

# PROTECTING FRONT RANGE FOREST WATERSHEDS FROM HIGH-SEVERITY WILDFIRES

AN ASSESSMENT BY THE PINCHOT INSTITUTE FOR CONSERVATION  
FUNDED BY THE FRONT RANGE FUELS TREATMENT PARTNERSHIP

The threat of high-severity wildfires to Colorado Front Range communities and their water supplies is real and unprecedented. The 11,900-acre Buffalo Creek Fire in 1996 put Colorado on alert about the seriousness and potential for wildfires in the state's watersheds and the after-effects of these fires on water delivery and quality. And the high-severity 2002 Hayman Fire burned 138,000 acres of forest, and destroyed 133 homes and 466 outbuildings at an estimated cost of \$238 million. It also surrounded Denver Water's 101-year-old Cheesman Reservoir exposing mud, ash and decomposed granite, which continue to pour into the reservoir after rainstorms.

Since the Hayman Fire, the U.S. Forest Service, Denver Water and Colorado State Forest Service have been working with the Pinchot Institute, a national conservation organization in Washington, D.C., to develop a strategy to assess Colorado's critical Front Range watersheds and the potential for wildfires within these watersheds. The Pinchot Institute has just completed its assessment.

The Front Range of Colorado was selected over other fire-prone states in the west to participate in the assessment due to past fire events, the resulting impacts of these fires and the importance of water to Colorado's Front Range communities.

## THE INCREASING THREAT OF HIGH-SEVERITY WILDFIRES IN COLORADO

The short-term impacts of high-severity wildfires — destruction of timber, forage, wildlife habitat and scenic vistas — are well known. Somewhat less familiar are the impacts of soil erosion and sediment, and organic debris flows in the immediate post-fire period. However, it is certain that the latter impacts can impose a heavy

toll on water infrastructures such as conveyances and storage reservoirs, which are costly to fix.

The threat of high-severity wildfires to Colorado's Front Range communities is serious. The annual number of wildfires has increased from an average of 457 fires per year in the 1960s to an average of 2,707 fires per year in the current decade. The annual number of acres burned also has increased from an average of 8,170 acres per year in the 1960s to an average of 97,408 acres in this decade.

When forests burn, watersheds also are affected. In the case of high-severity wildfires, watersheds are substantially altered. For example, roughly 56 percent of the area burned by the Hayman Fire drains directly into Cheesman Reservoir. This reservoir alone stores approximately 15 percent of Denver-metro's water supply.

To reduce the amount of sediment and organic debris entering the reservoir, extensive rehabilitation efforts were implemented around the reservoir and two upstream dams were built. Years later, rain continues to carry sediment and debris from the Buffalo Creek and Hayman fires into Strontia Springs and Cheesman reservoirs. Consequently, the annual cost to maintain and rehabilitate these reservoirs is enormous.



PINCHOT INSTITUTE  
FOR CONSERVATION

*Leadership in Forest Conservation Thought, Policy and Action*

## HIGH-SEVERITY WILDFIRES, SOIL EROSION AND WATERSHEDS

Depending on intensity and duration, wildfires can change the soil composition of a watershed by consuming the litter layer at the surface of the soil and by destroying binding organic matter in the soil itself. A water-repellent zone or layer forms when hydrophobic organic compounds from burning vegetation coat soil aggregates or minerals at or parallel to the surface. This hydrophobic layer prevents water from penetrating soil aggregates and seals off soil during rainfall events, which accelerates surface runoff resulting in the transport and deposit of sediments.

The adverse impacts continue when the water, sediment and debris pour off slopes into receiving channels, scouring banks and bottoms, often overwhelming them and causing flooding, sometimes many miles away from the precipitating wildfire event. Such sediment and organic debris can dramatically alter water courses.



*The fastest growing counties in Colorado are east of the continental divide along the Front Range.*

*When forests burn, watersheds also are affected. In the case of high-severity wildfires, watersheds are substantially altered. For example, roughly 56 percent of the area burned by the Hayman Fire drains directly into Cheesman Reservoir.*



*The above photos of Strontia Springs Reservoir and a creek on Denver Water property near Cheesman Reservoir show the impacts of high-severity wildfires on watersheds.*

## COLORADO'S INCREASING DEMAND FOR WATER

As the size of wildfires has increased, so has Colorado's population. From 1990-2000, Colorado had the third largest percentage increase in population — 30.6 percent — among the fifty states. And Colorado has continued to grow, but the population is not evenly distributed. The fastest growing counties generally are east of the continental divide along the Front Range. Ten of the 11 counties with populations over 100,000 — Adams, Arapahoe, Boulder, Denver, Douglas, El Paso, Jefferson, Larimer, Pueblo and Weld — are contiguous and contain 81 percent of Colorado's human population. Five of these counties — Boulder, Douglas, El Paso, Jefferson and Larimer — plus Clear Creek, Gilpin, Grand, Park and Teller counties are part of the Front Range Fuels Treatment Partnership and are referred to in the Pinchot Institute's assessment as the "ten Front Range counties."

