
Residential	457	445	455	$165,347,125	$82,673,563	$30,863,139	$278,883,827
Vacant Land	156	0	149	$0	$0	$8,805,576	$8,805,576
Total	**747**	**452**	**662**	**$176,784,462**	**$94,110,900**	**$49,162,463**	**$320,057,825**
Slope-Failure Area							
Agricultural	3	0	0	$0	$0	$8,294	$8,294
Exempt	11	0	1	$0	$0	$294,420	$294,420
HOA	7	0	6	$0	$0	$0	$0
Residential	90	89	91	$21,056,449	$10,528,225	$5,336,721	$36,921,395
Vacant Land	63	0	59	$0	$0	$2,682,300	$2,682,300
Total	**174**	**89**	**157**	**$21,056,449**	**$10,528,225**	**$8,321,735**	**$39,906,409**
Grand Total	**931**	**543**	**826**	**$198,464,752**	**$104,951,046**	**$57,812,507**	**$361,228,305**

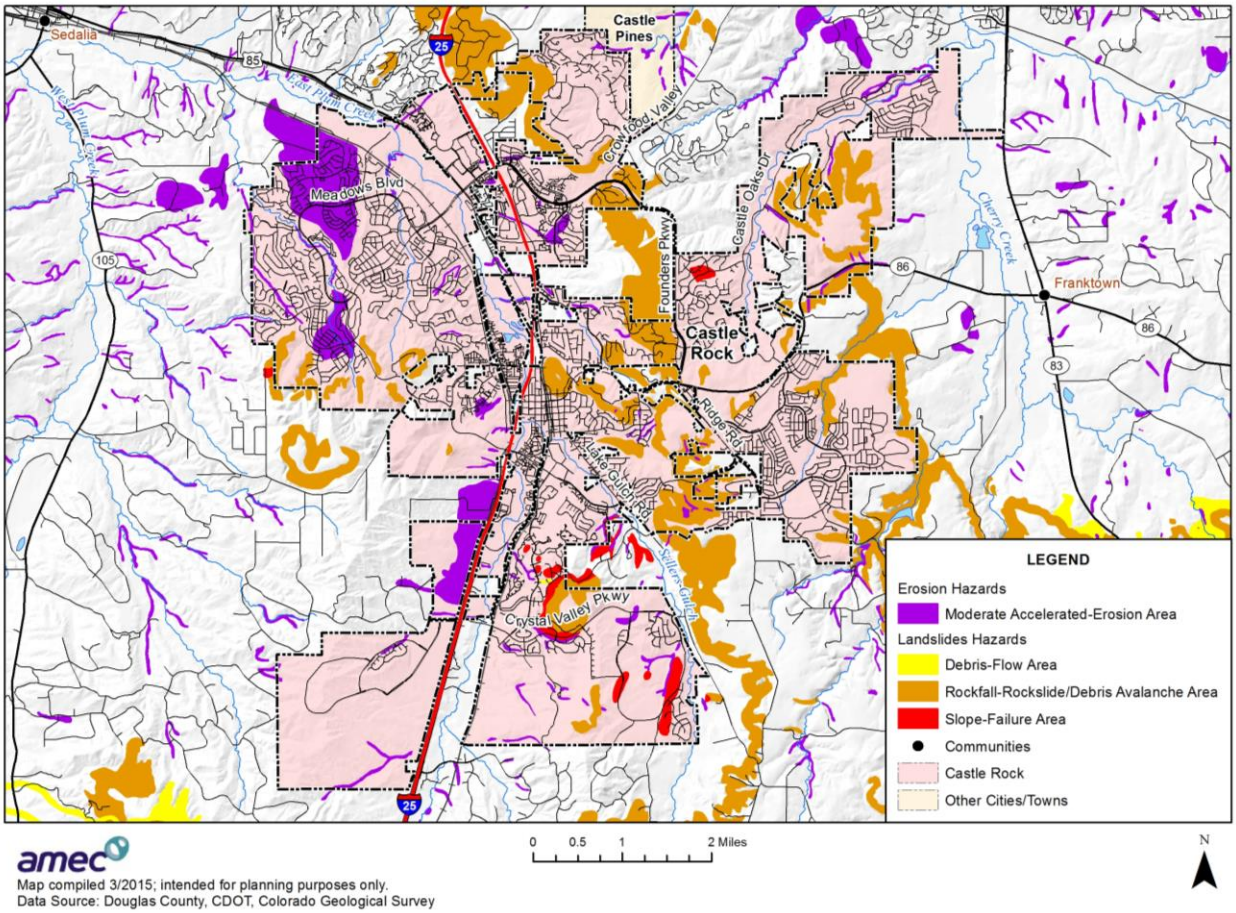
Source: Douglas County Assessor's Data

Table B.13. Town of Castle Rock Total Exposure to Moderate Accelerated Erosion

Property Type	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Land Value	Total Value
Agricultural	61	0	51	$0	$3,409	$3,409
Commercial	8	5	9	$3,261,035	$3,011,879	$6,272,914
Exempt	63	3	14	$7,433,295	$2,958,962	$10,392,257
HOA	63	0	37	$0	$0	$0
Industrial	1	1	1	$431,580	$588,060	$1,019,640
Residential	1,906	1,906	1,906	$372,771,572	$94,912,075	$467,683,647
Vacant Land	42	0	35	$0	$2,118,241	$2,118,241
Total	**2,144**	**1,915**	**2,053**	**$383,897,482**	**$103,592,626**	**$487,490,108**

Source: Douglas County Assessor's Data

Figure B.8. Castle Rock Erosion and Landslide Hazards



Population at Risk

An estimated 1,533 people are potentially exposed to landslide hazards in Castle Rock. This estimate is based on the number of exposed improved residential parcels (536) multiplied by the average household size in Castle Rock according to the 2010 U.S. Census (2.86).

Critical Facilities at Risk

Landslide and erosion analysis was performed on the critical facility inventory in Castle Rock. GIS was used to determine whether Castle Rock facility locations intersect the landslide and erosion hazard areas provided by Douglas County, and if so, which zones they intersect. There are a total of 25 critical facilities located in rockfall and moderate accelerated erosion hazard areas in Castle Rock.

Table B.14. Castle Rock Critical Facilities in Landslide and Erosion Hazard Areas

Hazard	Category	Type	Facility Count
Moderate Accelerated Erosion	At-Risk Population Facilities	School	3
	Essential Services Facilities	Bridge	1
		Water Hub/Treatment	1
	High Potential Loss Facilities	Hazardous Material	2
	Total		**7**
Rockfall	At-Risk Population Facilities	Assisted Living	1
	Essential Services Facilities	Cell Tower	1
	Essential Services Facilities	Microwave	16
	Total		**18**
	Grand Total		**25**

Source: Douglas County GIS

Development Trends

Castle Rock has two regulatory mechanisms for dealing with erosion, including the 2011 Grading, Erosion, and Sediment Control (GESC) Manual and the 2011 Drainage, Erosion, and Sediment Control (DESC) Manual. Castle Rock's Municipal Code states that "[t]he provisions of the GESC Manual shall apply to all land within the incorporated areas of the Town of Castle Rock or served by the Town, including public lands" (Section 15.34.020 Applicability). The provisions in these documents will also apply to future development built within the Town's boundaries or service area.

An analysis of recent development trends in hazard areas was conducted for Castle Rock. A total of 124 structures were built in landslide and moderate-accelerated erosion hazard areas in the Town between 2010 and 2014. Results of this analysis are shown in Table B.15.

Table B.15. Castle Rock Structures Built from 2010 to 2014: Summary of Assets Exposed to Landslide and Moderate Accelerated-Erosion Areas

Hazard	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Estimated Content Value	Land Value	Total Value
Debris Flow	1	1	1	$354,228	$177,114	$52,000	$583,342
Rockfall	16	16	16	$6,289,724	$3,144,862	$1,054,200	$10,488,786
Slope Failure	2	2	2	$208,974	$104,487	$130,000	$443,461
Moderate Accelerated Erosion	105	105	105	$20,306,057	$10,153,029	$4,995,400	$35,454,486
Total	**124**	**124**	**124**	**$27,158,983**	**$13,579,492**	**$6,231,600**	**$46,970,075**

Source: Douglas County GIS

Severe Weather: Hail

Vulnerability to Severe Weather: Hail

Likelihood of Future Occurrence—High
Potential Magnitude—Medium
Overall Vulnerability—High

Hail is one of the most damaging natural hazards in Colorado. It occurs in wide swaths, causing damage to large geographical areas at once. A single hailstorm could potentially impact all of Castle Rock at once. Hailstorms can also occur relatively frequently, especially in the summer, though they may not always cause significant damages. The impacts of hailstorms can vary substantially from one storm to another depending on weather conditions and the size of the hailstones. Losses are typically covered by insurance.

Development Trends

Any future development in Castle Rock will be exposed to hail. Impacts to people can be mitigated by staying indoors during a hailstorm, and some property such as cars can be protected with covered parking where available. Hail impacts are difficult to mitigate in general though, and insurance is one of the typical options for recouping property losses and reducing economic impacts.

Severe Weather: High Winds

Vulnerability to Severe Weather: High Winds

Likelihood of Future Occurrence—High
Potential Magnitude—Medium
Overall Vulnerability—Medium

High winds, often accompanying severe thunderstorms, can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. Winds in Castle Rock are typically straight-line winds. Straight-line winds are generally any thunderstorm wind that is not associated with rotation (i.e., is not a tornado). These winds can overturn mobile homes, tear roofs off of houses, topple trees, snap power lines, shatter windows, and sandblast paint from cars. Other associated hazards include utility outages, arcing power lines, debris blocking streets, dust storms, and an occasional structure fire.

Development Trends

The impact of high winds on future development in Castle Rock can be mitigated with building codes and design criteria.

Severe Weather: Thunderstorms/Heavy Rains

Vulnerability to Severe Weather: Thunderstorms/Heavy Rains

Likelihood of Future Occurrence—High
Potential Magnitude—Medium
Overall Vulnerability—High

According to historical hazard data, severe weather is an annual occurrence in Castle Rock. Damage and disaster declarations related to severe weather have occurred and will continue to occur in the future. Heavy rain and thunderstorms are the most frequent type of severe weather occurrences in the Town. Lightning often accompanies these storms and has caused damage to homes in Castle Rock in the past. However, actual damage associated with the primary effects of severe weather has been limited. It is the damage caused by secondary hazards such as floods and fire that have the greatest impact on Castle Rock. The risk and vulnerability associated with these secondary hazards are discussed in other sections where applicable.

Development Trends

New critical facilities such as communications towers should be built to withstand heavy rains and thunderstorms. It is difficult to quantify future deaths, injuries, or damages due to heavy rains or thunderstorms. Future development projects should consider severe weather hazards at the planning, engineering and architectural design stage with the goal of reducing vulnerability.

Development in the Town is regulated by zoning and subdivision regulations, and future development is not expected to increase vulnerability to hazards.

Severe Weather: Tornado

Vulnerability to Severe Weather: Tornado

Likelihood of Future Occurrence—Medium
Potential Magnitude—Medium
Overall Vulnerability—Medium

Tornadoes can cause damage to property and loss of life. While most tornado damage is caused by violent winds, the majority of injuries and deaths generally result from flying debris. Property damage can include damage to buildings, fallen trees and power lines, broken gas lines, broken sewer and water mains, and the outbreak of fires. Agricultural crops and industries may also be damaged or destroyed. Access roads and streets may be blocked by debris, delaying necessary emergency response.

Figure 4.22 in Chapter 4 indicates that tornadoes can occur anywhere in Douglas County, especially in the eastern half. Four F0 tornadoes and one F1 tornado were reported in Castle Rock.

Development Trends

Population growth and development expose more people to tornadoes in Castle Rock. The impact to people can be mitigated through warning systems and tornado shelters. Stringent building codes for high winds can help mitigate impacts from weaker tornadoes, and property insurance can reduce economic impacts.

Severe Weather: Winter Weather (includes snow/ice/extreme cold)

Vulnerability to Severe Weather: Winter Weather (includes snow/ice/extreme cold)

Likelihood of Future Occurrence—High
Potential Magnitude—High
Overall Vulnerability—High

Castle Rock typically experiences multiple winter storms in any given year. This hazard has been critical in its magnitude and severity in the past in Douglas County, as seen during the blizzards of March 2003 and December 2006. Vulnerability is high along busy roadways, particularly on Highway 470 and Interstate 25, the latter of which runs through the center of Castle Rock. Severe winter weather conditions may cause traffic related deaths and injuries. Road closures due to winter weather conditions also restrict or prevent the movement of people and goods and services (including food and gas), which can create the need for emergency sheltering for travelers. Poor road conditions can also delay emergency response.

It is difficult to identify specific winter weather hazard areas within Castle Rock. Data was not available to identify specific structures at risk or estimate potential losses to these structures. NCDC data did not provide enough details on past damages and casualties to obtain an average annual loss assessment. If the March 2003 blizzard is used as the event of record, then the Denver Metro area could expect over $31 million in property damages from a severe winter storm. Note that this damage estimate is spread over the entire Denver Metro area; Castle Rock's share of the damage would be smaller.

Development Trends

Future residential or commercial buildings built to code should be able to withstand snow loads from severe winter storms. Population growth in Castle Rock and growth in visitors will increase problems with road, business, and school closures and increase the need for snow removal and emergency services related to severe winter weather events.

Wildfire

Vulnerability to Wildfire

Likelihood of Future Occurrence—High
Potential Magnitude—Medium
Overall Vulnerability—Medium

An exposure analysis was performed to quantify risk to wildfire in Castle Rock. Potential losses to wildfire were estimated using a countywide Wildfire Hazard Potential GIS layer (created for the Douglas County Community Wildfire Protection Plan) and assessor's data from Douglas County. Potential losses were examined in terms of structures, property value, critical facilities, and people at risk. For all analyses, the threat levels were classified as low, medium, high, and extreme. According to the CWPP, "[t]here is no absolute set of conditions that cause an area to be identified as being in a particular hazard category. Instead, the hazard category identified is a function of the combined factors that influence controllability, values, and ignition risk" (pg. 59).

GIS was used to create a centroid, or point representing the center of the parcel polygon. The CWPP's Wildfire Hazard Potential layer was then overlaid on the parcel centroids. For the purposes of this analysis, the fire hazard zone that intersected a parcel centroid was assigned the severity zone for the entire parcel. The model assumes that every parcel with a structure value greater than zero is improved in some way. Specifically, an improved parcel assumes there is a building on it.

Table B.16 shows total parcel counts, improved parcel counts and their structure values by occupancy type (residential, industrial, etc.) and total land values within each fire severity zone in Castle Rock. Table B.17 summarizes this information by wildfire severity zone. Figure B.9 illustrates the wildfire severity zones in Castle Rock and the surrounding area.

Table B.16. Town of Castle Rock Total Exposure to Wildfire by Property Type

Property Type	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Estimated Content Value	Land Value	Total Value/Loss Estimate
Extreme							
Agricultural	2	0	0	$0	$0	$786	$786
Commercial	1	1	27	$11,113,512	$11,113,512	$2,836,488	$25,063,512
Exempt	11	1	2	$8,191,530	$8,191,530	$1,286,612	$17,669,672
HOA	12	0	2	$0	$0	$0	$0
Residential	100	88	100	$33,284,971	$16,642,486	$5,881,772	$55,809,229
Vacant Land	31	0	32	$0	$0	$1,802,335	$1,802,335
Total	**157**	**90**	**163**	**$52,590,013**	**$35,947,528**	**$11,807,993**	**$100,345,534**
High							
Agricultural	254	2	201	$277,506	$277,506	$536,121	$1,091,133
Commercial	40	31	131	$94,535,214	$94,535,214	$25,335,193	$214,405,621
Exempt	462	33	134	$132,224,647	$132,224,647	$45,624,269	$310,073,563
HOA	310	0	214	$0	$0	$0	$0
Industrial	3	3	9	$1,950,632	$2,925,948	$1,384,097	$6,260,677
Residential	6,146	5,671	6,339	$1,501,319,158	$750,659,579	$313,622,015	$2,565,600,752
Utilities	3	0	1	$0	$0	$0	$0
Vacant Land	1,631	4	1,541	$488,544	$0	$47,944,926	$48,433,470
Total	**8,849**	**5,744**	**8,570**	**$1,730,795,701**	**$980,622,894**	**$434,446,621**	**$3,145,865,216**
Moderate							
Agricultural	939	0	817	$0	$0	$94,130	$94,130
Commercial	40	33	167	$62,343,982	$62,343,982	$29,676,239	$154,364,203
Exempt	226	15	101	$124,658,072	$124,658,072	$37,942,118	$287,258,262
HOA	169	0	57	$0	$0	$0	$0
Industrial	1	1	2	$3,783,814	$5,675,721	$956,186	$10,415,721
Residential	3,313	2,910	3,467	$695,396,201	$347,698,101	$148,062,762	$1,191,157,064
Utilities	5	0	0	$0	$0	$0	$0
Vacant Land	694	2	624	$553,199	$0	$29,130,296	$29,683,495
Total	**5,387**	**2,961**	**5,235**	**$886,735,268**	**$540,375,876**	**$245,861,731**	**$1,672,972,875**
Low							
Agricultural	112	2	87	$7,313	$7,313	$13,038	$27,664
Commercial	372	353	1,408	$352,019,144	$352,019,144	$142,783,657	$846,821,945
Exempt	702	70	242	$299,398,569	$299,398,569	$31,304,730	$630,101,868
HOA	221	0	85	$0	$0	$0	$0
Industrial	21	21	37	$14,849,052	$22,273,578	$10,582,039	$47,704,669
Residential	8,508	8,415	8,543	$1,561,307,936	$780,653,968	$376,602,295	$2,718,564,199
Utilities	10	0	7	$0	$0	$0	$0
Vacant Land	280	0	142	$0	$0	$15,800,405	$15,800,405
Total	**10,226**	**8,861**	**10,551**	**$2,227,582,014**	**$1,454,352,572**	**$577,086,164**	**$4,259,020,750**
Grand Total	**24,619**	**17,656**	**24,519**	**$4,897,702,996**	**$3,011,298,870**	**$1,269,202,509**	**$9,178,204,375**

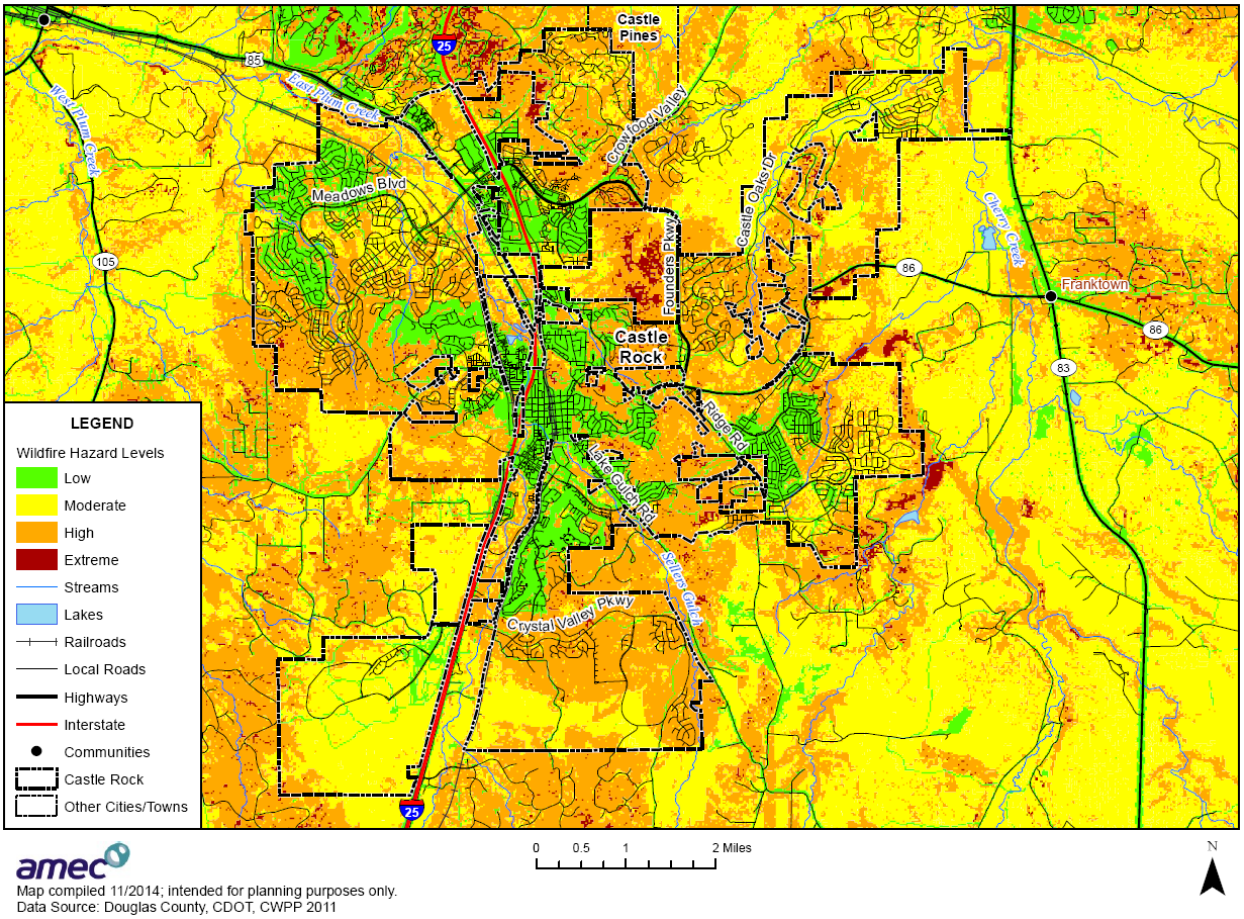
Source: Douglas County GIS

Table B.17. Town of Castle Rock Total Exposure to Wildfire Summary

Wildfire Severity	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Estimated Content Value	Land Value	Total Value/Loss Estimate
Extreme	157	90	163	$52,590,013	$35,947,528	$11,807,993	$100,345,534
High	8,849	5,744	8,570	$1,730,795,701	$980,622,894	$434,446,621	$3,145,865,216
Moderate	5,387	2,961	5,235	$886,735,268	$540,375,876	$245,861,731	$1,672,972,875
Low	10,226	8,861	10,551	$2,227,582,014	$1,454,352,572	$577,086,164	$4,259,020,750
Total	**24,619**	**17,656**	**24,519**	**$4,897,702,996**	**$3,011,298,870**	**$1,269,202,509**	**$9,178,204,375**

Source: Douglas County GIS

Figure B.9. Castle Rock Wildfire Hazard Potential



Population at Risk

Wildfire risk is greatest to those individuals residing in identified hazard areas. GIS analysis was performed to determine population in the different fire hazard areas. Using GIS, the Douglas County wildfire hazard potential layers were overlaid on the entire parcel layer. Those parcel centroids that intersect the wildfire hazard potential areas were counted and multiplied by the 2010 Census Bureau average household size for each jurisdiction and unincorporated area, which is 2.86 in Castle Rock. Table B.18 summarizes the results of this analysis.

Table B.18. Population at Risk to Wildfire

	Extreme	High	Moderate	Low
Population	252	16,219	8,323	24,067
Improved Residential Parcels	88	5,671	2,910	8,415

Source: Douglas County GIS, 2010 U.S. Census

Critical Facilities at Risk

Wildfire analysis was performed on the critical facility inventory in Douglas County and all jurisdictions, including Castle Rock. GIS was used to determine whether the facility locations intersect a wildfire hazard area. Table B.19 summarizes the results of the GIS analysis for Castle Rock, and Figure B.10 depicts the location of critical facilities in relation to wildfire severity zones. Details of critical facility definition, type, name and address and jurisdiction by wildfire zone are listed in Appendix E.

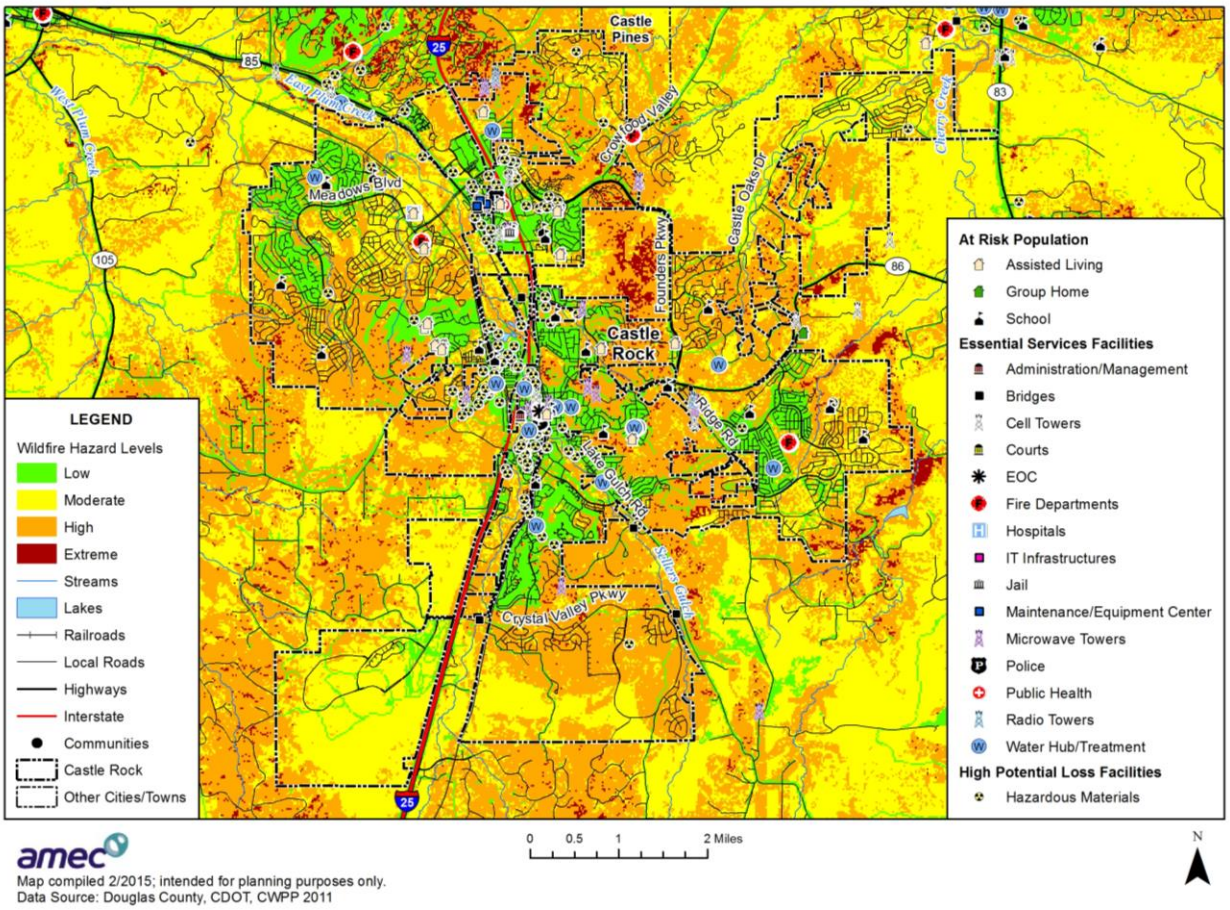
Table B.19. Castle Rock– Critical Facilities at Risk to Wildfire Detail

Fire Risk	Category	Type	Facility Count
High	At-Risk Population Facilities	Assisted Living	8
	At-Risk Population Facilities	School	12
	Essential Services Facilities	Bridge	1
	Essential Services Facilities	Cell Tower	3
	Essential Services Facilities	Fire Department	3
	Essential Services Facilities	Microwave	19
	Essential Services Facilities	Public Health	1
	Essential Services Facilities	Water Hub/Treatment	2
	High Potential Loss Facilities	Hazardous Material	30
	Total		**79**
Moderate	At-Risk Population Facilities	Assisted Living	2
	At-Risk Population Facilities	School	1
	Essential Services Facilities	Hospital	1
	Essential Services Facilities	Microwave	9
	Essential Services Facilities	Police	1
	Essential Services Facilities	Water Hub/Treatment	1
	High Potential Loss Facilities	Hazardous Material	16
	Total		**31**
Low	At-Risk Population Facilities	Assisted Living	4
	At-Risk Population Facilities	School	4
	Essential Services Facilities	Admin & Management	1
	Essential Services Facilities	Cell Tower	3
	Essential Services Facilities	Courts	1
	Essential Services Facilities	EOC	2
	Essential Services Facilities	Fire Department	2
	Essential Services Facilities	IT Infrastructure	2
	Essential Services Facilities	Jail	1
	Essential Services Facilities	Microwave	11
	Essential Services Facilities	Police	2
	Essential Services Facilities	Water Hub/Treatment	10

Fire Risk	Category	Type	Facility Count
	High Potential Loss Facilities	Hazardous Material	70
	Total		**113**
GRAND TOTAL			**223**

Source: Douglas County GIS

Figure B.10. Castle Rock Wildfire Hazard Potential and Critical Facilities



Development Trends

The pattern of increased damages is directly related to increased urban growth spread into historical forested areas that have wildfire as part of the natural ecosystem. Many WUI fire areas have long histories of wildland fires that burned only vegetation in the past. However, with new development, a wildland fire following a historical pattern now burns developed areas. Population growth and development in Castle Rock could potentially expose more people and structures to wildfires.

An analysis of recent development in extreme, high, and moderate wildfire hazard areas was conducted for Castle Rock. A total of 512 structures was built between 2010 and 2014. The

total value of these structures is $230,481,837, with the majority located in the high wildfire hazard area. Results of this analysis are shown in Table B.20.

Table B.20. Castle Rock Structures Built from 2010 to 2014: Assets Exposed to Wildfire by Hazard Level

Hazard Level	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Estimated Content Value	Land Value	Total Value
Extreme	1	1	1	$268,821	$134,411	$80,500	$483,732
High	323	322	350	$103,939,580	$43,744,447	$19,380,042	$167,064,069
Moderate	161	161	161	$36,895,395	$18,657,313	$7,381,328	$62,934,036
Total	**485**	**484**	**512**	**$141,103,796**	**$62,536,171**	**$26,841,870**	**$230,481,837**

Source: Douglas County GIS

Hazardous Materials: Transportation Incidents

Vulnerability to Hazardous Materials: Transportation Incidents

Likelihood of Future Occurrence—Medium
Potential Magnitude—Medium
Overall Vulnerability—Medium

Several major transportation routes cross through Castle Rock, including Interstate 25, the Union Pacific railroad, and the Burlington Northern Santa Fe (BNSF) railroad. Hazardous materials are transported along these corridors regularly, if not every day. Residential areas are located in the immediate vicinity of the corridors, potentially presenting a serious public health and safety concern if a hazardous materials incident were to occur in a populated area. GIS analysis was used to determine the number of people at potentially at risk to hazardous materials transportation incidents in Castle Rock.

Population at Risk

To determine an estimate of populations at risk from a transportation-related hazardous materials release within identified transportation corridors, an analysis was performed using GIS. A one-mile buffer was applied to both sides of Interstate 25 and the Union Pacific and Burlington Northern Santa Fe (BNSF) Railroads, creating a two-mile buffer zone around each corridor. The buffer distance was based on guidelines in the U.S. Department of Transportation's Emergency Response Guidebook that suggest distances useful to protect people from vapors resulting from spills involving dangerous goods considered toxic if inhaled. The recommended buffer distance referred to in the guide as the "protective action distance" is the area surrounding the incident in which people are at risk of harmful exposure. For purposes of this plan, an average buffer distance of one mile was used on either side of the transportation corridor. Actual buffer distances will vary depending on the nature and quantity of the release, whether the release occurred during the night or daytime, and prevailing weather conditions.

Since there is overlapping of the corridors in some locations in Castle Rock, individual population analysis was performed for each transportation corridor. Each buffered transportation corridor was intersected with improved residential parcels and therefore parcels could be counted more than once due to the individual analysis of each corridor. It is important to note that populations associated with commercial, industrial and other property types may also be affected by a hazardous materials release, but no census/population data is associated with these property types and are therefore excluded from this analysis. It is also important to note that the population at risk to a specific incident could vary greatly and would be dependent on accident location, severity and weather conditions.

The two railroads that go through Castle Rock are adjacent to each other so the majority of the population in this analysis is duplicated for each railroad. There are 15,350 people that live within the one-mile buffer of the Union Pacific Railroad that passes through Castle Rock. The BNSF Railroad (Burlington Northern Santa Fe Railroad) follows the same corridor through Castle Rock with an estimated population of 16,900. A population of 12,341 is within the proximity of Interstate 25 that passes through Castle Rock.

Development Trends

Development in Castle Rock occurs within existing town boundaries. As development in Castle Rock continues to grow, more people will be at risk to hazardous materials transportation incidents.

B.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capability assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation outreach and partnerships, and other mitigation efforts.

B.6.1 Regulatory Mitigation Capabilities

Table B.21 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Town of Castle Rock.

Table B.21. Town of Castle Rock Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Y/N	Date	Comments
Comprehensive plan	Y	2014	2035 Comprehensive Master Plan
Zoning ordinance	Y		
Subdivision ordinance	Y		
Growth management ordinance	Y		Addressed in Comprehensive Master Plan
Floodplain ordinance	Y		
Other special purpose ordinance (stormwater, steep slope, wildfire)	Y		
Building code	Y		
BCEGS Rating	4/2	2007	
Fire department ISO rating	Y		Rating of 5
Erosion or sediment control program	Y		
Stormwater management program	Y	2004	
Site plan review requirements	Y		
Capital improvements plan	Y		5 year plan
Economic development plan			Addressed in Comprehensive Master Plan with Council for Economic Development
Local emergency operations plan	Y	2005	Incident Management Guidelines and Standards
Community Wildfire Protection Plans	Y	2007	Woodlands-Escavera CWPP
Flood insurance study or other engineering study for streams	Y	2005	
Elevation certificates	Y		
Other	Y		Wastewater Master Plan Criteria Manuals Water Use Management Plan Water Resources Strategic Master Plan Water Facilities Master Plan Water Conservation Master Plan

Source: Amec Foster Wheeler Data Collection Guide

2035 Comprehensive Master Plan (2014)

The Comprehensive Master Plan is intended to provide direction to elected and appointed officials, the general citizenry, landowners and developers, and other area governmental entities for short-term and long-term growth and development of Castle Rock. It is a policy guide for community development decisions, to assist with community facility planning and budgeting, and guides future development of housing, employment, and cultural and educational opportunities for the Castle Rock community. The plan must be able to respond to changing conditions such as increased population and demand for public services, housing supply, legislative policies, technological development, and economic circumstances.

The plan includes the following sections:

- Land use
- Transportation
- Community Service
- Parks, Recreation, Trails and Open Space
- Community Character and Design
- Economic Development
- Natural Resources

Goals and policies related to mitigation of natural hazards are as follows:

Principle GM-2:	**Adequate community facilities and levels of services shall be provided for when considering the timing and location of development.**
Policy GM-2.1	Development will only be permitted where it can be efficiently served by critical public services such as transportation, water, wastewater, storm drainage, parks and recreation, fire and emergency services, and any other public facilities and services required by the Town.

Principle LU-4	**Environmentally Sensitive Development**
Policy LU-4.2	LU-4.2 Encourage clustering of development in order to avoid site constraints or preserve site amenities, such as steep or unstable slopes, rock outcroppings, ridgelines, floodplains or stands of trees.
Policy LU-4.4	Discourage development where natural hazards, unstable soils, or flood hazards exist. Development that increases these hazards for surrounding land uses shall not be allowed, nor shall it be allowed on steep slopes unsuitable for development when appropriate mitigation cannot be achieved.

Principle LU-8	**Interchange Districts**
Policy LU-8.1	Significant natural features, such as buttes, ridgelines, and major drainageways are critical to the character of Castle Rock and should be respected by all development. The Interchange Districts encourage a high-density built environment within these natural features through alternative form-based zoning regulations. The alternative form-based code will detail how these alternative regulations relate to the existing Municipal Code requirements. Incentives will be provided in the form-based code to promote the high-density, high-quality development desired at these interchanges.
Policy LU-8.2	The desired higher density urban level development will be required to protect significant natural drainageways by creating opportunities for natural design and added value; to protect the Plum Creek Corridor and its tributaries; to protect the designated floodplains and designated mouse habitat protection areas; and to integrate water conservation and water quality design concepts into the proposed land use plans.

Principle CS-1	**Water Supply**
Policy CS-1.1	Carefully evaluate water rights dedication (both actual conveyances and contract provisions) in conjunction with any new or amended Planned Development. Ensure compliance with the Town's existing water ordinance and policies.
Policy CS-1.2	Manage water demand to minimize infrastructure investments required to meet peak demands, to conserve the finite Denver Basin aquifer resource.

Principle CS-1	Water Supply
Policy CS-1.3	Implement water conserving principles related to landscape design, installation and maintenance.
Policy CS-1.4	Continue to manage peak demands in accordance with the Town's Water Demand Management Plan.
Policy CS-1.5	Reuse treated wastewater for irrigation to reduce potable water demand.

Principle CS-2:	Water Supply Regional Interaction and Cooperation
Policy CS-2.1	CS-2.1 Develop alliances with other water providers, municipalities, special districts, and the County.
Policy CS-2.2	CS-2.2 Participate in planning, evaluation and implementation of water supply alternatives sponsored by the Douglas County Water Resource Authority and the Denver Regional Council of Governments.
Policy CS-2.3	CS-2.3 Secure an imported renewable water supply.

Principle CS-7	Storm Water Management
Policy CS-7.1	Ensure provisions for detaining storm water necessary to meet the legal requirement that storm flows leaving the property cannot exceed.
Policy CS-7.2	All development shall incorporate a master drainage plan.

Principle CS-8	Floodplain Development
Policy CS-8.1	Restrict land uses and activities that are hazardous to the public health in time of flood.
Policy CS-8.2	Restrict uses that are particularly vulnerable to flood damage, so to alleviate hardship and eliminate demands for public expenditures for relief and protection.
Policy CS-8.3	Require permitted floodplain uses, including public facilities, which serve such uses, to be protected against floods through the uses of flood proofing, and other protective measures at the time of initial construction or reconstruction.
Policy CS-8.4	Encourage low-intensity uses such as agriculture, parking lots, recreation, and open space within the floodplain
Policy CS-8.5	Protect the public from the burden of avoidable financial expenditures for flood control and relief by regulating all uses within the flood plain areas so as to produce a method of construction and a pattern of development, which will minimize the probability of damage to property and loss of life or injury to the inhabitants of the flood hazard areas.

Principle CS-11	Emergency Cooperation
CS-11.1	Continue to cooperate with nearby fire protection emergency response districts and departments in such areas as communications, mutual-aid, and training.

Principle CS-12	Wildfire Prevention Design Standards
CS-12.1	At the time of development application, the dangers of wildfires shall be recognized and appropriate building and site design, access, maintenance, and mitigation measures to reduce potential hazards should be achieved through design standards.

Principle NR-1	Protect Natural Resources to Sustain High Quality of Life
Policy NR-1.1	Minimize disruption to the natural topography, steep slopes, and significant stands of vegetation through creative site planning and through design and sensitive construction practices.
Policy NR-1.2	Use requirements in the Planned Development (PD) zone district to encourage open space dedication and the preservation of key visual and environmental elements.
Policy NR-1.3	Support and actively participate with other public and private organizations to acquire environmentally important open space areas in and around Castle Rock.

Principle NR-2	Environmentally Sensitive Development
Policy NR-2.1	Ensure that development demonstrates that any impacts to air and water quality are mitigated to the extent technically feasible and practical.
Policy NR-2.2	Encourage clean and non-polluting land uses for the Castle Rock community
Policy NR-2.3	NR-2.3 Protect unique or distinctive natural features and systems, critical wildlife habitats and environmental resources from adverse impacts through sound conservation practices
Policy NR-2.4	Use creative land planning approaches where site conditions warrant due to the prevalence of significant native vegetation and natural landforms, or steep slopes.
Policy NR-2.5	Grading for site development will be carried out in conformance with an approved grading plan intended to minimize site disturbance and control erosion.

Principle NR-4	Environmental Hazards and Constraints
Policy NR-4.1	Require an environmental audit of lands being proposed for public dedication, including all open space, park, school, and rights-of-way, to ensure that they are free of environmental hazards and to ensure that the Town will not be liable for any future cleanup.
Policy NR-4.2	Discourage developments where a significant risk to life and property exist, as in areas of floodplain, geologic hazard, unstable soils and excessively steep slopes.

Storm Drainage Design and Technical Criteria Manual

The Stormwater Drainage Design and Technical Criteria Manual was adopted in 2007. The manual presents the policies and minimum technical criteria for the planning, analysis and design of storm drainage systems within Town boundaries. The manual was developed in cooperation with Douglas County and Urban Drainage to improve consistency between neighboring jurisdictions.

Stormwater Master Plan

The Stormwater Master Plan was adopted in 2004 and updated in 2010. The plan commits the Town to a long-term program to ensure that drainage and other systems control stormwater runoff, protect the public during major storms, protect property values, safeguard Town streams from the high level of pollutants carried by urban runoff, and balance storm drainage planning approaches to complement open space and recreation corridors.

The plan outlines stormwater and floodplain problem areas and recommends time frames and priorities for specific drainageway improvement projects through 2020. The prioritization and ranking of these capital improvement projects were based on an evaluation that included criteria such as property protection, public safety, flood risk and water quality enhancement.

Erosion and Sediment Control Manual

The Town has two permitting programs for erosion and sediment control on public and private construction projects within Town limits. The Drainage, Erosion and Sediment Control program covers residential construction on individual lots. The Grading, Erosion and Sediment Control program covers all other development and construction projects.

This GESC and DESC Manual (commonly known as the GESC Manual) describes the permitting programs that have been adopted to promote environmentally sound construction practices in Town. The goal of the program is to implement erosion and sediment control best management practices as a standard for all land-disturbance activities. The hope is to reduce increases in erosion and sedimentation over predevelopment conditions. Erosion caused by construction and downstream sedimentation can damage property and degrade the quality of streams and lakes.

Water Conservation Master Plan

The Water Conservation Master Plan outlines a goal-oriented, performance-based and cost-effective strategy that provides a practical approach to design and implementation, while providing measurable water savings. This plan outlines current and future water-use profiles, establishes conservation goals, identifies conservation measures, reflects the costs and benefits of conservation, defines regulations and incentives, outlines water budget rate structure and educational program, and establishes evaluation processes.

Water Facilities Master Plan

The Water Master Facilities Plan was adopted in 2006 and updated in 2010. The plan examines the existing water system infrastructure. It identifies water treatment and distribution capital improvement projects required to provide service to existing and future development through build-out of the Town's service area boundary. Specifically, the plan examines the following components of the water supply system:

- Existing water treatment and distribution system
- Potable water demands and finished water capacity
- Water treatment for meeting existing and future demands
- Water distribution system modeling for both existing and future conditions
- Recommended capital improvements for maintaining a safe reliable drinking water system

Water Resources Strategic Master Plan

The Water Resources Strategic Master Plan was adopted in 2006 and updated in 2010. This plan addresses the future water needs for the Town to achieve a sustainable long-term water supply. The plan charts the path and identifies strategies for the Town to move toward a sustainable water future.

Currently, 100 percent of the Town's water demands are met by deep aquifer groundwater. Over the past several years, water providers, community leaders and the public have noted declining water levels throughout the region, including in Castle Rock. With or without growth, that existing groundwater supply is a non-renewing resource that is not sustainable for the Town's long-term future.

Water Use Management Plan

The Water Use Management Plan is designed as a demand-management tool to allow adequate volumes and pressures to the water distribution system during landscape irrigation season. This program is also intended to encourage wise use of a finite resource.

Criteria Manuals

The Water System Design Criteria Manual and the Wastewater Collection Design Criteria Manual contain the policies and minimum technical criteria for the planning, analysis and design of potable water and wastewater-collection systems in the Town, as well as areas served by the Town. The manuals outline requirements for utility reports and plans, analyses and designs. The primary goal of the new manuals is to bring criteria up to current construction and design standards. The most significant change to the criteria is aligning the manuals with the new development procedures, which moves detail to the back end of the process.

Wastewater Master Plan

The Wastewater Master Plan was adopted in 2004 and updated in 2010. The plan examines the existing wastewater system infrastructure. It identifies collection system capital improvement projects required to provide service to existing and future development through build-out of the Town’s service area boundary.

The goals of the plan are to:

- Identify capital improvement projects that will provide adequate sanitary sewer service to the Town
- Establish capital improvement project costs
- Develop a capital improvement financial plan for the identified capital improvement projects

Ordinances

The Town of Castle Rock has many ordinances related to mitigation.

Zoning (Chapter 17)

This Title shall be enforced by the Town and its authorized officers, agents and representatives. Town officials may seek enforcement of this Title by injunctive or other equitable relief as necessary to protect the public health, safety and welfare.

All property within the Town shall be included within one of the primary Zoning Districts Residential, Business/Commercial/ Industrial, Open Space, or Planned Development.

Subdivision Regulations (Title 16)

These regulations are adopted to protect and to provide for the public health, safety and welfare of present and future residents of the Town and to guide the future growth and development of the Town. These regulations are designed, intended and should be administered to:

- Implement the Town's Comprehensive Master Plan and community vision statements, zoning and building ordinances, master plans and other development policies and ordinances;
- Provide for the coordinated development of adjoining properties to the benefit of future residents and the general public;
- Provide for adequate, safe and efficient public utilities and improvements; and provide for other general community facilities and public places;
- Provide for an adequate future water supply;
- Provide for optimum traffic circulation and stormwater drainage within the subdivision and throughout the Town;
- Provide necessary road and pedestrian connections to adjacent neighborhoods and to encourage pedestrian, bicycle and transit access;
- Provide for the preservation of important natural features, vegetation and view sheds;
- Provide for access to open space, recreational facilities and other amenities for all residents; and
- Provide for protection from fire, flood and other hazards.

Floodplain Regulations (Title 18)

In Title 29, Article 20, C.R.S., the State of Colorado has delegated the responsibility to local governments to adopt regulations designed to minimize flood losses. Therefore, the Town adopts the Floodplain Regulations set forth in this Title.

The flood hazard areas of the Town of Castle Rock are subject to periodic inundation, which can result in the loss of life and property, health and safety hazards, disruption of commerce and governmental services and extraordinary public expenditures for flood protection and relief, all of which adversely affect the health, safety and welfare of the public.

These flood losses are created by the cumulative effect of obstructions in floodplains or areas of special flood hazard which cause an increase in flood heights and velocities, and by the occupancy of flood hazard areas by uses vulnerable to floods and hazardous to other lands because they are inadequately elevated, floodproofed or otherwise protected from flood damage.

It is the purpose of this Title to promote public health, safety and general welfare and to minimize public and private losses due to flood conditions in specific areas by provisions designed to:

- Protect human life and health;
- Minimize expenditure of public money for costly flood control projects;
- Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
- Minimize prolonged business interruptions;
- Minimize damage to critical facilities, infrastructure and other public facilities such as water, sewer and gas mains; electric and communications stations; and streets and bridges located in floodplains;
- Protect the storage capacity of floodplains and assure retention of sufficient floodway area to convey flood flows which can be reasonably expected to occur;
- Protect the hydraulic characteristics of small watercourses, including the gulches, sloughs and artificial water channels used for conveying floodwaters, which make up a portion of the urban drainage system;
- Help maintain a stable tax base by providing for sound use and development of flood-prone areas in such a manner as to minimize future flood blight areas; and
- Ensure that potential buyers are notified that property is located in a flood hazard area so as to protect individuals from purchasing floodplain lands for unsuitable purposes.

In order to accomplish its purposes, these Floodplain Regulations use the following methods:

- Delineate and describe areas that could be inundated by floods;
- Restrict or prohibit uses that are dangerous to health, safety or property in times of flood, or cause excessive increases in flood heights or velocities;

- Require that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;
- Control the alteration of natural floodplains, small watercourses and natural protective barriers, which are involved in the accommodation of floodwaters;
- Control filling, grading, dredging and other development which may increase flood damage; and
- Prevent or regulate the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards to other lands.

This Title shall apply to all Special Flood Hazard Areas and areas removed from the floodplain by the issuance of a FEMA Letter of Map Revision Based on Fill (LOMR-F) within the jurisdiction of the Town, including those areas incorporated through annexation.

A floodplain development permit shall be required to ensure conformance with the provisions of this Title. A floodplain development permit is required prior to issuance of a building permit, construction permit and any other development, use or change of the use of land located in the floodplain. The floodplain development permit is required in addition to other permits, including but not limited to building permits, construction permits, grading, erosion and sediment control/residential drainage, erosion and sediment control (GESC/DESC) permits and other local, state and federal permits. Conditions and restrictions may apply to other permits and approval processes as necessary to ensure compliance with this Title.

In all Special Flood Hazard Areas, the following provisions are required for all uses, including development, new construction and substantial improvements:

- All new construction or substantial improvements shall be designed (or modified) and adequately anchored to prevent flotation, collapse or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy;
- All new construction or substantial improvements shall be constructed by methods and practices that minimize flood damage;
- All new construction or substantial improvements shall be constructed with materials resistant to flood damage;
- All new construction or substantial improvements shall be constructed with electrical, heating, ventilation, plumbing and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding;
- Manufactured homes shall not be allowed in the floodplain;
- All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of floodwaters into the system;
- New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of floodwaters into the system and discharge from the systems into floodwaters;
- On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding;

- The storage or processing of materials that are buoyant, flammable or which, in times of flooding, could be injurious to human, animal or plant life shall be at or above a point two feet above the Base Flood Elevation;
- The storage of materials or equipment which are not subject to major damage by floods, which are firmly anchored to prevent flotation or are readily removable from the flood hazard area within the time available after flood warning, may be permitted below the Base Flood Elevation; and
- The construction of levees and levee systems are prohibited in the Town.

In all Special Flood Hazard Areas outside the regulatory floodway where Base Flood Elevation data has been provided, the following provisions are required:

- Residential construction. New construction and substantial improvement of any residential structure shall have the lowest floor (including basement) elevated to two feet above the Base Flood Elevation. Upon completion of the structure, the elevation of the lowest floor, including basement, shall be certified by a registered Colorado professional engineer, architect or land surveyor. Such certification shall be submitted to the Floodplain Administrator prior to the release of the Certificate of Occupancy.
- Nonresidential construction. New construction and substantial improvements of any commercial, industrial or other nonresidential structure shall either have the lowest floor (including basement) elevated to two feet above the Base Flood Elevation or, together with attendant utility and sanitary facilities, be designed so that, at two feet above the Base Flood Elevation, the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy. A registered Colorado professional engineer or architect shall develop and/or review structural design, specifications and plans for the construction and shall certify that the design and methods of construction are adequate to withstand the flood depths, pressures, velocities, impact and uplift forces and other factors associated with the base flood. Upon completion of the structure, the work shall be certified by a registered Colorado professional engineer, architect or land surveyor. Such certification shall be submitted to the Floodplain Administrator prior to the release of the Certificate of Occupancy.
- Enclosures. New construction and substantial improvements, with fully enclosed areas below the lowest floor that are usable solely for building access or storage in an area other than a basement and which are subject to flooding, shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement must be certified by a registered Colorado professional engineer or architect and meet or exceed the following minimum criteria:
  - A minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided.
  - The bottom of all openings shall be no higher than one foot above grade.
  - Openings may be equipped with screens, louvers, valves or other coverings or devices, provided that they permit the automatic entry and exit of floodwaters.

- Manufactured homes. No construction, placement or substantial improvement of manufactured homes or manufactured home parks shall be permitted under any circumstances within the floodway fringe district.
- Recreational vehicles. All recreational vehicles placed on sites within the Special Flood Hazard Area shall:
  - Be on the site for fewer than 180 consecutive days; and
  - Be fully licensed and ready for highway use.
    - A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices and has no permanently attached additions.
- Prior approved activities. Any activity for which a floodplain development permit was issued by the Town or a CLOMR was issued by FEMA prior to the effective date of this Title may be completed according to the standards in place at the time of the permit or CLOMR issuance and will not be considered in violation of this Title if it meets such standards.

Building Code Section (Title 15)

In order to provide minimum standards for the proper regulations of building construction, the following publications are hereby adopted by reference and incorporated in this Code, except as expressly amended or superseded by the provisions of this Code.

- International Building Code, 2012 Edition, for regulating and governing conditions and maintenance of all property, buildings and structures; by providing the standards for supplied utilities and facilities and other physical things and conditions essential to ensure the structures are safe, sanitary and fit for occupation and use; and the condemnation of buildings and structures unfit for human occupancy and use and the demolition of such structures, as hereafter set out (published by the International Code Council, Inc., 4051 West Flossmoor Road, Country Club Hills, IL 60478-5795).
- International Residential Code for One- and Two-Family Dwellings, 2012 Edition, including Appendices G, H, J and M, for regulating and governing the construction, alteration, movement, enlargement, replacement, repair, equipment, location, removal and demolition of detached one- and two-family dwellings and multiple single-family dwellings (townhouses) not more than three stories in height with separate means of egress, as hereafter set out (published by the International Code Council, Inc., 4051 West Flossmoor Road, Country Club Hills, IL 60478-5795).
- International Mechanical Code, 2012 Edition, regulating and governing the design, construction, quality of materials, erection, installation, alteration, repair, location, relocation, replacement and addition to, use or maintenance of mechanical systems in Castle Rock, as hereafter set out (published by the International Code Council, Inc., 4051 West Flossmoor Road, Country Club Hills, IL 60478-5795).
- International Plumbing Code, 2012 Edition, including Appendices B, D, E and F, regulating and governing the design, construction, quality of materials, erection, installation, alteration, repair, location, relocation, replacement, addition to, use or maintenance of plumbing

systems, as hereafter set out (published by the International Code Council, Inc., 4051 West Flossmoor Road, Country Club Hills, IL 60478-5795).

- The National Electrical Code, 2011 Edition, as published by the National Fire Protection Association, One Batterymarch Park, Quincy, Massachusetts 02169-7471; and the corresponding National Electrical Code Handbook, Library of Congress. The subject matter of said code concerns are adopted as the minimum standards governing the planning, laying out and installing or the making of additions, alterations and repairs in the installation of wiring apparatus and equipment for electric light and power in the Town.
- International Energy Conservation Code, 2012 Edition, regulating and governing energy efficient building envelopes and installation of energy efficient mechanical, lighting and power systems, as hereafter set out (published by the International Code Council, Inc., 4051 West Flossmoor Road, Country Club Hills, IL 60478-5795).
- International Fuel Gas Code, 2012 Edition, regulating and governing fuel gas systems and gas-fired appliances, as hereafter set out (published by the International Code Council, Inc., 4051 West Flossmoor Road, Country Club Hills, IL 60478-5795).
- International Fire Code, 2012 Edition, including Appendices B, C, D, E, F and I, as hereafter set out (published by the International Code Council, Inc., 4051 West Flossmoor Road, Country Club Hills, IL 60478-5795).
- National Fire Alarm Code, 2010 Edition, published by the National Fire Protection Association, One Batterymarch Park, Quincy, MA 02269-9101.
- Uniform Code for the Abatement of Dangerous Buildings, 1997 Edition, as hereafter set out (published by the International Code Council, Inc., 4051 West Flossmoor Road, Country Club Hills, IL, 60478-5795).
- International Existing Building Code, 2012 Edition, regulating and governing the use and reuse of existing buildings, as hereafter set out (published by the International Code Council, Inc., 4051 West Flossmoor Road, Country Club Hills, IL 60478-5795).
- International Swimming Pool and Spa Code, 2012 Edition, regulating and governing swimming pools, spas, hot tubs, aquatic facilities, as hereafter set out (published by the International Code Council, Inc., 4051 West Flossmoor Road, Country Club Hills, IL 60478-5795).
- ICC A117.1-2009 American National Standard – Accessible and Usable Buildings and Facilities (published by the International Code Council, 4051 W. Flossmoor Road, Country Club Hills, IL 60478-5795;
- ASME A17.1-2007 and ASME A17.3, 2005 Edition, and A18.1-2005 Elevator Codes (published by the American Society of Mechanical Engineers, 3 Park Avenue, New York, NY 10016-5990).

Health and Safety (Title 8)

The Castle Rock Fire Department, the Fire Chief, and his or her duly authorized representatives are hereby assigned as the designated emergency response authority for hazardous materials incidents within the Town of Castle Rock. The Fire Chief shall provide an emergency response to hazardous materials incidents by taking necessary initial action to minimize the effects of such

an incident and provide continued supervision and authority over all further efforts to eliminate the threat of immediate and irreparable harm to the environment or public health and safety.

B.6.2 Administrative/Technical Mitigation Capabilities

Table B.22 identifies the Town department(s) responsible for activities related to mitigation and loss prevention in Castle Rock.

Table B.22. Town of Castle Rock Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/Engineer with knowledge of land development/land management practices	Y	Development Services Department	
Engineer/Professional trained in construction practices related to buildings and/or infrastructure	Y	Development Services Department	
Planner/Engineer/Scientist with an understanding of natural hazards	Y		
Personnel skilled in GIS	Y	Division of Innovation and Technology	
Full time building official	Y	Development Services Department	
Floodplain Manager	Y		
Emergency Manager	Y	Castle Rock Fire and Rescue Department/Fire Chief	
Grant writer	Y	Written by each department and coordinated through the Finance Department	
Other personnel			
GIS Data – Hazard areas	Y	Division of Innovation and Technology	
GIS Data - Critical facilities	Y	Division of Innovation and Technology	
GIS Data – Building footprints	Y	Division of Innovation and Technology	
GIS Data – Land use	Y	Division of Innovation and Technology	
GIS Data – Links to Assessor's data	Y	Division of Innovation and Technology	
Warning Systems/Services (Reverse 9-11, cable override, outdoor warning signals)	Y	Douglas County Emergency Telephone Service Authority/Castle Rock Fire and Rescue Department	CodeRED emergency mass notification system
Other			

Source: Amec Foster Wheeler Data Collection Guide

B.6.3 Fiscal Mitigation Capabilities

Table B.23 identifies financial tools or resources that the Town could potentially use to help fund mitigation activities.

Table B.23. Town of Castle Rock Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Y/N)	Comments
Community Development Block Grants	Y	
Capital improvements project funding	Y	Public Works Department budget
Authority to levy taxes for specific purposes	Y	Building use taxes
Fees for water, sewer, gas, or electric services	Y	
Impact fees for new development	Y	
Incur debt through general obligation bonds	N	
Incur debt through special tax bonds	N	
Incur debt through private activities	N	
Withhold spending in hazard prone areas	N	
Other	N	

Source: Amec Foster Wheeler Data Collection Guide

B.6.4 Mitigation Outreach and Partnerships

The Town partners with South Metro Fire and Rescue for wildfire mitigation. The Town also partners with the County, and has adopted the County EOP.

B.7 Mitigation Strategy

This section describes the mitigation strategy process and mitigation action plan for the Town of Castle Rock' inclusion with the Douglas County Local Hazard Mitigation Plan update.

B.7.1 Mitigation Goals and Objectives

The Town of Castle Rock adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy of the base plan.

B.7.2 Continued Compliance with the NFIP

As a participant of the National Flood Insurance Program (NFIP), the Town of Castle Rock has administered floodplain management regulations that meet the minimum requirements of the NFIP. The management program objective is to protect people and property within the Town. The Town of Castle Rock will continue to comply with the requirements of the NFIP in the future.

The Town's regulatory activities apply to existing and new development areas of the Town; implementing flood protection measures for existing structures and maintaining drainage systems. The goal of the program is to enhance public safety, and reduce impacts and losses while protecting the environment.

The National Flood Insurance Program's (NFIP) Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting the three goals of the CRS which are to reduce flood losses, facilitate accurate insurance rating, and promote the awareness of flood insurance. The Town of Castle Rock does not currently participate in the CRS.

B.7.3 Mitigation Actions

The planning team for the Town of Castle Rock identified and prioritized the following mitigation actions based on the risk assessment and in accordance with the process outline in Section 5, Mitigation Strategy, of the base plan. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. General processes and information on plan implementation and maintenance of this LHMP by all participating jurisdictions is included in Section 7, Plan Implementation and Maintenance, of the base plan.

Town of Castle Rock Action #1

Action Title:	**Public awareness – support Douglas County citizen disaster preparedness guide**
Hazard:	Thunderstorms/lightning/winter storms & extreme cold/floods/tornadoes/wildfires/hazardous materials/earthquake
Priority:	Medium, Ongoing
Project Description, Issue & Background:	Revise and Update the Citizen Preparedness Guide using a new format with a focus on disaster preparedness for all Douglas County Citizens. Components include Warning systems, Citizen Information, Preparing a Family Disaster Plan, Stockpile Checklist, Shelter & Recovery, Access & Functional Needs, Pet Preparedness and Evacuation, Thunderstorms & Lightning, Winter Storms & Extreme Cold, Floods, Tornadoes, Wildfires, Terrorism, Active Shooter, Public Health Emergency, Pandemic Flu, Hazardous Materials, and Helpful Resources. Printed and electronic versions available as well as an application for smart phones.
Ideas for Implementation:	Production and distribution of 5000 printed copies and 5000 smartphone copies summer of 2015. Continue standard order of 5000 printed versions and 5000 smartphone versions annually over subsequent 4 years.
Other Alternatives:	No action
Responsible Agency:	Douglas County OEM
Partners:	Town of Castle Rock, DC FFESS, DC Public Affairs, DCSO Community Resources
Potential Funding:	Douglas County
Cost Estimate:	Cost of materials
Benefits: (Losses Avoided)	Informative preparedness piece for citizens of Castle Rock, Douglas County, and other participating jurisdictions
Timeline:	Q2 2015 distribution and annually thereafter
Status:	New in 2015

Town of Castle Rock Action #2

Action Title:	**Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS) Update**
Hazard:	Flood
Priority:	High
Project Description, Issue & Background:	The Town of Castle Rock, in partnership with Douglas County and Urban Drainage and Flood Control District, is updating the FIRM and FIS to incorporate new flood hazard studies and changes to the special flood hazard area since 2005.
Ideas for Implementation:	This [project is largely completed but the maps will need to be adopted.
Other Alternatives:	N/A
Responsible Agency:	FEMA
Partners:	Douglas County, Urban Drainage and Flood Control District, Town of Castle Rock
Potential Funding:	Project fully funded
Cost Estimate:	$100,000
Benefits: (Losses Avoided)	Supports floodplain management ordinances and regulations for avoiding flood loss on new development.
Timeline:	Adoption in 2016
Status:	Adoption in 2016

Town of Castle Rock Action #3

Action Title:	**Stream Stabilization and Flood Control on Major Drainageways**
Hazard:	Flood; Soil Hazards: Erosion & Deposition
Priority:	High
Project Description, Issue & Background:	This project includes stream channel stabilization for East Plum Creek, Sellars Gulch and their tributaries within Town boundaries. Projects are identified and prioritized per the Stormwater Master Plan as scheduled activities. Stream improvements generally include natural or engineered segments of vegetated stream between engineered hard points that reduce channel slope and erosive velocities. Improvements also ensure adequate flood capacity in the channel to reduce flood potential for adjacent properties.
Ideas for Implementation:	Implementation as budget permits
Other Alternatives:	N/A
Responsible Agency:	Town of Castle Rock
Partners:	Watershed Management Agencies, Douglas County
Potential Funding:	Stormwater Enterprise Fund
Cost Estimate:	$5,000,000
Benefits: (Losses Avoided)	Improvements to the natural drainageway are required to mitigate for development impacts that accelerate erosion and pose a potential public safety hazard if left unattended over time. This project will restore a sustainable channel system for water quality and flood control. The improvements will reduce channel erosion and protect adjacent property from loss during flooding.
Timeline:	2016-2020
Status:	New in 2015

Town of Castle Rock Action #4

Action Title:	**Plum Creek /North Meadows Extension Flood Erosion Protection-Storm Drainage System**
Hazard:	Flood/Soil Hazards: Erosion & Deposition
Priority:	High
Project Description, Issue & Background:	Construction of 100-year storm drainage collection system to East Plum Creek to slow storm-water flow and prevent swift-water erosion to East Plum Creek banks. The existing area collection system is under-sized and has led to significant erosion to the area. Through installation of a regional detention facility, adequately sized storm-sewer pipes and downstream outfall protection, water speeds will be reduced and erosion minimized.
Ideas for Implementation:	The over-sized storm drainage collection system to Plum Creek is being constructed as part of the entire North Meadows Extension project. Implementation is imminent.
Other Alternatives:	N/A
Responsible Agency:	Town of Castle Rock Public Works
Partners:	Douglas County, State of Colorado Department of Transportation
Potential Funding:	The project is fully funded
Cost Estimate:	$1,350,000
Benefits: (Losses Avoided)	100-year floodplain contained in culverts at State Hwy 85 to eliminate roadway overtopping and protection of the new bridge girders from storm water erosion
Timeline:	2015-16
Status:	New in 2015

Town of Castle Rock Action #5

Action Title:	**Crystal Valley Stormwater Collection Re-design**
Hazard:	Flood/Soil Hazards: Erosion & Deposition
Priority:	High
Project Description, Issue & Background:	Re-construction of Crystal Valley storm drainage collection system to Crystal Valley regional detention pond to slow storm-water flow and prevent swift-water erosion to the area. The existing area collection system is too steep, has failed, and has led to significant erosion to the area. Through installation of new storm-sewer pipes and drop chambers, water speeds will be reduced and erosion minimized.
Ideas for Implementation:	Re-construction of Crystal Valley storm drainage collection system to Crystal Valley is being accomplished as part of the Fire Station 152 project to repair and prevent erosion to the potential station site. Implementation is imminent.
Other Alternatives:	N/A
Responsible Agency:	Town of Castle Rock Utilities Department
Partners:	N/A
Potential Funding:	The project is fully funded
Cost Estimate:	$250,000
Benefits: (Losses Avoided)	Eliminate erosion and excessive sediment to the Crystal Valley retention pond and fire station site.
Timeline:	2015-16
Status:	New in 2015

Town of Castle Rock Action #6

Action Title:	**Woodlands/Escavera Wildland Mitigation Program**
Hazard:	Wildfire
Priority:	High
Project Description, Issue & Background:	The wildland open space area that runs through the Woodlands and Escavera residential developments of Castle Rock poses a significant wildfire threat the surrounding residential areas. Aggressive mastication and mitigation efforts which began in 2007 have continued to present day, and regrowth continuously has to be addressed on an annual basis.
Ideas for Implementation:	The program has been underway since 2007 and consistently needs attention due to regrowth of Gamble Oak and drop branches of Ponderosa Pine. This is address through the use of private contractors working in partnership with the property owners in the area. The program is implemented annually.
Other Alternatives:	N/A
Responsible Agency:	Woodlands/Escavera HOA, the Villages at Castle Rock Metropolitan District No. 7.
Partners:	Woodlands/Escavera HOA, the Villages at Castle Rock Metropolitan District No. 7.
Potential Funding:	The project is fully funded
Cost Estimate:	$100,000
Benefits: (Losses Avoided)	Minimize risks to structures in the area due to wildfire
Timeline:	2015-16
Status:	New in 2015; Ongoing program

Annex C TOWN OF LARKSPUR

C.1 Introduction

This annex details the hazard mitigation planning elements specific to the Town of Larkspur, a participating jurisdiction to the Douglas County LHMP Update. This annex is not intended to be a standalone document, but appends to and supplements the information contained in the base plan document. As such, all sections of the base plan, including the planning process and other procedural requirements apply to and were met by the Town. This annex provides additional information specific to the Town of Larkspur, with a focus on providing additional details on the risk assessment and mitigation strategy for this community.

