Air

Status of Ground-Level Ozone in B.C. (2015-2017)

British Columbia operates a network of air monitoring stations that measure ground-level ozone and other air pollutants. This indicator reports on the concentration of ground-level ozone from 2015-2017 and compares it to the Canadian Ambient Air Quality Standard established by the Canadian Council of Ministers of the Environment.

- **Ground-level ozone is an air pollutant.** While ozone in the Earth's atmosphere occurs naturally, additional ozone at the ground level is a pollutant. It forms through chemical reactions involving nitrogen oxides and volatile organic compounds in the presence of sunlight.
- **Ground-level ozone can be harmful to humans.** Exposure to ground-level ozone (hereafter ozone) can reduce lung function and cause inflammation of airways, which can increase respiratory symptoms and aggravate asthma[1]. These effects are linked to more emergency room visits, hospitalizations, and absenteeism, and higher health care costs[2].
- **Ozone levels met the Canadian Ambient Air Quality Standard at 42 of 43 B.C. ozone monitoring stations.** Ozone levels (see box below) from the 43 stations ranged from 34 to 64 parts per billion (ppb). Ozone levels were ≤50 ppb at 25 reporting stations (58%). One station reported ozone levels >63 ppb.
- **Ozone levels met the Canadian Ambient Air Quality Standard in five of B.C.'s seven air zones.** The ozone level for an air zone is the highest ozone level reported from monitoring stations within the air zone. Currently, there are no air monitoring stations in the Northwest Air Zone.
- **Ozone levels are used to set management levels for each air zone.** Four management levels (green, yellow, orange, and red) are each associated with a suite of actions that become more rigorous as ozone levels approach the Canadian Ambient Air Quality Standard.

Ground-Level Ozone: Canadian Ambient Air Quality Standard

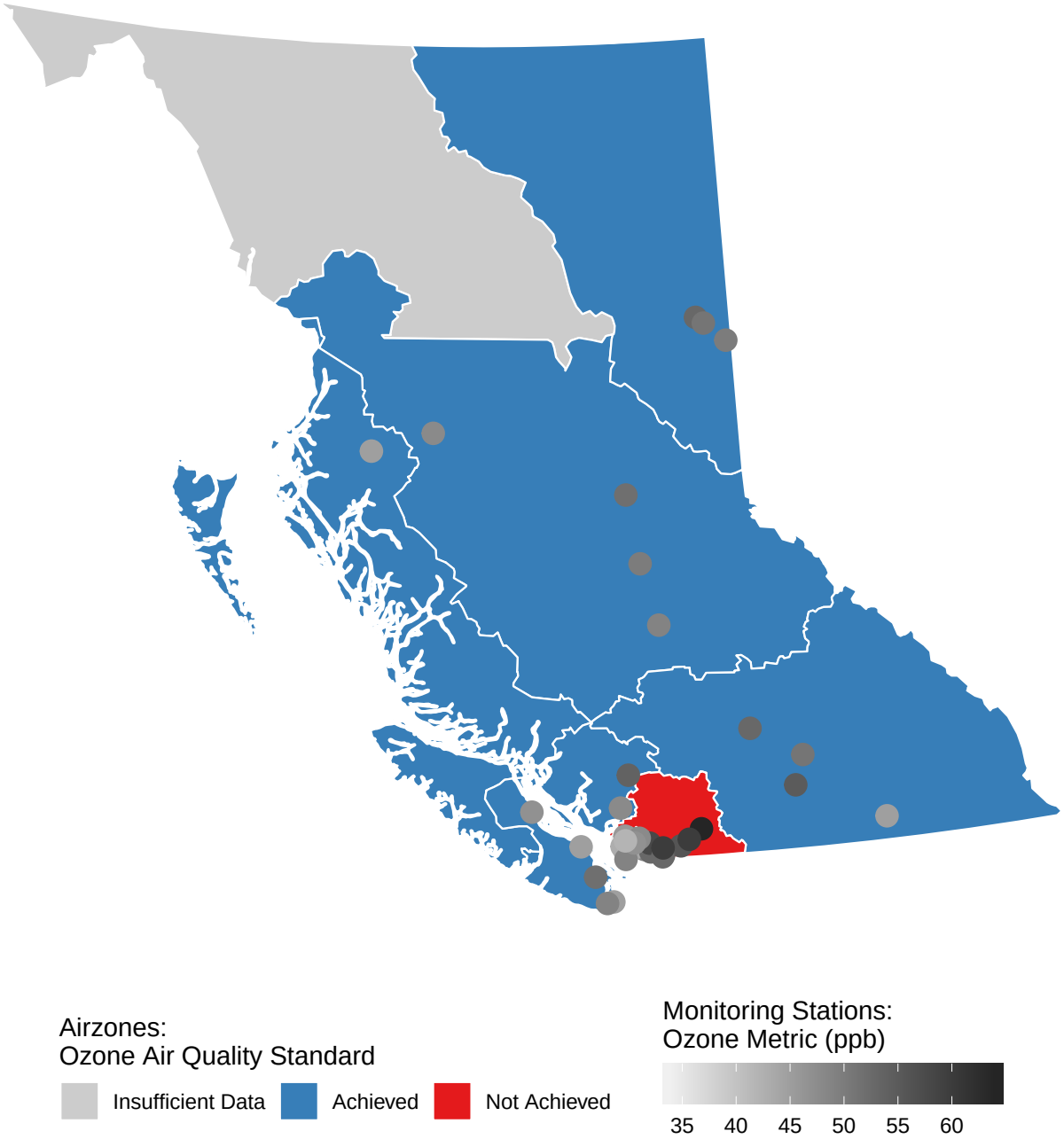
Ozone levels are calculated using a statistical form called the ozone metric.
The Canadian Ambient Air Quality Standard value for ozone is **63 parts per billion (ppb)**.
The ozone standard is achieved when ozone levels are ≤63 ppb.

What is an Air Zone?

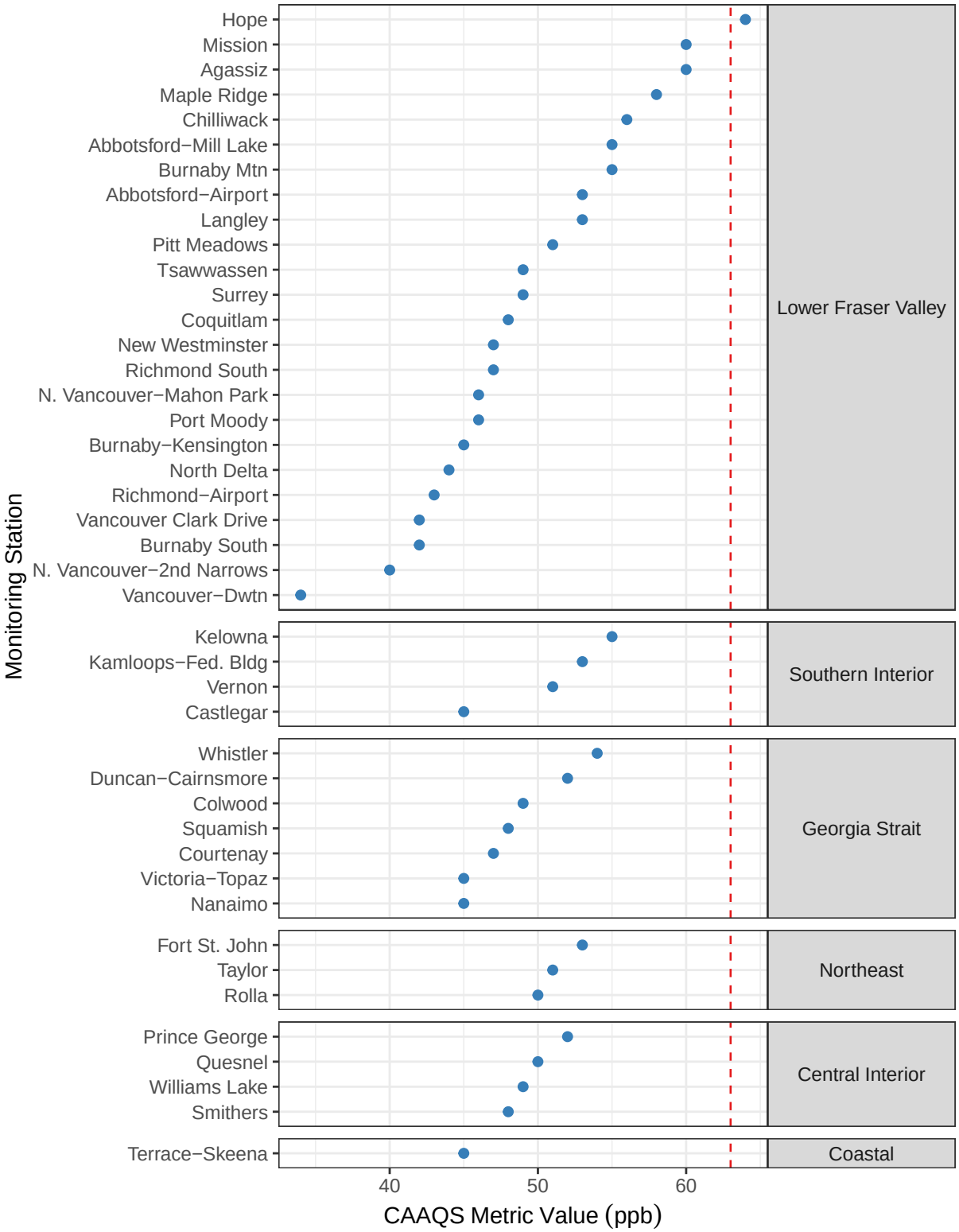
British Columbia is divided up into seven air zones, which are areas that typically exhibit similar air quality characteristics, issues, and trends.

