# SHEADWATERS ECONOMICS

# Boulder, Colorado—Balancing Regulation And Education To Reduce Wildfire Risk

# Leaders in Wildfire Adaptation

#### Introduction

Boulder County is located 30 miles northwest of Denver, and is home to nearly 300,000 residents. Boulder County includes 10 municipalities: the cities of Boulder (county seat), Lafayette, Longmont, and Louisville; and the towns of Erie, Jamestown, Lyons, Nederland, Superior, and Ward. The western half of Boulder County includes vast public lands comprised of city and county open space, state parks, Bureau of Land Management (BLM) land, U.S. Forest Service land, including the Indian Peaks Wilderness, and a portion of Rocky Mountain National Park. Collectively, these lands and their abundant natural amenities make the county a world-class recreation area and a destination for a burgeoning high tech workforce. Yet, many of these forested and scenic landscapes also are highly prone to wildfires.



View of Longs Peak from Boulder County.

Photo credit: Boulder County

#### **OVERVIEW**

Wildfires across the American West are increasing in frequency, size, and severity. The impacts from climate change and increasing growth within the region's Wildland-Urban Interface (WUI), further exacerbate the risks from wildfires.

Urban areas in the West are increasingly responding to the challenges of wildfire risk management through unique land use planning tools which affect the pace, pattern, and scale of development. Boulder, Colorado is one of five communities profiled by Headwaters Economics in a report identifying some of these innovative land use planning strategies, including:

- Integrating fire protection standards into development requirements—wildfire risk reduction measures, such as appropriate water systems, adequate access, and defensible space, are part of the county's Land use Code.
- The Wildfire Partners Program—a public-private collaboration that helps property owners prepare for wildfires by conducting on-site assessments with a trained mitigation specialist. Property owners who complete their required mitigation work earn a certificate, which is accepted by local insurance companies to maintain or receive coverage.

 $\mathbf{F}$ rom a land use and planning perspective, Boulder County is popularly known for its progressive and successful comprehensive open space management program. However, effectively managing growth and preserving thousands of acres of otherwise developable land is not the county's only strength. Indeed, Boulder County is an engine for innovation when it comes to dealing with planning and environmental issues. This case study highlights their ongoing and recent efforts related to wildfire risk reduction. Boulder County is also proactively addressing the present and predicted impacts from climate change, such as increasing average temperatures, frequent droughts, more severe heat waves, and other climate-related stresses which elevate wildfire potential. Changing climatic conditions and ongoing development pressures are forcing the county to increase the quantity and quality of wildfire mitigation strategies—something the county, its municipalities, and its property owners are committed to doing.

## History of Wildfire in Boulder

Boulder County has experienced several large fires during the past century. The Fourmile Canyon Fire in 2010, at the time the most destructive wildfire in Colorado's history, totaled \$217 million in claimed insurance losses (\$235 million in 2014 dollars).<sup>1</sup> Since that time, two major wildfires near Colorado Springs, the Waldo Canyon Fire and the Flagstaff Fire (2012) surpassed that record, with an estimated \$453.7 million in damages.<sup>2</sup>

Although summertime is often considered "fire season," data shows that Boulder County's history of major wildfires (fires more than 150 acres in size) have occurred during all four seasons. The Olde Stage Fire in 1990 burned over 3,000 acres in November of that year, and a fire by the same name burned 3,008 acres in January 2009.<sup>3</sup> According to historical incident records, many of these major fires were caused by humans, suggesting that prevention efforts and education are extremely important as Boulder County moves forward with its wildfire mitigation efforts.<sup>4</sup>

## Impacts of Wildfire on the City of Austin

Aside from the immediate effects on Boulder County, wildfires have long-lasting repercussions on the community at large. Almost every major fire in Boulder County has damaged homes and infrastructure, leaving residents uneasy. Additional impacts include: • Watershed. The Fourmile Creek watershed was significantly damaged during the 2010 Fourmile Canyon fire, burning 23 percent of the watershed (10 square miles) and degrading drinking water

# BOULDER, CO Major Wildfires, 2000-2013



#### OVERLAND FIRE, 2003 3,227 Acres

Total Cost	\$465K	Structures Threatened	256
Total	276	Structures	62
Personnel		Damaged	02
Firefighters	0	Evacuations	Yes
Injured		Caused	

The Overland fire was human caused and resulted in the evacuation of Jamestown and Lefthand Canyon and the closure of Lefthand Canyon road.

