Air Quality Update for the Cowichan Valley

November 30, 2016

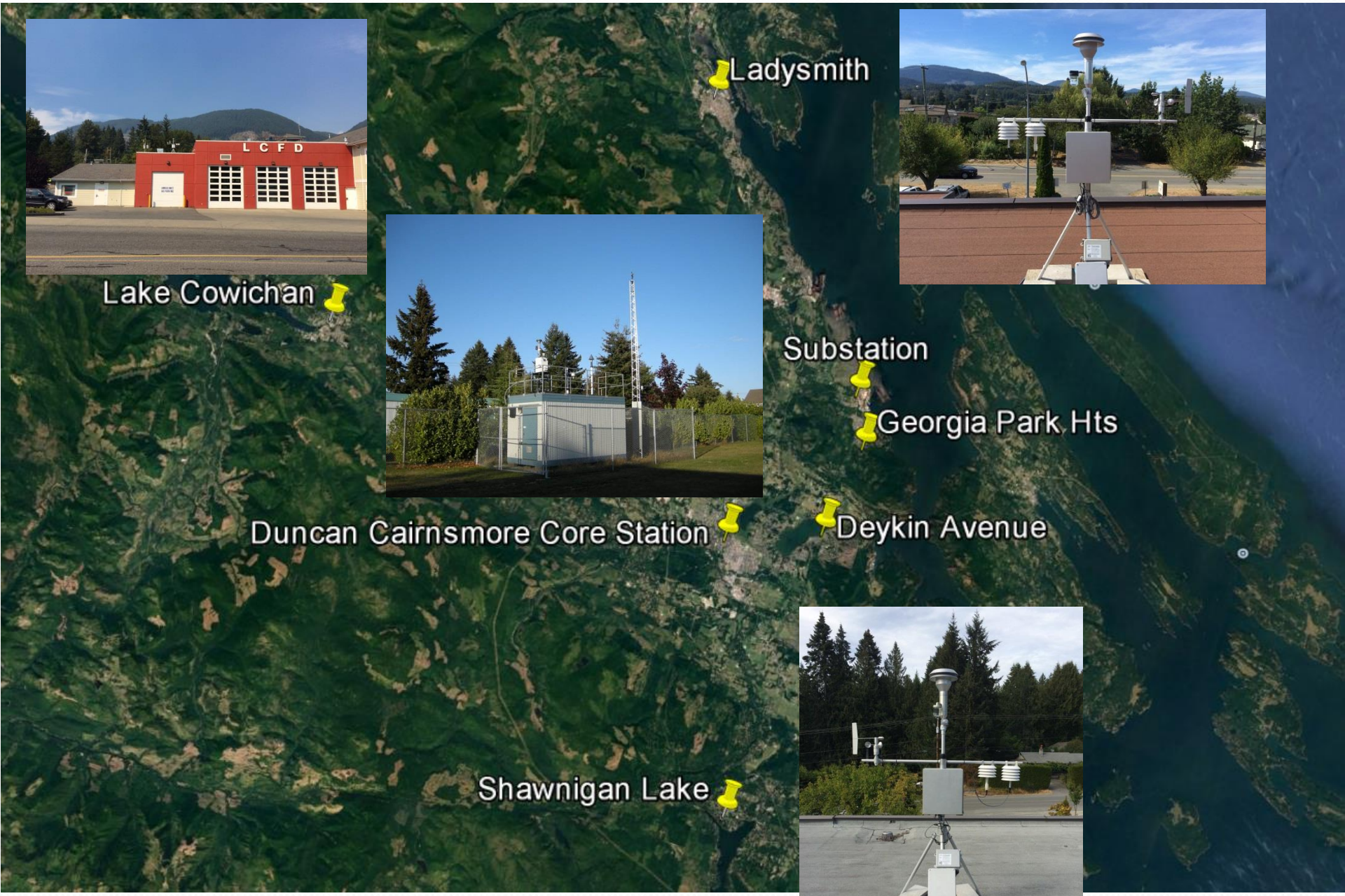
Earle Plain, Air Quality Meteorlogist

Overview

- Where is air quality measured in the Cowichan Valley?
- What is the data telling us?
- New things
  - Surveillance monitoring
  - SFBDAR

What is Measured in the CVRD?

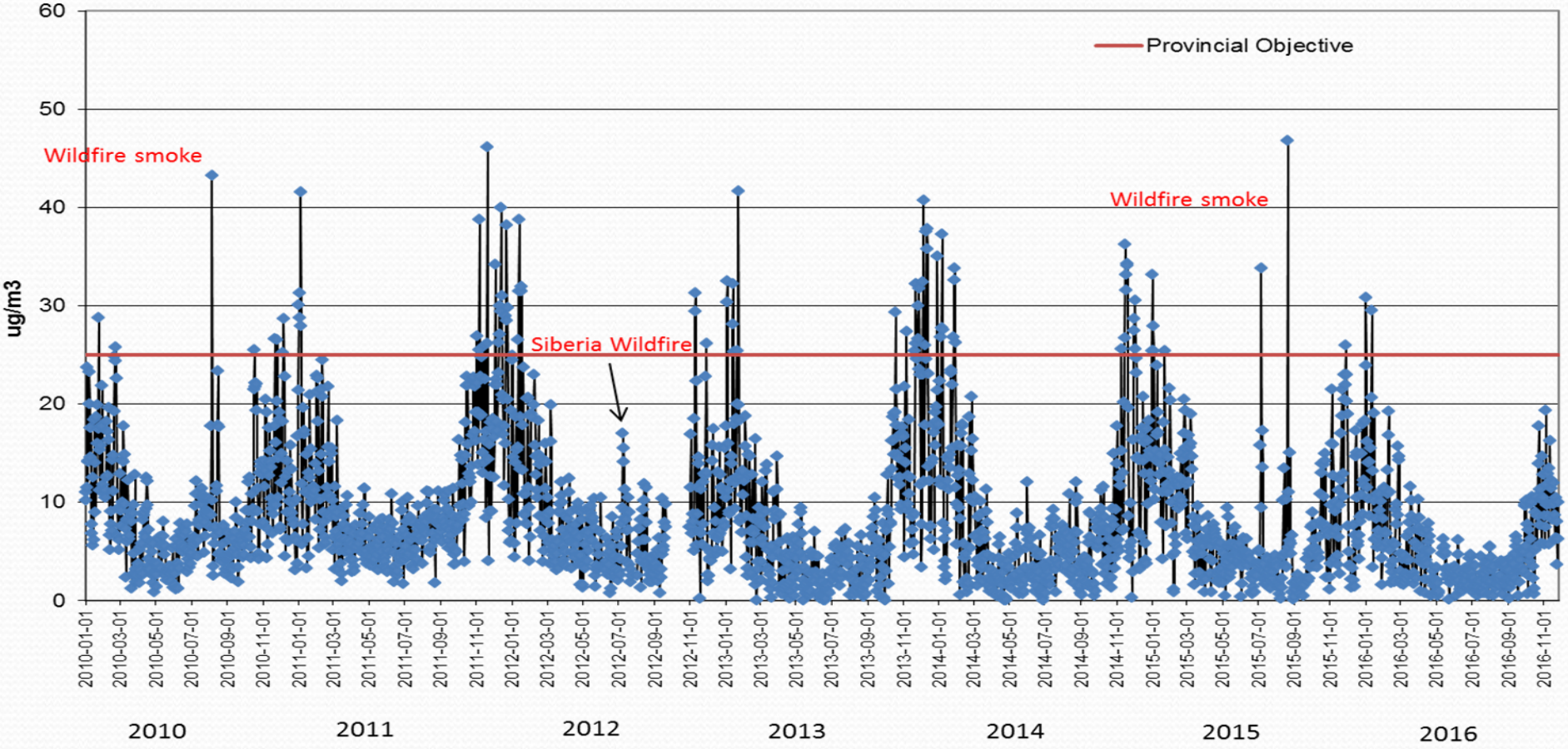
- Total Reduced Sulphur (TRS) at 3 sites
- Sulphur Dioxide (SO_2) at 1 site
- Nitrogen Oxides at 1 site
- Ground Level Ozone (O_3) at 1 site
- Fine Particulate Matter ($PM_{2.5}$) at 4 sites
- Meteorology (3 sites)
- Misc studies –rotational surveillance $PM_{2.5}$ and met monitoring (3 sites) 2014-2016


L C F D
Ladysmith
Lake Cowichan
Substation
Georgia Park Hts
Duncan Cairnsmore Core Station
Deykin Avenue
Shawnigan Lake

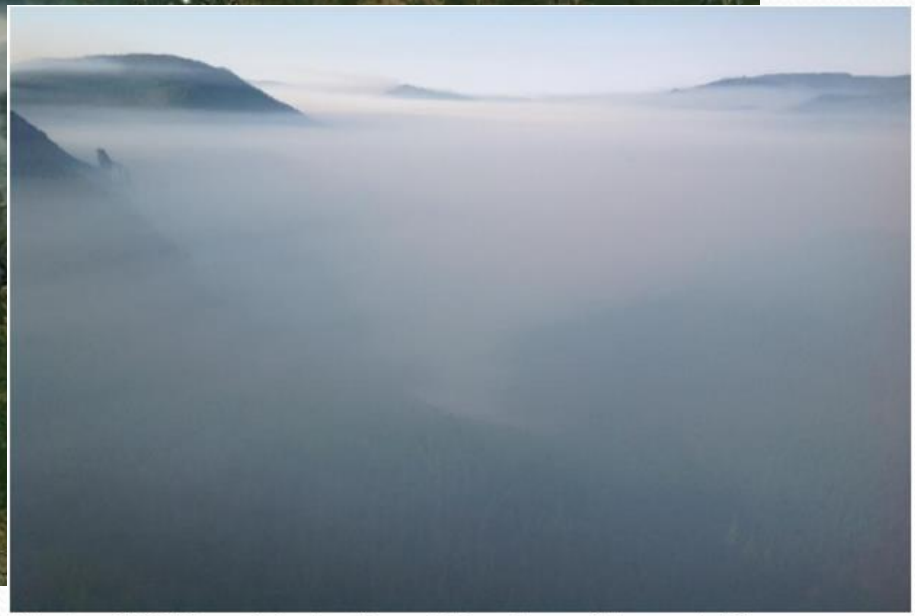
What is the data telling us?