The map and chart below summarise Canadian Ambient Air Quality Standard achievement status for ozone in B.C. air zones, as well as ozone levels at individual monitoring stations. Summaries are given for each monitoring station where sufficient data was available for the 2015-2017 reporting period.

Status of Ground-Level Ozone Levels in B.C. Air Zones (2015-2017)



Ozone Metrics for Air Monitoring Stations within B.C. Air Zones (2015-2017)



More about the Canadian Ambient Air Quality Standard ozone metric:

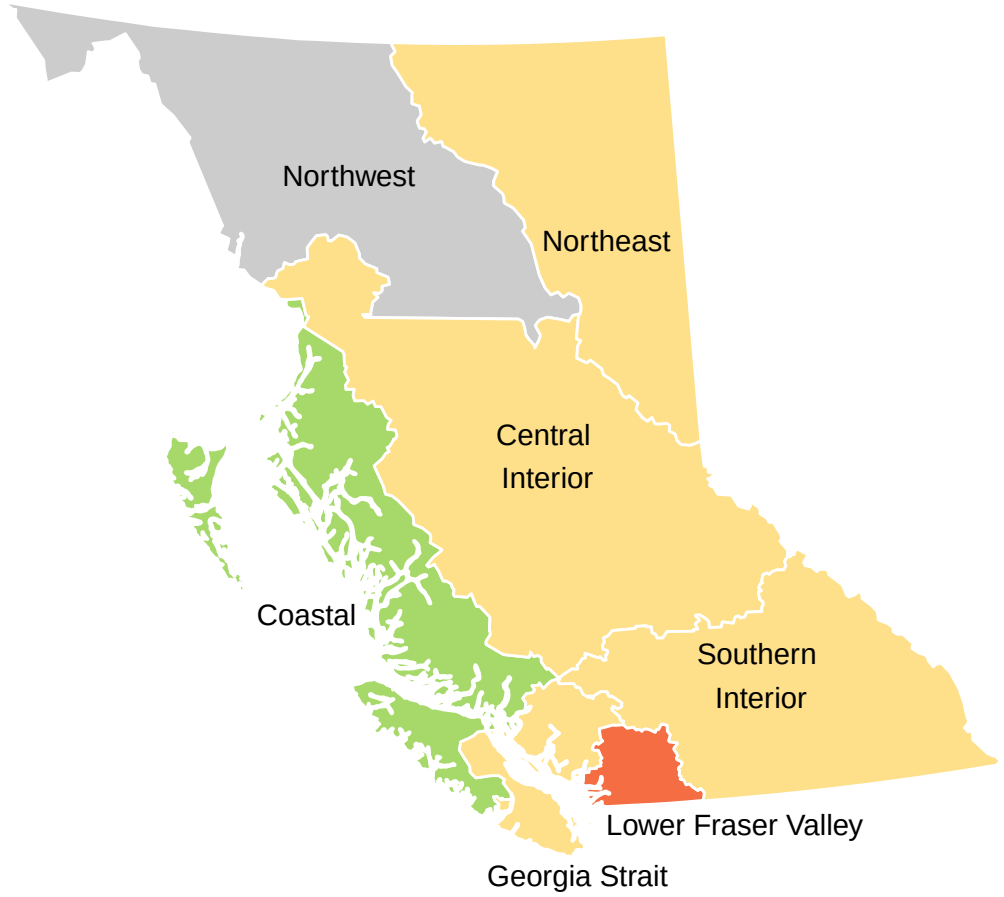
- The statistical form of the Canadian Ambient Air Quality Standard ozone metric is the 3-year average of the annual 4th-highest daily maximum 8-hour rolling average concentration.
- The ozone metric for an air zone is the highest ozone metric reported from monitoring stations within the air zone. Air zone metrics are only taken from stations reporting on two years of data when there are no available three year reporting stations in the air zone.
- Only air monitoring stations with sufficient data on ozone concentrations for the 2015-2017 reporting period were included in this indicator. Visit Current Air Quality Data for a complete list of air monitoring stations across B.C.
- Data completeness and sufficiency criteria for the ozone metric value are described in the Guidance Document on Achievement Determination: Canadian Ambient Air Quality Standards for Fine Particulate Matter and Ozone (2012).

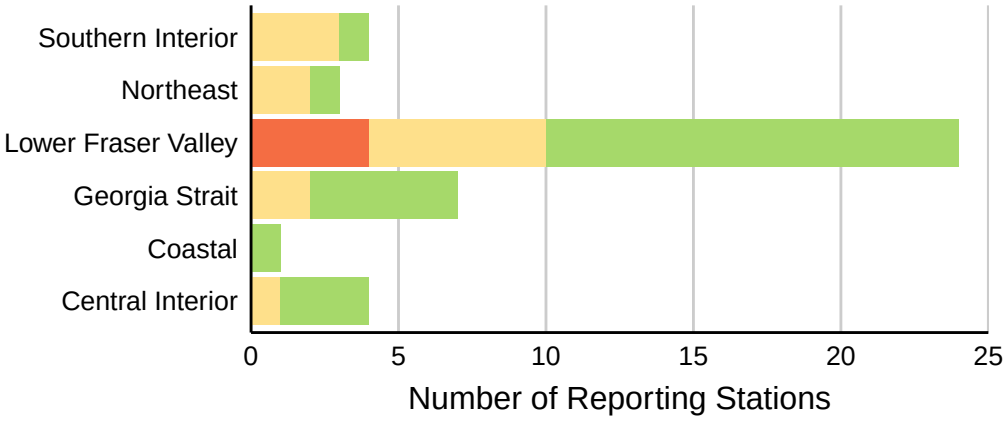
Canada-wide Air Quality Management System

The Air Quality Management System is Canada's approach for protecting air quality. Under the Air Quality Management System, provinces and territories monitor, report and manage local air quality within air zones, with the goal of continuously improving air quality and keeping pollutants below the Canadian Ambient Air Quality Standards.

- There are seven air zones in British Columbia: Coastal, Georgia Strait, Lower Fraser Valley, Southern Interior, Central Interior, Northeast and Northwest.
- The Air Zone Management Framework defines management levels based on the highest ozone level reported from monitoring stations within the air zone. The four management levels are (1) green (actions for keeping clean areas clean); (2) yellow (actions for preventing air quality deterioration); (3) orange (actions for preventing Canadian Ambient Air Quality Standard exceedance); and (4) red (actions for achieving air zone Canadian Ambient Air Quality Standard). Actions for each management level are detailed in the Guidance Document on Air Zone Management (2012).
- The Coastal air zone was assigned to a green management level, the Northeast, Central Interior, Southern Interior and Georgia Strait air zones were assigned to a yellow management level, and the Lower Fraser Valley was assigned to an orange management level. Currently, there are no air monitoring stations in the Northwest air zone.

Management Levels for Ground-Level Ozone in B.C. Air Zones (2015-2017)





Air Zone Management Levels

- Actions for Achieving Air Zone CAAQS
- Actions for Preventing CAAQS Exceedance
- Actions for Preventing Air Quality Deterioration
- Actions for Keeping Clean Areas Clean

More about the Air Quality Management System management levels:

- There can be cases when an air zone does not achieve a given Canadian Ambient Air Quality Standard because of sources over which jurisdictions have little or no control, such as those related to transboundary flows and exceptional events, like forest fires.
- Prior to determining management levels, jurisdictions have the option of adjusting their air zone metric values to remove such external influences. These arrangements aim to ensure that jurisdictions are responsible for managing only the emissions sources they can control.
- Eight days were flagged as exceptional events as a result of suspected wildfire influence at two monitoring stations in B.C. for the 2015-2017 reporting period (Agassiz and Hope). The daily concentrations for these days were removed from the calculations of management levels, resulting in a change from red to orange for the Lower Fraser Valley management level for ground-level ozone.

Methods

The methods used to develop this indicator—including procedures, data requirements, and calculation of the Canadian Ambient Air Quality Standard ozone metric—are detailed in the Guidance Document on Achievement Determination: Canadian Ambient Air Quality Standards for Fine Particulate Matter and Ozone (2012) published by the Canadian Council of Ministers of the Environment.

R package and code: We have developed an R package to facilitate the calculation of air quality metrics according to the Canadian Ambient Air Quality Standards. Download the 'rcaaqs' package from GitHub. The source code for repeating the analysis presented on this page is also available on GitHub.

References and Other Useful Links

Read individual Air Zone reports on the achievement of the Canadian Ambient Air Quality Standards for ground-level ozone and fine particulate matter in B.C.

Learn more about the implementation of the Air Quality Management System in British Columbia

Access B.C.'s real-time data on air pollutants and find locations of all provincial air monitoring stations in B.C.

BC Lung Asssociation's BC State of the Air Reports

Canadian Environmental Sustainability Indicators: Air and Climate Indicators

[1]United States Environmental Protection Agency. February 2013. Integrated Science Assessment of Ozone and Related Photochemical Oxidants (600/R-10/076F)

[2]Willey, J., N. Gilbert, and N. Lyrette. 2004. Human health effects of ozone: Update in support of the Canada-wide standards for particulate matter and ozone. Revised version. Working paper prepared for Canadian Council of Ministers of the Environment. Health Canada. Ottawa, Ontario: Health Canada

Data

*By accessing these datasets, you agree to the licence associated with each file, as indicated in parentheses below.

