

Air Quality Issues and Surface Networks

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Air Pollution Control Division

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Issues to be discussed

- Ozone
- Regional haze
- Population continues to increase
- Oil and gas development increasing significantly in the area
- Major agricultural area
- Number of power plants and other industrial sources in the area

Ozone

- North Front Range of Colorado is designated as non-attainment for ozone
- Ozone levels over the years have not decreased much
- Ozone standard is likely to be lowered in the future



Ozone data – Eastern Slope

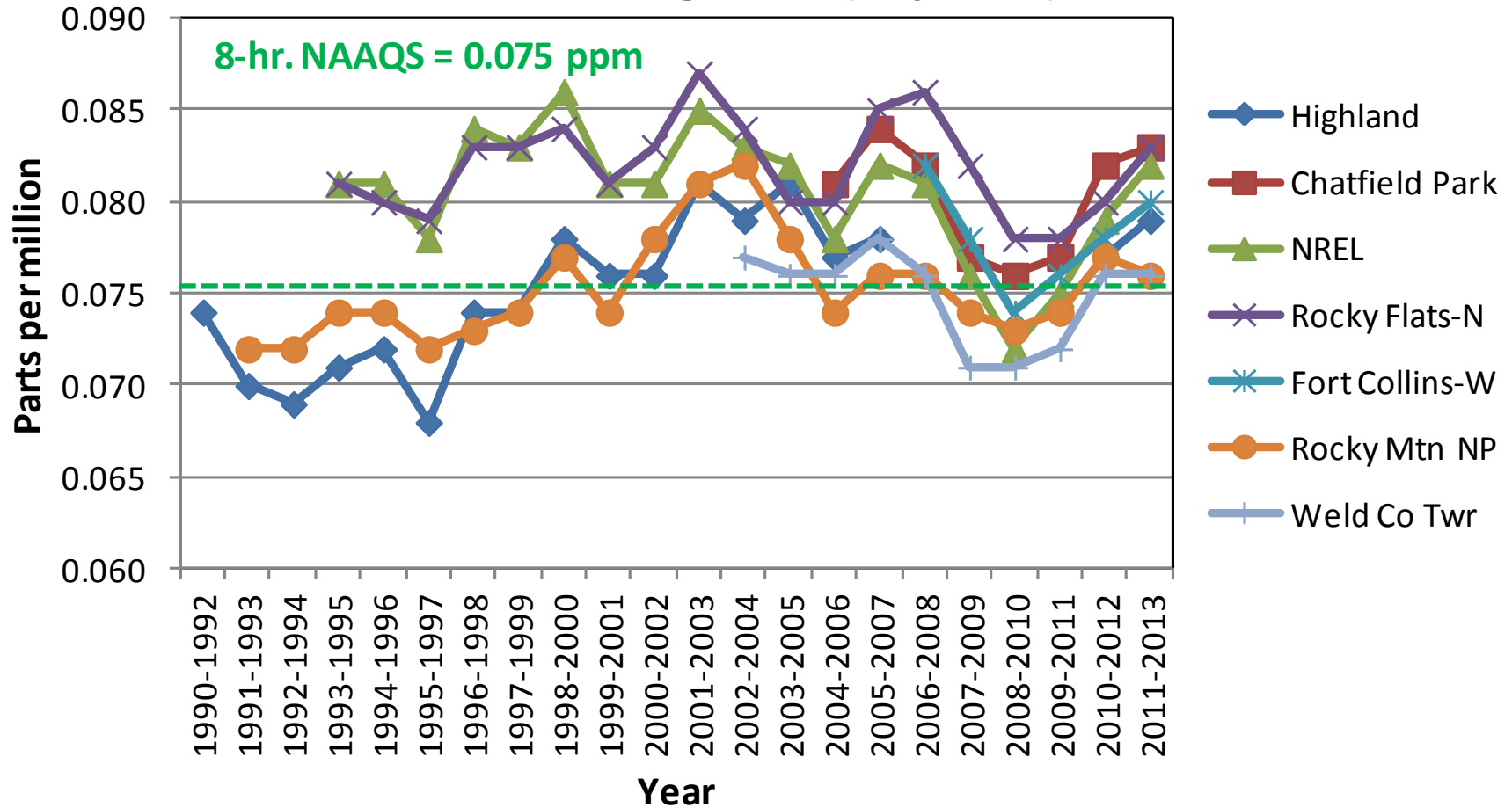
Three Year Average 4th Maximum Ozone Values

<i>East Slope Sites</i>		<u>2011</u>	<u>2012</u>	<u>2013</u>		<u>2014</u>
		8-hr. O3 4th Max. Value (ppm)	8-hr. O3 4th Max. Value (ppm)	8-hr. O3 4th Max. Value (ppm)	3-yr. Avg. 4th Max. Value (ppm)	Highest Allowable 4th Max. (ppm)
Site Name	AQS #					
Welby	08-001-3001	0.075	0.077	0.077	0.076	0.073
Highland	08-005-0002	0.078	0.080	0.079	0.079	0.068
Aurora East	08-005-0006	0.077	0.074	0.073	0.074	0.080
S. Boulder Creek	08-013-0011	0.076	0.076	0.079	0.077	0.072
CAMP	08-031-0002	---	0.068	0.067	---	0.092
La Casa	08-013-0026	---	---	0.071	---	---
Chatfield State Park	08-035-0004	0.082	0.086	0.083	0.083	0.058
USAF Academy	08-041-0013	0.074	0.075	0.074	0.074	0.078
Manitou	08-041-0016	0.075	0.075	0.072	0.074	0.080
Welch	08-059-0005	0.077	0.079	0.080	0.078	0.068
Rocky Flats North	08-059-0006	0.081	0.084	0.085	0.083	0.058
NREL	08-059-0011	0.083	0.081	0.084	0.082	0.062
Aspen Park	08-059-0013	0.072	0.077	0.077	0.075	0.073
Fort Collins - West	08-069-0011	0.080	0.080	0.082	0.080	0.065
Rist Canyon *	08-069-0012	0.073	0.071	0.066	0.070	--- *
Fort Collins - CSU	08-069-1004	0.068	0.074	0.074	0.072	0.079
Weld County Tower	08-123-0009	0.077	0.080	0.073	0.076	0.074
NPS - Rocky Mtn. NP	08-069-0007	0.077	0.079	0.074	0.076	0.074
NOAA - BAO Tower	n/a	0.076	0.077	0.071	0.074	0.079
NOAA - Niwot Ridge	n/a	0.067	0.076	0.072	0.071	0.079

* Rist Canyon site closed 6/28.

