Wildfires in Colorado: Air Quality Impacts

Waldo Canyon Wildfire – June 2012

COLORADO
Air Pollution Control Division
Department of Public Health & Environment

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Background

- Many wildfires in 2012 and 2013 across the West, including Colorado
- Many days influenced by wildfire smoke
- 3 air quality issues of concern:
  - Ozone
  - Particulates (both fine and coarse)
  - Visibility/Haze

Recent major Colorado wildfires

- Lower North Fork, 4/2/12
- Little Sand, 5/13/12 – 7/27/12
- Hewlett, 5/14/12 – 5/23/12
- Last Chance, 5/25/12 – 5/26/12
- High Park, 6/9/12 – 6/30/12
- Springer, 6/17/12 – 6/24/12
- Treasure, 6/21/12 – 7/2/12
- Weber, 6/22/12 – 7/6/12
- Woodland Heights, 6/23/12 – 6/25/12
- Waldo Canyon, 6/23/12 – 7/8/12
- Flagstaff (Bison), 6/26/12 – 7/2/12
- Pine Ridge, 6/27/12 – 7/4/12
- West Fork Complex, 6/5/13 – 7/19/13 (not officially out until winter snowfall)
- Black Forest, 6/11/13 – 6/20/13
- Big Meadows, 6/11/13 – 6/16/13 (not officially out until winter snowfall)
- Royal Gorge, 6/11/13 – 6/18/13
- Lime Gulch, 6/19/13 – 6/23/13

Black Forest Fire – June 2013

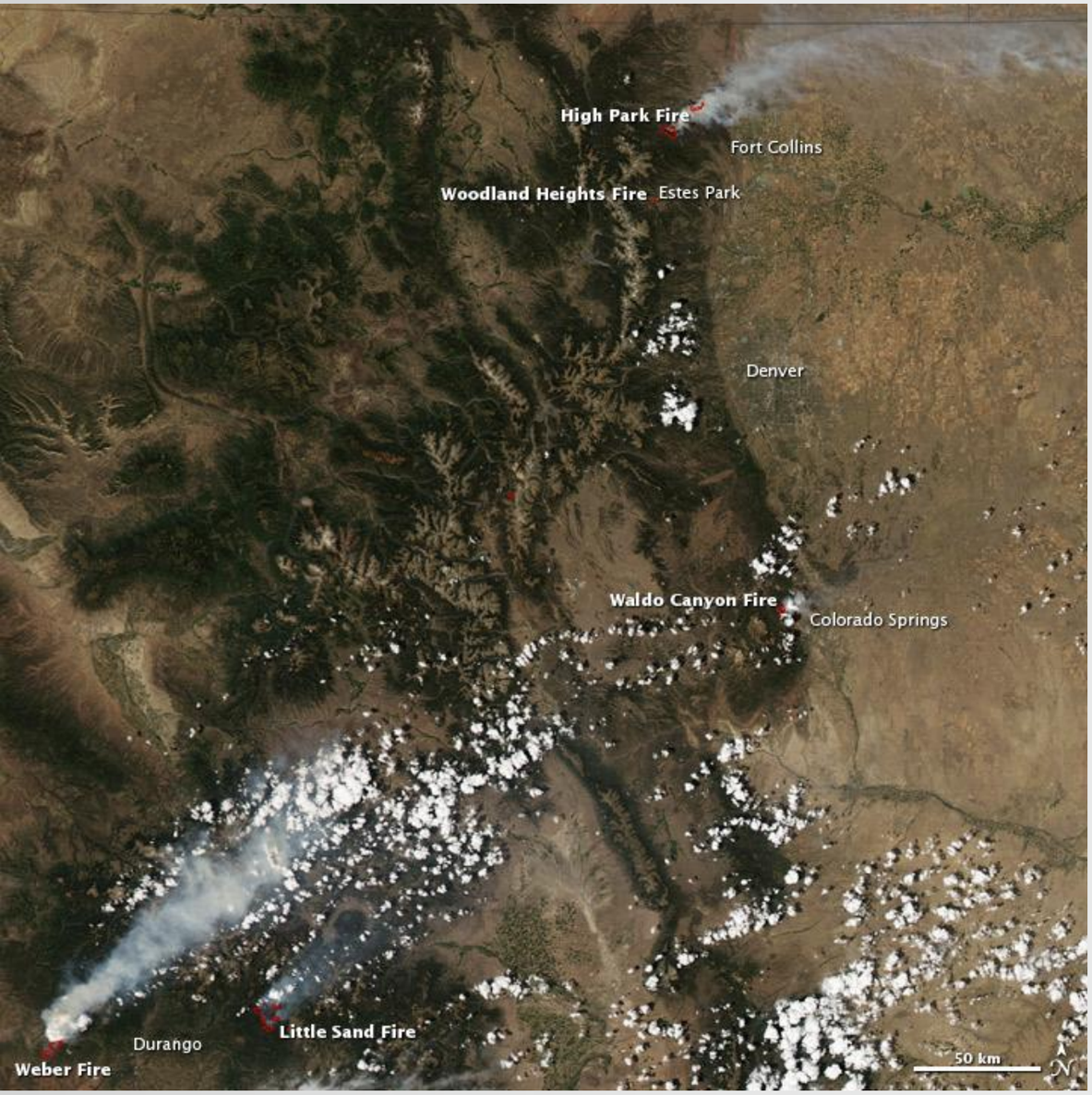
"Exceptional Events"