- Indicator Summary Data: BC Ground-Level Ozone Canadian Ambient Air Quality Standards 2015-2017 (Licence: Open Government Licence - British Columbia)

- B.C. Ground-level Ozone Hourly Data & Air Monitoring Station Locations (Licence: Open Government Licence - British Columbia)
- B.C. Air Zones (Licence: Open Government Licence - British Columbia)

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Email correspondence to: envreportbc@gov.bc.ca

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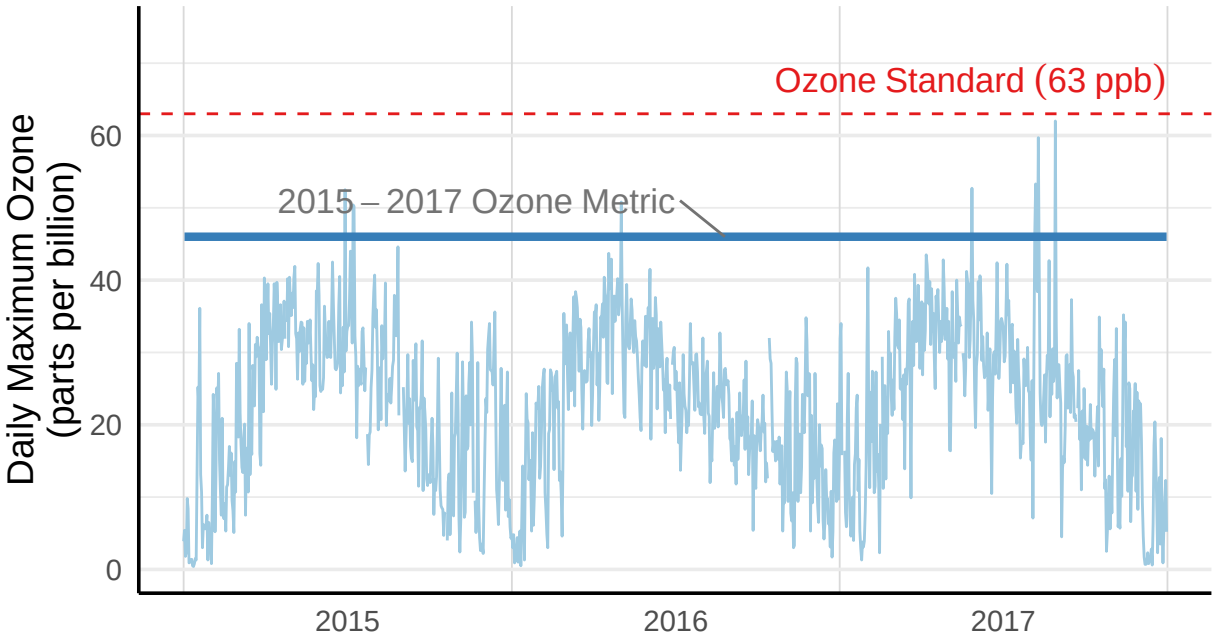
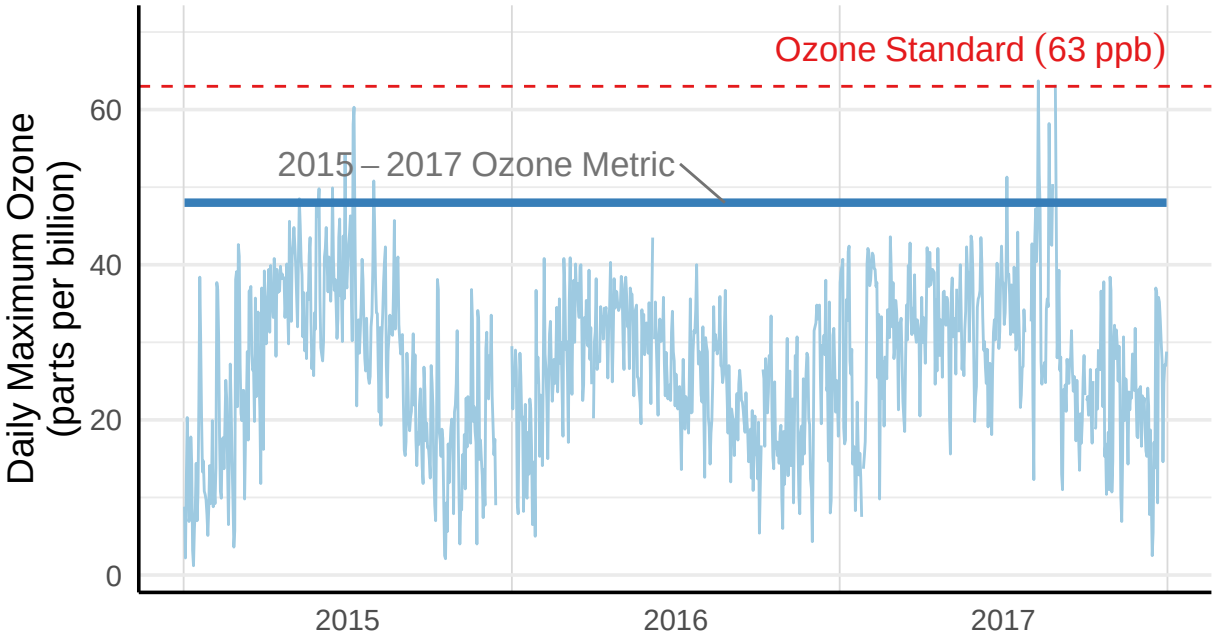
Appendix: Detailed Ground-Level Ozone Canadian Ambient Air Quality Standard Results for Monitoring Stations within Air Zones in B.C. (2015-2017)

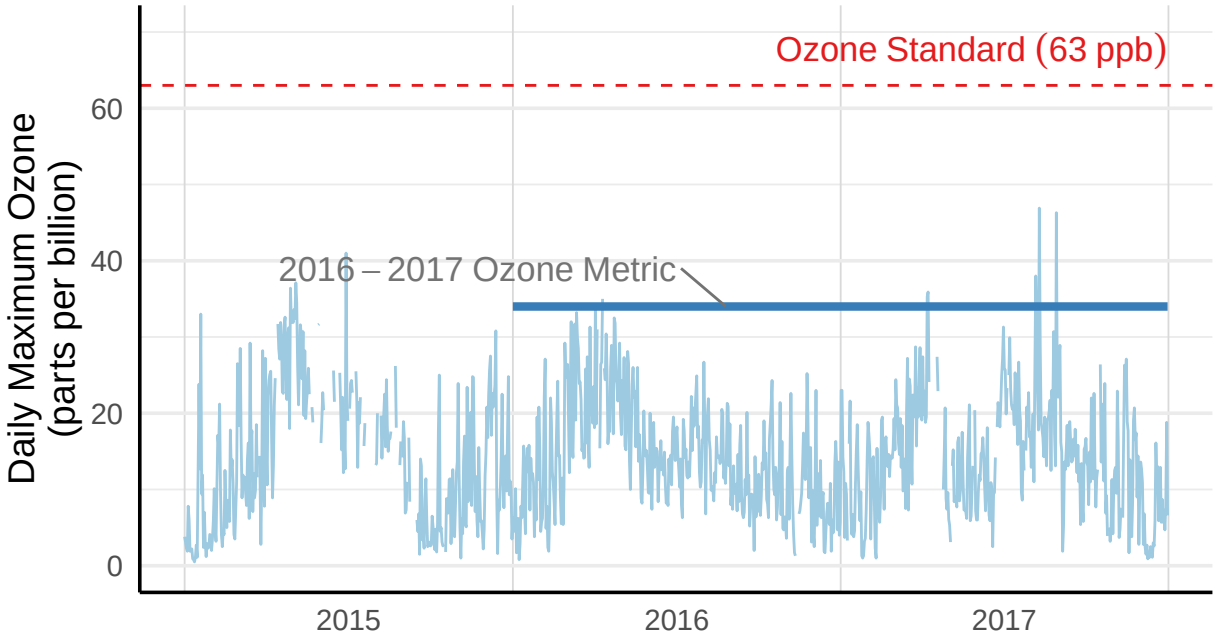
Air Zone: Lower Fraser Valley
Monitoring Station: Port Moody
Ozone Air Quality Standard: Achieved
Ozone Metric: 46 ppb (3 year average)