Ozone data – North Front Range

8-Hour Ozone --- 3-year Avg. of 4th Max.
North Front Range area (key sites)



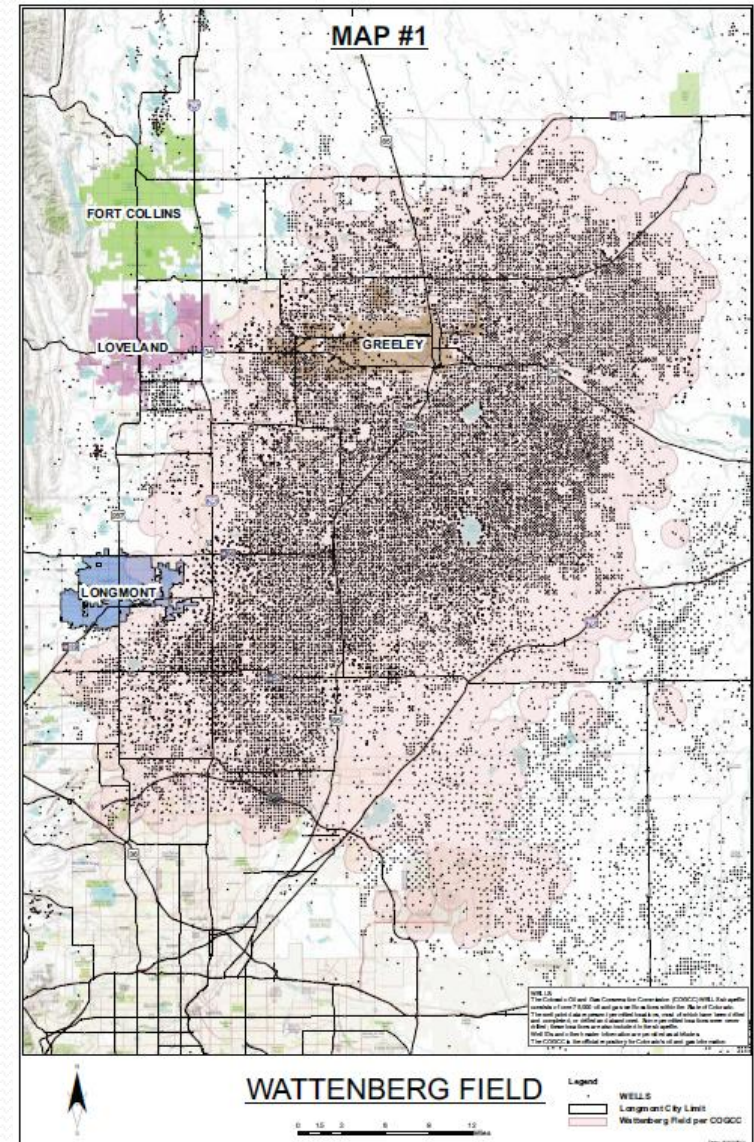
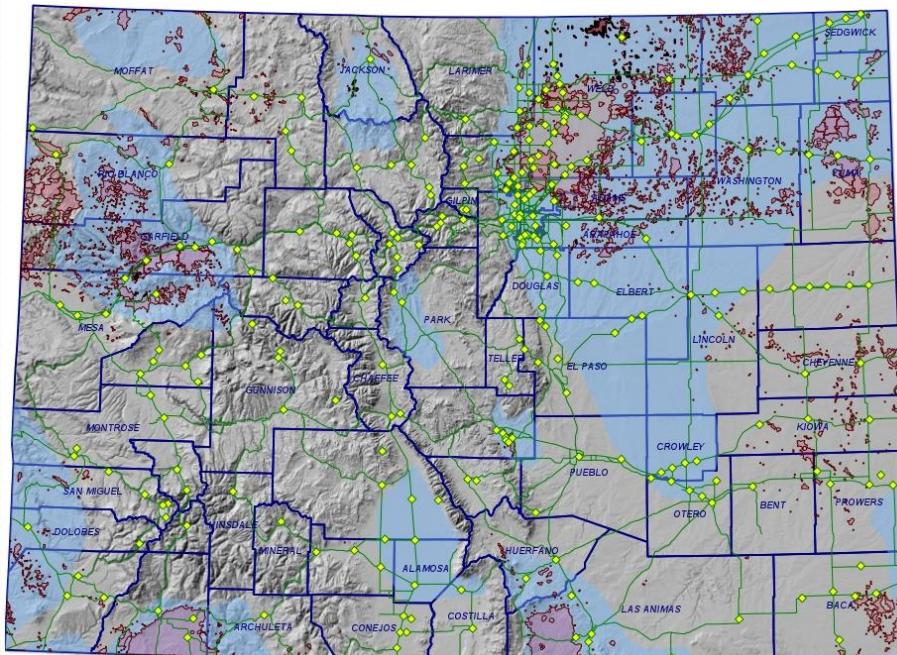
Regional Haze

- Colorado is one of only a few states with a visibility standard
- Haze is an issue for Class I areas in the west
 - Clean Air, Clean Jobs legislation to help
- We often get haze when PM_{2.5} is low especially in the foothills
- Fire haze is also an issue
 - Continuing debate on ozone production vs. suppression in wildfire plumes
 - The Front Range often sees plumes from fires in WY, MT, ID, WA, etc.