- NO_2, SO_2, and ground level O_3 levels remain well below Provincial objective levels
- TRS concentrations are below Provincial odour objective levels 99% of the time at Quamichan Lake and 96-98% of the time at sites closer to the pulp mill
  - Remains a pollutant of interest
- Fine particulate matter ($PM_{2.5}$) occasionally exceeds Provincial Air Quality Objectives
  - Main pollutant of concern – health effects, visibility, vegetation

Daily PM2.5 Concentrations at Duncan Cairnsmore January 2010 - November 2016



Lower
Mainland



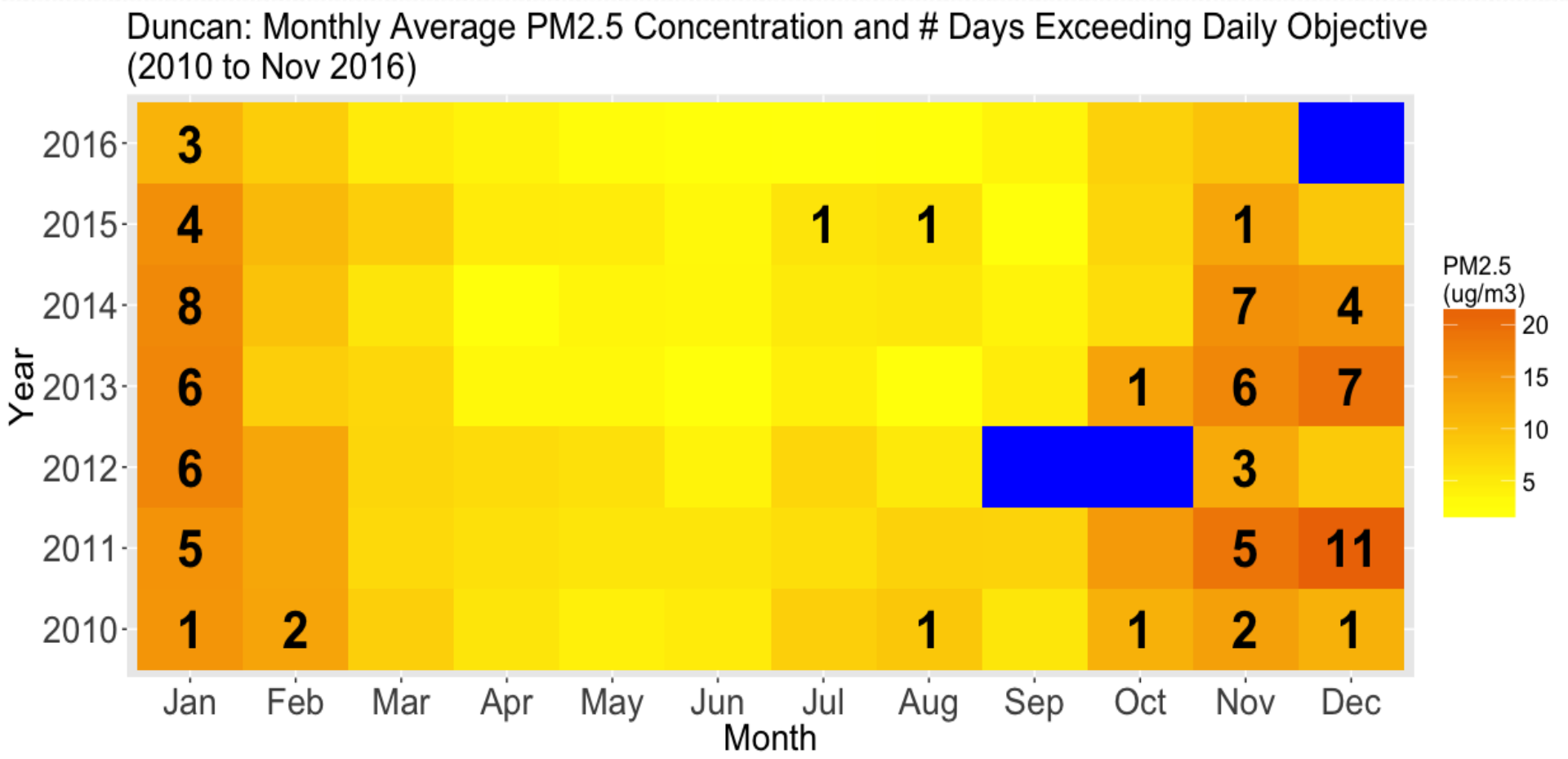
Spring Rd/Lizard Lake fire – Morning of August 13

Scales!

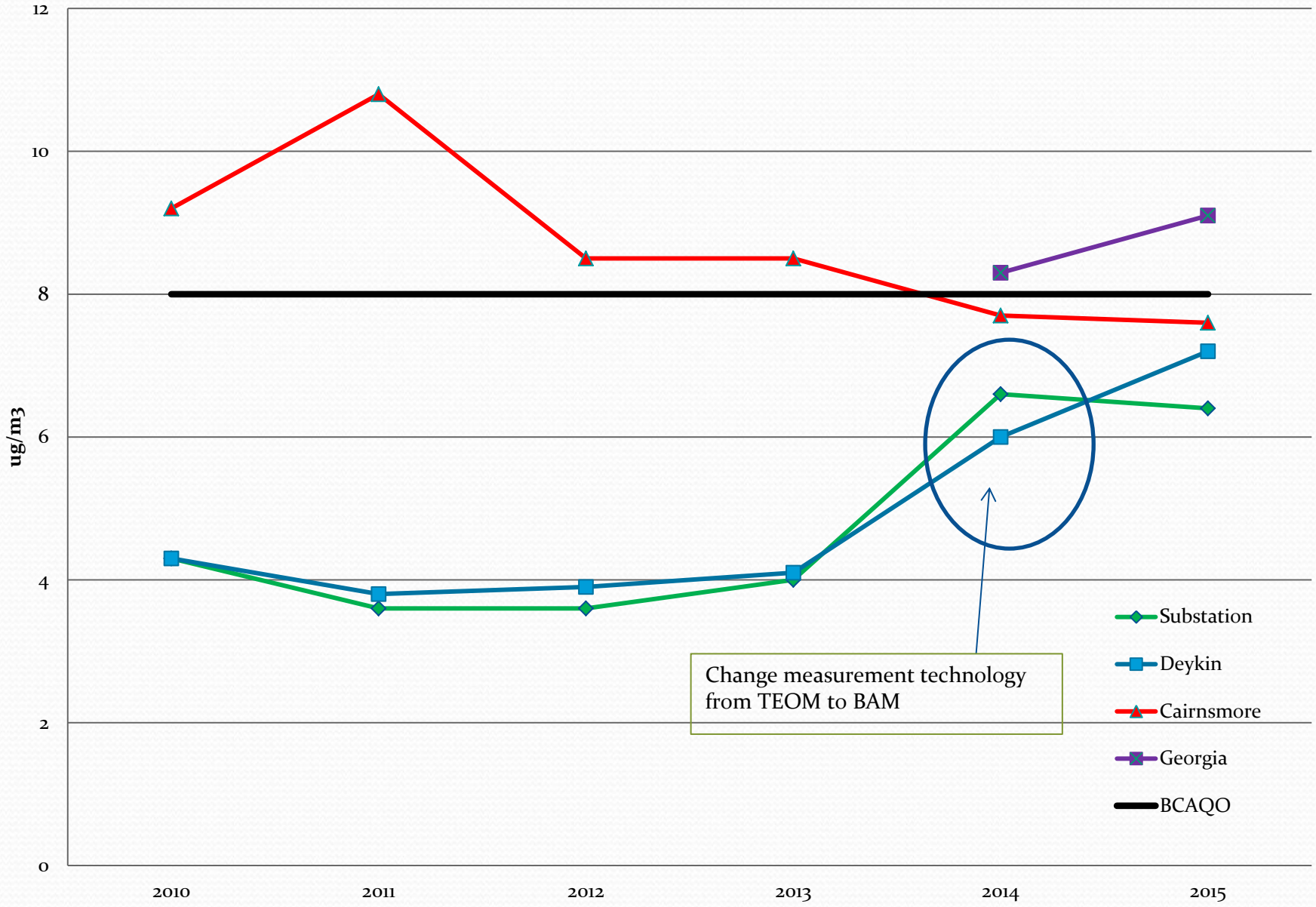
- Different emission sources affect exposure on different scales
  - In space / time