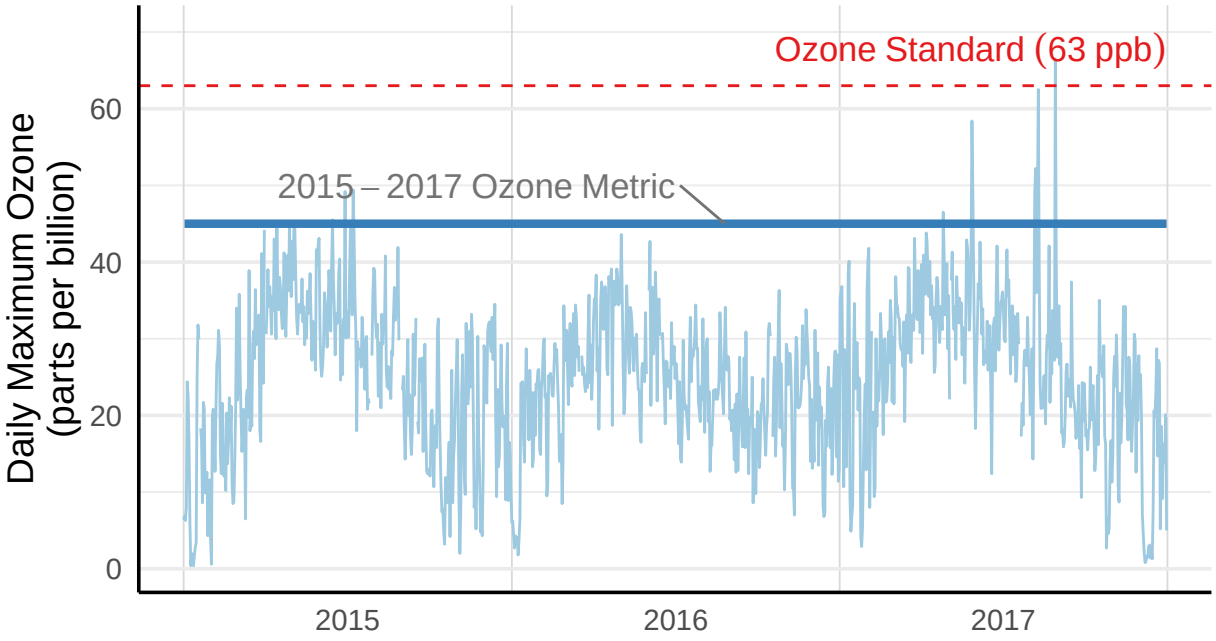
Air Zone: Georgia Strait
Monitoring Station: Squamish
Ozone Air Quality Standard: Achieved
Ozone Metric: 48 ppb (3 year average)



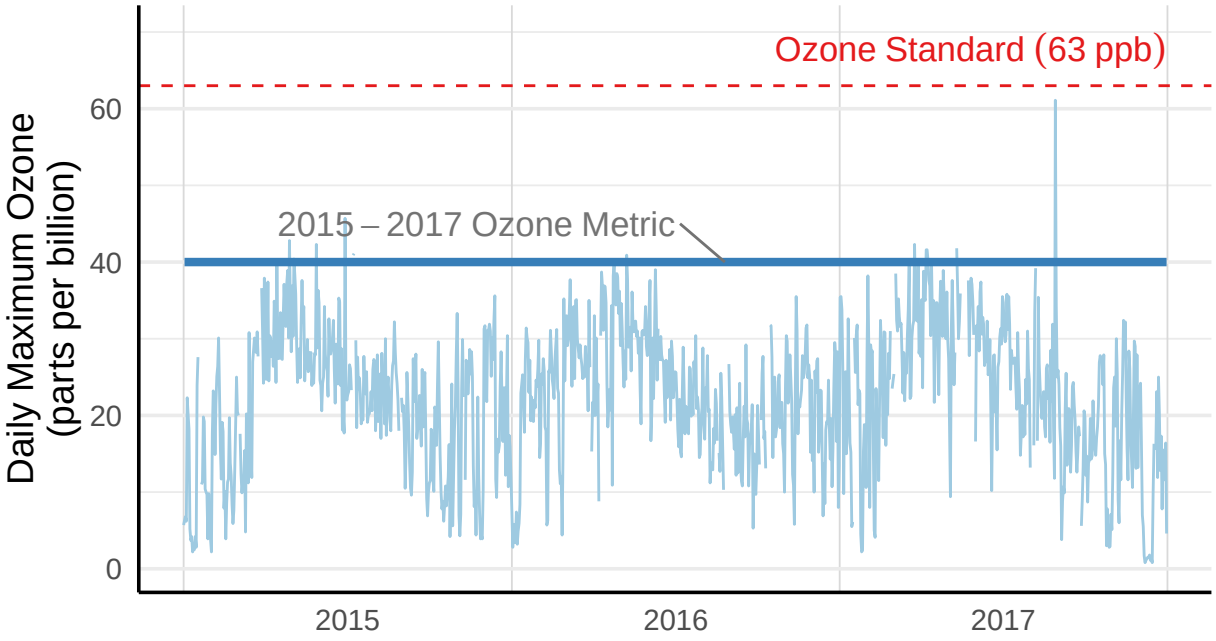
Air Zone: Lower Fraser Valley
Monitoring Station: Vancouver-Dwtn
Ozone Air Quality Standard: Achieved
Ozone Metric: 34 ppb (2 year average)



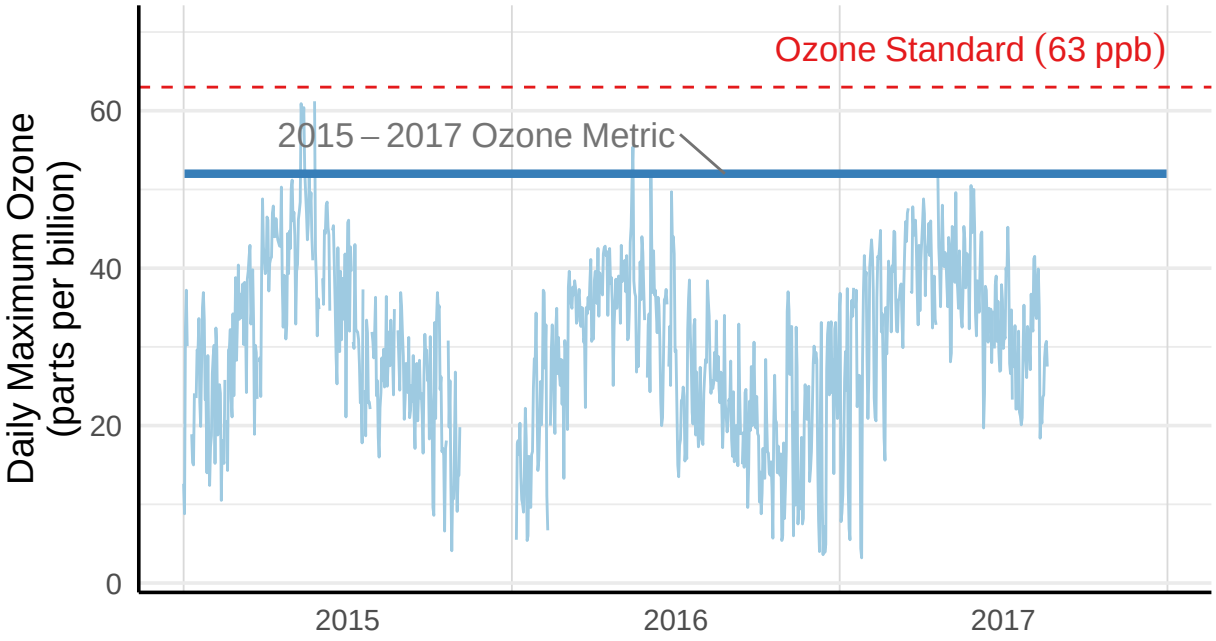
Air Zone: Lower Fraser Valley
Monitoring Station: Burnaby-Kensington
Ozone Air Quality Standard: Achieved
Ozone Metric: 45 ppb (3 year average)



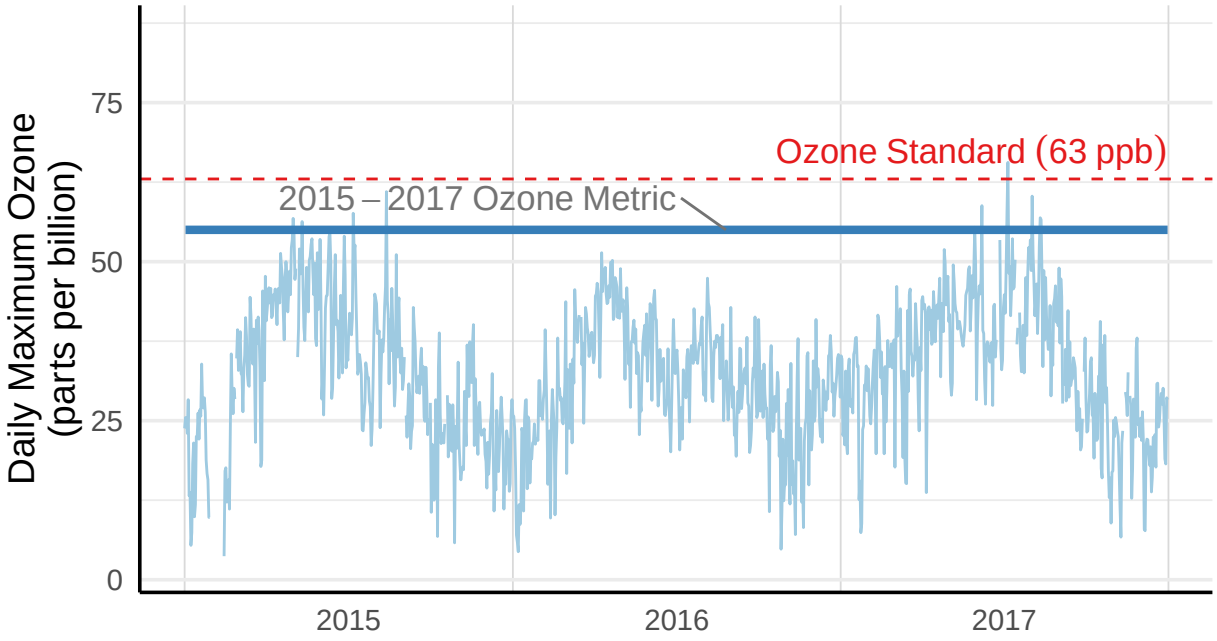
Air Zone: Lower Fraser Valley
Monitoring Station: N. Vancouver-2nd Narrows
Ozone Air Quality Standard: Achieved
Ozone Metric: 40 ppb (3 year average)