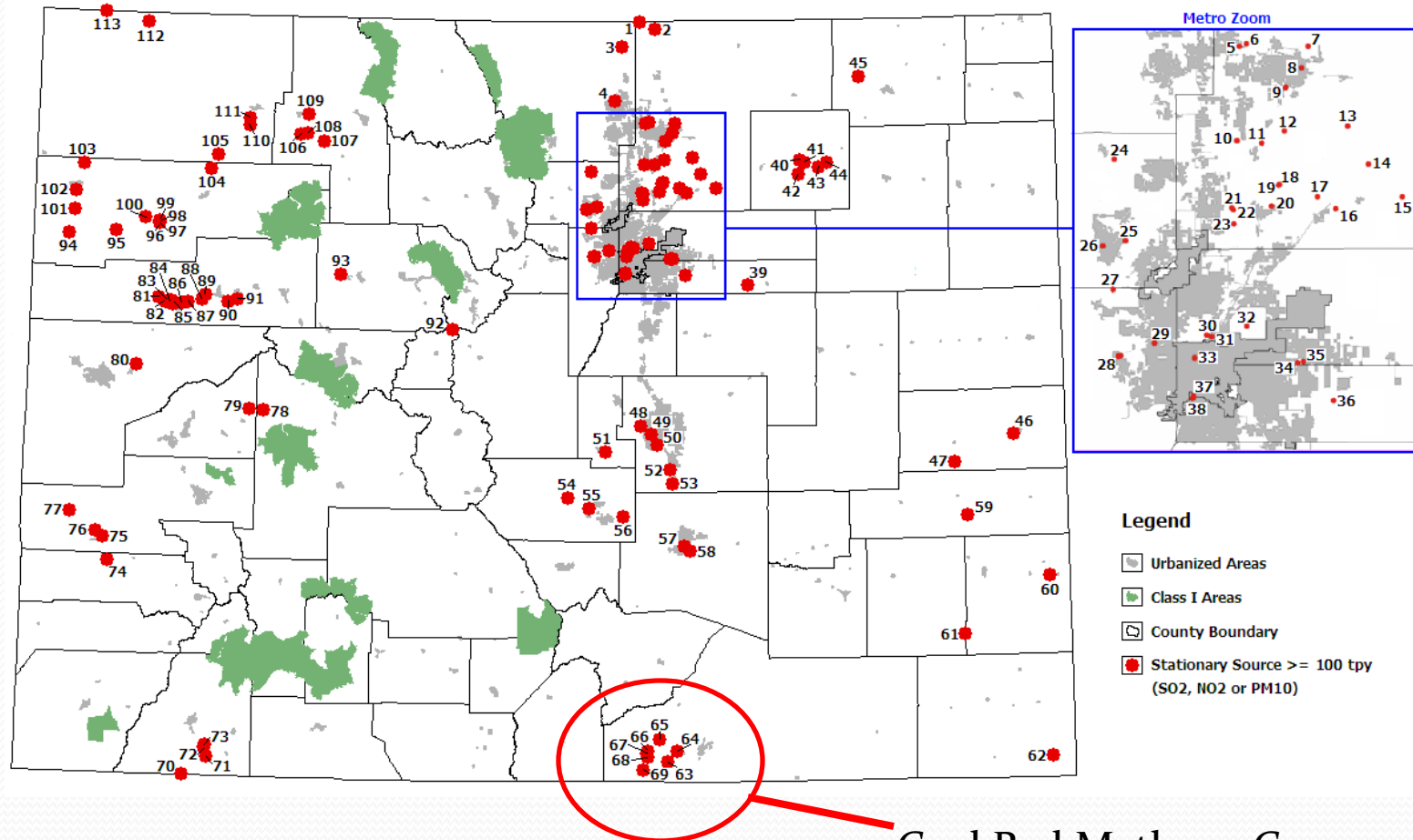
Oil and Gas Development

- Over 51,000 active wells in Colorado
 - Over 22,000 of these in the North Front Range
- Over 8000 condensate tanks
- Compressor stations, etc.



Coal Bed Methane Compressor Stations

Site Emission \geq 100 tpy for SO₂, NO₂ or PM₁₀
Number of Sources = 113

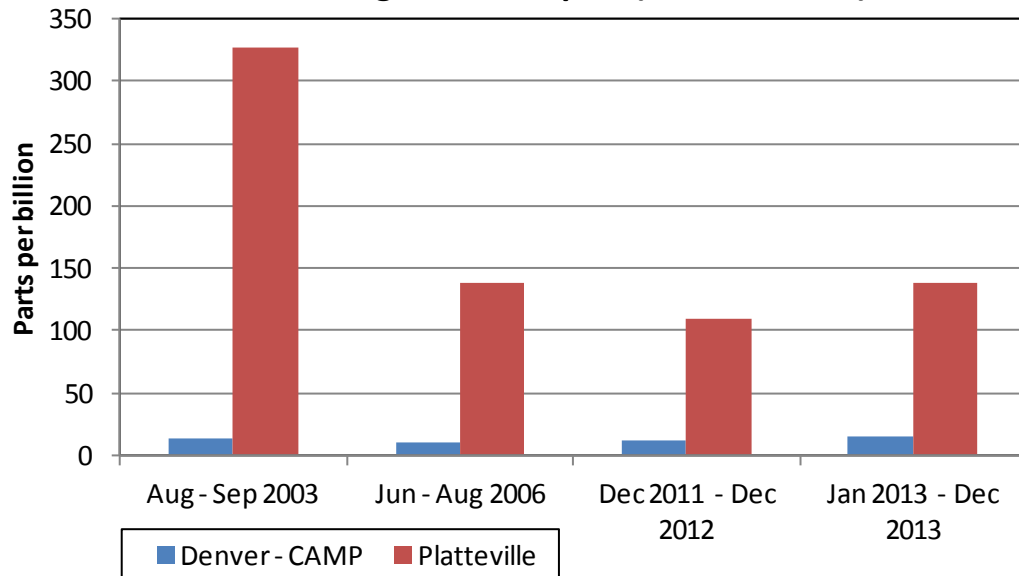


Data: CDPHE, 2011
Colorado Regional Haze
SIP

Coal Bed Methane Compressor
Stations with $>$ 100 tpy NO_x
emissions

Ethane

Average 3-hr. samples (6 a.m. - 9 a.m.)

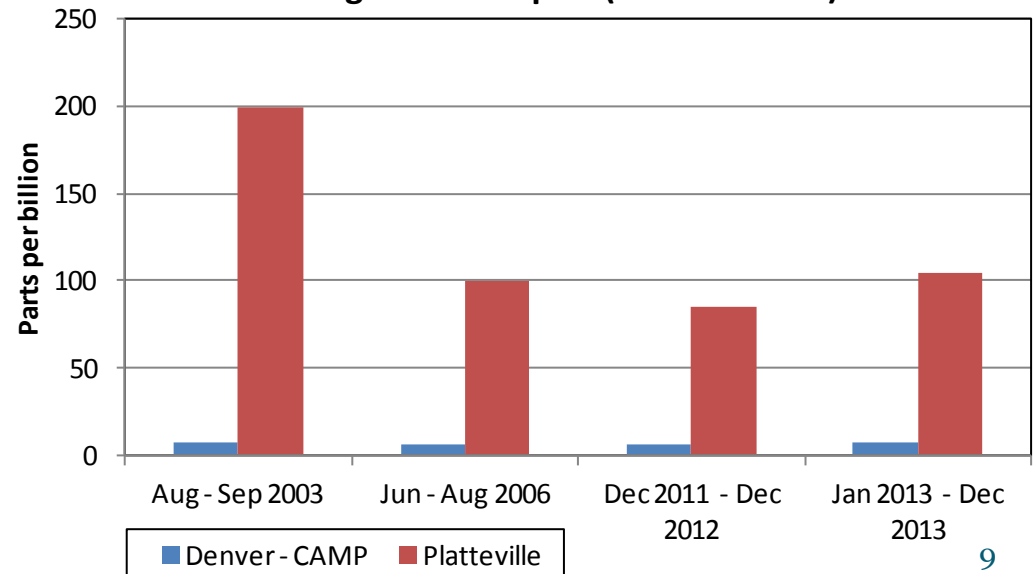


Select organics that are typically O&G-related

Higher in oil and gas development area versus urban area

Propane

Average 3-hr. samples (6 a.m. - 9 a.m.)