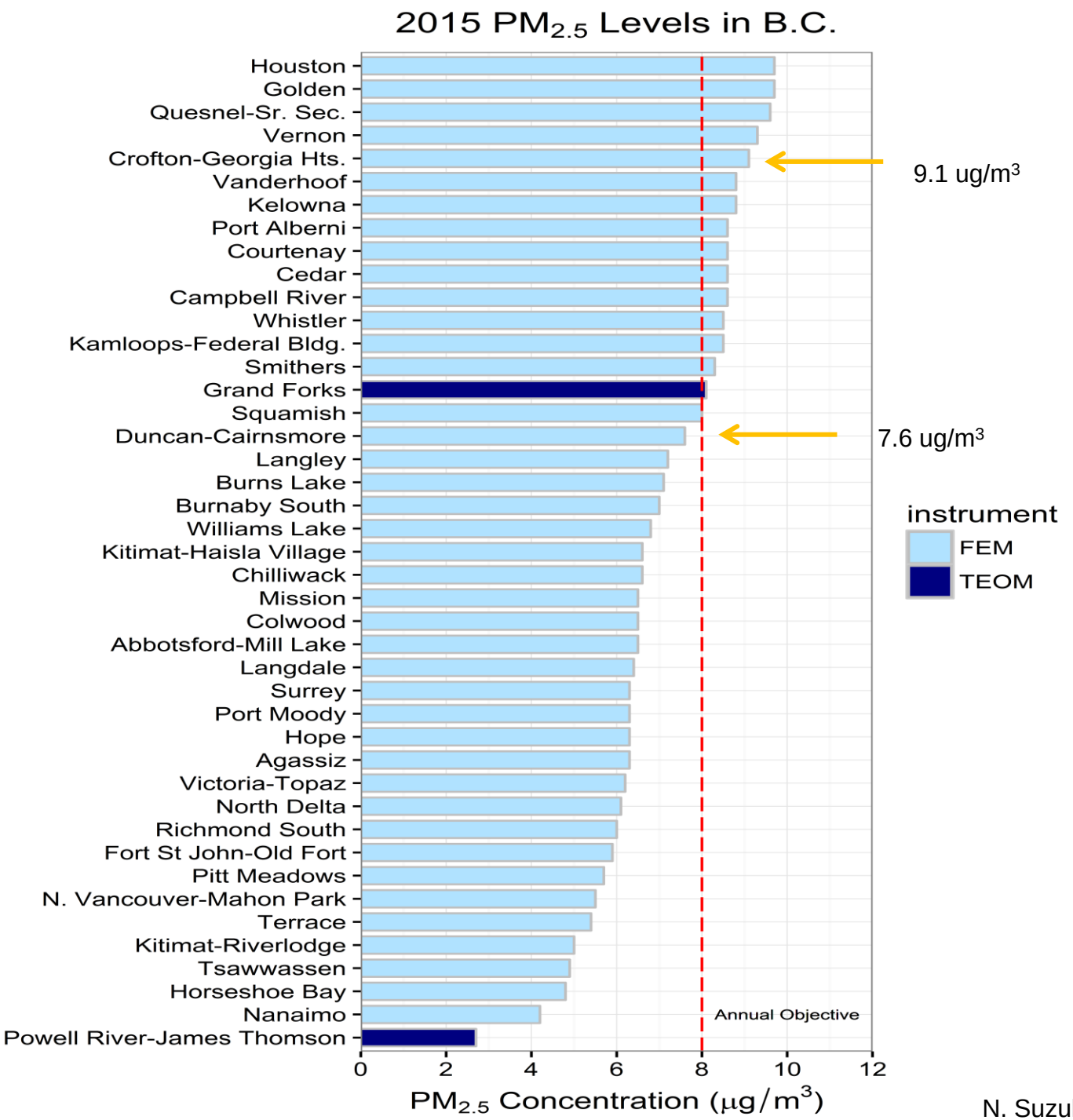
- Industrial burning: valley-wide / mostly autumn
- BY burning and land clearing: neighbourhood & community impacts / mostly autumn but can be sporadic throughout cold season
- Industrial sources: community / all year
- Woodstoves: neighbourhood & community / autumn, winter, spring

The data: exceedances and months



Annual Average PM2.5 Cowichan Valley 2010-2015





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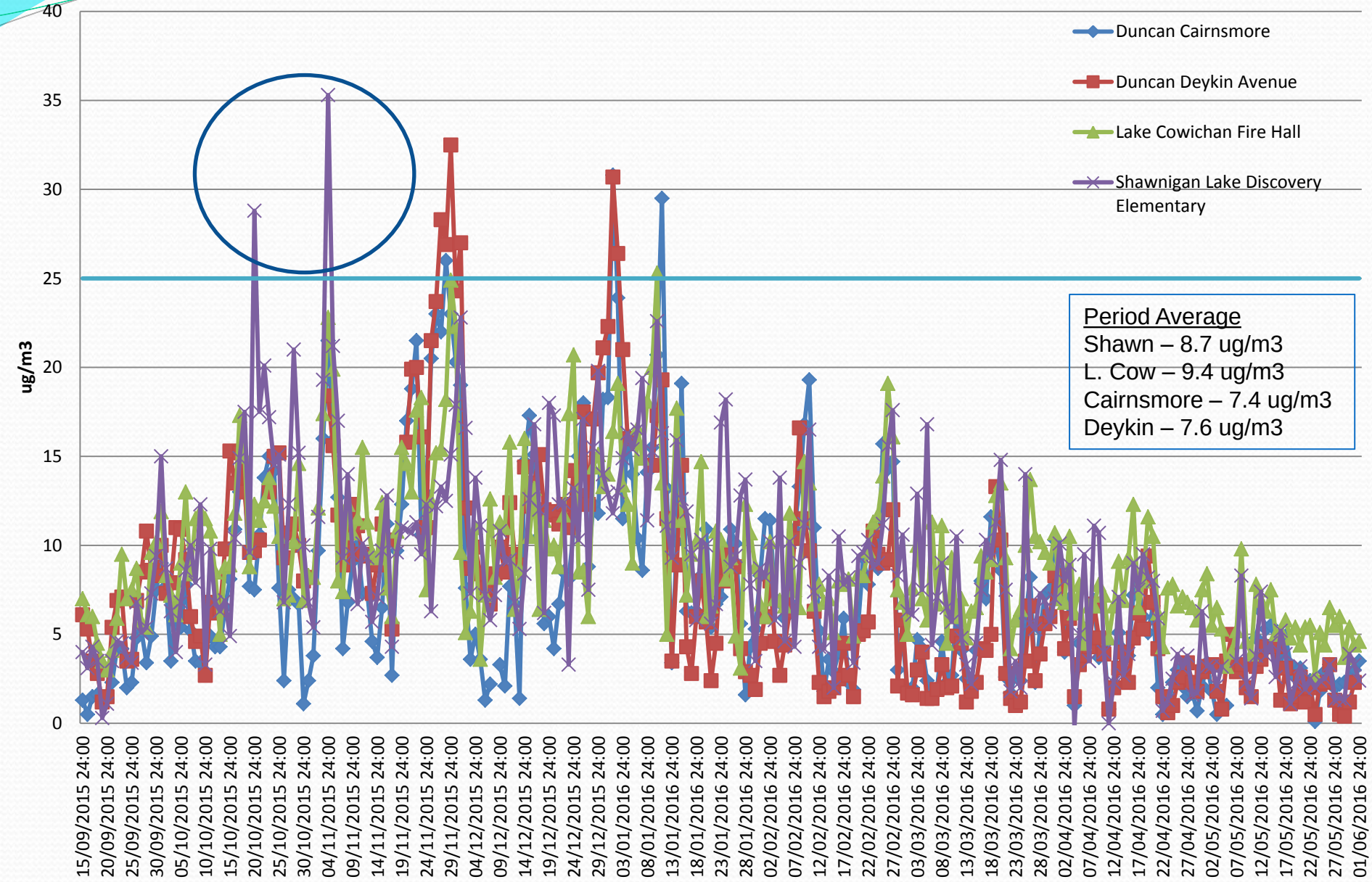
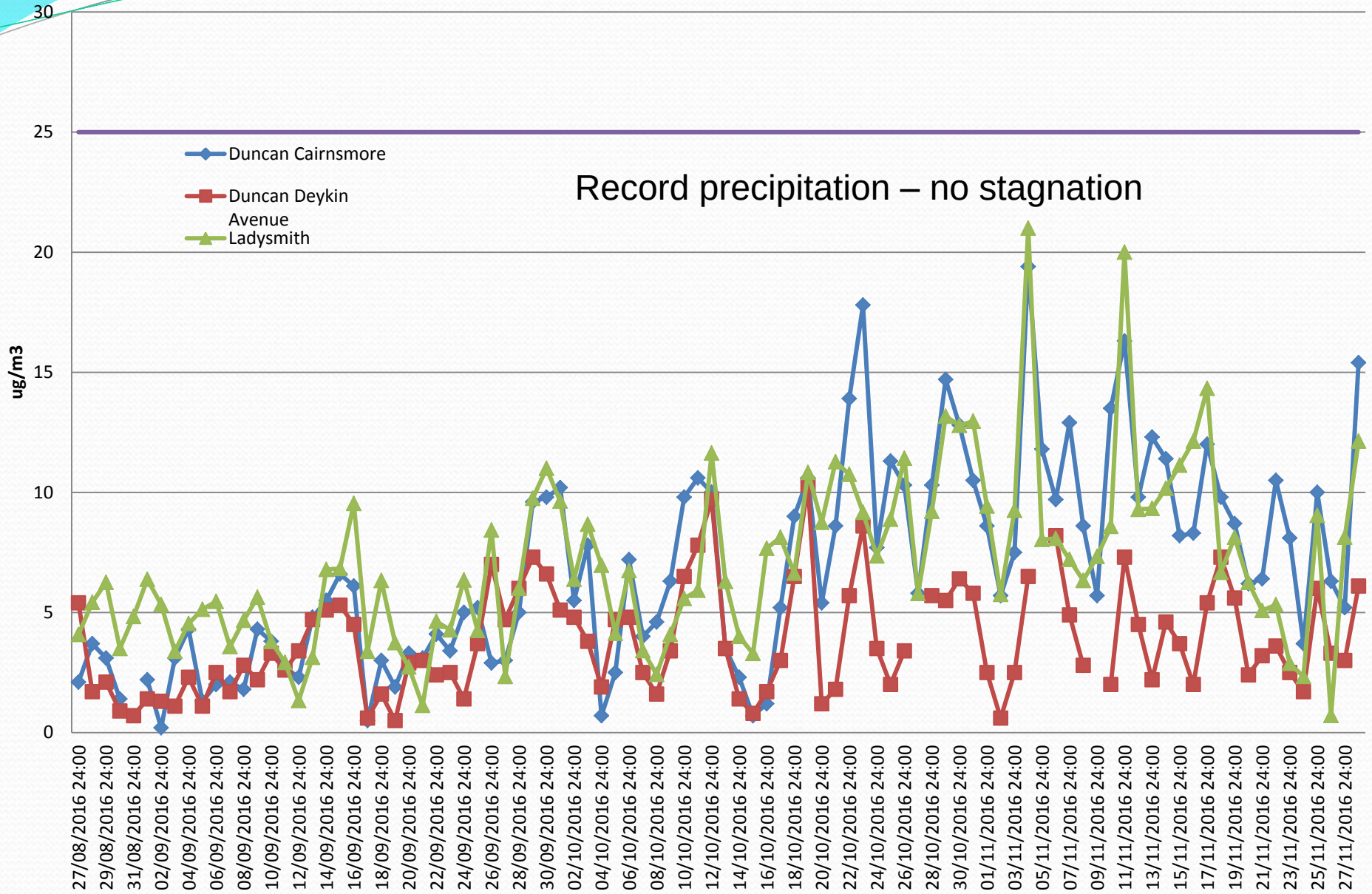
Rotational PM2.5 Monitoring