#### FOURMILE CANYON FIRE, 2010 6,475 Acres

Total Cost	\$10M	Structures Threatened	500+
Total	1,096	Structures	195
Personnel		Damaged	
Firefighters	7	Evacuations	Yes
Injured		Caused	

The Fourmile Canyon fire was human caused and resulted in the evacuation of 20 subdivisions west of Boulder and the closure of three major county roads.

supplies for the communities of Pinebrook and Lafayette.<sup>5</sup>

• Flooding and erosion. Major wildfires carry heavy ash downstream, and cause significant local and regional flooding. For example, the 2003 Overland Fire caused major flooding in Jamestown, Colorado. Increased erosion following the Fourmile Canyon Fire was a concern because of mine tailings and waste rock from historical mines nearby potentially flowing into downstream flows.<sup>6</sup>

• Home values. Wildfire events are devastating to a neighborhood, and research has shown drops in home sale prices even in adjacent neighborhoods during and following major wildfire events.<sup>7</sup>

• Air quality effects. Heavy smoke and particulates during a wildfire event fill the air across the Colorado Front Range. For particularly vulnerable populations (older and younger populations, or those with illness), smoke and particulates can pose significant health risks.

• Recreation and tourism.

Catastrophics wildfires reduce the tourist draw to Boulder County, which is otherwise a major Colorado hub for outdoor enthusiasts.

• Social and administrative implications. Recovering from major fires can take its toll on residents, many whom require assistance with ash and debris removal, erosion control and revegetation, flood and debris flow preparation, rebuilding on their property, transportation conditions, and many other issues related to the recovery process.



The Fourmile Canyon Fire in 2010.

Handling these myriad concerns is also an administrative challenge for local governments, requiring additional resources and enhanced coordination.

# How Boulder Is Addressing Wildfire Risk Through Land Use Planning and Regulations

Boulder County has incorporated wildfire mitigation and recovery strategies into several shortterm and long-term planning mechanisms, discussed below.

#### Growth Management and Development Plans

As mentioned earlier, Boulder County is well known for its systematic approach to preservation of open space and growth management. The county's Open Space and Recreation Department manages more than 100,000 acres of open space, with 60,000 acres of publicly owned land and the remaining lands preserved through conservation easements. Although not the program's primary intention, the preservation of these areas

Photo credit: Boulder County

prevents further encroachment of development into the Wildland-Urban Interface (WUI). <sup>8</sup>

In addition, Boulder County addresses wildfire risk in their Comprehensive Plan (the document identifying community objectives and guiding future development in the county). The Boulder County Comprehensive Plan, most recently updated in July 2015, includes an entire chapter dedicated to natural hazards. As part of this plan, there is a wildfire-specific section explicitly addressing eight policies including:

• Development and site plan reviews in areas identified to be at risk for wildfires should describe site location, building construction, design, landscaping, and defensible space, fuel management, access, and water availability within the context of wildfire mitigation.

• The county should continue to work in partnership with the local fire districts and departments to improve fire protection services addressing the increasing concerns of wildfire and development in the mountainous areas of the county.



Post-Fourmile debris flow, July 2011.

Complementing Boulder County's Comprehensive Plan is the Hazard Mitigation Plan and the **Community Wildfire Protection** Plan. The Hazard Mitigation Plan was formally adopted in 2008, and as of 2015, was undergoing an update. The plan identifies risk, vulnerabilities, and mitigation actions related to wildfires, such as creating fuel breaks along roadways, developing wildfire information kiosks, installing wildfire danger signage, and developing a water system loop in Lyons, Colorado (to increase water pressure at hydrants). Following the Fourmile Canyon Fire in 2011, the county also developed a Community Wildfire Protection Plan (CWPP). CWPPs are local plans designed to specifically address a community's unique

Photo credit: Boulder County

conditions, values, and priorities related to wildfire risk reduction and resilience. CWPPs can vary in scope, scale, and detail, but there are minimum requirements for their development and adoption. <sup>9</sup>

The Boulder County CWPP is an exemplary document containing 45 maps and was a collaborative process between hundreds of residents, fire personnel, and administrative staff. The plan also includes 10 links to video interviews detailing personal accounts of devastating wildfires, information for homeowners to insure their property, opportunities to create defensible space, and rehabilitation efforts following catastrophic fires, such as the Fourmile Canyon Fire. <sup>10</sup> Land Use Codes and Development Standards