## **SEVEN WATER PROVIDERS FOR 2.9 MILLION FRONT RANGE RESIDENTS**

The seven largest Front Range water providers are Aurora, Boulder, Colorado Springs, Denver Water, Fort Collins, Northern Colorado and Westminster; they draw their water from 10 critical watersheds. Studies done in 2006 indicate that six of the water providers — Aurora, Boulder, Denver Water, Colorado Springs Utilities and the Northern Colorado Water Conservancy District — provide water to approximately 63 percent of Colorado's 4.7 million people, either directly or through contracts or shares. And of the seven, Westminster is the only one that does not take water from west of the continental divide and deliver it to their customers using a complex system of pumps, conveyances and storage reservoirs.

Numerous other cities, towns and small communities also depend on the water from these major watersheds. All water users along the Front Range can be adversely affected by high-severity wildfire.

## **WILDFIRES AND THE THREAT TO CRITICAL WATERSHEDS**

The Pinchot Institute has just completed an overall watershed assessment of the risks of high-severity fire and the potential impacts to critical Front Range watersheds. Findings indicate that the accumulation of forest fuels, along with increasingly flammable forest conditions, place Front Range watersheds at risk of high-severity wildfires that could impact the ability of water providers to supply water for the foreseeable future. Wildfires are not only a threat to water supplies but, as noted earlier, the sediment transport and organic debris flows that often follow wildfires can be even more problematic. If watersheds are not protected through mitigation projects such as fuelbreaks, then sediment and organic debris can destroy reservoirs as a functional part of the water supply system. The alternatives to mitigation include the installation of costly post-fire catch basins and other structures that require maintenance.

The broad assessment by the Pinchot Institute analyzed 1) forest wildfire hazards, 2) fire regimes of Front Range forest types, 3) public and private

landownership within the ten Front Range counties (including Grand County), 4) soil erodibility and erosion hazards, and 5) water infrastructure in Front Range counties' watersheds. The risk of high-severity wildfire to critical Front Range watersheds, which could impact the quality and quantity of water going to Front Range communities and other users, is unprecedented. The Buffalo Creek and Hayman fires serve as reminders that such high-severity wildfires can adversely affect and seriously impact the Front Range economy.

The Pinchot Institute assessment also identified climate change and global warming as factors that have the potential to exacerbate fire severity. The past five- to ten-year drought cycle reflects larger and more intense wildfires on Colorado's Front Range.



*Drought cycles in Colorado during the past decade reflect larger and more intense wildfires on Colorado's Front Range.*

## MITIGATING WILDFIRE RISKS ON FRONT RANGE WATERSHEDS

Water is essential — and scarce — along the Front Range, and the threat of high-severity wildfire is imminent due to years of fire suppression and overcrowded, unhealthy forests approaching an age where stand-replacing wildfire can be expected. The need for water and the threat of wildfires presents major long-term challenges for Front Range water providers and Front Range residents who rely on them for safe, clean drinking water. It also presents an opportunity for water providers to leverage the development and implementation of public policy aimed at reducing the threat of high-severity wildfires in Colorado.

One way to exercise this leverage is through the development and coordinated implementation of Critical Community Watershed Wildfire Protection Plans (CCWWPP) for each critical watershed. Plans would be comparable to Community Wildfire Protection Plans (CWPP), which are provided for in the Healthy Forests Restoration Act of 2003. Elements of successful CCWWPPs would include:

- Engagement of concerned federal, state and local government agencies;
- Open participation of all interested parties;
- Preparation of a base map of the watershed including:
  - ✓ Major terrain features
  - ✓ Forest and range vegetation types
  - ✓ Local communities
  - ✓ Roads, major power and communication lines
  - ✓ Water supply structures and conveyances
- An assessment of:
  - ✓ Vegetative fuel hazards
  - ✓ Risk of wildfire occurrence
  - ✓ Potential impacts on water supply and infrastructure, communities and other human values
- A fuel-hazard reduction program including:
  - ✓ Priorities
  - ✓ Treatments
  - ✓ Roles and responsibilities
  - ✓ Specific timetables
  - ✓ Funding needs

- A monitoring program to assess implementation of the fuel-hazard reduction program.

Development and implementation of CCWWPPs would provide a viable mechanism for reducing the risk of high-severity wildfires to critical Front Range watersheds. Because the plans would be modeled after CWPPs, they are likely to be supported by decision-makers, community leaders, fire departments, homeowners associations and other stakeholders. In addition, land management agency personnel are familiar with CWPPs and are prepared to provide the technical expertise that is essential to developing plans and assisting with successful implementation.

*The need for water and the threat of wildfires presents major long-term challenges for Front Range water providers and Front Range residents who rely on them for safe, clean drinking water.*



*Critical Community Watershed Wildfire Protection Plans modeled after Community Wildfire Protection Plans are likely to be supported by decision-makers, homeowners associations and other stakeholders.*

### SUMMARY

The threat of high-severity wildfires to critical Front Range watersheds is real, but it can be mitigated through a focused planning and implementation effort based on sound science; it also must be supported by the public, and it must be sustainable. The seven major Front Range water providers are essential to the success of such an effort.