- Lake Cowichan & Shawnigan Lake – September 1, 2015 to June 1, 2016
- Ladysmith – September 1, 2016 to present

Daily PM2.5 Levels Shawnigan and Lake Cowichan Select CVRD Sites
September 15 2015 -June 01, 2016



Daily PM2.5 Levels Ladysmith vs. Select PM2.5 sites in the CVRD
August 27-November 28, 2016

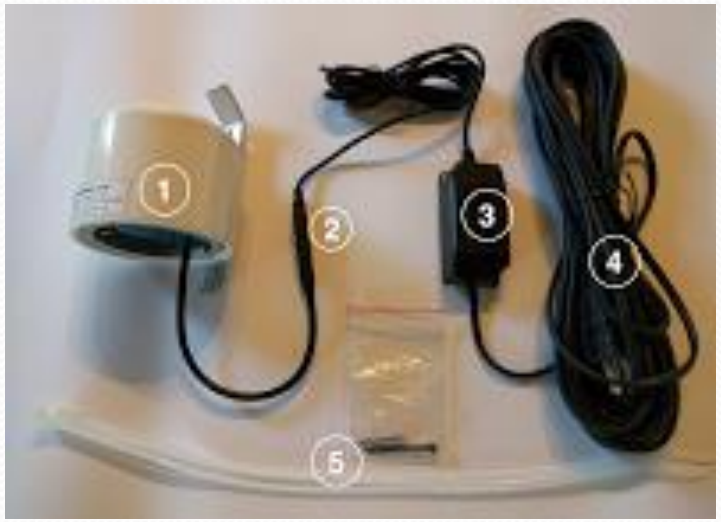


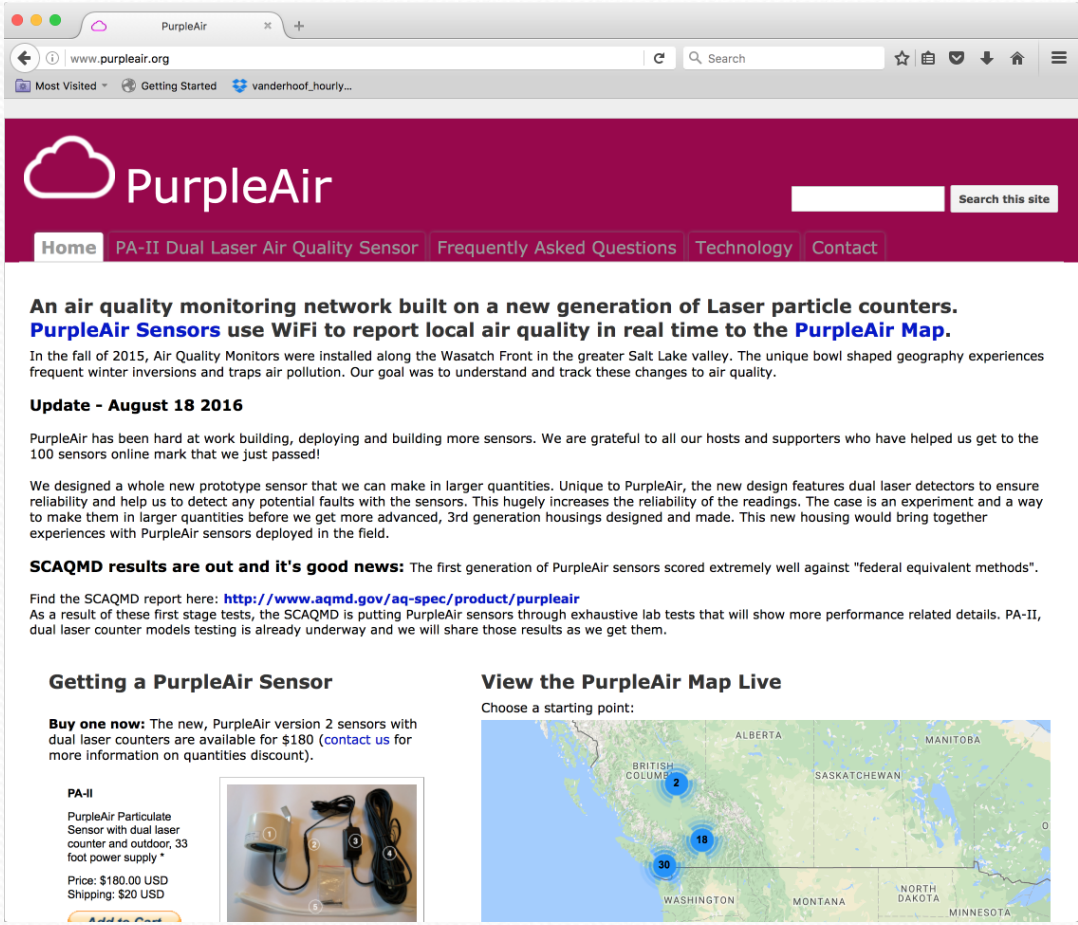
Updated - Solid Fuel Burning Domestic Appliance Regulation (SFBDAR)

- See bcairquality.ca for detailed FAQ.
- Ensures that solid fuel burning appliances sold in BC are the cleanest they can be – new appliance emissions down to 4.5 g/h by March 2017 and 2.5 g/h by 2020
- Closes loopholes for some appliance that were previously excluded
- Phases out non-certified outdoor boilers and provides setbacks for new installations

Purple Air Sensor Testing

PurpleAir – http://www.purpleair.org/





Summary

- SO_2, NO_2 and O_3 remain below Provincial and National ambient air quality objective levels
- $PM_{2.5}$ levels continue to indicate generally good AQ in summer and degraded AQ during cold months due to meteorology and additional emission sources
- Improvement in annual average PM2.5 in Duncan; still some short-term exceedances of the AAQO; New Georgia Hts station above AQO; Deykin below AQO
- Lake Cowichan and Shawnigan similar patterns to Duncan with open burning impacts more prevalent in Shawnigan; Ladysmith similar to Duncan
- Need to improve $PM_{2.5}$ levels by managing wood smoke/combustion sources in Airshed and through continuous improvement at permitted facilities

Extra Slides

AQ Data Collection

- Analyzers maintained by MOE & Permittee AQ technicians
  - Continuous measurements; polled hourly and undergoes validation checks by technical staff in Region and in Victoria before being placed in central database
  - Used to issue Air Quality Advisories; compliance with Objectives and standards; regulatory purposes; public reports
- Raw data posted to bcairquality.ca for near real-time access by the public

$PM_{2.5}$ Annual Data Summary – Duncan Cairnsmore

Year	Annual Average	Annual 98th Percentile of daily values	Max daily value	# of Daily values > 25 ug/m3	% of time > 25 ug/m3
2010	9.2 ug/m3	25.1 ug/m3	43.3 ug/m3	6	1.7
2011	10.7 ug/m3	30.8 ug/m3	46.2 ug/m3	21	5.8
2012	8.5 ug/m3	29.4 ug/m3	38.8 ug/m3	9	2.9
2013	8.6 ug/m3	32.4 ug/m3	41.7 ug/m3	19	5.3
2014	7.7 ug/m3	31.6 ug/m3	37.3 ug/m3	19	5.3
2015	7.6 ug/m3	23.9 ug/m3	46.8 ug/m3	5	1.9

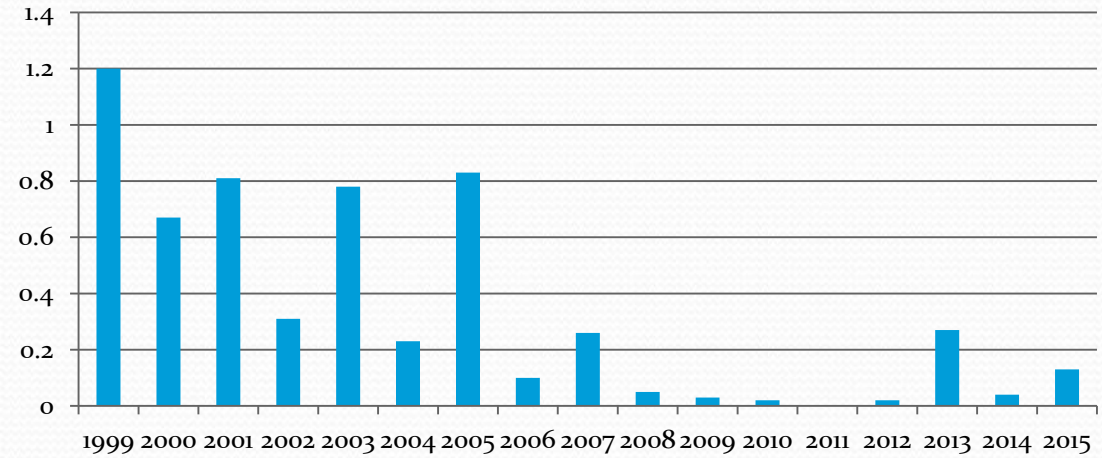
Provincial Air Quality Objectives for $PM_{2.5}$:

- 8 ug/m3 – Annual
- 25 ug/m3 – Applies to Daily average and to 98th percentile Daily average annually