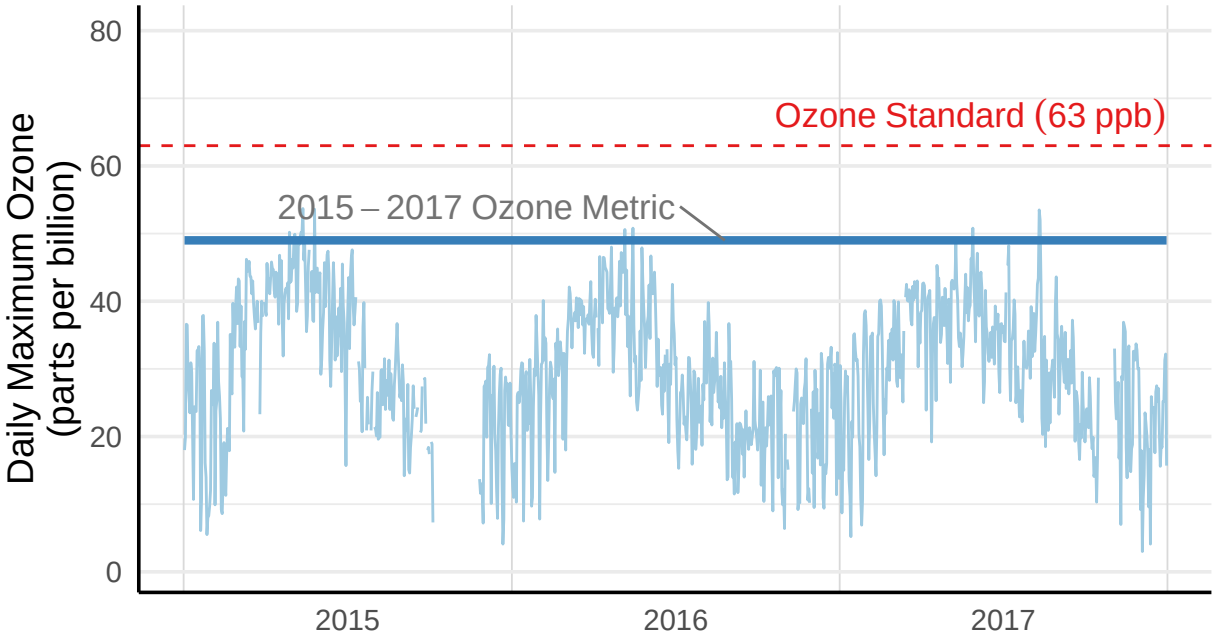
Air Zone: Central Interior
Monitoring Station: Prince George
Ozone Air Quality Standard: Achieved
Ozone Metric: 52 ppb (3 year average)



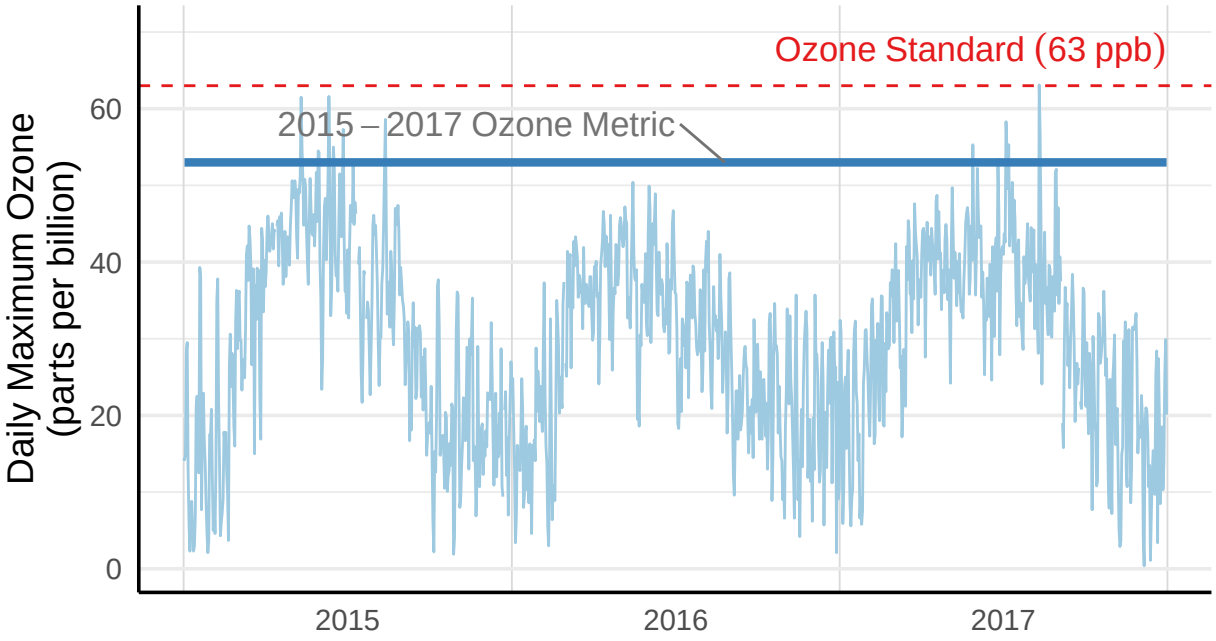
Air Zone: Southern Interior
Monitoring Station: Kelowna
Ozone Air Quality Standard: Achieved
Ozone Metric: 55 ppb (3 year average)



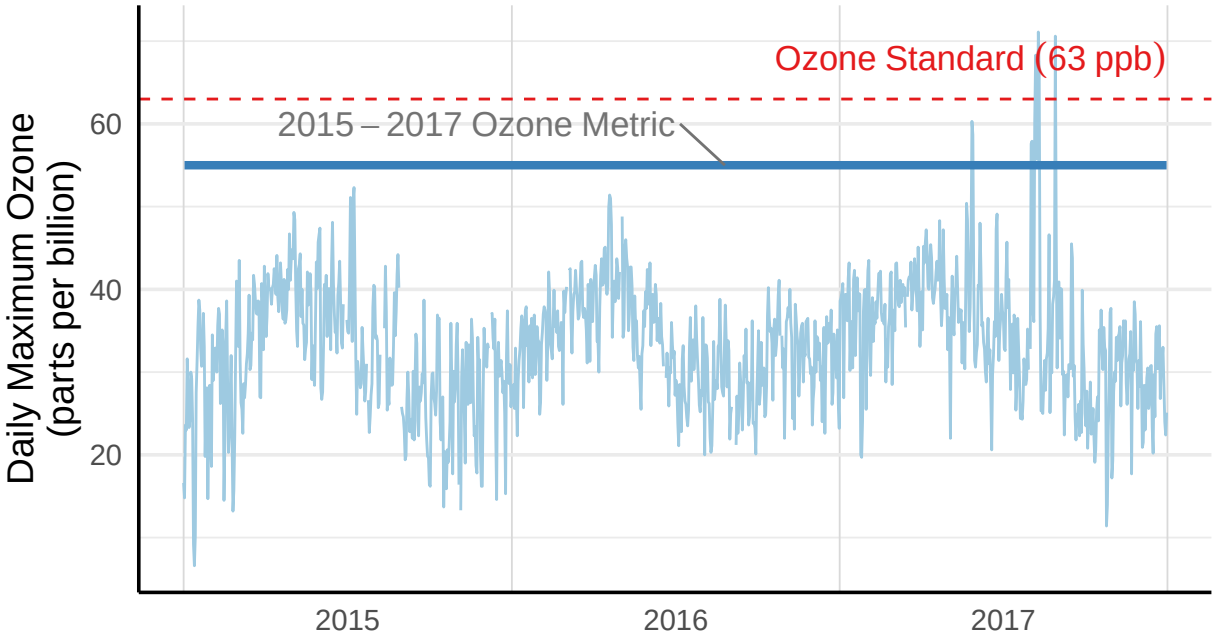
Air Zone: Central Interior
Monitoring Station: Williams Lake
Ozone Air Quality Standard: Achieved
Ozone Metric: 49 ppb (3 year average)