Development requirements for fire protection are part of the Boulder County Land Use Code, the set of regulations that guide how property is used and developed in Boulder County. Although less than a full page of text, this section (#7-1100) of code requires appropriate water systems, additional precautionary measures for areas rated high per the State of Colorado Forest Service or where the local fire protection agency identifies a specific danger, and additional requirements as deemed necessary by the Board of County Commissioners.<sup>11</sup>

In addition to development standards, another section of the Land Use Code (4-805.12) allows county staff to ask for a site plan with each development proposal.<sup>12</sup> As part of this, a standard was established (4-806.A.5) to allow staff to impose conditions for wildfire mitigation such as relocation of development, defensible space, water supply, and pullouts and turn-arounds on long driveways (in conjunction with the county's Transportation Standards).<sup>13</sup> Any mitigation conditions placed on a site plan review are subsequently placed on the building permit, and each development is inspected and verified to have fulfilled those wildfire mitigation requirements.

Lastly, Article 19 of the Land Use Code was adopted to lay out the procedures following major natural and human-caused hazard events in the county.<sup>14</sup> The article addresses disaster emergency response by granting temporary authority to staff (rather than the Planning Commission or the Board of County Commissioners), and it outlines regulations tied to specific

Boulder County has taken a calculated approach toward building regulations for wildfire mitigationlearning from other large fires in Colorado and applying the latest science to inform any adoption or amendment to the building code.



Gary Goodell is the Chief Building Official for Boulder County and was essential in revising the

site plan review process. With ten years of planning experience prior to becoming a building official, Mr. Goodell was uniquely qualified to bridge the gaps between the typical planning process, building permitting, and wildfire risk reduction.

events including the Fourmile Canyon Fire of 2010 and the major flooding events of September 2013. Article 19 also defines provisions for demolition, temporary housing, repair of damaged structures, and timelines for completion, among other regulations. Although not focused on wildfire mitigation explicitly, this article demonstrates Boulder County's long-term commitment to the community and dedication to learning from past experience.

#### Evolving Building Codes Based on History and Science

Building codes set the minimum construction standards for structures, offering protocols for sound construction principles, and are the regulatory review tool for building officials to approve initial construction permits, inspect properties under construction, and ultimately issue certificates of occupancy (final sign-off). Most communities have adopted them in some form, and they serve as the basis for ensuring safety in the community.

Since the Lefthand Canyon Fire in 1988 and the Black Tiger Fire in 1989, Boulder County's building codes have evolved to focus more heavily on preventing future structure loss from wildfire. Boulder County made several local amendments to the building code to address wildfire issues over the years, sometimes even before those provisions showed up in national building codes. The county started by introducing roof material requirements, and later, integrated standards for window screens. Roof material requirements reduced wildfire risk substantially by limiting the likelihood of an ember igniting the roof.

One of the most important wildfire risk reduction tools occurred in 1993 with amendments to the site plan review process. The county amended the land use process to review site plans for homes (new construction, additions, and remodels) and to include wildfire mitigation as part of that review process for forested areas prior to a building permit being issued. This gave the county the authority to require wildfire mitigation plans, and to send referral comments to the planning department for any discrepancies related to access, water supply, and other wildfirerelated issues. Put simply, wildfire mitigation is a code requirement if it is not integrated into the permitting process, then people are not allowed to occupy the structure.

In November 2015, the county officially adopted a suite of 2015 International Code Council (ICC) Codes, the universal standard for design codes, with amendments to consistently apply ignition-resistant construction and to streamline the defensible space and vegetation requirements, regardless of the applicable hazard rating to any property. By learning from other large fires in Colorado, Boulder County has taken a calculated approach toward building regulations for wildfire mitigation and is applying the latest science to inform adoptions and amendments to their building codes.