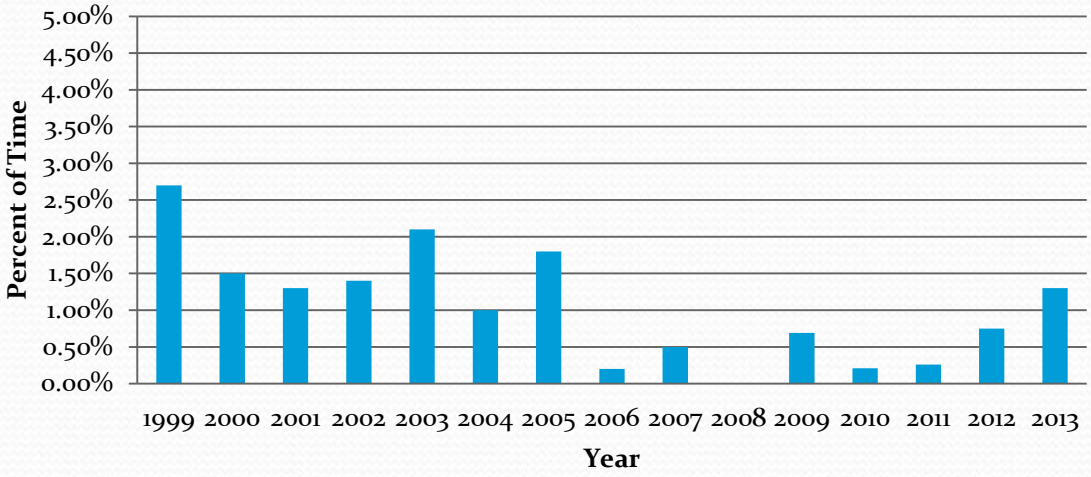
Total Reduced Sulphur -TRS

- TRS includes hydrogen sulphide, mercaptans, dimethyl sulphide, dimethyl disulphide and other sulphur compounds
- Rotten eggs or cabbage smell
- Sources in Cowichan Valley include pulp mill emissions, sewage treatment facilities, swamps, bogs and marshes

Percent of Time Hourly TRS Values are Greater Than Provincial Level A at Deykin Avenue 1999-2015



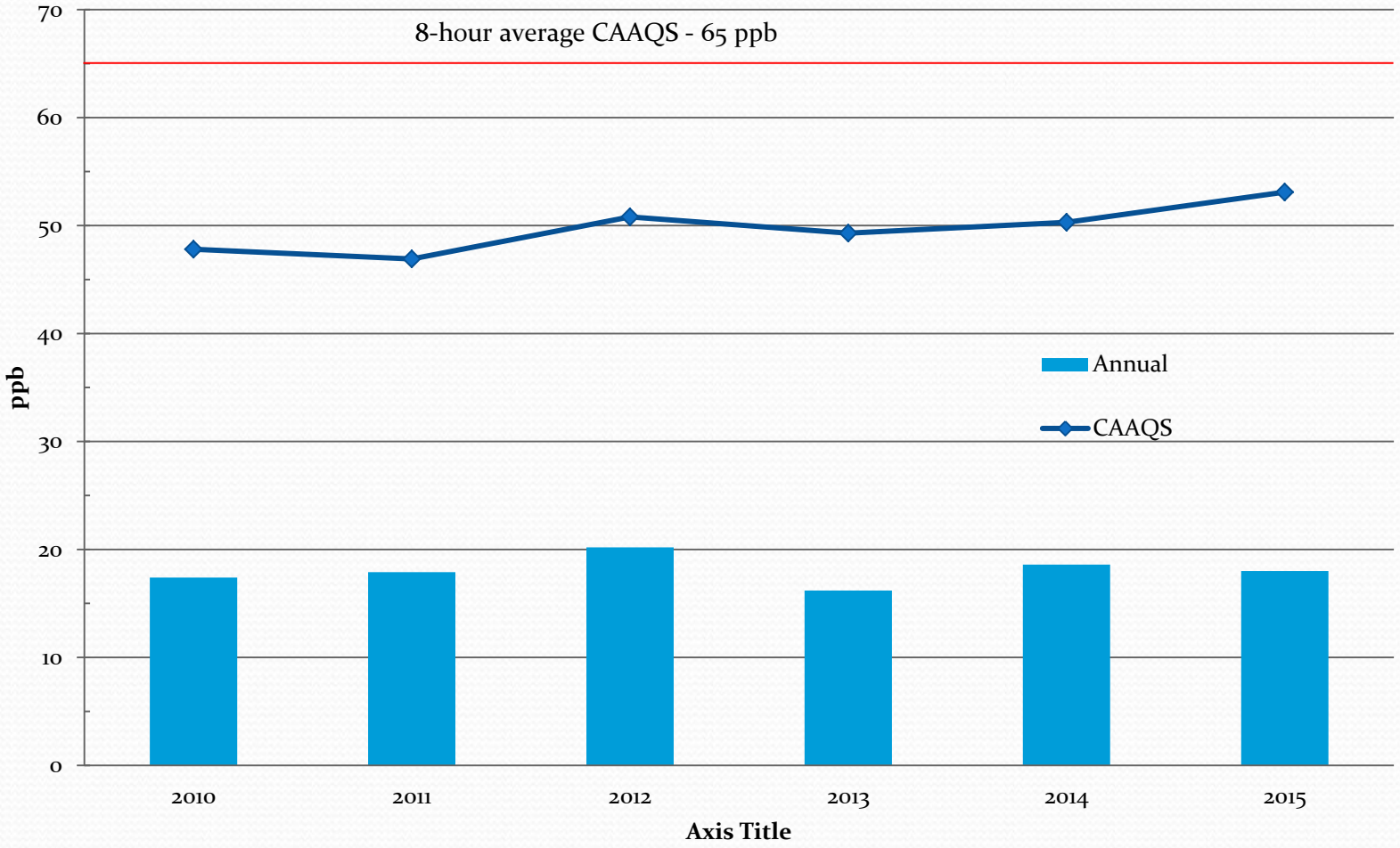
Percent of Time that Hourly TRS Values Above Provincial Level A Objective at Crofton South 1999-2013

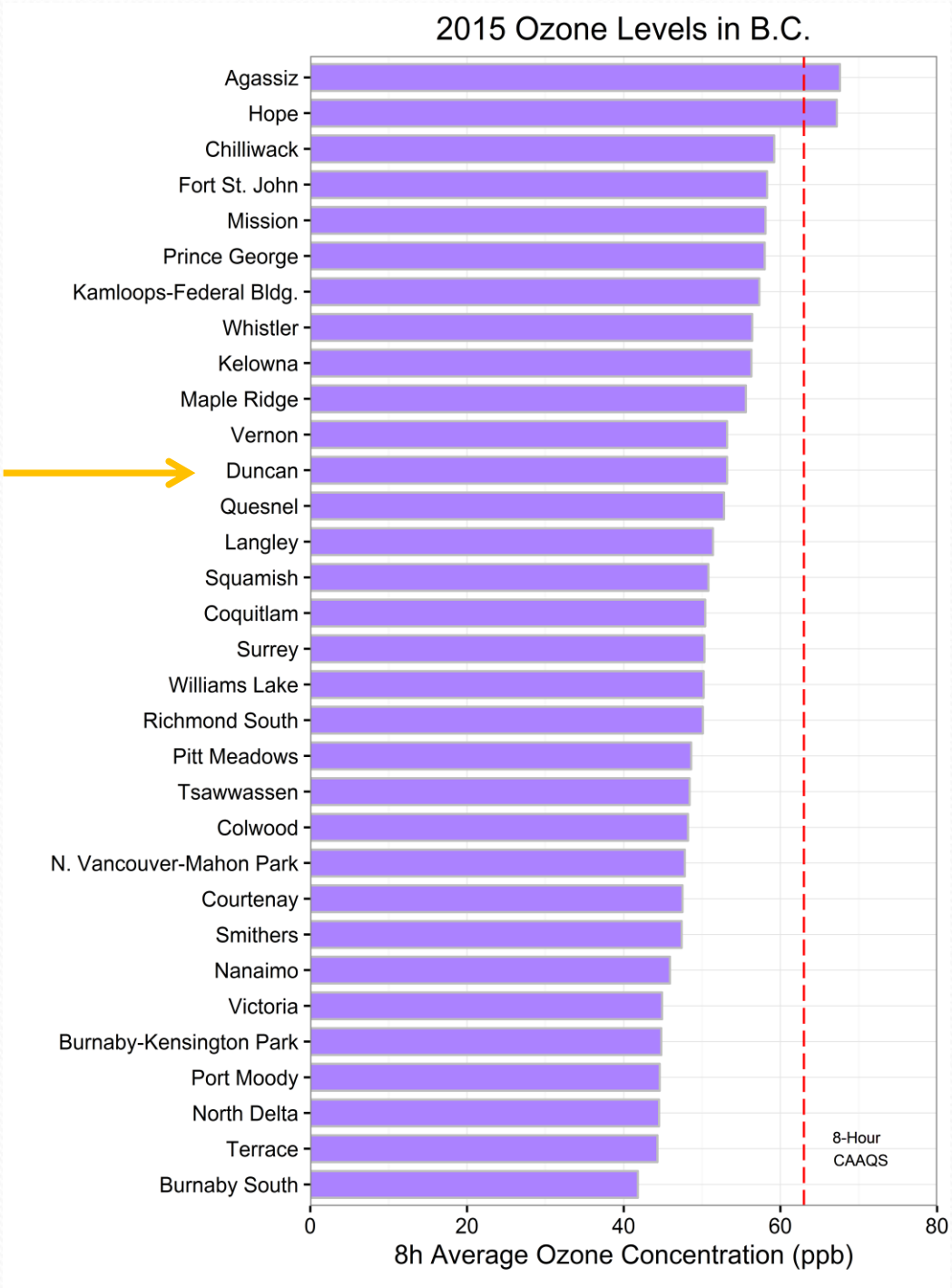


Ground Level Ozone

- O_3 is a major component of urban smog.
- Ground-level ozone is not emitted directly into the atmosphere. It results from photochemical reactions between oxides of nitrogen (NO_x) and volatile organic compounds (VOCs) in the presence of sunlight and warm temperatures. Highest levels typically occur from May to September, between noon and early evening.
- Health effects (respiratory tract and eyes), vegetation damage, visibility (smog)