C.2 Planning Process

As described above, the Town of Larkspur followed the planning process detailed in Section 3.0 of the base plan. In addition to providing representation on the Douglas County Hazard Mitigation Planning Committee (HMPC), the Town formulated their own internal planning team to support the broader planning process requirements. Internal planning participants included the following staff:

- Arlen Goertzen – Town Maintenance
- Becky Mobley – Administrative Assistant
- Gerry Been - Mayor
- Matt Krimmer – Town Manager

Additional details on plan participation and Town representatives are included in Appendix A.

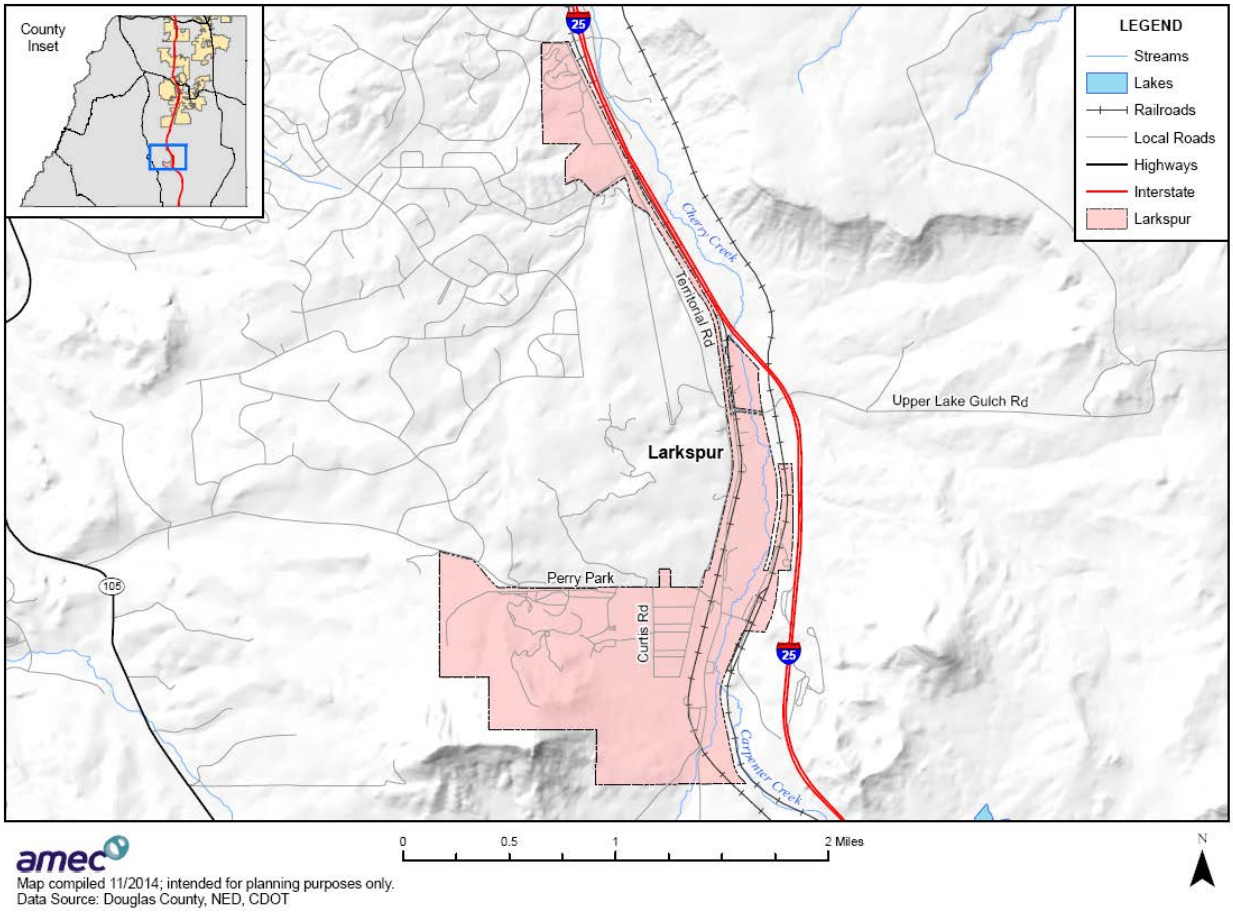
C.3 Community Profile

The community profile for the Town of Larkspur is detailed in the following sections. Figure C.1 displays a map and the location of the Town of Larkspur within Douglas County.

C.3.1 Geography and Location

Larkspur is located in the southern half of Douglas County along Interstate 25. The lands surrounding Larkspur are primarily open space and agricultural lands. Spruce Meadows Open Space and Spruce Mountain Open Space are located to the south, residential areas and open space are located to the north, and open space surrounds the Town to the east and west. The elevation is 6,669 ft. The topography is hilly, with Larkspur Butte and Raspberry Butte located to the east and west of the Town, respectively. Monkey Face Mountain is above the Larkspur Station Mobile Home Park on the west side of Spruce Mountain Road.

Figure C.1. Town of Larkspur Base Map



C.3.2 History

The Town of Larkspur website (http://townoflarkspur.org/about-us/larkspur-history/) summarizes the Town's history as follows:

- Before arrival of the pioneers, the Larkspur area was occupied by the Ute, Kiowa, Cheyenne, and Arapahoe tribes. What began as a stage stop along the Territorial Road soon became a resort and eventually a town.
- On January 22, 1862, a territorial post office was established at what was called Huntsville, Douglas County, Colorado named after Territorial Governor Alexander Hunt. The post office was discontinued on August 29, 1867 and re-established on April 8, 1869. With the arrival of the Rio Grande Railroad the name Huntsville was changed to Larkspur on December 13, 1871, by then Governor Elizabeth Hunt, for the abundant purple flowers growing in the area. Larkspur, rich in lumber, red sandstone, gypsum, and potash, prospered with the railroad and added two sawmills, a blacksmith shop, a hotel, two general stores, a school, and a casino.
- In 1916 the American Federation of Human Rights, a Co-Masonic Fraternal Order, purchased land in Larkspur and built their administration building which is still in use today.

- In 1965, Plum Creek, which runs along the east side of town, flooded and destroyed much of early day Larkspur including the Carlson Frink Creamery.
- Larkspur was incorporated in 1979.

C.3.3 Economy

Select economic characteristics and statistics for Larkspur are shown in Table C.1. These statistics were pulled from the 2008-2013 American Community Survey and the 2000 U.S. Census to demonstrate how certain economic factors in Larkspur have changed over time.

Table C.1. Economic Characteristics for the Town of Larkspur

Characteristic	2000	2013
Families below Poverty Level	6.4%	6.5%
Individuals below Poverty Level	8.4%	9.2%
Median Home Value	$165,600	$162,500
Median Household Income (Larkspur Town Residents)	$43,750	$30,294 (2012)
Per Capita Income	$18,150	$26,779
Population in Labor Force*	200	97

Source: 2008-2013 US Census Bureau American Community Survey 5-year Estimates, 2000 U.S. Census

C.3.4 Population

The 2013 population estimate for the Town (the most recent available) indicates there are 217 residents of Larkspur. The population was estimated at 183 for the 2010 U.S. Census.

C.4 Hazard Identification and Summary

This section details how the risk varies across the Douglas County planning area. The Town's planning team identified the hazards that affect the Town and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to Larkspur (see Table C.2). In the context of the plan's planning area, there are no hazards that are unique to Larkspur.

Information on past occurrences and the likelihood of future occurrences is detailed in Section 4, Risk Assessment, of the base plan. Additional information for high and medium significant hazards for the Town is included in the Vulnerability Assessment section of this Annex.

Table C.2. Town of Larkspur Hazard ID Table

Hazard	Spatial Extent	Likelihood of Future Occurrences	Magnitude /Severity	Significance
Avalanche	Limited	Low	Low	Low
Drought	Extensive	Medium	Low	High
Earthquake	Extensive	Low	Low	Low
Flood: Dam Failure	Limited	Low	Low	Low
Flood: 100/500 year	Extensive	Low	High	High
Flood: Localized/ Stormwater	Significant	Medium	Low	Low
Landslides/ Mud & Debris Flows /Rockfalls	Limited	Low	Low	Low
Severe Weather: Extreme Heat	Extensive	Medium	Low	High
Severe Weather: Hail	Significant	Medium	Medium	Medium
Severe Weather: High Winds	Extensive	Medium	Medium	High
Severe Weather: Lightning	Extensive	High	Low	High
Severe Weather: Thunderstorms/Heavy Rains	Extensive	High	Medium	High
Severe Weather: Tornado	Extensive	Low	High	High
Severe Weather: Winter Weather (includes snow/ice/extreme cold)	Extensive	High	Medium	High
Soil Hazards: Erosion & Deposition	Significant	Low	Medium	Medium
Soil Hazards: Expansive Soils	Significant	Low	Low	Low
Soil Hazards: Subsidence	Limited	Low	Low	Low
Wildfire	Extensive	High	High	High
Hazardous Materials: Transportation Incidents	Extensive	Low	High	High

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

Likelihood of Future Occurrences
Low: Occurs less than once every 10 years or more
Medium: Occurs less than once every 5 to 10 years
High: Occurs once every year or up to once every five years

Magnitude/Severity
Low: Negligible property damages (less than 5% of all buildings and infrastructure) Negligible loss of quality of life. Local emergency response capability is sufficient to manage the hazard.
Medium: Moderate property damages (15% to 50% of all buildings and infrastructure) Some loss of quality of life. Emergency response capability, economic and geographic effects of the hazard are of sufficient magnitude to involve one or more counties.
High: Property damages to greater than 50% of all buildings and infrastructure. Significant loss of quality of life Emergency response capability, economic and geographic effects of the hazard are of sufficient magnitude to require federal assistance.

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

C.5 Vulnerability Assessment

The intent of this section is to assess Larkspur's vulnerability separate from that of the planning area as a whole, which has already been assessed in Section 4.3 Vulnerability Assessment of the base plan. This vulnerability assessment provides an inventory of the population, property, and other assets located within the Town and further analyzes those assets at risk to identified hazards ranked of medium or high significance (as listed in Table C.2) to the community. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the main plan.

C.5.1 Total Assets at Risk

This section identifies Larkspur's total assets at risk, including values at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the community. This data is not hazard specific, but is representative of total assets at risk within a community.

Values at Risk

The following data from the Douglas County Assessor's Office is based on joining assessor data to the 2014 parcel layer in GIS. This data should only be used as an indicator of overall values in the County, as the information has some limitations. Table C.3 summarizes the parcels, improved parcels, structures, improved value, land value, and total value exposed in Larkspur. It is important to note, in the event of a disaster, it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a loss.

Table C.3. Town of Larkspur Total Exposure

Property Type	Total Parcel Count	Improved Parcel Count	Total Structures	Improved Value	Total Land Value	Total Value
Agricultural	6	0	3	$0	$6,108	$6,108
Commercial	27	16	79	$5,090,203	$3,635,643	$8,725,846
Exempt*	42	9	18	$5,215,004	$1,925,407	$7,140,411
HOA	0	0	0	$0	$0	$0
Industrial	1	1	5	$748,789	$126,187	$874,976
Producing Mine	0	0	0	$0	$0	$0
Residential	56	48	89	$6,108,699	$2,903,113	$9,012,005
Vacant Land	15	0	10	$0	$1,006,829	$1,006,829
Total	**151**	**74**	**204**	**$17,162,695**	**$9,603,287**	**$26,766,175**

Source: Douglas County Assessor's Data

*Includes utilities. Utilities has a total of 17 Structures that are Exempt (source CIRSA). New Well Project Capital Cost 3,500,000 as of April 2015

Critical Facilities and Infrastructure

For purposes of this plan, a critical facility is defined as:

> Any facility, including without limitation, a structure, infrastructure[1], property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.

This definition was refined by separating out three categories of critical facilities as further described in Section 4.3.1 of the base plan. These categories include At-Risk Populations, Essential Services, and High Potential Loss Facilities.

An inventory of critical facilities from Douglas County GIS was analyzed to determine which facilities are located in each jurisdiction. The GIS analysis did not show any facilities in Larkspur. However, the Town identified several critical facilities, which are listed below in Table C.4.

Table C.4. Town of Larkspur Critical Facilities: Summary Table

Name of Asset	Category of Critical Asset	Facility Type	Replacement Value	Hazard Information
Larkspur Fire Station	Essential	Fire station		This fire station is critical to the safety of the citizens of the Town of Larkspur and surrounding communities.
Larkspur School	High potential	Elementary school		There are approximately 298 students attending who would be at risk should a hazard occur.
Post Office	High potential	Commercial mail depot		This facility services all of Larkspur and surrounding areas. Inability to deliver mail would pose economic risk.
Spruce Mountain Road	Transportation/lifeline	Main arterial road		Spruce Mountain Road is a major arterial road through Larkspur and emergency vehicles utilize it every day.
Bridge over Fox Farm Road	Transportation/lifeline	Railroad bridge		Critical risk from hazard could pose a major risk to the community and its residents as the train runs through the middle of the town.

[1] Essential Service Facilities include bridges, roads, power grids, and infrastructure held by private companies (i.e. utility lines and private levees) that are not mapped for security reasons and are not under the control of the County.

Name of Asset	Category of Critical Asset	Facility Type	Replacement Value	Hazard Information
Railroads	Transportation/lifeline	Tracks and main crossing		BNSF & Denver Rio Grande are two railroad companies that use the tracks that run through the middle of town and haul hazardous materials.
Natural gas lines	Transportation/lifeline	Public utility facility		Gas lines pose a serious threat since the town is compact and one rupture would be felt by all.
Communication towers	Transportation/lifeline	Public utility facility		Inability to maintain communication would pose both economic and critical risk. The Douglas County Sheriff's Office is installing a new tower.
Frink House	Historical	Historical structure	Irreplaceable	This building is on the Douglas County and National Register of Historic Places listings
Federation Building	Historical	Historical structure	Irreplaceable	This building is on the Douglas County historical listing
Town Hall and property	High potential	Government	$583,000	
Town Hall Annex	High potential	Government	$265,270	
Town assets	High potential	Infrastructure	$1,884,602	Current wells and tanks, water and sewer treatment plants, maintenance building, town community park, etc.
New water well project	High potential	Infrastructure	$3,472,028	New Arapahoe water well, tank, water treatment plant, and water line located on west side of Spruce Mountain Road. New tank to be installed on the northwest side of Monkey Face Mountain.
Actual value of all real property			$21,949,701	

Source: Town of Larkspur

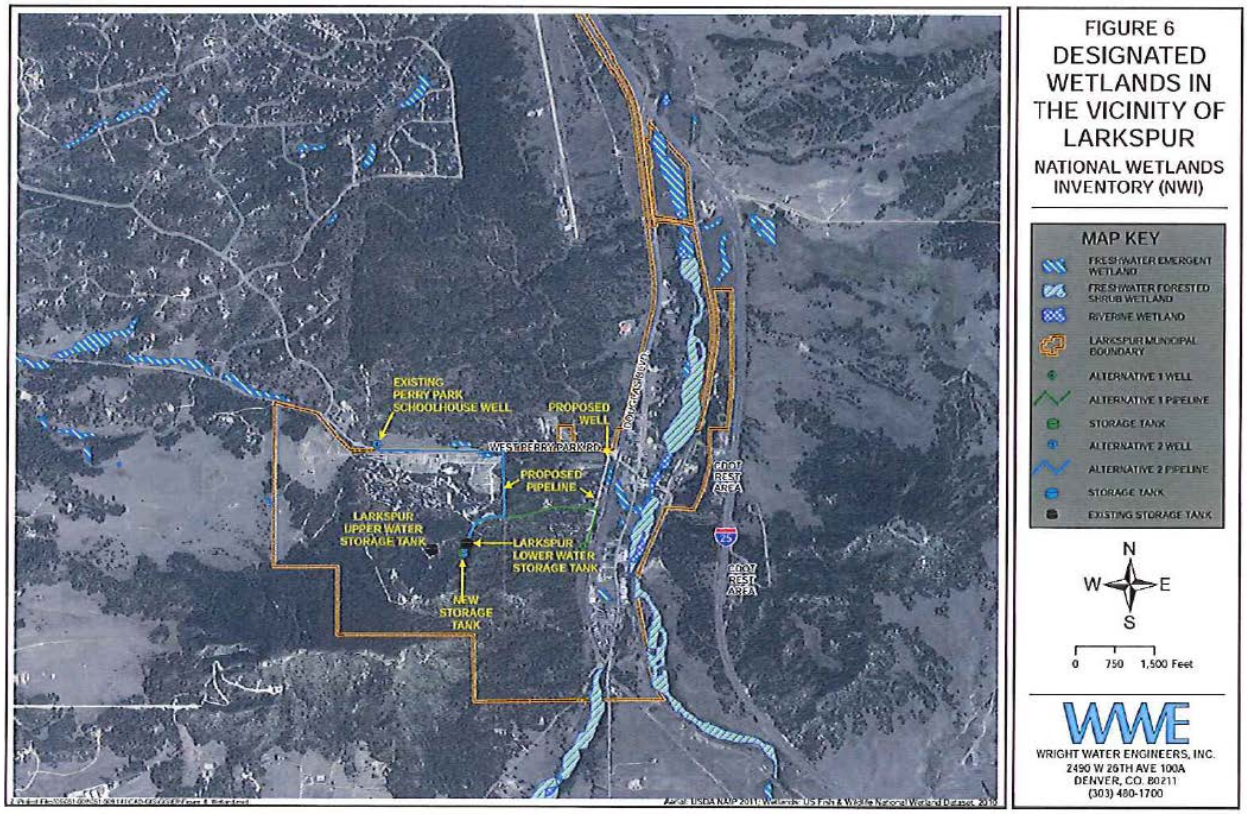
Natural Resources

The Town of Larkspur and the areas surrounding it include a rich and diverse range of biological resources.

Vegetation

Various types of wetlands exist within or near the Larkspur municipal boundaries. The locations of these resources are shown in Figure C.2.

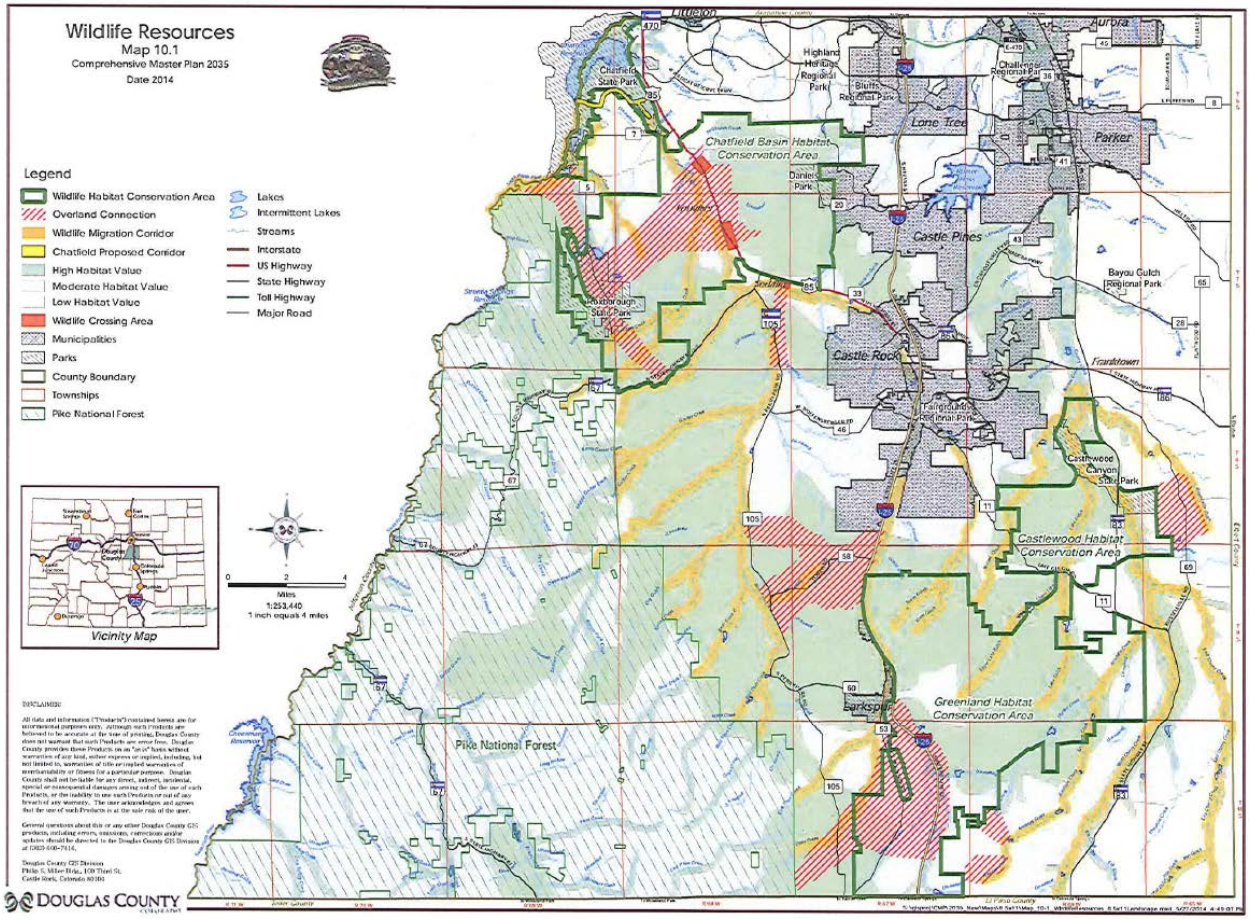
Figure C.2. Designated Wetlands in the Vicinity of Larkspur



Wildlife Habitat

Larkspur lies within a wildlife migration corridor and borders a wildlife habitat conservation area (see Figure C.3).

Figure C.3. Wildlife Resources in Douglas County



Historic and Cultural Resources

To inventory historically or culturally significant resources, the HMPC collected information from both the National Register of Historic Places and the Colorado State Register. Each program has different eligibility criteria and procedural requirements. These requirements are detailed in Section 4.3.1 of the base plan. Larkspur has two properties listed on the National Register of Historic Places: the Frink House and the American Federation of Human Rights Lodge.

Growth and Development Trends

Table C.5 summarizes the number and value of structures built in Larkspur from 2010 to 2014 based on a query of the 'year built' values in the County's parcel database. A total of 10 structures, with a total value greater than $1.2 million, were built in that short period of time. The vast majority of these structures were residential, built to accommodate the rapidly growing population in the Planning Area. Additional analysis on recent development in Larkspur's mapped hazard areas is discussed in the vulnerability assessments for flood, landslide/erosion, and wildfire.

Table C.5. Larkspur Structures Built from 2010 to 2014: Total Assets by Property Type

Property Type	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Land Value	Total Value
Commercial	1	1	2	$152,950	$44,000	$196,950
Exempt	2	2	2	$158,622	$80,000	$238,622
Residential	5	4	6	$610,643	$212,000	$822,643
Total	**8**	**7**	**10**	**$922,215**	**$336,000**	**$1,258,215**

Source: Douglas County

C.5.2 Priority Hazards: Vulnerability Assessment

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table C.2 as high or medium significance hazards. Impacts of past events and vulnerability of the Town to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the base plan for more detailed information about these hazards and their impacts on the Douglas County planning area). Methodologies for calculating loss estimates are the same as those described in Section 4.3 of the base plan. In general, the most vulnerable structures are those located within the floodplain, unreinforced masonry buildings, wildland urban interface (WUI), and buildings built prior to the introduction of modern building codes.

An estimate of the vulnerability of the Town to each identified hazard, in addition to the estimate of risk of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.

Drought

Vulnerability to Drought

Likelihood of Future Occurrence—Medium
Potential Magnitude—Low
Overall Vulnerability—High

Drought is different than many of the other natural hazards in that it is not a distinct event and usually has a slow onset. Drought can severely impact a region both physically and economically. Drought affects different sectors in different ways and with varying intensities. Adequate water is the most critical issue for agricultural, manufacturing, tourism, recreation, and commercial and domestic use. As the population in the area continues to grow, so too will the demand for water.

Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding. Water quality deterioration also is another potential problem. Wildfire protection, municipal usage, tourism, and recreation may also be impacted. Mandatory conservation measures are typically implemented during extended droughts.

Drought is considered to be a high significance hazard in Larkspur due to its connection to wildfire danger and impact on water resources. Larkspur is surrounded by open space and close to the Pike National Forest, making it vulnerable to wildfires. Drought can also impact the Town's agricultural economy; cattle Ranchers in the area would suffer loss with livestock. The Town's water resources consist of two wells, the Denver and Arapahoe. Of these wells one is going down and at the present time a new well has been drilled. The Town will improve its infrastructure significantly with the installation of a 461,000 gallon water tank, pump station, and waterline, which will help mitigate drought impacts.

Development Trends

Drought vulnerability will increase with future development as there will be increased demands for limited water resources. Larkspur can mitigate drought impacts by supporting water conservation measures such as wastewater reuse, xeriscaping, and water efficient fixtures.

Flood: 100/500-Year

Vulnerability to 100/500-Year Flooding

Likelihood of Future Occurrence—Low
Potential Magnitude—High
Overall Vulnerability—High

The Planning Area, including Larkspur, is prone to very intense rainfall. Floods have resulted from storms covering large areas with heavy general rainfall as well as from storms covering small area with extremely intense rainfall. This section quantifies the vulnerability of Larkspur to floods.

The tables flood loss estimates for Larkspur are located below. Table C.6 shows improved values at risk in the 1% annual chance flood zone, and Table C.7 shows the same information for the 0.2% annual chance flood zone. Contents values were estimated as a percentage of building value based on their property type, using FEMA/HAZUS estimated content replacement values. This includes 100% of the structure value for agricultural, commercial, exempt, HOA and utility, 50% for residential, 150% for industrial and 0% for vacant land use classifications. A 20% damage factor was applied to each flood zone's total value of improvements and estimated content value to obtain a loss estimate. This analysis is based on a FEMA depth damage function which assumes a two foot deep flood. Land Value was not included in this analysis. Figure C.4 shows the FEMA flood zones in Larkspur, and Figure C.5 shows the location of properties within those flood zones.

Table C.6. Larkspur 1% Annual Chance Flood Loss Estimate by Property Type

Property Type	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Estimated Content Value	Total Value	Loss Estimate
Commercial	7	3	9	$974,510	$974,510	$1,949,020	$389,804
Exempt	12	2	5	$772,897	$772,897	$1,545,794	$309,159
Residential	9	9	10	$808,222	$404,111	$1,212,333	$242,467
Utilities	1	0	0	$3,500,000	$3,500,000	$7,000,000	$1,400,000
Total	**33**	**14**	**26**	**$6,055,629**	**$5,651,518**	**$11,707,147**	**$2,341,430**

Source: Douglas County 2014 Assessor & Parcel Data; Douglas County DFIRM

Table C.7. Larkspur 0.2% Annual Chance Flood Loss Estimate by Property Type

Property Type	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Estimated Content Value	Total Value	Loss Estimate
Commercial	2	1	5	$362,177	$362,177	$724,354	$144,871
Exempt	1	1	1	$147,670	$147,670	$295,340	$59,068
Residential	1	1	1	$124,985	$62,493	$187,478	$37,496
Total	**4**	**3**	**7**	**$634,832**	**$572,340**	**$1,207,172**	**$241,434**

Source: Douglas County 2014 Assessor & Parcel Data; Douglas County DFIRM

Figure C.4. Larkspur FEMA Flood Hazards

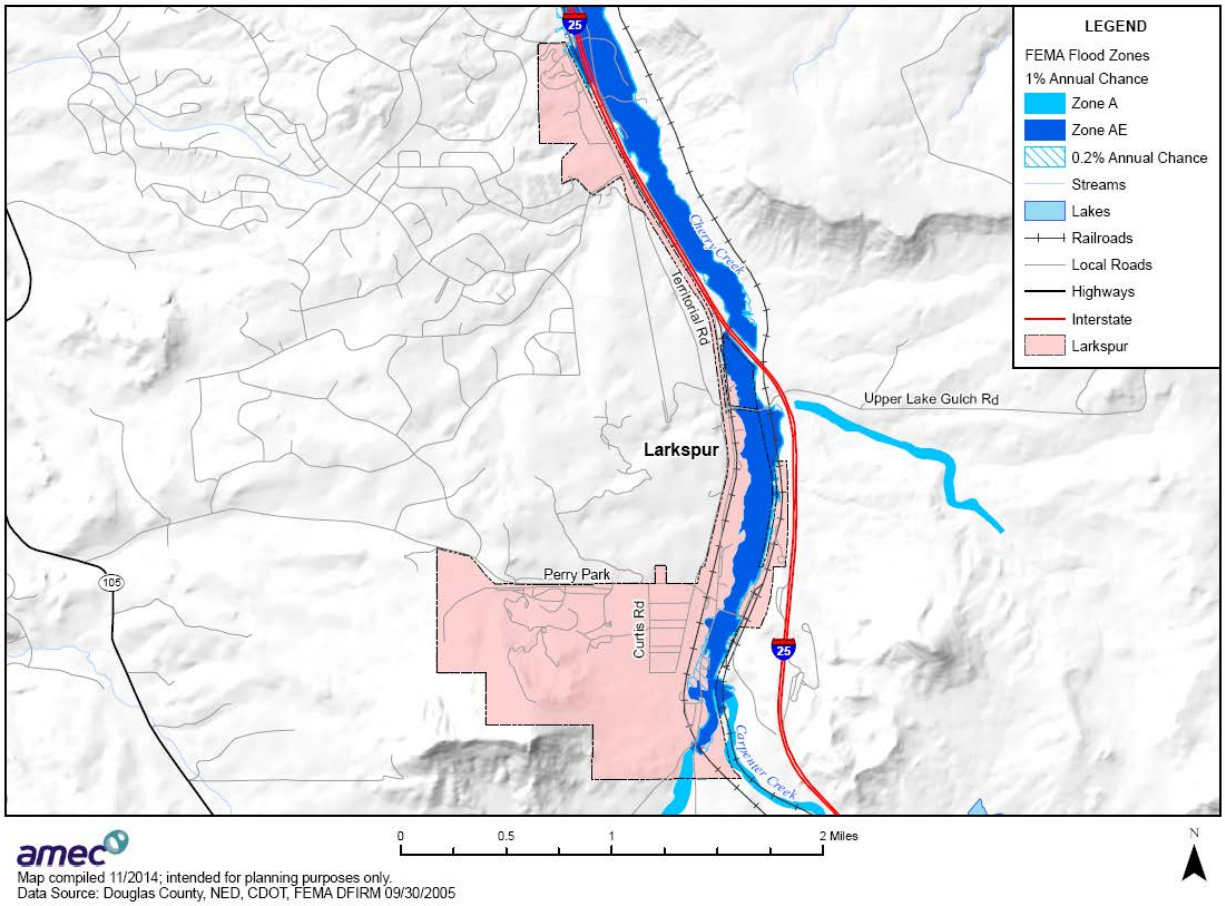
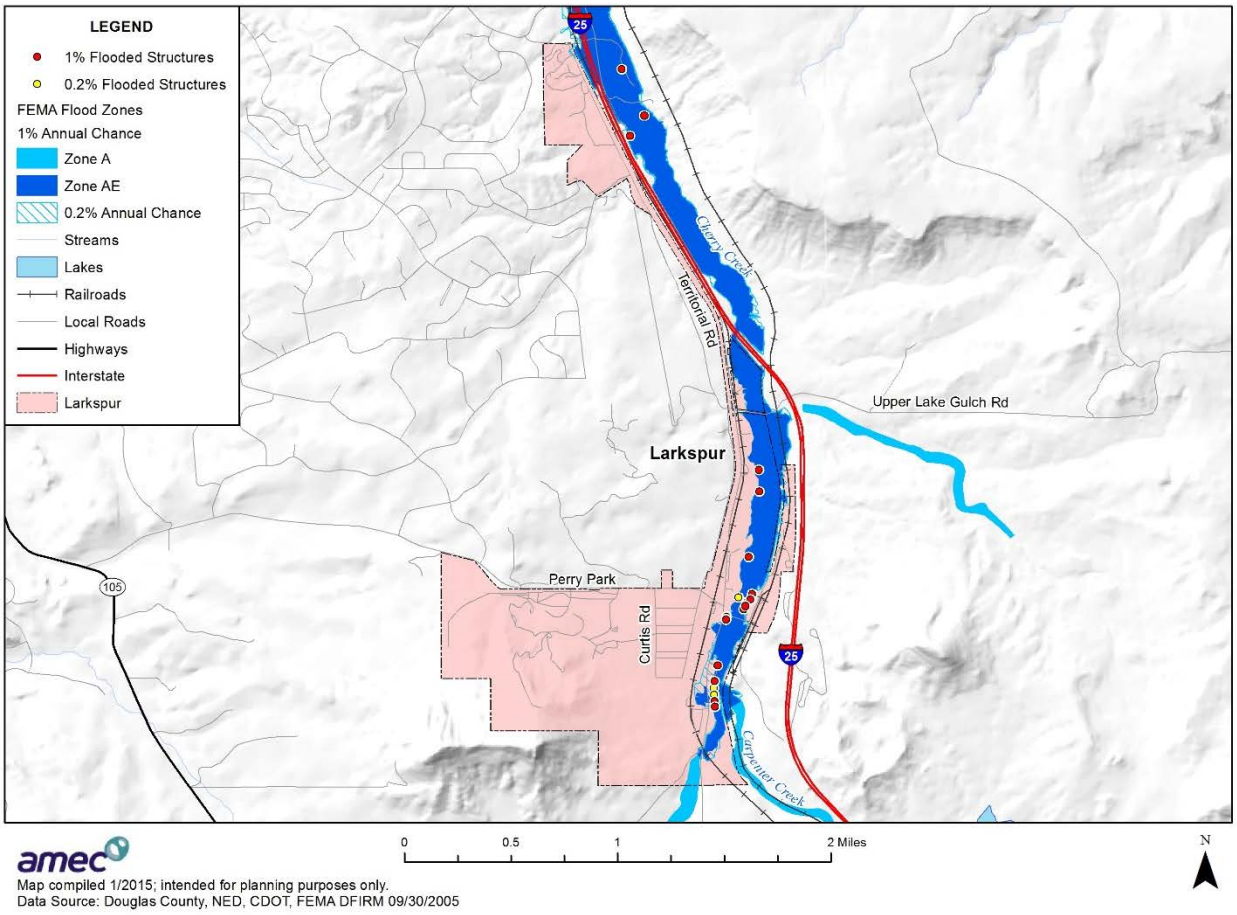


Figure C.5. Larkspur FEMA Flood Hazards and Flood Prone Improved Properties



Population at Risk

A separate analysis was performed to determine population in flood zones. Using GIS, the DFIRM dataset was overlaid on the improved residential parcel data. Those parcel centroids that intersect a flood zone were counted and multiplied by the 2010 U.S. Census household factor of 2.26; results were tabulated by jurisdiction and flood zone (see Table C.8). According to this analysis, there is a population of 20 in the 1% annual chance flood zone, and 2 in the 0.2% annual chance flood zone in Larkspur.

Table C.8. Larkspur - Improved Residential Parcels and Population in Floodplain

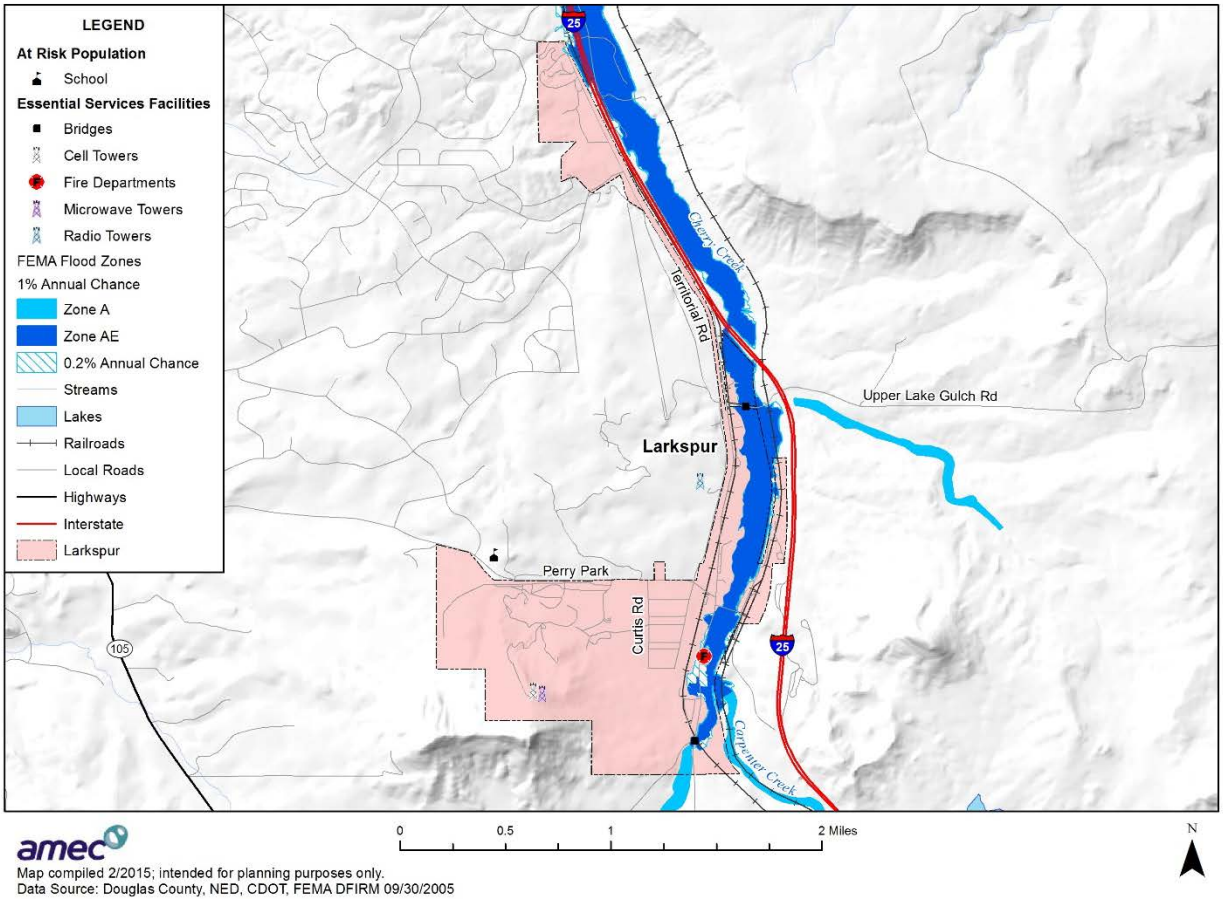
1% Annual Chance		0.2% Annual Chance	
Improved Residential Parcels	**Population**	**Improved Residential Parcels**	**Population**
9	20	1	2

Source: DFIRM, US Census Bureau, 2014 Douglas County Assessor & Parcel Data
* Census Bureau 2010 average household size for Larkspur – 2.26

Critical Facilities at Risk

Two critical facilities in Larkspur are located in the 1% annual chance flood zone, and no critical facilities are located in the 0.2% annual chance flood zone. Both are essential services facilities, specifically water hub/treatment facilities.

Figure C.6. Larkspur FEMA Flood Hazards and Critical Facilities



Development Trends

Table C.9 summarizes development in the 1% and 0.2% annual chance flood zones between 2010 and 2014. Based on this data, Larkspur has greatly minimized development in flood hazard areas.

Table C.9. Larkspur Structures Built from 2010 to 2014: Assets Exposed to the 1% and 0.2% Annual Chance Flood Zone

Flood Zone	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Estimated Content Value	Land Value	Total Value
1% Annual Chance	2	2	2	$242,884	$121,442	$92,000	$456,326
0.2% Annual Chance	1	1	1	$147,670	$0	$40,000	$187,670
Total	**3**	**3**	**3**	**$390,554**	**$121,442**	**$132,000**	**$643,996**

Source: Douglas County GIS

Landslides/ Mud & Debris Flows /Rockfalls/Erosion

Vulnerability to Landslides/ Mud & Debris Flows /Rockfalls/Erosion

Likelihood of Future Occurrence—Low
Potential Magnitude—Low
Overall Vulnerability—Low

Two different areas of existing development are vulnerable to erosion. Erosion of soils due to slope grade, soil content and cover, and exposure to weather conditions is fairly limited and generally falls within underdeveloped areas. This is also due to the concurrence of erosion potential with other geologic hazard areas, such as dipping bedrock. Areas susceptible to wildfire-driven erosion, which often result in debris flow or the erosion and deposition of soil into watersheds, also do not usually directly impact developed areas but can impact transportation and drainage infrastructure. Landslide hazards in Larkspur are also discussed in this section, despite being ranked low significance, due to the property exposure in potential hazard areas. The landslide hazard is made up of these attributes: debris-flow, rockfall-rockslide/debris, and slope-failure.

The County's parcel layer was used as the basis for the inventory of all parcels within Larkspur. GIS was used to overlay the landslide hazard layer with the parcel layer centroids and where the zones intersected a parcel centroid, it was assigned with that hazard zone for the entire parcel. The Town has 82 structures with a total value of over $8.9 million potentially exposed to landslide hazards, as detailed in Table C.10. Table C.11 summarizes exposure to moderate accelerated erosion. Erosion analysis does not include contents value since contents of buildings are unaffected by this hazard. Figure C.7 depicts Larkspur's mapped landslide and erosion hazard areas.

Table C.10. Town of Larkspur Total Exposure to Landslide

Property Type	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Estimated Content Value	Land Value	Total Value
Debris Flow Area							
Agricultural	5	0	1	$0	$0	$534	$534
Commercial	2	2	2	$767,128	$767,128	$245,222	$1,779,478
Exempt	5	5	7	$685,901	$685,901	$291,500	$1,371,802
Residential	23	18	23	$2,603,483	$1,301,742	$926,000	$3,905,225
Utilities	1	0	0	$0	$0	$0	$0
Vacant Land	4	0	3	$0	$0	$154,000	$0
Total	**40**	**25**	**36**	**$4,056,512**	**$2,754,771**	**$1,617,256**	**$7,057,039**
Rockfall/Rockslide/Debris Avalanche Area							
Commercial	1	1	46	$686,486	$686,486	$427,329	$1,800,301
Exempt	1	0	0	$0	$0	$50,000	$50,000
Total	**2**	**1**	**46**	**$686,486**	**$686,486**	**$477,329**	**$1,850,301**
Grand Total	**42**	**26**	**82**	**$4,742,998**	**$3,441,257**	**$2,094,585**	**$8,907,340**

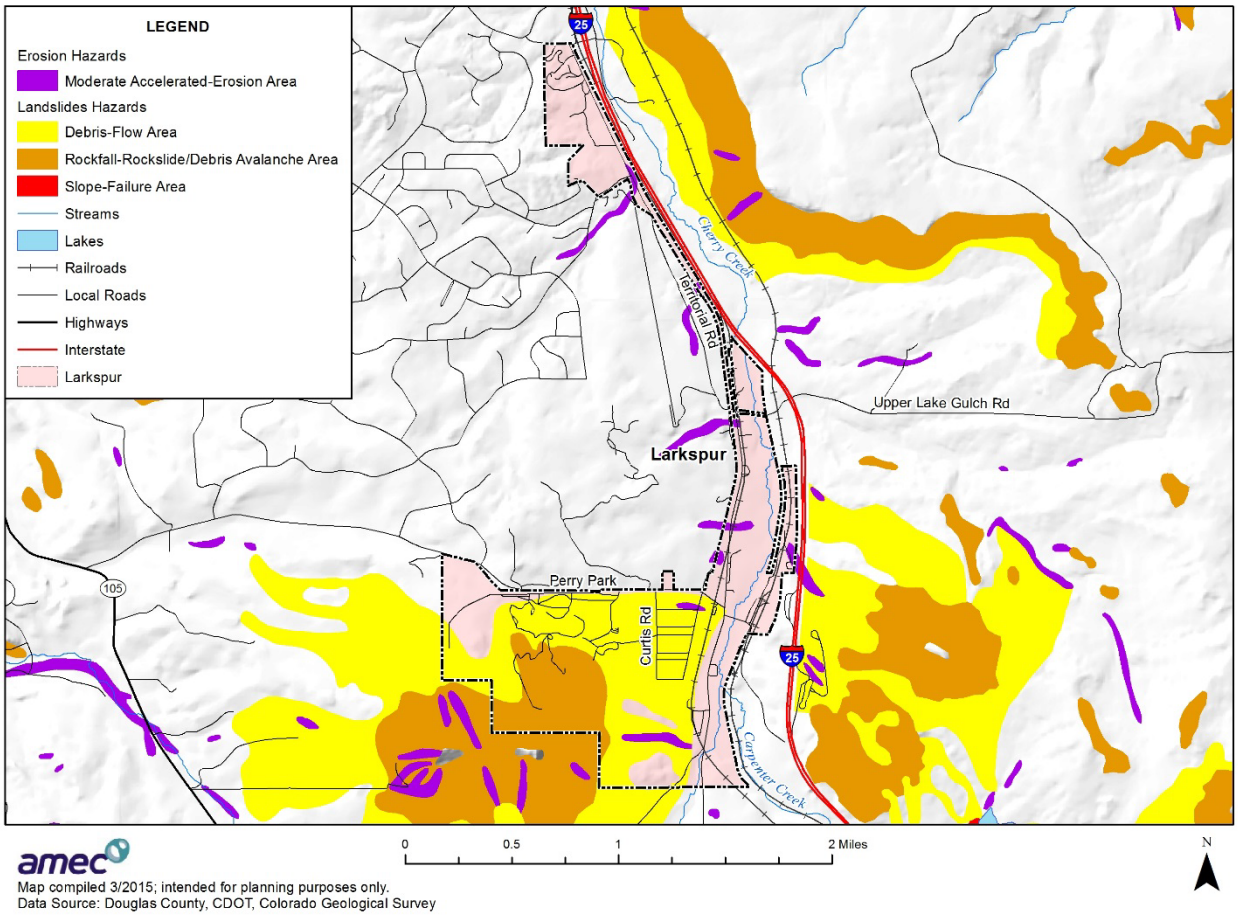
Source: Douglas County Assessor's Data

Table C.11. Town of Larkspur Total Exposure to Moderate Accelerated Erosion

Property Type	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Land Value	Total Value
Exempt	2	0	1	$0	$1,030	$1,030
Utilities	1	0	0	$0	$0	$0
Total	**3**	**0**	**1**	**$0**	**$1,030**	**$1,030**

Source: Douglas County Assessor's Data

Figure C.7. Larkspur Erosion and Landslide Hazards



Population at Risk

An estimated 41 people are potentially exposed to landslide hazards, specifically debris flow hazards, in Larkspur. This estimate is based on the number of exposed improved residential parcels multiplied by the average household size in Larkspur according to the 2010 U.S. Census (2.26).

Critical Facilities at Risk

Landslide and erosion analysis was performed on the critical facility inventory in Larkspur. GIS was used to determine whether Larkspur facility locations intersect the landslide and erosion hazard areas provided by Douglas County, and if so, which zones they intersect. There are no critical facilities located in either landslide or moderate accelerated erosion hazard areas in Larkspur.

Development Trends

An analysis of recent development trends in hazard areas was conducted for Larkspur. A total of two structures were built in debris flow hazard areas in the Town between 2010 and 2014. Results of this analysis are shown in Table C.12.

Table C.12. Larkspur Structures Built from 2010 to 2014: Summary of Assets Exposed to Debris Flow Areas

Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Estimated Content Value	Land Value	Total Value
2	2	2	$118,254	$53,651	$76,000	$247,905

Source: Douglas County GIS

Severe Weather: Extreme Heat

Vulnerability to Extreme Heat

Likelihood of Future Occurrence—Medium
Potential Magnitude—Low
Overall Vulnerability—High

According to information provided by FEMA, extreme heat is defined as temperatures that hover 10°F or more above the average high temperature for the region and last for several weeks. Heat kills by taxing the human body beyond its abilities. In a normal year, about 175 Americans succumb to the demands of summer heat. According to the National Weather Service (NWS), among natural hazards, only the cold of winter—not lightning, hurricanes, tornados, floods, or earthquakes—takes a greater toll. In the 40-year period from 1936 through 1975, nearly 20,000 people were killed in the United States by the effects of heat and solar radiation. In the heat wave of 1980, more than 1,250 people died.

Heat disorders generally have to do with a reduction or collapse of the body's ability to shed heat by circulatory changes and sweating or a chemical (salt) imbalance caused by too much sweating. When heat gain exceeds the level the body can remove, or when the body cannot compensate for fluids and salt lost through perspiration, the temperature of the body's inner core begins to rise and heat-related illness may develop. Elderly persons, small children, people with chronic illnesses, those on certain medications or drugs, and persons with weight and alcohol problems are particularly susceptible to heat reactions, especially during heat waves in areas where moderate climate usually prevails.

Heat emergencies are often slower to develop, taking several days of continuous, oppressive heat before a significant or quantifiable impact is seen. Heat waves do not strike victims immediately, but rather their cumulative effects slowly take the lives of vulnerable populations. Heat waves do not cause damage or elicit the immediate response of floods, fires, earthquakes, or other more

"typical" disaster scenarios. While heat waves are obviously less dramatic, they are potentially more deadly.

Development Trends

Any future development in Larkspur will be exposed to extreme heat. Impacts to people can be mitigated by staying indoors, especially in places where air conditioning is available. Certain populations, such as the elderly and lower income, tend to be at higher risk. Social programs designed to check on people can help mitigate the impacts to these populations.

Severe Weather: Hail

Vulnerability to Hail

Likelihood of Future Occurrence—Medium
Potential Magnitude—Medium
Overall Vulnerability—Medium

Hail is one of the most damaging natural hazards in Colorado. It occurs in wide swaths, causing damage to large geographical areas at once. A single hailstorm could potentially impact all of Larkspur at once. Hailstorms can also occur relatively frequently, especially in the summer, though they may not always cause significant damages. The impacts of hailstorms can vary substantially from one storm to another depending on weather conditions and the size of the hailstones. Losses are typically covered by insurance.

Development Trends

Any future development in Larkspur will be exposed to hail. Impacts to people can be mitigated by staying indoors during a hailstorm, and some property such as cars can be protected with covered parking where available. Hail impacts are difficult to mitigate in general though, and insurance is one of the typical options for recouping property losses and reducing economic impacts.

Severe Weather: High Winds

Vulnerability to High Winds

Likelihood of Future Occurrence—Medium
Potential Magnitude—Medium
Overall Vulnerability—High

High winds, often accompanying severe thunderstorms, can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. Winds in Larkspur are typically straight-line winds. Straight-line winds are generally any thunderstorm wind that is not associated with rotation (i.e., is not a tornado). These winds can

overturn mobile homes, tear roofs off of houses, topple trees, snap power lines, shatter windows, and sandblast paint from cars. Other associated hazards include utility outages, arcing power lines, debris blocking streets, dust storms, and an occasional structure fire.

Development Trends

The impact of high winds on future development in Larkspur can be mitigated with building codes and design criteria.

Severe Weather: Lightning

Vulnerability to Lightning

Likelihood of Future Occurrence—High
Potential Magnitude—Low
Overall Vulnerability—High

Colorado is one of the top states in the continental U.S. for lightning strikes, which can damage property and cause injury or even death to people. People are especially at risk in Colorado if they are outside in the early afternoon during the summer monsoons, though this is not the only time or place where people can be struck by lightning. Lightning can also ignite wildfires, which are a major concern for Larkspur given the Town's proximity to open space and Pike National Forest, as well as the elderly population living in the wildland/urban interface.

Development Trends

Future development in Larkspur will not influence where lightning strikes occur. However, growth and development can increase the number of people and structures exposed to lightning impacts. Lightning can also impact future development by igniting wildfires. Larkspur has nearly 134 buildings in extreme and high wildfire risk zones, and future development in these areas will place additional people and structures at risk to the secondary hazards caused by lightning.

Severe Weather: Thunderstorms/Heavy Rains

Vulnerability to Thunderstorms/Heavy Rains

Likelihood of Future Occurrence—High
Potential Magnitude—Medium
Overall Vulnerability—High

According to historical hazard data, severe weather is an annual occurrence in Larkspur. Damage and disaster declarations related to severe weather have occurred and will continue to occur in the future. Heavy rain and thunderstorms are the most frequent type of severe weather occurrences in the Town. However, actual damage associated with the primary effects of severe weather has been limited. It is the damage caused by secondary hazards such as floods and fire that have the greatest

impact on Larkspur. The risk and vulnerability associated with these secondary hazards are discussed in other sections where applicable.

Development Trends

New critical facilities such as communications towers should be built to withstand heavy rains and thunderstorms. It is difficult to quantify future deaths, injuries, or damages due to heavy rains or thunderstorms. Future development projects should consider severe weather hazards at the planning, engineering and architectural design stage with the goal of reducing vulnerability. Development in the Town is regulated by zoning and subdivision regulations, and future development is not expected to increase vulnerability to hazards.

Severe Weather: Tornado

Vulnerability to Tornado

Likelihood of Future Occurrence—Low
Potential Magnitude—High
Overall Vulnerability—High

Tornadoes can cause damage to property and loss of life. While most tornado damage is caused by violent winds, the majority of injuries and deaths generally result from flying debris. Property damage can include damage to buildings, fallen trees and power lines, broken gas lines, broken sewer and water mains, and the outbreak of fires. Access roads and streets may be blocked by debris, delaying necessary emergency response.

Figure 4.22 in Chapter 4 indicates that tornadoes can occur anywhere in Douglas County, especially in the eastern half. Figure 4.22 in the base plan does not show any recorded tornadoes within Larkspur, but a few F0s and F1s occurred within a few miles of the Town.

Development Trends

Population growth and development expose more people to tornadoes in Larkspur. The impact to people can be mitigated through warning systems and tornado shelters. Stringent building codes for high winds can help mitigate impacts from weaker tornadoes, and property insurance can reduce economic impacts.

Severe Weather: Winter Weather

Vulnerability to Winter Weather

Likelihood of Future Occurrence—High
Potential Magnitude—Medium
Overall Vulnerability—High

Larkspur typically experiences multiple winter storms in any given year. This hazard has been critical in its magnitude and severity in the past in Douglas County, as seen during the blizzards of March 2003 and December 2006. Vulnerability is high along busy roadways, particularly on Highway 470 and Interstate 25, the latter of which runs through the center of Larkspur. Severe winter weather conditions may cause traffic related deaths and injuries. Road closures due to winter weather conditions also restrict or prevent the movement of people and goods and services (including food and gas), which can create the need for emergency sheltering for travelers. Poor road conditions can also delay emergency response.

It is difficult to identify specific winter weather hazard areas within Larkspur. Data was not available to identify specific structures at risk or estimate potential losses to these structures. NCDC data did not provide enough details on past damages and casualties to obtain an average annual loss assessment. If the March 2003 blizzard is used as the event of record, then the Denver Metro area could expect over $31 million in property damages from a severe winter storm. Note that this damage estimate is spread over the entire Denver Metro area; Larkspur's share of the damage would be smaller.

Development Trends

Future residential or commercial buildings built to code should be able to withstand snow loads from severe winter storms. Population growth in Larkspur and growth in visitors will increase problems with road, business, and school closures and increase the need for snow removal and emergency services related to severe winter weather events.

Wildfire

Vulnerability to Wildfire

Likelihood of Future Occurrence—High
Potential Magnitude—High
Overall Vulnerability—High

An exposure analysis was performed to quantify risk to wildfire in Larkspur. Potential losses to wildfire were estimated using a countywide Wildfire Hazard Potential GIS layer (created for the Douglas County Community Wildfire Protection Plan) and assessor's data from Douglas County. Potential losses were examined in terms of structures, property value, critical facilities, and people at risk. For all analyses, the threat levels were classified as low, medium, high, and extreme. According to the CWPP, "[t]here is no absolute set of conditions that cause an area to be identified as being in a particular hazard category. Instead, the hazard category identified is a function of the combined factors that influence controllability, values, and ignition risk" (pg. 59).

GIS was used to create a centroid, or point representing the center of the parcel polygon. The CWPP's Wildfire Hazard Potential layer was then overlaid on the parcel centroids. For the purposes of this analysis, the fire hazard zone that intersected a parcel centroid was assigned the

severity zone for the entire parcel. The model assumes that every parcel with a structure value greater than zero is improved in some way. Specifically, an improved parcel assumes there is a building on it.

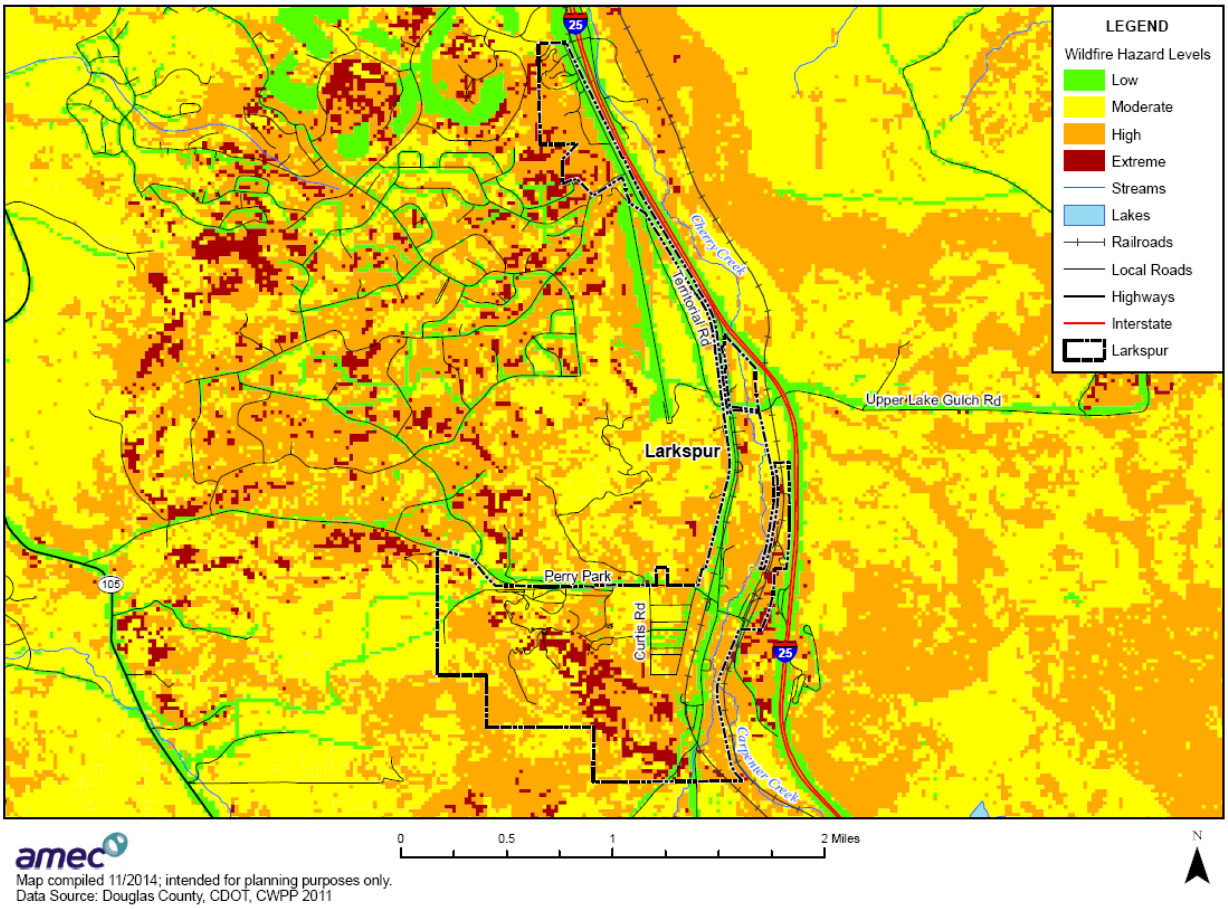
Table C.13 shows total parcel counts, improved parcel counts and their structure values by occupancy type (residential, industrial, etc.) and total land values within each fire severity zone in Larkspur. Figure C.8 illustrates the wildfire severity zones in Larkspur and the surrounding area.

Table C.13. Town of Larkspur Total Exposure to Wildfire by Property Type

Property Type	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Estimated Content Value	Land Value	Total Value/Loss Estimate
Extreme							
Exempt	1	0	0	$0	$0	$50,000	$50,000
Residential	1	1	1	$408,667	$204,334	$120,000	$733,001
Total	**2**	**1**	**1**	**$408,667**	**$204,334**	**$170,000**	**$783,001**
High							
Agricultural	3	0	3	$0	$0	$5,803	$5,803
Commercial	13	7	62	$2,589,647	$2,589,647	$2,736,850	$7,916,144
Exempt	22	6	10	$1,123,252	$1,123,252	$1,405,019	$3,651,523
Industrial	1	1	5	$748,789	$1,123,184	$126,187	$1,998,160
Residential	18	16	49	$2,630,693	$1,315,347	$1,176,113	$5,122,153
Utilities	3	0	0	$0	$0	$0	$0
Vacant Land	7	0	4	$0	$0	$758,829	$758,829
Total	**67**	**30**	**133**	**$7,092,381**	**$6,151,429**	**$6,208,801**	**$19,452,611**
Moderate							
Agricultural	2	0	0	$0	$0	$289	$289
Commercial	2	1	2	$201,920	$201,920	$267,612	$671,452
Exempt	7	2	3	$266,615	$266,615	$379,702	$912,932
Residential	14	13	16	$1,330,019	$665,010	$675,000	$2,670,029
Utilities	1	0	0	$0	$0	$0	$0
Vacant Land	4	0	4	$0	$0	$146,000	$146,000
Total	**30**	**16**	**25**	**$1,798,554**	**$1,133,545**	**$1,468,603**	**$4,400,702**
Low							
Agricultural	1	0	0	$0	$0	$16	$16
Commercial	12	8	15	$2,298,636	$2,298,636	$631,181	$5,228,453
Exempt	12	1	5	$325,137	$325,137	$90,686	$740,960
Residential	23	18	23	$1,739,320	$869,660	$932,000	$3,540,980
Vacant Land	4	0	2	$0	$0	$102,000	$102,000
Total	**52**	**27**	**45**	**$4,363,093**	**$3,493,433**	**$1,755,883**	**$9,612,409**
Grand Total	**151**	**74**	**204**	**$13,662,695**	**$10,982,741**	**$9,603,287**	**$34,248,723**

Source: Douglas County GIS

Figure C.8. Larkspur Wildfire Hazard Potential



Population at Risk

Wildfire risk is greatest to those individuals residing in identified hazard areas. Larkspur has a high elderly population living in the wildland/urban interface. GIS analysis was performed to determine population in the different fire hazard areas. Using GIS, the Douglas County wildfire hazard potential layers were overlaid on the entire parcel layer. Those parcel centroids that intersect the wildfire hazard potential areas were counted and multiplied by the 2010 Census Bureau average household size for each jurisdiction and unincorporated area, which is 2.26 in Larkspur. Table C.14 summarizes the results of this analysis.

Table C.14. Population at Risk to Wildfire

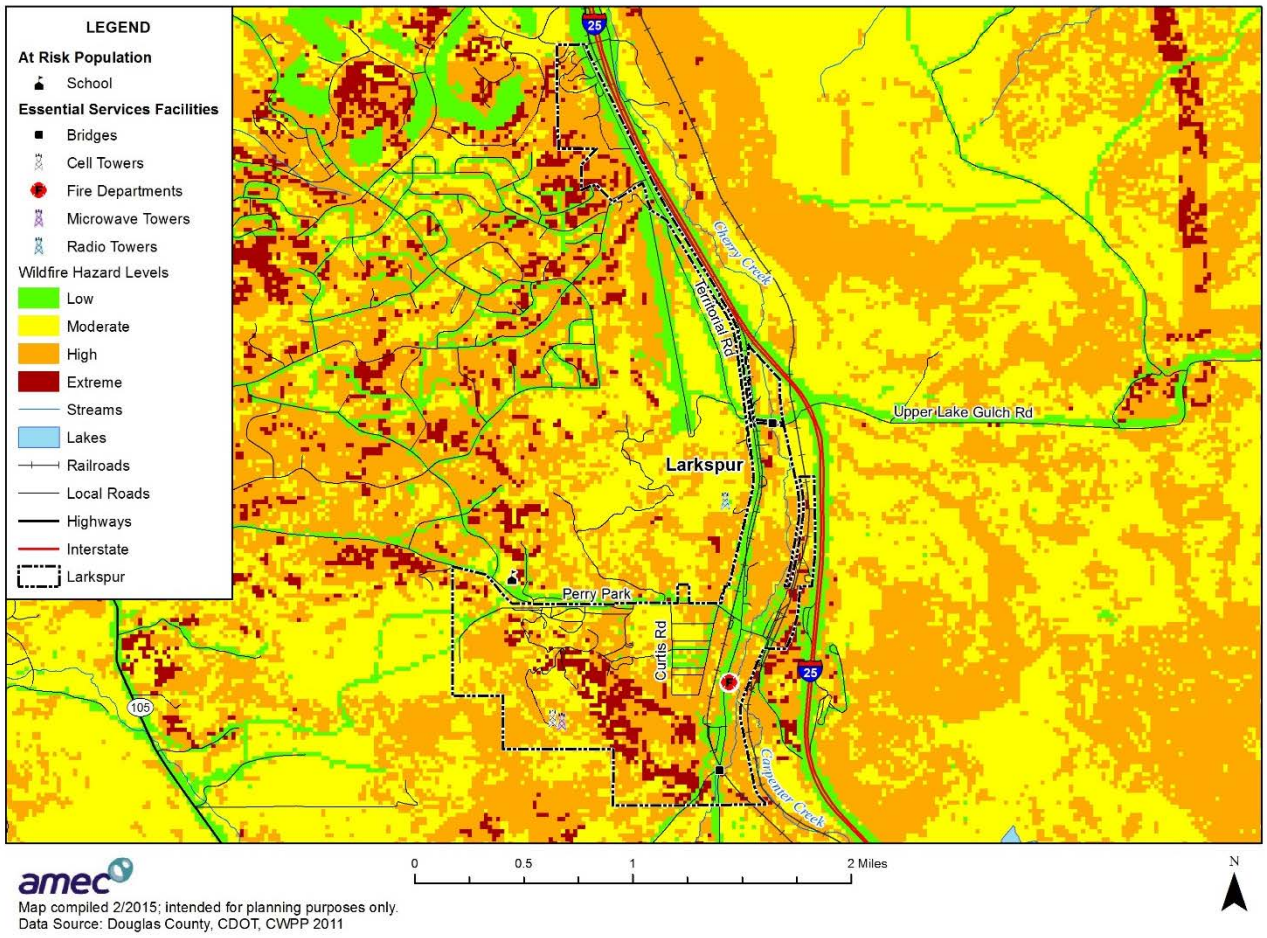
	Extreme	High	Moderate	Low
Population	2	36	29	41
Improved Residential Parcels	1	16	13	18

Source: Douglas County GIS, 2010 U.S. Census

Critical Facilities at Risk

Wildfire analysis was performed on the critical facility inventory in Douglas County and all jurisdictions, including Larkspur. GIS was used to determine whether the facility locations intersect a wildfire hazard area. No critical facilities are located in wildfire hazard areas in Larkspur. Further details of critical facility definition, type, name and address and jurisdiction by wildfire zone are listed in Appendix E.