#### Wildfire Education and Voluntary Site Assessments for Property Owners

Boulder County complements its regulatory approach to wildfire mitigation with an assessment program called "Wildfire



Looking east from the Boulder County WUI. Photo credit: Molly Mowery, Wildfire Planning International



A site assessment was conducted on this Boulder home through the Wildfire Partners program. Photo credit: Molly Mowery, Wildfire Planning International

Partners."<sup>15</sup> Launched in 2014, this unique public-private partnership is funded by Boulder County and grants from the Federal Emergency Management Agency (FEMA) and the Colorado Department of Natural Resources. Wildfire Partners helps property owners prepare for future wildfires by conducting individual site assessments with a hazard mitigation specialist, providing a customized report identifying priority risk reduction actions, offering financial awards to subsidize costs for mitigation contractors to complete recommended work, providing wildfire advisory contacts, and conducting follow-up inspections. Although eligibility for the program is broad, participation is limited to areas of the county designated as the WUI. The program has been largely successful, reaching more than 8,000 individual property owners and conducting more than 700 site assessments.16

Recently, some homeowners in the WUI have had trouble obtaining insurance. Wildfire

Partners was designed to address this problem. From early on, insurance industry representatives have been active participants in the program to ensure that the mitigation work being performed by homeowners is recognized by insurance providers. Homeowners who successfully complete the required risk reduction actions are issued a Wildfire Partners Certificate, signifying compliance with sound wildfire preparedness practices. A homeowner then sends their certificate to their insurance company to obtain insurance. The certificate satisfies the need for insurance companies to document and verify that wildfire risk reduction measures have been implemented. The certificate is also benefitting the real estate industry; certificates can be uploaded into the Multiple Listing Service (MLS) so prospective buyers can verify adequate wildfire mitigation measures have occurred on properties. As of the end of September 2015, the program partners have issued 172 certificates.17

#### Building Relationships Across Political Boundaries

Boulder County and the City of Boulder have a dynamic relationship, built on an understanding that protecting lives and property is not only the primary consideration but also a significant transboundary challenge. For example, the Office of Emergency Management is run jointly by the city and county. The City of Boulder has a fire department with a substantial budget, and offers free home assessments. Boulder County does not have a fire department, but rather 23 separate fire districts. The Wildfire Partners program is one demonstration of how the

county accomplishes streamlined steps toward prevention even within multiple separate districts. The county also supports community chipping programs (when larger pieces of wood and vegetation are reduced to smaller pieces and hauled away) by offering reimbursement of 50 percent of direct costs, up to \$4,000 per community in the county.<sup>17</sup>

# Boulder Prepares for Wildfire Risks and the Impacts of Climate Change

Despite substantial efforts to reduce greenhouse gas (GHG) emissions, Boulder County recognizes the inevitable challenges that climate change will pose on the community and on local planning efforts. For instance, Boulder County expects average temperatures to rise by 2-3°F by 2030, and 3.5-5°F by 2050.<sup>18</sup> Some of the expected challenges are highlighted in the 2012 Boulder County Climate Change Preparedness Plan, including:

- increased heat waves and wildfires;
- stronger extreme summer precipitation events;
- more frequent droughts and flash floods;
- greater spread of vector-borne diseases;
- difficulty with water storage for municipalities.

In that plan, the county recognizes an increase in wildfire frequency and magnitude is likely in the western United States, and that intense wildfires will produce erodible soils leading to increased sedimentation of water sources and infrastructure, and a degradation of water quality. (During the Fourmile Canyon Fire, the Betasso Treatment Plant was nearly shut down, which would have resulted in a loss of treated water to the City of Boulder.) The plan "calls to action" the county and its municipalities to work with the U.S. Forest Service to prepare for wildfire-related threats to the water supply infrastructure.

#### **Key Takeaways**

Innovation and evolution. Boulder County is known for testing the waters of unique and progressive techniques to solve common problems. The county understands that planning for hazards cannot simply be "accomplished," but rather requires continual maintenance and evaluation. In addition, the county allows technology, science, history, and lessons from their peers to iteratively guide the codes and policy reform process. This is further evidenced by Boulder County's Wildfire Partners program, and their interactive Community Wildfire Protection Plan document that links to several videos which illustrate priorities for the entire community. Even during periods of great success, the county is always looking to improve their wildfire protection planning.

**Community first.** Boulder County and its municipalities and special districts work together toward solutions that protect their entire community, not just individual jurisdictions. TThe Wildfire Partners program is one example of a successful initiative that transcends individual district interests to reduce overall wildfire risk. In doing so, the county recognizes that wildfire, and other natural hazards, do not respect political boundaries; therefore, plans for mitigating those hazards are best suited for community-wide discussions.