Annual Average and 8-hour (CAAQS) O_3 at Duncan Cairnsmore 2010-2015





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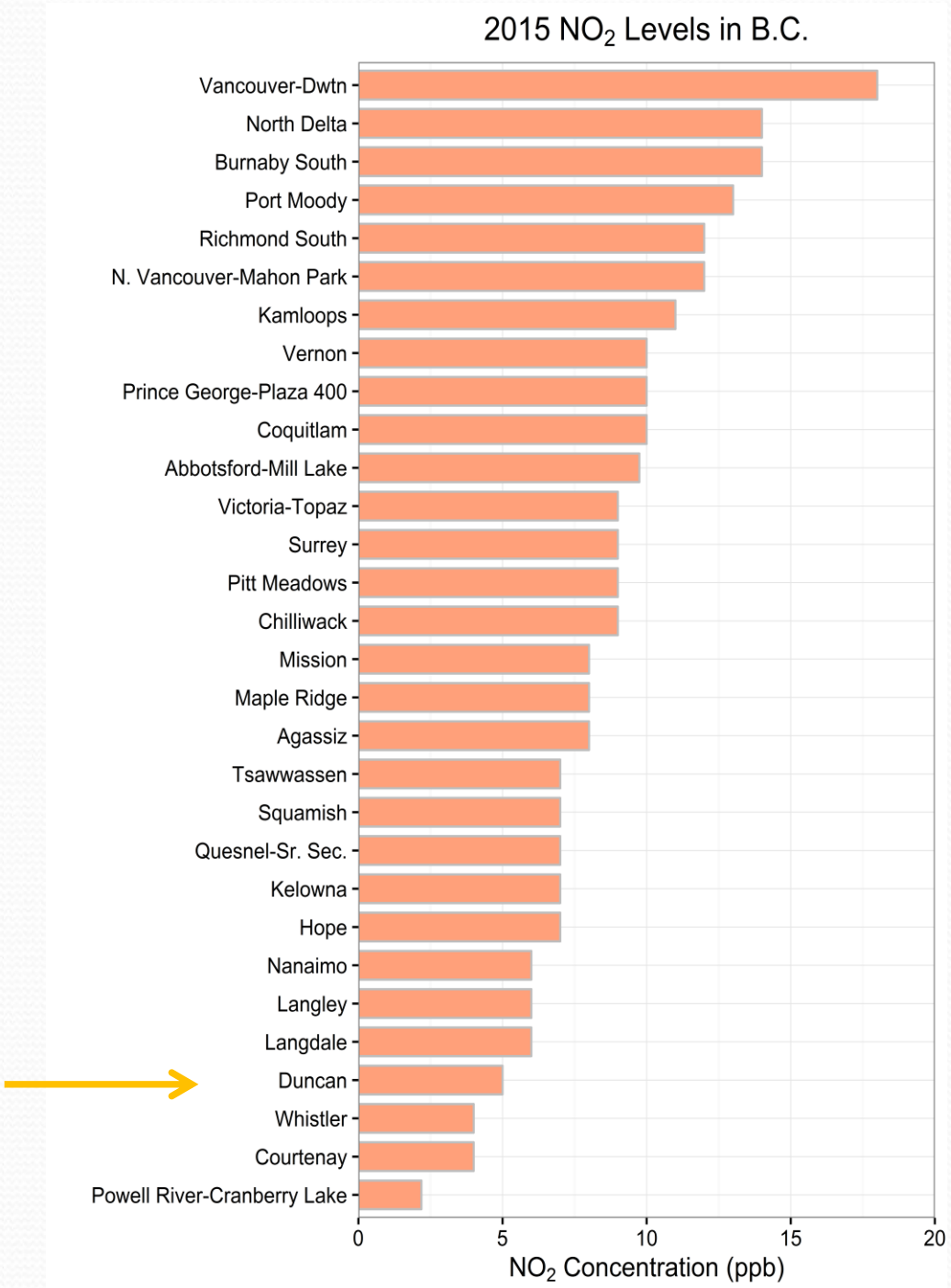
Nitrogen Dioxide – NO_2

- NO_2 plays a major role in atmospheric reactions that produce ground-level ozone, a major component of smog. Also a precursor to nitrates, which contribute to increased fine particle levels in the atmosphere.
- Sources – any kind of combustion in air; industry, mobile sources, wood burning, etc.
- Health effects (respiratory), vegetation effects, O_3 formation, acidification, secondary fine particle production

Annual and 98th Percentile of daily 1-Hour Maximum 2010-2015



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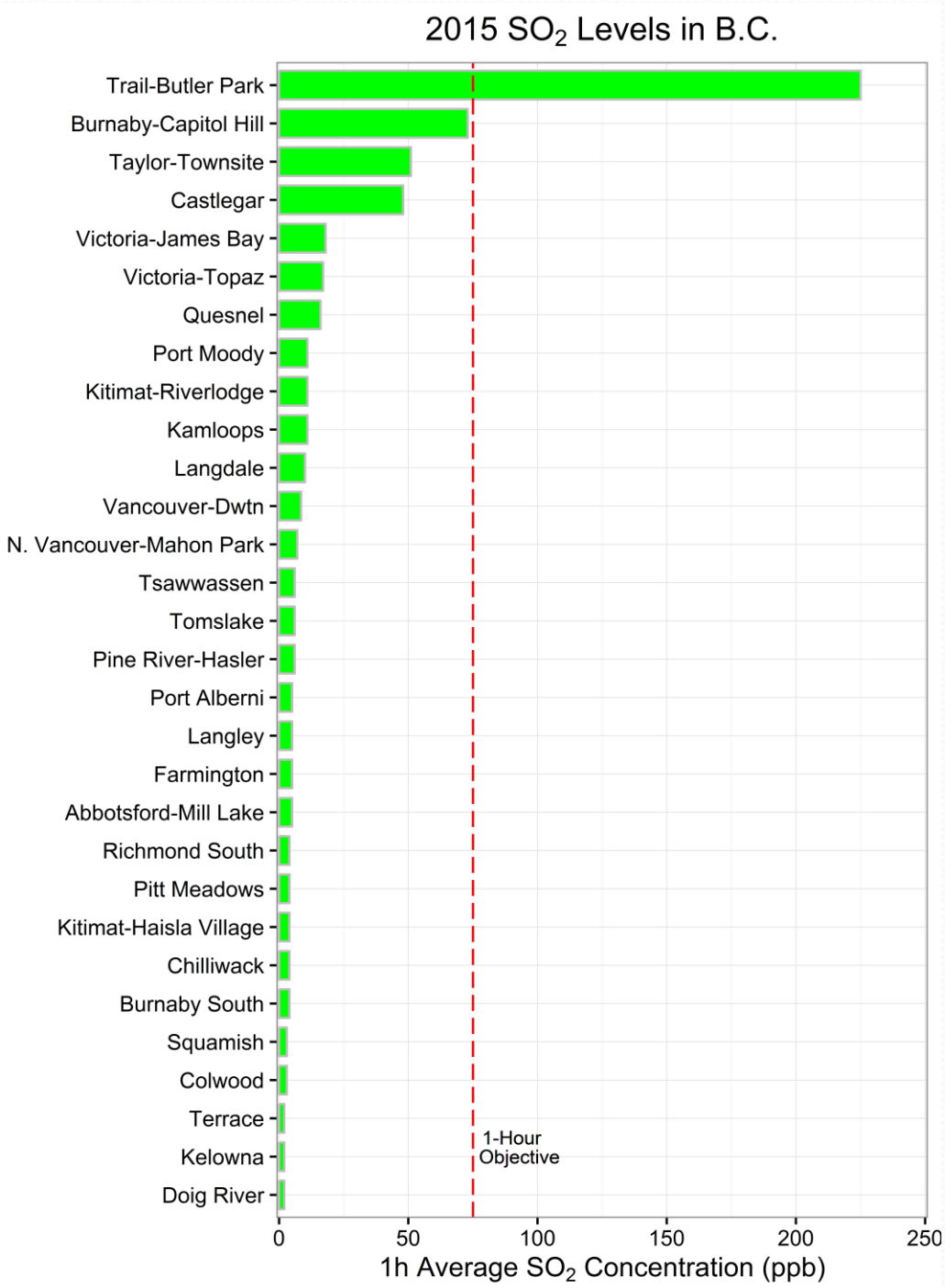
Sulphur Dioxide

- Sulphur dioxide (SO_2) is a colourless gas with a pungent odour (like burnt matches) at higher concentrations.
- Sources – pulp mill, combustion of fossil fuels containing sulphur.
- High levels - health effects (respiratory), vegetation damage, acidification, fine particulate formation, visibility degradation.
- Results - No exceedances of Provincial or National Objectives at any monitoring location.