Blowing dust in Lamar (southeast Colorado) in 2013

Exceptional Events are unusual or naturally occurring events that can affect air quality but are not reasonably controllable (such as uncontrolled fire or blowing dust)

- EPA recognizes that exceptional events should not penalize an area
- Monitored values determined to be exceptional are not considered when determining compliance with National Ambient Air Quality Standards
- CDPHE has flagged events that the science indicates are caused or heavily influenced by natural events

Exceptional Event 'Balance'



NASA's Aqua satellite image, June 23, 2012, showing regional transport of smoke from Colorado's wildfires

- Ongoing process
- CDPHE has up to the end of the calendar quarter 3 years from the event to submit a final science-based justification package to EPA for review and approval/denial
- EPA has issued very stringent guidance for determining exceptional events
  - Particulates from nearby wildfires will be easy to justify
  - Ozone related to wildfires will be difficult to justify
- Workload balance with other EE documentation (blowing dust events)
- Public concern is health & visibility during wildfire events

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Ozone

- Sunshine combined with urban and industrial emissions results in elevated ozone levels
- Wildfires impacts ozone levels, in *both* directions (still being researched)
- Thick "fresh" smoke blocks sunlight, reducing ozone
- Smoke ("aged") contains chemicals which can react in sunlight to form ozone

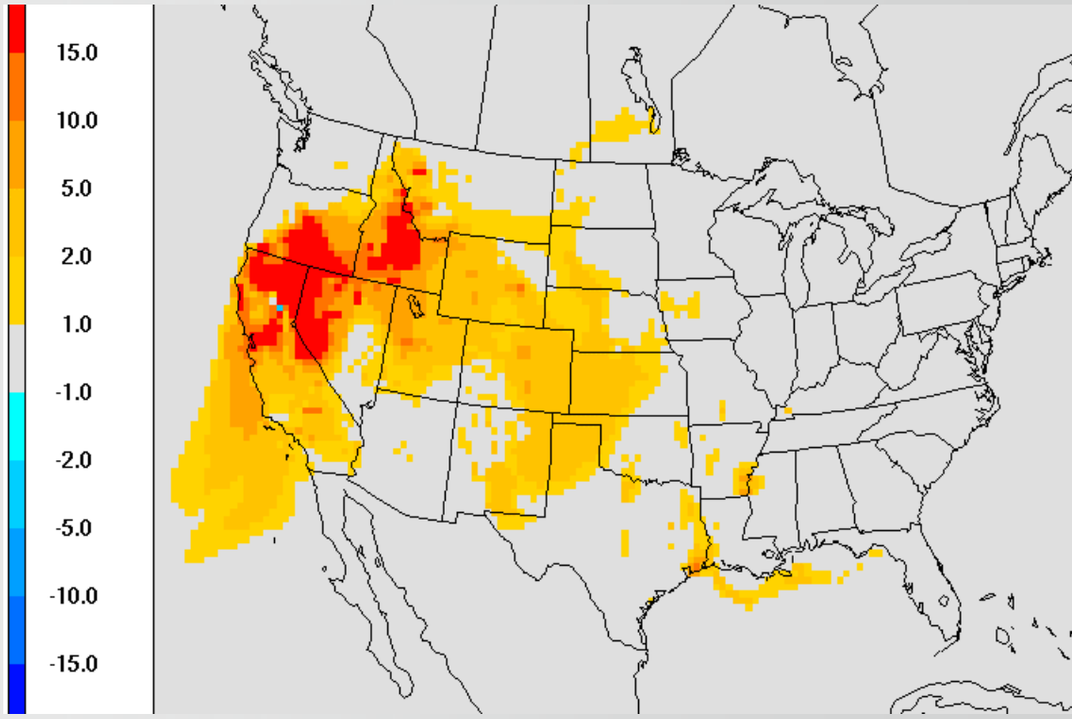
Smoke from Black Forest fire in Colorado Springs flows through downtown Denver during rush hour on June 12, 2013