Figure C.9. Larkspur Wildfire Hazard Potential and Critical Facilities



Development Trends

The pattern of increased damages is directly related to increased urban growth spread into historical forested areas that have wildfire as part of the natural ecosystem. Many WUI fire areas have long histories of wildland fires that burned only vegetation in the past. However, with new development, a wildland fire following a historical pattern now burns developed areas. Population growth and development in Larkspur could potentially expose more people and structures to wildfires.

An analysis of recent development in extreme, high, and moderate wildfire hazard areas was conducted for Larkspur. A total of seven structures was built between 2010 and 2014. The total value of these structures is $1,510,237, with all of the structures being located in the high wildfire hazard area. Results of this analysis are shown in Table C.15.

Table C.15. Larkspur Structures Built from 2010 to 2014: Assets Exposed to Wildfire by Hazard Level

Hazard Level	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Estimated Content Value	Land Value	Total Value
Extreme	-	-	-	-	-	-	-
High	6	6	7	$832,715	$413,522	$264,000	$1,510,237
Moderate	-	-	-	-	-	-	-
Total	**6**	**6**	**7**	**$832,715**	**$413,522**	**$264,000**	**$1,510,237**

Source: Douglas County GIS

Additionally, the new well project, existing water treatment plant, and wastewater treatment plant are all located among the pine trees on the west and east side of Spruce Mountain Road.

Hazardous Materials: Transportation Incidents

Vulnerability to Hazardous Materials: Transportation Incidents

Likelihood of Future Occurrence—Low
Potential Magnitude—High
Overall Vulnerability—High

Several major transportation routes cross through Larkspur, including Interstate 25, the Union Pacific railroad, and the Burlington Northern Santa Fe (BNSF) railroad. Hazardous materials are transported along these corridors regularly, if not every day. Residential areas are located in the immediate vicinity of the corridors, potentially presenting a serious public health and safety concern if a hazardous materials incident were to occur in a populated area. GIS analysis was used to determine the number of people at potentially at risk to hazardous materials transportation incidents in Larkspur.

Population at Risk

To determine an estimate of populations at risk from a transportation-related hazardous materials release within identified transportation corridors, an analysis was performed using GIS. A one-mile buffer was applied to both sides of Interstate 25 and the Union Pacific and Burlington Northern Santa Fe (BNSF) Railroads, creating a two-mile buffer zone around each corridor. The buffer distance was based on guidelines in the U.S. Department of Transportation's Emergency Response Guidebook that suggest distances useful to protect people from vapors resulting from spills involving dangerous goods considered toxic if inhaled. The recommended buffer distance

referred to in the guide as the "protective action distance" is the area surrounding the incident in which people are at risk of harmful exposure. For purposes of this plan, an average buffer distance of one mile was used on either side of the transportation corridor. Actual buffer distances will vary depending on the nature and quantity of the release, whether the release occurred during the night or daytime, and prevailing weather conditions.

Since there is overlapping of the corridors in some locations in Larkspur, individual population analysis was performed for each transportation corridor. Each buffered transportation corridor was intersected with improved residential parcels and therefore parcels could be counted more than once due to the individual analysis of each corridor. It is important to note that populations associated with commercial, industrial and other property types may also be affected by a hazardous materials release, but no census/population data is associated with these property types and are therefore excluded from this analysis. It is also important to note that the population at risk to a specific incident could vary greatly and would be dependent on accident location, severity and weather conditions.

The two railroads that go through Larkspur are adjacent to each other so the majority of the population in this analysis is duplicated for each railroad. There are 109 people that live within the one-mile buffer of the Union Pacific Railroad, BNSF Railroad, and Interstate 25 that passes through Larkspur. This is approximately 50% of the Town's total population.

Development Trends

Development in Larkspur occurs within existing town boundaries. As development in Larkspur continues to grow, more people will be at risk to hazardous materials transportation incidents.

C.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capability assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation outreach and partnerships, and other mitigation efforts.

C.6.1 Regulatory Mitigation Capabilities

Table C.16 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Town of Larkspur.

Table C.16. Town of Larkspur Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Y/N	Date	Comments
Comprehensive plan	Y	2011 through 2016	IGA Disaster Emergency Mutual Aid and Assistance
Zoning ordinance	Y	12/18/2010	Ordinance 3.01-3-106
Subdivision ordinance	Y	3/21/2002	Ordinance 3.02 and 3.83
Growth management ordinance	N		
Floodplain ordinance	Y	1987-2014	Ordinance 3.35, 3.44, and 3.45, Flood Damage Prevention Ordinance 3.107
Other special purpose ordinance (stormwater, steep slope, wildfire)	Y	11/4/1987	Ordinance 3.35 was adapted from Douglas County Storm Drainage
Building code	Y	5/3/2001	Ordinance 3.42, 3.50, 3.51, and 3.75
BCEGS Rating	N		
Fire department ISO rating	Y	6/12/2003	Resolution 03-04 adopted the 1997 Uniform Fire Code. The ISO rating for the Town of Larkspur is 4.
Erosion or sediment control program	Y	7/18/1996	Ordinance 3.61
Stormwater management program	Y	7/18/1996	Ordinance 3.35 and 3.61
Site plan review requirements	Y	7/22/2004	Ordinance 3.77
Capital improvements plan	N		
Economic development plan	Y	7/22/2004	Ordinance 3.87
Local emergency operations plan	N		
Community Wildfire Protection Plans	Y	3/24/2004	Educational seminars provided by Keith Worley. Douglas County IMT Resolution 004-036 in place.
Flood insurance study or other engineering study for streams	Y	12/8/2005	Ordinance 3.89
Elevation certificates	N		
Other			

Source: Amec Foster Wheeler Data Collection Guide

Ordinances

The Town of Larkspur has many ordinances related to mitigation, as noted in the comments in Table C.16.

Ordinance 3.44 Flood Damage Prevention

1.4 Methods of Reducing Flood Losses

In order to accomplish its purposes, this ordinance includes methods and provisions for:

A. Restricting or prohibiting uses which are dangerous to health, safety, and property due to water or erosion hazards, or which result in damaging increases in erosion or in flood heights or velocities;

B. Requiring that uses vulnerable to floods, including facilities which serve uses, be protected against flood damage at the time of initial construction;

C. Controlling the alteration of natural floodplains, stream channels, natural protective barriers, which help accommodate or channel flood waters;

D. Controlling filling, grading, dredging, and other development which may increase flood damage; and

E. Preventing or regulating the construction of flood barriers which will unnaturally divert flood waters or which may increase flood hazards in other areas.

Ordinance 3.45

4.2 Designation of a Flood Plain Administrator

A Flood Plain Administrator shall be appointed from time to time by resolution of the Town Council to administer and implement this Ordinance by granting or denying development, permitting applications in accordance with its provisions.

Ordinance 3.107 Adopting Flood Damage Prevention Regulations within the Town of Larkspur

In order to accomplish its purposes, this ordinance uses the following methods:

A. Restricting or prohibiting uses which are dangerous to health, safety, and property in times of flood, or cause excessive increases in flood heights or velocities;

B. Requiring that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;

C. Controlling the alteration of natural floodplains, stream channels, natural protective barriers, which are involved in the accommodation of flood waters;

D. Controlling filling, grading, dredging, and other development which may increase flood damage; and

E. Preventing or regulating the construction of flood barriers which will unnaturally divert flood waters or which may increase flood hazards to other lands.

C.6.2 Administrative/Technical Mitigation Capabilities

Table C.17 identifies the Town department(s) responsible for activities related to mitigation and loss prevention in Larkspur.

Table C.17. Town of Larkspur Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/Engineer with knowledge of land development/land management practices	Y	Town Planner	Planning Committee and outside consultant if needed are utilized
Engineer/Professional trained in construction practices related to buildings and/or infrastructure	Y	Town Manager/Professional Engineering Consultants	On call as needed
Planner/Engineer/Scientist with an understanding of natural hazards	Y	Douglas County Emergency Operations Plan	IGA with Douglas County
Personnel skilled in GIS	Y	Douglas County GIS Department	IGA with Douglas County
Full time building official	Y	Town Manager	Matt Krimmer
Floodplain Manager	Y	Town Manager	Matt Krimmer
Emergency Manager	Y	Town Manager/Mayor	Matt Krimmer/Gerry Been Town Charter §12.05
Grant writer	Y	Consultant	Margaret Dieote
Other personnel	Y	Council Members and administrative staff	Full time administrative and council members on call
GIS Data – Hazard areas	Y	Douglas County GIS Department	Douglas County Roads GIS Department
GIS Data - Critical facilities	Y	Douglas County GIS Department	Douglas County Roads GIS Department
GIS Data – Building footprints	Y	Douglas County Building Department	IGA with Douglas County
GIS Data – Land use	Y	Douglas County GIS and Assessor	IGA with Douglas County
GIS Data – Links to Assessor's data	Y	Douglas County Assessor website	IGA with Douglas County and Assessor's Office

Personnel Resources	Yes/No	Department/Position	Comments
Warning Systems/Services (Reverse 9-11, cable override, outdoor warning signals)	Y	CodeRED through Douglas County	Douglas County Sheriff's Office upgraded its emergency mass notification system. Now have high-speed telephone emergency notification.
Other	Y	Elected officials	Mayor, council members

Source: Amec Foster Wheeler Data Collection Guide with input from Town of Larkspur

C.6.3 Fiscal Mitigation Capabilities

Table C.18 identifies financial tools or resources that the Town could potentially use to help fund mitigation activities.

Table C.18. Town of Larkspur Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Y/N)	Comments
Community Development Block Grants	Y	Low income and infrastructure replacement grants
Capital improvements project funding	Y	New Arapahoe well – CDPHE and DOLA grants
Authority to levy taxes for specific purposes	Y	Town Charter
Fees for water, sewer, gas, or electric services	Y	Town Charter
Impact fees for new development	Y	Upon council approval
Incur debt through general obligation bonds	Y	Town Charter §8.01 Municipal Borrowing
Incur debt through special tax bonds	Y	
Incur debt through private activities	N	
Withhold spending in hazard prone areas	N	
Other		

Source: Amec Foster Wheeler Data Collection Guide with input from Town of Larkspur

C.6.4 Other Mitigation Capabilities

Larkspur partners with organizations involved in mitigation and preparedness on a case by case basis. The Town's preparedness and mitigation partners include:

- Larkspur Fire Protection District and Forestry Service

Town Well

In partnership with the Colorado Department of Public Health and Environment and the Colorado Water Resources and Power Development Authority, The Town of Larkspur has drilled a new well to supply water to the Town. This project was completed in November 2014 at a cost of $2,000,000. This water can be used to fight structure and wildfires within the Town limits as well as provide a potable water supply for the Town. Upon request for Mutual Aid the water will be shared with other Federal, State and Local agencies.

Smoke Alarms

The American Red Cross has provided smoke alarms and cadets from the Air Force Academy have installed the smoke alarms in the homes of every senior citizen who resides within the Town of Larkspur. Between 20 and 25 smoke alarms were installed. The project was completed in the summer 2015.

C.7 Mitigation Strategy

This section describes the mitigation strategy process and mitigation action plan for the Town of Larkspur's inclusion with the Douglas County Local Hazard Mitigation Plan update.

C.7.1 Mitigation Goals and Objectives

The Town of Larkspur adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy of the base plan.

C.7.2 Continued Compliance with the NFIP

As a participant of the National Flood Insurance Program (NFIP), the Town of Larkspur has administered floodplain management regulations that meet the minimum requirements of the NFIP. The management program objective is to protect people and property within the Town. The Town of Larkspur will continue to comply with the requirements of the NFIP in the future.

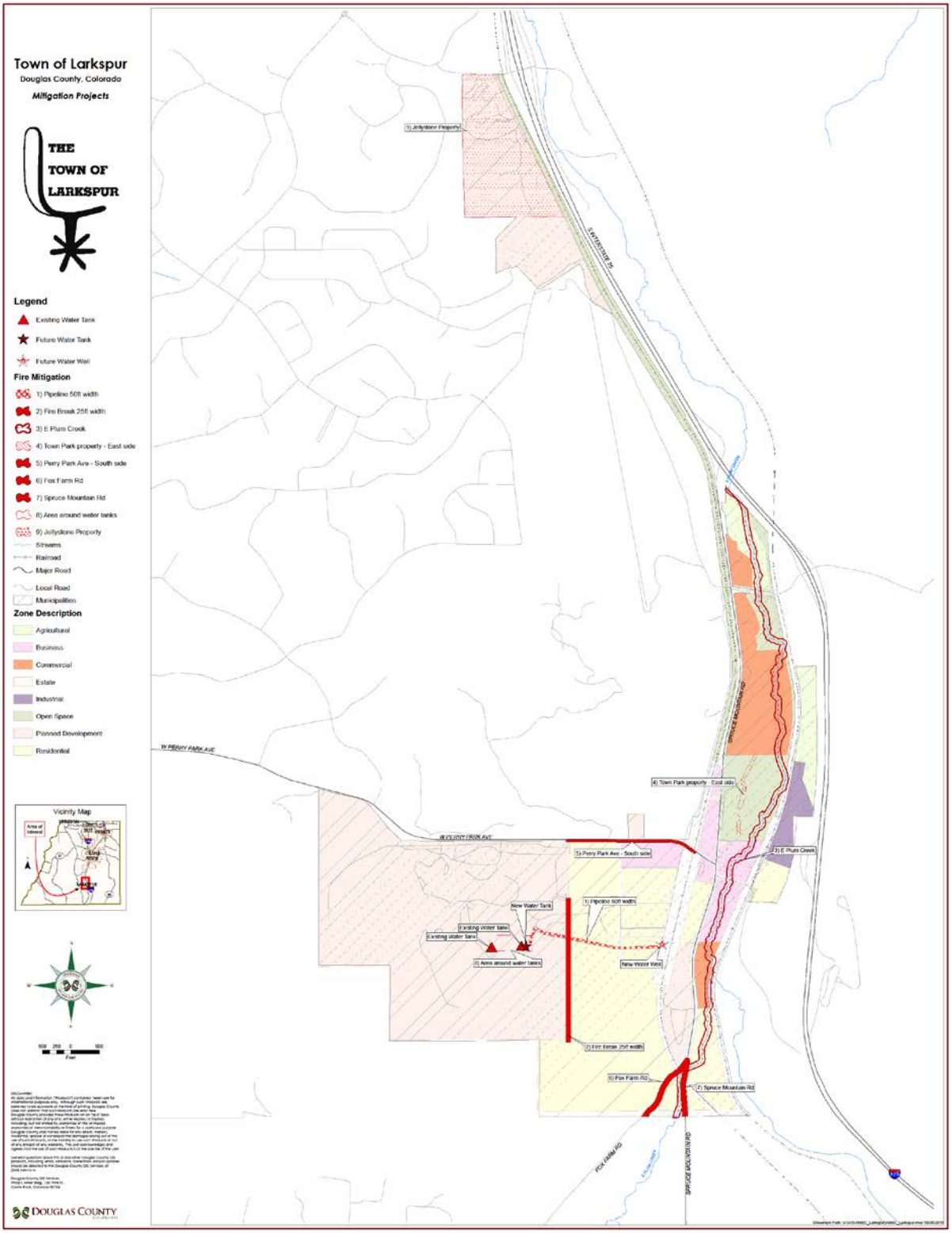
The Town's regulatory activities apply to existing and new development areas of the Town; implementing flood protection measures for existing structures and maintaining drainage systems. The goal of the program is to enhance public safety, and reduce impacts and losses while protecting the environment.

The Town provides public outreach activities through the Larkspur Fire Protection District

C.7.3 Mitigation Actions

The planning team for the Town of Larkspur identified and prioritized the following mitigation actions based on the risk assessment and in accordance with the process outline in Section 5, Mitigation Strategy, of the base plan. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. General processes and information on plan implementation and maintenance of this LHMP by all participating jurisdictions is included in Section 7, Plan Implementation and Maintenance, of the base plan.

Figure C.10. Mitigation Project Location Map



Town of Larkspur Action #1

Action Title:	**Create an east-west fire break along the pipeline construction**
Hazard:	Wildfire
Priority:	High
Project Description, Issue & Background:	The Town of Larkspur wants to construct a fire break on the north-south property line of the American Federation of Human Rights (see Plan # 2). The Town is constructing a new water storage tank and pipeline. The construction and installation of this system is scheduled for completion mid-2016. As part of this construction project the Town of Larkspur proposes to add a fire break to run along the east-west easement of the pipeline system. The easement is 50' wide. See area 1 on the project location map.
Ideas for Implementation:	Coordination with the Larkspur Fire Protection District. Submission, award and approval of the grant application to Douglas County. Completion of the formal bid process for selecting a contractor to complete the clearing and grading of the easement. Issuance of a Memorandum of Understanding between the Town of Larkspur and the Larkspur Fire Protection District with respect to the usage of the proposed fire break. In the future the Town of Larkspur will create and submit a plan for the future maintenance of the easement and fire break.
Other Alternatives:	No action
Responsible Agency:	Town of Larkspur
Partners:	Larkspur Fire Protection District Douglas County Sheriff's Office, Division of Emergency Management.
Potential Funding:	Douglas County
Cost Estimate:	$10,000
Benefits: (Losses Avoided)	The fire break will enhance public safety and first responder safety by providing safe access for fighting structure and wildfires within the Town of Larkspur, and a staging area for fighting wildfires in the surrounding area.
Timeline:	10/23/2015 Submission of this proposal to Douglas County. 11/1/2015 Coordinate with the Larkspur Fire Protection District.

	4/15/2016 Completion of the formal bid process for selecting a contractor to complete the grading of the easement. 8/1/2016 Start clearing and grading the easement. 9/1/2016 Completion of work.
Status:	New in 2015

Town of Larkspur Action #2

Action Title:	**Establishing a fire break along the new Town of Larkspur water line (East-West fire break) crossing the property of the American Federation of Human Rights**
Hazard:	Wildfire
Priority:	High
Project Description, Issue & Background:	The Town of Larkspur is currently installing a new water system with additional water storage capacity and new water line. The existing water tank capacities are: Tank # 1 128,000 gallons, Tank # 2 161,000 gallons. The new tank will tremendously increase the water storage capacity of the Town of Larkspur. The new tank capacity is 451,000 gallons. The construction and installation of this system is scheduled for completion mid-2016. As part of this construction project the Town of Larkspur proposes to add a fire break to run along the easement of this system. The easement is 50' wide. The Agreement and Deed for Water Line Easement with the dimensions is attached. See area 2 on the project location map.
Ideas for Implementation:	Coordination with the Larkspur Fire Protection District. Submission, award and approval of the proposed mitigation project to Douglas County. Completion of the formal bid process for selecting a contractor to complete the clearing and grading of the easement. Issuance of a Memorandum of Understanding between the Town of Larkspur and the Larkspur Fire Protection District with respect to the usage of the proposed fire break. In the future the Town of Larkspur will create and submit a plan for the future maintenance of the easement and fire break.
Other Alternatives:	No action
Responsible Agency:	Town of Larkspur

Partners:	Larkspur Fire Protection District Douglas County Sheriff's Office, Division of Emergency Management.
Potential Funding:	Colorado Department of Public Health and Environment, Small Community Wastewater and Drinking Water System Improvements grant awarded 01/08/2015.
Cost Estimate:	$10,000
Benefits: (Losses Avoided)	The fire break will enhance public and first responder safety by providing safe access for fighting structure and wildfires within the Town of Larkspur, and a staging area for fighting wildfires in the surrounding area.
Timeline:	10/23/2015 Submission of this Mitigation Plan to Douglas County. 11/1/2015 Coordinate with the Larkspur Fire Protection District. 4/15/2016 Completion of the formal bid process for selecting a contractor to complete the grading of the easement. 8/1/2016 Start clearing and grading the easement. 9/1/2016 Completion of work. Ongoing mitigations of the area surrounding the fire break.
Status:	New in 2015

Town of Larkspur Action #3

Action Title:	**Mitigation Along East Plum Creek from north end to the south end of the Town of Larkspur**
Hazard:	Flood and Wildfire
Priority:	Medium
Project Description, Issue & Background:	East Plum Creek runs along the east town limits of the Town of Larkspur. The creek banks have not been maintained in recent years and are overgrown. The overgrowth needs to be removed to reduce both wildfire damage and improve conveyance during high flow events. See area 3 on the project location map.
Ideas for Implementation:	The Town of Larkspur will initiate a mitigation project to remove the accumulated brush and debris from the creek bank running north to south from Upper Lake Gulch Road to the south Town limits.
Other Alternatives:	No action
Responsible Agency:	Town of Larkspur
Partners:	Larkspur Fire Protection District Douglas County Sheriff's Office, Division of Emergency Management.
Potential Funding:	Douglas County Grant
Cost Estimate:	$2,000
Benefits: (Losses Avoided)	This project will prevent the spread of wildfires and protect the creek and surrounding public and private properties. It will also improve conveyance in the creek and reduce flooding potential.
Timeline:	10/23/2015 Submit mitigation plan to Douglas County. 03/31/2016 Award of grant funds 04/01/2016 Notify partners of the plan 04/15/2016 Identify and select contractor to complete the work. 07/31/2016 Completion of the work

	Ongoing mitigation work. 04/15/2016 Identify and select contractor to complete the work.
Status:	New in 2015

Town of Larkspur Action #4

Action Title:	**Mitigation Along East town limits of the Town of Larkspur**
Hazard:	Wildfire
Priority:	Medium
Project Description, Issue & Background:	The Town of Larkspur will initiate a mitigation project to remove the accumulated brush and debris from the east town limits of the Town of Larkspur. This project will run from Upper Gulch Lake Road south to Fox Farm Road and west to east from Frank Road to 1-25. This wildfire mitigation to protect the business along the east edge of the town See area 4 on the project location map.
Ideas for Implementation:	This project will run from Upper Gulch Lake Road south to Fox Farm Road and west to east from Frank Road to 1-25.
Other Alternatives:	No action
Responsible Agency:	Town of Larkspur
Partners:	Larkspur Fire Protection District Douglas County Sheriff's Office, Division of Emergency Management. Colorado Department of Transportation (CDOT)
Potential Funding:	Douglas County Grant
Cost Estimate:	$2,000
Benefits: (Losses Avoided)	This project will prevent the spread of wildfires and protect the creek and surrounding public and private properties.

Timeline:	10/23/2015 Submit mitigation plan to Douglas County. 03/31/2016 Award of grant funds 04/01/2016 Notify partners of the plan 04/30/2016 Selection of vendor to complete the mitigation. 04/15/2016 Identify and select contractor to complete the work. 07/31/2016 Completion of the work Ongoing mitigation work.
Status:	New in 2015

Town of Larkspur Action #5

Action Title:	**Complete Wildfire Mitigation on the south side of Perry Park Ave from center of Town to the Larkspur Elementary**
Hazard:	Wildfire
Priority:	Low
Project Description, Issue & Background:	The Town of Larkspur will undertake wildfire mitigation from the south side of Perry Park Ave from center of Town to the Larkspur Elementary. This will add a fuel break on the north side of Town. See area 5 in the project location map.
Ideas for Implementation:	A survey of Town of Larkspur property revealed this area that needs to be mitigated to deduce the potential for damage from wildfires. As needed the Town of Larkspur will create and submit a plan for the future ongoing mitigation of this area.
Other Alternatives:	No action
Responsible Agency:	Town of Larkspur
Partners:	Larkspur Fire Protection District Larkspur Elementary School Douglas County Sheriff's Office, Division of Emergency Management
Potential Funding:	Douglas County Grant

Cost Estimate:	$3,000
Benefits: (Losses Avoided)	This mitigation work will reduce the potential for damage associated with wildfires.
Timeline:	10/23/2015 Submission of this Mitigation Plan to Douglas County. 11/20/2015 Notification to the Larkspur Elementary School. 11/20/2015 Coordinate with the Larkspur Fire Protection District. 03/31/2016 Grant awarded 04/30/2016 Selection of vendor to complete the mitigation. 07/30/2016 Completion of the project Ongoing mitigations of the area.
Status:	New in 2015

Town of Larkspur Action #6

Action Title:	**Complete Wildfire Mitigation from Fox Farm Rd to Spruce Mountain Rd**
Hazard:	Wildfire
Priority:	Low
Project Description, Issue & Background:	The Town of Larkspur will undertake wildfire mitigation from Fox Farm Road to Spruce Mountain Rd. The project will create a fuel break and allow for safer evacuations. See area 6 on the project location map.
Ideas for Implementation:	A survey of Town of Larkspur property revealed this area that needs to be mitigated to deduce the potential for damage from wildfires. As needed the Town of Larkspur will create and submit a plan for the future ongoing mitigation of this area.
Other Alternatives:	No action
Responsible Agency:	Town of Larkspur

Partners:	Larkspur Fire Protection District Douglas County Sheriff's Office, Division of Emergency Management
Potential Funding:	Douglas County Grant
Cost Estimate:	$2,500
Benefits: (Losses Avoided)	This mitigation work will reduce the potential for damage associated with wildfires and enhance public safety.
Timeline:	10/23/2015 Submission of this Mitigation Plan to Douglas County. 11/20/2015 Coordinate with the Larkspur Fire Protection District. 12/1/2015 Issuance of a Memorandum of Understanding between the Town of Larkspur and the Larkspur Fire Protection District 03/31/2016 Grant awarded 04/30/2016 Selection of vendor to complete the mitigation. 07/30/2016 Completion of the project Ongoing mitigations of the area.
Status:	New in 2015

Town of Larkspur Action #7

Action Title:	**Complete Wildfire Mitigation from Spruce Mountain Rd to Fox Farm Rd**
Hazard:	Wildfire
Priority:	Low
Project Description, Issue & Background:	The Town of Larkspur will undertake wildfire mitigation from Spruce Mountain Road to Fox Farm Road. The project will create a fuel break and allow for safer evacuations. See area 7 on the project location map.
Ideas for Implementation:	A survey of Town of Larkspur property revealed this area that needs to be mitigated to deduce the potential for damage from wildfires. As needed the Town of Larkspur will create and submit a plan for the future ongoing mitigation of this area.

Other Alternatives:	No action
Responsible Agency:	Town of Larkspur
Partners:	Larkspur Fire Protection District Douglas County Sheriff's Office, Division of Emergency Management
Potential Funding:	Douglas County Grant
Cost Estimate:	$2,000
Benefits: (Losses Avoided)	This mitigation work will reduce the potential for damage associated with wildfires and enhance public safety.
Timeline:	10/23/2015 Submission of this Mitigation Plan to Douglas County. 11/20/2015 Coordinate with the Larkspur Fire Protection District. 12/1/2015 Issuance of a Memorandum of Understanding between the Town of Larkspur and the Larkspur Fire Protection District 03/31/2016 Grant awarded 04/30/2016 Selection of vendor to complete the mitigation. 07/30/2016 Completion of the project Ongoing mitigations of the area.
Status:	New in 2015

Town of Larkspur Action #8

Action Title:	**Establishing a fire break along the new Town of Larkspur water line and water tanks**
Hazard:	Wildfire
Priority:	High
Project Description, Issue & Background:	The Town of Larkspur is currently installing a new water system with additional water storage capacity and a new water line. The existing water tank capacities are: Tank # 1 128,000 gallons, Tank # 2 161,000 gallons. The new tank will tremendously increase the water storage capacity of the Town of Larkspur. The

	new tank capacity is 451,000 gallons. The construction and installation of this system is scheduled for completion mid-2016. As part of this construction project the Town of Larkspur proposes to continue mitigation efforts around the old and new water tanks.
Ideas for Implementation:	See area 8 on the project location map. Coordination with the Larkspur Fire Protection District. Submission, award and approval of the grant application to Douglas County. Completion of the formal bid process for selecting a contractor to complete the clearing and grading of the easement. Issuance of a Memorandum of Understanding between the Town of Larkspur and the Larkspur Fire Protection District with respect to the usage of the proposed fire break. In the future the Town of Larkspur will create and submit a plan for the future maintenance of the easement and fire break.
Other Alternatives:	No action
Responsible Agency:	Town of Larkspur
Partners:	Larkspur Fire Protection District Douglas County Sheriff's Office, Division of Emergency Management
Potential Funding:	Colorado Department of Public Health and Environment, Small Community Wastewater and Drinking Water System Improvements grant awarded 01/08/2015.
Cost Estimate:	$10,000
Benefits: (Losses Avoided)	The mitigation will enhance public safety and first responder safety by providing safe access for fighting structure and wildfires within the Town of Larkspur, and a staging area for fighting wildfires in the surrounding area. It will also ensure the safety of the water supply for the Town of Larkspur.
Timeline:	10/23/2015 Submission of this mitigation plan to Douglas County. 11/1/2015 Coordinate with the Larkspur Fire Protection District. 4/15/2016 Completion of the formal bid process for selecting a contractor to complete the grading of the easement. 8/1/2016 Start clearing and grading the easement. 9/1/2016 Completion of work.
Status:	New in 2015

Town of Larkspur Action #9

Action Title:	**Assessment of Yogi Bear's Jellystone Park and RV Camp to determine mitigation needs and to establish evacuation routes**
Hazard:	Wildfire/Flood
Priority:	High
Project Description, Issue & Background:	Yogi Bear's Jellystone Park and RV Camp is a 104-acre property that contains a 35-acre campground and RV park. It sits at the intersection of I-25 and exit 174 and the address is 650 Sky View Ln, Larkspur, CO 80118. This site is a privately owned commercial venture. This property has operated as a campground since 1967 and currently has 179 campground sites including a guest lodge, yurts and tipis. All the roads are dirt, and the main entrance connects to a paved County maintained road. An aerial map is attached and a map of the camp sites is also attached. See area 9 on the project location map.
Ideas for Implementation:	Coordination with the Larkspur Fire Protection District. Issuance of a Memorandum of Understanding between the Town of Larkspur and the Larkspur Fire Protection District and Yogi Bear's Jellystone Park and RV Camp with respect to this plan and the determination of mitigation needs and evacuation routes.
Other Alternatives:	No action
Responsible Agency:	Town of Larkspur
Partners:	Larkspur Fire Protection District Douglas County Sheriff's Office, Division of Emergency Management Yogi Bear's Jellystone Park and RV Camp (Bear View LLC, and the Ian I. W. Steyn Trust)
Potential Funding:	TBD
Cost Estimate:	$1,500
Benefits: (Losses Avoided)	This project will establish safe evacuation routes in case of a natural disaster. It will also ensure routes for firefighters and other first responders and their equipment. It will protect lives, private property and publicly owned equipment.
Timeline:	10/23/2015 Submission of this Mitigation Plan to Douglas County.

1/2016 Meet with the Yogi Bear's Jellystone Park and RV Camp ownership and other stake owners to discuss this plan

1/2016 Issuance of the Memorandum of Agreement between the Town of Larkspur, the Larkspur Fire Protection District and Yogi Bear's Jellystone Park and RV Camp

3/2016 Larkspur Fire Protection District starts the assessment

4/2016 Completion of the assessment documents

Ongoing work on completion of the mitigation issues identified in the assessment.

Status: New in 2015

Town of Larkspur Action #10

Action Title:	**Water share with the U. S. Forest Service, Pike National Forest, Rampart Range Area**
Hazard:	Wildfire
Priority:	High
Project Description, Issue & Background:	The Town of Larkspur is currently installing a new water tank with additional water storage capacity. The existing water tank capacities are: Tank # 1 128,000 gallons, Tank # 2 161,000 gallons. The new tank will tremendously increase the water storage capacity of the Town of Larkspur. The new tank capacity is 451,000 gallons. The construction and installation of this system is scheduled for completion mid-2016. If approved, upon completion of the new water system the Town of Larkspur will enter into an agreement with the U.S. Forest Service to provide unused water for fighting wildfires within the Pike National Forest, Rampart Range Area.
Ideas for Implementation:	The Town of Larkspur currently has two water storage tanks that supply water to the Town. Tank number 1 holds 128,000 gallons of water. Tank number 2 holds 161,000 gallons of water. A new water tank has been purchased by the Town of Larkspur and is currently being constructed and a water line installed. This new tank, number 3, will hold 451,000 gallons of water. This water system will continuously auto-replenish its self. Any of the Towns thirty-four (34) existing fire hydrants can be accessed to tinder the water and then the water can be transported to active wildfires.
Other Alternatives:	No action
Responsible Agency:	Town of Larkspur

Partners:	U.S. Forest Service, Pike National Forest, Rampart Range Area Larkspur Fire Protection District Douglas County Sheriff's Office, Division of Emergency Management
Potential Funding:	Grant from the Colorado Department of Public Health and Environment.
Cost Estimate:	$200,000
Benefits: (Losses Avoided)	In a wildfire emergency this project will supply water to the U.S. Forest Service via a tender system. This project will help to ensure the safety of first responders and protect U.S. government property on U. S. Forest Service land, and aid in the suppression of fires.
Timeline:	10/21/2015 Larkspur Fire Chief Stu Mills was informed of this plan. 10/22/2015 Informed the U.S. Forest Service, Pike National Forest, Rampart Range Area District of this proposed project, and provided them with details of the plan. An additional conversation is planned for 10/27/2015. 10/23/2015 Submission of this proposed mitigation plan to Douglas County. 1/20/2016 Inform partners, Larkspur Fire Protection District, U. S. Forest Service, Pike National Forest, Rampart Range Area and the Douglas County Sheriff's Department, Emergency Management Division. 3/31/2016 Issuance of a Memorandum of Understanding between the Town of Larkspur and the U. S. Forest Service, Pike National Forest, Rampart Range Area and other interested parties. 07/01/2016 Completion of work.
Status:	New in 2015

Town of Larkspur Action #11

Action Title:	**Public awareness – support Douglas County citizen disaster preparedness guide**
Hazard:	Thunderstorms/lightning/winter storms & extreme cold/floods/tornadoes/wildfires/hazardous materials/earthquake
Priority:	Medium, Ongoing

Project Description, Issue & Background:	Revise and Update the Citizen Preparedness Guide using a new format with a focus on disaster preparedness for all Douglas County Citizens. Components include Warning systems, Citizen Information, Preparing a Family Disaster Plan, Stockpile Checklist, Shelter & Recovery, Access & Functional Needs, Pet Preparedness and Evacuation, Thunderstorms & Lightning, Winter Storms & Extreme Cold, Floods, Tornadoes, Wildfires, Terrorism, Active Shooter, Public Health Emergency, Pandemic Flu, Hazardous Materials, and Helpful Resources. Printed and electronic versions available as well as an application for smart phones. This will be used in conjunction with the Larkspur Fire Department's disaster and mitigation meetings and disaster potential guide for the Town.
Ideas for Implementation:	Production and distribution of 500 printed copies for Larkspur residents in summer of 2015. Continue standard order of 500 printed versions annually over subsequent 4 years.
Other Alternatives:	No action
Responsible Agency:	Douglas County OEM
Partners:	Town of Larkspur, DC FFESS, DC Public Affairs, DCSO Community Resources
Potential Funding:	Douglas County
Cost Estimate:	Cost of materials, staff time
Benefits: (Losses Avoided)	Informative preparedness piece for citizens of Larkspur, Douglas County, and other participating jurisdictions
Timeline:	Q2 2015 distribution and annually thereafter
Status:	New in 2015

Annex D CITY OF LONE TREE

D.1 Introduction

This annex details the hazard mitigation planning elements specific to the City of Lone Tree, a participating jurisdiction to the Douglas County LHMP Update. This annex is not intended to be a standalone document, but appends to and supplements the information contained in the base plan document. As such, all sections of the base plan, including the planning process and other procedural requirements apply to and were met by the City. This annex provides additional information specific to the City of Lone Tree, with a focus on providing additional details on the risk assessment and mitigation strategy for this community.

D.2 Planning Process

As described above, the City of Lone Tree followed the planning process detailed in Section 3.0 of the base plan. In addition to providing representation on the Douglas County Hazard Mitigation Planning Committee (HMPC), the City formulated their own internal planning team to support the broader planning process requirements. Internal planning participants included staff from the following City departments:

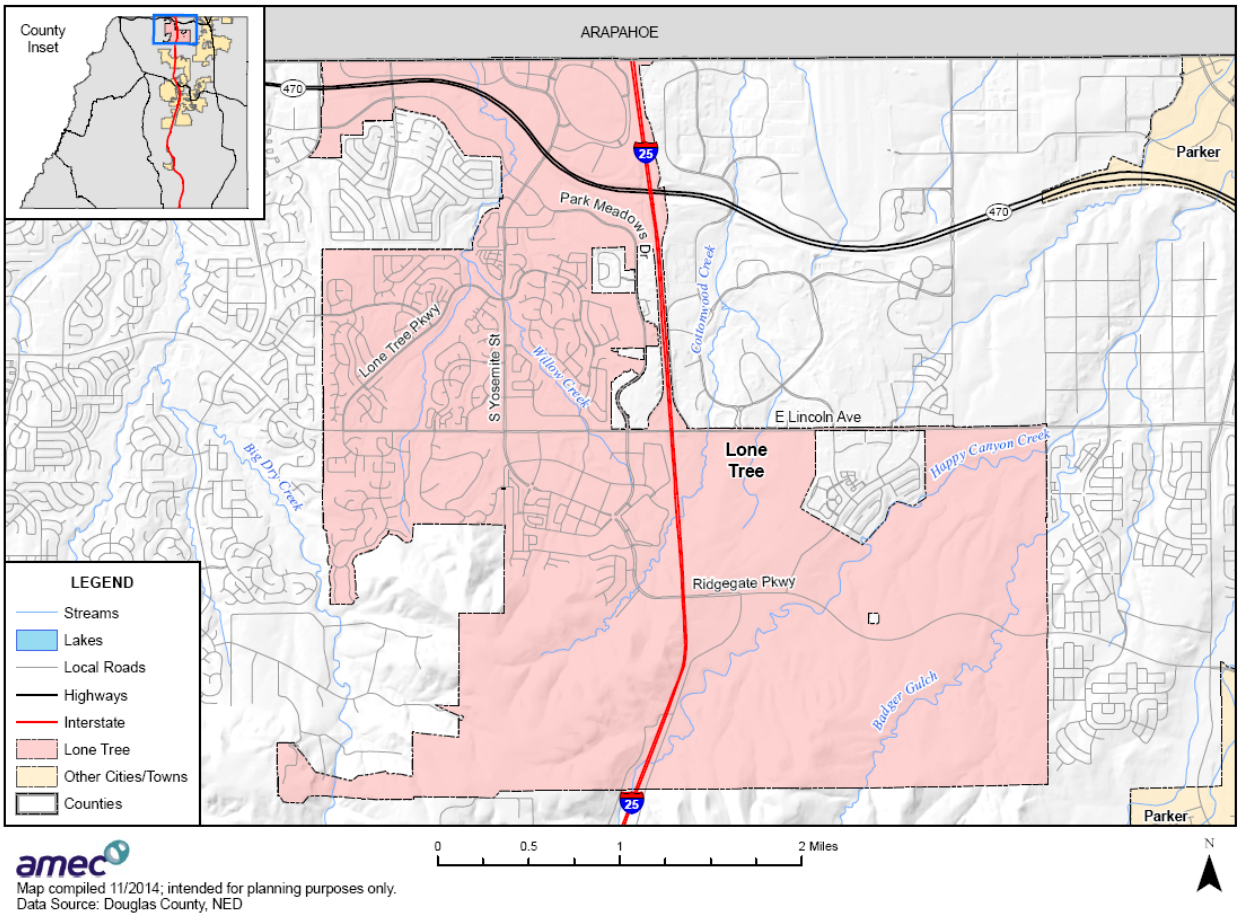
- Greg Weeks, City Engineer, Public Works
- Ron Pinson, Commander, Police Department
- Bill Sparkman, member, Public Safety Advisory Committee (PSAC)
- Darryl Jones, VP and Development Manager of Coventry

Additional details on plan participation and City representatives are included in Appendix A.

D.3 Community Profile

The community profile for the City of Lone Tree is detailed in the following sections. Figure D.1 displays a map and the location of the City of Lone Tree within Douglas County.

Figure D.1. City of Lone Tree Base Map



D.3.1 Geography and Location

The City of Lone Tree is located in northern Douglas County near the junction of Interstate 25 and Highway 470. The land consists of a wide range of topography encompassing mountain vistas, hills, and grass covered plains.

Because of the City's position in the Denver metro area and multi-modal transportation facilities, the area is desirous to new residents. The lands surrounding Lone Tree include Highlands Ranch to the west, Centennial to the north, Stonegate to the east, and Castle Pines and open space to the south.

D.3.2 History

The City of Lone Tree was incorporated in 1995. The City's website states that "A major impetus for incorporation was resident's concerns relating to land use, the quality of development along the C-470 corridor, and their desire for greater input over development decisions affecting their future. Through the tireless efforts of dedicated residents, the decision to incorporate was carefully evaluated, and through a vote of the electorate, was determined to be in

the best interest of the community. Initially, the City boundary followed that of the Park Meadows Metropolitan District and consisted of the subdivision of Lone Tree and surrounding developments, and some commercial development along C-470. In only a short amount of time, the City has grown and changed in a number of important ways, consistent with its vision for growth."

D.3.3 Economy

As the population of the City has grown, so has its economy. Select economic characteristics and statistics for Lone Tree are shown in Table D.1. These statistics were pulled from the 2008-2013 American Community Survey and the 2000 U.S. Census to demonstrate how certain economic factors in Lone Tree have changed over time.

Table D.1. Economic Characteristics for the City of Lone Tree

Characteristic	2000	2013
Families below Poverty Level	<1%	2.9%
Individuals below Poverty Level	<1%	4.9%
Median Home Value	$292,500	$462,000
Median Household Income	96,308	$107,417
Per Capita Income	46,287	$57,081
Population in Labor Force*	2,907	6,409

Source: 2008-2013 US Census Bureau American Community Survey 5-year Estimates, 2000 U.S. Census

D.3.4 Population

The 2013 population estimate for the City (the most recent available) indicates there are 11,600 residents of Lone Tree. The population was estimated at 10,218 for the 2010 U.S. Census.

D.4 Hazard Identification and Summary

This section details how the risk of individual hazards varies across Lone Tree. The City's planning team identified the hazards that affect the City and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to Lone Tree (see Table D.2). In the context of the plan's planning area, there are no hazards that are unique to Lone Tree.

Information on past occurrences and the likelihood of future occurrences is detailed in Section 4, Risk Assessment, of the base plan. Additional information for high and medium significant hazards for the City is included in the Vulnerability Assessment section of this Annex.

Table D.2. City of Lone Tree Hazard ID Table

Hazard	Spatial Extent	Likelihood of Future Occurrences	Magnitude /Severity	Significance
Avalanche	Limited	Low	Low	Low
Drought	Significant	Medium	Medium	Medium
Earthquake	Significant	Low	Low	Low
Flood: Dam Failure	Limited	Low	Low	Low
Flood: 100/500 year	Limited	Low	Low	Low
Flood: Localized/ Stormwater	Limited	Medium	Low	Low
Landslides/ Mud & Debris Flows /Rockfalls	Significant	Medium	Medium	Low
Severe Weather: Extreme Heat	Extensive	Medium	Low	Low
Severe Weather: Hail	Extensive	High	Low	Low
Severe Weather: High Winds	Extensive	High	Low	Low
Severe Weather: Lightning	Extensive	Medium	Low	Low
Severe Weather: Thunderstorms/Heavy Rains	Extensive	High	Medium	Medium
Severe Weather: Tornado	Extensive	Medium	Low	Low
Severe Weather: Winter Weather (includes snow/ice/extreme cold)	Extensive	Medium	High	Medium
Soil Hazards: Erosion & Deposition	Significant	Medium	Low	Low
Soil Hazards: Expansive Soils	Significant	Medium	Low	Low
Soil Hazards: Subsidence	Limited	Medium	Low	Low
Wildfire	Significant/Extensive	High	Medium	Medium
Hazardous Materials: Transportation Incidents	Significant	High	Medium	Medium

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

Likelihood of Future Occurrences
Low: Occurs less than once every 10 years or more
Medium: Occurs less than once every 5 to 10 years
High: Occurs once every year or up to once every five years

Magnitude/Severity
Low: Negligible property damages (less than 5% of all buildings and infrastructure) Negligible loss of quality of life. Local emergency response capability is sufficient to manage the hazard.
Medium: Moderate property damages (15% to 50% of all buildings and infrastructure) Some loss of quality of life. Emergency response capability, economic and geographic effects of the hazard are of sufficient magnitude to involve one or more counties.
High: Property damages to greater than 50% of all buildings and infrastructure. Significant loss of quality of life Emergency response capability, economic and geographic effects of the hazard are of sufficient magnitude to require federal assistance.

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

D.5 Vulnerability Assessment

The intent of this section is to assess Lone Tree's vulnerability separate from that of the planning area as a whole, which has already been assessed in Section 4.3 Vulnerability Assessment of the base plan. This vulnerability assessment provides an inventory of the population, property, and other assets located within the City and further analyzes those assets at risk to identified hazards ranked of medium or high significance (as listed in Table D.2) to the community. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the main plan.

D.5.1 Total Assets at Risk

This section identifies Lone Tree's total assets at risk, including values at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the community. This data is not hazard specific, but is representative of total assets at risk within a community.

Values at Risk

The following data from the Douglas County Assessor's Office is based on joining assessor data to the 2014 parcel layer in GIS. This data should only be used as an indicator of overall values in the County, as the information has some limitations. Table D.3 summarizes the parcels, improved parcels, structures, improved value, land value, and total value exposed in Lone Tree. It is important to note, in the event of a disaster, it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a loss.

Table D.3. City of Lone Tree Total Exposure

Property Type	Total Parcel Count	Improved Parcel Count	Total Structures	Improved Value	Total Land Value	Total Value
Agricultural	47	0	14	$0	$90,606	$90,606
Commercial	195	169	2,230	$983,383,425	$369,222,226	$1,352,605,651
Exempt	455	29	149	$85,366,377	$28,780,801	$114,147,178
HOA	174	0	48	$0	$0	$0
Industrial	0	0	0	$0	$0	$0
Producing Mine	0	0	0	$0	$0	$0
Residential	3,578	3,398	3,796	$1,370,559,065	$368,018,250	$1,738,577,315
Utilities	0	0	0	$0	$0	$0
Vacant Land	166	0	45	$0	$25,124,423	$25,124,423
Total	**4,615**	**3,596**	**6,282**	**$2,439,308,867**	**$791,236,306**	**$3,230,545,173**

Source: Douglas County Assessor's Data

Critical Facilities and Infrastructure

For purposes of this plan, a critical facility is defined as:

> Any facility, including without limitation, a structure, infrastructure[1], property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.

This definition was refined by separating out three categories of critical facilities as further described in Section 4.3.1 of the base plan. These categories include At-Risk Populations, Essential Services, and High Potential Loss Facilities.

An inventory of critical facilities in the City of Lone Tree from Douglas County GIS is provided in Table D.4. Details of critical facility definition, type, name and address and jurisdiction by hazard zone are listed in Appendix E.

Table D.4. City of Lone Tree Critical Facilities: Summary Table

Category	Type	Facility Count
At Risk Population Facilities	Assisted Living	2
	School	4
Essential Services Facilities	Bridge	4
	Cell Tower	9
	Fire Department	1
	Hospital	1
	Microwave	14
	Police	1
	Public Health	1
	Water Hub/Treatment	1
	Hazardous Material	25
High Potential Loss Facilities	Assisted Living	2
	Total City of Lone Tree	**63**

Source: Douglas County GIS

Natural Resources

The City of Lone Tree and the areas surrounding it include a rich and diverse range of biological resources.

[1] Essential Service Facilities include bridges, roads, power grids, and infrastructure held by private companies (i.e. utility lines and private levees) that are not mapped for security reasons and are not under the control of the County.

Vegetation

According to Lone Tree's 2008 Comprehensive Plan, "[p]rominent native species in the area include a variety of short and tall grasses in meadow areas, cottonwood and native willow tree species along drainages, and a sprinkling of Gambel Oak and Mountain Mahogany shrubs along the sides and tops of the bluffs. These hardy native species should be protected and riparian areas restored where appropriate to enhance habitat for wildlife, to prevent soil erosion, to protect water quality, and for their intrinsic value" (pg. 3-4).

Wildlife Habitat

According to the Lone Tree Comprehensive Plan, "[w]ildlife habitat is fundamentally preserved through the continued implementation of this Plan, which supports compact land patterns as opposed to sprawl which fragments land available for wildlife habitat and movement corridors. While Lone Tree is an urbanizing community, the City has also worked to conserve important wildlife habitat through the preservation of large tracks of open space along the bluffs and important drainages throughout the City (see the Environmental Resources Map). Cooperative efforts are undertaken to restore and enhance areas important for wildlife, including restoration of wetland and riparian areas, the control of noxious weeds, measures to maintain water quality, and the use of wildlife compatible fencing" (pg. 3-6).

Historic and Cultural Resources

To inventory historically significant homes, public buildings, and landmarks in the Planning Area, the HMPC collected information from both the National Register of Historic Places and the Colorado State Register. Each program has different eligibility criteria and procedural requirements. These requirements are detailed in Section 4.3.1 of the base plan. Lone Tree does not have any historic structures or landmarks listed in the National Register. However, the Schweiger Ranch Foundation is known to be one of the oldest ranches and historical sites in Douglas County. The Schweiger Ranch falls under the municipality of Lone Tree and should be considered an important historical asset.

Growth and Development Trends

The City's development context consists of a variety of residential densities, commercial uses, and mixed uses, with parks, trails, and open space. The history of the City's development and population growth periods are as follows:

"Initially, the City boundary followed that of the Park Meadows Metropolitan District and consisted of the subdivision of Lone Tree and surrounding developments, and some commercial development along C-470. In only a short amount of time, the City has grown and changed in a number of important ways, consistent with its vision for growth.

RidgeGate, a 3500-acre master planned community south of Lincoln (located on both sides of I-25), was annexed by a vote of Lone Tree residents in 2000. Because the property was already

zoned for development under County jurisdiction and would develop regardless, the City felt it was important to work with the landowner and take a direct role in shaping the master plan for the property. As a result of that effort, Lone Tree receives land dedication for public facilities including a new recreation center, police and fire stations, a City Hall, library, trails, parks, and open space, and land for a future City Center (to be located on the east side of I-25 and south of Lincoln Avenue). The City, along with Ridgegate Investments, Inc., the owner of RidgeGate, have committed to preserve the historic Schweiger Ranch, providing the City an opportunity to appreciate its ranching legacy.

Annexations to the City in 2001 included Heritage Hills and commercial development to the north, bringing considerable economic benefit to the community and include a neighborhood that was already part of the local community of interest. Likewise, in 2001, the residential communities of Centennial Ridge and Carriage Club were also annexed.

Sky Ridge Medical Center was constructed in 2003, providing needed emergency and medical care facility for residents in the region. That same year City offices were centralized in leased office space on South Yosemite Street.

In 2004, the City's police force was established, resulting in the hiring of the City's first public safety employees. The City also reconstructed a new Civic Center on Lone Tree Parkway in 2004 (replacing what was the sales office for the original Lone Tree development). Other important additions to Lone Tree included the annexation of Southridge Preserve in 2004, a residential development planned south of Centennial Ridge. This land was annexed principally to establish specific limitations on location and design of homes to protect ridgeline views for future generations to enjoy.

Park Meadows Mall was annexed in 2006, enhancing revenues to the City, while also ensuring that revenues will be reinvested in the area to sustain its economic viability over time. Businesses continue to grow and thrive in the community, and toward that end, the Lone Tree Chamber of Commerce was established in 2006.

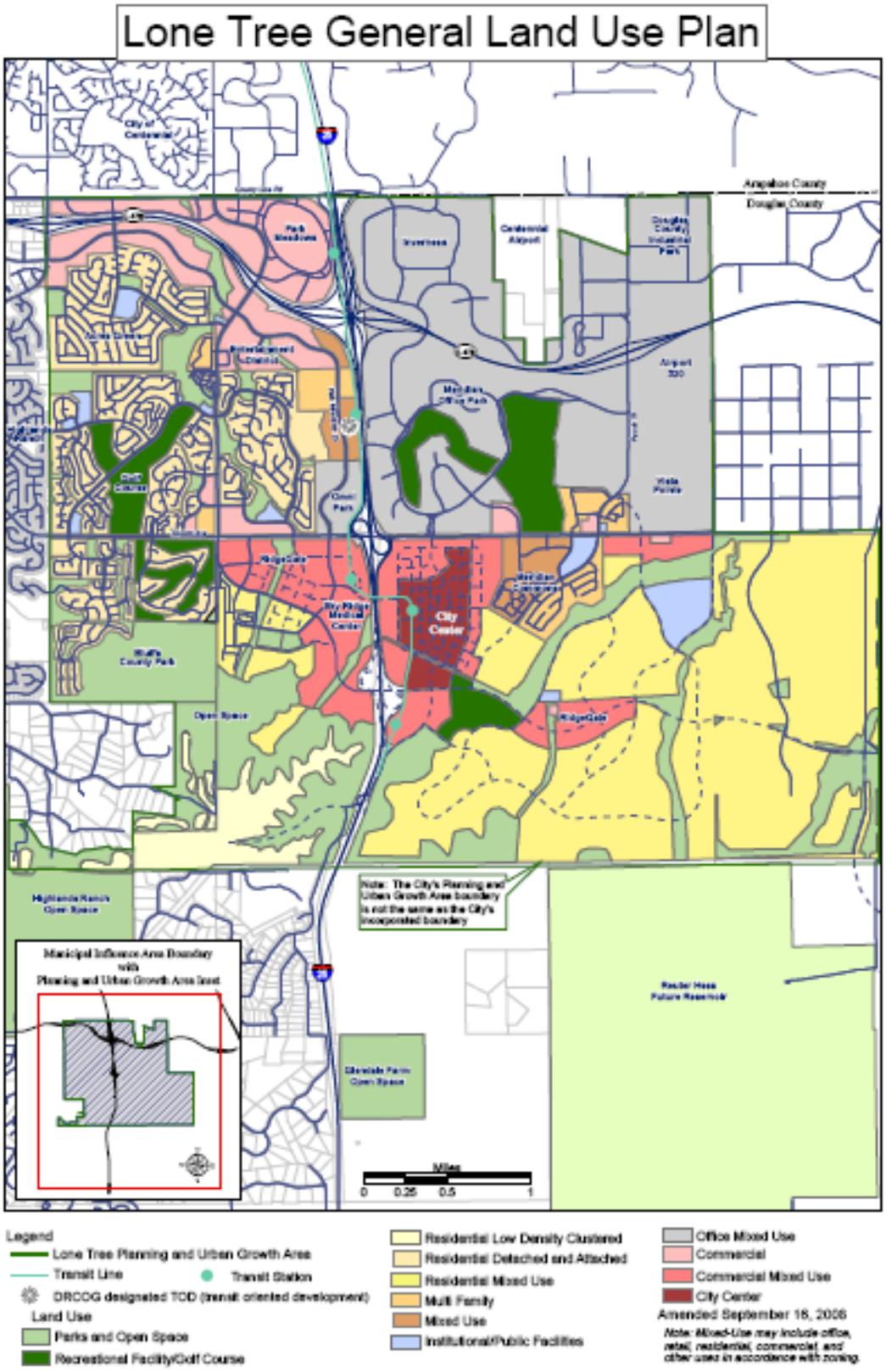
Light rail was extended to the Lone Tree community, with the first stop at Lincoln Station opening in 2006, followed by a stop at Park Meadows Mall in 2008. Future stops are planned at Sky Ridge Medical Center, the future City Center and a future end-of-the line station east of I-25 at the Ridgegate Parkway interchange.

The City renovated an existing office building and in April 2007, the City offices were relocated to their current location at 9220 Kimmer Drive."[2]

Development within the City consists of planned development residential uses, commercial uses, office mixed uses, other mixed uses, and parks and open space uses. Existing land use is shown in Figure D.2.

[2] "History of Lone Tree, a City that is growing…carefully." https://cityoflonetree.com/index.aspx?NID=276, accessed March 26, 2015.

Figure D.2. Current Land Use in the City of Lone Tree



Source: 2008 City of Lone Tree Comprehensive Plan

Table D.5 summarizes the number and value of structures built in Lone Tree from 2010 to 2014 based on a query of the 'year built' values in the County's parcel database. A total of 280 structures, with a total value greater than $166 million, were built in that short period of time. The vast majority of these structures were residential, built to accommodate the rapidly growing population in the Planning Area. Additional analysis on recent development in Lone Tree's mapped hazard areas is discussed in the vulnerability assessments for flood, landslide/erosion, and wildfire.

Table D.5. Lone Tree Structures Built from 2010 to 2014: Total Assets by Property Type

Property Type	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Land Value	Total Value
Commercial	15	15	71	$40,663,645	$27,106,153	$67,769,798
Residential	201	201	209	$78,345,513	$20,306,050	$98,651,563
Total	**216**	**216**	**280**	**$119,009,158**	**$47,412,203**	**$166,421,361**

Source: Douglas County

D.5.2 Priority Hazards: Vulnerability Assessment

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table D.2 as high or medium significance hazards. Lone Tree did not rank any hazards as high significance but does have several of medium significance. Flooding (100/500-year), landslide, and erosion were also analyzed to compare Lone Tree's exposure to the rest of the Planning Area, despite being ranked low significance to the City. Impacts of past events and vulnerability of the City to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the base plan for more detailed information about these hazards and their impacts on the Douglas County Planning Area). Methodologies for calculating loss estimates are the same as those described in Section 4.3 of the base plan.

An estimate of the vulnerability of the City to each identified hazard, in addition to the estimate of risk of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.

- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.

Drought

Vulnerability to Drought

Likelihood of Future Occurrence—Medium
Potential Magnitude—Medium
Overall Vulnerability—Medium

Drought is different than many of the other natural hazards in that it is not a distinct event and usually has a slow onset. Drought can severely impact a region both physically and economically. Drought affects different sectors in different ways and with varying intensities. Adequate water is the most critical issue for agricultural, manufacturing, tourism, recreation, and commercial and domestic use. As the population in the area continues to grow, so too will the demand for water.

The most significant qualitative impacts associated with drought in Lone Tree are those related to water intensive activities such as fire protection, municipal usage, commerce, tourism, recreation, and wildlife preservation. Mandatory conservation measures and water use restrictions are typically implemented during extended droughts. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding.

It is difficult to quantitatively assess drought impacts to Lone Tree. Some factors to consider include: habitat loss and associated effects on wildlife, and the drawdown of the groundwater table. The most direct and likely most difficult drought impact to quantify is to local economies. It can be assumed, however, that the loss of production in one sector of the economy would affect other sectors.

Development Trends

Drought vulnerability will increase with future development as there will be increased demands for limited water resources. Lone Tree supports water conservation measures through wastewater reuse, xeriscaping, water efficient fixtures, and best management practices established by the Colorado Water Wise Council.

The completion of the Rueter-Hess Reservoir helps mitigate drought impacts in parts of the City that fall within the Parker Water and Sanitation District service area. The District recognized the need to manage water supply, especially given the rapid growth rate in their service area. To help meet this need, the Rueter-Hess reservoir was constructed. The construction of the reservoir lasted from 2004 to 2012, and Parker Water and Sanitation District began gradually filling it in 2012. Rueter-Hess is primarily supplied by surface water from Cherry Creek, Newlin Gulch,

and return flows from nearby water districts.[3] The reservoir is primarily used for drinking water storage to supply current and future development in Lone Tree, Parker, Castle Rock, Castle Pines, and other local jurisdictions and will help mitigate future impacts to Lone Tree's water supply in future droughts

Flood: 100/500 year

Vulnerability to Flood: 100/500 year

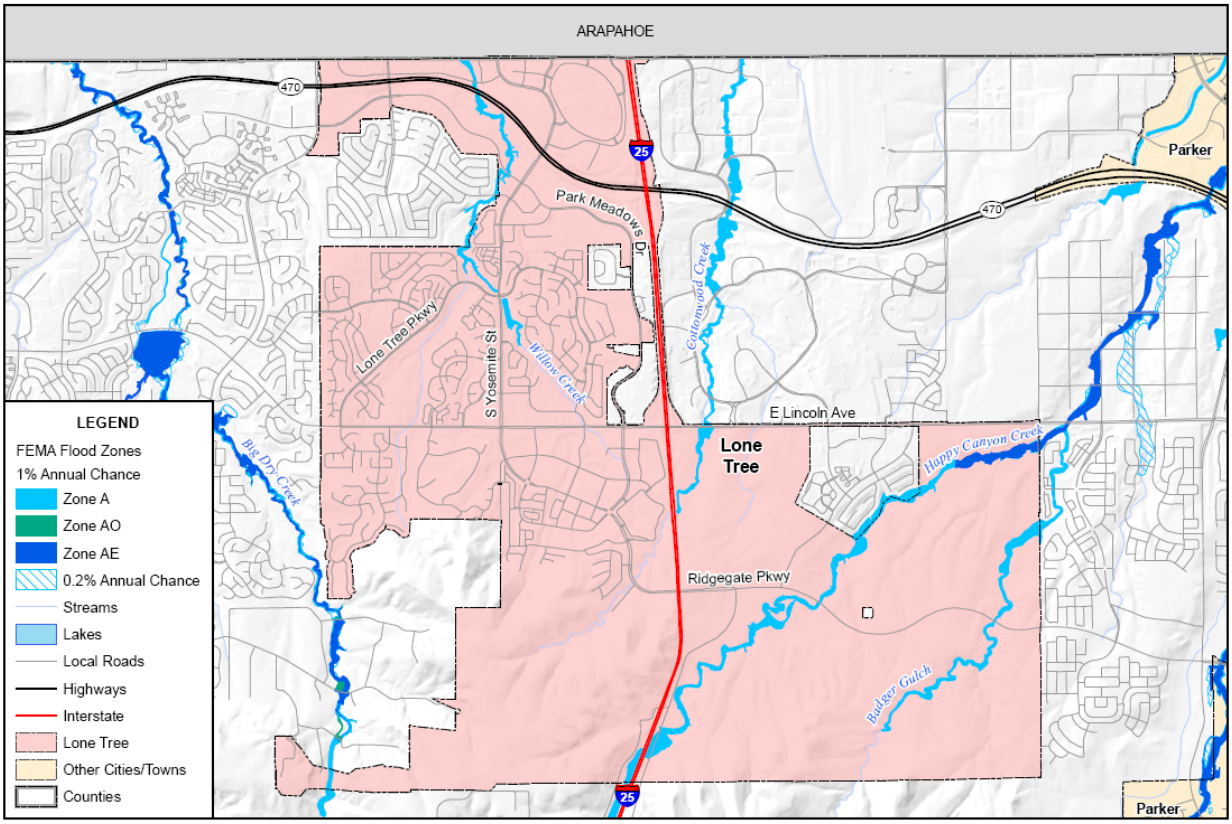
Likelihood of Future Occurrence—Low
Potential Magnitude—Low
Overall Vulnerability—Low

The Planning Area, including Lone Tree, is prone to very intense rainfall. Floods have resulted from storms covering large areas with heavy general rainfall as well as from storms covering small area with extremely intense rainfall. This section quantifies the vulnerability of Lone Tree to floods.

No structures or people are exposed to 100/500-year flooding within Lone Tree's limits. Figure D.3 through Figure D.5 depict the location of flood hazards, critical facilities, and properties affected by flooding in Lone Tree. Note that one critical facility, a bridge, is located in the 1% annual chance flood hazard zone.

[3] Town of Castle Rock, Colorado website. "Rueter-Hess Reservoir." http://www.crgov.com/index.aspx?NID=1277, accessed February 17, 2015.