Crofton Georgia Hts 2015 99th percentile of daily 1-hour max – 50.5 ppb



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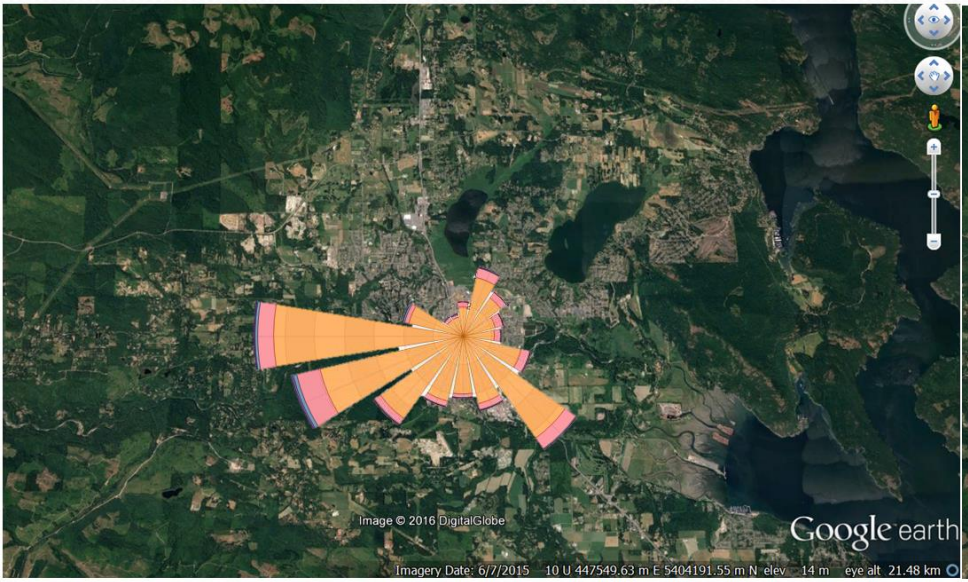
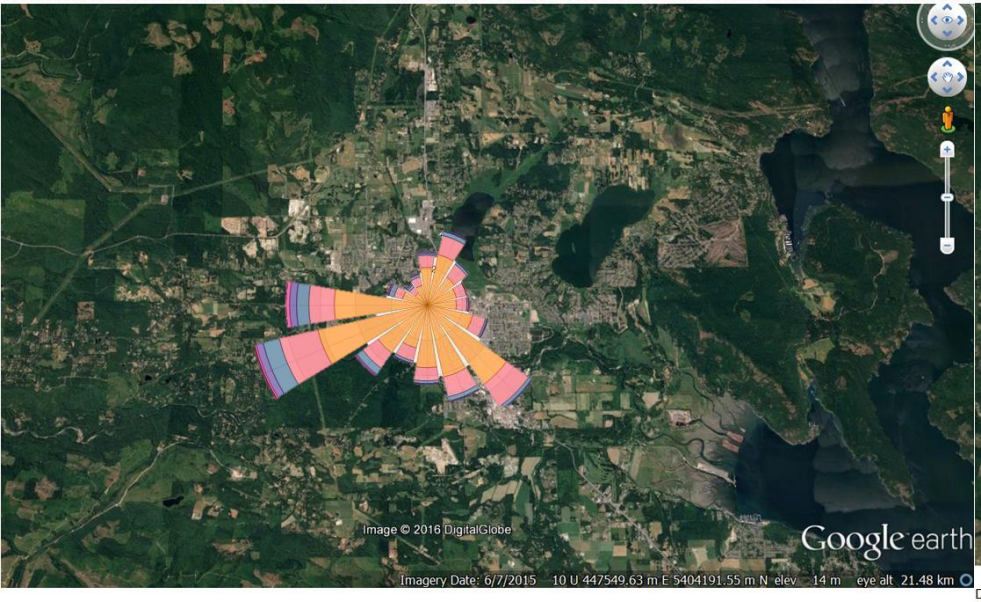
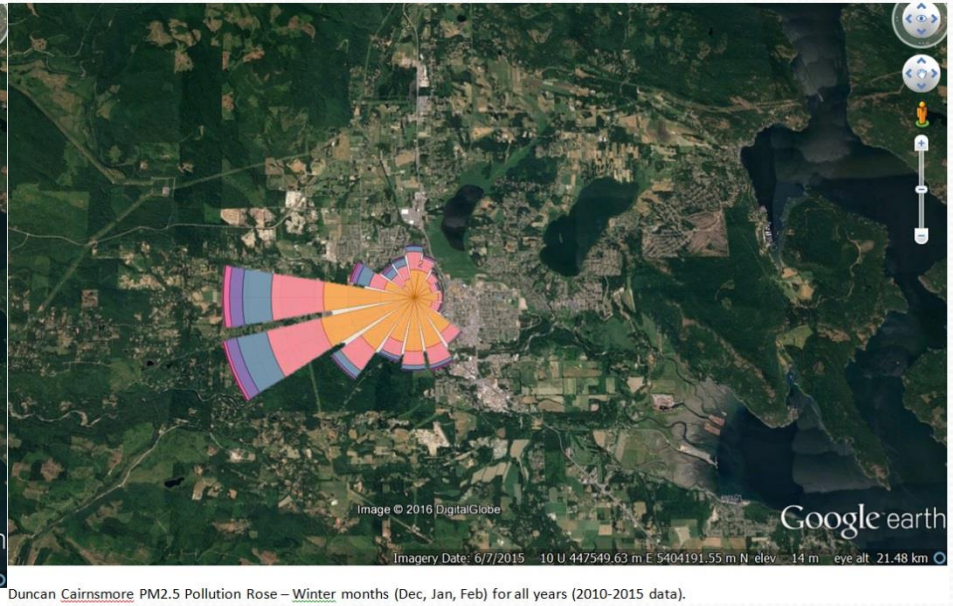


Duncan Cairnsmore PM2.5 Pollution Rose – Spring months (Mar, Apr, May) for all years (2010-2015 data).

Duncan Cairnsmore PM2.5 Pollution Rose – Summer months (Jun, Jul, Aug) for all years (2010-2015 data).

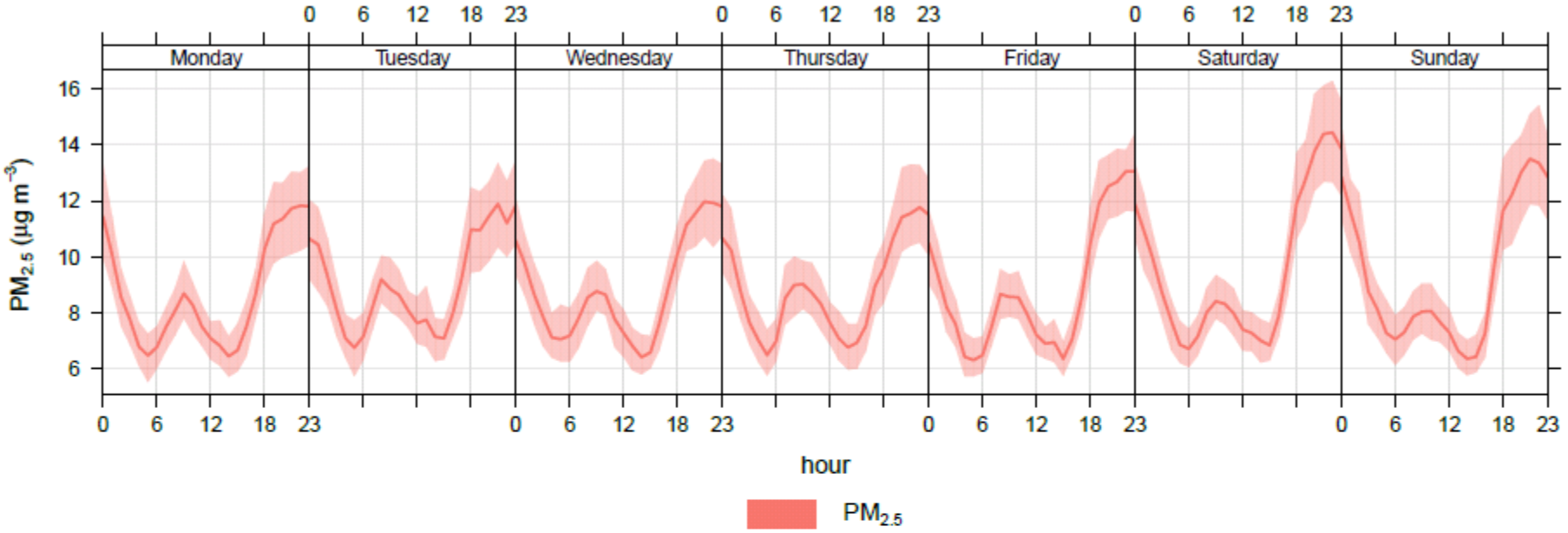


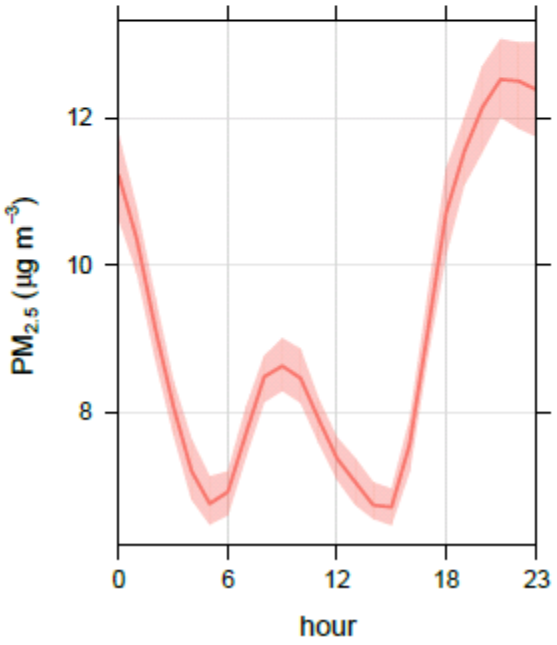
Duncan Cairnsmore PM2.5 Pollution Rose – Fall months (Sep, Oct, Nov) for all years (2010-2015 data).

