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## PLANNING FOR HAZARDS AND BUILDING COMMUNITY RESILIENCE

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### Introduction

Many communities in Colorado have felt the impact of natural hazard events such as flooding, wildfires, rockfalls, and drought. In the past five years, wildfires and floods in Colorado have severely impacted communities, generating more than \$5 billion in damages. In 2013, more than 1,850 homes were destroyed and an estimated 28,363 dwellings were damaged in a single federally declared flood alone.<sup>1</sup> Reducing risks to these hazards needs to be factored into land use planning, whether through integrating hazards into long-range plans or incorporating hazards into the development permit approval processes or myriad other strategies.

In 2016, the Department of Local Affairs released *Planning for Hazards: Land Use Solutions for Colorado*, a guide and website ([planningforhazards.com](http://planningforhazards.com)) to assist local governments in reducing risk.

Colorado experiences dozens of floods and an average 4,500 wildfire events annually.<sup>2</sup> Hazard events like these are occurring more frequently, and with greater severity across the state. In addition, underlying stressors, such as aging infrastructure, diminishing water supplies, energy inefficiency, or poor access to education, weaken a

community's overall ability to build resilience and exacerbates the impacts of hazards in times of crisis. While most hazard events seemingly occur independently, they often are interrelated with other hazards and stressors and, in some cases, may greatly influence the probability, frequency, and magnitude of one another. For example, a severe wildfire event may leave slopes denuded and unable to absorb water. A subsequent heavy rain event can lead to higher volumes of runoff and correspondingly a higher risk for flash flooding, erosion, and especially mud/debris flows.

The Colorado Resiliency and Recovery Office defines resilience as

*The ability of communities to rebound, positively adapt to, or thrive amidst changing conditions or challenges - including disasters and changes in climate - and maintain quality of life, healthy growth, durable systems and conservation of resources for present and future generations.*

— Colorado Resiliency Working Group

With continued projected population growth in Colorado and variable future climate conditions, reducing risks to hazards through land use planning is more important than ever. Colorado is forecast over the next 25 years to add close to 2.5 million new residents, or nearly 100,000 persons per year.<sup>3</sup>

3 Colorado State Demography Office.

In addition, Colorado's climate is warming with statewide projections ranging between 2.5°F and 6.5°F by 2050, creating a force multiplier that will continue to amplify hazard risks in the future.<sup>4</sup> This combination of rapid population growth, climate warming, and the increasing occurrence of natural hazards heightens the need for strategic land use patterns that *can reduce community risk by placing development out of harm's way to the greatest extent possible.*

Of the 5.5 million people in the state, 2 million already live in the wildland-urban interface.

— Colorado State Forest Service

### Land Use Planning Approaches for Mitigating Hazards

Some of the most beautiful developable lands and existing built environments in Colorado also pose significant risk from hazards. For example, some people are drawn to live in dense forests where there is a high risk of wildfire, or along river corridors that are subject to frequent flooding, or hillsides at risk of landslide or rockfall. Many people are drawn to relocate or build new homes and businesses in these attractive places despite the risk.

The challenge for Colorado's local governments is to plan for appropriate development to occur while also protecting people, property, and the

4 Colorado State Forest Service. 2016. Page 2. [csfs.colostate.edu/report-health-colorados-forests](http://csfs.colostate.edu/report-health-colorados-forests).

1 *Colorado Action Plan for Disaster Recovery*. 2014. Page 4. [colorado.gov/pacific/dola/action-plans-required-reports](http://colorado.gov/pacific/dola/action-plans-required-reports).  
2 *Denver Post*. 2017. [www.denverpost.com/2017/04/14/colorado-wildlife-forecast-2017](http://www.denverpost.com/2017/04/14/colorado-wildlife-forecast-2017).

environment from the impacts of hazards. Often the simplest and most effective way to ensure safer communities is to prohibit and avoid building in hazardous areas. However, avoiding development altogether in high-risk areas is not always feasible, and planners and local officials must balance the protection of public health and safety with other important goals such as economic development and the provision of affordable workforce housing. Fortunately, several approaches to mitigating hazards exist.

- **Prevent development in hazardous areas.** Communities can discourage or restrict development in vulnerable areas such as floodplains, landslide areas, the wildland-urban interface (WUI), and other known hazard areas. Avoiding hazardous areas can be accomplished through regulations such as overlay zoning and cluster subdivisions. There are also non-regulatory approaches such as land acquisition.
- **Direct future growth to safer areas.** Preventing development in hazardous locations is only part of the equation. Communities can also encourage growth in locations that are less vulnerable to natural hazards. Directing future growth requires that the community identify locations deemed suitable for development and redevelopment. This process often forms the core of future land use elements in comprehensive plans. Once safe areas have been identified, communities can back up those policy decisions by directing investment (such as capital improvements and schools) and removing barriers to developing in those areas.
- **Protect existing development in hazardous areas.** Avoiding hazard areas protects future development; however, protecting people, property, and facilities in already developed areas is just as important. Strengthening existing development can be achieved through many land use and mitigation strategies, such as

upgrading development standards to protect vulnerable areas (e.g., stronger floodplain regulations), requiring nonconforming properties to be brought into compliance with updated standards, updating building codes to promote safer development, and in some cases relocating existing structures to less vulnerable areas.