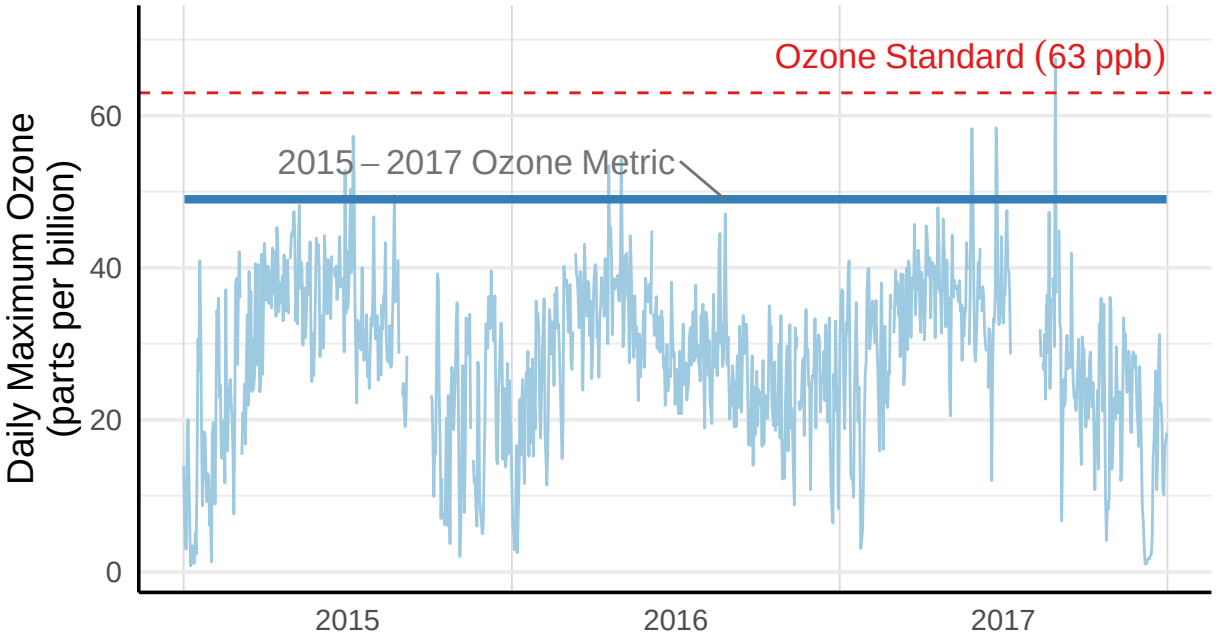
Air Zone: Southern Interior
Monitoring Station: Kamloops-Fed. Bldg
Ozone Air Quality Standard: Achieved
Ozone Metric: 53 ppb (3 year average)



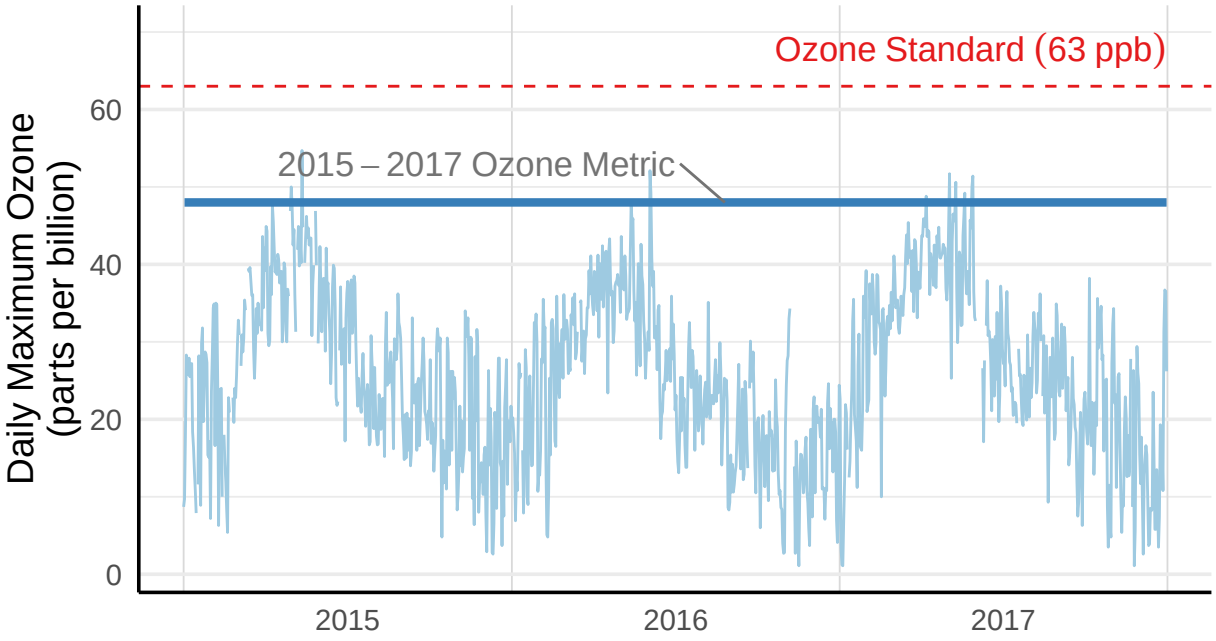
Air Zone: Lower Fraser Valley
Monitoring Station: Burnaby Mtn
Ozone Air Quality Standard: Achieved
Ozone Metric: 55 ppb (3 year average)



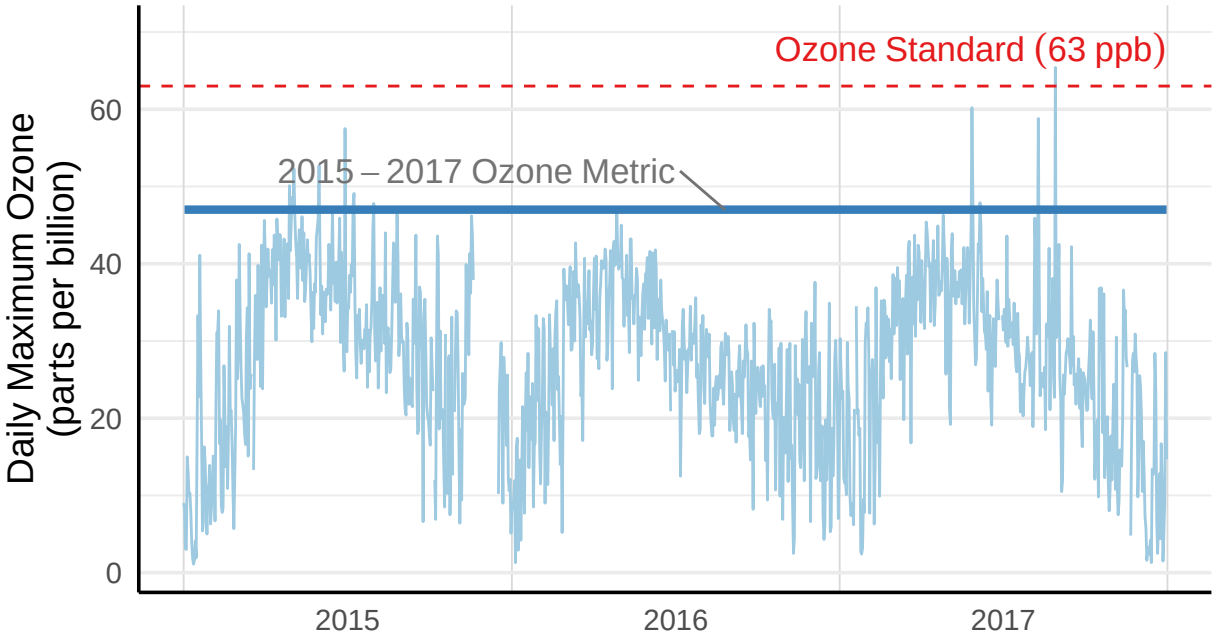
Air Zone: Lower Fraser Valley
Monitoring Station: Surrey
Ozone Air Quality Standard: Achieved
Ozone Metric: 49 ppb (3 year average)



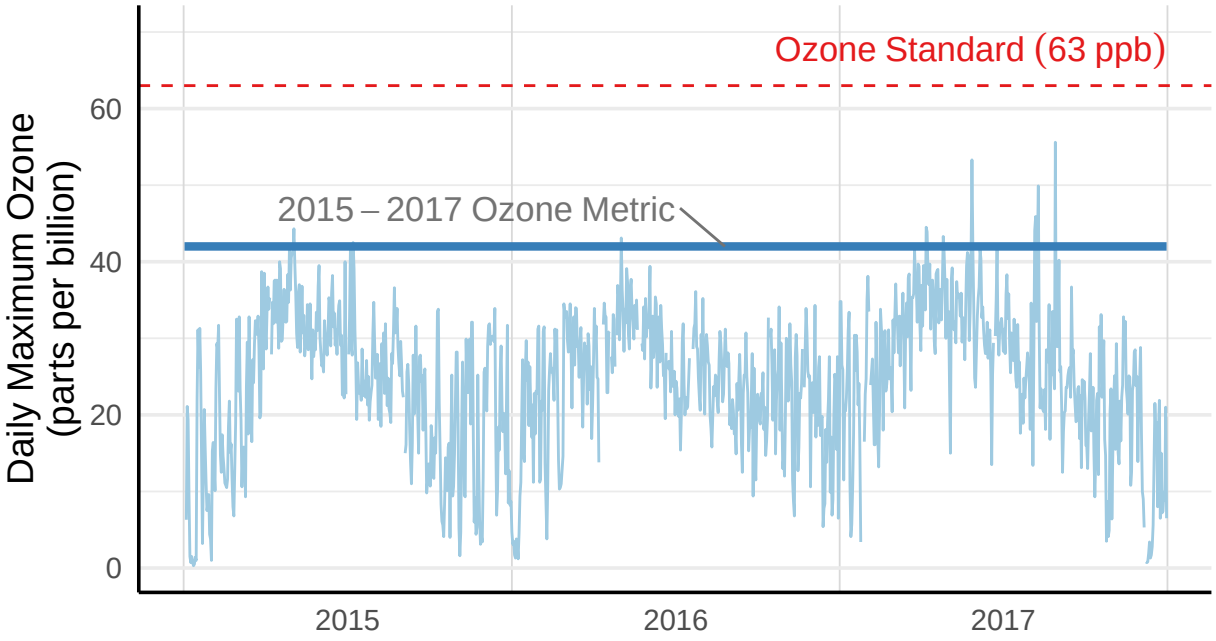
Air Zone: Central Interior
Monitoring Station: Smithers
Ozone Air Quality Standard: Achieved
Ozone Metric: 48 ppb (3 year average)