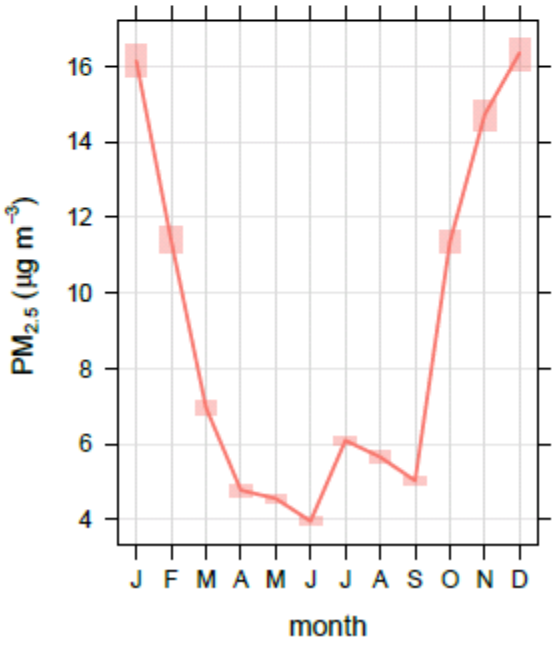


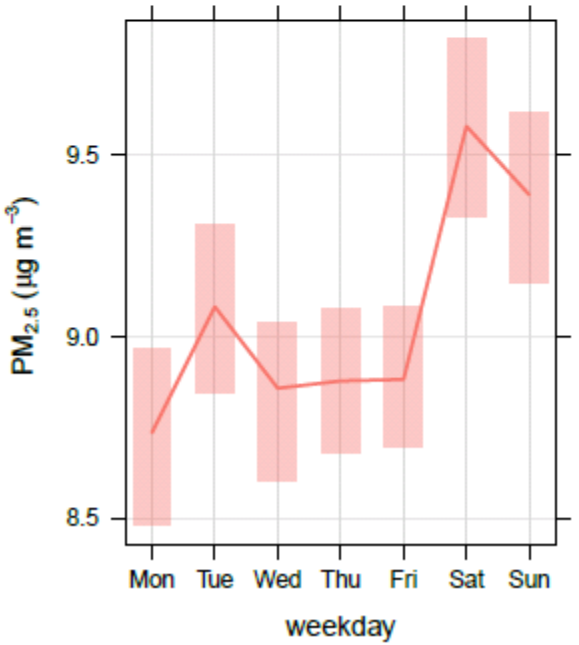
Duncan Cairnsmore PM2.5 Pollution Rose – Winter months (Dec, Jan, Feb) for all years (2010-2015 data).

Duncan Cairnsmore 2014



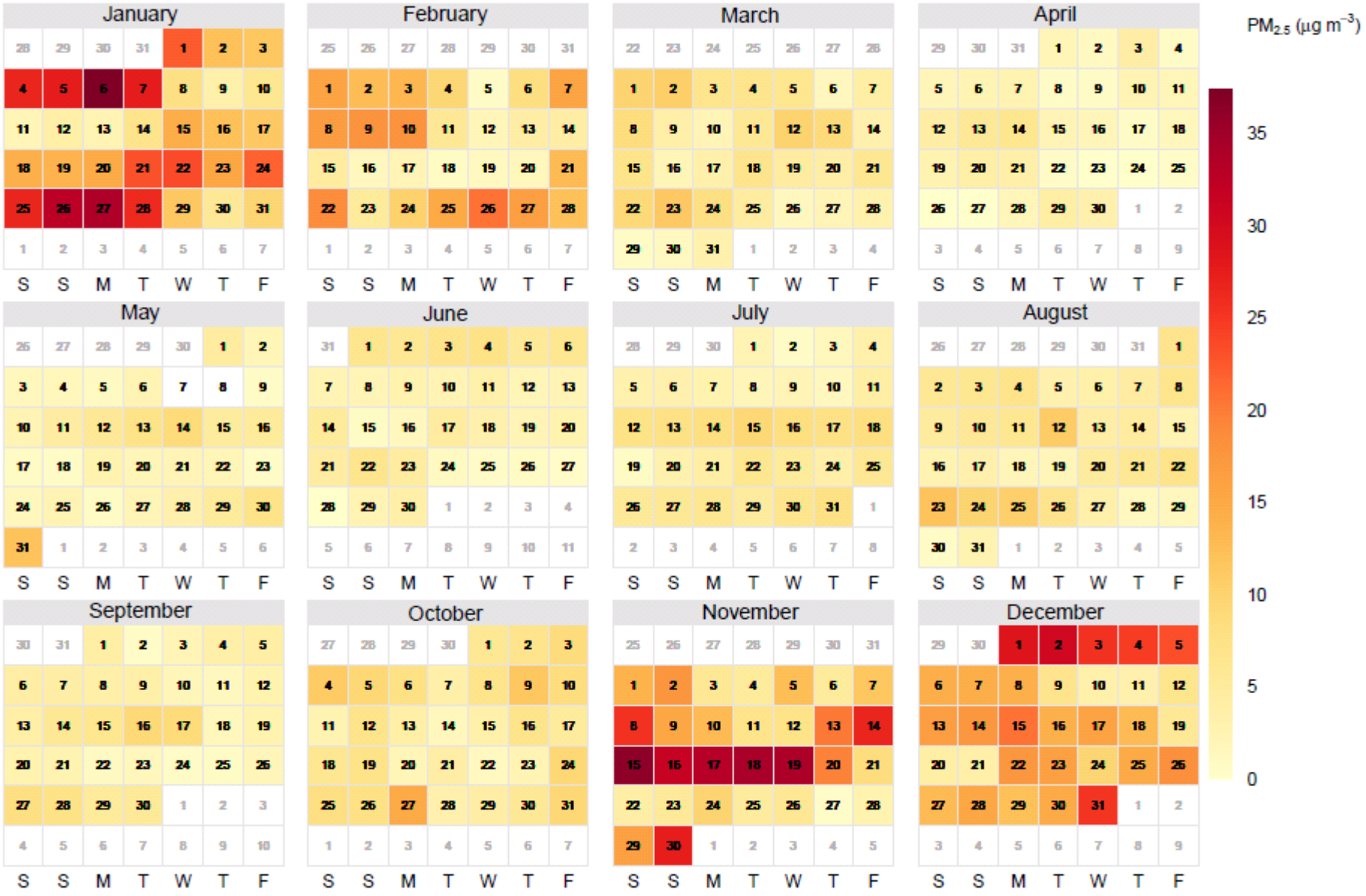




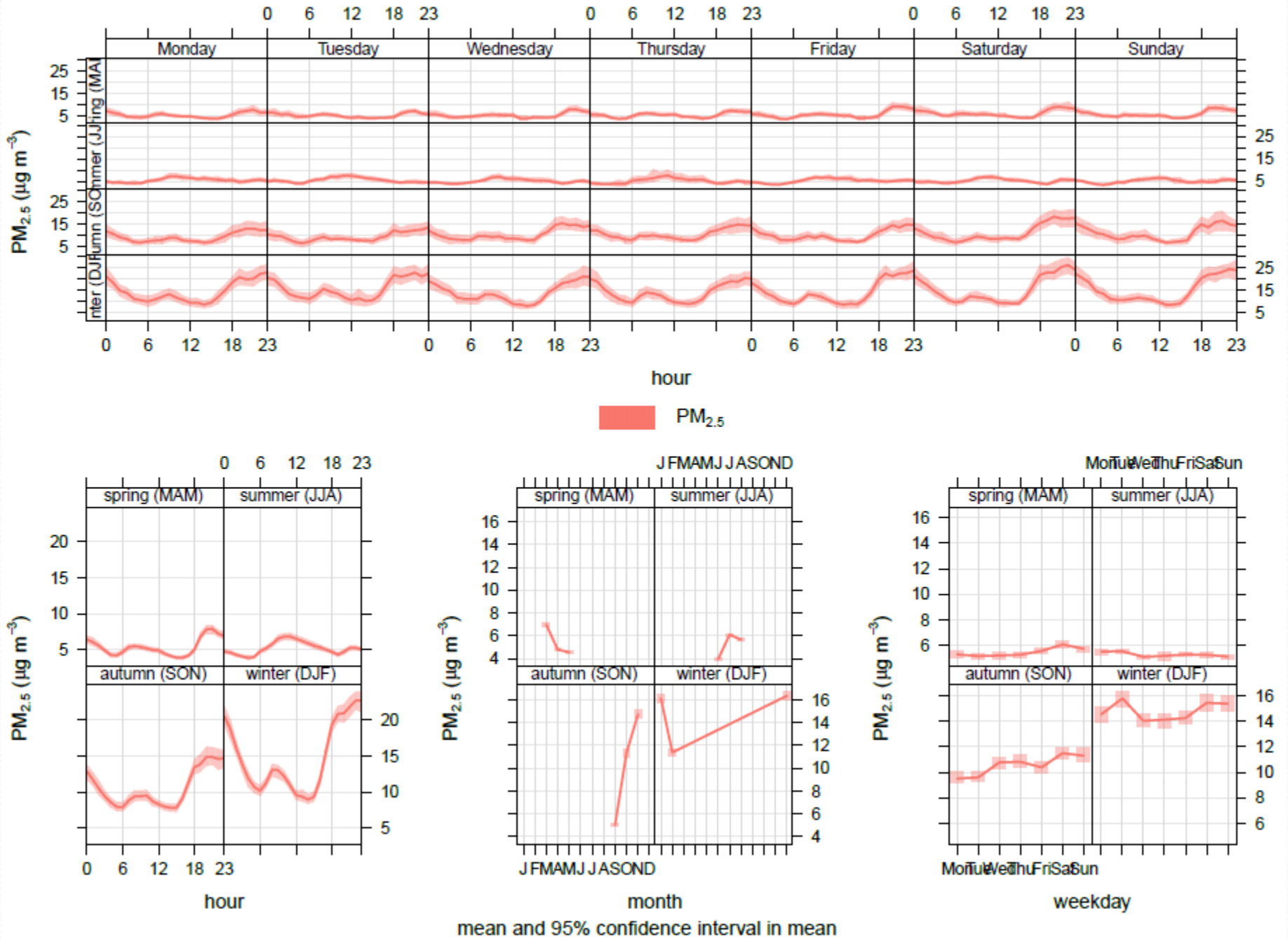


mean and 95% confidence interval in mean

Duncan Cairnsmore 2014



Duncan Cairnsmore 2014



Duncan Cairnsmore 2014