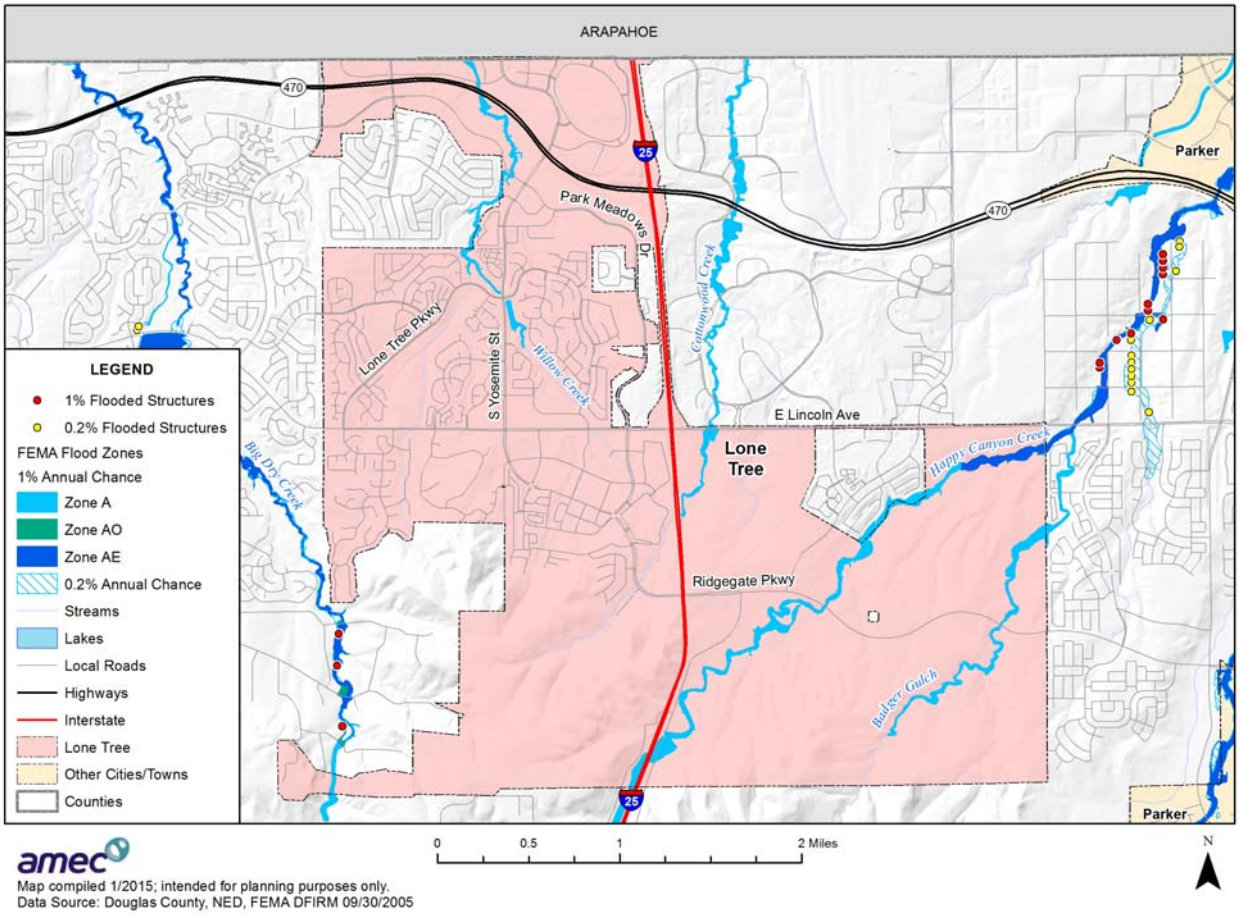
Figure D.3. City of Lone Tree FEMA Flood Hazard Zones



amec

Map compiled 11/2014; intended for planning purposes only.
Data Source: Douglas County, NED, FEMA DFIRM 09/30/2005

Figure D.4. City of Lone Tree Properties in FEMA Flood Hazard Zones



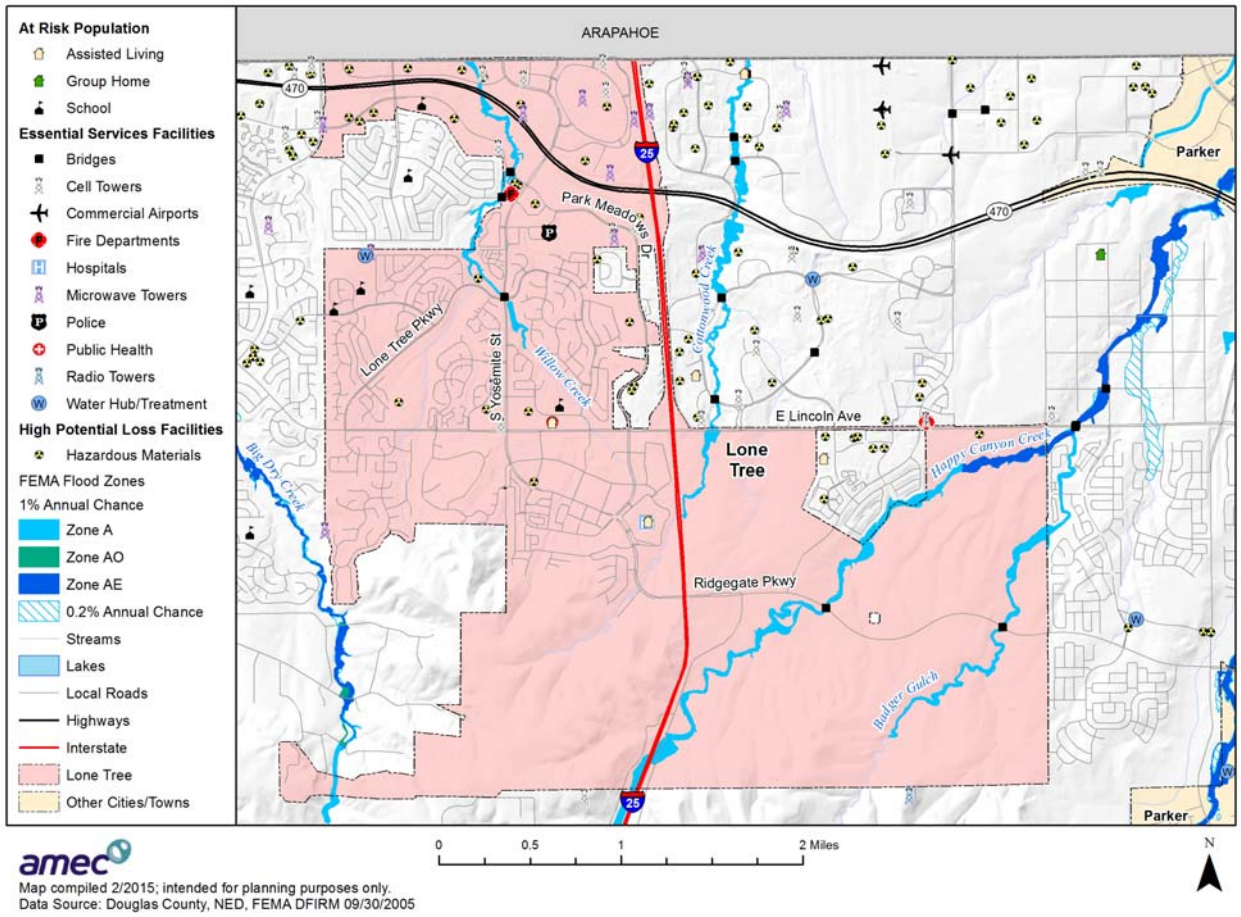
Population at Risk

No Lone Tree residents live in FEMA flood hazard zones.

Critical Facilities at Risk

Lone Tree has bridge, located at 1st Street over Happy Canyon Creek, that is subject to overtopping by the 1% annual chance flood event.

Figure D.5. City of Lone Tree Critical Facilities and FEMA Flood Hazard Zones



Development Trends

The flood hazard area in Lone Tree is relatively small. The spatial extent of this hazard could potentially change after an annexation, for example, or if growth occurred in the eastern and southern parts of the City. Chapter 15 of Lone Tree's municipal code, in particular Articles III and IV, will help limit exposure of future development to this type of flooding.

An analysis of build-out from 2010 to 2014 in hazard areas was conducted for Lone Tree. The build-out analysis returned no results for properties built since 2010 in 100/500-year flood zones.

Landslides/ Mud & Debris Flows /Rockfalls/Erosion

Vulnerability to Landslides/ Mud & Debris Flows /Rockfalls/Erosion

Likelihood of Future Occurrence—Medium for landslides and erosion
Potential Magnitude—Medium for landslides, Low for erosion
Overall Vulnerability—Low for landslides and erosion

The landslide hazard is made up of these attributes: debris-flow, rockfall-rockslide/debris, and slope-failure. Erosion hazards in Lone Tree are also discussed in this section, despite being ranked low significance, due to the property exposure in potential hazard areas. Collectively, these may be referred to as geologic hazards.

The County's parcel layer was used as the basis for the inventory of all parcels within Lone Tree. GIS was used to overlay the geologic hazard layer with the parcel layer centroids and where the zones intersected a parcel centroid, it was assigned with that hazard zone for the entire parcel. According to the Douglas County Comprehensive Master Plan, the geologic hazard layer is "based upon the coincidence of steeply dipping (tilted or upturned) layers of sedimentary expansive bedrock having dip angles of greater than 30 degrees from horizontal." Lone Tree does not have any mapped areas exposed to debris flow. However, the City has 46 structures with a total value of over $30 million potentially exposed to rockfall and slope-failure hazards, as detailed in Table D.6. Table D.7 summarizes exposure to moderate accelerated erosion. Erosion analysis does not include contents value since contents of buildings are unaffected by this hazard. Figure D.6 depicts Lone Tree's mapped landslide and erosion hazard areas.

Table D.6. City of Lone Tree Total Exposure to Landslide

Property Type	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Estimated Content Value	Land Value	Total Value
Rockfall/Rockslide/Debris Avalanche Area							
Agricultural	1	0	0	$0	$0	$17	$17
Commercial	1	1	2	$7,190,731	$7,190,731	$3,188,069	$17,569,531
Exempt	3	0	1	$0	$0	$61,404	$61,404
Total	**5**	**1**	**3**	**$7,190,731**	**$7,190,731**	**$3,249,490**	**$17,630,952**
Slope-Failure Area							
Exempt	5	0	0	$0	$0	$743,760	$743,760
HOA	3	0	0	$0	$0	$0	$0
Residential	47	17	43	$5,770,241	$2,885,121	$3,319,156	$11,974,518
Total	**55**	**17**	**43**	**$5,770,241**	**$2,885,121**	**$4,062,916**	**$12,718,278**
Grand Total	**60**	**18**	**46**	**$12,960,972**	**$10,075,852**	**$7,312,406**	**$30,349,230**

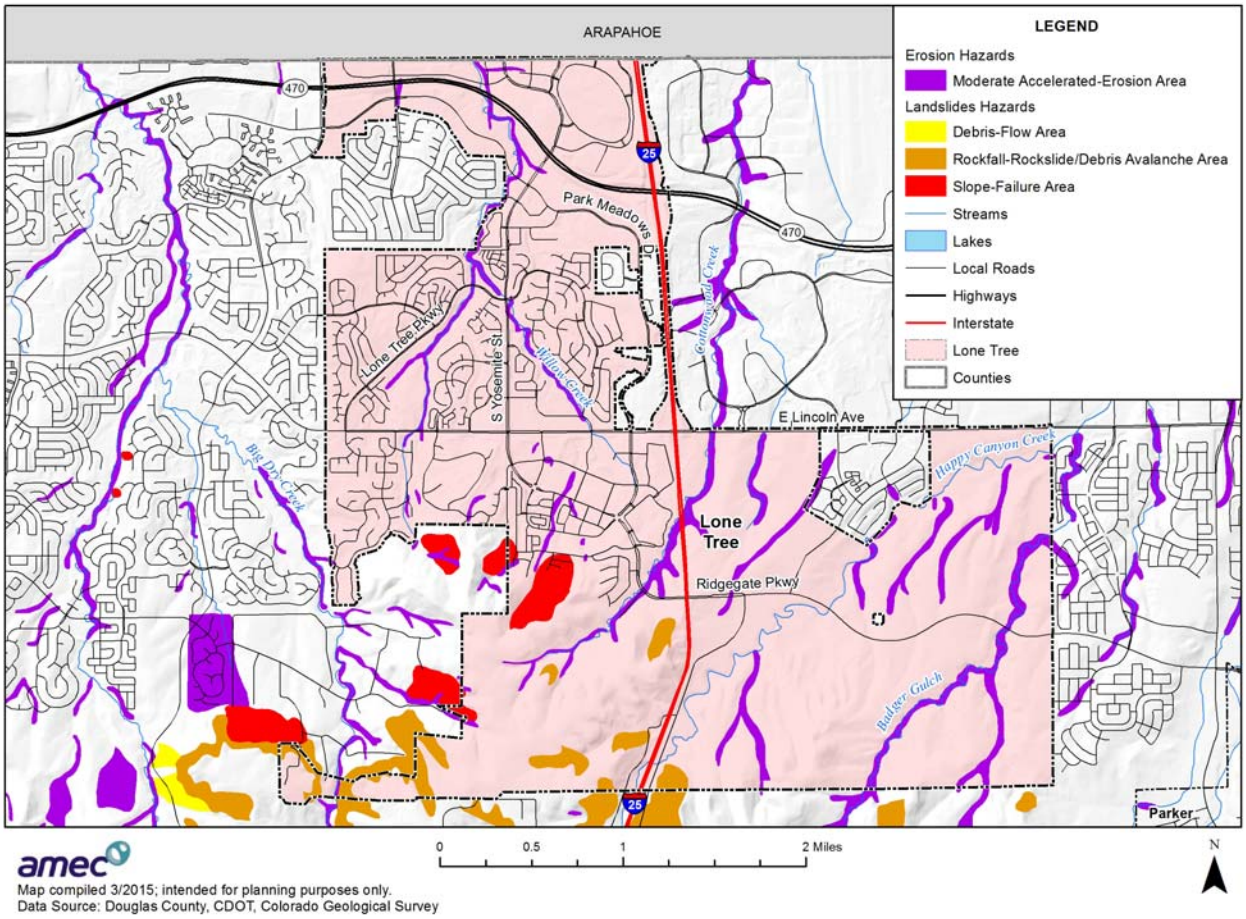
Source: Douglas County Assessor's Data

Table D.7. City of Lone Tree Total Exposure to Moderate Accelerated Erosion

Property Type	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Land Value	Total Value
Agricultural	2	0	2	$0	$1,265	$1,265
Commercial	3	2	27	$9,842,790	$8,251,832	$18,094,622
Exempt	25	2	9	$7,225,815	$3,605,600	$10,831,415
Residential	10	10	11	$3,742,777	$730,050	$4,472,827
Total	**40**	**14**	**49**	**$20,811,382**	**$12,588,747**	**$33,400,129**

Source: Douglas County Assessor's Data

Figure D.6. City of Lone Tree Landslide and Erosion Hazards



Population at Risk

No people live within landslide or erosion hazard areas in Lone Tree; most of the geologic hazard issues are located along drainage channels or in undeveloped parts of the City, and no structures are at risk in these areas.

Critical Facilities at Risk

Landslide and erosion analysis was performed on the critical facility inventory in Lone Tree. GIS was used to determine whether Lone Tree's facility locations intersect the landslide and erosion hazard areas provided by Douglas County, and if so, which zones they intersect. There are no critical facilities located in landslide hazard areas in Lone Tree. Two essential services facilities (a bridge and a cell tower) and one high potential loss facility (with hazardous materials) are located in the moderate accelerated erosion hazard area.

Development Trends

Fortunately, the landslide and erosion hazard areas in Lone Tree are fairly small. The City's Municipal Code addresses erosion in Section 17-2-60, which states that that proposed development is subject to the regulations established in "Chapter 16 of [the] Code; the Roadway Design and Construction Standards; the Storm Drainage Design and Technical Criteria Manual; and the Grading, Erosion, and Sediment Control Manual. If applicable, the Soil Conservation District shall be consulted regarding erosion and sediment control." Section 16 of the Municipal Code regulates clearing, grading, and land disturbance.

An analysis of recent development trends in hazard areas was conducted for Lone Tree. A total of seven structures were built in moderate-accelerated erosion hazard areas in the City between 2010 and 2014. No structures were built in landslide hazard areas during that time. Results of this analysis are shown in Table D.8.

Table D.8. Lone Tree Structures Built from 2010 to 2014: Summary of Assets Exposed to Moderate Accelerated-Erosion Areas

Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Estimated Content Value	Land Value	Total Value
1	1	7	$4,964,468	$4,964,468	$3,372,415	$13,301,351

Source: Douglas County GIS

Severe Weather: Thunderstorms/Heavy Rains

Vulnerability to Severe Weather: Thunderstorms/Heavy Rains

Likelihood of Future Occurrence—High
Potential Magnitude—Medium
Overall Vulnerability—Medium

According to historical hazard data, severe weather is an annual occurrence in Lone Tree. Damage and disaster declarations related to severe weather have occurred and will continue to occur in the future. Heavy rain and thunderstorms are the most frequent type of severe weather occurrences in the City. Lightning often accompanies these storms and has caused damage to homes in Lone Tree in the past. However, actual damage associated with the primary effects of severe weather has been limited. It is the damage caused by secondary hazards such as floods and fire that have the greatest impact on Lone Tree. The risk and vulnerability associated with these secondary hazards are discussed in other sections where applicable.

Development Trends

New critical facilities such as communications towers should be built to withstand heavy rains and thunderstorms. It is difficult to quantify future deaths, injuries, or damages due to heavy rains or thunderstorms. Future development projects should consider severe weather hazards at the planning, engineering and architectural design stage with the goal of reducing vulnerability.

Development in the City is regulated by zoning and subdivision regulations, and future development is not expected to increase vulnerability to hazards.

Severe Weather: Winter Weather (includes snow/ice/extreme cold)

Vulnerability to Severe Weather: Winter Weather (includes snow/ice/extreme cold)

Likelihood of Future Occurrence—Medium
Potential Magnitude—High
Overall Vulnerability—Medium

Lone Tree typically experiences multiple winter storms in any given year. This hazard has been critical in its magnitude and severity in the past in Douglas County, as seen during the blizzards of March 2003 and December 2006. Vulnerability is high along busy roadways, particularly on Highway 470 and Interstate 25, which intersect in Lone Tree. Severe winter weather conditions may cause traffic related deaths and injuries. Road closures due to winter weather conditions also restrict or prevent the movement of people and goods and services (including food and gas), which can create the need for emergency sheltering for travelers. Poor road conditions can also delay emergency response.

It is difficult to identify specific winter weather hazard areas within Lone Tree. Data was not available to identify specific structures at risk or estimate potential losses to these structures. NCDC data did not provide enough details on past damages and casualties to obtain an average annual loss assessment. If the March 2003 blizzard is used as the event of record, then the Denver Metro area could expect over $31 million in property damages from a severe winter storm. Note that this damage estimate is spread over the entire Denver Metro area; Lone Tree's share of the damage would be smaller.

Development Trends

Future residential or commercial buildings built to code should be able to withstand snow loads from severe winter storms. Population growth in Lone Tree and growth in visitors will increase problems with road, business, and school closures and increase the need for snow removal and emergency services related to severe winter weather events.

Wildfire

Vulnerability to Wildfire

Likelihood of Future Occurrence—High
Potential Magnitude—Medium
Overall Vulnerability—Medium

An exposure analysis was performed to quantify risk to wildfire in Lone Tree. Potential losses due to wildfire were estimated using a countywide Wildfire Hazard Potential GIS layer (created

for the Douglas County Community Wildfire Protection Plan) and assessor's data from Douglas County. Potential losses were examined in terms of structures, property value, critical facilities, and people at risk. For all analyses, the threat levels were classified as low, medium, high, and extreme. According to the CWPP, "[t]here is no absolute set of conditions that cause an area to be identified as being in a particular hazard category. Instead, the hazard category identified is a function of the combined factors that influence controllability, values, and ignition risk" (pg. 59).

GIS was used to create a centroid, or point representing the center of the parcel polygon. The CWPP's Wildfire Hazard Potential layer was then overlaid on the parcel centroids. For the purposes of this analysis, the fire hazard zone that intersected a parcel centroid was assigned the severity zone for the entire parcel. The model assumes that every parcel with a structure value greater than zero is improved in some way. Specifically, an improved parcel assumes there is a building on it.

The Douglas County wildfire hazard assessment was prepared and approved by the Douglas County CWPP Core Team specifically for the development of the Douglas County Community Wildfire Protection Plan (CWPP). The assessment was conducted using wildfire behavior models and geographic information system (GIS) technology. The hazard assessment is meant to provide a snapshot of resistance to control (RTC), values, and ignition risk across Douglas County's landscape. For the purpose of this assessment, hazard level is defined as the composite of a particular area's resistance to controlling a wildland fire (based on flame length and response time), its values, and its ignition risk.

This assessment can raise awareness of the areas throughout Douglas County that pose the highest hazard potential. Wildland fire professionals and agency officials can use this assessment at a strategic level for determining which areas in Douglas County could potentially be impacted the most by a wildfire. This assessment can also be used as a baseline or starting point for local-level CWPP core teams when conducting community risk assessments. During a community risk assessment, the baseline can be adjusted after accounting for more specific factors not taken into account during the County wide hazard assessment.

This assessment is not intended or appropriate to be used for or during fire response. Also, the assessment is not intended to be interpreted at a fine scale for determining hazard for individual homes or other structures. For more detail on the Wildfire Hazard Assessment development, see Appendix A, of the CWPP, http://www.douglas.co.us/land/wildfire-mitigation/community-wildfire-protection-plan/.

Table D.9 shows total parcel counts, improved parcel counts and their structure values by occupancy type (residential, industrial, etc.) and total land values within each fire severity zone in Lone Tree. Table D.10 summarizes this information by wildfire severity zone. Figure D.7 illustrates the wildfire severity zones in Lone Tree and the surrounding area.

Table D.9. City of Lone Tree Total Exposure to Wildfire by Property Type

Property Type	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Estimated Content Value	Land Value	Total Value/Loss Estimate
Extreme							
Agricultural	1	0	0	$0	$0	$3,605	$3,605
Commercial	1	1	39	$5,097,321	$5,097,321	$222,679	$10,417,321
Exempt	2	0	0	$0	$0	$628,752	$628,752
Residential	6	4	6	$1,924,323	$962,162	$652,637	$3,539,122
Total	**10**	**5**	**45**	**$7,021,644**	**$6,059,483**	**$1,507,673**	**$14,588,800**
High							
Agricultural	13	0	1	$0	$0	$9,392	$9,392
Commercial	20	16	513	$80,388,930	$80,388,930	$20,747,847	$181,525,707
Exempt	71	6	27	$10,742,121	$10,742,121	$3,905,144	$25,389,386
HOA	31	0	7	$0	$0	$0	$0
Residential	586	471	734	$234,949,940	$117,474,970	$61,363,582	$413,788,492
Vacant Land	44	0	14	$0	$0	$5,172,525	$5,172,525
Total	**765**	**493**	**1,296**	**$326,080,991**	**$208,606,021**	**$91,198,490**	**$625,885,502**
Moderate							
Agricultural	33	0	13	$0	$0	$77,609	$77,609
Commercial	47	30	442	$373,391,194	$373,391,194	$109,645,101	$856,427,489
Exempt	91	6	23	$27,708,768	$27,708,768	$8,961,283	$64,378,819
HOA	33	0	5	$0	$0	$0	$0
Residential	448	397	493	$177,195,414	$88,597,707	$40,626,251	$306,419,372
Vacant Land	48	0	16	$0	$0	$11,961,947	$11,961,947
Total	**700**	**433**	**992**	**$578,295,376**	**$489,697,669**	**$171,272,191**	**$1,239,265,236**
Low							
Commercial	127	122	1,236	$524,505,980	$524,505,980	$238,606,599	$1,287,618,559
Exempt	291	17	99	$46,915,488	$46,915,488	$15,285,622	$109,116,598
HOA	110	0	36	$0	$0	$0	$0
Residential	2,538	2,526	2,563	$956,489,388	$478,244,694	$265,375,780	$1,700,109,862
Vacant Land	74	0	15	$0	$0	$7,989,951	$7,989,951
Total	**3,140**	**2,665**	**3,949**	**$1,527,910,856**	**$1,049,666,162**	**$527,257,952**	**$3,104,834,970**

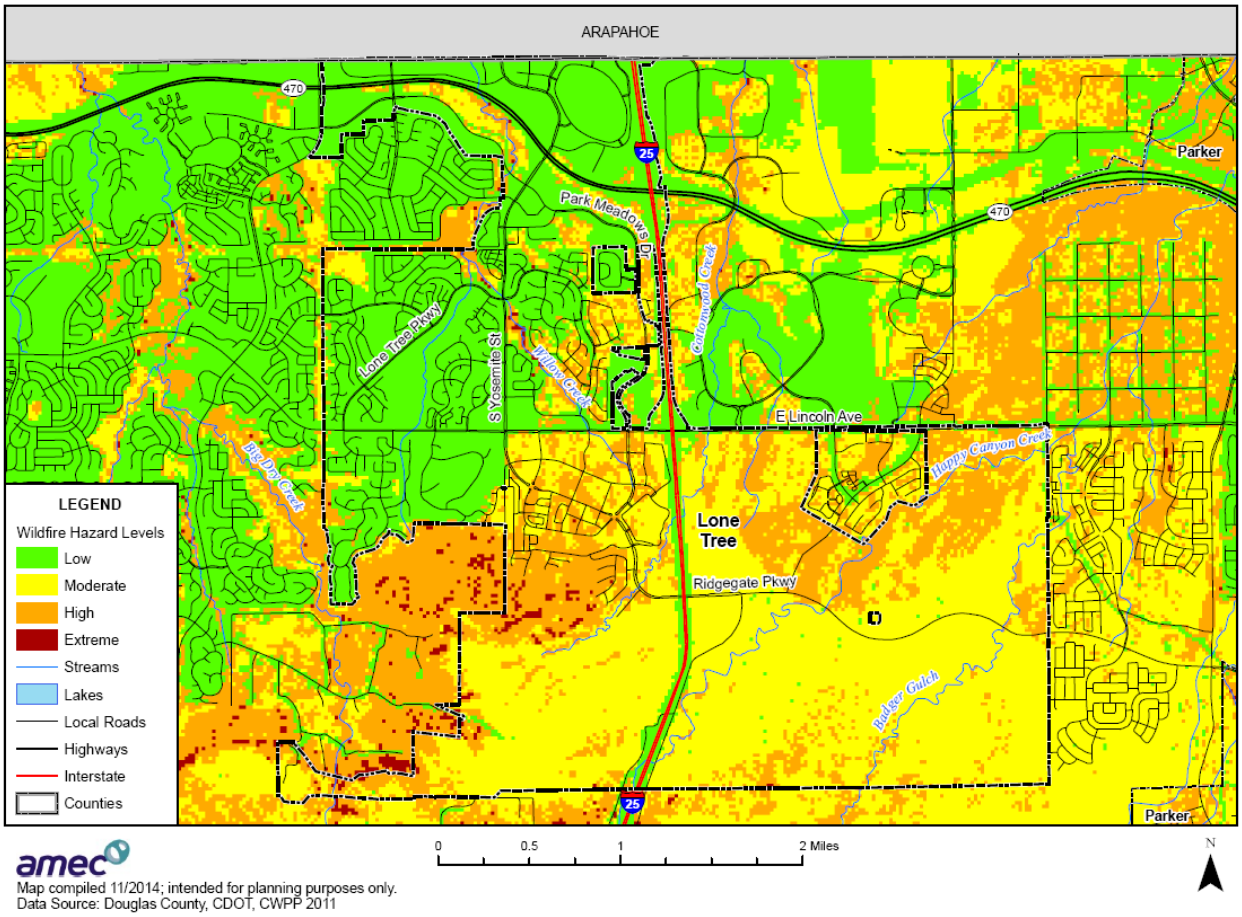
Source: Douglas County GIS

Table D.10. City of Lone Tree Total Exposure to Wildfire Summary

Wildfire Severity	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Estimated Content Value	Land Value	Total Value/Loss Estimate
Extreme	10	5	45	$7,021,644	$6,059,483	$1,507,673	$14,588,800
High	765	493	1,296	$326,080,991	$208,606,021	$91,198,490	$625,885,502
Moderate	700	433	992	$578,295,376	$489,697,669	$171,272,191	$1,239,265,236
Low	3,140	2,665	3,949	$1,527,910,856	$1,049,666,162	$527,257,952	$3,104,834,970
Total	**4,615**	**3,596**	**6,282**	**$2,439,308,867**	**$1,754,029,335**	**$791,236,306**	**$4,984,574,508**

Source: Douglas County GIS

Figure D.7. Lone Tree Wildfire Hazard Potential



Population at Risk

Wildfire risk is greatest to those individuals residing in identified hazard areas. GIS analysis was performed to determine population in the different fire hazard areas. Using GIS, the Douglas County wildfire hazard potential layers were overlaid on the entire parcel layer. Those parcel centroids that intersect the wildfire hazard potential areas were counted and multiplied by the 2010 Census Bureau average household size for each jurisdiction and unincorporated area, which is 2.54 in Lone Tree. Table D.11 summarizes the results of this analysis.

Table D.11. Population at Risk to Wildfire

	Extreme	High	Moderate	Low
Population	10	1,196	1,008	6,416
Improved Residential Parcels	4	471	397	2,526

Source: Douglas County GIS, 2010 U.S. Census

Critical Facilities at Risk

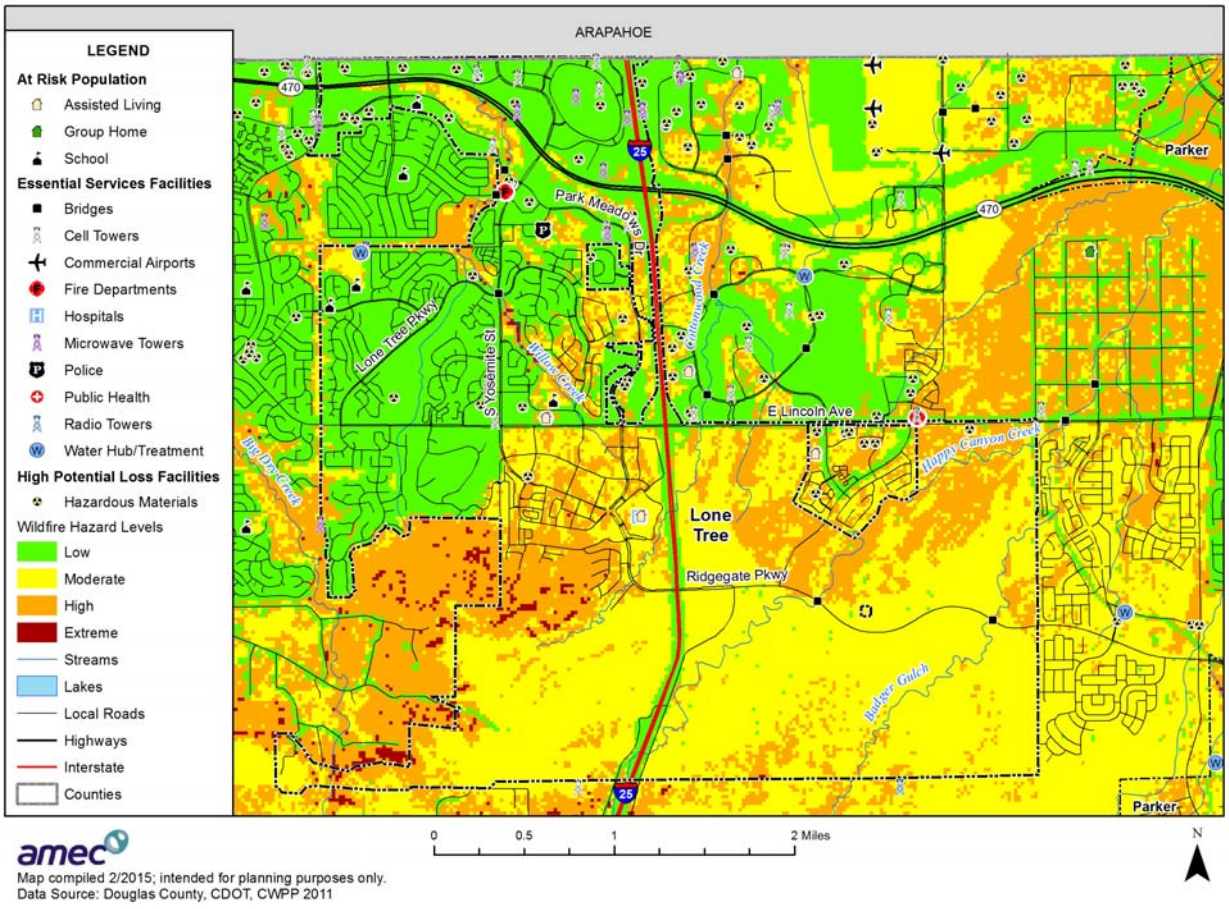
Wildfire analysis was performed on the critical facility inventory in Douglas County and all jurisdictions, including Lone Tree. GIS was used to determine whether the facility locations intersect a wildfire hazard area. Table D.12 summarizes the results of the GIS analysis for Lone Tree, and Figure D.8 depicts the location of critical facilities in relation to wildfire severity zones. Details of critical facility definition, type, name and address and jurisdiction by wildfire zone are listed in Appendix E.

Table D.12. Lone Tree– Critical Facilities at Risk to Wildfire Detail

Fire Risk	Category	Type	Facility Count
High	At Risk Population Facilities	Assisted Living	1
	At Risk Population Facilities	School	1
	Essential Services Facilities	Bridge	2
	Essential Services Facilities	Cell Tower	1
	Essential Services Facilities	Fire Department	1
	Essential Services Facilities	Public Health	1
	Essential Services Facilities	Water Hub/Treatment	1
	High Potential Loss Facilities	Hazardous Material	5
	Total		**13**
Moderate	At Risk Population Facilities	Assisted Living	1
	Essential Services Facilities	Bridge	1
	Essential Services Facilities	Hospital	1
	High Potential Loss Facilities	Hazardous Material	3
	Total		**6**
Low	At Risk Population Facilities	School	3
	Essential Services Facilities	Bridge	1
	Essential Services Facilities	Cell Tower	8
	Essential Services Facilities	Microwave	14
	Essential Services Facilities	Police	1
	High Potential Loss Facilities	Hazardous Material	17
	Total		**44**
GRAND TOTAL			**63**

Source: Douglas County GIS

Figure D.8. Lone Tree Wildfire Hazard Potential and Critical Facilities



Development Trends

The magnitude of wildfires throughout Colorado continues to grow as development increases. The City of Lone Tree has interface areas of grasslands and scrub brush along the bluffs. Embers from a grass fire in this location could potentially be carried into nearby residential areas given the right wind conditions.

An analysis of recent development in extreme, high, and moderate wildfire hazard areas was conducted for Lone Tree. A total of 57 structures was built between 2010 and 2014. The total value of these structures is $44,880,114, with the majority located in the moderate wildfire hazard area. Results of this analysis are shown in Table D.13.

Table D.13. Lone Tree Structures Built from 2010 to 2014: Assets Exposed to Wildfire by Hazard Level

Hazard Level	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Estimated Content Value	Land Value	Total Value
High	21	21	23	$10,321,154	$5,160,577	$2,121,700	$17,603,431
Moderate	27	27	34	$14,239,466	$7,815,629	$5,221,588	$27,276,683
Total	**48**	**48**	**57**	**$24,560,620**	**$12,976,206**	**$7,343,288**	**$44,880,114**

Source: Douglas County GIS

Hazardous Materials: Transportation Incidents

Vulnerability to Hazardous Materials: Transportation Incidents

Likelihood of Future Occurrence—High
Potential Magnitude—Medium
Overall Vulnerability—Medium

Several major transportation routes cross through Lone Tree, including Interstate 25 and Highway 470. Hazardous materials are transported along these corridors regularly, if not every day. Residential areas are located in the immediate vicinity of the corridors, potentially presenting a serious public health and safety concern if a hazardous materials incident were to occur in a populated area. GIS analysis was used to determine the number of people at potentially at risk to hazardous materials transportation incidents in Lone Tree.

Population at Risk

To determine an estimate of populations at risk from a transportation-related hazardous materials release within identified transportation corridors, an analysis was performed using GIS. A one-mile buffer was applied to both sides of Interstate 25 and Highway 470, creating a two-mile buffer zone around each corridor. The buffer distance was based on guidelines in the U.S. Department of Transportation's Emergency Response Guidebook that suggest distances useful to protect people from vapors resulting from spills involving dangerous goods considered toxic if inhaled. The recommended buffer distance referred to in the guide as the "protective action distance" is the area surrounding the incident in which people are at risk of harmful exposure. For purposes of this plan, an average buffer distance of one mile was used on either side of the transportation corridor. Actual buffer distances will vary depending on the nature and quantity of the release, whether the release occurred during the night or daytime, and prevailing weather conditions.

Since there is some overlapping of the corridors where Interstate 25 and Highway 470 meet in Lone Tree, individual population analysis was performed for each transportation corridor. Each buffered transportation corridor was intersected with improved residential parcels and therefore parcels could be counted more than once due to the individual analysis of each corridor. It is

important to note that populations associated with commercial, industrial and other property types may also be affected by a hazardous materials release, but no census/population data is associated with these property types and are therefore excluded from this analysis. It is also important to note that the population at risk to a specific incident could vary greatly and would be dependent on accident location, severity and weather conditions.

A population of 3,721 is within the proximity of Interstate 25 that passes through Lone Tree. The population within the Highway 470 buffer zone is 2,233.

Development Trends

Development in Lone Tree occurs within existing city boundaries. As development in Lone Tree continues to grow, more people will be at risk to hazardous materials transportation incidents.

D.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capability assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation outreach and partnerships, and other mitigation efforts.

D.6.1 Regulatory Mitigation Capabilities

Table D.14 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the City of Lone Tree.

Table D.14. City of Lone Tree Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Y/N	Date	Comments
General plan	Y	4/07	City Comprehensive Plan On City website at http://www.cityoflonetree.com/index.aspx?nid=453
Zoning ordinance	Y	12/13	City Code*** - Chapter 16 (link below) (Municipal Code available at https://www.municode.com/library/co/lone_tree/codes/municipal_code
Subdivision ordinance	Y		City Code*** - Chapter 16 (link below)
Growth management ordinance	Y	4/07	City Comprehensive Plan
Floodplain ordinance	Y	9/13	City Code*** –Chapter 15 – Art. III – Flood Damage Prevention & Art. IV – Floodplain Overlay District. NFIP and CWCB compliant ordinances.
Other special purpose ordinance (stormwater, steep slope, wildfire)	Y		Stormwater (see stormwater management program below); Others - Specific to Building Codes of the city. Link available on City Website at http://www.cityoflonetree.com/index.aspx?nid=139
Building code	Y	11/14	See City Website at http://www.cityoflonetree.com/index.aspx?nid=99

Regulatory Tool (ordinances, codes, plans)	Y/N	Date	Comments
BCEGS Rating			
Fire department ISO rating	Y		Conducted by SMFD
Erosion or sediment control program	Y		Grading, Erosion & Sedimentation Control (GESC) – City Code*** - Sec.15-1-30. See City Code (Link above) and Link to GESC Standards at www.cityoflonetree.com/developmentreview
Stormwater management program	Y		City Code*** - Sec. 15-1-10
Site plan review requirements	Y		City Code*** - Chap. 16 – Sec. 27
Capital improvements plan	Y		
Economic development plan	Y		
Local emergency operations plan	Y		
Community Wildfire Protection Plans	Y		Work with SMFD and DC WMP
Flood insurance study or other engineering study for streams	Y		NFIP – DC FIRM/DFIRM Panels & FIS
Elevation certificates	Y		See Flood Plain Ordinance Standards (City Code Sec 15-3)
Other			

Source: Amec Foster Wheeler Data Collection Guide
***City Code Book available online at https://www.municode.com/library/co/lone_tree/codes/municipal_code

Comprehensive Plan (2008)

The City of Lone Tree Comprehensive Plan (Plan) represents another step in the City's on-going efforts to build and maintain a balanced, sustainable community. The Plan is a document that sets forth the policies for the future of the community and is designed to be a flexible "living" document that can be changed as the needs change for the Lone Tree community. The Comprehensive Plan is a provisional document and regular updates should occur in order to maintain the usefulness of the plan. The planning horizon for the Plan is a focus of 20 years in the future and is a resource for community leaders to use as a guide in formulating future policies for the City and guide growth and development.

Goals and policies related to mitigation of natural hazards are as follows:

Environmental Quality

Section	Objective:	Policy
Water Quality	Protect our water resources.	Control drainage and surface erosion and sedimentation problems and encourage the use of new technology to improve existing facilities.
Vegetation	Conserve and enhance the integrity of the natural and built landscape in	New development should be designed to conserve and enhance existing vegetation ecosystems, including woody

Section	Objective:	Policy
	ways compatible and complementary to our climate.	vegetation species and grasslands (i.e., trees, ground cover, etc.) that serve to stabilize hillside areas, stream banks, eroded areas, and for wildlife habitat.
		Existing ground cover in undeveloped areas and on slopes exceeding 20% shall remain undisturbed except in cases where it is required for public improvements, surveying, fire prevention, or weed control. Existing vegetation to be retained should be carefully protected during construction.
		Grading shall be carried out in conformance with an approved grading plan intended to minimize on-site and off-site disturbance and erosion. In cases of disturbance, the City's Erosion Control Manual shall be followed.
Environmental Hazards	Ensure the safety of the community and the protection of public and private property through careful siting, appropriate monitoring, and mitigation.	Preserve the 100-year floodplain in its natural state. Where structural improvements are necessary, such as the channelization of the floodplain, provide transitions from natural areas to more urban settings. Any alteration to the floodplain will be in conformance with the City's Zoning Code, as well as any additional requirements of the Storm Drainage Criteria Manual or the U.S. Army Corps of Engineers. Structures are prohibited within the 100-year floodplain, except for those relating to flood control, wildlife, and recreation.
		Avoid development where geologic hazards exist, including but not limited to slope failure or rock fall areas, unless it can be demonstrated that methods are available to minimize potential hazards.
		Development should be designed for site-specific conditions so as to minimize the potential for slope instability. The following must be considered in the planning process: • Slope and geologic stability • Disruption of existing surface conditions • Historic and future drainage in relation to specific surface materials • Increased pedestrian or other traffic that may impact surface conditions • Erosion control, revegetation and reclamation of sensitive areas
		All proposed development on slopes of 12% to 20% must be sensitive to slope stability, visual impact, erosion, drainage, and infrastructure requirements.
		Development on slopes greater than 20% should be avoided.
		The City should closely monitor activities which may pose a risk to the community, such as the transport of hazardous waste along I-25 through the City's Municipal Influence Area. The City shall work with appropriate agencies to ensure that maximum precautions are taken to protect the health of the community.
		Implement land use and other measures to address the potential for wildfire along the City's southern boundary (urban wildland interface areas).

Community Facilities and Services

Section	Objective:	Policy
Fire Protection	Provide for fire protection and prevention for the Lone Tree community.	Actively solicit the input of the appropriate Fire District in review of all new development proposals.
Water Supply and Wastewater Treatment	Ensure safe and adequate water supply and wastewater treatment services.	The City supports amendments to district or regional plans when required to provide or expand capacity to accommodate the City's growth projections or where public health is threatened.
Stormwater Management	Ensure stormwater facilities are properly designed and maintained consistent with the City's land use and environmental quality goals and objectives.	Continue to coordinate and/or oversee drainage planning, design, construction and maintenance for the City and surrounding area in conjunction with the Urban Drainage and Flood Control District and Douglas County.
		Ensure all drainage improvements are constructed and designed in a manner complementary to the natural and built environment. Where structural improvements are necessary, such as the channelization of the floodplain, provide transitions from natural areas to more urban settings.
		Prohibit development within the defined 100-year floodplain except for those relating to flood control, wildlife and recreation. Proposed development shall comply with the City's Zoning Code, as well as any additional requirements of the Storm Drainage Criteria Manual or the U.S. Army Corps of Engineers.

Storm Drainage Design and Technical Criteria Manual

The Stormwater Drainage Design and Technical Criteria Manual was adopted in 2012 under Ordinance No. 12-09. The manual presents the policies and minimum technical criteria for the planning, analysis and design of storm drainage systems within City boundaries. The manual was developed in cooperation with Douglas County and Urban Drainage to improve consistency between neighboring jurisdictions.

City of Lone Tree Emergency Operations Plan

The City of Lone Tree Emergency Operations Plan (EOP) was adopted by Resolution No. 12-07. The EOP establishes the City's procedures for responding to emergency events, lines of succession, continuity of government, delegation of authority, concept of operations, roles and responsibilities, and command structure. The EOP includes several annexes for specific topics, such as communications, public warning and information, sheltering and mass care, etc. Several of the annexes are based on the Emergency Support Functions (ESF) format established in the National Response Framework. The EOP also includes several hazard-specific appendices for both natural and human-caused hazards.

Snow Management, Snow Plowing, and De-icing Procedures

Lone Tree's Public Works Operations Department is responsible for snow removal within the City. Once three to four inches of snow has accumulated, the Operations Department first plows

major roadways (primary routes), then main connectors that link subdivisions and collectors that distribute traffic (secondary routes), and lastly local roads and cul-de-sacs (tertiary routes). De-icing products and abrasive materials may be applied to roads to provide traction. Additional details on the City's snow removal and de-icing procedures are available here: https://www.cityoflonetree.com/index.aspx?NID=308.

Appendix IV of the City's EOP details Lone Tree's procedures and decision-making criteria for snow management and removal based on the severity of a given winter storm. Appendix IV establishes roles and responsibilities for Lone Tree personnel. The responsibilities of external agencies, such as CDOT and South Metro Fire Rescue Authority, are also discussed.

Ordinances

The City of Lone Tree has many ordinances related to mitigation in its Municipal Code. Key pieces of the most relevant codes are excerpted below:

Public Works Section (Chapter 15)

Sec. 15-1-10. - Adoption by reference: Storm Drainage Design and Technical Criteria Manual.

The Douglas County Storm Drainage Design and Technical Criteria Manual, as amended, revised and updated from time to time, is hereby adopted by reference and incorporated into this Article as though fully set forth herein as the City of Lone Tree Storm Drainage Design and Technical Criteria Manual. Except as otherwise provided, this code is adopted in full.

Sec. 15-1-30. - Adoption by reference: Grading, Erosion and Sediment Control Manual.

(a) The Douglas County Grading, Erosion and Sediment Control Manual, as amended, revised and updated from time to time, is hereby adopted by reference and incorporated into this Article as though fully set forth herein as the City of Lone Tree Grading, Erosion and Sediment Control (GESC) Manual. Except as otherwise provided, this code is adopted in full.

ARTICLE III - Flood Damage Prevention

Division 1 - General Provisions

Sec. 15-3-10. - Statement of purpose.

It is the purpose of this Article to promote the public health, safety and general welfare and to minimize public and private losses due to flood conditions in specific areas by provisions designed to:

(1) Protect human life and health;

(2) Minimize expenditure of public money for costly flood control projects;

(3) Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;

(4) Minimize prolonged business interruption;

(5) Minimize damage to critical facilities, infrastructure and other public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, streets and bridges located in floodplains;

(6) Help maintain a stable tax base by providing for the sound use and development of flood-prone areas in such a manner as to minimize future flood-blight areas;

(7) Ensure that potential buyers are notified that property is in a flood area and

(8) Meet the minimum requirements as set forth by the Colorado Water Conservation Board and the National Flood Insurance Program.

Sec. 15-3-20. - Methods of reducing flood losses.

In order to accomplish its purposes, this Article uses the following methods:

(1) Restricting or prohibiting uses that are dangerous to health, safety or property in times of flood, or cause excessive increases in flood heights or velocities;

(2) Requiring that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;

(3) Controlling the alteration of natural floodplains, stream channels and natural protective barriers which are involved in the accommodation of floodwaters;

(4) Controlling filling, grading, dredging and other development which may increase flood damage; and

(5) Preventing or regulating the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards to other lands.

Sec. 15-3-130. - Designation of Floodplain Administrator.

The Director of Public Works is hereby appointed the Floodplain Administrator to administer and implement the provisions of this Article and other appropriate sections of 44 C.F.R. (National Flood Insurance Program regulations) pertaining to floodplain management. The

Director of Public Works may appoint a designated representative to perform the Floodplain Administrator duties.

Division 2 - Flood Hazard Reduction

Sec. 15-3-210. - General standards.

In all special flood hazard areas, the following provisions are required for all new construction and substantial improvements:

(1) All new construction or substantial improvements shall be designed (or modified) and adequately anchored to prevent flotation, collapse or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy.

(2) All new construction or substantial improvements shall be constructed by methods and practices that minimize flood damage.

(3) All new construction or substantial improvements shall be constructed with materials resistant to flood damage.

(4) All new construction or substantial improvements shall be constructed with electrical, heating, ventilation, plumbing and air-conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.

(5) All manufactured homes shall be installed using methods and practices which minimize flood damage. For purposes of this requirement, manufactured homes must be elevated and anchored to resist flotation, collapse or lateral movement. Methods of anchoring may include, but are not limited to, use of over-the-top or frame ties to ground anchors. This requirement is in addition to applicable state and local requirements for resisting wind forces.

(6) All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of floodwaters into the system.

(7) New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of floodwaters into the system and discharge from the systems into floodwaters.

(8) On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding.

(9) For waterways with base flood elevations for which a regulatory floodway has not been designated, the Floodplain Administrator must require that no new construction, substantial improvements or other development (including fill) shall be permitted within Zones A1-30 and AE on the City's FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one-half (½) foot at any point within the City.

(10) Under the provisions of 44 C.F.R. Chapter 1, Section 65.12, of the National Flood Insurance Program regulations, the City may approve certain development in Zones A1-30, AE or AH on the City's FIRM which increases the water surface elevation of the base flood by more than one-half (½) foot, provided that the City first applies for a conditional FIRM revision through FEMA (Conditional Letter of Map Revision), fulfills the requirements for such revisions as established under the provisions of 44 C.F.R. Chapter 1, Section 65.12, and received FEMA approval.

ARTICLE IV - Floodplain - Overlay District

Sec. 15-4-30. - Nature of district.

The Floodplain Overlay District shall be applied as a supplemental regulation on existing zoned areas containing flood hazard areas, including Planned Developments (PDs). The Floodplain Overlay District is superimposed on the existing zoning, and the restrictions and requirements herein are in addition to those of the underlying zone. All land use review processes that apply to the underlying zoning district shall remain in full force and effect. In the case of overlapping or conflicting requirements, the most restrictive provision shall apply.

Sec. 15-4-40. - Concurrent floodplain regulation.

Article III of this Chapter provides additional regulations regarding development within or adjacent to floodplains. In the event of a conflict between this Article and Article III of this Chapter, the more restrictive requirement shall apply.

Sec. 15-4-60. - Uses prohibited.

The following uses are strictly prohibited within the Floodplain Overlay District:

(1) Habitable structures or commercial/ industrial structures (except fish hatcheries, water-related recreational facilities, single-family dwellings on nonconforming lots and reconstruction of nonconforming structures as allowed by a floodplain development permit);

(2) Junk or salvage yards, solid waste disposal facilities or landfills;

(3) Storage or processing of materials that are buoyant, flammable, explosive, potentially dangerous or capable of causing injury in the time of flooding; and

(4) Critical facilities, except as allowed by a floodplain development permit, and in conformance with Article III of this Chapter, and provided that the critical facility is permitted in the underlying zoning district and to the extent that the critical facility does not impair the flood carrying capacity of the channel in compliance with the intent of this Article.

D.6.2 Administrative/Technical Mitigation Capabilities

Table D.15 identifies the City department(s) responsible for activities related to mitigation and loss prevention in Lone Tree.

Table D.15. City of Lone Tree Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/Engineer with knowledge of land development/land management practices	Y	Kelly First/ Community Development Director Greg Weeks / Public Works -City Engineer	
Engineer/Professional trained in construction practices related to buildings and/or infrastructure	Y	Building Department	
Planner/Engineer/Scientist with an understanding of natural hazards	Y	Public Works / Engineering	
Personnel skilled in GIS	Y	Public Works / GIS Coordinator	
Full time building official	Y	Matt Archer/ Building Official	
Floodplain Manager	Y	Greg Weeks / Public Works – City Engineer	
Emergency Manager		In process for formal identification	
Grant writer	Y	Police Department	
Other personnel	Y	Public Works Department Staff	
GIS Data – Hazard areas	Y	Public Works / GIS Coordinator	
GIS Data - Critical facilities	Y	Building Dept. – with Public Works / GIS Coordinator	
GIS Data – Building footprints	Y	Building Dept. – with Public Works / GIS Coordinator	
GIS Data – Land use	Y	Public Works / GIS Coordinator	
GIS Data – Links to Assessor's data	Y	Public Works / GIS Coordinator	
Warning Systems/Services (Reverse 9-11, cable override, outdoor warning signals)	Y	Police Department	
Other			

Source: Amec Foster Wheeler Data Collection Guide

D.6.3 Fiscal Mitigation Capabilities

Table D.16 identifies financial tools or resources that the City could potentially use to help fund mitigation activities.

Table D.16. City of Lone Tree Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Y/N)	Comments
Community Development Block Grants	Y	
Capital improvements project funding	Y	
Authority to levy taxes for specific purposes	Y (with Citizen Approval)	
Fees for water, sewer, gas, or electric services	Y	
Impact fees for new development	Y	Typically NO, but in some cases YES - Identified with new development
Incur debt through general obligation bonds	Y	With citizen approval
Incur debt through special tax bonds	Y	With citizen approval
Incur debt through private activities		
Withhold spending in hazard prone areas		
Other		

Source: Amec Foster Wheeler Data Collection Guide

D.6.4 Mitigation Outreach and Partnerships

Lone Tree participates in environmental education and recommends citizens to attend preparedness training within the County. For example, Lone Tree posts on the City Website notices for public education, such as the May 2, 2015 Wildfire Mitigation and Preparation Workshop being hosted by Douglas County.

Lone Tree partners with organizations involved in mitigation and preparedness on a case by case basis. The City's preparedness and mitigation partners include:

- South Metro Fire Rescue Authority (SMFRA)
- Douglas County Emergency Management

D.7 Mitigation Strategy

This section describes the mitigation strategy process and mitigation action plan for the City of Lone Tree's inclusion with the Douglas County Local Hazard Mitigation Plan update.

D.7.1 Mitigation Goals and Objectives

The City of Lone Tree adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy of the base plan.

D.7.2 Continued Compliance with the NFIP

As a participant of the National Flood Insurance Program (NFIP), the City of Lone Tree administers floodplain management regulations that meet the minimum requirements of the NFIP. The City has adopted, and enforced, NFIP and CWCB compliant Floodplain Damage Prevention and associated Flood Plain Overlay District Ordinances. The City is not currently entered into the CRS program. The management program objective is to protect people and property within the City. The City of Lone Tree will continue to comply with the requirements of the NFIP in the future.

The City's regulatory activities apply to existing and new development areas of the City; implementing flood protection measures for existing structures and maintaining drainage systems. The goal of the program is to enhance public safety, and reduce impacts and losses while protecting the environment.

The City participates and cooperates with Urban Drainage and Flood Control District (UDFCD) with respect to UDFCD's mailing of its annual Flood Risk Brochure to all properties within the City which abut the identified 1% annual chance flood plain limits within the City.

D.7.3 Mitigation Actions

The planning team for the City of Lone Tree identified and prioritized the following mitigation actions based on the risk assessment and in accordance with the process outline in Section 5, Mitigation Strategy, of the base plan. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. General processes and information on plan implementation and maintenance of this LHMP by all participating jurisdictions is included in Section 7, Plan Implementation and Maintenance, of the base plan.

City of Lone Tree Action #1

Action Title:	**Drought mitigation**
Hazard:	Drought
Priority:	Medium
Project Description, Issue & Background:	As noted in the Chapter 4 Risk Assessment (Section 4.2.10 Drought) write-up, drought is a gradual phenomenon. All development within the City of Lone Tree is serviced by public water systems, with water provided either through Southgate Water District/Denver Water or by Parker Water & Sanitation District. The City cooperates with these water suppliers in terms of water use restrictions if/when such restrictions are implemented. Additionally, City Planning recommends/requires low water use landscaping and water monitoring/conserving irrigation systems for new development.
Ideas for Implementation:	The City will continue to implement the above development management techniques to minimize future water supply demands, and to reduce demand when necessary during drought conditions.
Other Alternatives:	No action
Responsible Agency:	Lone Tree Community Development
Partners:	Southgate Water District/Denver Water & Parker Water & Sanitation District.
Potential Funding:	
Cost Estimate:	Staff time
Benefits: (Losses Avoided)	Reduced water demand during water supply restrictions.
Timeline:	Ongoing
Status:	New in 2015

City of Lone Tree Action #2

Action Title:	**Hazardous materials mitigation**
Hazard:	Hazardous materials
Priority:	Medium
Project Description, Issue & Background:	The City of Lone Tree has identified the potential for hazardous materials – transportation incidents as having a potential of medium significance. The City of Lone Tree has two major highways that travel through the community. There are no railroads within the jurisdiction. Hazardous materials are transported on a daily basis along I-25 and C-470, normally in quantities that do not pose a substantial threat to the community. However; there are opportunities that a major incident could occur on a daily basis. Past history indicates the majority of hazardous materials incidents are associated with the fuel spills from accidents and not the actual cargo carried. The City recognizes the need to work in conjunction with the teams designed and trained to address hazardous material should there be an actual or potential incident. Identification of the incident at the onset will be a major priority to ensure safety for the community. The first responders need to be properly trained in recognition of potential events and the proper safety precautions to take. A portion of this training is already conducted within individual department yearly training (fire and police). However, there is little cross training that has occurred within this realm to ensure both side are performing their duties as expected. Therefore it is recommended that cross training between both groups of first responders be implemented.
Ideas for Implementation:	Work in conjunction with South Metro Fire Rescue Authority (SMFRA), Douglas County Sheriff's Office (DCSO), and local law enforcement to design cross awareness training and plan utilization.
Other Alternatives:	No action
Responsible Agency:	Lone Tree/Parker (Emergency Preparedness Coordinator)
Partners:	Douglas County, Lone Tree, Parker, Castle Rock and SMFRA
Potential Funding:	
Cost Estimate:	Manpower/Instructor salary and course design / implementation.
Benefits: (Losses Avoided)	Ensuring that first responders are able to quickly identify a hazardous material incident and properly respond to the incident to mitigate injury to the public and communities.
Timeline:	Completed by end of 2015
Status:	New in 2015

City of Lone Tree Action #3

Action Title:	**Continue to implement zoning and development regulations and grading/drainage plan reviews to mitigate flooding caused by thunderstorms/heavy rain**
Hazard:	Flooding/thunderstorms/heavy rain
Priority:	Medium
Project Description, Issue & Background:	High intensity, relatively short duration, rain events are not uncommon during the rainy seasons. Localized surface flooding potential exists from these cloud-burst type events. However, incidents of significant flooding are not frequent (no specific records on file). The City of Lone Tree reviews proposed grading and drainage plans for development within the City through zoning codes, development standards, and engineering plans reviews – with consideration for appropriate drainage management to minimize such drainage hazards.
Ideas for Implementation:	The City will continue to implement the above development management techniques to minimize potential for surface flooding/drainage problems. If/when heavy rain induced incidents should occur, we will work with the impacted development(s) to evaluate potential ways to reduce or eliminate future potential.
Other Alternatives:	No action
Responsible Agency:	Lone Tree Public Works / Engineering
Partners:	Lone Tree Community Development (Building & Planning Departments).
Potential Funding:	Ongoing Public Works budgets – special funding if specific project need is identified.
Cost Estimate:	Staff time and physical improvements (if any) which may be recommended
Benefits: (Losses Avoided)	Elimination of future localized flooding damages – if any other than temporary inconveniences such as localized standing water in streets.
Timeline:	Ongoing
Status:	New in 2015

City of Lone Tree Action #4

Action Title:	**Continue to implement existing planning mechanisms related to severe winter weather mitigation**
Hazard:	Winter weather
Priority:	Medium
Project Description, Issue & Background:	The City of Lone Tree has plowing and de-icing procedures in place to address winter storm related events within the City (see City Website). Additionally, the City of Lone Tree Emergency Operations Plan addresses the City's plan for dealing with Winter Storm related events. Winter Storm impacts on C-470 and/or I-25 are addressed by CDOT. There is a CDOT Region 1 generated Douglas County I-25 South Traffic Incident Management Plan established which includes addressing winter storm events impacts on I-25. The City of Lone Tree was a participant in development of this Plan, and will cooperate as required in the Plan implementation.
Ideas for Implementation:	The City will continue to implement the above noted winter storm event management plans. Incidents and response results will be reviewed, and response plans will be updated as necessary.
Other Alternatives:	No action
Responsible Agency:	Lone Tree Police Department & Public Works
Partners:	Douglas County / CDOT
Potential Funding:	Annual budget item
Cost Estimate:	Annual winter snow/ice management budget is in the range of $830,000.
Benefits: (Losses Avoided)	Maintenance of City street access for residents, businesses and emergency services during winter storm events.
Timeline:	Ongoing
Status:	New in 2015

City of Lone Tree Action #5

Action Title:	**Wildfire prevention and preparation**
Hazard:	Wildfire
Priority:	Medium
Project Description, Issue & Background:	The City of Lone Tree has identified the potential for wildfire impacts within portion of the City as having a medium significance. The City of Lone Tree will continue to work with South Metro Fire/Rescue Authority to develop plans to mitigate the impact of future wildfires within our community. In addition, Lone Tree has put into place means of communicating with the community during the time of an actual emergency as well as providing ongoing communication on fire prevention and mitigation strategies for the citizens. The city also works in conjunction with Douglas County to identify situations when the fire danger is higher and incorporate additional restrictions associated with open fires.
Ideas for Implementation:	There will be ongoing discussion with emergency managers within the County, City, and fire authority to ensure changes over time are adapted too.
Other Alternatives:	No action
Responsible Agency:	South Metro Fire Rescue Authority
Partners:	Douglas County, Lone Tree, Parker, Castle Rock
Potential Funding:	
Cost Estimate:	Low cost due to the use of previously designed plans and available communication tools. However, there is a cost associated with providing information to the community through PSAs, brochures and printing of plan documents for affected areas.
Benefits: (Losses Avoided)	Ensuring that citizens are aware of the potential for wildfires and the need for them to work to mitigate damages caused from wildfires; to take evasive action should there be a fire and to take action to prevent the events in the first place.
Timeline:	Ongoing discussions and meetings with Emergency Managers Coordination Group (EMCG)
Status:	New in 2015

Annex E TOWN OF PARKER

E.1 Introduction

This annex details the hazard mitigation planning elements specific to the Town of Parker, a participating jurisdiction to the Douglas County LHMP Update. This annex is not intended to be a standalone document, but appends to and supplements the information contained in the base plan document. As such, all sections of the base plan, including the planning process and other procedural requirements apply to and were met by the Town. This annex provides additional information specific to the Town of Parker, with a focus on providing additional details on the risk assessment and mitigation strategy for this community.

E.2 Planning Process

As described above, the Town of Parker followed the planning process detailed in Section 3.0 of the base plan. In addition to providing representation on the Douglas County Hazard Mitigation Planning Committee (HMPC), the Town formulated their own internal planning team to support the broader planning process requirements. Internal planning participants included staff from the following Town departments:

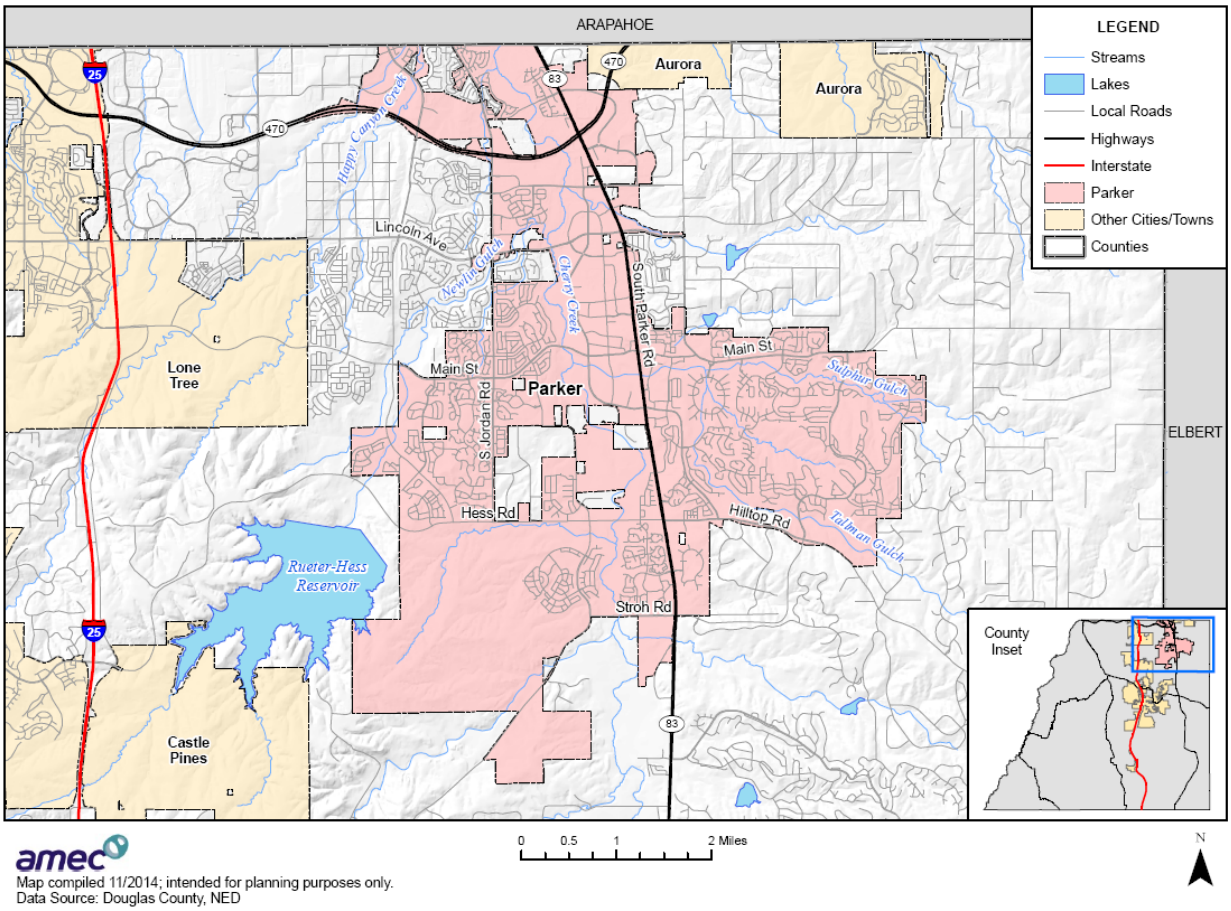
- Mike Sutherland, Public Works Director
- Mike Waid, Floodplain Manager
- Merlin Klotz, Parker Water and Sanitation District

Additional details on plan participation and Town representatives are included in Appendix A.

E.3 Community Profile

The community profile for the Town of Parker is detailed in the following sections. Figure E.1 displays a map and the location of the Town of Parker within Douglas County.

Figure E.1. Town of Parker Base Map



E.3.1 Geography and Location

Parker's boundary is located on the east side of Interstate 25. Highway 470 and South Parker Road come to a junction in the northern part of the Town. The land consists of a wide range of topography encompassing mountain vistas, dramatic ridgelines, hills, and grass covered plains. Because of the Town's close proximity to the Denver metro area and multi-modal transportation facilities, the area is desirous to new residents. The lands surrounding Parker include Lone Tree, Castle Pines and open space to the west; Foxfield and Aurora to the north; unincorporated residential areas to the east; and The Pinery and Castle Rock to the south.

E.3.2 History

Parker can trace its colorful recent history to the establishment of the Pine Grove Post Office by Alfred Butters around 1862. Prior to that time, the area was used for hunting by Indians, including the ancient (prehistoric) Indians, the Plains-Woodland Indians and later (circa 1800s) mostly Arapaho, Cheyenne and Ute Indians.

The Town of Parker was incorporated in 1981 and included the Rowley Downs subdivision, the downtown area and the Parker Square and Parker Plaza commercial areas. The incorporated area encompassed approximately one square mile and included 285 residents. Soon after incorporation in 1981, the Town adopted zoning and subdivision ordinances.

The Town increased from one square mile at incorporation to 20.8 square miles currently. The Town's population has increased from less than 300 at incorporation to more than 46,000 currently.

The Town of Parker was incorporated in May of 1981. The Town of Parker offers a variety of services to their citizens ranging from police protection to recreation. They have a Council / Administration form of government with Town Council and Mayor elected at large and an appointed Town Administrator who oversees the day-to-day operations of the organization.[1]

E.3.3 Economy

As the population of the Town has grown, so has its economy. Select economic characteristics and statistics for Parker are shown in Table E.1. These statistics were pulled from the 2008-2013 American Community Survey and the 2000 U.S. Census to demonstrate how certain economic factors in Parker have changed over time.