CDPHE Oil and Gas Regulation

- Recent State rules expanded to include regulation of methane leaks
- CDPHE has an aggressive inspection and enforcement program, including:
 - annual inspections of major (>100 tpy) sources
 - 4 full time FLIR (infrared) camera inspectors
 - inspection of exploration and production operations
- CDPHE's Oil and Gas team works collaboratively with other state, local and federal officials as well as scientific, community groups, etc.
- The O&G team welcomes appropriate calls and reports of major leaks, etc. that may be observed during the FRAPPE campaign
- All O&G operations required to post CDPHE identification numbers, permits, etc. on location at the site

Methane/Greenhouse Gas Inventory Needs

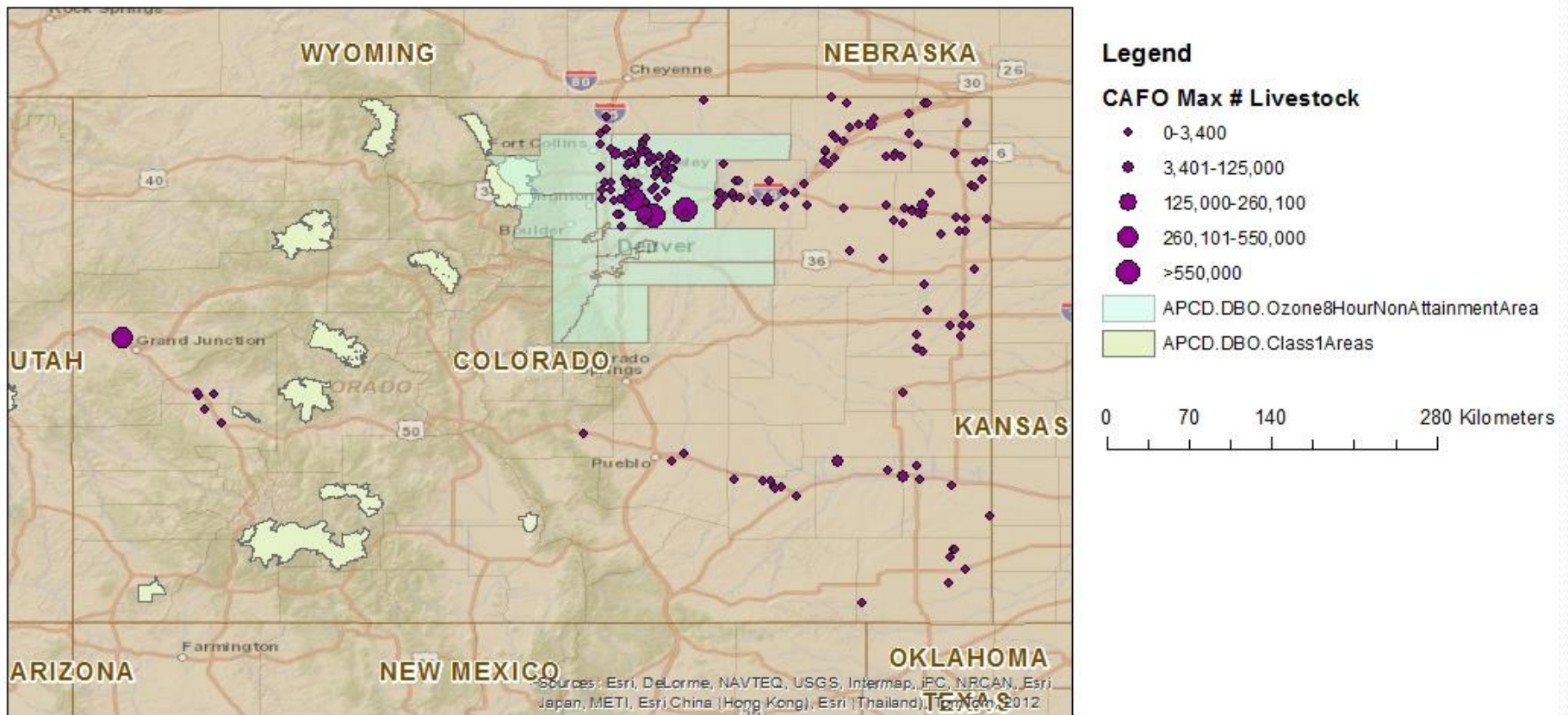
- Interest in methane emissions from different sources
 - Landfills
 - Water treatment plants
 - Animal feeding operations
- Research Questions
 - Can isotope analysis distinguish agricultural vs. oil and gas sources?
 - Ratios of CH₄/NH₃ and CH₄/ethane?
 - Other methods?
 - Do different methods give the same result?

Ammonia

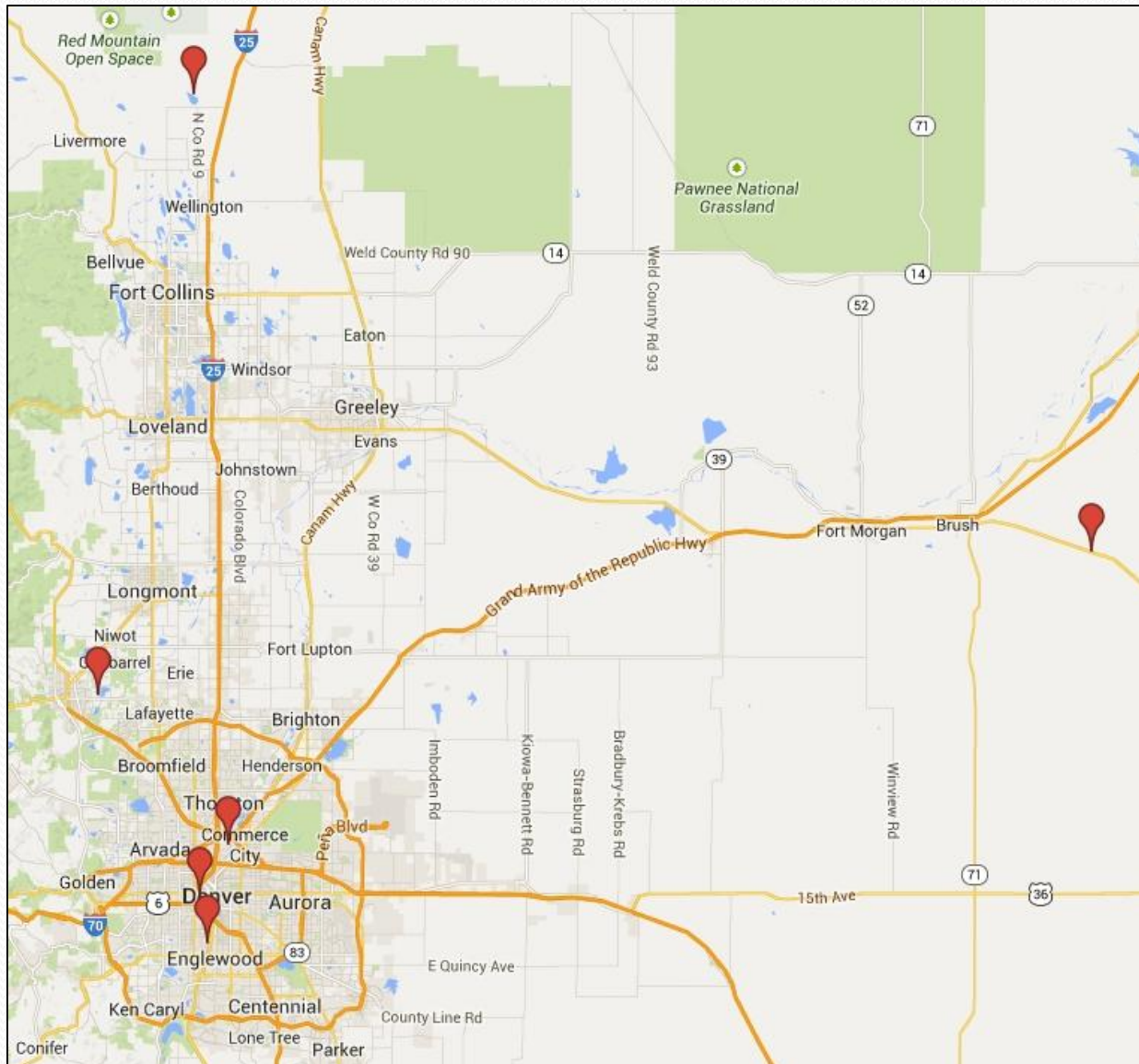
- Important emerging policy issue
- Main concern is nitrogen deposition in Rocky Mtn. National Park
 - Currently dry deposition is thought to be ~1:1 (nitrate:ammonia)
 - Many sources of nitrate have been controlled (EGUs, mobile, etc.)
 - Ammonia controls
- Animal feeding operations are a major uncontrolled source
- However, we also need data on other sources:
 - Landfills
 - Water treatment plants
 - Composters
 - Biosolid use
 - Crop producers / fertilizer use
 - Golf courses
 - Commercial landscapers
- CDPHE can provide source locations/size/etc.