### Planning for Hazards Guide and Website

In the wake of the 2012-2013 wildfires and floods, and with input from federal, state, and local government partners, the Colorado Department of Local Affairs used federal Community Development Block Grant – Disaster Recovery (CDBG–DR) Resilience Planning grant funding to research, develop, and publish a tool to assist municipalities and counties. The result: the *Planning for Hazards: Land Use Solutions for Colorado* guide and website ([www.planningforhazards.com](http://www.planningforhazards.com)).

The guide enables municipalities and counties to prepare for and mitigate multiple hazards by integrating resilience and hazard mitigation principles into plans, codes, and standards related to land use and the built environment. This guide provides detailed information about assessing a community’s risk level to hazards and describes how to implement numerous land use planning tools and strategies in a manner that reduces risk.



**PLANNING FOR HAZARDS**  
Land Use Solutions for Colorado

### The Way it Works

*Planning for Hazards* provides information on how to conduct a Hazard Identification and Risk Assessment (HIRA), which is used to establish why and how land use planning can address hazards through various approaches. A community can use the guide’s description of more than 25 planning tools to implement effective land use strategies to mitigate risks to potential hazards. Communities may choose to implement land use planning tools and strategies that reduce risk and mitigate hazards by:

- addressing hazards in plans or policies;
- strengthening incentives;
- protecting sensitive areas;
- improving site development standards;
- improving buildings and infrastructure; and/or
- enhancing administration and procedures.

The guide is structured to assist communities in taking action. For example, if a community decides to develop or modify its stream buffer or setback regulations to better mitigate flood risk, it would reference the section that outlines:

- how this particular strategy works;
- how to implement it;
- profiles of other locations where it has been done;
- the advantages and challenges of the strategy; and



- model code language and commentary that can be tailored to their community.

### Model Code Language and Commentary

Eleven of the 25 planning tools include model code language and supporting commentary that can be tailored to communities.

- Development Agreement
- Transfer of Development Rights (TDRs)
- 1041 Regulations
- Cluster Subdivision
- Overlay Zoning
- Stream Buffers and Setbacks
- Stormwater Ordinance
- Subdivision and Site Design Standards
- Use-Specific Standards
- Application Submittal Requirements
- Post-Disaster Building Moratorium

The [www.planningforhazards.com](http://www.planningforhazards.com) website was created to make the guide accessible and user friendly. A user needs only to click on the “Flood” hazard to see a description, its relationship to other hazards, how to assess risk to this specific hazard, and available data resources. Most importantly, the user can access various applicable planning strategies and tools that are available for mitigating this hazard through their land use processes.

Successful implementation includes learning from communities that have already tested specific tools and strategies. Therefore, the guide and website offer model policies and regulations for several planning tools. Each model includes key elements of the policies or regulations, drawing on various best practices from around Colorado and beyond. The site also features video clips from planners and community leaders describing the various planning processes, successes, challenges, and general

experiences of implementing land use solutions.

The following sections highlight just a few of the planning tools included in *Planning for Hazards*: integrating hazards into the comprehensive plan, land use solutions to wildfires and floods, and reducing risks to geological hazards.

### Integrating Hazards into the Comprehensive Plan

Integrating hazard mitigation and risk reduction into a community’s comprehensive plan is a key approach that provides an umbrella, or overarching policy framework, for various other planning tools. The comprehensive plan is used to identify and chart long-range vision, goals, objectives, policies, and strategies for the future growth, development, and preservation of the community, protection of community assets, and provision of services. The organizational structure of the comprehensive plan allows for hazards and resilience to be addressed throughout, or through individual plan elements. However, each community must consider a few things throughout the comprehensive planning process, such as:

- Hazard mitigation measures are not only infrastructure related. They can include community-level communication, preparedness planning, and other nonstructural measures.
- Whenever possible, mitigation measures should work to mimic natural processes rather than engineered solutions, such as reconnecting a creek to its floodplain for natural flood control rather than channelizing it.
- The safety of vulnerable communities related to natural hazard risks and other stressors should receive particular attention in the comprehensive plan.