Table E.1. Economic Characteristics for the Town of Parker

Characteristic	2000	2013
Families below Poverty Level	1.7%	3.2%
Individuals below Poverty Level	2.3%	4.2%
Median Home Value	194,600	284,200
Median Household Income	74,116	96,772
Per Capita Income	27,479	35,973
Population in Labor Force*	13,399	26,047

Source: 2008-2013 US Census Bureau American Community Survey 5-year Estimates, 2000 U.S. Census

E.3.4 Population

The 2013 population estimate for the Town (the most recent available) indicates there are 46,390 residents of Parker. The population was estimated at 45,297 for the 2010 U.S. Census.

[1] History, Town of Parker website. http://www.parkeronline.org/167/History, accessed March 26, 2015.

E.4 Hazard Identification and Summary

This section details how the risk varies across the Douglas County planning area. The Town's planning team identified the hazards that affect the Town and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to Parker (see Table E.2). In the context of the plan's planning area, there are no hazards that are unique to Parker.

Information on past occurrences and the likelihood of future occurrences is detailed in Section 4, Risk Assessment, of the base plan. Additional information for high and medium significant hazards for the Town is included in the Vulnerability Assessment section of this Annex.

Table E.2. Town of Parker Hazard ID Table

Hazard	Spatial Extent	Likelihood of Future Occurrences	Magnitude /Severity	Significance
Avalanche	None	None	None	None
Drought	Extensive	Low/Med	Med	Med
Earthquake	Significant	Low	Low	Low
Flood: Dam Failure	Significant	Low	Med	Med
Flood: 100/500 year	Limited	Med	Low/High*	Low/High*
Flood: Localized/ Stormwater	Significant	Med	Low	Low
Landslides/ Mud & Debris Flows /Rockfalls	Limited	Low	Low	Low
Severe Weather: Extreme Heat	Extensive	High	Low	Low
Severe Weather: Hail	Significant	High	Med	Med
Severe Weather: High Winds	Extensive	High	Low	Low
Severe Weather: Lightning	Significant	High	Low	Low
Severe Weather: Thunderstorms/Heavy Rains	Extensive	High	Low	Low
Severe Weather: Tornado	Limited	Low	Low	Med
Severe Weather: Winter Weather (includes snow/ice/extreme cold)	Extensive	High	Med	Low
Soil Hazards: Erosion & Deposition	Limited	Med	Low	Low
Soil Hazards: Expansive Soils	Limited	Med	Low	Low
Soil Hazards: Subsidence	Limited	Low	Low	Low
Wildfire	Limited	Med	Low	Low
Hazardous Materials: Transportation Incidents	Limited	Low	Med	Med

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

Likelihood of Future Occurrences
Low: Occurs less than once every 10 years or more
Medium: Occurs less than once every 5 to 10 years
High: Occurs once every year or up to once every five years

Magnitude/Severity
Low: Negligible property damages (less than 5% of all buildings and infrastructure) Negligible loss of quality of life. Local emergency response capability is sufficient to manage the hazard.
Medium: Moderate property damages (15% to 50% of all buildings and infrastructure) Some loss of quality of life. Emergency response capability, economic and geographic effects of the hazard are of sufficient magnitude to involve one or more counties.
High: Property damages to greater than 50% of all buildings and infrastructure. Significant loss of quality of life Emergency response capability, economic and geographic effects of the hazard are of sufficient magnitude to require federal assistance.

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

*Low for 100-year, High for 500-year

E.5 Vulnerability Assessment

The intent of this section is to assess Parker's vulnerability separate from that of the planning area as a whole, which has already been assessed in Section 4.3 Vulnerability Assessment of the base plan. This vulnerability assessment provides an inventory of the population, property, and other assets located within the Town and further analyzes those assets at risk to identified hazards ranked of medium or high significance (as listed in Table E.2) to the community. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the main plan.

E.5.1 Total Assets at Risk

This section identifies Parker's total assets at risk, including values at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the community. This data is not hazard specific, but is representative of total assets at risk within a community.

Values at Risk

The following data from the Douglas County Assessor's Office is based on joining assessor data to the 2014 parcel layer in GIS. This data should only be used as an indicator of overall values in the County, as the information has some limitations. Table E.3 summarizes the parcels, improved parcels, structures, improved value, land value, and total value exposed in Parker. It is important to note, in the event of a disaster, it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a loss.

Table E.3. Town of Parker Total Exposure

Property Type	Total Parcel Count	Improved Parcel Count	Total Structures	Improved Value	Total Land Value	Total Value
Agricultural	29	2	4	$90,127	$177,756	$267,883
Commercial	454	378	1,974	$765,090,166	$251,841,351	$1,016,931,517
Exempt	1,378	85	148	$260,629,379	$121,143,270	$381,772,649
HOA	705	0	40	$0	$0	$0
Industrial	24	24	66	$17,404,526	$5,948,290	$23,352,816
Producing Mine	1	0	0	$0	$58,292	$58,292
Residential	14,439	14,171	15,145	$3,008,303,994	$874,107,959	$3,882,411,953
Utilities	18	0	4	$0	$0	$0
Vacant Land	1,401	2	1,129	$117,696	$79,698,287	$79,815,983
Total	**18,449**	**14,662**	**18,510**	**$4,051,635,888**	**$1,332,975,205**	**$5,384,611,093**

Source: Douglas County Assessor's Data

Critical Facilities and Infrastructure

For purposes of this plan, a critical facility is defined as:

> Any facility, including without limitation, a structure, infrastructure[2], property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.

This definition was refined by separating out three categories of critical facilities as further described in Section 4.3.1 of the base plan. These categories include At-Risk Populations, Essential Services, and High Potential Loss Facilities.

An inventory of critical facilities in the Town of Parker from Douglas County GIS is provided in Table E.4. Details of critical facility definition, type, name and address and jurisdiction by hazard zone are listed in Appendix E.

Table E.4. Town of Parker Critical Facilities: Summary Table

Category	Type	Facility Count
At Risk Population Facilities	Assisted Living	1
	Group Home	2
	School	17
Essential Services Facilities	Cell Tower	16
	EOC	1
	Fire Department	2
	Hospital	1
	Microwave	9
	Police	1
	Water Hub/Treatment	31
High Potential Loss Facilities	Hazardous Material	174
TOTAL		**255**

Source: Douglas County GIS

Natural Resources

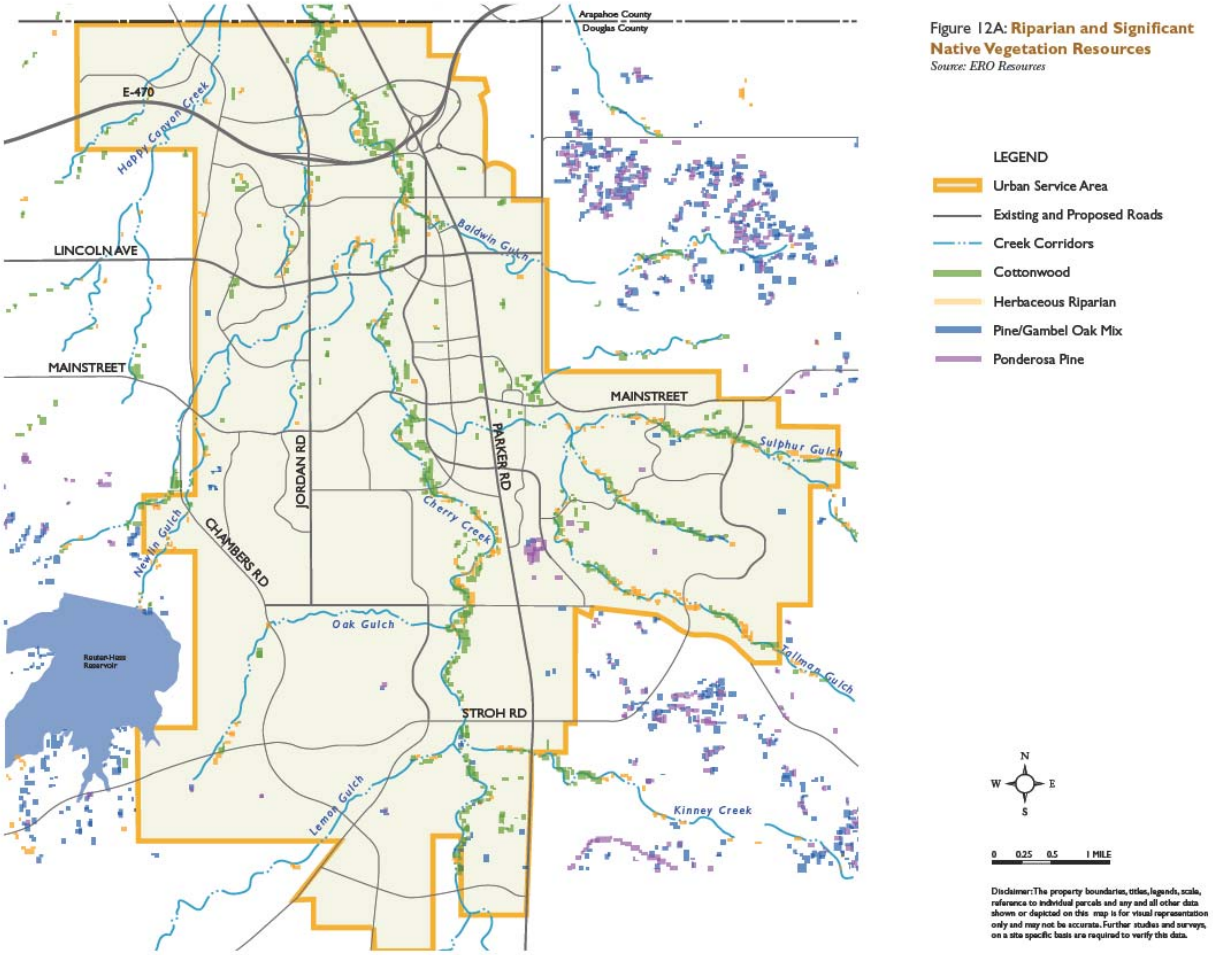
The Town of Parker and the areas surrounding it include a rich and diverse range of biological resources.

[2] Essential Service Facilities include bridges, roads, power grids, and infrastructure held by private companies (i.e. utility lines and private levees) that are not mapped for security reasons and are not under the control of the County.

Vegetation

The Parker Master Plan identifies riparian and vegetative resources within city boundaries and in the surrounding area. "In addition to…riparian features, the area just north of Hess Road and east of Parker Road is the site of an enclave of the Black Forest, a ponderosa pine community that is indigenous to the lower elevations of the Rocky Mountain Range. Additionally, stands of large Cottonwoods accentuate and frame the riparian corridors throughout the community. [Figure E.2] depicts these significant natural vegetative resources within our community" (pg. 12.2).

Figure E.2. Riparian and Vegetative Resources



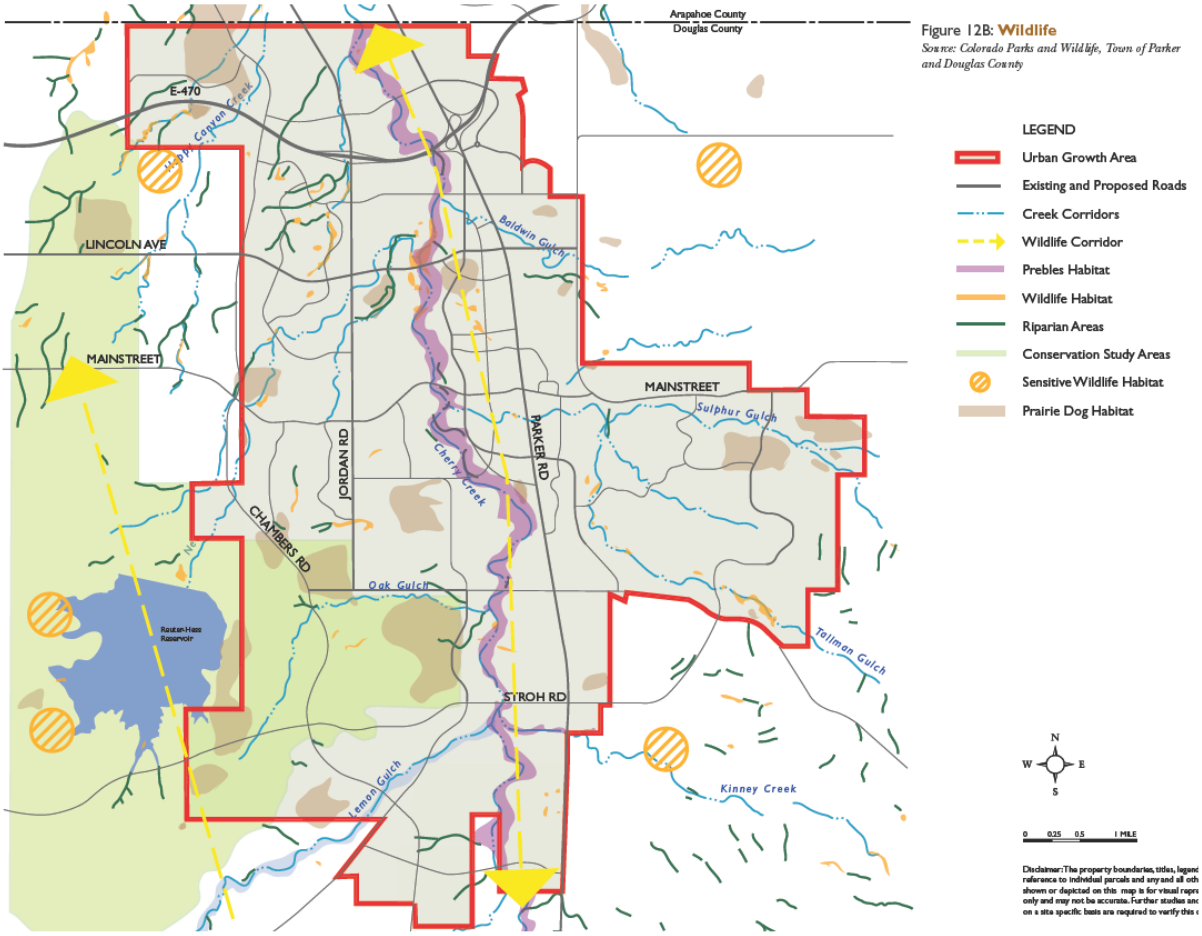
Source: 2014 Town of Parker Master Plan

Wildlife Habitat

According to the Parker Master Plan, "[v]egetation provides prime habitat for wildlife, while riparian corridors, such as Cherry Creek, also function as movement corridors. [Figure E.3] maps the primary wildlife habitat found in our community. The wildlife-movement corridors

and habitat areas, depicted on this map, will assist the Town in making land use decisions and will be updated as conditions warrant. It should be noted that delineation of movement corridors or wildlife value areas does not preclude development, as mitigation measures may be possible and appropriate in designated areas" (pg. 12.2).

Figure E.3. Wildlife Habitat and Movement Corridors



Source: 2014 Town of Parker Master Plan

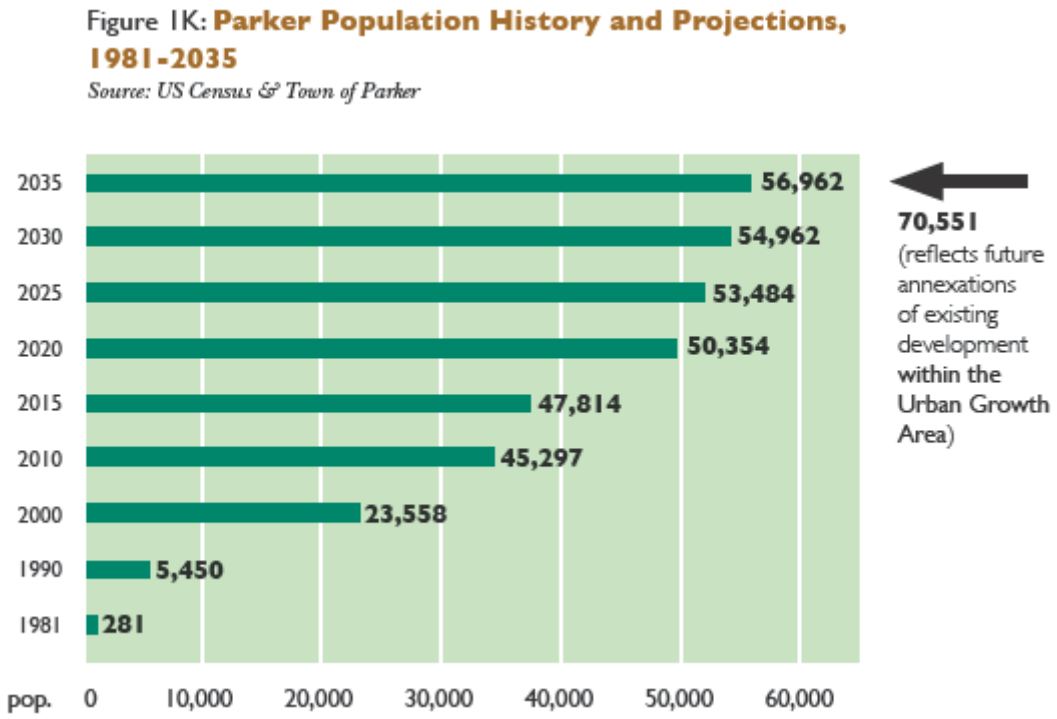
Historic and Cultural Resources

To inventory these resources, the HMPC collected information from both the National Register of Historic Places (NRHP) and the Colorado State Register. Each program has different eligibility criteria and procedural requirements. These requirements are detailed in Section 4.3.1 of the base plan. Parker has one resource listed in the NRHP: Ruth Memorial Methodist Episcopal Church.

Growth and Development Trends

Parker experienced unprecedented growth over the past few decades. Figure E.4 summarizes the Town's population growth beginning in 1981 and population projections through 2035. From 1981 to 2013 Parker's population grew by 16,409%, which averages to roughly 513% annually. Naturally, the Town experienced a building boom as well to accommodate the population. Parker's population is expected to continue increasing over the next 20 years, but at a much slower rate of growth.

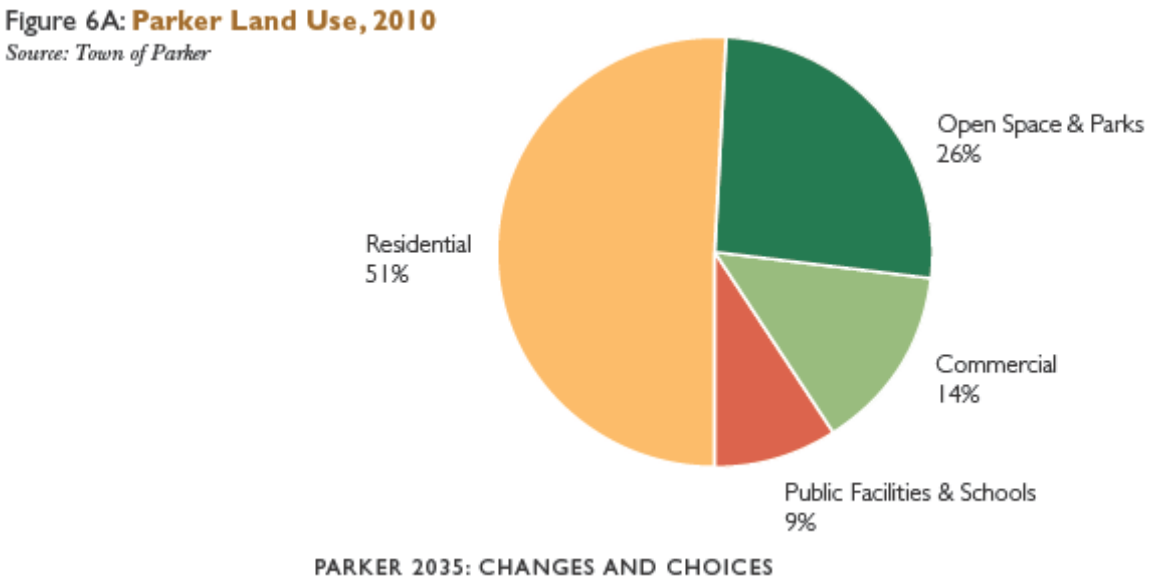
Figure E.4. Parker Population History and Projections 1981-2035



Source: 2014 Town of Parker Master Plan

Existing land uses within the Town of Parker have been generally urban or suburban residential development. Development within the Town consists of planned development residential uses, commercial uses, public facilities and schools, and parks and open space uses. Existing land use is broken down by percentage in Figure E.5.

Figure E.5. Current Land Use in the Town of Parker



Source: 2014 Town of Parker Master Plan

Parker's 2014 Master Plan includes a General Land Use Plan (Figure E.6) that represents the Town's vision for future growth and development through 2035. The majority of planned development within the Urban Growth Area boundary is expected to be medium or low density residential use. The Town's zoning map in Figure E.7 has more detailed information on planned developments, including planned community names and locations with the Town's Urban Growth Area boundary.

Figure E.6. Town of Parker General Land Use Plan

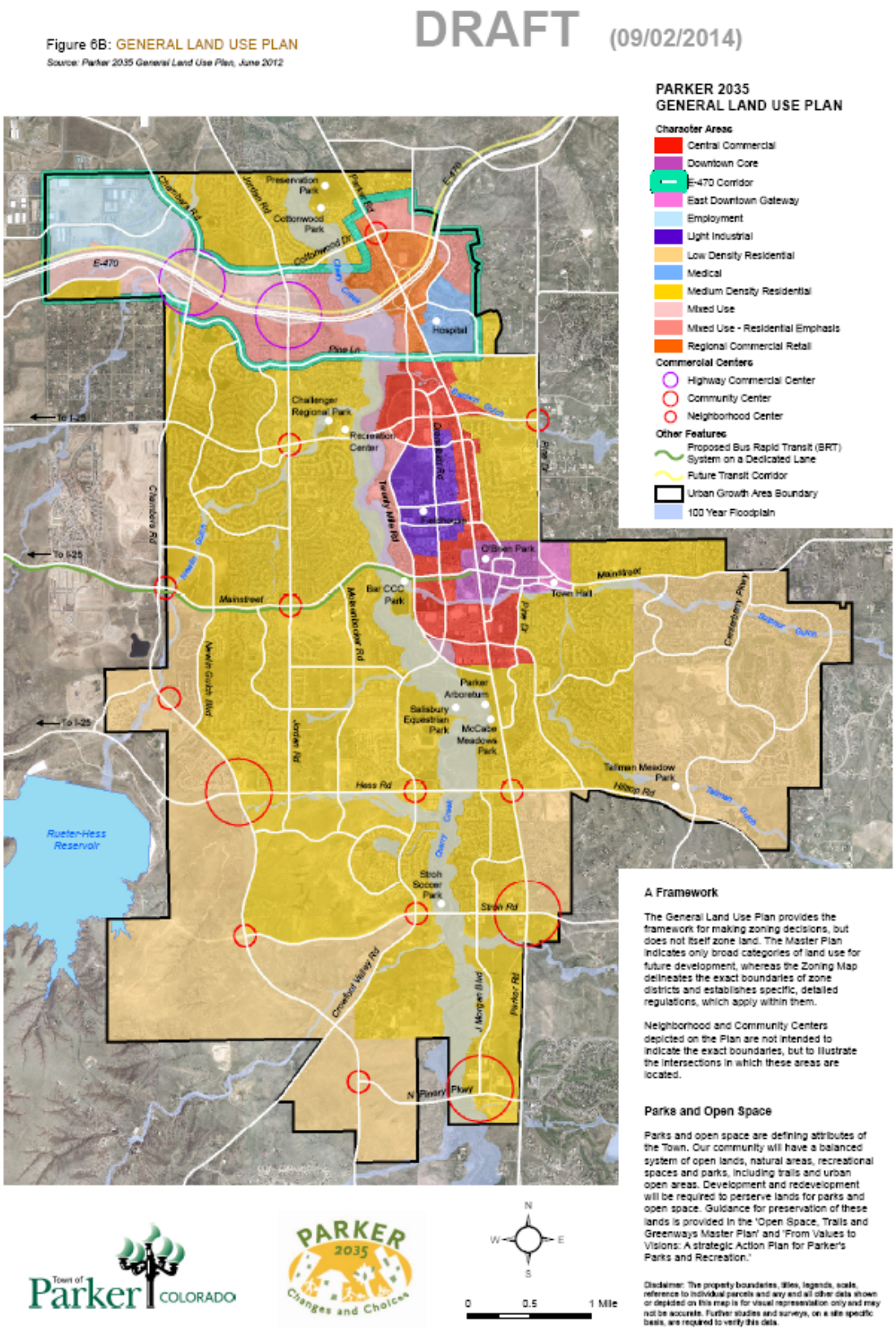


Figure E.7. Town of Parker Zoning Map with Planned Developments

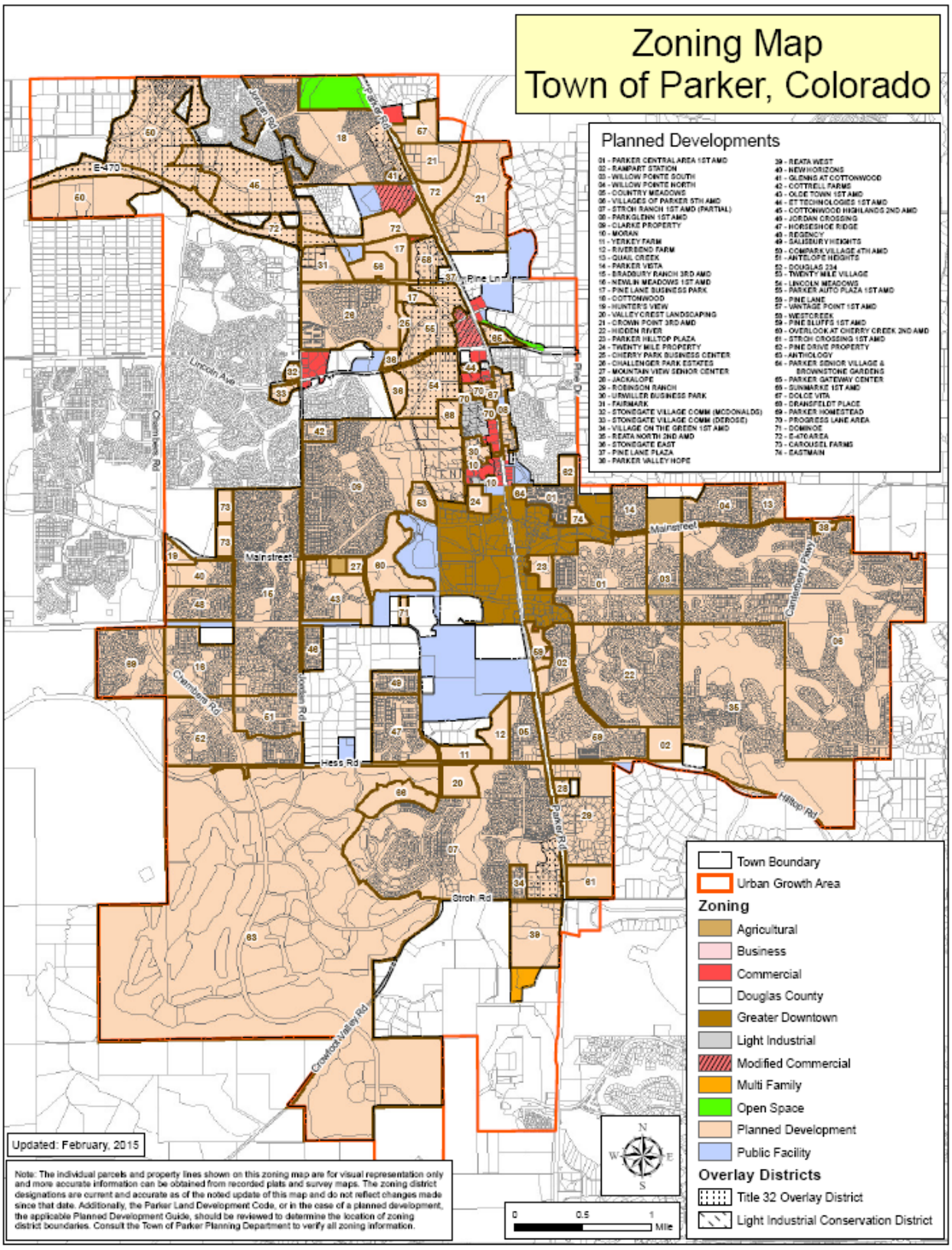


Table E.5 summarizes the number and value of structures built in Parker from 2010 to 2014 based on a query of the 'year built' values in the County's parcel database. Over 18,500 structures, with a total value greater than $5.3 billion, were built in that short period of time. The vast majority of these structures were residential, built to accommodate the rapidly growing population in the Planning Area. Additional analysis on recent development in Parker's mapped hazard areas is discussed in the vulnerability assessments for flood, landslide/erosion, and wildfire.

Table E.5. Parker Structures Built from 2010 to 2014: Total Assets by Property Type

Jurisdiction	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Land Value	Total Value
Agricultural	29	2	4	$90,127	$177,756	$267,883
Commercial	454	378	1,974	$765,090,166	$251,841,351	$1,016,931,517
Exempt	1,378	85	148	$260,629,379	$121,143,270	$381,772,649
HOA	705	0	40	$0	$0	$0
Industrial	24	24	66	$17,404,526	$5,948,290	$23,352,816
Producing Mine	1	0	0	$0	$58,292	$58,292
Residential	14,439	14,171	15,145	$3,008,303,994	$874,107,959	$3,882,411,953
Utilities	18	0	4	$0	$0	$0
Vacant Land	1,401	2	1,129	$117,696	$79,698,287	$79,815,983
Total	**18,449**	**14,662**	**18,510**	**$4,051,635,888**	**$1,332,975,205**	**$5,384,611,093**

Source: Douglas County

E.5.2 Priority Hazards: Vulnerability Assessment

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table E.2 as high or medium significance hazards. Wildfire was also analyzed to compare Parker's exposure to the rest of the Planning Area, despite being ranked low significance to the Town. A brief discussion on landslide and erosion was included for the same reason. Impacts of past events and vulnerability of the Town to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the base plan for more detailed information about these hazards and their impacts on the Douglas County planning area). Methodologies for calculating loss estimates are the same as those described in Section 4.3 of the base plan. In general, the most vulnerable structures are those located within the floodplain or dam inundation areas, unreinforced masonry buildings, and buildings built prior to the introduction of modern building codes.

An estimate of the vulnerability of the Town to each identified hazard, in addition to the estimate of risk of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.

Drought

Vulnerability to Drought

Likelihood of Future Occurrence—Low/Medium
Potential Magnitude—Medium
Overall Vulnerability—Medium

Drought is different than many of the other natural hazards in that it is not a distinct event and usually has a slow onset. Drought can severely impact a region both physically and economically. Drought affects different sectors in different ways and with varying intensities. Adequate water is the most critical issue for agricultural, manufacturing, tourism, recreation, and commercial and domestic use. As the population in the area continues to grow, so too will the demand for water.

The most significant qualitative impacts associated with drought in Parker are those related to water intensive activities such as fire protection, municipal usage, commerce, tourism, recreation, and wildlife preservation. Mandatory conservation measures and water use restrictions are typically implemented during extended droughts. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding.

It is difficult to quantitatively assess drought impacts to Parker. Some factors to consider include: habitat loss and associated effects on wildlife, and the drawdown of the groundwater table. The most direct and likely most difficult drought impact to quantify is to local economies. It can be assumed, however, that the loss of production in one sector of the economy would affect other sectors.

Development Trends

The Parker Water and Sanitation District recognized the need to manage water supply, especially given the rapid growth rate in the Planning Area and Parker in particular. To help meet this need, the Rueter-Hess reservoir was constructed. The construction of the reservoir lasted from 2004 to 2012, and Parker Water and Sanitation District began gradually filling it in 2012. Rueter-Hess is primarily supplied by surface water from Cherry Creek, Newlin Gulch, and return

flows from nearby water districts.[3] The reservoir is primarily used for drinking water storage to supply current and future development in Parker, Lone Tree, Castle Rock, Castle Pines, and other local jurisdictions and will help mitigate future impacts to the Town's water supply in future droughts

Flood: Dam Failure

Vulnerability to Dam Failure

Likelihood of Future Occurrence—Low
Potential Magnitude—Medium
Overall Vulnerability—Medium

The potential impacts from a dam failure are largely dependent on the specific dam or jurisdiction in question. Rueter-Hess dam poses the most immediate threat to Parker, but the dam was recently built and is actively monitored. As of mid-2015, the Rueter-Hess reservoir is only partially full, which further decreases the risk of dam failure in the short term. Parker experienced a dam failure event in 1933 when the Castlewood Dam failed and caused massive flooding on Cherry Creek. Historical accounts indicate that the Castlewood Dam had repeated problems due to structural issues, and downstream residents regularly expressed concern over the dam's safety. Castlewood Dam finally breached in August 1933 after heavy rains. Since the area was mainly agricultural at that point in time, the event caused extensive damage to farmland and crops. Bridges were also damaged by debris carried by the floodwaters.

A catastrophic dam failure would challenge local response capabilities and require timely evacuations to save lives in Parker. Impacts to life safety would depend on the warning time available and the resources to notify and evacuate the public. Major loss of life could result as well as potentially catastrophic effects to roads, bridges, and homes. Associated water quality and health concerns could also be an issue. Due to homeland security concerns specific impacts are not included here.

Development Trends

Flooding due to a dam failure event is likely to exceed the special flood hazard areas regulated through local floodplain ordinances. Parker should consider the dam failure hazard when permitting development downstream of the high and significant hazard dams. Low hazard dams could become significant or high hazard dams if development occurs below them. Regular monitoring of dams, exercising and updating of EAPs, and rapid response to problems when detected at dams are ways to mitigate the potential impacts of these rare, but potentially catastrophic, events.

[3] Town of Castle Rock, Colorado website. "Rueter-Hess Reservoir." http://www.crgov.com/index.aspx?NID=1277, accessed February 17, 2015.

Flood: 100/500-Year

Vulnerability to 100/500-Year Flooding

Likelihood of Future Occurrence—Medium
Potential Magnitude—Low for 100-year, High for 500-year
Overall Vulnerability— Low for 100-year, High for 500-year

The Planning Area, including Parker, is prone to very intense rainfall. Floods have resulted from storms covering large areas with heavy general rainfall as well as from storms covering small area with extremely intense rainfall. This section quantifies the vulnerability of Parker to floods.

The tables flood loss estimates for Parker are located below. Table E.6 shows improved values at risk in the 1% annual chance flood zone, and Table E.7 shows the same information for the 0.2% annual chance flood zone. Contents values were estimated as a percentage of building value based on their property type, using FEMA/HAZUS estimated content replacement values. This includes 100% of the structure value for agricultural, commercial, exempt, HOA and utility, 50% for residential, 150% for industrial and 0% for vacant land use classifications. A 20% damage factor was applied to each flood zone's total value of improvements and estimated content value to obtain a loss estimate. This analysis is based on a FEMA depth damage function which assumes a two foot deep flood. Land Value was not included in this analysis. Figure E.8 shows the FEMA flood zones in Parker, and Figure E.9 shows the location of properties within those flood zones. Based on this data, Parker has minimized risk in the 1% annual chance flood hazard areas. Development in the 0.2% annual chance zone exposes the Town to loss from this less frequent, but potentially devastating, flood event.

Table E.6. Parker 1% Annual Chance Flood Loss Estimate by Property Type

Property Type	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Estimated Content Value	Total Value	Loss Estimate
Agricultural	1	0	0	$0	$0	$0	$0
Commercial	2	0	0	$0	$0	$0	$0
Exempt	98	6	11	$691,591	$691,591	$1,383,182	$276,636
HOA	11	0	0	$0	$0	$0	$0
Residential	5	3	4	$653,552	$326,776	$980,328	$196,066
Utilities	1	0	0	$0	$0	$0	$0
Vacant Land	7	0	0	$0	$0	$0	$0
Total	**125**	**9**	**15**	**$1,345,143**	**$1,018,367**	**$2,363,510**	**$472,702**

Source: Douglas County 2014 Assessor & Parcel Data; Douglas County DFIRM

Table E.7. Parker 0.2% Annual Chance Flood Loss Estimate by Property Type

Property Type	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Estimated Content Value	Total Value	Loss Estimate
Agricultural	1	0	0	$0	$0	$0	$0
Commercial	18	10	62	$28,897,896	$28,897,896	$57,795,792	$11,559,158
Exempt	125	15	21	$23,698,806	$23,698,806	$47,397,612	$9,479,522
HOA	6	0	0	$0	$0	$0	$0
Residential	758	757	846	$131,232,921	$65,616,461	$196,849,382	$39,369,876
Vacant Land	36	0	22	$0	$0	$0	$0
Total	**944**	**782**	**951**	**$183,829,623**	**$118,213,163**	**$302,042,786**	**$60,408,557**

Source: Douglas County 2014 Assessor & Parcel Data; Douglas County DFIRM

Figure E.8. Parker FEMA Flood Hazard Zones

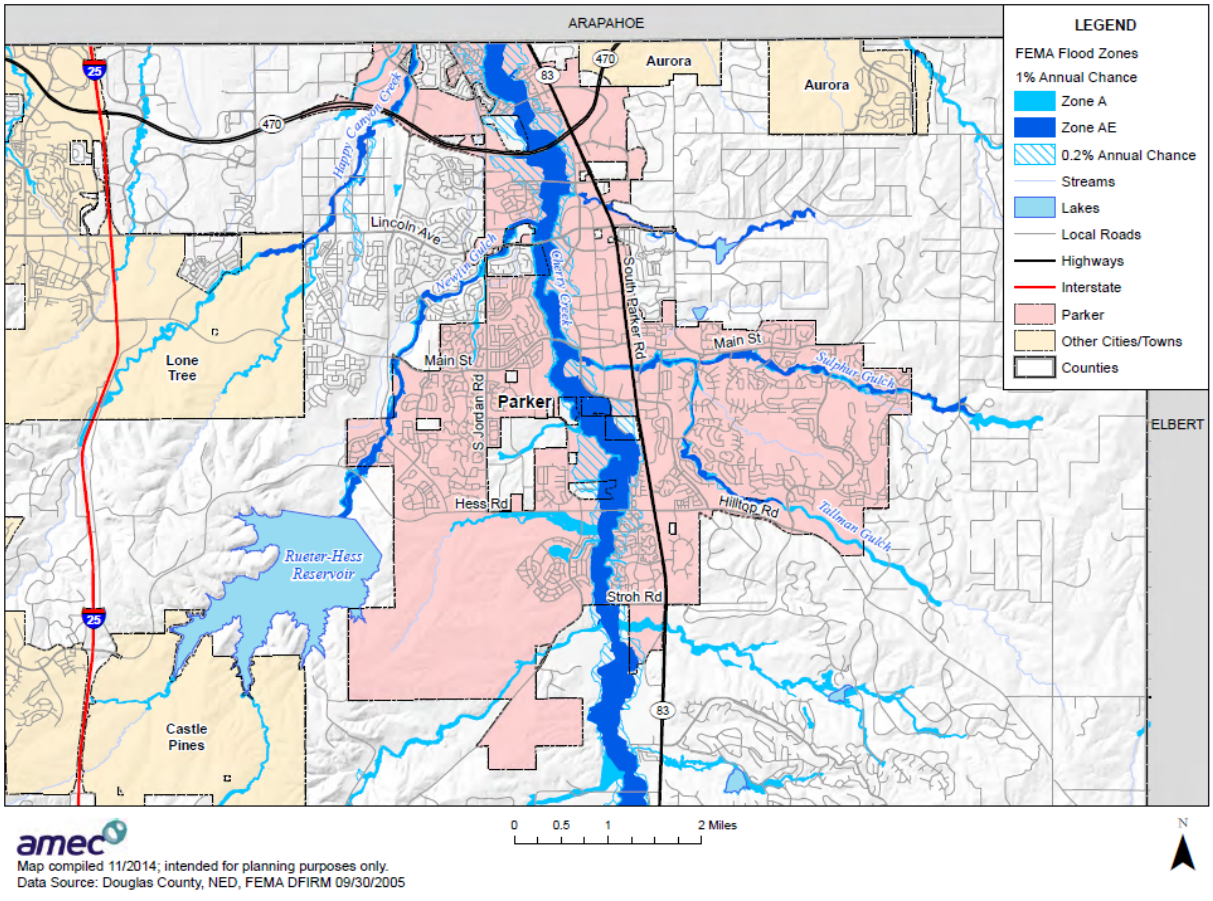
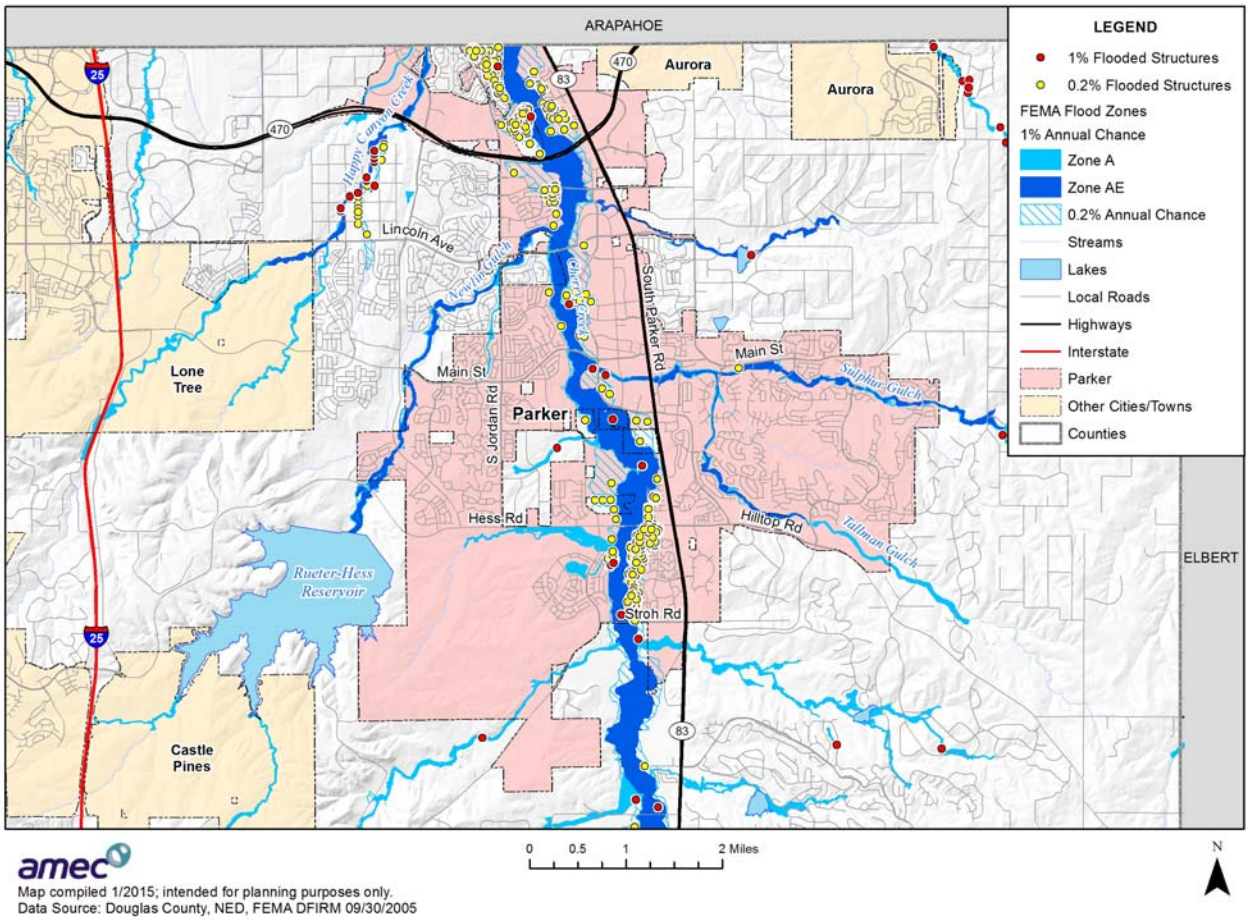


Figure E.9. Parker FEMA Flood Hazards and Flood Prone Improved Properties



Population at Risk

A separate analysis was performed to determine population in flood zones. Using GIS, the DFIRM dataset was overlaid on the improved residential parcel data. Those parcel centroids that intersect a flood zone were counted and multiplied by the 2010 U.S. Census household factor of 2.71; results were tabulated by jurisdiction and flood zone (see Table E.8). According to this analysis, there is a population of eight in the 1% annual chance flood zone, and 2,051 in the 0.2% annual chance flood zone in Parker.

Table E.8. Parker - Improved Residential Parcels and Population in Floodplain

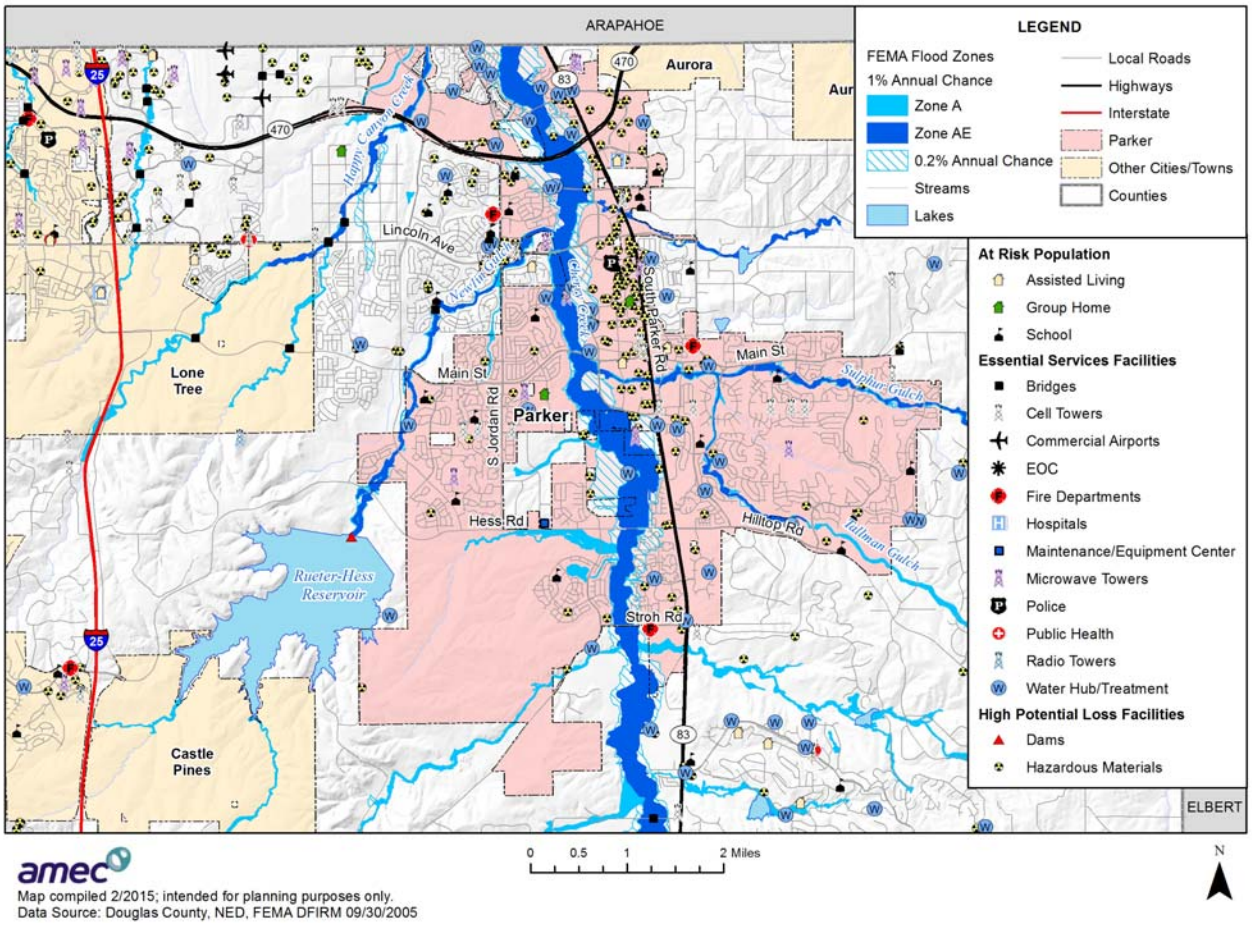
	1% Annual Chance		0.2% Annual Chance	
Jurisdiction	**Improved Residential Parcels**	**Population**	**Improved Residential Parcels**	**Population**
Parker	3	8	757	2,051

Source: DFIRM, US Census Bureau, 2014 Douglas County Assessor & Parcel Data
* Census Bureau 2010 average household size for Parker – 2.71

Critical Facilities at Risk

Two critical facilities in Parker are located in the 1% annual chance flood zone, and no critical facilities are located in the 0.2% annual chance flood zone. Both are essential services facilities, specifically water hub/treatment facilities.

Figure E.10. Parker FEMA Flood Hazards and Critical Facilities



Development Trends

The Town's floodplain regulations are laid out in Title 13 of the Parker Municipal Code. These regulations prohibit various types of development within the floodplain overlay district.

Largely the undeveloped area comprising the southwest quadrant of Parker within the Urban Growth Boundary (UGB)--south of Hess Road and west of Motsenbocker Road--has flood vulnerabilities due to lack of stormwater management infrastructure, which will be required with all new development. This area is included in the study area described below.

Oak Gulch Outfall Systems Planning Study Update

The Town, Douglas County and the Urban Drainage and Flood Control District (District) prepared an Outfall Systems Planning Study (OSP) in 2001 for Oak Gulch--which is a major drainageway and regulatory floodplain with our jurisdiction. OSPs are used by local communities within the District to identify flood and erosion hazards for major drainageways and to recommend mitigation measures. The OSPs are also used to properly plan future improvements necessary to mitigate the adverse effect of development within the watersheds.

The majority of the Oak Gulch watershed was undeveloped at the time of the study in 2001, however, assumptions on land use were made at the time. Since this study was completed, a Property Owner who owns the majority of the land within this watershed has been granted approval of Planned Development that varied from the original assumptions on land use. As a result, the Town and the District has initiated an update to this OSP to identify any required modifications to the mitigation measures necessary to prevent flood damage within the basin, with completion anticipated by the end of 2015.

Table E.9 summarizes development in the 1% and 0.2% annual chance flood zones between 2010 and 2014. Based on this data, Parker has greatly minimized development in the 1% annual chance flood hazard areas. No structures were built in the 1% annual chance flood zone between 2010 and 2014. Development in the 0.2% annual chance zone exposes the Town to loss from this less frequent flood event.

Table E.9. Parker Structures Built from 2010 to 2014: Assets Exposed to the 1% and 0.2% Annual Chance Flood Zone

Flood Zone	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Estimated Content Value	Land Value	Total Value
1% Annual Chance	-	-	-	-	-	-	-
0.2% Annual Chance	38	38	57	$7,284,984	$3,642,160	$1,954,246	$12,881,390
Total	**38**	**38**	**57**	**$7,284,984**	**$3,642,160**	**$1,954,246**	**$12,881,390**

Source: Douglas County GIS

Landslide/Mud and Debris Flows/Rockfalls/Erosion

Vulnerability to Landslide/Mud and Debris Flows/Rockfalls/Erosion

Likelihood of Future Occurrence—Low
Potential Magnitude—Low
Overall Vulnerability—Low

The landslide hazard is made up of these attributes: debris-flow, rockfall-rockslide/debris, and slope-failure. Erosion hazards in Parker are also discussed in this section, despite being ranked

low significance, due to the property exposure in potential hazard areas. Landslide hazards in Parker are minimal. The Town identified Sulphur Gulch near the east end of Parker as one potential landslide hazard area. Erosion issues are fairly minor in developed areas but can be significant in undeveloped areas that lack stormwater management infrastructure.

The County's parcel layer was used as the basis for the inventory of all parcels within Parker. GIS was used to overlay the landslide hazard layer with the parcel layer centroids and where the zones intersected a parcel centroid, it was assigned with that hazard zone for the entire parcel. The Town has 11 structures with a total value of over $7 million potentially exposed to landslide hazards, as detailed in Table E.10. Table E.11 summarizes exposure to moderate accelerated erosion. Erosion analysis does not include contents value since contents of buildings are unaffected by this hazard. Figure E.11 depicts Parker's mapped landslide and erosion hazard areas.

Table E.10. Town of Parker Total Exposure to Landslide

Property Type	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Estimated Content Value	Land Value	Total Value
Slope-Failure Area							
HOA	1	0	1	$0	$0	$0	$0
Residential	10	10	10	$3,773,733	$1,886,867	$1,751,139	$7,411,739
Total	**11**	**10**	**11**	**$3,773,733**	**$1,886,867**	**$1,751,139**	**$7,411,739**

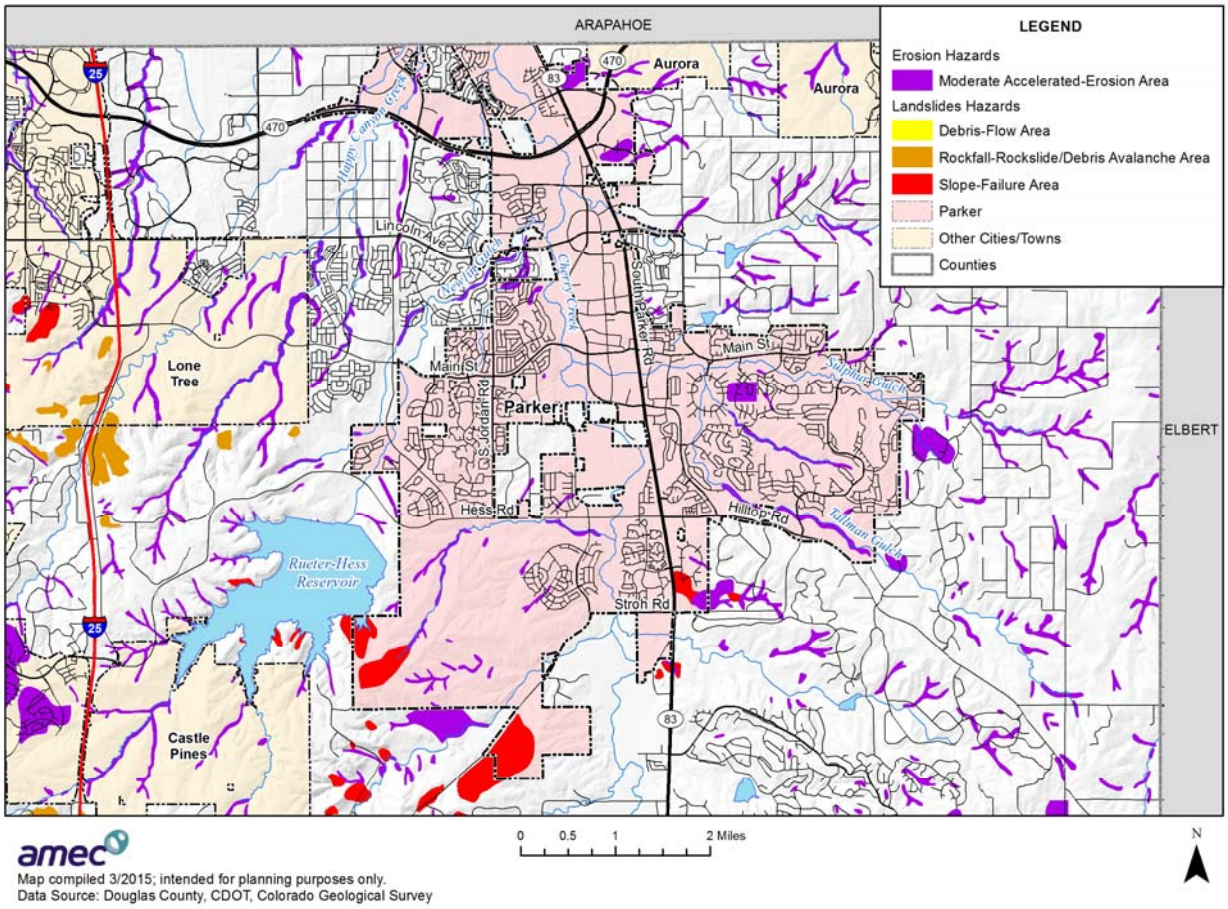
Source: Douglas County Assessor's Data

Table E.11. Town of Parker Total Exposure to Moderate Accelerated Erosion

Property Type	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Land Value	Total Value
Agricultural	4	0	0	$0	$3,431	$3,431
Commercial	2	2	50	$127,335,551	$6,686,956	$134,022,507
Exempt	10	1	2	$2,516	$1,869,392	$1,871,908
HOA	14	0	0	$0	$0	$0
Residential	208	207	209	$39,974,450	$13,948,480	$53,922,930
Utilities	2	0	0	$0	$0	$0
Vacant Land	25	0	20	$0	$360,266	$360,266
Total	**265**	**210**	**281**	**$167,312,517**	**$22,868,525**	**$190,181,042**

Source: Douglas County Assessor's Data

Figure E.11. Parker Erosion and Landslide Hazards



Population at Risk

An estimated 27 people are potentially exposed to landslide hazards, specifically slope-failure areas, in Parker. This estimate is based on the number of exposed improved residential parcels multiplied by the average household size in Parker according to the 2010 U.S. Census (2.71).

Critical Facilities at Risk

Landslide and erosion analysis was performed on the critical facility inventory in Parker. GIS was used to determine whether Parker facility locations intersect the landslide and erosion hazard areas provided by Douglas County, and if so, which zones they intersect. There are a total of nine critical facilities located in moderate accelerated erosion hazard areas in Parker. No critical facilities are located in landslide hazard areas in the Town.

Table E.12. Parker Critical Facilities in Moderate Accelerated Erosion Hazard Areas

Category	Type	Facility Count
	Cell Tower	1
	Hospital	1
Essential Services Facilities	Water Hub/Treatment	1
High Potential Loss Facilities	Hazardous Material	6
TOTAL		**9**

Source: Douglas County GIS

Development Trends

An analysis of recent development trends in hazard areas was conducted for Parker. A total of 14 structures were built in moderate-accelerated erosion hazard areas in the Town between 2010 and 2014. No structures were built in landslide zones. Results of this analysis are shown in Table E.13.

Table E.13. Parker Structures Built from 2010 to 2014: Summary of Assets Exposed to Moderate Accelerated Erosion Areas

Hazard	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Estimated Content Value	Land Value	Total Value
Moderate Accelerated Erosion	14	14	14	$2,907,881	$1,453,941	$848,050	$5,209,872
Total	**14**	**14**	**14**	**$2,907,881**	**$1,453,941**	**$848,050**	**$5,209,872**

Source: Douglas County GIS

Severe Weather: Hail

Vulnerability to Hail

Likelihood of Future Occurrence—High
Potential Magnitude—Medium
Overall Vulnerability—Medium

Hail is one of the most damaging natural hazards in Colorado. It occurs in wide swaths, causing damage to large geographical areas at once. A single hailstorm could potentially impact all of Parker at once. Hailstorms can also occur relatively frequently, especially in the summer, though they may not always cause significant damages. Approximately 5,100 residential and commercial roof permits were issued in Parker between 2011 and 2012 due to hail damages. Hailstorms have also damaged siding and windows, vehicles, rolling equipment, trees, and pastureland in Parker.

The impacts of hailstorms can vary substantially from one storm to another depending on weather conditions and the size of the hailstones. Losses are typically covered by insurance.

Development Trends

Any future development in Parker will be exposed to hail. Impacts to people can be mitigated by staying indoors during a hailstorm, and some property such as cars can be protected with covered parking where available. Hail impacts are difficult to mitigate in general though, and insurance is one of the typical options for recouping property losses and reducing economic impacts.

Severe Weather: Tornado

Vulnerability to Tornado

Likelihood of Future Occurrence—Low
Potential Magnitude—Low
Overall Vulnerability—Medium

Tornadoes can cause damage to property and loss of life. While most tornado damage is caused by violent winds, the majority of injuries and deaths generally result from flying debris. Property damage can include damage to buildings, fallen trees and power lines, broken gas lines, broken sewer and water mains, and the outbreak of fires. Access roads and streets may be blocked by debris, delaying necessary emergency response.

Figure 4.22 in Chapter 4 indicates that tornadoes can occur anywhere in Douglas County, especially in the eastern half. Figure 4.22 indicates that several F0 and F1 tornadoes were reported in Parker. A minor touchdown occurred in the Cottonwood Subdivision in the late 1990s, causing minor damage to fences and shingles.

Development Trends

Population growth and development expose more people to tornadoes in Parker. The impact to people can be mitigated through warning systems and tornado shelters. Stringent building codes for high winds can help mitigate impacts from weaker tornadoes, and property insurance can reduce economic impacts.

Wildfire

Vulnerability to Wildfire

Likelihood of Future Occurrence—Medium
Potential Magnitude—Low
Overall Vulnerability—Low

An exposure analysis was performed to quantify risk to wildfire in Parker. Potential losses to wildfire were estimated using a countywide Wildfire Hazard Potential GIS layer (created for the Douglas County Community Wildfire Protection Plan) and assessor's data from Douglas County. Potential losses were examined in terms of structures, property value, critical facilities, and

people at risk. For all analyses, the threat levels were classified as low, medium, high, and extreme. According to the CWPP, "[t]here is no absolute set of conditions that cause an area to be identified as being in a particular hazard category. Instead, the hazard category identified is a function of the combined factors that influence controllability, values, and ignition risk" (pg. 59).

GIS was used to create a centroid, or point representing the center of the parcel polygon. The CWPP's Wildfire Hazard Potential layer was then overlaid on the parcel centroids. For the purposes of this analysis, the fire hazard zone that intersected a parcel centroid was assigned the severity zone for the entire parcel. The model assumes that every parcel with a structure value greater than zero is improved in some way. Specifically, an improved parcel assumes there is a building on it.

Table E.14 shows total parcel counts, improved parcel counts and their structure values by occupancy type (residential, industrial, etc.) and total land values within each fire severity zone in Parker. Figure E.12 illustrates the wildfire severity zones in Parker and the surrounding area.

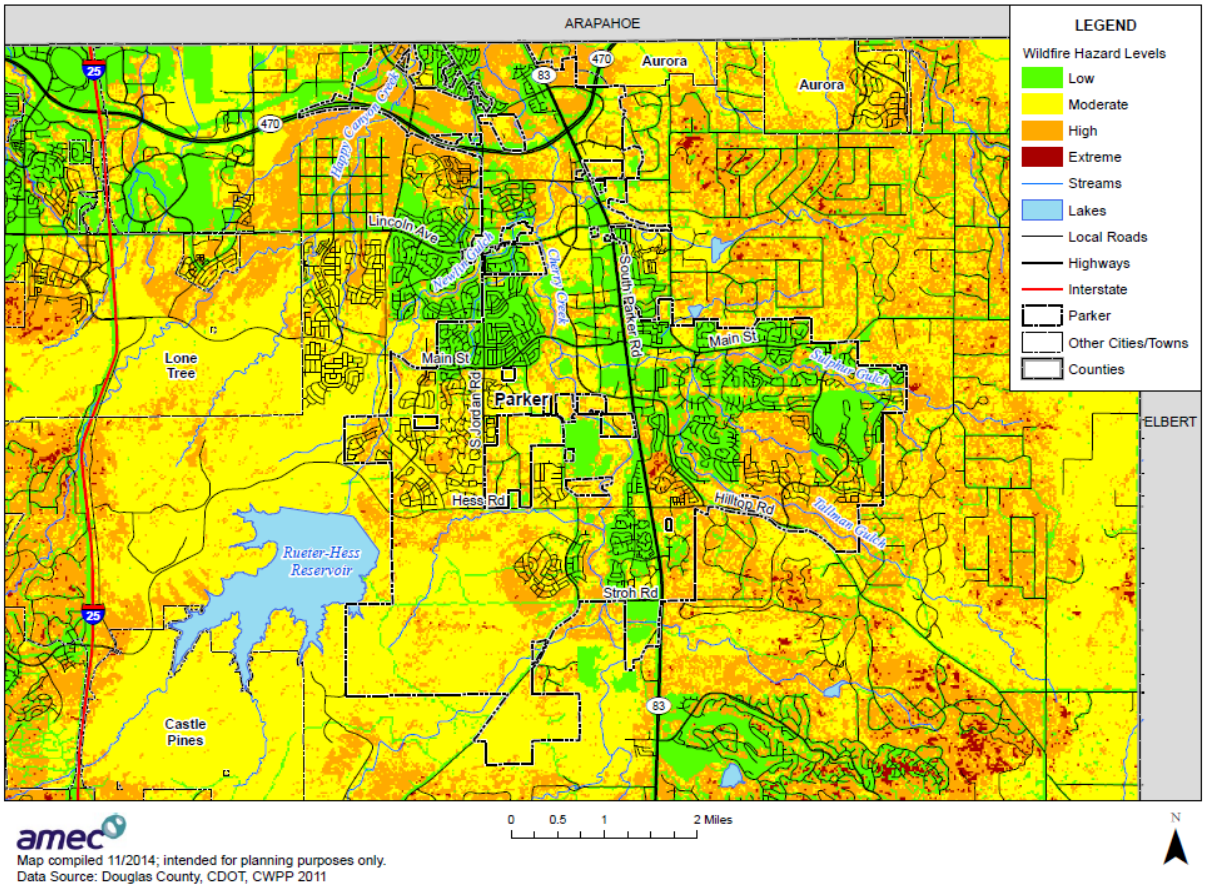
Table E.14. Town of Parker Total Exposure to Wildfire by Property Type

Property Type	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Estimated Content Value	Land Value	Total Value/Loss Estimate
Extreme							
Exempt	3	0	0	$0	$0	$201,924	$201,924
HOA	2	0	0	$0	$0	$0	$0
Residential	5	5	5	$1,550,702	$775,351	$370,000	$2,696,053
Vacant Land	1	0	1	$0	$0	$43,368	$43,368
Total	**11**	**5**	**6**	**$1,550,702**	**$775,351**	**$615,292**	**$2,941,345**
High							
Agricultural	13	1	1	$3,942	$3,942	$12,096	$19,980
Commercial	60	41	205	$79,048,137	$79,048,137	$32,299,144	$190,395,418
Exempt	208	16	24	$69,031,437	$69,031,437	$42,672,922	$180,735,796
HOA	165	0	12	$0	$0	$0	$0
Industrial	1	1	1	$246,834	$370,251	$152,460	$769,545
Producing Mine	1	0	0	$0	$0	$58,292	$58,292
Residential	1,971	1,851	2,073	$474,077,857	$237,038,929	$139,668,558	$850,785,344
Utilities	2	0	0	$0	$0	$0	$0
Vacant Land	515	0	502	$0	$0	$32,858,315	$32,858,315
Total	**2,936**	**1,910**	**2,818**	**$622,408,207**	**$385,492,696**	**$247,721,787**	**$1,255,622,690**
Moderate							
Agricultural	11	1	2	$86,185	$86,185	$162,992	$335,362
Commercial	100	72	407	$307,127,785	$307,127,785	$72,655,017	$686,910,587
Exempt	291	21	56	$91,363,483	$91,363,483	$32,749,203	$215,476,169
HOA	190	0	17	$0	$0	$0	$0
Industrial	3	3	17	$3,610,095	$5,415,143	$612,585	$9,637,823
Residential	3,223	3,112	3,389	$780,282,226	$390,141,113	$224,286,253	$1,394,709,592
Utilities	12	0	4	$0	$0	$0	$0
Vacant Land	714	2	561	$117,696	$0	$32,258,760	$32,376,456
Total	**4,544**	**3,211**	**4,453**	**$1,182,587,470**	**$794,133,709**	**$362,724,810**	**$2,339,445,989**
Low							
Agricultural	5	0	1	$0	$0	$2,668	$2,668
Commercial	294	265	1,362	$378,914,244	$378,914,244	$146,887,190	$904,715,678
Exempt	876	48	68	$100,234,459	$100,234,459	$45,519,221	$245,988,139

Property Type	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Estimated Content Value	Land Value	Total Value/Loss Estimate
HOA	348	0	11	$0	$0	$0	$0
Industrial	20	20	48	$13,547,597	$20,321,396	$5,183,245	$39,052,238
Residential	9,240	9,203	9,678	$1,752,393,209	$876,196,605	$509,783,148	$3,138,372,962
Utilities	4	0	0	$0	$0	$0	$0
Vacant Land	171	0	65	$0	$0	$14,537,844	$14,537,844
Total	**10,958**	**9,536**	**11,233**	**$2,245,089,509**	**$1,375,666,703**	**$721,913,316**	**$4,342,669,528**
Grand Total	**18,449**	**14,662**	**18,510**	**$4,051,635,888**	**$2,556,068,459**	**$1,332,975,205**	**$6,810,619,152**

Source: Douglas County GIS

Figure E.12. Parker Wildfire Hazard Potential



Population at Risk

Wildfire risk is greatest to those individuals residing in identified hazard areas. GIS analysis was performed to determine population in the different fire hazard areas. Using GIS, the Douglas County wildfire hazard potential layers were overlaid on the entire parcel layer. Those parcel centroids that intersect the wildfire hazard potential areas were counted and multiplied by the 2010 Census Bureau average household size for each jurisdiction and unincorporated area, which is 2.71 in Parker. Table E.15 summarizes the results of this analysis.