Wildfire risk reduction is a common thread. Similar to other communities in the West responding to increasing wildfire risk, Boulder County has instilled a culture of collaboration. Local fire departments engage with their counterparts in the land use planning department and work to identify the various interdepartmental priorities with respect to overall wildfire protection. Most planners in the Land Use Department have some level of knowledge about mitigation plans, and developers are notified early during the preapplication process about wildfire risk reduction requirements. For Boulder County, it is less about one person providing expert opinion rather it is more about creating broad and consistent knowledge among staff and departments.

#### **KEY CONTACTS**

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#### **Key Resources**

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Land Use Department	http://www.bouldercounty. org/dept/landuse/pages/de- fault.aspx
Planning Division	http://www.bouldercounty. org/property/build/pages/ luplanningmain.aspx
Boulder Office of Emergency Management	http://www.boulderoem. com/
Wildfire and Forest Health	http://www.bouldercoun- ty.org/property/forest/ pages/default.aspx
Boulder County Zoning	http://www.bouldercoun- ty.org/property/build/pag- es/bczoning.aspx
D (	
Documents	
Boulder County Comprehensive Plan	http://www.bouldercounty. org/property/build/pages/ bccp.aspx

Boulder County Land Use Code	http://www.bouldercounty. org/property/build/pages/ lucode.aspx
Community Wildfire Protection Plan	http://www.bouldercounty. org/property/forest/pages/ lucwppmain.aspx
Hazard Mitigation Plan	http://www.boulderoem. com/attachment/8631/
Boulder County Climate Change Preparedness Plan	http://www.bouldercounty. org/doc/sustainability/ccpp. pdf
Boulder County Wildfire Mitigation Quick Checklist	http://www.bouldercounty. org/doc/landuse/wildfiremit- igationquickchecklist.pdf
Other Resources	
Wildfire Partners	http://www.wildfirepartners. org/
City of Boulder Colorado	https://bouldercolorado.gov/

#### References

1. According to the Rocky Mountain Insurance Information Association (RMIIA), Catastrophe Facts and Statistics. Available online: http://www.rmiia.org/ catastrophes\_and\_statistics/catastrophes.asp.

2. RMIAA, Catastrophe Facts and Statistics.

3. Boulder County Community Wildfire Protection Plan (CWPP), page 7. Available online: http://www. bouldercounty.org/property/forest/pages/lucwppmain. aspx.

4. Ibid.

5. United States Geological Survey (USGS) Fact Sheet 2012-3095, Wildfire Effects on Source-Water Quality— Lessons from Fourmile Canyon Fire, Colorado, and Implications for Drinking-Water Treatment. Available online: http://pubs.usgs.gov/fs/2012/3095/FS12-3095. pdf.

6. United States Geological Survey (USGS). Fact Sheet 2012-3095.

7. United States Department of Agriculture/Forest Service (USDA Forest Service), Fourmile Canyon Fire Findings, page 73. Available online: http://www.fs.fed. us/rm/pubs/rmrs\_gtr289.pdf.

8. For more on Boulder County's open space management system. Available online: http://www.

bouldercounty.org/os/openspace/pages/default.aspx.

9. As described in Title I of the Healthy Forest Restoration Act (HFRA) of 2003 that authorizes communities to draft and implement a CWPP.

10. YouTube videos accessible from Boulder County's Wildfire Maps & Videos page. Available online: http://www.bouldercounty.org/property/forest/pages/ mapsvideos.aspx.

11. Boulder Land Use Code. 2015. Available online: http://www.bouldercounty.org/doc/landuse/landusecode.pdf.

12. Ibid.

13. Boulder County Multimodal Transportation Standards. 2012. Available online: http:// www.bouldercounty.org/doc/transportation/ multimodaltransstds.pdf.

14. Boulder Land Use Code. 2015. Available online: http://www.bouldercounty.org/doc/landuse/ landusecode.pdf.

15. Information and logo from www.wildfirepartners. org.

16. More than 8,000 residents have received two mailings with aerial photos showing their defensible space.

17. "Boulder wildfire mitigation program could become template for the state." September 24, 2015. The Gazette. Available online: http://gazette.com/ boulder-wildfire-mitigation-program-could-becometemplate-for-state/article/1559989.

18. Community Chipping Reimbursement Program website. Available online: http://www.bouldercounty. org/property/forest/pages/chippingreimbursement.aspx.

19. Boulder County Climate Change Preparedness Plan. Available online: http://www.bouldercounty.org/ doc/sustainability/ccpp.pdf.