‘Exceptional’ Ozone Methodology

- Multiple sites flagged in 2012 and 2013 during wildfires
- Some days likely to exceed standard without smoke
- Screening method:

1. Compare forecast (using model) with actual ozone. If ≥ 10 ppb higher than forecast, then:
1. Check MODIS satellite images for evidence of smoke
2. Check AIRS satellite data for evidence of areas of high carbon monoxide (good smoke tracer)
3. Flag 1-hour data associated with 8-hour averages ≥ 70 ppb

- New EPA ozone standard consideration



Calculated contribution of wildfires to ozone concentrations (ppb) on August 12, 2012 in the western U.S.[1]

[1]Jaffe et al. “Impact of Wildfires on Ozone Exceptional Events in the Western U.S.”

Particulates

- Extensive wildfires, both in Colorado and in neighboring states, generate smoke creating elevated particulate matter levels
- Particulate matter concentrations in many of Colorado's towns and cities have been higher in summers of 2012 and 2013 due to smoke
- Number of exceedances of health standards (primarily $PM_{2.5}$, but a few PM_{10}) recorded

West Fork Complex Fire June 2013

Visibility & Haze

Smoke from Wyoming & Montana wildfires
impacting the Denver-metro area on July 4, 2012

- Wildfires, both in Colorado and in other western states, generate smoke which creates haze and visibility issues
- Many poor visibility days during summers of 2012 & 2013
- While poor visibility/haze from fires causes public concern, events may not exceed NAAQS

CDPHE's Smoke Messaging

Through CDPHE's website, social media (Facebook & Twitter), EnviroFlash, telephone hotlines and media advisories:

"If visibility is less than 5 miles, smoke has reached levels that are unhealthy.

If smoke is thick or becomes thick, remain indoors. This is especially true for those with heart disease, respiratory illnesses, the very young, and the elderly.

Consider limiting outdoor activity when moderate to heavy smoke is present.

Consider relocating temporarily if smoke is present indoors and is making you ill."

Questions?