Agricultural Feeding Operations

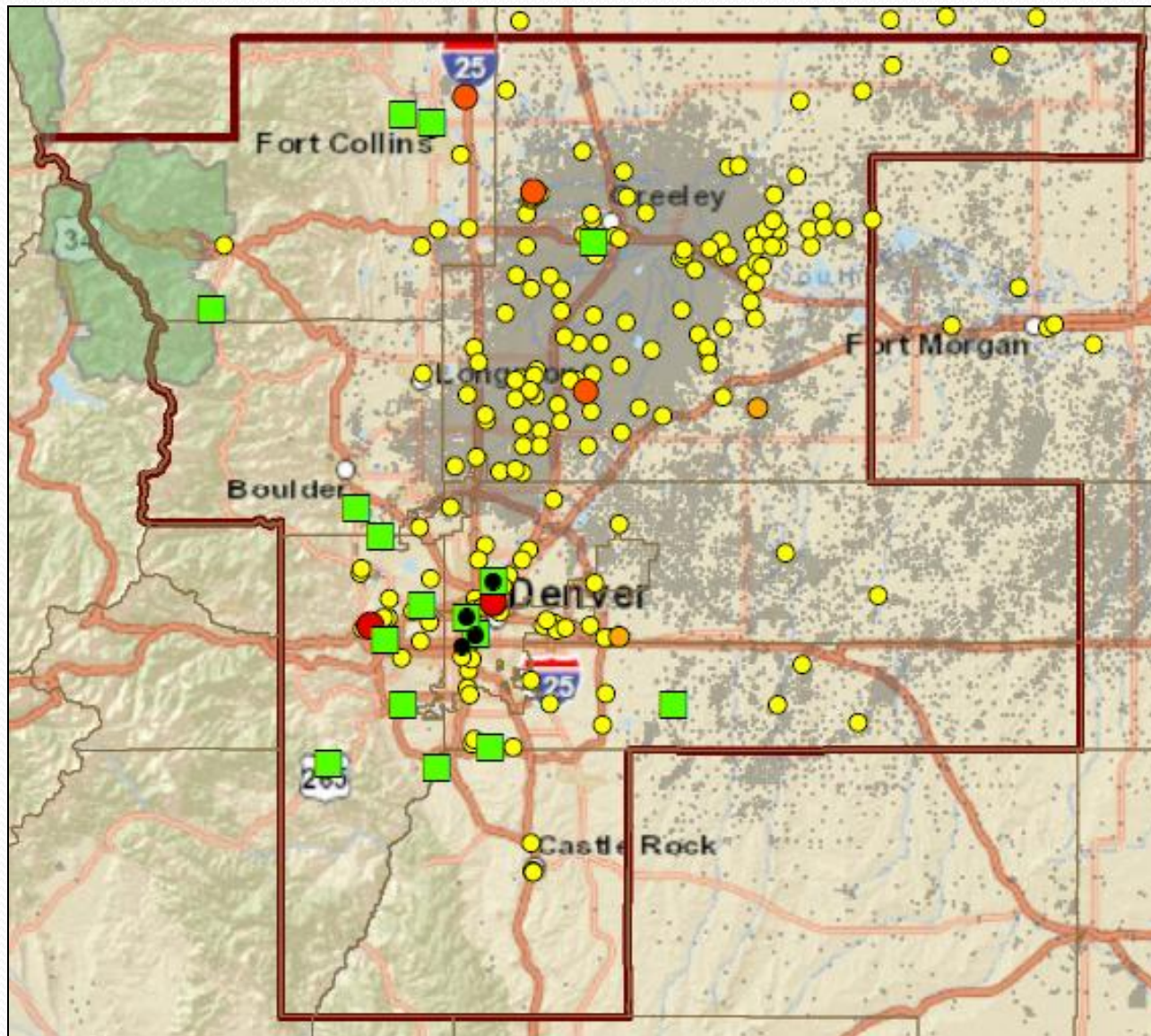
Colorado CAFOs 2009 Data Year



Power Plants



Industrial – VOC Point Sources

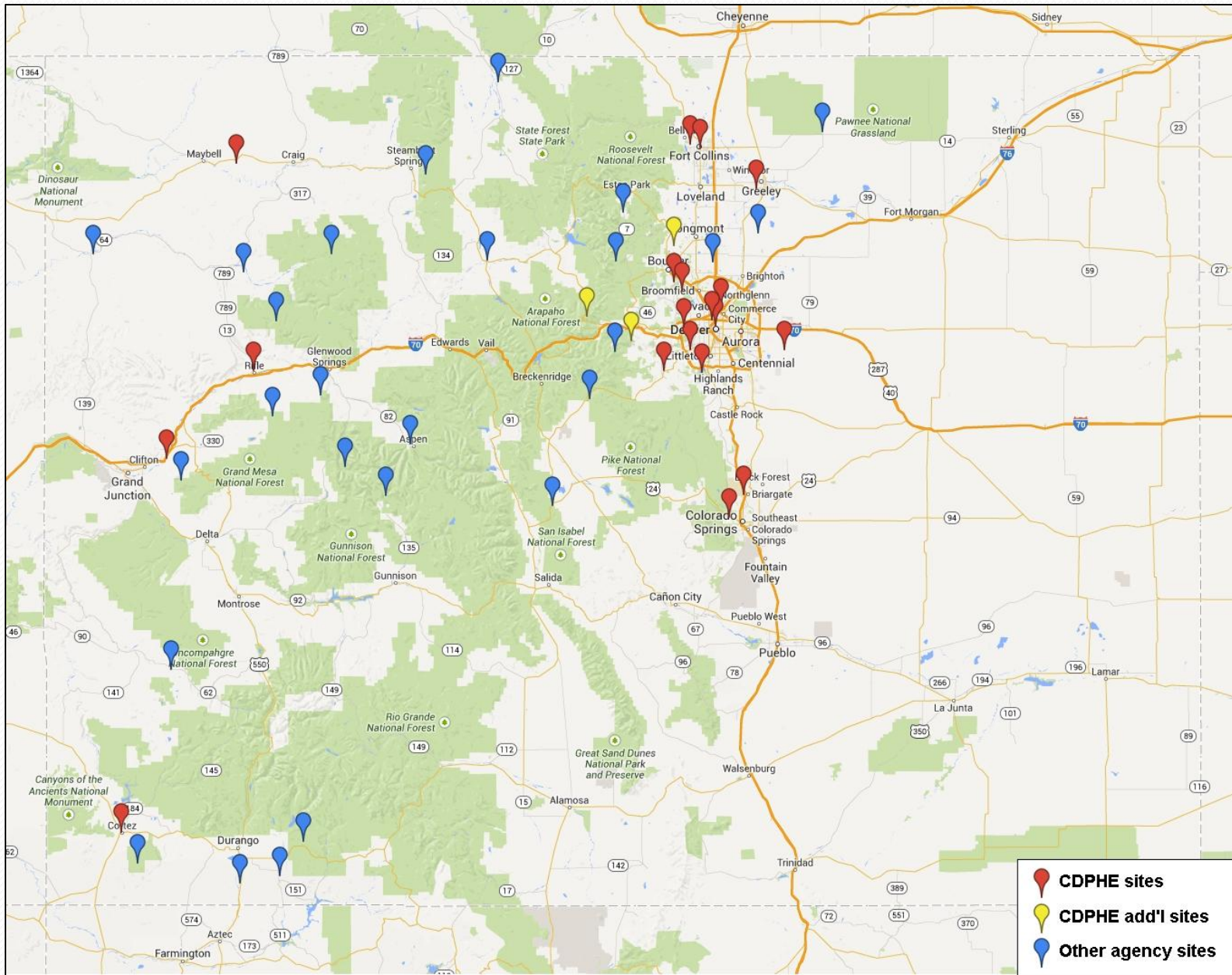


Yellow dot = point source

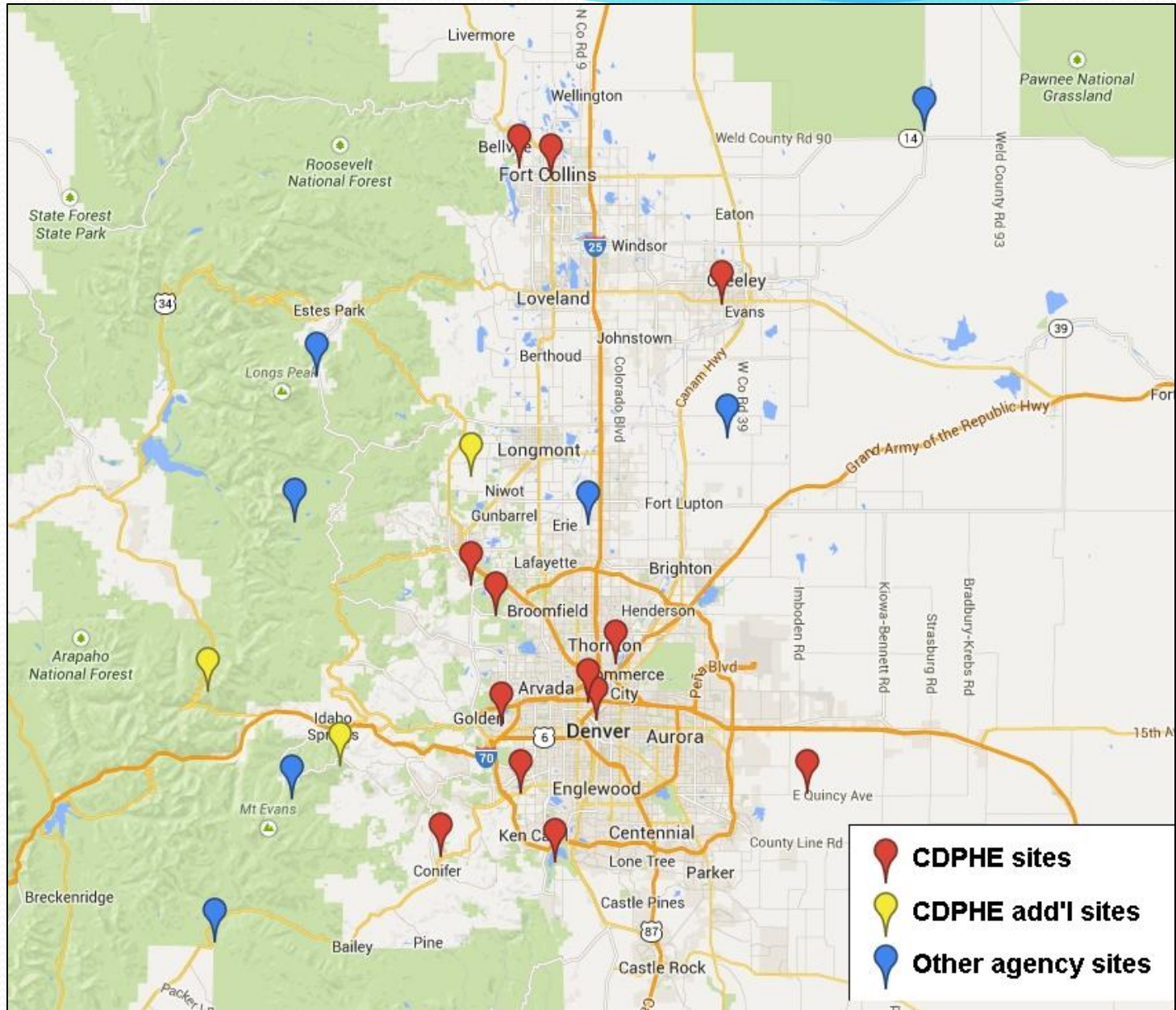
Gray = oil/gas wells

Green square = ozone monitor

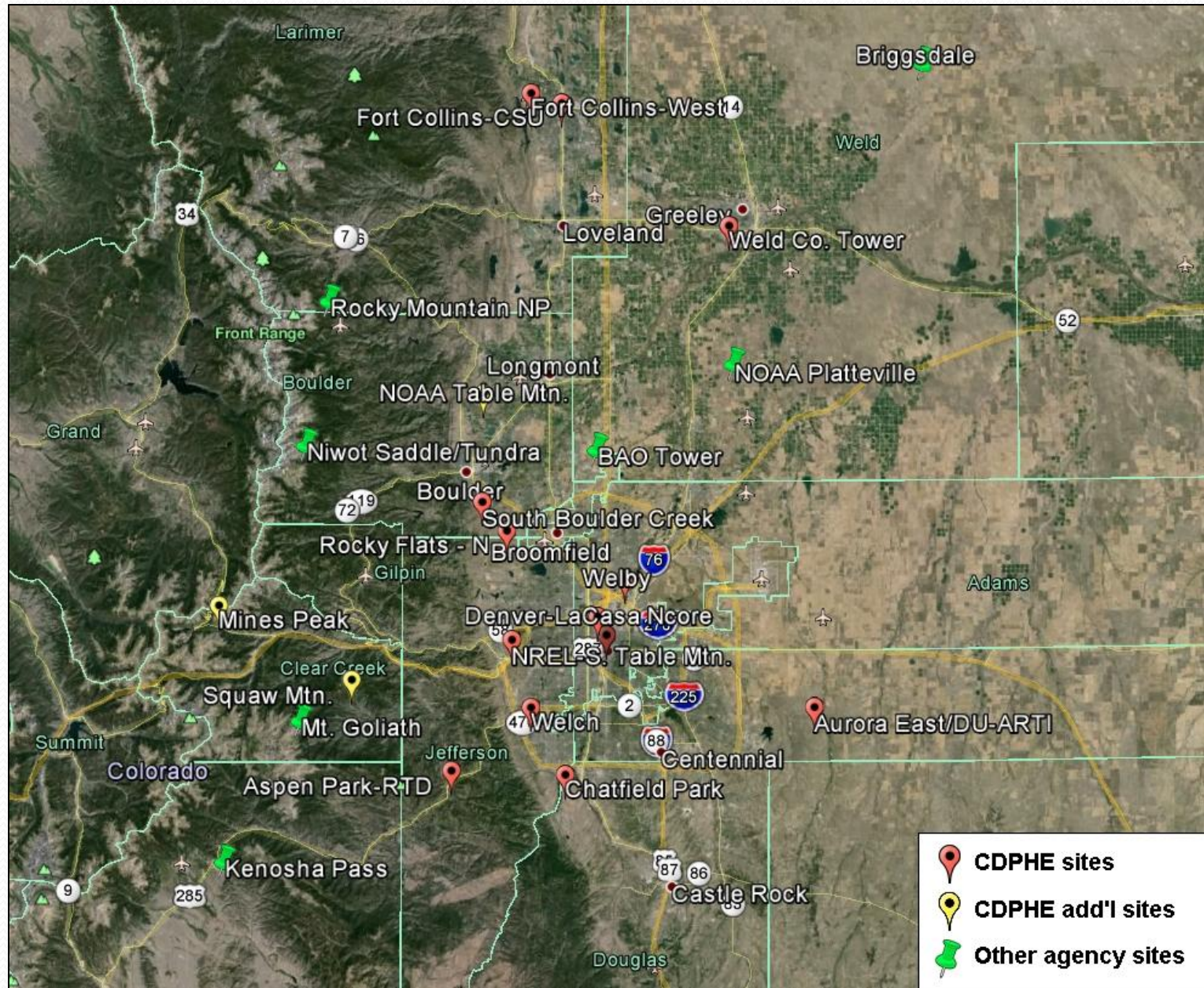
Ozone Sites - Colorado



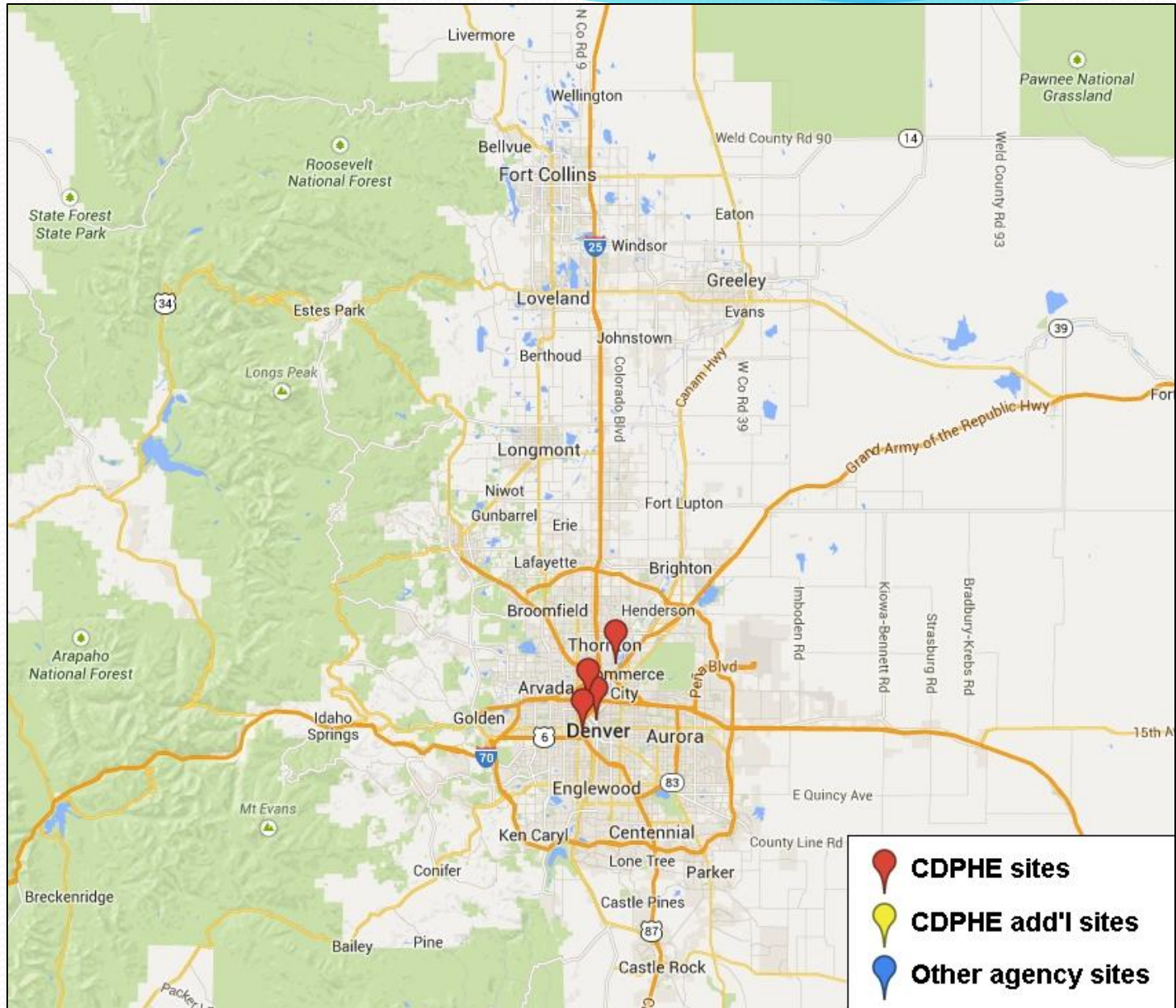
Ozone sites in the NFR area



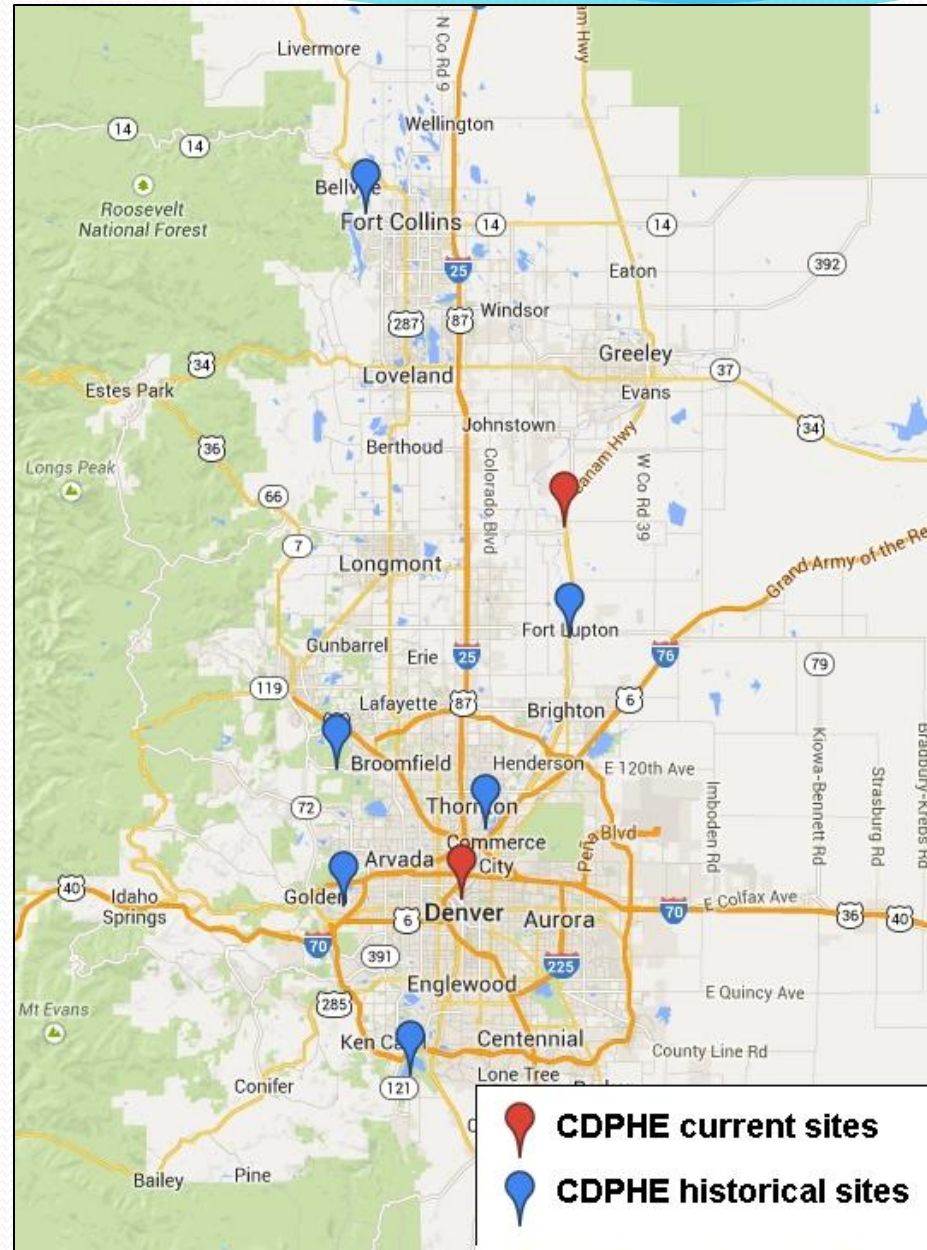
Ozone sites in the NFR area