Table E.15. Population at Risk to Wildfire

	Extreme	High	Moderate	Low
Population	14	5,016	8,434	24,940
Improved Residential Parcels	5	1,851	3,112	9,203

Source: Douglas County GIS, 2010 U.S. Census

Critical Facilities at Risk

Wildfire analysis was performed on the critical facility inventory in Douglas County and all jurisdictions, including Parker. GIS was used to determine whether the facility locations intersect a wildfire hazard area. Table E.16 summarizes the results of the GIS analysis for Parker, and Figure E.13 depicts the location of critical facilities in relation to wildfire severity zones. Details of critical facility definition, type, name and address and jurisdiction by wildfire zone are listed in Appendix E.

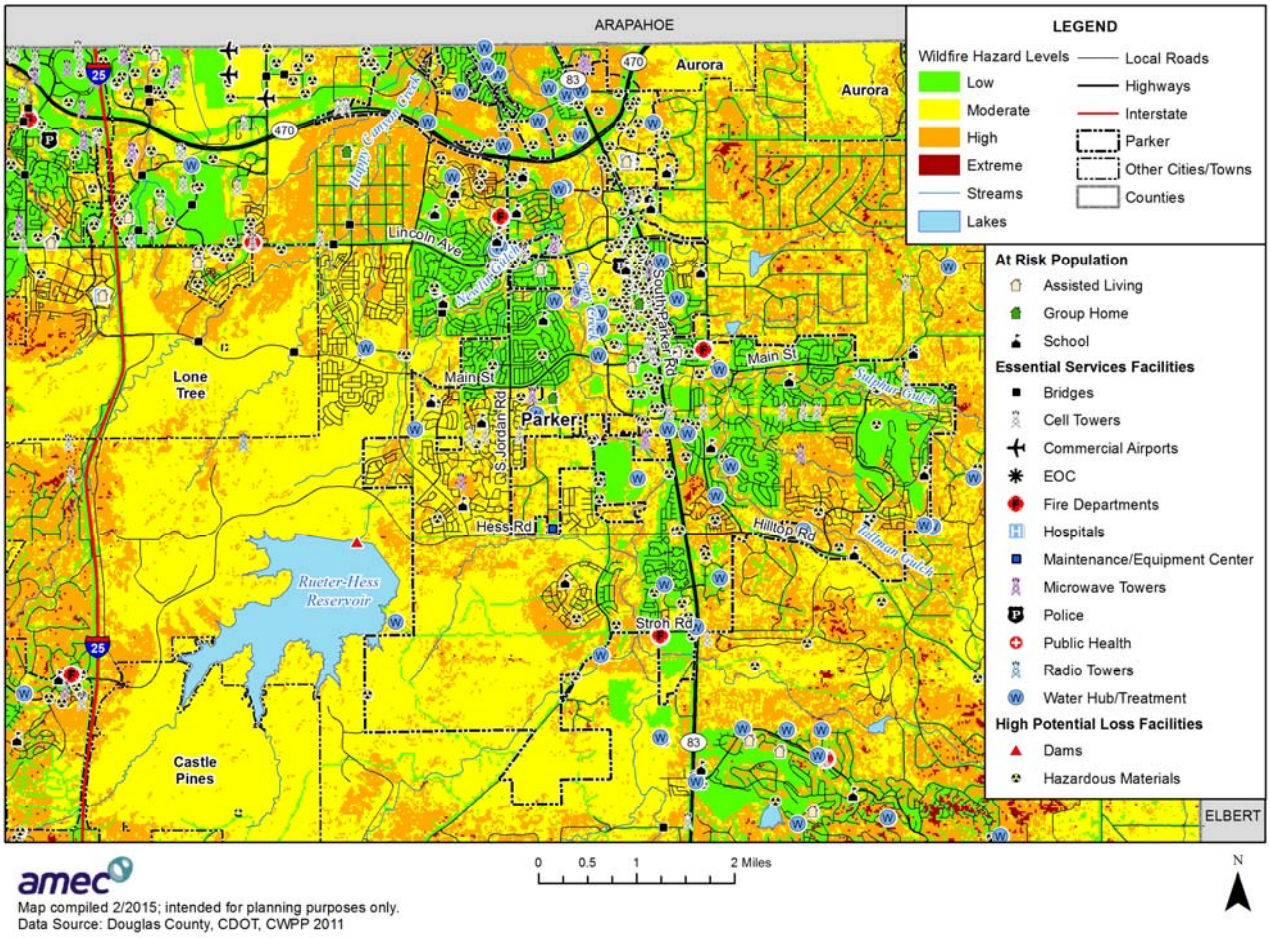
Table E.16. Parker– Critical Facilities at Risk to Wildfire Detail

Fire Risk	Category	Type	Facility Count
High	At Risk Population Facilities	Group Home	1
	At Risk Population Facilities	School	7
	Essential Services Facilities	Cell Tower	3
	Essential Services Facilities	Microwave	1
	Essential Services Facilities	Water Hub/Treatment	12
	High Potential Loss Facilities	Hazardous Material	54
	TOTAL		**78**
Moderate	At Risk Population Facilities	Assisted Living	1
	At Risk Population Facilities	School	4
	Essential Services Facilities	Cell Tower	7
	Essential Services Facilities	EOC	1
	Essential Services Facilities	Hospital	1
	Essential Services Facilities	Microwave	4
	Essential Services Facilities	Police	1
	Essential Services Facilities	Water Hub/Treatment	7
	High Potential Loss Facilities	Hazardous Material	44
	TOTAL		**70**
Low	At Risk Population Facilities	Group Home	1
	At Risk Population Facilities	School	6
	Essential Services Facilities	Cell Tower	6
	Essential Services Facilities	Fire Department	2
	Essential Services Facilities	Microwave	4
	Essential Services Facilities	Water Hub/Treatment	12
	High Potential Loss Facilities	Hazardous Material	76

Fire Risk	Category	Type	Facility Count
	TOTAL		**107**
Grand Total			**255**

Source: Douglas County GIS

Figure E.13. Parker Wildfire Hazard Potential and Critical Facilities



Development Trends

The pattern of increased damages is directly related to increased urban growth spread into historical forested areas that have wildfire as part of the natural ecosystem. Many WUI fire areas have long histories of wildland fires that burned only vegetation in the past. However, with new development wildland fires have the potential to burn developed areas, as demonstrated by the Waldo Canyon Fire in Colorado Springs in 2012. Population growth and development in Parker could potentially expose more people and structures to wildfires.

An analysis of recent development in extreme, high, and moderate wildfire hazard areas was conducted for Parker. A total of 340 structures was built between 2010 and 2014. The total

value of these structures is $146,423,713, with the majority located in the high wildfire hazard area. Results of this analysis are shown in Table E.17.

Table E.17. Parker Structures Built from 2010 to 2014: Assets Exposed to Wildfire by Hazard Level

Hazard Level	Total Parcel Count	Improved Parcel Count	Total Building Count	Improved Value	Estimated Content Value	Land Value	Total Value
High	108	108	132	$27,991,428	$14,121,352	$7,881,790	$49,994,570
Moderate	170	170	208	$51,157,664	$29,880,540	$15,390,939	$96,429,143
Total	**278**	**278**	**340**	**$79,149,092**	**$44,001,892**	**$23,272,729**	**$146,423,713**

Source: Douglas County GIS

Hazardous Materials: Transportation Incidents

Vulnerability to Hazardous Materials: Transportation Incidents

Likelihood of Future Occurrence—Low
Potential Magnitude—Medium
Overall Vulnerability—Medium

Hazardous materials are transported highways and railroads regularly, if not every day. Residential areas are located in the immediate vicinity of the corridors, potentially presenting a serious public health and safety concern if a hazardous materials incident were to occur in a populated area. GIS analysis was used to determine the number of people at potentially at risk to hazardous materials transportation incidents in Parker.

Population at Risk

To determine an estimate of populations at risk from a transportation-related hazardous materials release within identified transportation corridors, an analysis was performed using GIS. None of the hazardous materials corridors identified in this plan pass through Parker. Therefore, no at-risk populations were identified as part of this analysis. However, a hazardous materials spill in another part of the Planning Area could still affect Parker, depending on the nature of the spill, weather, wind speed and direction, etc.

Development Trends

Development in Parker occurs within existing city boundaries. As development in Parker continues to grow, more people will be at risk to hazardous materials transportation incidents.

E.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capability assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation outreach and partnerships, and other mitigation efforts.

E.6.1 Regulatory Mitigation Capabilities

Table E.18 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Town of Parker.

Table E.18. Town of Parker Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Y/N	Date	Comments
Comprehensive plan	Yes	2014	Master Plan 2035
Zoning ordinance	Yes	11-7-14	Master Plan 2035
Subdivision ordinance	Yes	11-7-14	Master Plan 2035
Growth management ordinance	Yes		Urban Growth Boundary-Mgmt. Tool
Floodplain ordinance	Yes	11-7-14	Master Plan 2035
Other special purpose ordinance (stormwater, steep slope, wildfire)	Yes	11-7-14	Master Plan 2035
Building code	Yes		2012 International Series, 2014 NEC
BCEGS Rating	Yes		3 - commercial, 4 - 1&2 Family Dwellings
Fire department ISO rating	Yes		ISO Rating 3
Erosion or sediment control program	Yes	2-2014	Storm Drainage & Environmental Criteria Manual
Stormwater management program	Yes		Storm Drainage & Environmental Criteria Manual
Site plan review requirements	Yes		Storm Drainage & Environmental Criteria Manual Section 8.4.1
Capital improvements plan	Yes		Annual - updated within annual budget
Economic development plan	Yes		Annual - updated within annual budget
Local emergency operations plan	Yes	6-2013	Town of Parker Emergency Ops. Plan
Community Wildfire Protection Plans	No		Incl. in Douglas County plans
Flood insurance study or other engineering study for streams	Yes		DFIRM Maps; annual stormwater review
Elevation certificates	No		Only Grading Certifications
Other			

Source: Amec Foster Wheeler Data Collection Guide

Master Plan (2014)

The Town of Parker Master Plan represents another step in the Town's on-going efforts to build and maintain a balanced, sustainable community. The Plan is a document that sets forth the policies for the future of the community and is designed to be a flexible "living" document that can be changed as the needs change for the Parker community. The planning horizon for the Plan is a focus of 20 years in the future and is a resource for community leaders to use as a guide in formulating future policies for the Town and guide growth and development.

Goals and policies related to mitigation of natural hazards are as follows:

Goal 12-2	**Locate development in areas free of environmental hazards and constraints.**
2.A.	Prohibit development within the 100-year floodplain unless associated with wildlife management, nonpolluting recreational uses, drainage improvements, or maintenance.
2.B.	Continue to prohibit development on slopes of 20% or greater and limit development on slopes of 15% or greater.
2.C.	Minimize disruption to the natural topography through creative site planning and through design and sensitive construction practices.

Goal 12-3	**Maintain high water quality and protect water resources.**
4.D.	Ensure that development adequately incorporates effective measures to protect groundwater and surface water from contamination.
4.E.	Ensure that development adequately incorporates design and engineering practices that minimize pollution of water resources from non-point sources (pavement water run-off) and point sources (discharge that can be linked to a specific source).
4.F.	Control short and long-term drainage and surface erosion or sedimentation problems.
4.I.	Implement stabilization and restoration projects to ensure natural drainageways are protected from the damaging effects of erosion.

Ordinances

The Town of Parker has many ordinances related to mitigation.

Zoning

The Town of Parker has adopted the Douglas County zoning code.

Chapter 13.05.010 Floodplain Regulations

(4) Methods of reducing flood losses.

In order to accomplish its purposes, this Section includes methods and provisions for:

a. Restricting or prohibiting uses which are dangerous to health, safety and property due to water or erosion hazards, or which result in damaging increases in erosion or in flood heights or velocities;

b. Requiring that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;

c. Controlling the alteration of natural floodplains, stream channels and natural protective barriers, which help accommodate or channel floodwaters;

d. Controlling, filling, grading, dredging and other development which may increase flood damage; and

e. Preventing or regulating the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards in other areas.

(2) Designation of the Floodplain Administrator.

The Public Works Director is hereby appointed to administer and implement this Section by granting or denying floodplain development permit applications in accordance with its provisions and other appropriate sections of 44 C.F.R. (National Flood Insurance Program Regulations) pertaining to floodplain management. The Public Works Director may assign a designee to act as the Floodplain Administrator.

(e) Provisions for flood hazard reduction.

(1) General standards. In all areas of special flood hazard, the following standards are required:

a. Anchoring.

1. All new construction and substantial improvements shall be anchored to prevent flotation, collapse or lateral movement of the structure and capable of resisting the hydrostatic and hydrodynamic loads.

2. All manufactured homes must be elevated and anchored to resist flotation, collapse or lateral movement and capable of resisting the hydrostatic and hydrodynamic loads. Methods of anchoring may include, but are not limited to, use of over-the-top or frame ties to ground anchors. This requirement is in addition to applicable state and local anchoring requirements for resisting wind forces. Specific requirements may be:

a) Over-the-top ties be provided at each of the four (4) corners of the manufactured home, with two (2) additional ties per side at intermediate locations, with manufactured homes less than fifty (50) feet long requiring one (1) additional tie per side;

b) Frame ties be provided at each corner of the home with five (5) additional ties per side at intermediate points, with manufactured homes less than fifty (50) feet long requiring four (4) additional ties per side;

c) All components of the anchoring system be capable of carrying a force of four thousand eight hundred (4,800) pounds; and

d) Any additions to the manufactured home be similarly anchored.

b. Construction materials and methods.

1. All new planned developments, subdivisions, site plans and building permits for new buildings shall preclude any development within a designated one-hundred-year floodplain, with the exception of necessary roads, utilities, trails and other facilities found to be acceptable to the Planning Commission and the Town Council. Buildable lots may be partially located within a one-hundred-year floodplain provided that the developer demonstrates that a buildable envelope, suitable in area and dimensions, is located entirely outside of the floodplain.

2. All substantial improvements shall be constructed with materials and utility equipment resistant to flood damage.

3. All substantial improvements shall be constructed using methods and practices that minimize flood damage.

4. All substantial improvements shall be constructed with electrical, heating, ventilation, plumbing and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.

c. Utilities.

1. All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of floodwaters into the system;

2. New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of floodwaters into the systems and discharge from the systems into floodwaters; and

3. On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding.

d. Subdivision proposals.

1. All subdivision proposals shall be consistent with the need to minimize flood damage;

2. All subdivision proposals shall have public utilities and facilities such as sewer, gas, electrical and water systems located and constructed to minimize flood damage;

3. All subdivision proposals shall have adequate drainage provided to reduce exposure to flood damage; and

4. Base flood elevation data shall be provided for subdivision proposals and other proposed development which contain at least fifty (50) lots or five (5) acres (whichever is less).

(2) Specific standards. In all areas of special flood hazard where base flood elevation data has been provided as set forth in Paragraph (c)(2) or Subparagraph (d)(3)b. above, the following provisions are required:

a. Residential construction. New construction and substantial improvement of any residential structure shall have the lowest floor (including basement), electrical, heating, ventilation, plumbing and air conditioning equipment elevated, at a minimum, to two (2) feet above the base flood elevation.

b. Nonresidential construction. New construction and substantial improvement of any commercial, industrial or other nonresidential structure shall either have the lowest floor (including basement) elevated to two (2) feet above the base flood elevation or, together with attendant utility and sanitary facilities, shall:

1. Be floodproofed so that below two (2) feet above the base flood elevation the structure is watertight with walls substantially impermeable to the passage of water;

2. Have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy; and

3. Be certified by a registered professional engineer or architect that the design and methods of construction are in accordance with accepted standards of practice for meeting the provisions of this Paragraph. Such certifications shall be provided to the Floodplain Administrator as set forth in Subparagraph (d)(3)c.2. above.

c. Critical facilities. All new and substantially changed critical facilities and new additions to critical facilities, shall have a minimum freeboard of two (2) feet above the 100-year-flood elevation (base flood elevation).

d. Openings in enclosures below the lowest floor. For all new construction and substantial improvements, fully enclosed areas below the lowest floor that are subject to flooding shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement must either be certified by a registered professional engineer or architect or must meet or exceed the following minimum criteria:

1. A minimum of two (2) openings having a total net area of not less than one (1) square inch for every square foot of enclosed area subject to flooding shall be provided;

2. The bottom of all openings shall be no higher than one (1) foot above grade;

3. Openings may be equipped with screens, louvers or other coverings or devices, provided that they permit the automatic entry and exit of floodwaters.

Community Rating System

The National Flood Insurance Program's (NFIP) Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting the three goals of the CRS which are to reduce flood losses, facilitate accurate insurance rating, and promote the awareness of flood insurance. The Town of Parker currently participates in the CRS and has a rating of 6. The Town of Parker has maintained a Class 6 rating since 2006, with the most recent verification visit by the CRS coordinator in 2013. Below is a summary of the Town's floodplain management programs that were provided during the verification visit:

Activity 310 – Elevation Certificates: The Town's Building Department maintains elevation certificates for new and substantially improved buildings. Copies of elevation certificates are made available upon request. Elevation certificates are also kept for post-FIRM buildings. (112 points)

Activity 320 – Map Information: The Town furnishes inquirers with flood zone information from the community's latest Flood Insurance Rate Map (FIRM), and publicizes the service annually in the monthly newsletter sent to all property owners. (140 points)

Activity 330 – Outreach Projects: A community brochure is mailed to all properties in the community on an annual basis (via Town monthly newsletter). (13 points)

Activity 340 – Hazard Disclosure: Credit is provided for the state regulation requiring disclosure of flood hazards. (12 points)

Activity 350 – Flood Protection Information: Credit is provided for floodplain information displayed on the Town's website. (12 points)

Activity 420 – Open Space Preservation: Credit is provided for preserving 855 acres in the Special Flood Hazard Area (SFHA) as open space. Credit is also provided for open space land that is deed restricted. (986 points)

Activity 430 – Higher Regulatory Standards: Credit is provided for enforcing regulations that require other higher regulatory standards, land development criteria, and state mandated regulatory standards. This credit is obtained through the Town's Stream Protection ordinance which was adopted by Council over 10 years ago. Credit is also provided for a BCEGS Classification of 4/3, adoption of the 2009 International Building Codes, and certification as a floodplain manager. (380 points)

Activity 450 – Stormwater Management: The Town enforces regulations for stormwater management, freeboard in non-SFHA zones, soil and erosion control, and water quality as provided in the Parker Storm Drainage and Environmental Criteria Manual and the associated programs and permits. (141 points)

Section 502 - Repetitive Loss Category: Parker is a Category A community for CRS purposes and no further action is required.

Activity 540 – Drainage System Maintenance: The Town's drainage system is inspected regularly throughout the year and maintenance is performed as needed by Town of Parker Public Works Department. Records are being maintained for both inspections and required maintenance through our Geographic Information System. The Town also enforces a regulation prohibiting dumping in the drainage system. (315 points)

Activity 630 – Dam Safety: All Colorado communities currently receive CRS credit for the state's dam safety program. (71 points)

E.6.2 Administrative/Technical Mitigation Capabilities

Table E.19 identifies the Town department(s) responsible for activities related to mitigation and loss prevention in Parker.

Table E.19. Town of Parker Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/Engineer with knowledge of land development/land management practices	Yes	Community Development	& Public Works staff
Engineer/Professional trained in construction practices related to buildings and/or infrastructure	Yes	Chief Building Official	& Civil Engineers

Personnel Resources	Yes/No	Department/Position	Comments
Planner/Engineer/Scientist with an understanding of natural hazards	Yes	Civil Engineers on staff	
Personnel skilled in GIS	Yes	Two specialists within IT	Department
Full time building official	Yes	Numerous within Building	Division
Floodplain Manager	Yes	Floodplain Administrator	is Public Works Director
Emergency Manager	Yes	Lieutenant with Parker PD	
Grant writer	No	Various individuals within	departments handle
Other personnel	Yes	Douglas County personnel	are available
GIS Data – Hazard areas	Yes	All floodplain maps/data	
GIS Data - Critical facilities	Yes	Locations and maps	
GIS Data – Building footprints	Yes	via aerial photography	
GIS Data – Land use	Yes	in GIS layers	
GIS Data – Links to Assessor's data	Yes	"	
Warning Systems/Services (Reverse 9-11, cable override, outdoor warning signals)	Yes		Code Red Mass Emergency Notification system
Other			

Source: Amec Foster Wheeler Data Collection Guide

E.6.3 Fiscal Mitigation Capabilities

Table E.20 identifies financial tools or resources that the Town could potentially use to help fund mitigation activities.

Table E.20. Town of Parker Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Y/N)	Comments
Community Development Block Grants	Yes	
Capital improvements project funding	Yes	
Authority to levy taxes for specific purposes	Yes, by Town Council	Ordinance and/or elections
Fees for water, sewer, gas, or electric services	No	
Impact fees for new development	Yes - Parker has Excise Tax	instead of Impact Fees
Incur debt through general obligation bonds	Yes	Requires an election approval
Incur debt through special tax bonds	No	
Incur debt through private activities	No	
Withhold spending in hazard prone areas	Yes	Per Council decision
Other		

Source: Amec Foster Wheeler Data Collection Guide

E.6.4 Mitigation Outreach and Partnerships

The Town's Stormwater Utility has designed and constructed numerous projects in the past 15 years focused on erosion and flood mitigation/protection. These projects include channel and stream stabilization projects that prevent damage to private properties and public infrastructure that can result from erosion. The Town has also constructed a number flood control projects including regional detention ponds and channel/infrastructure improvements during that time. Other programs include:

- A biennial Bridge Inspection and Maintenance Program
- Elevator inspections that occur semi-annually
- Periodic safety inspections performed by the Fire Authority

E.7 Mitigation Strategy

This section describes the mitigation strategy process and mitigation action plan for the Town of Parker' inclusion with the Douglas County Local Hazard Mitigation Plan update.

E.7.1 Mitigation Goals and Objectives

The Town of Parker adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy of the base plan.

E.7.2 Continued Compliance with the NFIP

As a participant of the National Flood Insurance Program (NFIP), the Town of Parker has administered floodplain management regulations that meet the minimum requirements of the NFIP. The management program objective is to protect people and property within the Town. The Town of Parker will continue to comply with the requirements of the NFIP in the future.

The Town's regulatory activities apply to existing and new development areas of the Town; implementing flood protection measures for existing structures and maintaining drainage systems. The goal of the program is to enhance public safety, and reduce impacts and losses while protecting the environment.

E.7.3 Mitigation Actions

The planning team for the Town of Parker identified and prioritized the following mitigation actions based on the risk assessment and in accordance with the process outline in Section 5, Mitigation Strategy, of the base plan. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. General processes and

information on plan implementation and maintenance of this LHMP by all participating jurisdictions is included in Section 7, Plan Implementation and Maintenance, of the base plan.

Town of Parker Action #1

Action Title:	Creation of Emergency Action Plan (EAP) for significant contamination of stored water in Rueter-Hess Reservoir (RHR)
Hazard:	Hazardous materials
Priority:	High
Project Description, Issue & Background:	Analysis and evaluation of various water contamination risks from natural or man-made sources, both intentional and accidental, resulting in an EAP. Due to the "slow-fill" nature of RHR any significant source of contamination must be quickly identified and contained, requiring well-thought out response and remediation plans.
Ideas for Implementation:	-Hold a brainstorming workshop to list & consider all known types of events that may lead to water contamination. -Evaluate, itemize and rank likelihood of occurrence. -Prepare mitigation and prevention plans for most probable events. -Prepare action plan(s), needed resources & call-down lists.
Other Alternatives:	No action
Responsible Agency:	Parker Water and Sanitation District (PWSD)
Partners:	Town of Parker, Douglas County, water storage partners
Potential Funding:	EMPG funds (Town of Parker), partner contributions
Cost Estimate:	$1,000 to $5,000
Benefits: (Losses Avoided)	-Prevention of very costly water treatment options, or in the worst case, draining of much or all of stored water. -Rapid response planning to minimize event impacts.
Timeline:	Completion by end of year 2017
Status:	New in 2015

Town of Parker Action #2

Action Title:	Achieving “Storm Ready Community” designation for Parker
Hazard:	Flood/thunderstorms/lightning/hail/severe winter storms
Priority:	Medium
Project Description, Issue & Background:	Receiving recognition via the National Weather Service (NWS) StormReady program means a community is better prepared for extreme weather events, has planned for infrastructure needs and developed expertise and systems for protecting property and minimizing the potential for loss of life. Continuous maintenance of Parker’s CRS rating of 6 or better is important.
Ideas for Implementation:	Public Works and the Town’s Office of Emergency Management (OEM) will collaborate in gathering existing documents and procedures (program requirements) and determine those elements under the StormReady guidelines remaining to be developed/completed, then finalize a work plan.
Other Alternatives:	No action
Responsible Agency:	Parker Public Works
Partners:	OEM & Parker Police Department
Potential Funding:	Departmental budgets and/or EMPG funds.
Cost Estimate:	$500 to $1,000
Benefits: (Losses Avoided)	Acquisition of additional Community Rating System points for NFIP, improve hazardous weather alerts and warnings for members of our Community; reduce public and private vulnerabilities to storms; recognition through StormReady signage.
Timeline:	Begin 3rd quarter 2015, completion by 2nd quarter 2016, renewal in 2019.
Status:	New in 2015

Annex F DENVER WATER

F.1 Introduction

This annex details the hazard mitigation planning elements specific to Denver Water, a participating special district to the Douglas County LHMP Update. This annex is not intended to be a standalone document, but appends to and supplements the information contained in the base plan document. As such, all sections of the base plan, including the planning process and other procedural requirements apply to and were met by Denver Water. This annex provides additional information specific to Denver Water, with a focus on providing additional details on the risk assessment and mitigation strategy for this entity.

F.2 Planning Process

As described above, Denver followed the planning process detailed in Section 3.0 of the base plan. In addition to providing representation on the Douglas County Hazard Mitigation Planning Committee (HMPC), Denver Water formulated their own internal planning team to support the broader planning process requirements. Internal planning participants included the following Denver Water staff:

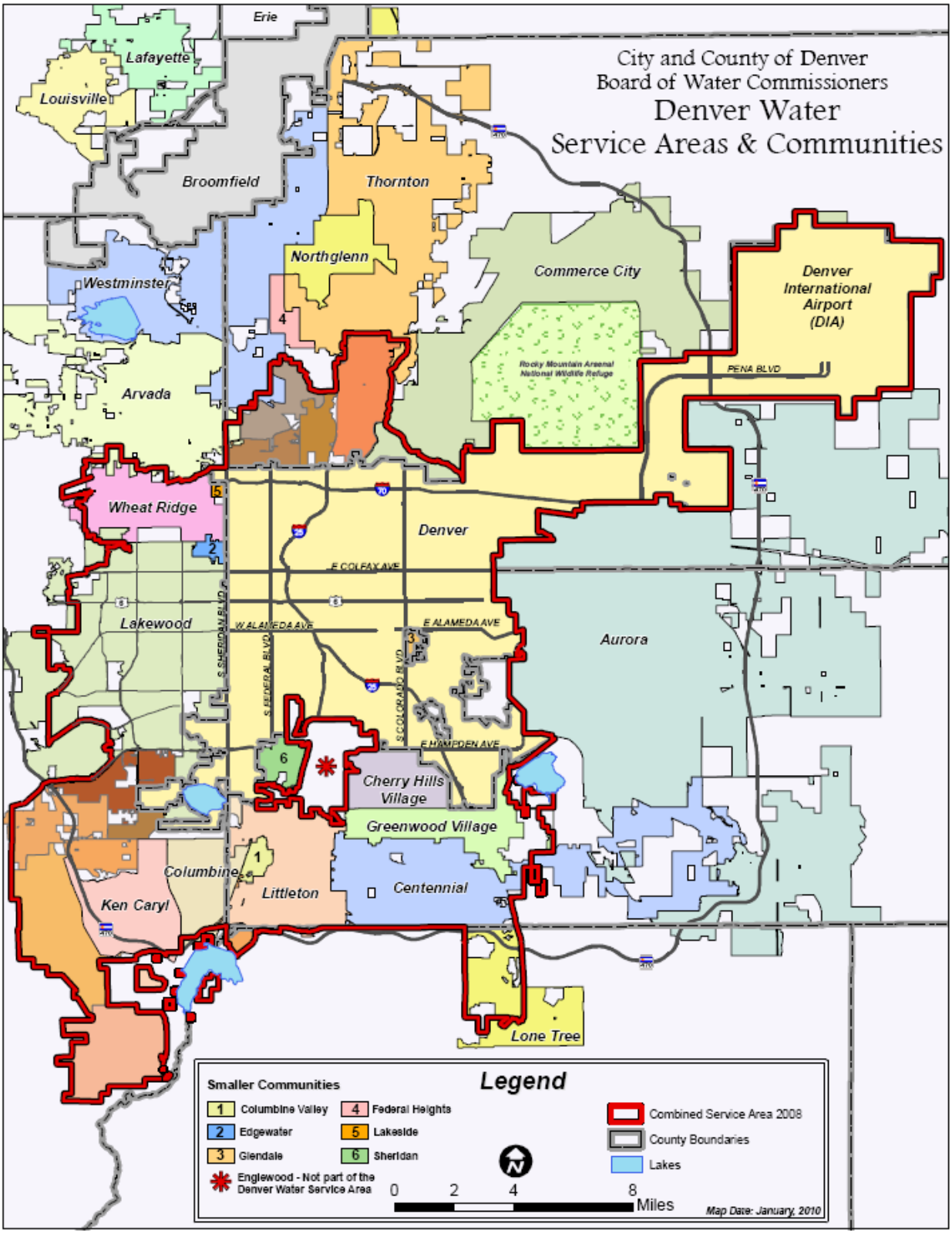
- Becky Franco, Denver Water Emergency Management

Additional details on plan participation and Denver Water representatives are included in Appendix A.

F.3 District Profile

Denver Water is an Article XX home-rule municipality governed by a board of five commissioners appointed by the Mayor as per Article X of the Denver City Charter. Denver Water provides water to approximately 1.5 million people in the Denver metropolitan area and is a property owner in Douglas County. Part of the City of Lone Tree and small area near Chatfield Reservoir lie within its service area. Denver Water is the State's oldest and largest water utility, established in 1918. It is funded by water rates and new tap fees, as opposed to taxes.

Figure F.1. Denver Water Service Area



F.4 Hazard Identification and Summary

Representatives of Denver Water identified the hazards that affect the District and summarized their geographic location, probability of future occurrence, potential magnitude or severity, and planning significance specific to the District and its facilities (see Table F.1). In the context of the countywide planning area, there are no hazards that are unique to Denver Water.

Table F.1. Denver Water—Hazard ID Table

Hazard	Spatial Extent	Likelihood of Future Occurrences	Magnitude /Severity	Significance
Avalanche	Limited	Low	Low	Low
Drought	Significant	High	Low	High
Earthquake	Significant	Low	Low	High
Flood: Dam Failure	Limited	Low	High	High
Flood: 100/500 year	Significant	Low	Medium	Medium
Flood: Localized/ Stormwater	Significant	Low	Low	Low
Landslides/ Mud & Debris Flows /Rockfalls	Limited	Low	Low	Low
Severe Weather: Extreme Heat	Extensive	Medium	Low	Low
Severe Weather: Hail	Significant	Medium	Medium	Low
Severe Weather: High Winds	Significant	Medium	Low	Low
Severe Weather: Lightning	Significant	Medium	Low	Low
Severe Weather: Thunderstorms/Heavy Rains	Extensive	Medium	Medium	Low
Severe Weather: Tornado	Limited	Medium	Low	Low
Severe Weather: Winter Weather (includes snow/ice/extreme cold)	Extensive	Medium	Low	Low
Soil Hazards: Erosion & Deposition	Limited	Medium	Low	Low
Soil Hazards: Expansive Soils	Limited	Medium	Low	Low
Soil Hazards: Subsidence	Limited	Medium	Low	Low
Wildfire	Extensive	High	Low	Low
Hazardous Materials: Transportation Incidents	Significant	Medium	Medium	Low

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

Likelihood of Future Occurrences
Low: Occurs less than once every 10 years or more
Medium: Occurs less than once every 5 to 10 years
High: Occurs once every year or up to once every five years

Magnitude/Severity
Low: Negligible property damages (less than 5% of all buildings and infrastructure) Negligible loss of quality of life. Local emergency response capability is sufficient to manage the hazard.
Medium: Moderate property damages (15% to 50% of all buildings and infrastructure) Some loss of quality of life. Emergency response capability, economic and geographic effects of the hazard are of sufficient magnitude to involve one or more counties.
High: Property damages to greater than 50% of all buildings and infrastructure. Significant loss of quality of life Emergency response capability, economic and geographic effects of the hazard are of sufficient magnitude to require federal assistance.

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

F.5 Vulnerability Assessment

The intent of this section is to assess Denver Water's vulnerability separately from that of the planning area as a whole, which has already been addressed in Section 4.3 Vulnerability Assessment in the base plan. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment.

F.5.1 District Asset Inventory

Table F.2 lists critical facilities and other community assets identified by the District as important to protect in the event of a disaster.

Table F.2. Denver Water—Critical Facilities and Other Community Assets

Name of Asset	Facility Type	Replacement Value	Hazard Specific Info/Comments
Cheesman Dam and Reservoir	Dam and reservoir	$300 million	
Cheesman Dam Valve House	Valve house	$30 million	
Conduit 20 Diversion Dam (Marston Intake Dam)	Dam	$15 million	
Conduit 26	Conduit	$4 million (1,900 ft buried pipe)	
Foothills Spray Application Pump Station	Pump station	$1 million	
Foothills Treatment Plant	Treatment Plant	$600 million	
Foothills Overflow Holding Pond	Pond	$5 million	
High Line Canal Diversion Dam	Dam	$5 million	
High Line Canal Waterton Canyon	Canal		
Lone Tree Pump Station	Pump station	$10 million	
Lone Tree Treated Reservoir No. 1	Reservoir		
Lone Tree Treated Reservoir No. 2	Reservoir		
Platte Canyon Dam and Reservoir	Dam and reservoir	$25 million	
Strontia Springs Dam and Reservoir	Dam and reservoir	$400 million	

Sources: Denver Water

F.5.2 Priority Hazards: Vulnerability Assessment

This section examines those existing and future structures and other assets at risk to hazards ranked of medium or high significance that vary from the risks facing the entire planning area and estimates potential losses. The medium and high significance hazards for Denver Water include drought, earthquake, dam failure, and 100/500-year flooding.

An estimate of the vulnerability of Denver Water to each identified hazard, in addition to the estimate of risk of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.

Drought

Vulnerability to Drought

Likelihood of Future Occurrence—High
Potential Magnitude—Low
Overall Vulnerability—High

Drought is different than many of the other natural hazards in that it is not a distinct event and usually has a slow onset. Drought can severely impact a region both physically and economically. Drought affects different sectors in different ways and with varying intensities. Adequate water is the most critical issue for agricultural, manufacturing, tourism, recreation, and commercial and domestic use. As the population in the area continues to grow, so too will the demand for water.

The most significant qualitative impacts associated with drought in Denver Water are those related to water intensive activities such as wildfire protection and municipal usage. Mandatory conservation measures are typically implemented by the municipalities during extended droughts. A reduction of electric power generation and water quality deterioration are also potential problems. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding.

It is difficult to quantitatively assess drought impacts to Denver Water's service area within Douglas County. Some factors to consider include the impacts of drawdown of the groundwater table. In early 2015, Denver Water met with Douglas County, the South Metro Water, Infrastructure and Supply (WISE) Authority, and Aurora to discuss reserving a certain amount of WISE Project water for Douglas County to reduce the latter's dependence on groundwater. The County can choose to make the reserved water available if needed between now and January 2021.[1]

[1] Denver Water Board of Commissioners meeting summary, January 28, 2015. http://www.denverwater.org/docs/assets/F81AC0D6-FD97-FC5D-040C55F6AAEAC255/II-B-1.pdf, accessed April 6, 2015.

Development Trends

Drought vulnerability will increase with future development as there will be increased demands for limited water resources. Denver Water can mitigate drought impact by supporting water conservation measures such as water use audits, wastewater reuse, and water efficient transmission.

Earthquake

Vulnerability to Earthquake

Likelihood of Future Occurrence—Low
Potential Magnitude—Low
Overall Vulnerability—High

Ground shaking is the primary earthquake hazard, but cascading impacts can include landslides, rockfall, dam failure and ground failure. Many factors affect the survivability of structures and systems from earthquake-caused ground motions. These factors include proximity to the fault, direction of rupture, epicenter location and depth, magnitude, local geologic and soils conditions, types and quality of construction, building configurations and heights, and comparable factors that relate to utility, transportation, and other network systems. Ground motions become structurally damaging when average peak accelerations reach 10 to 15% of gravity, average peak velocities reach 8 to 12 centimeters per second, and when the Modified Mercalli Intensity Scale is about VII (18-34% peak ground acceleration), which is considered to be very strong (general alarm; walls crack; plaster falls).

Potential earthquake impacts specific to Denver Water were not available but the primary concern is damage to water infrastructure and dams. The HAZUS-MH 2.1 analysis provided in Section 4.3.4 in the base plan is countywide and does not differentiate water infrastructure impacts specific to Denver Water. HAZUS does indicate an estimated $316M in potable water systems within the County. The 2,500 year probabilistic analysis results in 64 potable water pipeline leaks and 16 water pipeline breaks.

Development Trends

Damage to dams caused by earthquakes would be of particular concern to the District. Utilizing high development standards for dams and developing and exercising EAPs can help mitigate the impact of damages caused by earthquakes.

Flood: Dam Failure

Vulnerability to Dam Failure

Likelihood of Future Occurrence—Low
Potential Magnitude—High
Overall Vulnerability—High

A catastrophic dam failure would challenge local response capabilities and require timely evacuations to save lives in Denver Water's service area. Impacts to life safety would depend on the warning time available and the resources to notify and evacuate the public. Major loss of life could result as well as potentially catastrophic effects to roads, bridges, and homes. Associated water quality and health concerns could also be an issue. Due to homeland security concerns specific impacts are not included here. The economic impacts of a failure of a Denver Water-owned dam to the district would be considerable, in addition to water supply consequences that could impact multiple jurisdictions.

Development Trends

Flooding due to a dam failure event is likely to exceed the special flood hazard areas regulated through local floodplain ordinances. Denver Water should work with municipalities that are considering permitting development downstream of the high and significant hazard dams in Douglas County. Low hazard dams could become significant or high hazard dams if development occurs below them. Regular monitoring of dams, exercising and updating of EAPs, and rapid response to problems when detected at dams are ways to mitigate the potential impacts of these rare, but potentially catastrophic, events.

Flood: 100/500-Year

Vulnerability to 100/500-Year Flooding

Likelihood of Future Occurrence—Low
Potential Magnitude—Medium
Overall Vulnerability—Medium

The Planning Area, including Denver Water's service area within the County, is prone to very intense rainfall. Floods have resulted from storms covering large areas with heavy general rainfall as well as from storms covering small area with extremely intense rainfall. For specific details on flooding issues in the City of Lone Tree within the service area, refer to Annex D.

Development Trends

The risk of flooding to future development can be minimized through flood ordinances and zoning. The individual municipalities ultimately have authority over these ordinances. Denver Water can utilize GIS mapping and floodplain mapping to ensure that future facilities are located outside of flood hazard areas.

Wildfire

Vulnerability to Wildfire

Likelihood of Future Occurrence—High
Potential Magnitude—Low

Overall Vulnerability—Low

Watersheds and the numerous associated reservoirs in Denver Water's service area in Douglas County could be significantly impacted by high severity wildfire. For example, the damage to Strontia Springs Reservoir caused by siltation from the 1996 Buffalo Creek Fire took fifteen years to complete and cost Denver Water over $30 million.

Watersheds can be considered as assets in their own right. Consultation with those water supply agencies with facilities, reservoirs, and properties should be included in mitigation discussions, and are in fact required to take part since the passage of Colorado House Bill 09-1162. Further consultation with members of a Burned Area Emergency Response Team may provide further guidance in mitigating and preparing for the effects of wildfire in a watershed.

Large wildfires have occurred in Denver Water's service area in Douglas County. From May 21-29, 2002, the Schoonover Fire burned 23 acres of Denver Water property near Cheesman Reservoir. In June of that same year, the Hayman Fire burned 4,245 acres of Denver Water property. More recently, the Foothills Fire burned four acres of Denver Water property near the Foothills Water Treatment Plant on July 4, 2014.

Development Trends

Continued growth of Douglas County's population will generally mean an expanded WUI and potential exposure of buildings, water infrastructure, and people. Additional water infrastructure in the WUI should be built with fire resistance in mind.

F.5.3 Growth and Development Trends

Denver Water does not have authority to manage growth or development within its district.

F.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. The capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation outreach and partnerships, and other mitigation efforts.

F.6.1 Regulatory Mitigation Capabilities

Regulatory mitigation capabilities include the planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities. Table F.3 lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Denver Water. Many of the regulatory capabilities used by local jurisdictions are not applicable to Denver Water.

Table F.3. Denver Water Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Y/N	Date	Comments
Comprehensive plan	N/A		
Zoning ordinance	N/A		
Subdivision ordinance	N/A		
Growth management ordinance	N/A		
Floodplain ordinance	N/A		
Other special purpose ordinance (stormwater, steep slope, wildfire)	N/A		
Building code	N/A		
BCEGS Rating			
Fire department ISO rating	N/A		
Erosion or sediment control program	N/A		
Stormwater management program	N/A		
Site plan review requirements	N/A		
Capital improvements plan	Yes		
Economic development plan	N/A		
Local emergency operations plan	Yes	8/2010	Denver Water implemented a new emergency management program for their utility to develop a comprehensive EM program that interfaces with all county EMS.
Community Wildfire Protection Plans			
Flood insurance study or other engineering study for streams	N/A		
Elevation certificates	N/A		
Other			Drought Response Plan All high hazard dams are required to have Emergency Action Plans (EAPs). Also have treatment and distribution plans.

Source: Amec Foster Wheeler Data Collection Guide

F.6.2 Administrative/Technical Mitigation Capabilities

Table F.4 identifies the personnel responsible for activities related to mitigation and loss prevention in Denver Water.

Table F.4. Denver Water Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/Engineer with knowledge of land development/land management practices			
Engineer/Professional trained in construction practices related to buildings and/or infrastructure	Y	Engineering	
Planner/Engineer/Scientist with an understanding of natural hazards	Y	Planning/Emergency Management	
Personnel skilled in GIS	Y	GIS/IT	
Full time building official			
Floodplain Manager	1	Emergency Management Section	
Emergency Manager	2	Emergency Management Section	
Grant writer			
Other personnel			
GIS Data – Hazard areas			
GIS Data - Critical facilities	Y		
GIS Data – Building footprints			
GIS Data – Land use			
GIS Data – Links to Assessor's data			
Warning Systems/Services (Reverse 9-11, cable override, outdoor warning signals)	1	Emergency Management Section	
Other			

Source: Amec Foster Wheeler Data Collection Guide

F.6.3 Fiscal Mitigation Capabilities

Fiscal mitigation capabilities are financial tools or resources that Denver Water could or already does use to help fund mitigation activities. Denver Water has received funding for watershed improvements from the Colorado State Forest Service.

F.6.4 Mitigation Outreach and Partnerships

Denver Water has public education programs related to water conservation, drought response, water quality, and a very active youth education program focusing on a variety of water-related topics. Additionally, Denver Water has a public affairs division that provides media relations, social media, marketing, publications, internal communication, stakeholder relations, government relations, community outreach, and website communications for both our combined service area of 1.3 million people and for the communities where Denver Water's watersheds and facilities are located.

F.6.5 Past Mitigation Efforts

Denver Water has partnered with USFS to improve forest and watershed conditions in parts of Colorado by implementing hazardous fuels treatments and removing hazardous biomass. Forests play a role in protecting areas important to surface drinking water. USFS maps these areas using GIS before working with Denver Water on fuels treatment projects. This effort is part of the Forests to Faucets program.

F.7 Mitigation Goals and Objectives

Denver Water has adopted the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

F.8 Mitigation Actions

The planning team for Denver Water identified and prioritized the following mitigation actions based on the risk assessment and in accordance with the process outline in Section 5, Mitigation Strategy, of the base plan. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. General processes and information on plan implementation and maintenance of this LHMP by all participating jurisdictions is included in Section 7, Plan Implementation and Maintenance, of the base plan.

Denver Water Action #1

Action Title:	**Flood inundation maps**
Hazard:	Flood
Priority:	High
Project Description, Issue & Background:	New maps of Cheesman, Strontia, Platte Canyon and Robert's Tunnel reservoirs need to be updated to include the FEMA and FERC requirements of high waters, 100/500 storm waters, etc. and this will include a hydrology study and the critical infrastructure.
Ideas for Implementation:	
Other Alternatives:	No action
Responsible Agency:	Denver Water
Partners:	Douglas County OEM/GIS
Potential Funding:	Yes
Cost Estimate:	$80,000
Benefits: (Losses Avoided)	Pre-planning efforts for catastrophic dam failure. Warning, evacuation planning, etc.
Timeline:	2016-2021
Status:	New in 2015

Denver Water Action #2

Action Title:	**Watershed protection**
Hazard:	Wildfire
Priority:	High
Project Description, Issue & Background:	Continue with the watershed protection plan with United State Forest Service (USFS). This project entails forest hazardous fuels reduction in the Pike National Forest and is based on contract acreage with the USFS. The Pike National Forest includes Jefferson, Douglas, Teller and Park counties. There will be over 25,000 acres treated in this project.
Ideas for Implementation:	
Other Alternatives:	No action
Responsible Agency:	Denver Water
Partners:	Including both what the USFS is paying for and what DW is contributing
Potential Funding:	Yes
Cost Estimate:	
Benefits: (Losses Avoided)	Reduce potential frequency and magnitude of wildfires in project area
Timeline:	Completed through 2017 or earlier.
Status:	New in 2015

Denver Water Action #3

Action Title:	**Training/exercising at Foothills Treatment Plant**
Hazard:	Wildfire
Priority:	Medium
Project Description, Issue & Background:	Roll out emergency response plan training and conduct tabletop and functional exercises with local first response agencies at the Foothills treatment plant.
Ideas for Implementation:	
Other Alternatives:	No action
Responsible Agency:	Denver Water
Partners:	Douglas County OEM/Sheriff/West Metro Fire
Potential Funding:	Yes
Cost Estimate:	$10,000
Benefits: (Losses Avoided)	Pre-planning and response coordination
Timeline:	To be completed between 2016-2020
Status:	New in 2015

Denver Water Action #4

Action Title:	**Public education and outreach**
Hazard:	Dam failure and drought
Priority:	Medium
Project Description, Issue & Background:	Continue with public education and outreach efforts on dam safety, water conservation, drought, etc. Producing presentations, brochures, etc.
Ideas for Implementation:	
Other Alternatives:	No action
Responsible Agency:	Denver Water
Partners:	Douglas County OEM
Potential Funding:	Yes
Cost Estimate:	Low
Benefits: (Losses Avoided)	Pre-planning and response coordination
Timeline:	To be completed between 2016-2020
Status:	New in 2015

Denver Water Action #5

Action Title:	**Sediment removal from Strontia Springs Dam**
Priority:	Low to Medium
Project Description, Issue & Background:	Flush sediment from the reservoir. Sediment run-off due to several major forest fires followed by regular storm events has caused a build-up of sediment within the reservoir. Continued sediment inflow without a plan to remove it efficiently can become a long-term Dam Safety and Operational issue if the sediment plume reaches the dam.
Ideas for Implementation:	Install new slide gates on the upstream and downstream sides of the river bypass tunnel which was left in place after the construction of the dam. Once the gates are in place, the concrete plug within the tunnel can be removed and the reservoir will be flushed to remove accumulated sediment. The flushing can then occur on regular intervals to control the level of sediment accumulation.
Other Alternatives:	No action
Responsible Agency:	Denver Water
Partners:	City of Aurora
Potential Funding:	Yes
Cost Estimate:	$8,000,000
Benefits: (Losses Avoided)	Pre-planning and response coordination
Timeline:	Estimated completion between 2016-2021, pending modeling to confirm idea above and any necessary permitting.
Status:	New in 2015

Denver Water Action #6

Action Title:	**Defensible space in Waterton Canyon**
Priority:	Low to Medium
Project Description, Issue & Background:	To establish defensible space around critical infrastructure on Denver Water properties located in Waterton Canyon.
Ideas for Implementation:	
Other Alternatives:	No action
Responsible Agency:	Denver Water
Partners:	
Potential Funding:	Yes
Cost Estimate:	$10,000
Benefits: (Losses Avoided)	Reduce wildfire risk and magnitude
Timeline:	Estimated completion between 2016-2021
Status:	New in 2015

APPENDIX A: PLANNING PROCESS MATERIALS

HMPC invite lists, meeting agendas, meeting sign-in sheets, and emails are documented on the following pages.

Table A.1. HMPC and Steering Committee Members

Name	Jurisdiction/Position	HMPC	Steering Committee
Anne Walton	Douglas County FFESS	X	
Arlen Goertzen	Town of Larkspur	X	
Art Morales	Castle Rock Fire Chief	X	X
Barbara Drake	Douglas County Admin	X	
Becky Barnes	Citizen		X
Becky Franco	Denver Water Emergency Manager	X	
Bill Sparkman	Citizen	X	X
Brad Meyering	Castle Pines Public Works	x	X
CJ Lay	DCCO	X	
Connie Pipes	Douglas County Finance	X	
Dan Escobedo	USFS – Pike National Forest	X	
Dan Montague	HRCA Rec Centers	X	
Dave House	Douglas County Open Space	X	
David Mallory	Urban Drainage and Flood Control District	X	
David Van Dellen	Town of Castle Rock	X	
Don Bammes	Citizen		X
Don Van Wormer	Castle Pines	X	
Doug Barnes	Citizen		X
Ed Seal	Douglas County Sheriff's Office	X	
Garth Englund	Douglas County Floodplain Manager	X	X
Gary Goldsberry	CDOT	X	
Greg Weeks	Lone Tree Floodplain Administrator	x	X
J. Romann	Douglas County CO	X	
Jason Finehout	Denver Water Floodplain Manager		X
Jeff Case	Highlands Ranch Metropolitan District	X	
Jill Alexander	Douglas County	X	
Jim Olsen	Littleton OEM	X	
Justin Olson	Colorado Parks and Wildlife	X	
Kelly Dunnawa	Douglas County	X	
Ken Joseph	Highlands Ranch Community Association	X	
Kevin Devine	Colorado Department of Transportation	X	
Kevin Stewart	Urban Drainage and Flood Control District	X	
Kristin Garrison	Colorado State Forest Service	X	
Lee Abbott	Citizen		X

Name	Jurisdiction/Position	HMPC	Steering Committee
Leonard Cheslock	Douglas County Traffic	X	
Loretta Bortagni	Douglas County Libraries	X	
Martha Marshall	Douglas County Finance	X	
Matt Krimmer	Larkspur Town Manager		X
Matt Ziska	Xcel Energy	X	
Merlin Klotz	Parker Water	X	
Michael Perret-Gentil	Tri-County Health Department	X	
Mike Sutherland	Parker	X	
Mike Waid	Parker Floodplain Manager		X
Patty Moschner	Douglas County Sheriff's Office	X	
Phillip Anderle	CDOT/TSMO	X	
Randy Burkhardt	Douglas County Parks	X	
Rebecca Mobley	Town of Larkspur	X	
Robert Wareham	Citizen		X
Rod Meredith	Douglas County Public Works Operations	X	
Ron Hanavan	Douglas County Sheriff's Office	X	
Sara Crowe	Parker	X	
Sara Garrington	Tri-County Health Department	X	
Sharon Roman	Town of Larkspur	X	
Steve Koster	Douglas County Planning	X	
Taylor Goertz	Lone Tree Public Works	X	
Terry Nolan	Highlands Ranch Metropolitan District	X	
Tim Johnson	Douglas County Emergency Manager	X	
Tim Ralph	Douglas County Sheriff's Office	X	
Tom Repp	Douglas County Public Works	X	
Tom Williams	Town of Parker	X	
Vicki McPherson	Douglas County Treasurer's Office	X	
Vicky Starkey	Douglas County FFESS	X	
Virginia Scally	Citizen	X	X

PARTNERSHIP OF
DOUGLAS COUNTY GOVERNMENTS
COLLABORATE • INNOVATE • LEAD
100 North Wilcox Street • Castle Rock, Colorado 80104

Wednesday, July 16, 2014
7:00 – 9:30 a.m.
Host: Highlands Ranch Metro District
Location: Highlands Ranch Mansion 9950 E Gateway Dr.
Highlands Ranch, CO 80126

Meeting Agenda

7:00 a.m. **Breakfast/Networking**

7:30 a.m. **Call to Order and Introductions – Jeffrey T. Huff, Mayor, City of Castle Pines**

7:35 a.m. **Welcome and Jurisdictional Updates**

1. Town of Parker
2. City of Castle Pines
3. Douglas County Libraries
4. Douglas County
5. City of Lone Tree
6. Town of Larkspur
7. Town of Castle Rock
8. Highlands Ranch Metro District
9. Douglas County School District
10. Guests

8:35 a.m. Overview of Boardroom to Barnyard Event and County Fair – Commissioner Partridge

8:50 a.m. DC Citizen Survey – Wendy Holmes

9:10 a.m. Recovery Plan/Hazard Mitigation – Vicky Starkey

9:30 a.m. Adjourn

Next Partnership Meeting – 7:00 a.m. - Wednesday, August 20 – Hosted by Douglas County School Dist.

DOUGLAS COUNTY
SHERIFF'S OFFICE

Tony G. Spurlock, Sheriff

August 29, 2014

Tim Johnson, Director
Office of Emergency Management
4000 Justice Way
Castle Rock, CO 80109

Dear Don,

Douglas County has begun the formal planning process to develop our Hazard Mitigation Plan (HMP). Your jurisdiction is a vital piece of this comprehensive plan for Douglas County. We are listing the City of Castle Pines as a participating jurisdiction to the plan.

As a participating jurisdiction to the HMP, we are requesting that information about your jurisdiction be made available to enhance the overall plan. This will also give you the opportunity to adopt the plan as your own. The benefit from your participation is the ability to identify mitigation projects and apply for FEMA grant funds.

We are working with AMEC, and they have drafted the attached Letter of Commitment for your review and approval. Once you have signed the original, please return it to me at the above address. In additional, the data collection guide is attached for your information.

Thanks for the opportunity to include you in this important process. We trust this plan will be beneficial to your jurisdiction.

Sincerely,

Tim Johnson

Robert A. Christensen Justice Center
4000 Justice Way
Castle Rock, CO 80109

303.660.7505
www.dcsheriff.net
dcso@dcsheriff.net

Tim Johnson

From:	Tim Johnson
Sent:	Friday, August 29, 2014 9:44 AM
To:	'don.vanwormer@castlepinesgov.com'
Cc:	Anne Walton; Holly Nicholson-Kluth; Victoria Starkey; Doug DeBord
Subject:	Updated Douglas County Hazard Mitigation Plan
Attachments:	8 27 2014 Letter Regarding Commitment to Municipal Managers.docx; Douglas County LHMP Data Collection Guide.docx; City of Castle Pines Ltr.pdf

Don, we are working with AMEC to complete our updated County Hazard Mitigation Plan. I have attached a letter asking for your jurisdiction's support as a 'participating jurisdiction' along with the email from AMEC sent out after our kick-off meeting on August 19. I have also included a couple of additional attachments from the contractor. Please let me know if you have questions.

Thanks,
Tim Johnson
Director,
Douglas County Office of Emergency Management
303-660-7589

All,

I appreciate everyone's attendance at the kickoff meeting of the planning team for the Douglas County Hazard Mitigation Plan Update. As discussed, Douglas County is taking the lead on the development of a Hazard Mitigation Plan Update to the 2010 DRCOG Regional Plan. Unincorporated Douglas County and each of the incorporated communities are considered participating jurisdictions for purposes of this plan update. As such, there are certain participation requirements expected of your jurisdictions:

Participate in the process/attend and participate in HMPC meetings;
Provide details about their specific geographical planning area where the risk in their area differs from that experienced by the entire area;
Provide additional data from your jurisdiction as requested;
Identify specific projects to be eligible for funding;
Review and provide/coordinate comments on the draft plans;
Advertise, coordinate and participate in the public input process; and
Coordinate the formal adoption of the plan by the governing board

I am attaching a couple of documents to facilitate the plan development process and inclusion of your community as a participating jurisdiction to the plan update. Being included as a participating jurisdiction will provide your community with formal FEMA approval of the plan that entitles you to pursue FEMA grant funding as an applicant.

***Letter of Commitment** – please complete, sign and forward the letter of commitment to the County leads for this project and copy myself as these letters will be included in the planning process documentation.*

***Data Collection Guide** – This guide is prepared to provide an overview of the process and includes several worksheets to be completed by each participating jurisdiction and returned to us. Completion of the worksheets meets two primary objectives:*

1. *Provides input necessary to prepare annexes for each participating jurisdiction and as required for FEMA approval of individual jurisdictions.*
2. *Serves as documentation of participation by participating jurisdictions in the plan update.*

Note that as part of the planning team, you will also be receiving another email that provides an Historic Hazard Worksheet. This is actually the same as Worksheet #2 in your Data Collection Guide. As instructed in the email that follows, please complete the worksheet for significant hazard events that have impacted the Douglas County planning

area that, 1) were not included in the 2010 DRCOG regional plan specific to Douglas County, or 2) hazard events occurring since the 2010 plan. A link to the 2010 DRCOG plan is provided below.

https://www.drcog.org/documents/2010%20Denver%20Metro%20NHMP%20Final.pdfy

When completing the attached worksheet, to the extent data is available, please indicate which areas of the County were affected by an event with a focus on providing specifics for your jurisdiction.

Thanks again for everyone's help and participation. We will start work on the risk assessment portion of the plan and will provide follow up information on our next planning team meeting. Also, please plan on attending the first public meeting for this project at the Douglas County Events Center conference room at 6 pm on September 19th. We will send reminders as we get closer.

Please feel free to contact me via email or at the following number if you have additional questions.

Thanks,

Jeanine Foster
AMEC Environment & Infrastructure
(303) 717-7171

DOUGLAS COUNTY
SHERIFF'S OFFICE

Tony G. Spurlock, Sheriff

August 29, 2014

Tim Johnson, Director
Office of Emergency Management
4000 Justice Way
Castle Rock, CO 80109

Dear Mark,

Douglas County has begun the formal planning process to develop our Hazard Mitigation Plan (HMP). Your jurisdiction is a vital piece of this comprehensive plan for Douglas County. We are listing the Town of Castle Rock as a participating jurisdiction to the plan.

As a participating jurisdiction to the HMP, we are requesting that information about your jurisdiction be made available to enhance the overall plan. This will also give you the opportunity to adopt the plan as your own. The benefit from your participation is the ability to identify mitigation projects and apply for FEMA grant funds.

We are working with AMEC, and they have drafted the attached Letter of Commitment for your review and approval. Once you have signed the original, please return it to me at the above address. In additional, the data collection guide is attached for your information.

Thanks for the opportunity to include you in this important process. We trust this plan will be beneficial to your jurisdiction.

Sincerely,

Tim Johnson

Robert A. Christensen Justice Center
4000 Justice Way
Castle Rock, CO 80109

303.660.7505
www.dcsheriff.net
dcso@dcsheriff.net

Tim Johnson

From:	Tim Johnson
Sent:	Friday, August 29, 2014 9:28 AM
To:	'mstevens@crgov.com'
Cc:	Holly Nicholson-Kluth; Victoria Starkey; Doug DeBord; Anne Walton
Subject:	Updated Douglas County Hazard Mitigation Plan
Attachments:	8 27 2014 Letter Regarding Commitment to Municipal Managers.docx; Douglas County LHMP Data Collection Guide.docx; Town of Castle Rock ltr.pdf

Mark, we are working with AMEC to complete our updated County Hazard Mitigation Plan. I have attached a letter asking for your jurisdiction's support as a 'participating jurisdiction' along with the email from AMEC sent out after our kick-off meeting on August 19. I have also included a couple of additional attachments from the contractor. Please let me know if you have questions.

Thanks,
Tim Johnson
Director,
Douglas County Office of Emergency Management
303-660-7589

All,

I appreciate everyone's attendance at the kickoff meeting of the planning team for the Douglas County Hazard Mitigation Plan Update. As discussed, Douglas County is taking the lead on the development of a Hazard Mitigation Plan Update to the 2010 DRCOG Regional Plan. Unincorporated Douglas County and each of the incorporated communities are considered participating jurisdictions for purposes of this plan update. As such, there are certain participation requirements expected of your jurisdictions:

Participate in the process/attend and participate in HMPC meetings;
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Provide additional data from your jurisdiction as requested;
Identify specific projects to be eligible for funding;
Review and provide/coordinate comments on the draft plans;
Advertise, coordinate and participate in the public input process; and
Coordinate the formal adoption of the plan by the governing board

I am attaching a couple of documents to facilitate the plan development process and inclusion of your community as a participating jurisdiction to the plan update. Being included as a participating jurisdiction will provide your community with formal FEMA approval of the plan that entitles you to pursue FEMA grant funding as an applicant.

***Letter of Commitment** – please complete, sign and forward the letter of commitment to the County leads for this project and copy myself as these letters will be included in the planning process documentation.*

***Data Collection Guide** – This guide is prepared to provide an overview of the process and includes several worksheets to be completed by each participating jurisdiction and returned to us. Completion of the worksheets meets two primary objectives:*

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area that, 1) were not included in the 2010 DRCOG regional plan specific to Douglas County, or 2) hazard events occurring since the 2010 plan. A link to the 2010 DRCOG plan is provided below.

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When completing the attached worksheet, to the extent data is available, please indicate which areas of the County were affected by an event with a focus on providing specifics for your jurisdiction.

Thanks again for everyone's help and participation. We will start work on the risk assessment portion of the plan and will provide follow up information on our next planning team meeting. Also, please plan on attending the first public meeting for this project at the Douglas County Events Center conference room at 6 pm on September 19th. We will send reminders as we get closer.

Please feel free to contact me via email or at the following number if you have additional questions.

Thanks,

Jeanine Foster
AMEC Environment & Infrastructure
(303) 717-7171

DOUGLAS COUNTY
SHERIFF'S OFFICE

Tony G. Spurlock, Sheriff

August 29, 2014

Tim Johnson, Director
Office of Emergency Management
4000 Justice Way
Castle Rock, CO 80109

Dear Matt,

Douglas County has begun the formal planning process to develop our Hazard Mitigation Plan (HMP). Your jurisdiction is a vital piece of this comprehensive plan for Douglas County. We are listing the Town of Larkspur as a participating jurisdiction to the plan.

As a participating jurisdiction to the HMP, we are requesting that information about your jurisdiction be made available to enhance the overall plan. This will also give you the opportunity to adopt the plan as your own. The benefit from your participation is the ability to identify mitigation projects and apply for FEMA grant funds.

We are working with AMEC, and they have drafted the attached Letter of Commitment for your review and approval. Once you have signed the original, please return it to me at the above address. In additional, the data collection guide is attached for your information.

Thanks for the opportunity to include you in this important process. We trust this plan will be beneficial to your jurisdiction.

Sincerely,

Tim Johnson

Robert A. Christensen Justice Center
4000 Justice Way
Castle Rock, CO 80109

303.660.7505
www.dcsheriff.net
dcso@dcsheriff.net

Tim Johnson

From: Tim Johnson
Sent: Friday, August 29, 2014 9:39 AM
To: 'mkrimmer@townoflarkspur.org'
Cc: Anne Walton; Holly Nicholson-Kluth; Victoria Starkey; Doug DeBord
Subject: Updated Douglas County Hazard Mitigation Plan
Attachments: 8 27 2014 Letter Regarding Commitment to Municipal Managers.docx; Douglas County LHMP Data Collection Guide.docx; Town of Larkspur Ltr.pdf

Matt, we are working with AMEC to complete our updated County Hazard Mitigation Plan. I have attached a letter asking for your jurisdiction's support as a 'participating jurisdiction' along with the email from AMEC sent out after our kick-off meeting on August 19. I have also included a couple of additional attachments from the contractor. Please let me know if you have questions.