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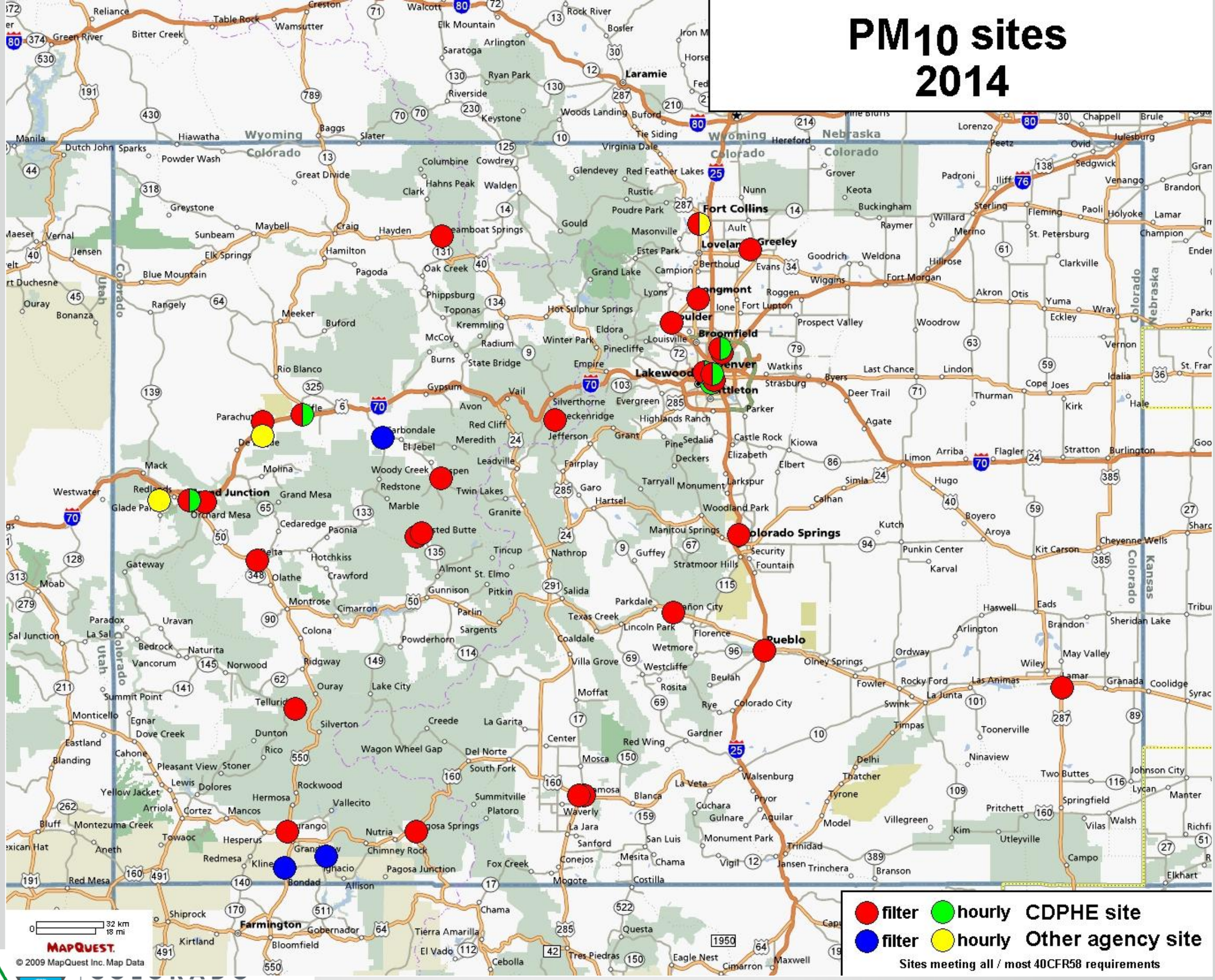
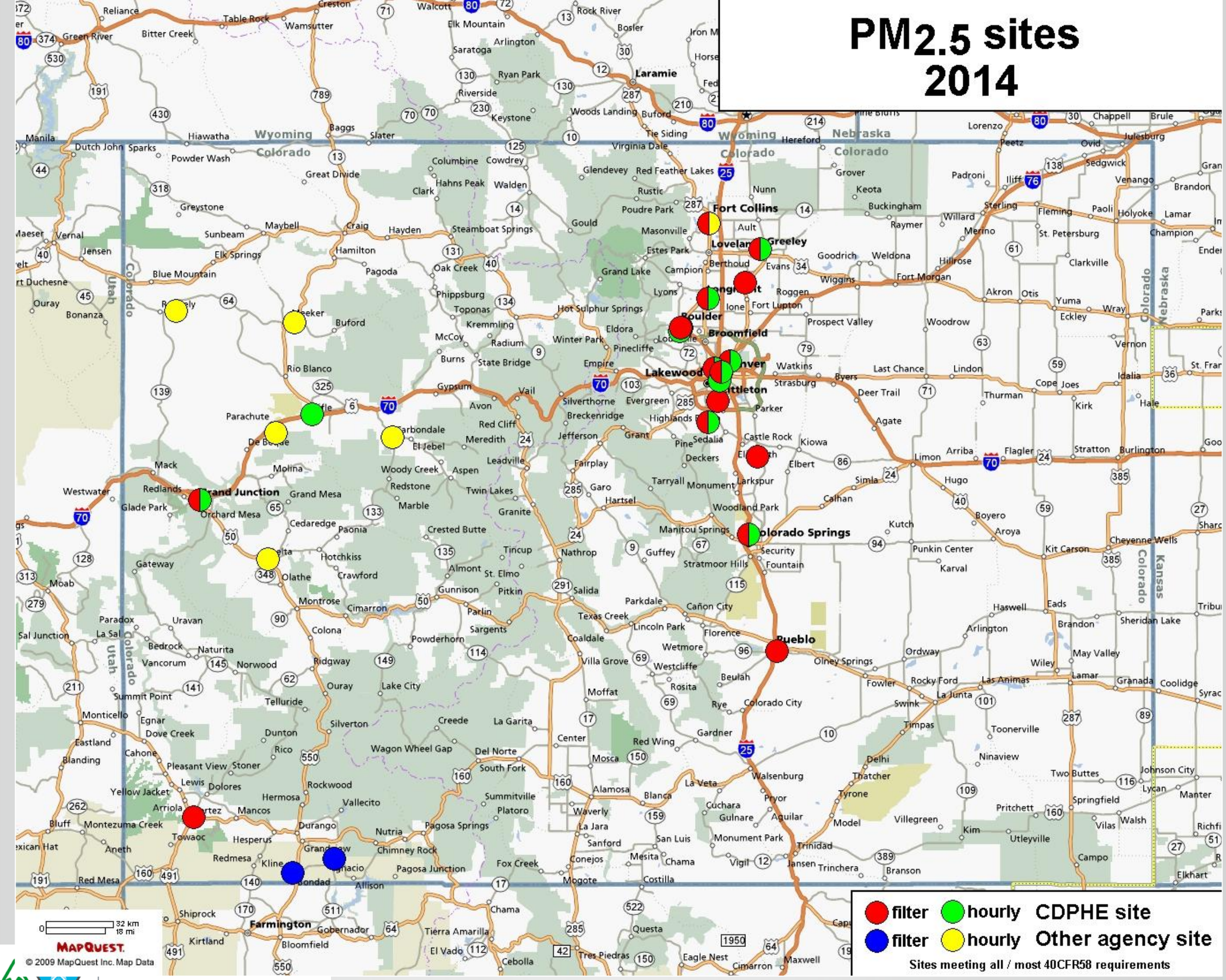