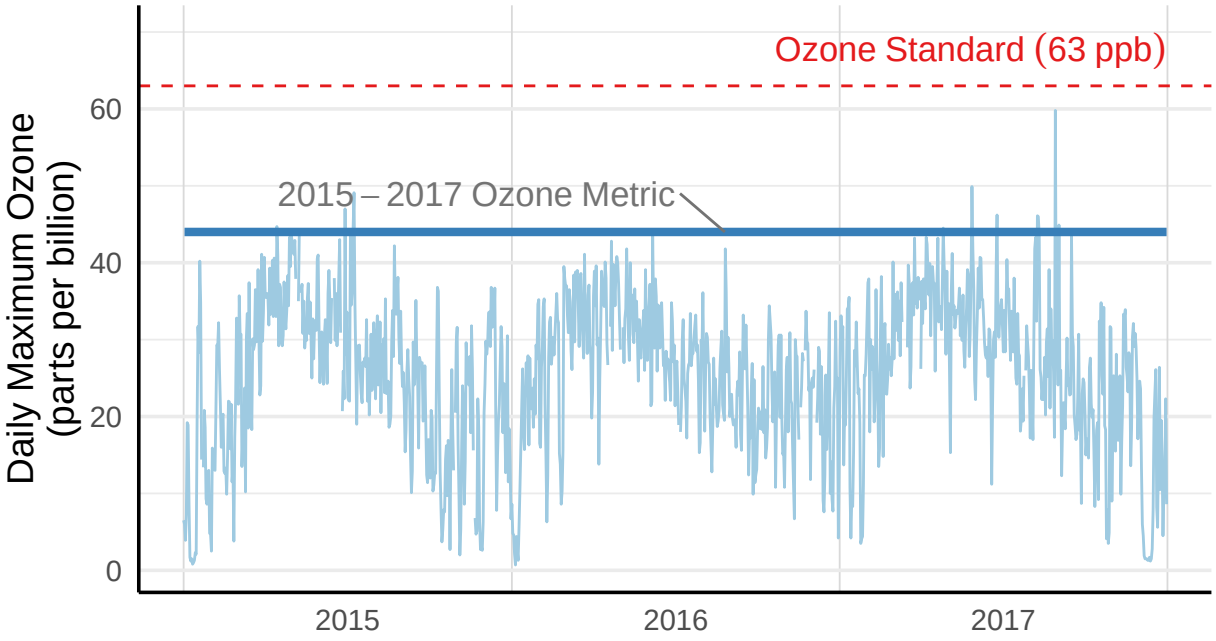
Air Zone: Lower Fraser Valley
Monitoring Station: Richmond South
Ozone Air Quality Standard: Achieved
Ozone Metric: 47 ppb (3 year average)



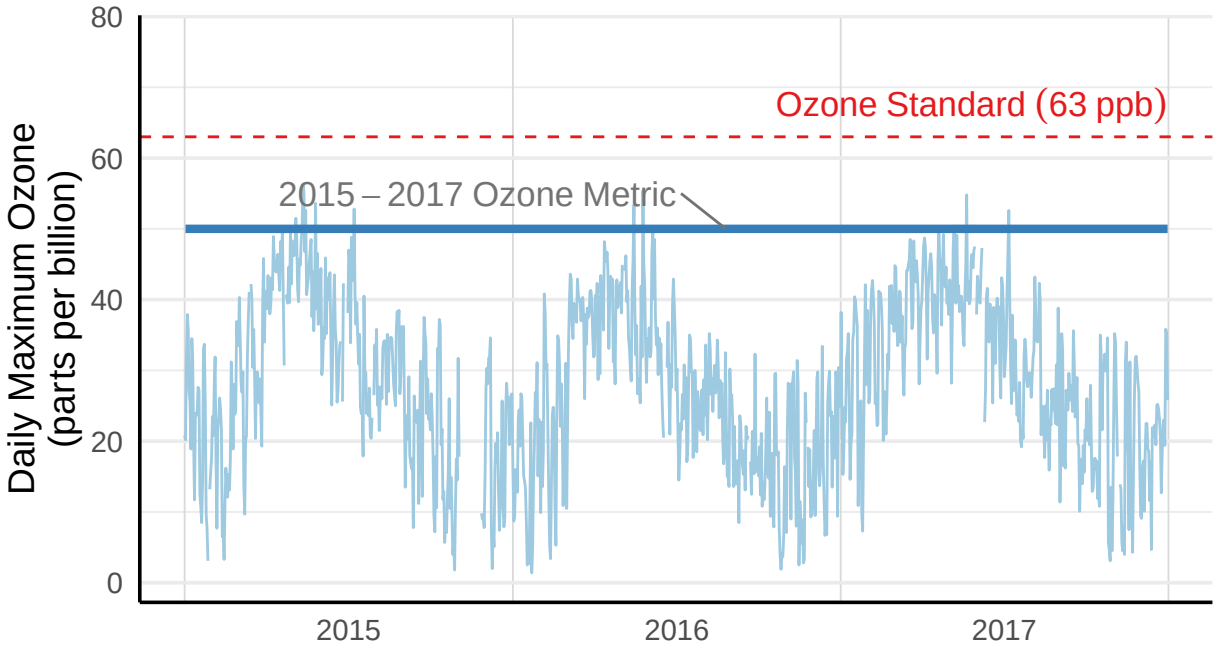
Air Zone: Lower Fraser Valley
Monitoring Station: Burnaby South
Ozone Air Quality Standard: Achieved
Ozone Metric: 42 ppb (3 year average)



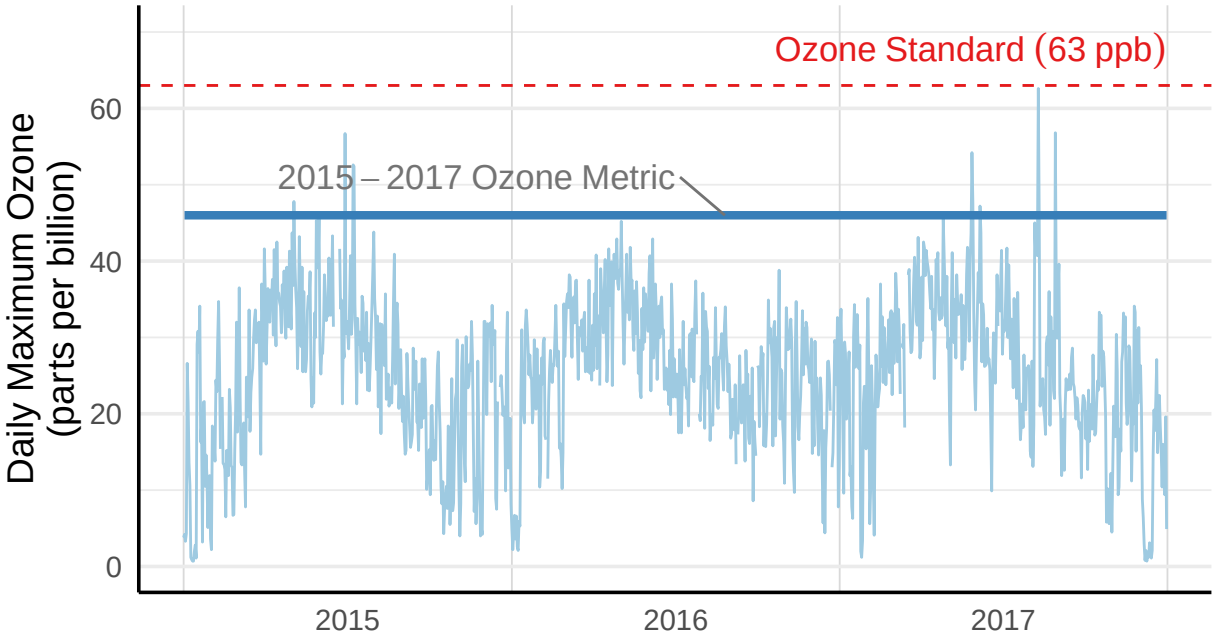
Air Zone: Lower Fraser Valley
Monitoring Station: North Delta
Ozone Air Quality Standard: Achieved
Ozone Metric: 44 ppb (3 year average)