Thanks,
Tim Johnson
Director,
Douglas County Office of Emergency Management
303-660-7589

All,

I appreciate everyone's attendance at the kickoff meeting of the planning team for the Douglas County Hazard Mitigation Plan Update. As discussed, Douglas County is taking the lead on the development of a Hazard Mitigation Plan Update to the 2010 DRCOG Regional Plan. Unincorporated Douglas County and each of the incorporated communities are considered participating jurisdictions for purposes of this plan update. As such, there are certain participation requirements expected of your jurisdictions:

Participate in the process/attend and participate in HMPC meetings;
Provide details about their specific geographical planning area where the risk in their area differs from that experienced by the entire area;
Provide additional data from your jurisdiction as requested;
Identify specific projects to be eligible for funding;
Review and provide/coordinate comments on the draft plans;
Advertise, coordinate and participate in the public input process; and
Coordinate the formal adoption of the plan by the governing board

I am attaching a couple of documents to facilitate the plan development process and inclusion of your community as a participating jurisdiction to the plan update. Being included as a participating jurisdiction will provide your community with formal FEMA approval of the plan that entitles you to pursue FEMA grant funding as an applicant.

***Letter of Commitment** – please complete, sign and forward the letter of commitment to the County leads for this project and copy myself as these letters will be included in the planning process documentation.*

***Data Collection Guide** – This guide is prepared to provide an overview of the process and includes several worksheets to be completed by each participating jurisdiction and returned to us. Completion of the worksheets meets two primary objectives:*

1. *Provides input necessary to prepare annexes for each participating jurisdiction and as required for FEMA approval of individual jurisdictions.*
2. *Serves as documentation of participation by participating jurisdictions in the plan update.*

Note that as part of the planning team, you will also be receiving another email that provides an Historic Hazard Worksheet. This is actually the same as Worksheet #2 in your Data Collection Guide. As instructed in the email that follows, please complete the worksheet for significant hazard events that have impacted the Douglas County planning

area that, 1) were not included in the 2010 DRCOG regional plan specific to Douglas County, or 2) hazard events occurring since the 2010 plan. A link to the 2010 DRCOG plan is provided below.

https://www.drcog.org/documents/2010%20Denver%20Metro%20NHMP%20Final.pdfy

When completing the attached worksheet, to the extent data is available, please indicate which areas of the County were affected by an event with a focus on providing specifics for your jurisdiction.

Thanks again for everyone's help and participation. We will start work on the risk assessment portion of the plan and will provide follow up information on our next planning team meeting. Also, please plan on attending the first public meeting for this project at the Douglas County Events Center conference room at 6 pm on September 19th. We will send reminders as we get closer.

Please feel free to contact me via email or at the following number if you have additional questions.

Thanks,

Jeanine Foster
AMEC Environment & Infrastructure
(303) 717-7171

DOUGLAS COUNTY
SHERIFF'S OFFICE

Tony G. Spurlock, Sheriff

August 29, 2014

Tim Johnson, Director
Office of Emergency Management
4000 Justice Way
Castle Rock, CO 80109

Dear Seth,

Douglas County has begun the formal planning process to develop our Hazard Mitigation Plan (HMP). Your jurisdiction is a vital piece of this comprehensive plan for Douglas County. We are listing the City of Lone Tree as a participating jurisdiction to the plan.

As a participating jurisdiction to the HMP, we are requesting that information about your jurisdiction be made available to enhance the overall plan. This will also give you the opportunity to adopt the plan as your own. The benefit from your participation is the ability to identify mitigation projects and apply for FEMA grant funds.

We are working with AMEC, and they have drafted the attached Letter of Commitment for your review and approval. Once you have signed the original, please return it to me at the above address. In additional, the data collection guide is attached for your information.

Thanks for the opportunity to include you in this important process. We trust this plan will be beneficial to your jurisdiction.

Sincerely,

Tim Johnson

Robert A. Christensen Justice Center
4000 Justice Way
Castle Rock, CO 80109

303.660.7505
www.dcsheriff.net
dcso@dcsheriff.net

Tim Johnson

From: Tim Johnson
Sent: Friday, August 29, 2014 9:35 AM
To: 'seth.hoffman@cityoflonetree.com'
Cc: Anne Walton; Holly Nicholson-Kluth; Victoria Starkey; Doug DeBord
Subject: Updated Douglas County Hazard Mitigation Plan
Attachments: 8 27 2014 Letter Regarding Commitment to Municipal Managers.docx; Douglas County LHMP Data Collection Guide.docx; City of Lone Tree Ltr.pdf

Seth, we are working with AMEC to complete our updated County Hazard Mitigation Plan. I have attached a letter asking for your jurisdiction's support as a 'participating jurisdiction' along with the email from AMEC sent out after our kick-off meeting on August 19. I have also included a couple of additional attachments from the contractor. Please let me know if you have questions.

Thanks,
Tim Johnson
Director,
Douglas County Office of Emergency Management
303-660-7589

All,

I appreciate everyone's attendance at the kickoff meeting of the planning team for the Douglas County Hazard Mitigation Plan Update. As discussed, Douglas County is taking the lead on the development of a Hazard Mitigation Plan Update to the 2010 DRCOG Regional Plan. Unincorporated Douglas County and each of the incorporated communities are considered participating jurisdictions for purposes of this plan update. As such, there are certain participation requirements expected of your jurisdictions:

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Provide details about their specific geographical planning area where the risk in their area differs from that experienced by the entire area;
Provide additional data from your jurisdiction as requested;
Identify specific projects to be eligible for funding;
Review and provide/coordinate comments on the draft plans;
Advertise, coordinate and participate in the public input process; and
Coordinate the formal adoption of the plan by the governing board

I am attaching a couple of documents to facilitate the plan development process and inclusion of your community as a participating jurisdiction to the plan update. Being included as a participating jurisdiction will provide your community with formal FEMA approval of the plan that entitles you to pursue FEMA grant funding as an applicant.

***Letter of Commitment** – please complete, sign and forward the letter of commitment to the County leads for this project and copy myself as these letters will be included in the planning process documentation.*

***Data Collection Guide** – This guide is prepared to provide an overview of the process and includes several worksheets to be completed by each participating jurisdiction and returned to us. Completion of the worksheets meets two primary objectives:*

1. *Provides input necessary to prepare annexes for each participating jurisdiction and as required for FEMA approval of individual jurisdictions.*
2. *Serves as documentation of participation by participating jurisdictions in the plan update.*

Note that as part of the planning team, you will also be receiving another email that provides an Historic Hazard Worksheet. This is actually the same as Worksheet #2 in your Data Collection Guide. As instructed in the email that follows, please complete the worksheet for significant hazard events that have impacted the Douglas County planning

area that, 1) were not included in the 2010 DRCOG regional plan specific to Douglas County, or 2) hazard events occurring since the 2010 plan. A link to the 2010 DRCOG plan is provided below.

https://www.drcog.org/documents/2010%20Denver%20Metro%20NHMP%20Final.pdfy

When completing the attached worksheet, to the extent data is available, please indicate which areas of the County were affected by an event with a focus on providing specifics for your jurisdiction.

Thanks again for everyone's help and participation. We will start work on the risk assessment portion of the plan and will provide follow up information on our next planning team meeting. Also, please plan on attending the first public meeting for this project at the Douglas County Events Center conference room at 6 pm on September 19th. We will send reminders as we get closer.

Please feel free to contact me via email or at the following number if you have additional questions.

Thanks,

Jeanine Foster
AMEC Environment & Infrastructure
(303) 717-7171

DOUGLAS COUNTY
SHERIFF'S OFFICE

Tony G. Spurlock, Sheriff

August 29, 2014

Tim Johnson, Director
Office of Emergency Management
4000 Justice Way
Castle Rock, CO 80109

Dear Randy,

Douglas County has begun the formal planning process to develop our Hazard Mitigation Plan (HMP). Your jurisdiction is a vital piece of this comprehensive plan for Douglas County. We are listing the Town of Parker as a participating jurisdiction to the plan.

As a participating jurisdiction to the HMP, we are requesting that information about your jurisdiction be made available to enhance the overall plan. This will also give you the opportunity to adopt the plan as your own. The benefit from your participation is the ability to identify mitigation projects and apply for FEMA grant funds.

We are working with AMEC, and they have drafted the attached Letter of Commitment for your review and approval. Once you have signed the original, please return it to me at the above address. In additional, the data collection guide is attached for your information.

Thanks for the opportunity to include you in this important process. We trust this plan will be beneficial to your jurisdiction.

Sincerely,

Tim Johnson

Robert A. Christensen Justice Center
4000 Justice Way
Castle Rock, CO 80109

303.660.7505
www.dcsheriff.net
dcso@dcsheriff.net

Tim Johnson

From:	Tim Johnson
Sent:	Friday, August 29, 2014 9:21 AM
To:	'ryoung@parkeronline.org'
Cc:	Holly Nicholson-Kluth; Victoria Starkey; Doug DeBord
Subject:	Updated Douglas County Hazard Mitigation Plan
Attachments:	8 27 2014 Letter Regarding Commitment to Municipal Managers.docx; Douglas County LHMP Data Collection Guide.docx; Town of Parker Ltr.pdf

Randy, we are working with AMEC to complete our updated County Hazard Mitigation Plan. I have attached a letter asking for your jurisdiction's support as a 'participating jurisdiction' along with the email from AMEC sent out after our kick-off meeting on August 19. I have also included a couple of additional attachments from the contractor. Please let me know if you have questions.

Thanks,
Tim Johnson
Director,
Douglas County Office of Emergency Management
303-660-7589

All,

I appreciate everyone's attendance at the kickoff meeting of the planning team for the Douglas County Hazard Mitigation Plan Update. As discussed, Douglas County is taking the lead on the development of a Hazard Mitigation Plan Update to the 2010 DRCOG Regional Plan. Unincorporated Douglas County and each of the incorporated communities are considered participating jurisdictions for purposes of this plan update. As such, there are certain participation requirements expected of your jurisdictions:

Participate in the process/attend and participate in HMPC meetings;
Provide details about their specific geographical planning area where the risk in their area differs from that experienced by the entire area;
Provide additional data from your jurisdiction as requested;
Identify specific projects to be eligible for funding;
Review and provide/coordinate comments on the draft plans;
Advertise, coordinate and participate in the public input process; and
Coordinate the formal adoption of the plan by the governing board

I am attaching a couple of documents to facilitate the plan development process and inclusion of your community as a participating jurisdiction to the plan update. Being included as a participating jurisdiction will provide your community with formal FEMA approval of the plan that entitles you to pursue FEMA grant funding as an applicant.

***Letter of Commitment** – please complete, sign and forward the letter of commitment to the County leads for this project and copy myself as these letters will be included in the planning process documentation.*

***Data Collection Guide** – This guide is prepared to provide an overview of the process and includes several worksheets to be completed by each participating jurisdiction and returned to us. Completion of the worksheets meets two primary objectives:*

1. *Provides input necessary to prepare annexes for each participating jurisdiction and as required for FEMA approval of individual jurisdictions.*
2. *Serves as documentation of participation by participating jurisdictions in the plan update.*

Note that as part of the planning team, you will also be receiving another email that provides an Historic Hazard Worksheet. This is actually the same as Worksheet #2 in your Data Collection Guide. As instructed in the email that follows, please complete the worksheet for significant hazard events that have impacted the Douglas County planning

area that, 1) were not included in the 2010 DRCOG regional plan specific to Douglas County, or 2) hazard events occurring since the 2010 plan. A link to the 2010 DRCOG plan is provided below.

https://www.drcog.org/documents/2010%20Denver%20Metro%20NHMP%20Final.pdfy

When completing the attached worksheet, to the extent data is available, please indicate which areas of the County were affected by an event with a focus on providing specifics for your jurisdiction.

Thanks again for everyone's help and participation. We will start work on the risk assessment portion of the plan and will provide follow up information on our next planning team meeting. Also, please plan on attending the first public meeting for this project at the Douglas County Events Center conference room at 6 pm on September 19th. We will send reminders as we get closer.

Please feel free to contact me via email or at the following number if you have additional questions.

Thanks,

Jeanine Foster
AMEC Environment & Infrastructure
(303) 717-7171

#2014073561, 12/17/2014 at 08:21:43 AM, 1 OF 3,Rec Fee $0.00 Douglas County CO
Jack Arrowsmith, Clerk & Recorder

Resolution No. R-014- 137

THE BOARD OF COUNTY COMMISSIONERS
OF THE COUNTY OF DOUGLAS, COLORADO

RESOLUTION OF THE BOARD OF COUNTY COMMISSIONERS OF DOUGLAS COUNTY, COLORADO TO UPDATE THE DOUGLAS COUNTY LOCAL HAZARD MITIGATION PLAN AND ESTABLISHMENT OF DOUGLAS COUNTY LOCAL HAZARD MITIGATION PLANNING COMMITTEE.

WHEREAS, Douglas County and its incorporated communities are exposed to flooding, wildfire, severe weather, and other natural hazards that increase the vulnerability to life, property, environment and the County's economy; and

WHEREAS, hazard mitigation planning will create an operational framework for reducing losses from these hazards; and

WHEREAS, hazard mitigation planning is a requirement of the Robert T. Stafford Disaster Mitigation Act of 2000 (DMA 2000) and continued eligibility for certain sources of federal mitigation funding programs that support loss reduction activities; and

WHEREAS, Douglas County is in the process of updating its Douglas County Local Hazard Mitigation Plan, in accordance with FEMA's DMA 2000 to remain eligible for future federal disaster funding; and

WHEREAS, Douglas County and its flood-prone incorporated communities participate in the National Flood Insurance Program (NFIP); and

WHEREAS, the Disaster Mitigation Act of 2000 (DMA) and the NFIP's Community Rating System (CRS) Program require the County and incorporated communities to adopt an updated Hazard Mitigation Plan on a 5-year basis; and

WHEREAS, FEMA and the CRS Program encourage public participation and involvement from a variety of stakeholders throughout the nine-month planning process; and

WHEREAS, the Hazard Mitigation Planning Committee (HMPC) will be involved in the development of the hazard mitigation plan through assessment of the flood, wildfire and other hazards that threaten our community, development of goals that address the identified hazards, and creation of various mitigation strategies that will be implemented to reduce our exposure to future natural hazard losses, while contributing to other community and economic goals and objectives; and

WHEREAS, the HMPC has the responsibility to meet and fulfill the obligations of the DMA and CRS planning requirements; and

WHEREAS, DMA and CRS require the public and other stakeholders to be fully involved in the planning process, and

WHEREAS, a multi-jurisdictional and public HMPC will be established to lead this mitigation planning effort. The HMPC meetings will be widely advertised and open to all attendees and will consist of representatives of various county departments, the incorporated communities, special districts, other federal, state and local agency stakeholders, the public, and others who could be affected by or interested in the impacts of natural disasters; and

WHEREAS, a Steering Committee, a subset of the HMPC, will be established and tasked to provide input and have a decision-making role in the plan development process. The Steering Committee will be comprised of key HMPC representatives from the County, incorporated communities, other participating jurisdictions, and public stakeholders. This non-local government and public stakeholders, appointed by Douglas County Emergency Management, will comprise at least 50% of the makeup of the Steering Committee.

NOW, THERFORE, BE IT RESOLVED THAT, the Douglas County Board of County Commissioners hereby supports the update of the Douglas County Local Hazard Mitigation Plan and establishes the new Hazard Mitigation Planning Committee (HMPC) and Steering Committee comprised of representatives from the following participating Douglas County Offices, Departments and Divisions:

- Douglas County
- Facilities, Fleet & Emergency Support Services
- Emergency Management
- Community Development
- Public Works
- Planning
- Fire
- Sheriff
- Information Technology

Incorporated communities (includes representation from departments similar to the County):

- City of Castle Pines
- Town of Castle Rock
- Town of Larkspur
- City of Lone Tree
- Town of Parker

Other participating jurisdictions:

- Denver Water

Other private citizens and stakeholders including local, regional, state and federal agencies and partners appointed by the Douglas County Emergency Management.

PASSED AND ADOPTED this 16th day of December 2014, in Castle Rock, Douglas County, Colorado.

THE BOARD OF COUNTY COMMISSIONERS
OF THE COUNTY OF DOUGLAS, COLORADO

BY:

ROGER A. PARTRIDGE, Chair

ATTEST:

MELISSA PELLETIER, Deputy Clerk

DOUGLAS COUNTY, COLORADO SEAL EST. 1874

CITY OF CASTLE PINES • 7501 VILLAGE SQUARE DRIVE, SUITE 100 • CASTLE PINES, CO 80108

Douglas County Office of Emergency Management
Attn: Tim Johnson, Emergency Management Director

3026 N. Industrial Way
Castle Rock, CO 80109

Re: Letter of Commitment as participating jurisdiction in the Douglas County Hazard Mitigation Plan Update

Dear Mr. Johnson:

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44 CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, the City of Castle Pines is submitting this letter of commitment to confirm that City of Castle Pines has agreed to participate in the Douglas County Hazard Mitigation Planning Project.

Further, as a condition to participating in the mitigation planning process; City of Castle Pines agrees to participate in meeting the requirements for mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to the Douglas County Office of Emergency Management to complete the plan in conformance with FEMA requirements.

City of Castle Pines understands that it must engage in the following planning process, as more fully described in FEMA's *Local Mitigation Plan Review Guide* dated October 1, 2011, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction. ;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, data, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan; and,
- Formal adoption of the Local Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the requirements of participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I, Don Van Wormer, Castle Pines City Manager, commit City of Castle Pines to the Douglas County Hazard Mitigation Planning effort.

Executed this 23rd day of October, 2014

Don Van Wormer, City Manager

October 31, 2014

Douglas County Office of Emergency Management
Attn: Tim Johnson, Emergency Management Director

Re: Letter of Commitment as participating jurisdiction in the Douglas County Hazard Mitigation Plan Update

Dear Mr. Johnson:

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44 CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, the Town of Castle Rock, Colorado is submitting this letter of commitment to confirm that the Town of Castle Rock, Colorado has agreed to participate in the Douglas County Hazard Mitigation Planning Project.

Further, as a condition to participating in the mitigation planning process; the Town of Castle Rock, Colorado agrees to participate in meeting the requirements for mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to the Douglas County Office of Emergency Management to complete the plan in conformance with FEMA requirements.

The Town of Castle Rock, Colorado understands that it must engage in the following planning process, as more fully described in FEMA's *Local Mitigation Plan Review Guide* dated October 1, 2011, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction. ;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, data, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan; and,
- Formal adoption of the Local Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the requirements of participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I, Arturo J. Morales, Fire Chief and Emergency Manager of the Town of Castle Rock, Colorado, commit the Town of Castle Rock, Colorado to the Douglas County Hazard Mitigation Planning effort.

Executed this 31st day of October, 2014

Respectfully,
Arturo J. Morales
Fire Chief
Castle Rock Fire and Rescue Department

TOWN OF LARKSPUR
8720 Spruce Mountain Road
Larkspur, Colorado 80118
November 14, 2014

Douglas County Office of Emergency Management
Attn: Tim Johnson, Emergency Management Director
3026 N. Industrial Way
Castle Rock, CO 80109

Re: Letter of Commitment as participating jurisdiction in the Douglas County Hazard Mitigation Plan Update

Dear Mr. Johnson:

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44 CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, the Town of Larkspur is submitting this letter of commitment to confirm that the Town of Larkspur has agreed to participate in the Douglas County Hazard Mitigation Planning Project.

Further, as a condition to participating in the mitigation planning process; the Town of Larkspur agrees to participate in meeting the requirements for mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to the Douglas County Office of Emergency Management to complete the plan in conformance with FEMA requirements.

The Town of Larkspur understands that it must engage in the following planning process, as more fully described in FEMA's *Local Mitigation Plan Review Guide* dated October 1, 2011, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction. ;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, data, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan; and,
- Formal adoption of the Local Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the requirements of participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I, Mayor Gerry L. Been, commit the Town of Larkspur to the Douglas County Hazard Mitigation Planning effort.

Executed this 14 day of NOV, 2014.

Gerry L. Been, Mayor

9220 Kimmer Drive
Suite 120
Lone Tree, Colorado 80124

Ph: 303-339-8150
Fax: 303-330-8179
www.cityoflonetree.com

CITY OF LONE TREE
Police Department

October 2, 2014

Douglas County Office of Emergency Management
Attn: Tim Johnson, Emergency Management Director
4000 Justice Way
Castle Rock, CO 80109

Re: Letter of Commitment as participating jurisdiction in the Douglas County Hazard Mitigation Plan Update

Dear Mr. Johnson:

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44 CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, the City of Lone Tree is submitting this letter of commitment to confirm that the City of Lone Tree has agreed to participate in the Douglas County Hazard Mitigation Planning Project.

Further, as a condition to participating in the mitigation planning process; The City of Lone Tree agrees to participate in meeting the requirements for mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to the Douglas County Office of Emergency Management to complete the plan in conformance with FEMA requirements.

The City of Lone Tree understands that it must engage in the following planning process, as more fully described in FEMA's *Local Mitigation Plan Review Guide* dated October 1, 2011, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction. ;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, data, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan; and,
- Formal adoption of the Local Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Therefore, with a full understanding of the requirements of participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I, Seth Hoffman, City Manager, commit the City of Lone Tree to the Douglas County Hazard Mitigation Planning effort.

Executed this 2nd day of October, 2014.

Seth Hoffman, City Manager
City of Lone Tree

Town of Parker COLORADO™

November 5, 2014

Douglas County Office of Emergency Management
Attn: Tim Johnson, Emergency Management Director
4000 Justice Way
Castle Rock, CO 80104

Re: Letter of Commitment as participating jurisdiction in the Douglas County Hazard Mitigation Plan Update

Dear Mr. Johnson:

As the Federal Emergency Management Agency's (FEMA) Local Mitigation Plan requirements under 44 CFR §201.6 specifically identify criteria that allow for multi-jurisdictional mitigation plans and that many issues are better resolved by evaluating hazards more comprehensively by coordinating at the county, regional, or watershed level, the Town of Parker is submitting this letter of commitment to confirm that the Town of Parker has agreed to participate in the Douglas County Hazard Mitigation Planning Project.

Further, as a condition to participating in the mitigation planning process; the Town of Parker agrees to participate in meeting the requirements for mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to the Douglas County Office of Emergency Management to complete the plan in conformance with FEMA requirements.

The Town of Parker understands that it must engage in the following planning process, as more fully described in FEMA's *Local Mitigation Plan Review Guide* dated October 1, 2011, including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction.
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, data, or other information, commenting on drafts of the plan, etc.); and
- Documentation of an effective process to maintain and implement the plan; and,
- Formal adoption of the Local Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

20120 E. Mainstreet • Parker, Colorado 80138-7334 • VOICE 303.841.0353 • FAX 303.840.9792
EMAIL town@parkeronline.org • WEB www.parkeronline.org

Therefore, with a full understanding of the requirements of participating in the FEMA hazard mitigation planning process as a participant in a multi-jurisdictional plan; I, Randy Young, commit the Town of Parker to the Douglas County Hazard Mitigation Planning effort.

Executed this 5 day of November 2014

G. Randolph Young, Town Administrator

DENVER WATER
1600 West 12th Avenue • Denver, Colorado 80204-3412
Phone 303-628-6000 • Fax No. 303-628-6199 • denverwater.org

LETTER OF INTENT TO PARTICIPATE

December 24, 2014

Douglas County Sheriff's Office
Tim Johnson, Emergency Management Director
4000 Justice Way
Castle Rock, CO 80109

Re: "Statement of Intent to Participate" as a special property owner in the Douglas County Multi-Jurisdictional Hazard Mitigation Plan (HMP)

Dear Mr. Johnson,

In accordance with the Federal Emergency Management Agency's (FEMA) Local Hazard Mitigation Plan (HMP) requirements, under 44 CFR §201.6, which specifically identify criteria that allow for multi-jurisdictional mitigation plans, Denver Water is submitting this letter of intent to confirm participation in the Douglas County Multi-Jurisdictional Hazard Mitigation Planning effort.

Further, as a condition to participating in the mitigation planning, Denver Water agrees to meet the requirements for mitigation plans identified in 44 CFR §201.6 and to provide such cooperation as is necessary and in a timely manner to Douglas County to complete the plan in conformance with FEMA requirements.

Denver Water understands that it must engage in the following planning process, as more fully described in FEMA's *Local Mitigation Planning Handbook* dated March 2013 including, but not limited to:

- Identification of hazards unique to the jurisdiction and not addressed in the master planning document;
- The conduct of a vulnerability analysis and an identification of risks, where they differ from the general planning area;
- The formulation of mitigation goals responsive to public input and development of mitigation actions complementary to those goals. A range of actions must be identified specific for each jurisdiction;
- Demonstration that there has been proactively offered an opportunity for participation in the planning process by all community stakeholders (examples of participation include relevant involvement in any planning process, attending meetings, contributing research, data, or other information, commenting on drafts of the plan, etc.);
- Documentation of an effective process to maintain and implement the plan;
- Formal adoption of the Multi-Jurisdictional Hazard Mitigation Plan by the jurisdiction's governing body (each jurisdiction must officially adopt the plan).

Please note that Denver Water is a critical infrastructure with facilities in Douglas County. Under the Annual Operation Plan (AOP) we are classified as a "special property owner." Denver Water has completed several mitigation projects within the county on our properties and we'll continue to do so.

This letter is our intent to participate in the overall planning effort with the Douglas County mitigation plan as we have done with other counties in 2014.

Sincerely,

Rebecca J. Franco

Rebecca J. Franco
Manager of Emergency Response

DENVER WATER
1600 West 12th Avenue • Denver, Colorado 80204-3412
Phone 303-628-6000 • Fax No. 303-628-6199 • denverwater.org

FUNDING MATCH COMMITMENT LETTER

December 24, 2014

State Hazard Mitigation Officer (SHMO)
Colorado Division of Homeland Security & Emergency Management (DHSEM)
9195 East Mineral Avenue, Suite 200
Centennial, CO 80112

Re: "Funding Match Commitment Letter" as a participating jurisdiction in the Douglas County Multi-jurisdictional Hazard Mitigation Plan (HMP)

Dear Ms. Gally,

This letter serves as Denver Water's commitment to meet the matching fund requirements for the Douglas County Hazard Mitigation Plan (HMP) Update.

If awarded an HMGP Planning Grant Denver Water will provide local in-kind services in lieu of cash funds via staff time (labor) to assist in the planning process, compilation of data, and other services related to the development of the Douglas County HMP. Documentation of in-kind costs will be tracked by hourly wages and participation in planning activities via official sign-in sheets, and other data gathering needs as assessed and assigned by the Local Planning Committee (LPC).

Denver Water is committed to support the local/state planning efforts as it relates to mitigation efforts as a special property owner.

Sincerely,

Rebecca J. Franco

Rebecca J. Franco
Manager of Emergency Response

Douglas County Recovery Plan
Invitation List - Kick-off Meeting and Community Meeting

- **Kick-off Meeting – Tuesday August 19, 2014, 2:00 pm – 4:00 pm (Douglas County Events Center Conference Room)**

- **Community Meeting – September 18, 2014, 6:00 pm – 8:00 pm (Douglas County Events Center Conference Room)**

Kick-off Meeting Presentation Schedule

- **Introductions**

- **Mitigation, Mitigation Planning, & the Disaster Mitigation Act Requirements**

- **The Role of the Hazard Mitigation Planning Committee (HMPC)**

- **Planning for Public Input**

- **Coordinating with other Agencies**

- **Hazard Identification**

- **Data Collection Needs (Handout)**

- **Questions and Answers/Adjourn**

Participant List

- **Government Administration:**
    1. **Doug DeBord (Douglas County Manger)**
    2. **Barbara Drake (Douglas County Deputy County Manager)**
    3. **Seth Hoffman (Lone Tree City Manager)**
    4. **Terry Nolan (HRMD General Manager)**
    5. **Randy Young (Parker City Manager)**

6. **Mark Stevens (CR Town Manager)**
7. **Don VanWormer (Castle Pines City Manager)**
8. **Matt Krimmer (Larkspur Town Manager)**
9. **Vicky Starkey (HRMD Elected Official)**
10. **Anne Walton (Emergency Support Services Coordinator)**

- **Elected Officials:**
  1. **Susan Squyer (Lone Tree Council)**
  2. **Mayor Jim Gunning (Lone Tree)**
  3. **Mayor Jeff Huff (Castle Pines)**
  4. **Mayor Gerry Been (Larkspur)**
  5. **Mayor Mike Waid (Parker)**
  6. **Rick Owens (HRMD Chair)**
  7. **Roger Partridge (DC BOCC Chair)**
  8. **Jill Repella (DC BOCC)**
  9. **Dave Weaver (DC BOCC)**
  10. **Tony Spurlock (DC Sheriff's Office)**
  11. **Jack Arrowsmith (DC Clerk & Recorder)**
  12. **Merlin Klotz (DC Clerk & Recorder)**
  13. **Teri Cox (DC Assessor)**
  14. **Lisa Frizell (DC Assessor)**
  15. **Diane Holbert (DC Treasurer)**
  16. **Lora Thomas (DC Coroner)**
  17. **Jill Romann (DC Coroner)**
- **PIO:**
  1. **Ron Hanavan (DCSO)**
  2. **Wendy Holmes (Douglas County Public Affairs)**
- **Emergency Management:**
  1. **Tim Johnson (DC OEM)**
  2. **Clint Fey (JeffCo OEM)**
  3. **Nathan Fogg (Arapahoe OEM)**
  4. **Lizabeth Jordan (El Paso OEM)**
  5. **Steve Steed (Teller County OEM)**
  6. **Brandon Lenderink (Elbert OEM)**
  7. **Zach Nannestad (DCSD)**
  8. **Jim Olsen (Littleton FD)**
  9. **Molly Duffy (Castle Rock EM)**
  10. **Art Morales (Castle Rock FD)**

11. **Brad Meyering (Castle Pines)**
12. **Doreen Jokherst (Parker EM; Parker PD)**
13. **Ron Pinson (Lone Tree EM; Lone Tree PD)**
14. **Jeff Case (HRMD)**
15. **Loretta Bergtani (DC Libraries)**
16. **Michele Askenzai (TCHD)**
17. **Sara Garrington (TCHD)**
18. **Steve Standridge (SMFR)**
19. **Cory Stark (State of CO)**

- **Legal/Finance**
  1. **Lance Ingalls (DC Attorney)**
  2. **Andrew Copland (DC Finance)**
  3. **Martha Marshall (DC Finance)**
  4. **Connie Pipes (DC Finance)**
  5. **Sherry Monroe (Risk Management)**
- **HR:**
  1. **Laura Leary**
- **GIS:**
  1. **Mark Rankin (Douglas County)**
  2. **Joel Hansen (Douglas County)**
- **Land Use:**
  1. **Kristin Garrison (CO State Forest Service)**
  2. **Jill Alexander (DC Wildland Fire Mitigation Division)**
  3. **Terence Quinn (DC Planning/Zoning)**
  4. **Cheryl Matthews (DC Open Space, Environmental)**
  5. **Randy Burkhardt (DC Parks)**
  6. **Judy Hammer (DC Historic Preservation Board)**
  7. **Bill Detweiler (CR Planning)**
  8. **John Fussa (Parker Community Development Director)**
  9. **Kelly First (Lone Tree Community Development Director)**
  10. **Lisa Kallweit (CEO Douglas Elbert Realtor Association)**
  11. **Carole Walker (Rocky Mountain Insurance Information Association)**
- **Housing:**
  1. **Diane Leavesley (DC Housing Authority)**
  2. **Korby Lintz (DC Building)**
  3. **Jerry Flannery (HRCA)**
- **Economic Development:**

1. **Dennis Houston, President (Parker Chamber of Commerce)**
2. **Andrea LaRew, President (Highlands Ranch Chamber of Commerce)**
3. **Darryl Jones, President (Lone Tree Chamber of Commerce)**
4. **Pam Ridler, President (Castle Rock Chamber of Commerce)**
5. **Becky Nelson (DC Economic Development)**
6. **DC Private Sector Employers**
    - **CH2M Hill – Scott Ingvolstad, Director of Government Affairs Sky Ridge Medical Center – Linda Watson, Director of Marketing**
    - **Teletech – Giles Whiting, Chief of Staff**
    - **TW Telecom – Steve Hardardt**
    - **Western Union – Tim Daly, Senior VP of Public Policy**

- **Infrastructure:**
    1. **Rod Meredith (DC Public Works Operations)**
    2. **Mike Sutherland (Parker Public Works)**
    3. **Tom Williams (Parker Flood Plain Administrator)**
    4. **Vicky Starkey (DC Facilities, Fleet & Emergency Support Services)**
    5. **Jonna Negus-Pemberton (DC Facilities)**
    6. **Debra Schnackenburg (PetAid)**
    7. **Nick Strebe (CO State Veterinarian)**
    8. **Fred Koch (DC Engineering)**
    9. **Leonard Cheslock (DC Traffic)**
    10. **Todd Richardson (DC Fleet)**
    11. **Josh Shaw (Sedalia Landfill)**
    12. **Debra Douglas (Xcel)**
    13. **James Elmer (IREA)**
    14. **Ron Zuroff (Black Hills Energy)**
    15. **William Benson (Century Link)**
    16. **Tim Murrell (DC Water Planner)**
    17. **Jeff Case (HRMD)**
- **Health & Social Services**
    1. **Dan Makelky (DC Human Services)**
    2. **Melanie Worley (Developmental Pathways)**
    3. **John Douglas, jr. (TCHD)**
    4. **Garrett Chism (Sky Ridge Hospital EM)**
    5. **Michael Edwards (Parker Adventist Hospital EM)**
    6. **Phil Currance (Castle Rock Adventist Hospital EM)**

7. **Tiffany Richens (Castle Rock Adventist Hospital EM)**
8. **Christine Manson-DeRabe (Red Cross)**
9. **Daniel Ball (Salvation Army)**
10. **Jen Poitras (COVOAD)**
11. **Tim Ralph (DCSO Chaplain)**
12. **Laurie Elliott (Arapahoe Douglas Mental Health)**
13. **Patty Moschner (Victims Assistance)**

- **Environmental**
  1. **Julie Baxter (FEMA Region 8)**
  2. **Garth Englund (DC Engineering, Drainage)**
  3. **Todd Farrow (CO State Parks)**
  4. **Ed Seal (DC LEPC Chair)**
  5. **Kevin Stewart (Urban Drainage and Flood Control)**
  6. **Tim Tonge (SkyView Weather)**
  7. **Bob Glancy (National Weather Service)**
  8. **Eliza Hunholz (CO Fish & Game)**
  9. **Fred Rios (US Army Corps of Engineers)**
  10. **Randy Hickenbottom (US Forest Service)**
  11. **Becky Franco (Denver Water)**
  12. **Jason Feinholt (Denver Water)**
  13. **Scott Anthony(Burlington Northern/Santa Fe Railroad)**
  14. **Sherman Spear (Union Pacific Railroad)**
  15. **Patricia Gavelda (CDEM Mitigation)**
  16. **Kevin Houck (CO Water Conservation Board)**
  17. **Jamie Prochno (Colorado Water Conservation Board)**
  18. **Vaughn Jones (State Division of Fire Prevention and Control)**
  19. **Abra Geissler (CODOT)**
  20. **Phillip Anderle (CODOT)**

From: Anne Walton [mailto:alwalton@douglas.co.us]
Sent: Wednesday, July 16, 2014 3:36 PM
To: "Detweiler"<bdetweiler@crgov.com>; Abra Geissler; Andrea LaRew; Andrew Copland; Anne Walton; Art Morales (amorales@crgov.com); Barbara Drake; Becky Nelson; Bertagni, Loretta A.; Bob Glancy; Brad Meyering; Brandon Lenderink (Brandon.Lenderink@elbertcounty-co.gov); Cheryl Matthews; Christine Manson de Babe - Red Cross (christine.mansonderabe@redcross.org); Clint Fey; Connie Pipes; Cora Gatlin; Cory Stark (cory.stark@state.co.us); Daniel Ball (daniel.ball@usw.salvationarmy.org); Daniel Makelky; Darryl Jones (djones@coventrydevelopment.com); David Weaver Sheriff; Debra Douglas; Debrah Schnackenberg (debrahschnackenberg@petaidcolorado.org); Dennis Houston; Diane Holbert; Diane Leavesley; Don VanWormer; Doreen Jokerst (djokerst@parkeronline.org); Doug Debord; Ed Seal; Eliza Hunholz; Fred Koch; Garrett Chism; Garth Englund; Gerry Been; Giles Whiting; Jack Arrowsmith; James Elmer; Jamie Prochno; Jason Finehout (Jason.Finehout@denverwater.org); Foster, Jeanine; Jeff Case; Jeffrey Huff; Jerry Flannery; Jill Alexander; Jill Elizabeth Repella; Jill Romann; Jim Gunning (jim.gunning@cityoflonetree.com); Jim Olsen; Joel R. Hanson; John Fussa; Jonna Negus-Pemberton; Judy Hammer; Julie Baxter; Kelly First; Kevin Houck; Kevin Stewart; Korby Lintz; Kristin Garrison (Kristin.Garrison@ColoState.EDU); Lance Ingalls; Laura Leary; Laurie Elliott; Leonard Cheslock; Linda Watson; Lisa Frizell; Lisa Kallweit; Lizabeth Jordan; Lora Thomas; Chambers, Mack; Mark Rankin; Mark Stevens (mstevens@crgov.com); Martha Marshall; Matt Krimmer (mkrimmer@townoflarkspur.org); Mayor Waid; Melanie Worley (melanieworley@developmentalpathways.org); Merlin Klotz; Michael Edwards (michaeledwards@centura.org); Michele Askenazi (maskenaz@tchd.org); Mike Sutherland (msutherland@parkeronline.org); Molly Duffy (mduffy@crgov.com); Nathan Fogg; Nick Striegel (nick.striegel@state.co.us); Pam Ridler; Patricia Gavelda; Patty Moschner; Phil Currance ; Randall Burkhardt; Randy Young (ryoung@parkeronline.org); Rebecca Martinez; rhickenbottom@fs.fed.us; Rick Owens; Rod Meredith; Roger Partridge; Ron Hanavan; Ron Pinson; Ron Zuroff; Sara Garrington; Scott Ingvolstad; Seth Hoffman; Sherry Monroe; Skyview Weather (tim@skyview-wx.com); Steve Hardardt; Steve Standridge; Steve Steed; Susan Squyer (susan.squyer@cityoflonetree.com); Terence T. Quinn; Teri Cox; Terry Nolan (tnolan@highlandsranch.org); Tiffany Richens (tiffanyrichens@centura.org); Tim Daly; Tim Johnson; Timothy Murrell; Timothy Ralph; Todd Farrow; Todd Richardson; Tom Williams; Tony Spurlock; Victoria Starkey; Wendy Holmes; William Benson; Zach Nannestad (zach.nannestad@dcsdk12.org)
Subject: Douglas County Hazard Mitigation Plan

Good afternoon all:

Douglas County is preparing to update the Douglas County Hazard Mitigation Plan which was originally adopted in 2010 as part of the Denver Regional Council of Governments (DRCOG). The plan is intended to reduce the impacts of hazards to the citizens, property, and critical infrastructure in Douglas County.

The Disaster Mitigation Act of 2000 (DMA 2000) requires that local governments have a FEMA-approved Hazard Mitigation Plan in place in order to maintain their eligibility for certain pre-disaster and post-disaster funding. This funding can be used for mitigation projects that protect communities from future disaster losses. The plan is updated by Douglas County and its emergency management partners and reviewed and approved by FEMA every 5 years.

Community participation and coordination is a requirement of an approved plan, as is the citing of any proposed project our organizations may wish to submit for future FEMA mitigation funding (e.g., a flood, wildfire or tornado protection project). Your participation in this process is important and encouraged. You have knowledge about our communities that will enhance the plan and your input will be important for our joint success.

The Douglas County Facilities, Fleet & Emergency Support Services Department will be taking the lead on coordinating the plan update for the County. Douglas County has hired AMEC Environment & Infrastructure to facilitate the process and create the document.

The Hazard Mitigation Planning Kickoff meeting will be held Tuesday August 19th, 2:00 pm – 4:00 pm. The meeting will be held at the Douglas County Events Center Conference Room (500 Fairgrounds Drive Castle Rock, CO 80104). The Kick-off Meeting will:

- Explain the process
- Discuss a plan for additional public input
- Coordinate the plan with our Partners
- Convey the planning schedule

A public meeting will be held on Thursday September 18th, 6:00 pm to 8:00 pm, and will also be held at the Douglas County Events Center.

Please plan on attending or delegating attendance to this important process; R. S. V. P. to Anne Walton (alwalton@douglas.co.us or 303.814.4356) no later than Friday August 8th.

Thank you -

Anne

Anne L. Walton
Emergency Support Services Coordinator
3026 N. Industrial Way
Castle Rock, CO 80109
(303) 814.4356 Office
(720) 539.1092 Cellular

AGENDA

Douglas County
Local Hazard Mitigation Plan (LHMP) Update Project
Kickoff Meeting: August 19, 2014

1. Introductions
2. Mitigation, Mitigation Planning, & the Disaster Mitigation Act Requirements
3. The Role of the Hazard Mitigation Planning Committee (HMPC)
4. Planning for Public Input
5. Coordinating with other Agencies
6. Hazard Identification
7. Data Collection Needs (Handout)
8. Questions and Answers/Adjourn

SIGN-IN SHEET
DOUGLAS COUNTY
LOCAL HAZARD MITIGATION PLAN UPDATE PROJECT
HMPC Kickoff Meeting #1
August 19, 2014

Name	Email Address	Address	Phone	Jurisdiction/ Department/Organization/ Affiliation
Jim Olsen	JOLSEN@LITTLETONGOV.ORG	2255 W. Berry Ave Littleton 80120	3-591-4962	Littleton OEM
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Justin Olson	justin.olson@state.co.us	6060 Broadway Denver 80216	3-291-7131	CO Parks & Wildlife
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Vicky Starkey	VSTARKEY@DOUGLAS.CO.US		3-9523641	DCFFESS
Ron Hanavan	RHANAVAN@DCSHERIFF.NET	4000 JUSTICE WAY CASTLE ROCK CO 80109	3-814-7089	DCSO
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Kevin Stewart	Kstewart@udfcd.org	2480 W. 26th Ave, Denver	3-455-6277	UDFCD
Art Morales	amorales@crgov.com	300 Perry St., Castle Rock 80104	3-435-0608	Town of Castle Rock

SIGN-IN SHEET
DOUGLAS COUNTY
LOCAL HAZARD MITIGATION PLAN UPDATE PROJECT
HMPC Kickoff Meeting #1
August 19, 2014

Name	Email Address	Address	Phone	Jurisdiction/ Department/Organization/ Affiliation
Rebecca Franco	Rebecca.franco@denverwater.org	1600 W. 12Th Ave Denver CO 80204	303-607-3160	Denver Water
Kevin R Devins	Kevin.Devins@state.co.us		303 913 8964	CDOT
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Kelly Dunnaway	kdunnava@douglas.co.us	100 Third St. CR	303 660-7444	DC
Matt Ziska	Matthew.A.Ziska@xcelenergy.com		720 278 1018	Xcel Energy
Phillip Anderle	phillip.anderle@state.co.us	425 Corporate Cir. Golden Co	303 512 5838	CDOT/TSMO
Gary Goldsberry	gary.goldsberry@state.co.us	18500 E. Colfax Ave Aurora	303-365-7042	CDOT
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Jill Alexander	Jalexand@douglas.co.us	100 Third St	3-660-5252	Douglas County
[illegible]	Don.VanWormer@castlepinesgov.com		303 706-2600	Castle Pines
Matt Krimmer	mkrimmer@townoflarkspur.org	8720 Spr. Mtn. Rd	303 681-2324	Larkspur
Terry Nolan	62 Plaza HR	tnolan@highlandsranch.org	3-785-0320	HR Metro

AGENDA

Douglas County Local Hazard Mitigation Plan Update Project

RISK ASSESSMENT and GOALS UPDATE MEETING

Thursday February 5th 2015
2:00 pm – 5:00 pm.
Douglas County Office of Emergency Management
4000 Justice Way, Castle Rock, CO 80109

- **Introductions**
- **Review of the Planning Process**
- **Review of Identified Hazards**
- **Vulnerability Assessment Results by Hazard**
- **Capability Assessment Review**
- **Reviewing, Setting and Updating Plan Goals**
- **Update on Public Involvement Activities**
- **Information Needs and Next Steps**
- **Questions and Answers/Adjourn**

SIGN-IN SHEET
DOUGLAS COUNTY
LOCAL HAZARD MITIGATION PLAN UPDATE PROJECT
HMPC Meeting #2 and 3 (Risk Assessment and Goals Update)
February 5th, 2015

Name	Email Address	Address	Phone	Jurisdiction/ Department/Organization/ Affiliation
Brad Meyering	brad.meyering@ castlepines.gov		3-705-0216	
Bill SPARKMAN	billSPARKMAN@msn.com	9220 GRAFTON DR. LONE TREE, 80124	3-910-0101	PS AC-Lone Tree
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Garth Englund	genglund@douglas.co.us	100 3rd St Castle Rock	3-660-7479	DC Public Wks
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Dan Montague	dan.montague@hrcaonline.org	4800 McArthur Ranch Rd HR. CO 80130	7-556-2999	HRCA Rec. Centers
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DAVID VANDELLEN	DVANDELLEN@CRGOV.COM	175 KELLOGG CT CASTLE ROCK	720-733-6029	TOCR
MERLIN KLOTZ	MERLIN@MKLOTZ.COM	11868 PARK High DESERT RD	303-521-5173	PARKER WATER

SIGN-IN SHEET
DOUGLAS COUNTY
LOCAL HAZARD MITIGATION PLAN UPDATE PROJECT
HMPC Meeting #2 and 3 (Risk Assessment and Goals Update)
February 5th, 2015

Name	Email Address	Address	Phone	Jurisdiction/ Department/Organization/ Affiliation
Rebecca Franco	rebecca.franco@denverwater.org	1600 W. 12th Ave Denver CO 80204	303-628-3160	Denver Water
Dan Escobedo	descobedo@fs.fed.us	19316 Goddard Ranch Ct Morrison, CO 80465	303-588-7674 303-275-5630	USFS- PikeNF
DAVE WALSE	[illegible]	100 3rd St	(303) 356 0634	[illegible]
RANDY BURKHARDT	rburkhardt@douglas.co.us	100 3RD St	303 662 6226	D.C. PARKS
Virginia Scally	scallyv@yahoo.com	76 Curtis Pl Castle Rock, CO 80104	(303) 829-0328	retired
Vicki McPherson	Vmcphers@douglas.co.us	100 3rd St	303-660-7455 ex 422	DC Treas office
ART MORALES	amorales@crgov.com	300 Perry St	303-663-3108	Town of Castle Rock
Sara Garrington	Sgarring@TCHD.org	6162 S. Willow	7) 2001479	TCHD
Michael Perret-Gentil	mperretgentil@tchd.org	" "	720-200-1412	"
Kristin Garrison	kristin.garrison@colostate.edu	P.o. Box 485 Franktown, Co 80116	3-660-9625	CSFS
Jill Alexander	Jalexande@douglas.co.us			DC wildfire mgT
Laura Leary				
J. E Romann	Jromann@douglas.co.us	4000 Justice Way CR	720-443-9710	DCCO
C J Lay	clay@douglas.co.us	" "		DCCO

Sara Crowe	Sara@parkerchamber.com	19590 E. Mainstreet Parker	303-841-9268	Parker
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Loretta Bertagni	LBERTAGNI@dclibraries.org	100 S. Wilcox Castle Rock CO 80104	719-337-7481	
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Anne Walton	awalton@douglas.co.us	1003rd St CR, 80104	7/384-1092	DC FFESS
Ron Hanaway	DCSHERIFF.NET	4000 Justice Way CO 80109	3-814-7085	
Mike Sutherland	msetherl@dcparkeronline.org		3-805-3205	Parker
Vicky Starkey	DCFFESS		3-915-2364	D.C.
David Mallory	UDFCD		3/455-6277	
Rod Meredith	PWOPS		3-660-7480	D.C.
Barbara Drake	DCAdmin			DC

AGENDA

Douglas County Local Hazard Mitigation Plan Update Project

MITIGATION STRATEGY MEETING

Thursday, March 5th 2015
2:00 pm – 5:00 pm
Douglas County Events Center Conference Room
500 Fairgrounds Drive, Castle Rock, CO 80104

- **Opening remarks and introductions**
- **Review of the planning process and key issues from the risk assessment and capability assessment**
- **Overview of revised goals and objectives**
- **Review of possible mitigation activities and alternatives**
- **Discuss criteria for mitigation action selection and prioritization**
- **Review of progress on existing actions in the plan**
- **Brainstorming Session: Development of new mitigation actions (group process)**
- **Prioritize mitigation actions (group process)**
- **Discuss plan implementation and maintenance**
- **Discuss next steps and public involvement**
- **Questions and Answers/Adjourn**

SIGN-IN SHEET
DOUGLAS COUNTY
LOCAL HAZARD MITIGATION PLAN UPDATE PROJECT
HMPC Meeting #4 (Mitigation Strategy Update)
March 5th, 2015

Name	Email Address	Address	Phone	Jurisdiction/ Department/Organization/ Affiliation
Sara Gaunington	Sgaussing@TCHD.org	6162 S. Willow Dr.	720 200 1479	TCHD
Anne L Walton	awalton@douglas.co.us	3026 N Industrial Way CR, CO 80109	720/539-1092	DC FFESS
Don Bammes	dbammes@dcsheriff.net			DC SHERIFF
Rebecca Franco	rebecca.franco@denverwater.org	1600 W. 12th Ave Denver, CO 80204	303-607-3160	Denver Water
Tim Johnson				Douglas OEM
Ed Seal	Eseal@dcsheriff.net		303-567-7193	DCSO
Bill Sparkman	bill.sparkman@psac.com	9220 Grafton 80124 Dr	303 910-0101	P.S.A.C.
Arlen Goertzen	agoertzen@town of larkspur.org	8720 Spruce Mtn Rd Larkspur	303-681-2324	Town of Larkspur
Tom Williams	twilliams@parkeronline.org	20120 E Mainstreet	3-840-9546	Town of Parker
Merlin Klotz	Merlin@mklotz.com		3-521-5177	Parker Water
Tim Ralph	tralph@dcsheriff.net	Justice Way	303 8059669	DCSO
Vicki McPherson	Vmcpherson@douglas.co.us		303-660-7455	Treas office
Tom Repp	TREPP@douglas.co.us	100 3rd Street		Public Works/Eng.
Vicky Starkey	VSTARKEY@douglas.co.us		3-915-2364	DC FFESS

SIGN-IN SHEET
DOUGLAS COUNTY
LOCAL HAZARD MITIGATION PLAN UPDATE PROJECT
HMPC Meeting #4 (Mitigation Strategy Update)
March 5th, 2015

Name	Email Address	Address	Phone	Jurisdiction/ Department/Organization/ Affiliation
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Brad Meyering				Castle Pines
Virginia Scally	scallyv@yahoo.com	76 Curtis Pl 80104 Castle Rock CO	303-688-6118	citizen
Martha Marshall	mmarshal@douglas.co.us	DC Finance	303-663-6174	DC Finance
Jill Alexander	jalexande douglas.co.us	DC wildfire mitigation	3-880-5252	DC
Patty Moschner	pmoschne@dcsheriff.net	DCSO	3-660-7535	DCSO
Loretta Bertagni	LBERTAGNI@dcl.biblarier.org	100 S. Wilcox DEL 80104	719-337-7981	Douglas Cty Libraries
Leona Chesloc	lchesloc@douglas.co.us	100 3rd, Castle rock	720-440-7308	DC Traffic
Steve Koster	skoster@douglas.co.us	PS Miller Bld	4316	DC Planning
Jeff Case	JCASE@highlandsranch.org	62 Plaza Drive Highlands Ranch	3-791-0130	H.R. Metro District
Connie Pipes	cpipes@douglas.co.us	PS MILLER	3-660-7442	DC. FINANCE.
Rod Meredith	rmeredith@douglas.co.us	PWOPS	3-660-7480	DC.
Ron Hannan	RHANNAN@DCSHERIFF.NET	DCSO	3-814-7089	DC

Grey Weeks	greg.weeks@cityoflonetree.com	9222 Teddy Lane, Lone Tree 80124	303-662-8112	Public Works/engr - Lonetree

	E-mail			
Ken Joseph	kjoseph@hrcaonline.org		303-471-8857	

LOCAL HAZARD MITIGATION PLAN (LHMP) UPDATE

DATA COLLECTION GUIDE

Douglas County

Hazard Mitigation Planning Committee (HMPC)

August 2014

Clarification on Terminology to be used during the Hazard Mitigation Planning Process

HAZARD – Something that is potentially dangerous:

- Natural – dangerous situations or events driven by the conditions of nature
- Man-made – dangerous incidents driven by human interaction with the physical environment.

MITIGATION – Hazard mitigation means any sustained action taken to reduce or eliminate long-term risk to human life and property from natural hazards.

PLANNING PROCESS – This is the method in which AMEC uses to makes sure all the required components of the plan are included so that the State and FEMA approval process is successful.

Table 1.1. AMEC'S 10 Step Planning Process Uses a Combination of Three Recommended Processes – DMA, FMA and Community Rating System (CRS)

FEMA Phases	Hazard Mitigation Grant and Pre-Disaster Mitigation Grant Programs (DMA, 44 CFR 201)	Flood Mitigation Assistance Program (44 CFR 78.5)	Community Rating System Floodplain Management Planning (10-Step Process)
Phase I Organize Resources	Coordination among agencies	Coordination with other agencies or organizations	Organize to prepare the plan
	Integration with other planning efforts	Involve the public, including a description of the planning process. Public involvement may include workshops, public meetings, or hearings	Coordination with other agencies
	Involve public throughout the planning process		Involve the public
Phase II Assess Risks	Identify all hazards	Flood hazard area inventory that identifies the flood risk, including estimates of the number and types of structures at risk and repetitive-loss properties	Assess the (flooding) hazard
	Profile hazard events		
	Assess vulnerability	Problem identification, including a description of the existing flood hazard, the extent of flood depth and damage potential, and the applicant's floodplain management goals	Assess the problem
	Estimate potential losses		
Phase III Develop the Mitigation Plan	Documentation of planning process	Review of possible mitigation actions, including the identification and evaluation of cost-effective and technically feasible mitigation actions	Set goals
	Capability assessment		Review possible activities
	Develop hazard mitigation goals		Draft an action plan
	Identification and analysis of mitigation measures		
	Funding sources		
Phase IV Implement and Monitor Progress and Project Management/ Project Tracking	Adoption	Documentation of the formal plan adoption by the legal entity submitting the plan (e.g., governor, mayor, county executive)	Adopt the plan
	Implementation of mitigation measures		Implement, evaluate, and revise the plan
	Monitoring, evaluating, and updating the plan		
	Continued public involvement		

RISK – A combination of hazard, vulnerability, and exposure. The impact a hazard would have on people, services, facilities, and structures in a community and refers to the likelihood of a hazard event resulting in an adverse condition that causes injury or damage.

VULNERABILITY – Being open to damage or attack. The likelihood that an area or sector will be negatively affected by a hazard event.

IMPACT - Measured or observed affect of a hazard event that could include social, economic, and environmental sectors.

MITIGATION CAPABILITIES - In the context of hazard mitigation, mitigation capabilities relate to loss prevention mechanisms implemented by a jurisdiction or community that act to reduce hazard-related impacts from a hazard event.

MITIGATION STRATEGY – As a part of the planning process, each participating jurisdiction is required to identify their specific mitigation goals, objectives and actions (collectively referred to as the mitigation strategy) designed to reduce the risk and vulnerability of a community to identified hazards.

- **Goals** are a broader statement of what a jurisdiction would like to work toward accomplishing. Such as: "Reduce impacts from natural hazards on life, wildlife, property and the environment."
- **Objectives** provide more specifics on how to obtain the goal. Such as: "Increase awareness about natural hazards."
- **Actions** are specific projects that will need to be implemented to successfully accomplishing identified goals and objectives. Such as: "Develop a natural hazards public outreach program."

PARTICIPATING JURISDICTIONS – A participating jurisdiction may be defined as a geographical area over which a governing body has the power and right to exercise authority as in a County, City, Township, Parish, Borough, Tribal and Special District; however, there might not be a distinct political boundary as in a watershed or metropolitan district. A participating jurisdiction for purposes of this LHMP update include any jurisdiction that is willing to meet the plan participation requirements and is seeking approval of the plan for their jurisdiction.

HAZARD MITIGATION PLANNING COMMITTEE (HMPC) - The HMPC is a committee made up of local representation from all the jurisdictions, who want to participate in the planning process, that are located within an identified geographical boundary (i.e., Douglas County Planning Area. For example: this includes representation for each municipality, city, town, and special district within a county, as well as representation for the county government and/or any special district and/or unincorporated area within the county. Also included on the HMPC are other agencies, neighboring jurisdictions, and other public and private stakeholders with an interest in the Douglas County LHMP update process.

OVERVIEW

The contents of this workbook have been designed to assist Douglas County and participating jurisdictions in collecting necessary background information to support the hazard mitigation planning process pursuant to the Federal Disaster Mitigation Act (DMA) of 2000.

The essential information needed to support the planning process includes background information about Douglas County in general and relative to hazards, risks, vulnerabilities, and mitigation capabilities as previously described.

The planning process is heavily dependent on the data submitted back to AMEC by each of the participating jurisdictions represented. The DMA plan development process does not require the development of new data, but requires existing data only.

The goal of this process is to produce a hazard mitigation plan that meets the needs of each participating jurisdiction, as well as the requirements of DMA and CRS and that contains a list of projects that may be eligible for federal mitigation funding, pre and post disaster.

Participation

The DMA planning regulations and guidance stress that each jurisdiction seeking the required FEMA approval of their mitigation plan must:

- Participate in the process;
- Provide details about their specific geographical planning area where the risk in their area differs from that experienced by the entire area;
- Identify specific projects to be eligible for funding; and
- Have the governing board formally adopt the plan.

For HMPC members, 'participation' means the planning committee representatives will:

- Attend and participate in Local HMPC meetings;
- Provide available data that is requested of the HMPC coordinator
- Review and provide/coordinate comments on the draft plans;
- Advertise, coordinate and participate in the public input process; and
- Coordinate the formal adoption of the plan by the governing board.

DATA COLLECTION WORKBOOK

This workbook contains an explanation of the types of hazard mitigation or loss prevention data that is needed for the hazard mitigation planning process. This workbook identifies specific requirements for general community information, the Risk Assessment Process (ie., Hazard Identification and Profiles; Vulnerability Assessment; Capability Assessment), as well as defines requirements for development of the Mitigation Strategy.

The worksheets have been developed to facilitate the data collection process. This needs to be completed by a representative from Douglas County and each participating jurisdiction and returned as soon as possible. Completion of the data collection workbook will serve two purposes:

1) They will help facilitate the collection of the necessary information from the local perspective; and
2) They will function as evidence of "participation" in the planning process.

WORKSHEET #1: HAZARD IDENTIFICATION

Name of Department/Jurisdiction: _____

Use this worksheet to identify possible hazards that may impact your jurisdiction. Please rank according to the guidelines that follow the table. Use the Hazard Event Worksheet #2 to provide evidence to justify your conclusions.

Hazard	Spatial Extent	Probability of Future Occurrences	Magnitude/ Severity	Significance	Hazard Map*
Avalanche					
Drought					
Earthquake					
Flood: Dam Failure					
Flood: 100/500 year					
Flood: Localized/ Stormwater					
Flood: Levee Failure					
Landslides/ Mud & Debris Flows /Rockfalls					
Severe Weather: Extreme Heat					
Severe Weather: Hail					
Severe Weather: Lightning					
Severe Weather: Thunderstorms/Heavy Rains					
Severe Weather: Tornado					
Severe Weather: High Winds					
Severe Weather: Winter Weather (includes snow/ice/extreme cold)					
Soil Hazards: Erosion & Deposition					
Soil Hazards: Expansive Soils					
Soil Hazards: Subsidence					
Wildfire					
Hazardous Materials: Transportation Incidents					

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

Probability of Future Occurrences
Low: Occurs less than once every 10 years or more
Medium: Occurs less than once every 5 to 10 years
High: Occurs once every year or up to once every five years

Magnitude/Severity
Low: Negligible property damages (less than 5% of all buildings and infrastructure) Negligible loss of quality of life. Local emergency response capability is sufficient to manage the hazard.
Medium: Moderate property damages (15% to 50% of all buildings and infrastructure) Some loss of quality of life. Emergency response capability, economic and geographic effects of the hazard are of sufficient magnitude to involve one or more counties.
High: Property damages to greater than 50% of all buildings and infrastructure. Significant loss of quality of life Emergency response capability, economic and geographic effects of the hazard are of sufficient magnitude to require federal assistance.

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

*What is the data source –Paper map/DFIRM/GIS

Prepared by: _____
Phone _____
Email _____
Date _____

Please return worksheets by mail, email, or fax to:
Jeanine Foster, AMEC Earth & Environmental
1002 Walnut Street, Suite 200
Boulder, CO 80302
fax: (303) 442-0616
email: jeanine.foster@amec.com

WORKSHEET #2: HISTORIC HAZARD EVENT

Name of Department/Jurisdiction: _____

Please fill out one sheet for each significant hazard event with as much detail as possible. Attach supporting documentation, photocopies of newspaper articles, or other original sources.

Type of event	
Nature and magnitude of event	
Location	
Date of event	
Injuries	
Deaths	
Property damage	
Infrastructure damage	
Crop damage	
Business/economic impacts	
Road/school/other closures	
Other damage	
Insured losses	
Federal/state disaster relief funding	
Opinion on likelihood of occurring again	
Source of information	
Comments	

Prepared by: _____

Phone _____

Email _____

Date _____

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WORKSHEET #3: VULNERABILITY ASSESSMENT

Name of Department/Jurisdiction: _____

The purpose of this worksheet is to assess the vulnerable buildings, populations, critical facilities, infrastructure, and other important assets in your community by using the best available data to complete the table and questions that follow. Use the table on the next page to compile a detailed inventory of specific assets at risk including critical facilities and infrastructure; natural, cultural, and historical assets; and economic assets as defined below. These may include hospitals, fire stations, or historic buildings. In the hazard specific column of the asset inventory table, indicate if there is a specific hazard to which the asset is at risk.

Critical Facilities

FEMA generally defines four kinds of critical facilities:

- 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 have occupants who may not be sufficiently mobile to avoid injury or death during a hazard event
- Police stations, fire stations, vehicle and equipment storage facilities, and emergency operations centers that are needed for emergency response activities before, during, and after a hazard event
- Public and private utility facilities that are vital to maintaining or restoring normal services to hazard areas before, during, and after a hazard event

FEMA's HAZUS-MH loss estimation software uses the following three categories of critical assets. 'Essential facilities' are those that if damaged would have devastating impacts on disaster response and/or recovery. 'High potential loss facilities' are those that would have a high loss or impact on the community. Transportation and lifeline facilities are third category of critical assets; examples are provided below.

Essential Facilities	High Potential Loss Facilities	Transportation and Lifeline
Hospitals and other medical facilities	Power plants	Highways, bridges, and tunnels
Police stations	Dams/levees	Railroads and facilities
Fire station	Military installations	Bus facilities
Emergency Operations Centers	Hazardous material sites	Airports
	Schools	Water treatment facilities
	Shelters	Natural gas facilities and pipelines
	Day care centers	Oil facilities and pipelines
	Nursing homes	Communications facilities
	Main government buildings	

Natural, Cultural, and Historical Assets

Natural resource assets may include wetlands, threatened and endangered species, or other environmentally sensitive areas. Historical assets include state and federally listed historic sites.

Economic Assets

Economic assets at risk may include major employers or primary economic sectors, such as agriculture, whose losses or inoperability would have severe impacts on the community and its ability to recover from disaster.

Critical Facility/Asset Inventory

Name of Department/Jurisdiction: _____

Name of Asset	Facility Type	Replacement Value	Hazard Info

Prepared by: _____

Phone _____

Email _____

Date _____

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Boulder, CO 80302
fax: (303) 442-0616
email: jeanine.foster@amec.com

Additional Hazard, Risk, and Vulnerability Questions

Localized/Stormwater Flooding

1. Please describe the localized/stormwater flood issue specific to your jurisdiction in paragraph form. In addition, please provide a list detailing types and location of localized/stormwater flooding problems. If available, also attach a map of problem areas.

Earthquake Vulnerability

1. Number of unreinforced masonry buildings. If available, please provide an inventory of URM buildings specific to your jurisdiction. Include any tables and/or maps. Is this a layer available in GIS?

Special Populations

1. Describe any hazard-related concerns or issues regarding the vulnerability of special needs populations, such as the elderly, disabled, low-income, or migrant farm workers.

Future Development

1. Describe development trends and expected growth areas and how they relate to hazard areas and vulnerability concerns/issues. Please provide zoning/land use maps and GIS layers and maps and tables detailing areas targeted for future development within your jurisdiction.

2. By property type (residential, commercial, industrial, etc) detail the numbers of structures and/or development areas built since the 2004 plan and provide details on whether any of the new development falls within any of the hazard areas.

WORKSHEET #4: MITIGATION CAPABILITY ASSESSMENT

Name of Department/Jurisdiction: _____

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities.

Regulatory

The following planning and land management tools are typically used by local jurisdictions to implement hazard mitigation activities. Please indicate which of the following your jurisdiction has in place. If your jurisdiction does not have this capability or authority, please indicate in the comments column if a higher level of government has the authority. Also use the comments column to indicate how we can obtain a copy of the plan or document (i.e. available on the web, will put on ftp, will email or mail).

Regulatory Tool (ordinances, codes, plans)	Y/N	Date	Comments
General plan			
Zoning ordinance			
Subdivision ordinance			
Growth management ordinance			
Floodplain ordinance			
Other special purpose ordinance (stormwater, steep slope, wildfire)			
Building code			
BCEGS Rating			
Fire department ISO rating			
Erosion or sediment control program			
Stormwater management program			
Site plan review requirements			
Capital improvements plan			
Economic development plan			
Local emergency operations plan			
Community Wildfire Protection Plans			
Flood insurance study or other engineering study for streams			
Elevation certificates			
Other			

Administrative/Technical

Identify the technical and personnel resources responsible for activities related to hazard mitigation/loss prevention within your jurisdiction. For smaller jurisdictions without local staff resources, if there are public resources at the next higher level government that can provide technical assistance, please indicate so in the comments column.

