Streamwater chemistry and sediment responses to wildfire in the Colorado Front Range
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Introduction
The influence of forest fire on streamwater chemistry depends on the extent and conditions of the burn, the physical and biotic characteristics of the watershed and the flow regime. A monthly streamwater monitoring network initiated in 2001 on the Pike National Forest allows evaluation of fire effects in catchments burned by the 2002 Hayman fire and allows comparison of streams in burned and unburned drainages.

The Hayman Fire – Colorado’s Largest Fire
• Started: June 8, 2002  
• Contained: July 2 Controlled: July 18  
• Area: 556 km² (137,760 acres)  
• Cost: $39,100,000

Site Characteristics
• Colorado Front Range, S. Platte River Drainage  
• Montane Forest Ecosystem  
• Ponderosa Pine (53%) / Douglas-fir (36%)  
• Elevation: 1980 m to 2750 m (6500 to 9000 ft)

Background Information:
Graham R T 2003 Hayman Fire Case Study.  
RMRS-GTR-114, Rocky Mountain Research Station

Study Watersheds, South Platte River Drainage, Colorado Front Range

<table>
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<tr>
<th>Watershed Area</th>
<th>Burned Area</th>
<th>Burn Severity</th>
<th>Burned Watersheds</th>
<th>Unburned Watersheds</th>
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High Severity
• Crown fire  
  Kills most of canopy, understory  
  Kills all roots, rhizomes  
  Consumes all surface organic matter  
  Possible water repellency

Low Severity
• Surface fire  
  Kills few canopy trees  
  Creates open forest structure  
  Rapid vegetation recovery  
  Consumes little surface organic matter  
  Little water repellency

Moderate Severity
• Intense surface fire  
  Canopy is scorched in areas  
  Stand-replacing in pockets  
  (Romme et al. 2003)

Individual Streams
Pre-fire / Post-fire

Burned / Unburned
Mean Comparisons

Burn Extent & Severity

Summary
Water quality response to wildfire depends on
Relative extent and severity of burn  
Catchment area (small basins respond most)  
Immediate, Temporal, Prolonged responses  
Cations, ANC increased then declined rapidly  
Sediment, nitrate, water temp remain elevated after 3 seasons

Immediate 50% increase  
 Recovery within 2 years  
 Similar: Mg²⁺, NH₄⁺  

Percentage burned –  
Turbidity increases by 0.8X (r² = 0.42)  
Nitrate increases by 0.3X (r² = 0.64)  
High severity area  
Nitrate increases by 0.4X (r² = 0.77)  
Burn extent decreases with watershed area  
Decline by -0.1X (r² = 0.65)