The City of Longmont’s *Envision Longmont* and the City of Manitou Springs’ *Plan Manitou* are two examples of comprehensive plans that strategically and purposefully integrate

hazards, risk reduction, and resilience. *Envision Longmont* used a systems-based approach to create the community vision and ensure sustainability and resiliency are at the center of all the goals and policies within the plan. Also, this long-range plan was used to tie back to the ongoing flood recovery and resiliency work going on throughout the City and Boulder County as a whole. Spurred by recent flooding and wildfire events, *Plan Manitou* was adopted as the Community Master Plan and Hazard Mitigation Plan in order to best address the hazards in Manitou Springs. The Natural Hazard Risk Assessment and the Hazard Mitigation Strategy are key integrated components that inform and align the plan’s policy recommendations and action items (along with those of resilience and sustainability).

### Land Use Solutions to Wildfires and Flooding

Colorado has experienced many severe flooding and wildfire events. High risk, special flood hazard areas exist in nearly every community in the state. In addition, as of 2015, Colorado had nearly 100,000 homes that were either at high or very high risk of wildfire — translating into \$28 billion of residential assets exposed to potential future wildfire damage.<sup>5</sup> Several land use strategies highlighted in the guide are designed to greatly assist in preventing future damage due to wildfires and flooding.

A stormwater ordinance is one effective land use planning tool that can be designed to mitigate flood risk. A stormwater ordinance allows communities to establish low-impact development (LID) and stormwater best management practices (BMPs) for new development within their codes. For wildfires, a WUI code is specifically designed to mitigate the risks from wildfire to life and property, which will vary according to the scope that a community adopts and enforces. Other land use planning strategies, such as overlay zoning, can address

<sup>5</sup> Botts, et al. 2015. *CoreLogic Wildfire Hazard Risk Report*.

multiple hazard risks such as flood, wildfire, and steep slopes.

A local government may determine that land acquisition or conservation easements may be the most effective way to protect sensitive areas from flood and wildfire risks. Oftentimes, especially when land is acquired for hazard mitigation purposes, communities will pursue the acquisition of individual land parcels on a case-by-case basis. Such was the case in 2011 when Cañon City successfully acquired a flood-prone residential property that had been experiencing repetitive losses and had become a chronic problem for the City's engineering department. Although not located in a mapped special flood hazard area, the home was built in an area that saw heavy stormwater runoff and would suffer flooding during even moderate rainfall events. Through the assistance of a FEMA hazard mitigation grant and in coordination with the homeowners, who were eager to relocate, the City was able to acquire the property and replace the structure with permanent green space. The site is now filled with natural vegetation and serves to absorb stormwater flows and reduce the potential flood risk for neighboring properties.<sup>6</sup>

Alternatively, establishing development agreements or granting density bonuses to reward risk-reducing development activity may be the right solution to incentivize growth from occurring in hazard-prone areas. These are just several applicable land use solutions detailed in the guide applying to flood and wildfire hazards.

## Reducing Risk to Geologic Hazards

Land movement related to landslides, mud and debris flows, and rockfalls occurs naturally across the West on a continuous basis, and also can be triggered through human activity (primarily related to mining, land development, oil and gas extraction, and other disturbances). It is estimated

that thousands of landslides take place in Colorado each year, with varying degrees of frequency and severity. When a single geologic event such as a landslide does occur within the built environment, it can cause a crippling ripple effect across the state and communities. As an example, a 2016 I-70 rockfall cost the State of Colorado just under \$2 million in infrastructure repairs alone, while also disrupting and delaying critical commerce and supply chains.<sup>7</sup> A large landslide, rockfall, or debris flow might dam a river or its supporting culverts creating increased flood risks upstream and down, knocking bridges off their abutments, or roaring into moving traffic — and present serious threats to buildings and homes built in slide paths.<sup>8</sup>

Local governments can take action to reduce risk with a number of land use planning tools and strategies. A city or town may want to improve site development standards by requiring site-specific hazard assessments be conducted to highlight potentially hazardous conditions prior to any development occurring. Another municipality may choose to limit development on steep slopes or incorporate specific mitigation strategies such as slope stabilization for landslides and rockfalls into its subdivision and site design standards.

<sup>7</sup> Colorado Department of Transportation.

<sup>8</sup> Colorado Geological Survey. [coloradogeologicalsurvey.org/geologic-hazards/landslides](http://coloradogeologicalsurvey.org/geologic-hazards/landslides).

The Town of Pagosa Springs is one Colorado community that has adopted sensitive area protection standards for subdivisions and for redevelopment of existing areas in its *Land Use and Development Code* (2015). The standards generally address the following issues:

- Slopes. Slopes greater than 30 percent, or otherwise unstable or subject to hazards, are not allowed to be platted or developed for residential uses without mitigation controls in place.
- Natural Features. Subdivisions or development shall protect waterways, vegetation, and rocks and other natural features or vistas.
- Areas of Special Flood Hazard. Mapped special flood hazard areas identify areas where subdivisions shall not be approved without evidence that it is not in a flood hazard or meets other flood damage protection regulations to the satisfaction of the floodplain administrator.
- Geologic Hazard Areas. Subdivisions and site plans must meet mitigation conditions prior to approval in mapped geologic hazard areas in the Town as the information becomes available, including provisions to prevent danger to human life or property.