Personnel Resources	Yes/No	Department/Position	Comments
Planner/Engineer with knowledge of land development/land management practices			
Engineer/Professional trained in construction practices related to buildings and/or infrastructure			
Planner/Engineer/Scientist with an understanding of natural hazards			
Personnel skilled in GIS			
Full time building official			
Floodplain Manager			
Emergency Manager			
Grant writer			
Other personnel			
GIS Data – Hazard areas			
GIS Data - Critical facilities			
GIS Data – Building footprints			
GIS Data – Land use			
GIS Data – Links to Assessor's data			
Warning Systems/Services (Reverse 9-11, cable override, outdoor warning signals)			
Other			

Fiscal

Identify whether your jurisdiction has access to or is eligible to use the following financial resources for hazard mitigation

Financial Resources	Accessible/Eligible to Use (Y/N)	Comments
Community Development Block Grants		
Capital improvements project funding		
Authority to levy taxes for specific purposes		
Fees for water, sewer, gas, or electric services		
Impact fees for new development		

Financial Resources	Accessible/Eligible to Use (Y/N)	Comments
Incur debt through general obligation bonds		
Incur debt through special tax bonds		
Incur debt through private activities		
Withhold spending in hazard prone areas		
Other		

Additional Capabilities Questions

1. Does your community have any hazard-related certifications, such as Storm Ready certification or Firewise Communities certification?

2. List any past or ongoing public education or information programs, such as for responsible water use, earthquake or fire safety, household preparedness, or environmental education.

3. Please provide details on the County's/City's floodplain management program that demonstrates, "Continued compliance with the NFIP". If applicable please provide specifics on your CRS program for the community.

4. By hazard, list any other past or ongoing mitigation projects or programs designed to reduce disaster losses.

Prepared by: _____

Phone _____

Email _____

Date _____

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The Mitigation Strategy

One of the planning process' last activities will be for HMPC members to prepare brief descriptions of proposed mitigation projects that would effectively reduce future disaster losses. This section provides guidance on the categories of mitigation measures to be considered and a mitigation project outline with one example projects.

Categories of Mitigation Measures

PREVENTION: Preventive measures are designed to keep the problem from occurring or getting worse. Their objective is to ensure that future development is not exposed to damage and does not increase damage to other properties.

- Planning
- Zoning
- Open Space Preservation
- Land Development Regulations
  - Subdivision regulations
  - Building Codes
    - Fire-Wise Construction
  - Floodplain development regulations
  - Geologic Hazard Areas development regulations (for roads too!)
- Storm Water Management
- Fuels Management, Fire-Breaks

EMERGENCY SERVICES measures protect people during and after a disaster. A good emergency services program addresses all hazards. Measures include:

- Warning (flooding, tornadoes, winter storms, geologic hazards, fire)
  - NOAA Weather Radio
  - Sirens
  - "Reverse 911" (Emergency Notification System)
- Emergency Response
  - Evacuation & Sheltering
  - Communications
  - Emergency Planning
    - Activating the EOC (emergency management)
    - Closing streets or bridges (police or public works)
    - Shutting off power to threatened areas (utility company)
    - Holding/releasing children at school (school district)
    - Passing out sand and sandbags (public works)
    - Ordering an evacuation (mayor)
    - Opening emergency shelters (Red Cross)

    - Monitoring water levels (engineering)
    - Security and other protection measures (police)
  - Critical Facilities Protection (Buildings or locations vital to the response and recovery effort, such as police/fire stations, hospitals, sewage treatment plants/lift stations, power substations)
  - Buildings or locations that, if damaged, would create secondary disasters, such as hazardous materials facilities and nursing homes
  - Lifeline Utilities Protection
- Post-Disaster Mitigation
  - Building Inspections
  - ID mitigation opportunities & funding before reconstruction

PROPERTY PROTECTION: Property protection measures are used to modify buildings subject to damage rather than to keep the hazard away. A community may find these to be inexpensive measures because often they are implemented by or cost-shared with property owners. Many of the measures do not affect the appearance or use of a building, which makes them particularly appropriate for historical sites and landmarks.

- Retrofitting/disaster proofing
  - Floods
    - Wet/Dry floodproofing (barriers, shields, backflow valves)
    - Relocation/Elevation
    - Acquisition
    - Retrofitting
  - High Winds/Tornadoes
    - Safe Rooms
    - Securing roofs and foundations with fasteners and tie-downs
    - Strengthening garage doors and other large openings
  - Winter Storms
    - Immediate snow/ice removal from roofs, tree limbs
    - "Living" snow fences
  - Geologic Hazards (Landslides, earthquakes, sinkholes)
    - Anchoring, bracing, shear walls
    - Dewatering sites, agricultural practices
    - Catch basins
  - Drought
    - Improve water supply (transport/storage/conservation)
    - Remove moisture competitive plants (Tamarisk/Salt Cedar)
    - Water Restrictions/Water Saver Sprinklers/Appliances
    - Grazing on CRP lands (no overgrazing-see Noxious Weeds)
    - Create incentives to consolidate/connect water services
    - Recycled wastewater on golf courses

  - Wildfire, Grassfires
    - Replacing building components with fireproof materials
    - Roofing, screening
    - Create "Defensible Space"
    - Installing spark arrestors
    - Fuels Modification
  - Noxious Weeds/Insects
    - Mowing
    - Spraying
    - Replacement planting
    - Stop overgrazing
    - Introduce natural predators
- Insurance

NATURAL RESOURCE PROTECTION: Natural resource protection activities are generally aimed at preserving (or in some cases restoring) natural areas. In so doing, these activities enable the naturally beneficial functions of floodplains and watersheds to be better realized. These natural and beneficial floodplain functions include the following:

- storage of floodwaters
- absorption of flood energy
- reduction in flood scour
- infiltration that absorbs overland flood flow
- groundwater recharge
- removal/filtering of excess nutrients, pollutants, and sediments from floodwaters
- habitat for flora and fauna
- recreational and aesthetic opportunities

Methods of protecting natural resources include:

- Wetlands Protection
- Riparian Area/Habitat Protection/Threatened-Endangered Species
- Erosion & Sediment Control
- Best Management Practices

Best management practices ("BMPs") are measures that reduce nonpoint source pollutants that enter the waterways. Nonpoint source pollutants come from non-specific locations. Examples of nonpoint source pollutants are lawn fertilizers, pesticides, and other farm chemicals, animal wastes, oils from street surfaces and industrial areas and sediment from agriculture, construction, mining and forestry. These pollutants are washed off the ground's surface by stormwater and flushed into receiving storm sewers, ditches and streams. BMPs can be implemented during

construction and as part of a project's design to permanently address nonpoint source pollutants. There are three general categories of BMPs:

1) Avoidance: setting construction projects back from the stream.
2) Reduction: Preventing runoff that conveys sediment and other water-borne pollutants, such as planting proper vegetation and conservation tillage.
3) Cleanse: Stopping pollutants after they are en route to a stream, such as using grass drainageways that filter the water and retention and detention basins that let pollutants settle to the bottom before they are drained

- Dumping Regulations
- Set-back regulations/buffers
- Fuels Management
- Water Use Restrictions
- Landscape Management
- Weather Modification

STRUCTURAL PROJECTS have traditionally been used by communities to control flows and water surface elevations. Structural projects keep flood waters away from an area. They are usually designed by engineers and managed or maintained by public works staff. These measures are popular with many because they "stop" flooding problems. However, structural projects have several important shortcomings that need to be kept in mind when considering them for flood hazard mitigation:

- They are expensive, sometimes requiring capital bond issues and/or cost sharing with Federal agencies, such as the U.S. Army Corps of Engineers or the Natural Resources Conservation Service.
- They disturb the land and disrupt natural water flows, often destroying habitats or requiring Environmental Assessments.
- They are built to a certain flood protection level that can be exceeded by a larger flood, causing extensive damage.
- They can create a false sense of security when people protected by a structure believe that no flood can ever reach them.
- They require regular maintenance to ensure that they continue to provide their design protection level.

- Structural measures include:
- Detention/Retention structures
- Erosion and Sediment Control
- Basins/Low-head Weirs
- Channel Modifications
- Culvert resizing/replacement/Maintenance

- Levees and Floodwalls
- Anchoring, grading, debris basins (for landslides)
- Fencing (for snow, sand, wind)
- Drainage System Maintenance
- Reservoirs(for flood control, water storage, recreation, agriculture)
- Diversions
- Storm Sewers

PUBLIC INFORMATION: A successful hazard mitigation program involves both the public and private sectors. Public information activities advise property owners, renters, businesses, and local officials about hazards and ways to protect people and property from these hazards. These activities can motivate people to take protection

- Hazard Maps and Data
- Outreach Projects (mailings, media, web, speakers bureau, displays)
- Library Resources
- Real Estate Disclosure
- Environmental Education

Mitigation Action Worksheet

Instructions: Use this guide to record potential mitigation projects (1 page per project) identified during the planning process. Provide as much detail as possible and use additional pages as necessary. These will be collected following HMPC meetings on mitigation goals and measures and included in the plan.

Jurisdiction:

Mitigation Project Title:

Hazards Addressed:

Issue/Background:

Project Description:

Other Alternatives:

Existing Planning Mechanism(s) through which Action Will Be Implemented:

Responsible Office:

Cost Estimate:

Benefits (Losses Avoided):

Potential Funding:

Schedule:

Worksheet Completed by:

Name and Title:

Phone:

Mitigation Action Worksheet - EXAMPLE

Action #12: Elevate Remaining 95 Homes in the Dry Creek Watershed

Hazards Addressed: Floods

Issue/Background: Historically, flooding in the Dry Creek watershed has been a major concern. The February 1986 flood caused widespread damage in most of the Dry Creek watershed. Nearly all bridges and culverts were overtopped, with 30 sustaining embankment damages and one crossing washing out; two bridges over Dry Creek were damaged, street cave ins occurred at a number of locations, and over 125 homes flooded. Of the 145 homes subject to historical flooding within the Watershed, 95 structures remain non-elevated. Of these 95 remaining homes, 25-30 declined initial grant money for elevation as did the three repetitive loss structures. Placer County is not only concerned with existing flooding problems, but with future problems resulting from increased growth and development in the area. According to the 1992 Dry Creek Watershed, Flood Control Plan, substantial flood damages will occur with the 100 year flood under existing conditions. Areas with the most extensive and frequent damages include areas in the location of the 95 homes. The report indicates that some of these areas are susceptible to flooding from storms as frequent as the 10-year storm. Elevating the remaining 95 homes will reduce future flood-related losses.

Project Description: Elevation of 95 homes to current floodplain ordinance requirements of BFE+1.

Other Alternatives: Acquisition of homes; no action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Capital Improvement Plan, Dry Creek Watershed Master Plan

Responsible Office: Placer County Flood Control and Water Conservation District, in conjunction with its member agencies including the cities of Rocklin, Loomis, and Roseville.

Priority (H, M, L): Medium

Cost Estimate: The cost to elevate is estimated at $40 per square foot. Homes need to be elevated anywhere from one to six feet. Of the 95 homes where elevating is feasible, it is estimated to cost $6 million or $50 to $6 K per home.

Benefits (Losses Avoided): Life Safety; Reduction in Property Loss.

Potential Funding: HGMP, PDM, Dry Creek Trust Fund

Schedule: Within three years

AGENDA

Douglas County
Hazard Mitigation Plan (LHMP) Update Project
Early Public Meeting
September 18, 2014

1. Introductions

2. Mitigation, Mitigation Planning, & the Disaster Mitigation Act Requirements

3. Overview of the Douglas County Hazard Mitigation Plan Update Project

4. Questions and Answers/Public Input

SIGN-IN SHEET
DOUGLAS COUNTY
HAZARD MITIGATION PLAN UPDATE PROJECT
Early Public Meeting #1
September 18, 2014

Name	Email Address	Address	Phone	Jurisdiction/ Department/Organization/ Affiliation
Bill SPARKMAN	billgSPARKMAN@MSN.COM	9220 GRAFTON DR Lone Tree 80124	303-910-0101	P.S.A.C. - D.C.
Tim Johnson	timbohnso@dcsheriff.net	4000 Justice Wy Castle Rock 80109	3-660-7589	Douglas DEM
Anne L. Walton	alwalton@douglas.co.us	3026 N. Industrial Way Castle Rock, CO 80109	31814-4356	DC Facilities, Fleet & Emerg. Support Services
Jeanine Foster	jeanine.foster@amec.com	Boulder CO 80302	3)717-7171	AMEC

Anne Walton

From: Douglas County Government <citizenconnect=douglas.co.us@mail224.atl21.rsgsv.net> on behalf of Douglas County Government <citizenconnect@douglas.co.us>
Sent: Tuesday, September 02, 2014 1:27 PM
To: Anne Walton
Subject: Douglas County Government - Colorado

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DOUGLAS COUNTY
COLORADO
www.douglas.co.us

Douglas County Government

News and Events

Countywide Hazard Mitigation Plan Public Meeting

To identify potential hazards that could cause a large scale community disaster, and to qualify Douglas County for mitigation funding from FEMA, Douglas County is partnering with local jurisdictions to update the countywide Hazard Mitigation Plan. Public input is invited to an open meeting on Thursday, September 18, 6 p.m., Douglas County Events Center, 500 Fairgrounds Drive, Castle Rock. For additional information please contact Anne Walton 303-814-4356.

September is National Preparedness Month

Are you ready should a local emergency occur? Make it a priority – prepare yourself and your family – including your pets and livestock. Stock your home with food, water, medicines, and other

related incident or other emergency. Also assemble a 'To Go Kit' should you be asked to leave your home – during an emergency or a disaster – to seek safety elsewhere. For detailed information please visit **www.readycolorado.com** or **www.ready.gov** or call 1-800-BE-READY.

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News Calendar

September 2014

M	T	W	T	F	S	S
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« Aug

Categories

2013

2014

Archives

2007

2008

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2010

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2012

Uncategorized

Tags

Art Encounters Assessor Board Building permits CDBG Chatfield Clerk and Recorder Commissioner Commissioners County Line Road DCHP Department of Motor Vehicles Developmental Disability Grant Douglas County Fair and Rodeo Elections Engineering Flood Insurance Governor Grant Hilbert Homeowner Rebates HUD Human Services Insulate Colorado Program Jack Arrowsmith Jack Hilbert jobs Low Income meeting Motor Vehicle NACo Open Space Parks Division Philip S. Miller prescription drug card primary Property Tax public Public Hearing Rural Framework Committee Tri-County Health Department

Countywide Hazard Mitigation Plan Public Meeting

Posted on September 2, 2014

To identify potential hazards that could cause a large scale community disaster, and to qualify Douglas County for mitigation funding from FEMA, Douglas County is partnering with local jurisdictions to update the countywide Hazard Mitigation Plan. Public input is invited to an open meeting on Thursday, September 18, 6 p.m., Douglas County Events Center, 500 Fairgrounds Drive, Castle Rock. For additional information please contact Anne Walton 303-814-4356.

‹ September is National Preparedness Month

Posted in 2014

NEWS IN A HURRY

Living & Aging Well events set

The Living and Aging Well in Lone Tree committee is sponsoring two events in September.

Artie Lybl with the Douglas County Housing Partnership will speak during a presentation called "Insight into Reverse Mortgages" during the 11:30 a.m. Sept. 9 lunch. It will be held at the Lone Tree Golf Club and Hotel, 9808 Sunningdale Blvd, in Lone Tree.

The event is $10 per person and includes lunch. RSVP at 303-225-4930 or at LivingandAgingWellinLT@gmail.com by Sept. 5.

The group also will present a free "Understanding Dementia" seminar from 8 a.m. to 11:15 a.m. Sept. 27 at the Lone Tree Arts Center event hall. A continental breakfast will be served. Guest speakers will include Natalie Grace of Azura Memory Care and Dr. Huntington Potter of the University of Colorado Anschutz Medical Center. Various community resources, including the

Hurry continues on Page 13

Douglas County

www.douglas.co.us

Household Chemical Roundup in Castle Rock - Sept. 13

The final Household Chemical Roundup for 2014 will be held on Sept. 13, 175 Kellogg Court from 9 a.m. to 3 p.m. This event is hosted by the Tri-County Health Department, and offered free-of-charge to Douglas County residents. Participants will be asked for a $25 contribution to help offset the high costs of hazardous waste disposal and will be asked to verify residency. For more information including a list of acceptable items, please visit ***www.tchd.org/250/Home-Chemical-Waste***

Countywide Hazard Mitigation Plan Public Meeting

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Youth Congress Seeks Youth Delegates

Douglas County youth, 9-12th graders, have an opportunity to become involved as youth delegates at the Douglas County 2014 Youth Congress on Monday, Sept. 22 from 8:30 a.m. to 3:30 p.m. at the State Capitol. To learn more about the 2014 Youth Congress please visit ***www.douglas.co.us/countyadmin/youth/youth-congress/*** or contact Marsha Alston, Youth Services Program Manager at 303.688.4825 ext 5327 or ***malston@douglas.co.us***

September is National Preparedness Month

Ready
Prepare. Plan. Stay Informed.

Are you ready should a local emergency occur? Make it a priority - prepare yourself and your family - including your pets and livestock. Stock your home with food, water, medicines, and other ongoing needs should you be asked to take shelter at home for up to five days due to a weather-related incident or other emergency. Also assemble a 'To Go Kit' should you be asked to leave your home - during an emergency or a disaster - to seek safety elsewhere. For detailed information please visit ***www.readycolorado.com*** or ***www.ready.gov*** or call 1-800-BE-READY.

CODE RED
Keeping citizens informed.
For more information or to register for CodeRED please visit www.DouglasCountyCodeRed.com

Mixed signals frustrate foes of death penalty

Governor's view on capital punishment was kept close to vest

By Vic Vela
vvela@coloradocommunitymedia.com

Key Democratic lawmakers were frustrated with Gov. John Hickenlooper's guidance last year on a death penalty repeal bill and now feel that there was an opportunity lost, given that Hickenlooper's stance against capital punishment is now known.

At the same time, Democrats believe that the governor's "wrestling" on the issue was sincere and hold no resentment toward him for his limited involvement during the legislative process.

A sponsor of a bill that sought to end capital punishment in Colorado believes that the repeal effort would have passed had Hickenlooper come around on his anti-death penalty position sooner.

Hickenlooper — who had campaigned as a supporter of the death penalty in 2010 — acknowledged in an interview with KDVR-TV in August that his position has evolved over the years and that he now opposes capital punishment.

But Hickenlooper wasn't prepared to talk about those views in 2013, when Democrats were crafting a death penalty repeal bill.

Former Rep. Claire Levy, D-Boulder, a sponsor of the bill, said her effort was a "challenge" because of Hickenlooper's lack of guidance on the legislation.

"It did it make it difficult for lawmakers who felt they may be vulnerable for repealing the death penalty; difficult to make to make a commitment to me knowing the bill could be vetoed," Levy said.

Levy said she had several conversations with Hickenlooper about the bill, but it wasn't until just before the legislation was up for a committee hearing that he suggested that might veto.

The bill died in the House Judiciary Committee on March 26, after the governor's feelings on the legislation became known.

"If (Hickenlooper) had arrived at his position earlier, we would have all benefited because we would have known what to do," said Rep. Daniel Kagan, D-Cherry Hills Village, the committee chairman who is against capital punishment. "He was wrestling, no question about it."

The repeal bill had Republican support as well, with Adams County Rep. Kevin Priola's name appearing on the legislation. Priola had hoped the bill would also spark a conversation on abortion, which he opposes.

"I wanted to have a discussion on state policy on the sanctity of life," he said. "The state of Colorado needs to have a discussion of being pro-life in every way."

With Priola's support and the support of religious groups, Levy said she was optimistic about the bill's chances of clearing the General Assembly, had Hickenlooper provided his support.

"We really did have a unique opportunity," she said.

CNN interview surfaces

While there was frustration with Hickenlooper over his role in the death penalty repeal bill, Democrats say they respected the governor's decision-making process.

"While I really wanted a firm yes or no, I understand completely why he was not able to do that for us," Levy said. "And I think the reason he couldn't is really what he's been saying publicly all along and that he's really been wrestling with this issue."

The death penalty issue made headlines again recently after a newly surfaced CNN interview from November became public. In the interview, Hickenlooper told a reporter that clemency for death row inmate Nathan Dunlap could still be on the table. Hickenlooper granted Dunlap an indefinite reprieve in May 2013.

Hickenlooper's campaign said that in the CNN interview, the governor was responding to a hypothetical question, and that Dunlap — who killed four people at an Aurora Chuck E. Cheese's restaurant in 1993 — will die in prison.

Even though Kagan would have liked to have seen Hickenlooper support last year's death penalty repeal, he was OK with how the governor handled the Dunlap situation.

"I respect the position he arrived at in the end," Kagan said. "He said he's not going to decide for an entire state on this issue, instead he said, `I cannot, in good conscience, be the one to sign the death warrant.'"

But Republicans have blasted Hickenlooper over his evolution on the death penalty and for his "indecision and weak leadership" on the issue.

"On my watch, justice will carried out, the laws of the state of Colorado will be enforced and I will never turn my back on the victims," said former Congressman Bob Beauprez, who is running against Hickenlooper in this fall's gubernatorial election.

Rep. Mark Waller, R-Colorado Springs, a former House minority leader, said the death penalty is just one example where Hickenlooper has been hesitant to "weigh in on legislation unless he absolutely has to."

"He never lets you know what his position is," Waller said. "It's like he lets the issue lead him."

But Democrats, for all their frustrations, say Hickenlooper's "thoughtful" approach to painful, moral decisions on issues like the death penalty is better than the alternative.

"When somebody is so completely glib and saying, `Oh, I would put someone to death if I were in charge,' that reflects to me a lack of depth, a lack of appreciation of the enormity of the decision you're making," Levy said.

Kagan agrees.

"I will never knock a man who follows his conscience before taking a politically expedient position," he said.

New field house gets old name

Park complex will be called Miller Activity Center

By Mike DiFerdinando
mdiferdinando
@coloradocommunitymedia.com

The field house at the new Philip S. Miller Park finally has a name: the Miller Activity Center.

The town's "What's in a name" campaign set up kiosks at numerous gathering places around town, asking residents to submit ideas for naming the building. Participants could also submit their ideas, or vote for their favorites, on the town's website.

The contest ran for three weeks, and in total, 83 ideas were submitted and 157 votes were cast.

The public submitted ideas that ranged from names that reflected native wildlife to a memorial for Navy SEAL from the Denver who was killed in MAC, received the most votes.

MAC was the name originally suggested by the town before creating the naming contest to seek public input.

"I know this was the name that was brought up first, but I think it made sense to bring this to the public," Mayor Paul Donahue said. "This is something that is going to be around for a while and I'm glad to see that name came back as the top choice. As far as I'm concerned, if that's the name that got the most votes then I'm all for it."

The field house is not eligible for naming rights, since the issuing of tax-free bonds financed it. It is a restriction of the bond qualifications that the facility cannot allow naming rights in exchange for funding.

The newly named Miller Activity Center will include youth and young adult play areas, an indoor pool, a synthetic turf field and a functional training area with unique programming opportunities such as batting cages, a golf simulator

Waller denounces GOP candidate's anti-gay comments

House District 15 hopeful Klingenschmitt draws ire of fellow Republicans

By Vic Vela
vvela@coloradocommunitymedia.com

Former House Minority Leader Mark Waller on Aug. 27 blasted the fellow Republican who is seeking to succeed him over his recent "horribly inappropriate" anti-gay comments.

Waller, who is not seeking re-election for his Colorado Springs-based House District 15 seat, also told Colorado Community Media that Gordon Klingenschmitt's candidacy "certainly does have an impact" on other races on the fall ballot.

When reached for comment, Klingenschmitt said he takes no issue with Waller's comments and apologized for what led to Waller's admonishment.

Klingenschmitt, who is a chaplain, made national headlines earlier in the week for comments he made in a mass-distributed email. Klingenschmitt suggested that Democratic U.S. Rep. Jared Polis, who is gay, wants to kill Christians, much like the Islamic extremist group who was responsible for beheading a U.S. journalist earlier in August.

"Democrats like Polis want to bankrupt Christians who refuse to worship and endorse his sodomy," he wrote. "Next he'll join ISIS in beheading Christians, but not just in Syria, right here in America."

Waller said his "11-year-old son can identify that as a hateful speech."

"I think it was horribly inappropriate to say," Waller said. "It doesn't matter if he's a person running for state representative or a person on the street. I think it's terrible to say.

"Obviously, he does not speak for me or the Republican Party."

Waller hasn't endorsed Klingenschmitt, but he wouldn't go as far as saying that he should drop out of the race — as Klingenschmitt's opponent, Democrat Lois Fornander has.

"If you're not voting for him, you're voting for the Democrat and quite honestly legislative majorities matter," Waller said. "But that puts (House District 15 voters) in a rock and a hard place in terms of who to vote for."

House District 15 is heavily Republican and Klingenschmitt is still favored to win, in spite of his recent comments.

Klingenschmitt apologized earlier in the week and did so again during a phone interview. He said he was trying to point out the "bad policies of Jared Polis," but that he realizes his comments were offensive.

Klingenschmitt has taken issue with Polis' backing of the Employment Non-Discrimination Act. He said the legislation should have religious exceptions.

"I apologize for the hyperbole and I wrote that statement when I was tired between 1 and 2 in the morning, but I do not apologize for defending Christians for persecution."

When asked if it dawned on him that he was using language that has historically been used to persecute gays while trying to defend Christians from "persecution," Klingenschmitt said, "I don't accept the premise of the question."

Klingenschmitt said he hopes voters will see past his comments.

"I'm a first-time candidate and I am new at this," he said. "I made a mistake and I won't always say the right thing, but I do have a backbone and I will always stand on conviction."

Waller wasn't the only Republican to denounce Klingenschmitt's comments. Owen Loftus, a spokesman for the Colorado Republican Party, said that Klingenschmitt's "comments in no way reflect the views of the party."

House Speaker Mark Ferrandino, D-Denver, who is gay, said Klingenschmitt's comments were "homophobic, extreme and slanderous."

Carjacking suspect found competent for trial

Staff report

Ryan Cole Stone was deemed competent to stand trial during an Aug. 28 status conference held at the Douglas County Justice Center in Castle Rock.

Stone is charged in connection with a multi-county, high-speed March 12 chase that ended at about 8:15 a.m. when Stone allegedly crashed a stolen silver sedan at Lincoln Avenue and Peoria Street.

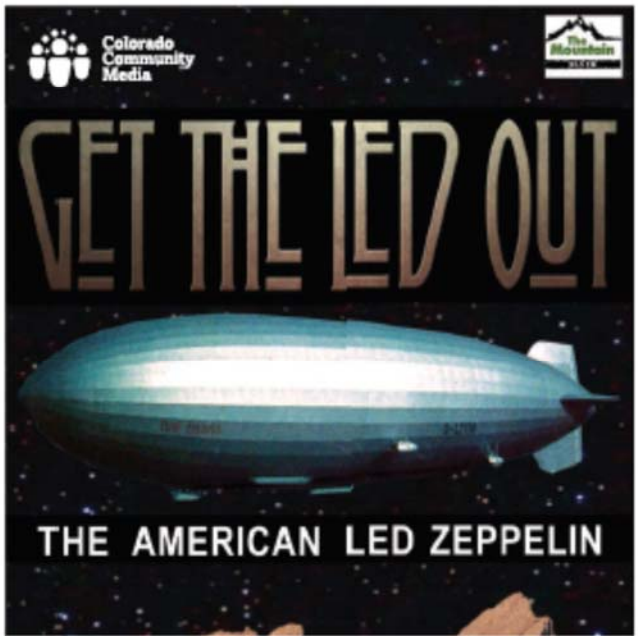
The morning rush-hour chase started in Longmont after, police say, Stone stole an SUV with a 4-year-old boy in it, then carjacked two other vehicles before crashing in Douglas County.

During the chase, Stone struck and injured a Colorado State Patrol trooper.

Stone, who is in custody, appeared with council.

Two competency evaluations were presented to the court - one from the defense's doctor and one from the state. The court accepted the recommendation of both, finding Stone competent to proceed. The defense did not object.

A preliminary hearing for Stone is set for 2 p.m. Oct. 2 at the Justice center.



Man's death deemed suicide

Staff report

The Douglas County Coroner's Office confirmed that the death of a man whose body was discovered near Cherry Hills Community Church and the Valor Christian High School football field in Highlands Ranch was a suicide.

The Douglas County Sheriff's Office, at about 3:30 p.m. Aug. 28, responded to a call concerning "an individual that was seen lying down and not moving around," according to a public statement issued by the sheriff's office.

Responders arrived immediately on scene and discovered the body belonged to a deceased male, a sheriff's office spokesman said. The 71-year-old man was a Highlands Ranch resident, the coroner said. Colorado Community Media generally does not print the name of suicide victims.

DOUGLAS COUNTY
COLORADO

www.douglas.co.us

Household Chemical Roundup in Castle Rock - Sept. 13

The final Household Chemical Roundup for 2014 will be held on Sept. 13, 175 Kellogg Court from 9 a.m. to 3 p.m. This event is hosted by the Tri-County Health Department, and offered free-of-charge to Douglas County residents. Participants will be asked for a $25 contribution to help offset the high costs of hazardous waste disposal and will be asked to verify residency. For more information including a list of acceptable items, please visit www.tchd.org/250/Home-Chemical-Waste

Countywide Hazard Mitigation Plan Public Meeting

To identify potential hazards that could cause a large scale community disaster, and to qualify Douglas County for mitigation funding from FEMA, Douglas County is partnering with local jurisdictions to update the countywide Hazard Mitigation Plan. Public input is invited to an open meeting on Thursday, September 18, 6 p.m., Douglas County Events Center, 500 Fairgrounds Drive, Castle Rock. For additional information please contact Anne Walton 303-814-4356.

Youth Congress Seeks Youth Delegates

NEWS IN A HURRY

Castlewood Canyon programs abound

Castlewood Canyon State Park naturalists lead visitors on a journey of discovery through guided hikes and activities as the seasons prepare to change.

Programs are free, however, all vehicles entering the park must purchase a $7 daily pass or display an annual Colorado State Parks pass.

Park interpreter Warren Coker will give an introduction to the history of stone tools and the basics of flint knapping from noon to 2 p.m. Sept. 6 at the visitor center.

Attendees will learn how breaking and splitting stone into useful tools was a vital part of Native American life in and around Douglas and Elbert counties.

Coker will also lead a full moon hike and teach visitors about the park's nocturnal animals from 6 to 8 p.m. Sept. 6 starting at the Canyon Point parking lot.

Those who attend should bring a flashlight. Additional upcoming events include: "Snakes Alive" at 1:30 p.m. Sept. 7; "Align Yourself With/In Nature…Yoga In Castlewood Canyon" at 8:30 a.m. Sept. 10 (a $10 donation is suggested); "Medicinal Plants of Castlewood Canyon" at 10 a.m. Sept. 10 from the Canyon Point parking lot.

For program information, call 303-688-5242.

Fishing tournament set

The first annual Cabela's charity fishing tournament is slated from 6 a.m. to 3:30 p.m. Sept. 6 at Aurora Reservoir, 5800 S. Powhaton Road in Aurora.

The entry is $35 per person. Prizes will be awarded for the first-, second- and third-largest walleye, trout and bass.

All proceeds will benefit the Douglas/Elbert Task Force. For more information, check the events tab at www.detaskforce.org.

Pinery West getting more homes

KB Home, one of the nation's largest homebuilders, announced plans last month to build 86 new homes at Pinery West, its newest Denver-area community.

The new KB homes are designed in Craftsman style and located west of South Parker Road and North Pinery Parkway.

The gated community, the company says, is well suited for people with active lifestyles, and provides quick access to outdoor pursuits such as hiking or biking on the Cherry Creek Trail or golfing at the Pinery Country Club.

Homes at Pinery West are available in both one- and two-story floor plans, ranging in size from 1,747 to 3,044 square feet, with up to six bedrooms and four-and-a-half baths.

Priced from the $400,000s, all new KB homes in the community include open floor plans with customizable flex space, large kitchens and walk-in closets.

Modern, energy-efficient homes are now available at Pinery West.

For more information, visit www.kbhome.com.

A 32,000 square-foot public works facility — under construction at Hess Road and Tammy Lane — will be ready for move-in in May 2015. *Photo by Chris Michlewicz*

Public works buildings taking shape

Project at Hess Road and Tammy Lane expects to be ready in May 2015

By Chris Michlewicz
cmichlewicz
@coloradocommunitymedia.com

A construction project that aims to accommodate the expanding Parker Public Works Department is right on schedule.

Residents driving along Hess Road between Jordan and Motsenbocker roads in recent months might have noticed two massive buildings going up on the north side. It's part of a yearlong, $15.6 million undertaking to house the growing streets, traffic and stormwater departments.

"The project is going well and it is on schedule for public works to move into the building in May of 2015," said Chris Hudson, project manager for the public works department.

The existing public works building, adjacent to Salisbury Park on Motsenbocker Road, will remain open.

The additional space, at Hess Road and Tammy Lane, will enable public works to operate comfortably for at least the next 20 years.

Last year, town council approved the issuance of $21 million in debt in the form of certificates of participation to fund the new facility and the expansion and renovation of the Parker Recreation Center. Roughly $13.5 million is that sum is going toward the public works building.

The facility will initially be 65-70 percent occupied and include space for future expansion. It will have room to store street sweepers and crack seal machines, as well as specialized turf equipment that has been kept outdoors. One building also will contain the town's first welding and fabrication shop.

Singer's death puts Survivor show in question

Iconic 80s rock band scheduled to perform at PACE Center

By Chris Michlewicz
cmichlewicz
@coloradocommunitymedia.com

A plan by the 1980s band Survivor to kick off its tour in Parker is up in the air following the sudden death of lead singer Jimi Jamison.

Jamison died of a heart attack at the age of 63 on Aug. 31, less than two weeks before a scheduled performance with the iconic rock group at the Parker Arts, Culture and Events Center. Organizers have not canceled the Sept. 12 show and are working with Survivor's tour manager to determine a course of action during a delicate time, said Carrie Glassburn, marketing manager for the PACE Center.

Meanwhile, the venue is offering credit or refunds "to anyone who has asked," she said. A handful of ticket-holders have contacted the PACE Center since hearing the news of Jamison's death, including those who were planning to attend specifically to see the big-voiced front man.

Survivor is best known for hits like "Eye of

A scheduled concert by the 1980s band, Survivor, at the PACE Center is up in the air following the Aug. 31 death of lead singer Jimi Jamison. Survivor was planning to kick off its next tour in Parker. *Photo by Sally Irwin*

singing duties with David Bickler, the band's original singer and the voice behind "Eye of the Tiger." Glassburn expressed hope that Bickler might step in.

The band performed in California the night before Jamison died.

AGENDA

Douglas County
Local Hazard Mitigation Plan (LHMP) Update Project
Public Meeting #2

May 14, 2015
6:00-7:30 pm
Douglas County Events Center
500 Fairgrounds Dr., Castle Rock, CO

1. Introductions
2. Overview of the Douglas County Hazard Mitigation Plan Update Project
3. Mitigation, Mitigation Planning, & the Disaster Mitigation Act Requirements
4. Hazards in Douglas County
5. Mitigation Plan Goals
6. Mitigation Plan Actions
7. Reviewing and Commenting on the Draft Plan
8. Questions and Answers/Public Input

SIGN-IN SHEET
DOUGLAS COUNTY
LOCAL HAZARD MITIGATION PLAN UPDATE PROJECT
Public Workshop #2
May 14th, 2015

Name	Email Address	Address	Phone	Jurisdiction/ Department/Organization/ Citizen/Affiliation
Joyce Bammes	joycebammes@comcast.net	Parker	720-851 9627	Citizen
Don Bammes	dcsithbriff.net	—		
Pat Nohavec	patnohavec1@msn.com	1650 Thatch Cir		PSAC
Tim Johnson				Douglas OEM
Debrah Schnackenberg	debrah.schnackenberg@outlook.com	8508 Tanglewood Rd Franktown, CO 80116	303-585-1775	Douglas
AC Stremble	astremble@gmail.com	7205 Marshall Larkspur 80118	303 681 2374	PSAC
Bill Sparkman	Billsparkman@msn.com	9220 Grafton Dr Lone Tree, Co.	303-910-0101	PSAC
Virginia Scally	scallyv@yahoo.com	76 Curtis Pl Castle Rock CO 80104	303-688-6118	citizen
Brad Meyering	brad.meyering@castlepinesgov.com	7501 Village Square	3-705-0216	Castle Pines
Vicky Starkey	VStarkey@DouglasCo.us		3-9152364	DCFFE88
D. Weaver		BOCC		
Kalley Weishapl				Citizen

Grey Weeks	grey.weeks@cityofcastlepines.com		303-662-8112	City of Castle Pines
David VanDellen	DVANDELLEN@CRGOV.COM		720-733-6029	Castle Rock
Matt Krimmer	mkrimmer@townoflarkspur.org		303-681-2324	Larkspur
Vicki McPherson	vmcpher@douglas.co.us		303-660-7455	DC
Mike Sutherland	msutherland@parkeronline.org		303-805-3205	Parker
Art Morales	amorales@crgov.com		303-435-0608	TOCR
Connie Pipes	cpipes@douglas.co.us		303-660-7442	Douglas Co.
Andrew Butler	abutler4383@GMAIL.COM		303 663 1174	Happy Canyon
Jeff Brislawn	jeff.brislawn@amecfw.com	AMEC Foster Wheeler	303-742-5506	AMEC Foster Wheeler
Anne Walker		DCFFESS		

Please complete this questionnaire and return
by June 1, 2015 to Jeff Brislawn
jeff.brislawn@amecfw.com
Amec Foster Wheeler
1002 Walnut St., Ste. 200
Fax: 303 442-0616 Attn: Jeff Brislawn

Douglas County
Local Hazard Mitigation Plan

The draft plan can be accessed at www.douglas.co.us.

1. The hazards addressed in the draft Douglas County Local Hazard Mitigation Plan Update are listed below. Please indicate the level of significance in Douglas County that you perceive for each hazard. Please rate these hazards 1 through 3 as follows: 1=low, 2=moderate, 3=high.

- ☐ Extreme Heat
- ☐ Hail
- ☐ High Winds
- ☐ Lightning
- ☐ Heavy Rain and Thunderstorms
- ☐ Tornado
- ☐ Winter Weather
- ☐ Avalanche
- ☐ Drought
- ☐ Earthquake
- ☐ Dam Failure
- ☐ 100/500-year Floods and Localized Stormwater Floods
- ☐ Landslide / Mud and Debris Flows / Rockfall
- ☐ Erosion and Deposition
- ☐ Expansive Soils
- ☐ Land Subsidence
- ☐ Wildfire
- ☐ Hazardous Materials: Transportation Incidents

2. Do you have information on specific hazard issues/problem areas that you would like the planning committee to consider?

3. Review the types of mitigation actions being considered in Douglas County. Please place a check ☒ next to the types of mitigation actions that you think should have the highest priority in the Douglas County Local Hazard Mitigation Plan Update.

- ☐ Public education/awareness
- ☐ Indoor/outdoor warning
- ☐ Evacuation route development
- ☐ Flood hazard mitigation
- ☐ Continued participation in the National Flood Insurance Program
- ☐ Erosion mitigation and stream stabilization
- ☐ Wildfire fuels treatment projects
- ☐ Planning/zoning
- ☐ Critical facilities protection
- ☐ Installation of generators

4. Please comment on the draft plan update or any other pre-disaster strategies that the planning committee should consider for reducing future losses caused by natural disasters (use the back of this form if needed).

5. Provide your name and email address if you would like to be added to a distribution list for upcoming activities related to the planning process:

http://www.douglas.co.us/public-input-sought-on-multi-hazard-plan/

On our website promoting the HMP…

Anne

Anne L. Walton
Emergency Support Services Coordinator
3026 N. Industrial Way
Castle Rock, CO 80109
(303) 814.4356 Office
(720) 539.1092 Cellular

From: Douglas County Government [mailto:citizenconnect=douglas.co.us@mail60.suw11.mcdlv.net] **On Behalf Of** Douglas County Government
Sent: Tuesday, May 05, 2015 8:37 AM
To: Anne Walton
Subject: Douglas County Government - Colorado

Douglas County News

View this email in your browser

DOUGLAS COUNTY
COLORADO
www.douglas.co.us

Public input sought on multi-hazard plan

Douglas County's Office of Emergency Management, the Denver Water Board and the municipalities of Castle Pines, Castle Rock, Larkspur, Lone Tree and Parker are updating the County's comprehensive Multi-Hazard Mitigation Plan. **...Read More**

-------- Original Message --------
Subject: FW: Hazard Mitigation Plan Draft Presentation Meeting
From: Greg Weeks <GWeeks@ttgcorp.com>
To: Anne Walton <alwalton@douglas.co.us>
CC:

Ann

FYI, - Notice on City of Lone Tree Website -- in case you need to "document" for the HMP.

Greg

Gregory A. Weeks, P.E. **CFM, LEED ® AP**
City Engineer
City of Lone Tree Public Works Department
9222 Teddy Lane
Lone Tree, CO 80124
(303) 662-8112
Fax: (303) 792-9489
greg.weeks@cityoflonetree.com

Please consider the environment before printing this e-mail.

From: Kristen Knoll [mailto:Kristen.Knoll@cityoflonetree.com]
Sent: Monday, April 27, 2015 5:12 PM
To: Greg Weeks
Subject: RE: Hazard Mitigation Plan Draft Presentation Meeting

Thanks, Greg. This will go live on our website on May 4.

Kristen Knoll
Community Outreach Coordinator
City of Lone Tree
9220 Kimmer Drive, Suite 100
Lone Tree, CO 80124
303-708-1818
kristen.knoll@cityoflonetree.com

Follow the City on Facebook and Twitter:

From: Greg Weeks [mailto:GWeeks@ttgcorp.com]
Sent: Wednesday, April 22, 2015 3:19 PM
To: Kristen Knoll
Cc: Ron Pinson
Subject: FW: Hazard Mitigation Plan Draft Presentation Meeting

Kristen

Can this notice get put up on the City Website?

Thanks

Greg

Gregory A. Weeks, P.E. **CFM, LEED ® AP**
City Engineer
City of Lone Tree Public Works Department
9222 Teddy Lane
Lone Tree, CO 80124
(303) 662-8112
Fax: (303) 792-9489
greg.weeks@cityoflonetree.com


Please consider the environment before printing this e-mail.

From: Anne Walton [mailto:alwalton@douglas.co.us]
Sent: Wednesday, April 22, 2015 2:02 PM
To: "Detweiler"<bdetweiler@crgov.com>; Abra Geissler; Alex Mendez (Amendez@irea.coop); Andrea LaRew; Andrew Copland; Anne Walton; Art Morales (amorales@crgov.com); Barbara Drake; Becky Barnes; Becky Nelson; Bertagni, Loretta A.; Bill Sparkman (billsparkman@msn.com); Bob Glancy; Brad Meyering; Brandon Lenderink (Brandon.Lenderink@elbertcounty-co.gov); Cheryl Matthews; Christine Manson de Babe - Red Cross (christine.mansonderabe@redcross.org); Clint Fey (cfey@co.jefferson.co.us); Connie Pipes; Cora Gatlin; Cory Stark (cory.stark@state.co.us); Dan Escobedo; Daniel Ball (daniel.ball@usw.salvationarmy.org); Daniel Makelky; Darryl Jones (djones@coventrydevelopment.com); David A Weaver; David Mallory; Debra Douglas; Debrah Schnackenberg (debrahschnackenberg@petaidcolorado.org); Dennis Houston; Diane Holbert; Diane Leavesley; Don Bammes; Don VanWormer; Doreen Jokerst (djokerst@parkeronline.org); Doug Barnes; Doug DeBord; Ed Seal; Eliza Hunholz; Franco, Rebecca J. (Rebecca.Franco@denverwater.org); Fred Koch; Garrett Chism; Garth Englund; Gerry Been; Giles Whiting; Greg Weeks; Hillary King; Jamie Prochno; Janet

Herman; Jason Finehout (Jason.Finehout@denverwater.org); Jeff Brislawn; Jeff Case; Jeffrey Huff; Jen Poitras; Jerry Flannery; Jill Alexander; Jill Elizabeth Repella; Jill Romann; Jim Gunning (jim.gunning@cityoflonetree.com); Jim Olsen (jolsen@littletongov.org); Joel R. Hanson; John Fussa; Jonna Negus-Pemberton; Judy Hammer; Julie Baxter; Justin Olson (justin.olson@state.co.us); Kelly Brown; Kelly First; Ken Joseph; Kevin Houck; Kevin Stewart; Korby Lintz; Kristin Garrison (Kristin.Garrison@ColoState.EDU); Lance Ingalls; Laura Leary; Laurie Elliott; Leonard Cheslock; Linda Watson; Lisa Frizell; Lisa Kallweit; Lizabeth Jordan; Mark Rankin; Mark Stevens (mstevens@crgov.com); Martha Marshall; Matt Krimmer (mkrimmer@townoflarkspur.org); Mayor Waid; Melanie Worley (melanieworley@developmentalpathways.org); Merlin Klotz; Michael Edwards (michaeledwards@centura.org); Michele Askenazi (maskenaz@tchd.org); Mike Sutherland (msutherland@parkeronline.org); Molly Duffy (mduffy@crgov.com); Monica Wasden; Nathan Fogg (nfogg@arapahoegov.com); Nick Striegel (nick.striegel@state.co.us); Pam Ridler; Patricia Gavelda; Patty Moschner; Phil Currance ; Randall Burkhardt; Randy Johnson; Randy Young (ryoung@parkeronline.org); rhickenbottom@fs.fed.us; Rick Owens; Robert Wareham (rbwareham@thelawcenterpc.com); Rod Meredith; Roger Partridge; Ron Hanavan; Ron Pinson; Ron Zuroff; Sara Garrington; Scott Ingvolstad; Seth Hoffman; Sharon Roman (sroman@townoflarkspur.org); Sherry Monroe; Skyview Weather (tim@skyview-wx.com); Stephanie Miller (stephanie.miller@centurylink.com); Steve Koster; Steve Standridge; Steve Steed (steeds@co.teller.co.us); Susan Squyer (susan.squyer@cityoflonetree.com); Terence T. Quinn; Terry Nolan (tnolan@highlandsranch.org); Tiffany Richens (tiffanyrichens@centura.org); Tim Daly; Tim Johnson; Timothy Murrell; Timothy Ralph; Todd Farrow; Tom Williams; Tony Spurlock; Vicki Mcpherson; Victoria Starkey; Virginia Scally (scallyv@yahoo.com); Wendy Holmes; Zach Nannestad (zach.nannestad@dcsdk12.org)
Subject: Hazard Mitigation Plan Draft Presentation Meeting

DOUGLAS COUNTY EMERGENCY MANAGEMENT

4000 Justice Way
Castle Rock, CO 80109
Phone: 303-660-7589
Fax: 303-814-8790

FOR IMMEDIATE RELEASE

April 22, 2015

Contact: Anne Walton
Douglas County Emergency Support Services
303-814-4356

PUBLIC INPUT OPPORTUNITY ON DOUGLAS COUNTY MULTI-HAZARD MITIGATION PLAN UPDATE

DOUGLAS COUNTY, CO – Douglas County Emergency Management is hosting an open house and workshop. The open house is part of the Douglas County Multi-Hazard Mitigation Planning Project. Douglas County, Castle Pines, Castle Rock, Larkspur, Lone Tree, Parker, and the Denver Water Board are developing a comprehensive Multi-Hazard Mitigation Plan Update to reduce the vulnerability of people and impact to property in the County. All interested parties are invited. The Multi-Hazards

Planning Open House will be held on **Thursday, May 14, 2015 between 6:00 and 7:30pm at the Douglas County Events Center (500 Fairgrounds Drive, Castle Rock, CO).** For more information on this project, contact Anne Walton at 303-814-4356 or alwalton@douglas.co.us.

Anne

Anne L. Walton
Emergency Support Services Coordinator
3026 N. Industrial Way
Castle Rock, CO 80109
(303) 814.4356 Office
(720) 539.1092 Cellular

From: Douglas County Government [mailto:citizenconnect=douglas.co.us@mail31.us4.mcsv.net] **On Behalf Of** Douglas County Government
Sent: Tuesday, May 19, 2015 9:02 AM
To: Anne Walton
Subject: Douglas County Government - Colorado

Douglas County News

View this email in your browser

DOUGLAS COUNTY
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www.douglas.co.us

Comment on County's hazard plan

Douglas County is asking for citizen input on updates to the County's comprehensive Local Hazard Mitigation

Plan.

The plan and the accompanying annexes identify and describe potential hazards in Douglas County as well as provide mitigation projects for consideration. **...Read More**

PSAC Meeting

December 11, 2014 — Sign-In Sheet

Patricia Mohave Smith

Glenda Smith

Jenne Blackburn

* — Lindy Blackburn

Tom Mancuso

Matthew Fierro

Pat Perlinger

Robert Wareham

Tim Johnson

Monica Warden

Bill Sparkman

MEETING RECORD

Project:	Date:
Douglas County LHMP Update	December 11, 2014

Meeting Purpose:
PSAC monthly meeting: County OES presented information on the LHMP Update with the purpose of obtaining PSAC (public) support and participation on the LHMP planning committee.

Meeting Attendees:__See attached sign in sheet._____
_____
_____
_____

Items Discussed: _AMEC presented a PowerPoint presentation and provided a handout on mitigation planning and the plan update process. Questions on the level of commitment and other items related to the LHMP update process were asked and answered. Based on initial feedback, it appears that in general the PSAC group supports the LHMP Update and individual PSAC members will be working with County OES to provide a commitment to being standing members of the steering committee to the HMPC.

Follow-up: _____AMEC and County to work with establishing the PSAC individuals that will be committing to participation on the HMPC Steering Committee. Additional follow up will be to include PSAC members on email and other announcements regarding LHMP meetings and other planning activities.

By:
Name: _ Jeanine Foster _____
Organization: ____AMEC_____

PSAC Meeting

December 11, 2014 Sign-In Sheet

Patrice Nohava Fish

Glenda Smith

Jenne Blackburn

* — Linny Blackburn

Tom Mancuso

Matthew Fierro

Pat Perlinger

Robert Wareham

Tim Johnson

Monica Worden

Bill Sparkman

Good afternoon Monica –

I hope this finds you well into a wonderful holiday season!

I was told we initially have 3 interested parties for the Hazard Mitigation Plan development:

1. Don Bammes
2. Bill Sparkman
3. Robert Wareham

I am hoping we have others who are interested, I recall the need for dates for planning purposes. I apologize it has taken so long to pull those together. Finding a spot that will accommodate this group plus the expanded planning group has been a challenge!

Tentatively, I am looking at the following dates for the meetings:

- Vulnerability Assessment & Goals Update Meeting: **Thursday February 5th** (2:00 pm – 5:00 pm). At this meeting, AMEC will present the results of the hazard identification and vulnerability assessment for each hazard. This discussion lays the foundation for the development of new and updated mitigation goals and action strategies. Following the vulnerability discussion, AMEC will facilitate a goal setting discussion. Goals are broad based statements that formalize the intent of the multi-hazard plan. We will revisit the goals established in the DRCOG plan as a starting point. Location TBD.

- Mitigation Strategy Meeting : **Thursday March 5th** (2:00 pm – 5:00 pm). AMEC will facilitate a work session to finalize the draft goals and develop new and updated actions (or projects) to be incorporated into the plan. These are the specific action items that each jurisdiction would implement in the future to reduce hazard losses. These actions must be pre-disaster actionable projects, as opposed to response or preparedness activities, and each jurisdiction needs at least one action specific to their priority hazard(s). We will also discuss an approach to implementation of the plan at this meeting. Location Douglas County Events Center.

- Draft of Plan Presented: **Thursday May 14th** (6:00 pm – 7:00 pm). Location TBD.

Please let me know if there are others who would be able to participate as well as their email addresses and I will add them to the list. I will be able to

get notification out to them next week, when the venues come back available!

Thank you again, our volunteers are very important for this process and I sincerely appreciate their time and effort to be part of this plan development.

Warm regards,

Anne

Anne L. Walton
Emergency Support Services Coordinator
3026 N. Industrial Way
Castle Rock, CO 80109
(303) 814.4356 Office
(720) 539.1092 Cellular

Good afternoon all –

Can you please pass along to me your respective agency's floodplain manager and their email address? We will need them for the next 3 meetings that will be scheduled over the next 6 months.

Thank you so much!

Anne

Anne L. Walton
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Good morning all -

I am writing to update you on the status of the Hazard Mitigation Plan for Douglas County.

I have confirmed the following dates and locations:

- **Vulnerability Assessment Meeting:** Thursday February 5th, 2:00 pm – 5:00 pm (DC OEM at the Justice Center) – we will need to 'borrow' 20 additional chairs for theater style seating in OEM (this will bring the capacity to 50 people). Tim, we will need to move the tables out of the area to accommodate the additional seating – can your folks do that? I will contact Tim Hallmark and see if they can bring in 20 additional chairs for us.
- **Mitigation Strategy Meeting:** Thursday March 5th, 2:00 pm – 5:00 pm (DC Events Center)
- **Public Meeting to Present Draft Plan:** Thursday May 14th, 6:00 pm – 7:30 pm (DC Events Center)

The following have been confirmed for the Steering Committee:

1. Bill Sparkman, Citizen
2. Robert Wareham, Citizen
3. Don Bammes, Citizen
4. Virginia Scally, Citizen
5. Lee Abbott, Citizen
6. Becky Barnes, Citizen
7. Doug Barnes, Citizen
8. Garth Englund, DC Engineering Flood Plain Manager
9. Greg Weeks, Lone Tree Flood Plain Administrator
10. Mike Waid, Parker Flood Plain Manager
11. Brad Meyering, Castle Pines PW
12. Jason Finehout, Denver Water Flood Plain Manager
13. Matt Krimmer, Larkspur (Flood Plain person TBD)
14. Art Morales, Castle Rock (Flood Plain person TBD)

I will be sending along an email for the participants shortly to save the dates. Hopefully we will have a flood plain specialist for Castle Rock and Larkspur soon.

Thanks!

Anne

Anne L. Walton
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APPENDIX B: REFERENCES

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Appendix C
Mitigation Strategy Documentation

C.1 Formulating and Updating the Mitigation Strategy

Goals, Objectives, and Actions

Goals, objectives, and mitigation actions should be based on the information revealed in the Risk Assessment. Definitions and actions are provided below:

Goals are general guidelines that explain what you want to achieve. Goals are defined before considering how to accomplish them so that the goals are not dependent on the means of achievement. They are usually broad policy-type statements and represent long term global visions such as:

- Reduce exposure to hazard related losses
- Minimize the risk from natural disasters to existing facilities and proposed development
- Reduce the impact of natural hazards to the citizens of the county
- Provide protection for natural resources from hazard impacts
- Maintain and enhance existing mitigation measures
- Increase public awareness of vulnerability to hazards and support and demand for hazard mitigation

Objectives define strategies or implementation steps to attain the identified goals. Unlike goals, objectives are specific and measurable, such as:

- Maintain the flood mitigation programs to provide 100-year flood protection
- Protect critical facilities to the 500 year flood
- Educate citizens about wildfire defensible space actions

Mitigation Actions are specific actions that help you achieve your goals and objectives. Some examples include:

- Elevate three historic structures located in the downtown district
- Sponsor a community fair to promote wildfire defensible space
- Retrofit the police department to withstand flood damage

Existing Goals and Objectives in 2010 DRCOG Hazard Mitigation Plan

Goal 1: Protect people, property, and natural resources

Goal 2: Increase public awareness of natural hazards and their mitigation

Goal 3: Strengthen communication and coordination among public agencies, non-governmental organizations (NGOs), businesses and private citizens

Goal 4: Coordinate and integrate natural hazard mitigation activities with local land development planning activities and emergency operations planning

Other Goals from Related Plans

It is also important to integrate the mitigation strategy with other existing goals to ensure consistency, efficiency, and effectiveness, which is also useful in identifying funding opportunities.

State of Colorado Multi-Hazard Mitigation Plan, 2013

1. Reduce the loss of life and personal injuries from natural hazard events.
    - Strengthen risk communication tools and procedures
    - Strengthen continuity of operations at the state, regional, tribal, and local levels of government to ensure the delivery of essential services
    - Strengthen cross-sector connections
    - Identify specific areas at risk to natural hazards and zones of vulnerability
    - Continue to develop and expand public awareness and information programs
    - Develop projects focused on preventing loss of life and injuries from natural hazards
2. Reduce damage to local government assets.
    - Assist local government officials with non-construction activities
    - Assist local government officials with construction activities
    - Improve local government monitoring and decision-making tools
3. Reduce damage to state government assets.
    - Continue to identify and prioritize state critical, essential, and necessary assets
    - Develop projects to protect state critical, essential, and necessary assets in natural hazard risk areas
    - Improve state government monitoring and decision-making tools
4. Reduce state and local costs of disaster response and recovery.
    - Strengthen connections between hazard mitigation activities and preparedness, response, and recovery activities
    - Improve coordination of state government resources with local and tribal government and private nonprofit resources
5. Minimize damages to personal property.
    - Distribute information on and promote involvement in existing programs
    - Continue to partner with local and tribal governments to develop projects and initiatives to protect personal property
6. Minimize economic losses.
    - Reduce service interruptions and revenue losses to the state
    - Reduce down time and revenue losses for local and tribal governments and private nonprofit organizations

Douglas County Community Wildfire Protection Plan (2011) Goals:

- Define the existing wildfire situation in Douglas County.

- Identify common obstacles communities and stakeholders in Douglas County face in reducing their wildfire hazards.

- Provide information and tools to help overcome common obstacles that communities in Douglas County face in reducing their wildfire hazards, including streamlining the local-level CWPP process.

- Provide an implementation plan that suggests future programmatic steps in overcoming common obstacles and reducing wildfire hazard around Douglas County.

- Identify county-owned parcels for treatment and parameters for prioritizing treatment.

- Identify recommendations for potential landscape scale fuel treatments.

Douglas County Comprehensive Master Plan (2014):

- 2-6: Achieve compatibility between residential and nonresidential land uses, in terms of land use and design

- 9-1: Recognize and respect natural geologic conditions

- 9-2: Limit land uses in floodplains

- 9-3: Reduce the risk of loss from wildfire hazard

- 9-5: Maintain high water quality and protect water resources

Group Goals and Objectives Update/Development

The purpose of this process is to revisit the existing goals and objectives and come to a team decision, or consensus, on revisions to them. **List below suggested revisions or additions to the goals and objectives of Douglas County's Hazard Mitigation Plan.** You can refer to the existing plan goals listed previously and you may reword them or add new ones. If you believe the existing goals and objectives are already comprehensive as is then indicate "no change." For any new goals suggest one or more objectives to accomplish that goal. Leave behind or return to Jeff Brislawn (jeff.brislawn@amec.com or Fax to 303-442-0616).

Goal 1:

Objectives:

Goal 2:

Objectives:

Goal 3:

Objectives:

Goal 4:

Objectives

Does the proposed action protect lives?

Does the proposed action address hazards or areas with the highest risk?

Does the proposed action protect critical facilities, infrastructure, or community assets?

Does the proposed action meet multiple objectives (multi-objective management)?

C.2.1 STAPLE/E

Developed by FEMA, this method of applying evaluation criteria enables the planning team to consider in a systematic way the social, technical, administrative, political, legal, economic, and environmental opportunities and constraints of implementing a particular mitigation action. For each action, the HMPC should ask, and consider the answers to, the following questions:

Social

Does the measure treat people fairly (different groups, different generations)?

Technical

Will it work? (Does it solve the problem? Is it feasible?)

Administrative

Is there capacity to implement and manage project?

Political

Who are the stakeholders? Did they get to participate? Is there public support? Is political leadership willing to support it?

Legal

Does your organization have the authority to implement? Is it legal? Are there liability implications?

Economic

Is it cost-beneficial? Is there funding? Does it contribute to the local economy or economic development? Does it reduce direct property losses or indirect economic losses?

Environmental

Does it comply with environmental regulations or have adverse environmental impacts?

Example Mitigation Action Items by Community Rating System categories

Note: The following matrix was referenced by the HMPC while considering mitigation alternatives related to Prevention, Property Protection, Public Eduction, Natural Resource Protection, Emergency Services and Structural projects.

Alternative Mitigation Actions	Dam Failure	Floods	Hazardous Materials	Landslides/ Debris Flows/ Rockfalls; soil hazards	Weather Extremes (hail, lightning, wind, temps, drought)	Earthquakes	Wildland Fires	Severe Winter Storm
PREVENTION								
Building codes and enforcement		■	■	■	■	■	■	■
Comprehensive Watershed Tax		■						
Density controls	■	■	■	■			■	
Design review standards		■	■	■		■	■	
Easements		■	■	■			■	
Environmental review standards		■	■	■		■	■	
Floodplain development regulations	■	■	■					
Hazard mapping	■	■	■	■			■	
Floodplain zoning	■	■	■					
Forest fire fuel reduction			■				■	
Housing/landlord codes			■		■			
Slide-prone area/grading/hillside development regulations				■			■	
Manufactured home guidelines/regulations		■			■	■		
Minimize hazardous materials waste generation			■					
Multi-Jurisdiction Cooperation within watershed	■	■						
Open space preservation	■	■		■			■	
Performance standards	■	■		■	■	■	■	■

Alternative Mitigation Actions	Dam Failure	Floods	Hazardous Materials	Landslides/ Debris Flows/ Rockfalls; soil hazards	Weather Extremes (hail, lightning, wind, temps, drought)	Earthquakes	Wildland Fires	Severe Winter Storm
Periodically contain/remove wastes for disposal			■					
Pesticide/herbicide management regulations			■					
Special use permits	■	■	■	■			■	
Stormwater management regulations		■	■					
Subdivision and development regulations	■	■	■	■		■	■	
Surge protectors and lightning protection					■			
Tree Management					■		■	■
Transfer of development rights		■		■			■	
Utility location			■	■	■			■
PROPERTY PROTECTION								
Acquisition of hazard prone structures	■	■		■			■	
Facility inspections/reporting	■	■	■			■		
Construction of barriers around structures	■	■	■					
Elevation of structures	■	■						
Relocation out of hazard areas	■	■	■	■			■	
Structural retrofits (e.g., reinforcement, floodproofing, bracing, etc.)		■	■	■	■	■	■	■
PUBLIC EDUCATION AND AWARENESS						■		
Debris Control		■		■				
Flood Insurance	■	■						
Hazard information centers	■	■	■	■	■	■	■	■
Public education and outreach programs	■	■	■	■	■	■	■	■
Real estate disclosure	■	■	■	■	■	■	■	■
Crop Insurance					■	■		
Lightning detectors in public areas					■			

Alternative Mitigation Actions	Dam Failure	Floods	Hazardous Materials	Landslides/ Debris Flows/ Rockfalls; soil hazards	Weather Extremes (hail, lightning, wind, temps, drought)	Earthquakes	Wildland Fires	Severe Winter Storm
NATURAL RESOURCE PROTECTION								
Best Management Practices (BMPs)		■	■	■	■		■	
Forest and vegetation management	■	■		■	■		■	■
Hydrological Monitoring	■	■	■	■	■			
Sediment and erosion control regulations	■	■	■	■				
Stream corridor restoration		■		■				
Stream dumping regulations		■	■					
Urban forestry and landscape management		■		■	■		■	■
Wetlands development regulations		■	■	■			■	
EMERGENCY SERVICES								
Critical facilities protection	■	■	■	■	■	■	■	■
Emergency response services	■	■	■	■	■	■	■	■
Facility employee safety training programs	■	■	■	■	■	■	■	■
Hazard threat recognition	■	■	■	■	■	■	■	■
Hazard warning systems (community sirens, NOAA weather radio)	■	■	■	■	■	■	■	■
Health and safety maintenance	■	■	■	■	■	■	■	■
Post-disaster mitigation	■	■	■	■	■	■	■	■
Evacuation planning	■	■	■	■			■	
STRUCTURAL PROJECTS								
Channel maintenance		■		■				
Dams/reservoirs (including maintenance)	■	■						
Isolate hazardous materials waste storage sties			■					
Levees and floodwalls (including maintenance)		■						
Safe room/shelter					■	■		■
Secondary containment system			■					

Alternative Mitigation Actions	Dam Failure	Floods	Hazardous Materials	Landslides/ Debris Flows/ Rockfalls; soil hazards	Weather Extremes (hail, lightning, wind, temps, drought)	Earthquakes	Wildland Fires	Severe Winter Storm
Site reclamation/restoration/revegetation		■	■	■				
Snow fences								■
Water supply augmentation					■			

Douglas County Local Hazard Mitigation Plan
New Mitigation Action Worksheet

Name of Department/Jurisdiction: _____

Use this to record new potential mitigation projects (1 page per project) identified during the planning process. Provide as much detail as possible and use additional pages as necessary. Complete and return to Jeff Brislawn by **April 3, 2015**.

Mitigation Project Title	
Project Description, Issue & Background	
Ideas for Implementation	
Responsible Agency	
Partners	
Priority (High, Medium, Low)	
Cost Estimate	
Benefits (Avoided Losses)	
Potential Funding	
Timeline	

Prepared by: _____

Phone: _____

Email: _____

Please return worksheets by mail, email, or fax to: Jeff Brislawn jeff.brislawn@amecfw.com
1002 Walnut St, Boulder CO, 80302
Tel 303-443-7839
Fax 303-442-0616

APPENDIX D: ADOPTION RESOLUTIONS

Note: The records of adoption will be incorporated as an electronic appendix. When the plan is adopted in 2015, scanned versions of all adoption resolutions will be incorporated here. A sample adoption resolution is provided here.

Local Hazard Mitigation Plan Update Adoption Sample Resolution

Resolution # _____

Adopting the Douglas County
Local Hazard Mitigation Plan Update 2015

Whereas, *(name of county or community) recognizes the threat that natural hazards pose to people and property within our community; and*

Whereas, *undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and*

Whereas, *an adopted Local Hazard Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and*

Whereas, *(name of county or community) resides within the Planning Area, and fully participated in the mitigation planning process to prepare this Local Hazard Mitigation Plan Update; and*

Whereas, *the Colorado Division of Homeland Security and Emergency Management and Federal Emergency Management Agency Region VIII officials have reviewed the Douglas County Local Hazard Mitigation Plan Update and approved it contingent upon this official adoption of the participating governing body; and*

Now, therefore, be it resolved, *that the (name of board or council), hereby adopts the Douglas County Local Hazard Mitigation Plan Update, as an official plan; and*

Be it further resolved, *Douglas County Emergency Management will submit this Adoption Resolution to the Colorado Division of Homeland Security and Emergency Management and Federal Emergency Management Agency Region VIII officials to enable the Plan's final approval.*

Passed: ___(date)___

_____

Certifying Official

APPENDIX E: CRITICAL FACILITIES

This Appendix is an electronic spreadsheet with the following tabs:

- Summary by Category – Contains the total numbers of facilities summarized by At Risk Population, Essential Services, and High Potential Loss facilities
- Facility Summary by Jurisdiction – Summaries by jurisdiction also presented in jurisdictional annexes
- All CF - Detailed list of 1,511 identified critical facilities with addresses. A corresponding GIS database was created based on this table.
- Fire – Critical facilities in identified fire hazard areas, by jurisdiction
- Flood - Critical facilities in identified flood hazard areas, by jurisdiction
- Erosion - Critical facilities in identified erosion hazard areas, by jurisdiction
- Landslide - Critical facilities in identified landslide and rockfall hazard areas, by jurisdiction
- Castle Rock CF – Castle Rock specific facilities