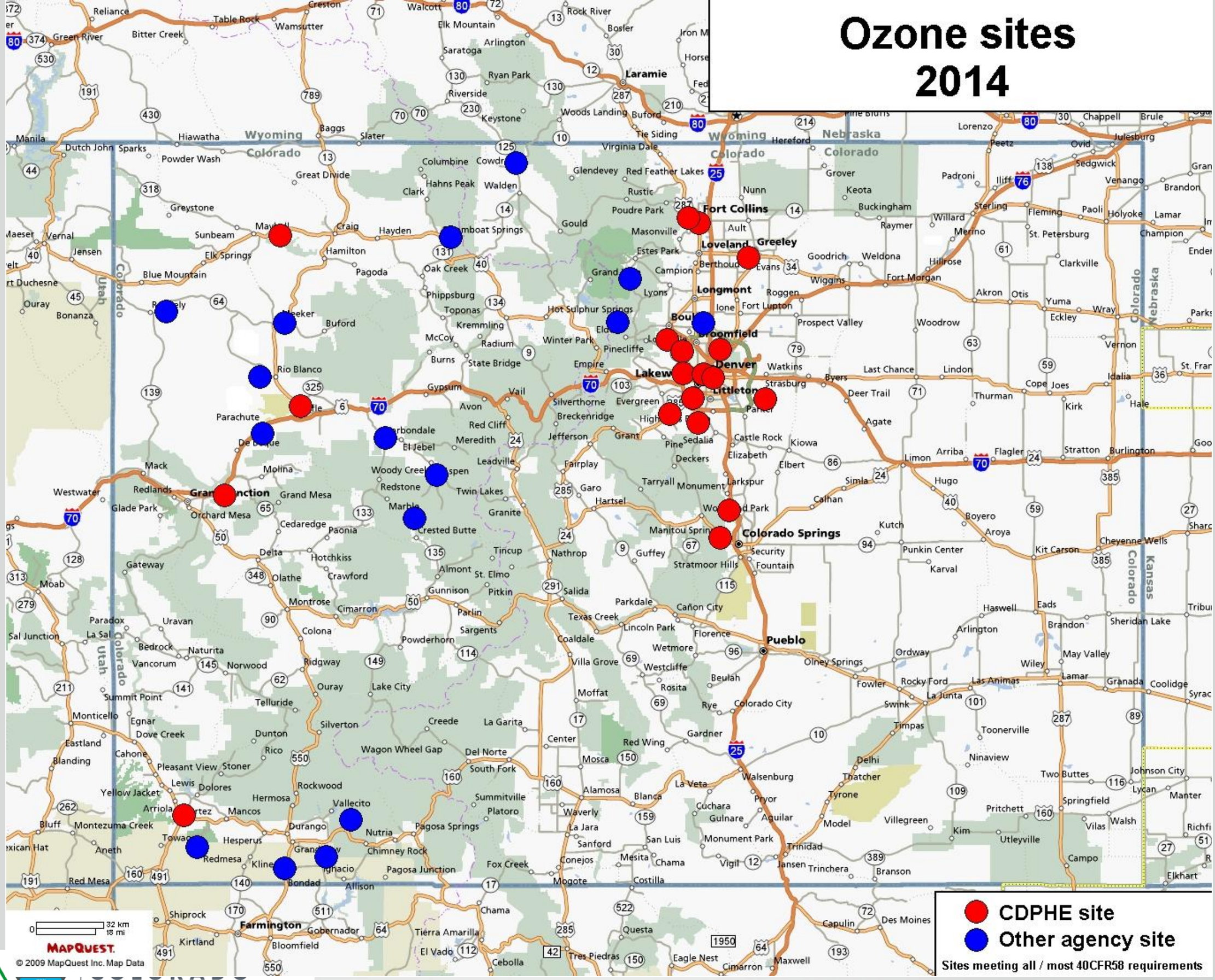
www.colorado.gov/airquality

PM10 sites 2014



$PM_{2.5}$ sites 2014



Ozone sites 2014