Photo credit: Logan Sand.

<sup>6</sup> Federal Emergency Management Agency. *Best Practices: Promoting Successful Mitigation in Colorado*, 2014. p. 23-24.

- **Wildfire Hazard Areas.** Applicants for subdivisions or other development must provide evidence from a professional forester that the proposal meets several conditions, including adequate roads for emergency services and criteria for wildfire areas published by the Colorado State Forest Service.
- **Perimeter Fencing.** Limits the height to protect migration of elk and deer.
- **Riparian Setbacks.** To promote and preserve the quality of the river ecology, aesthetic, and recreation.

A local government also may consider adopting a geologic hazard overlay district (or overlay zone) to apply an additional layer of standards to all areas within a defined overlay boundary, regardless of the underlying base zoning district. These are just several of the land use solutions detailed in the guide that apply to landslide, mud/debris flow, and rockfall.

## Colorado's State Agencies Leading the Charge in Building Community Resilience

The Colorado Resiliency and Recovery Office (CRRO) is a national leader for its work in collaboratively building a culture of community resilience across the state. The CRRO coordinates overarching disaster recovery and resiliency activities for the state by collaborating with numerous multidisciplinary local, state, federal, and private partners. The CRRO developed the Colorado Resiliency Framework, providing a strategy and roadmap to proactively help state agencies and communities address vulnerabilities to shocks and stresses; adapt to and thrive amidst changing social, environmental, and economic conditions; and rebound after natural and human-caused disasters. The framework provides guiding principles and tools for community stakeholders and promotes partnerships and action.

*A resilient community is one in which community members have the information necessary and tools available to make resilient decisions ... building state and local capabilities and resources that facilitate holistic pre- and post-disaster recovery planning, effective implementation and community resiliency and sustainability.*

— Colorado Resiliency Framework

The CRRO also has developed and released the Colorado Resiliency (COResiliency) Resource Center ([www.coresiliency.com](http://www.coresiliency.com)), an online, interactive hub for resiliency knowledge and resources in Colorado. Through a variety of training modules, webinars, case studies, templates and model plans, grant information, etc., the resource center provides critical tools for communities and their stakeholders to integrate resiliency into everyday activities.

The resource center is organized around three key sections:

- “Understand” contains information about what resiliency is, how it aligns with a community and everyday business, and why resiliency is critical given Colorado’s past disasters, future population growth, and changing conditions.
- “Plan” guides users from moving beyond resiliency concepts into planning for resiliency. It includes guidance and tools for developing a local resiliency framework, as well as an overview of opportunities to incorporate resiliency into community practices, including hazard mitigation plans, land use policies, comprehensive plans, and capital improvement plans.
- “Act” (currently under development) includes best practices from around the state and the country for implementing resiliency projects. It also will help communities navigate and better understand the variety of potential state, federal, and private funding opportunities.

The Colorado Department of Local Affairs (DOLA) is a strong supporter of efforts to create stronger and more resilient communities throughout the state. DOLA led the collaborative effort to develop the *Planning for Hazards: Land Use Solutions for Colorado* guide, website, and current community implementation project — a recommendation of the framework. DOLA also regularly provides technical assistance and education to communities and local governments on how they can effectively use land use planning tools and strategies to reduce the risk of damage or destruction due to hazards such as floods and wildfires. DOLA incentivizes integrating hazards into the municipal and county comprehensive plans and land use codes it helps fund.

## What the *Planning for Hazards* Guide and Other Resiliency Resources Offer

The *Planning for Hazards* guide and website are valuable resources to support Colorado land use planners and allied professions to mitigate hazard risk with smart and safe land use planning. Additionally, the COResiliency Resource Center is another great resource for CML members, and is continually being updated with new resources and best practices. These resources can help build a safer, more resilient community.

Stayed tuned for a new *Planning for Hazards* implementation resource by checking [www.planningforhazards.com](http://www.planningforhazards.com). DOLA is working on a companion series of planning work sessions and supporting materials that can assist any community in forming a small working group to assess the community’s risk to hazards and select, develop, and implement appropriate land use strategies. This work is currently being piloted in two Colorado communities: the City of Manitou Springs and the Town of Milliken.

Visit [planningforhazards.com](http://planningforhazards.com) to explore how land use strategies and tools can help reduce risk to hazards, as well as [www.coresiliency.com](http://www.coresiliency.com) to help increase your community’s resilience.



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