NO_x sites in the NFR area

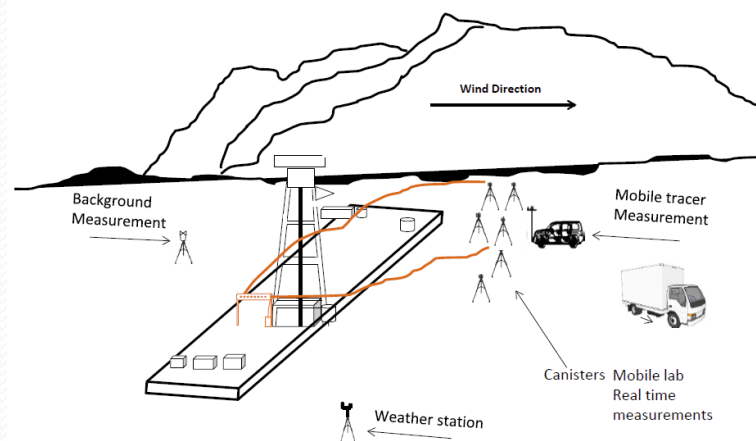


Precursor NMOC and carbonyl sites



Other Ongoing Studies

- North Front Range Oil and Gas Air Pollutant Emissions and Dispersion Study
 - Similar study in Garfield County
 - Designed to characterize emissions of air toxics, ozone precursors, and methane from oil and gas activities
- CU NSF multi-media study (Sustainability Research Network)



What monitoring will CDPHE provide?

- Ozone
 - Monitoring at 13 existing sites + 3-4 additional sites
 - Data uploaded to website hourly
- NO_x
 - Monitoring at 4 sites
 - Data uploaded to website hourly
- NMOC and carbonyl
 - Monitoring at 2 existing sites + 1-2 additional sites

What resources will CDPHE provide?

- Statewide and Front Range forecasts for ozone and other pollutants 7 days a week, including:
 - 9 AM MDT update
 - 24-36 hour forecast by 3 PM MDT
 - multi-day outlook (crafted specifically for FRAPPE and DISCOVER-AQ)
- Advisories for blowing dust, wildland fire smoke, stratospheric ozone intrusions, and any air quality event in Colorado.
- Forecasts are based on several synoptic and mesoscale meteorological models, a variety of satellite products, observations, in-house regression tools, and more than 7 decades of combined staff Colorado air quality forecasting experience. RAP HRRR best tool for 15-hour convection outlook.
- Forecasts and advisories are currently disseminated on our web pages and via listserves, AIRNow, local media, and hotlines. We can arrange for project-specific methods of distribution. (Note: A large number of wildfires will absorb much of our time.)