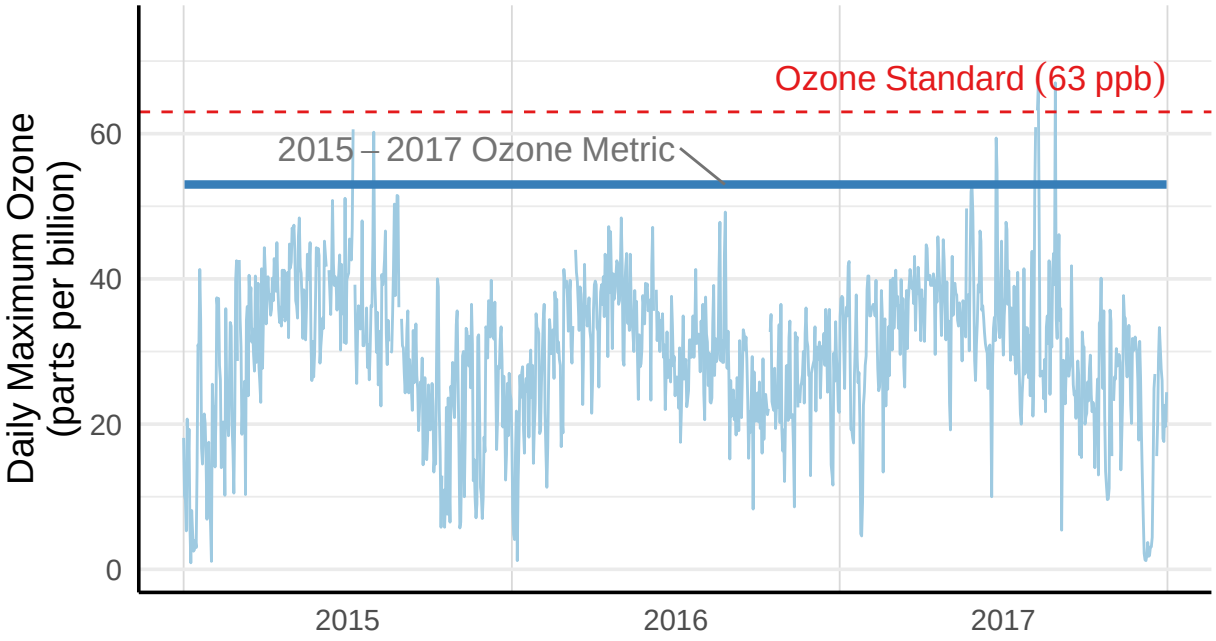
Air Zone: Central Interior
Monitoring Station: Quesnel
Ozone Air Quality Standard: Achieved
Ozone Metric: 50 ppb (3 year average)



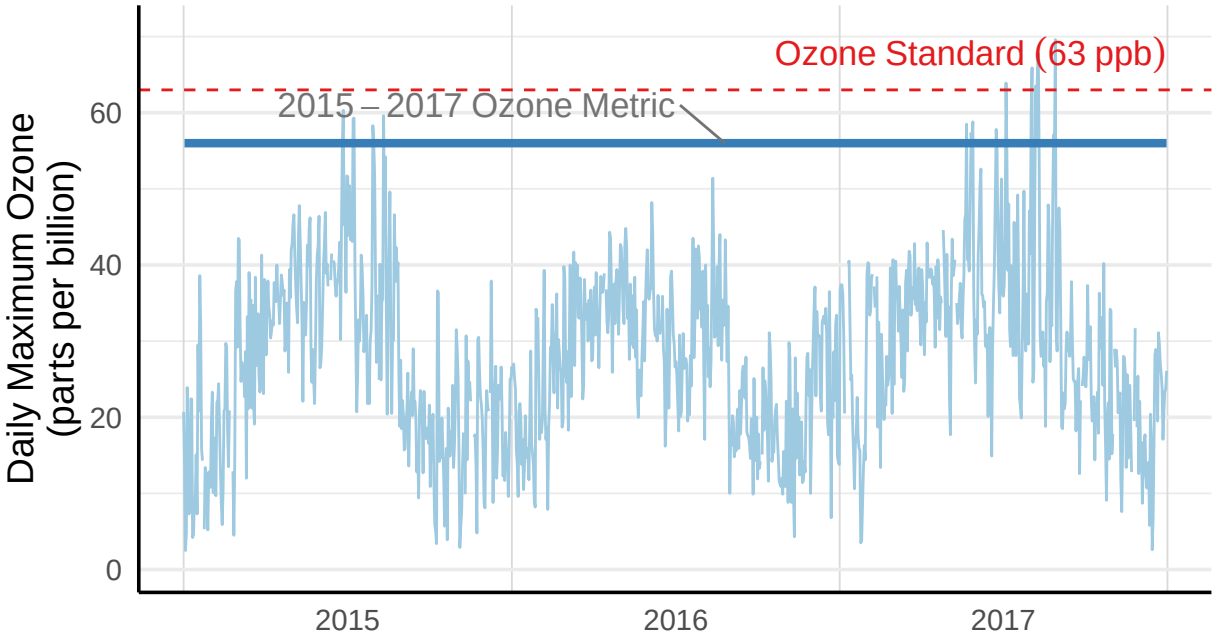
Air Zone: Lower Fraser Valley
Monitoring Station: N. Vancouver-Mahon Park
Ozone Air Quality Standard: Achieved
Ozone Metric: 46 ppb (3 year average)



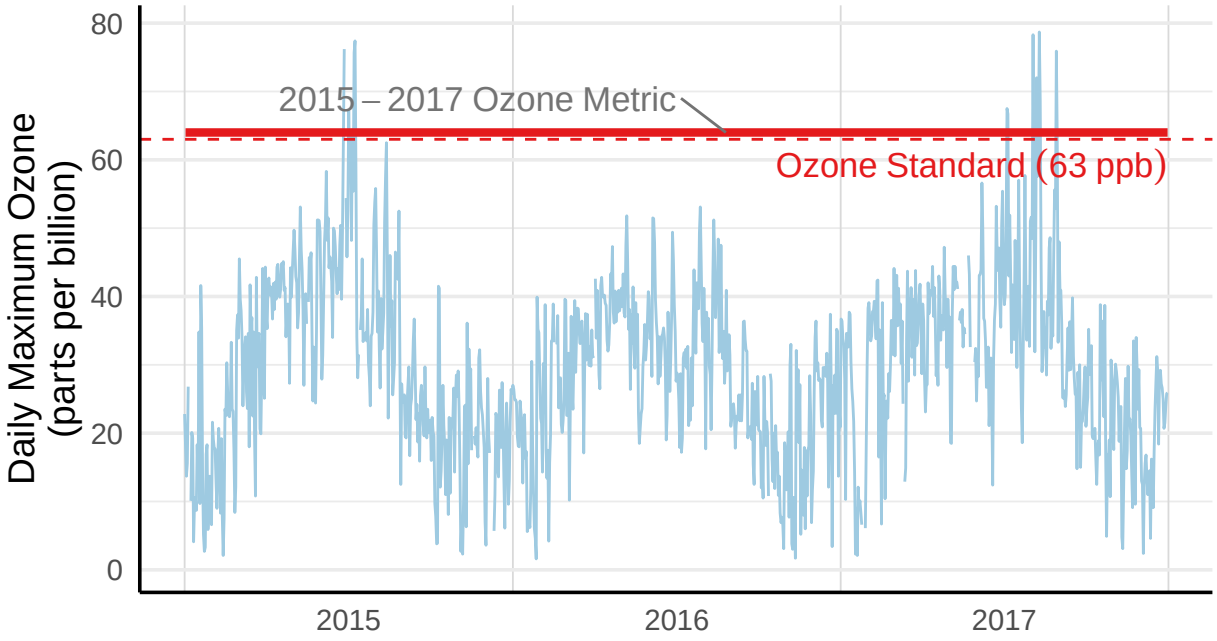
Air Zone: Lower Fraser Valley
Monitoring Station: Langley
Ozone Air Quality Standard: Achieved
Ozone Metric: 53 ppb (3 year average)



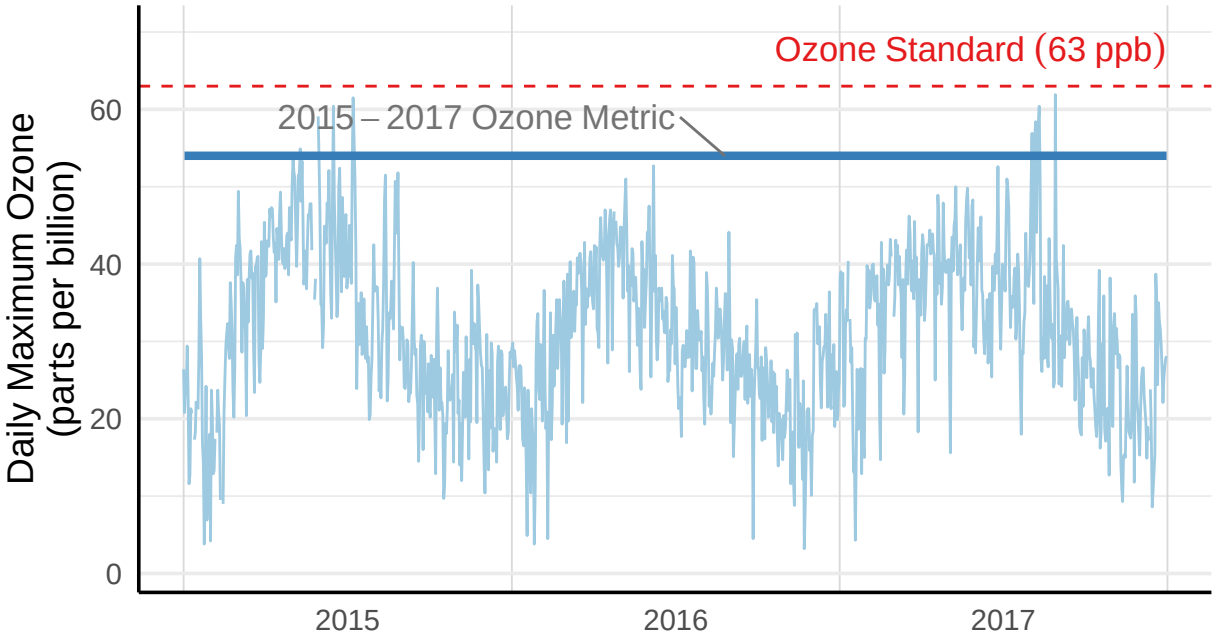
Air Zone: Lower Fraser Valley
Monitoring Station: Chilliwack
Ozone Air Quality Standard: Achieved
Ozone Metric: 56 ppb (3 year average)



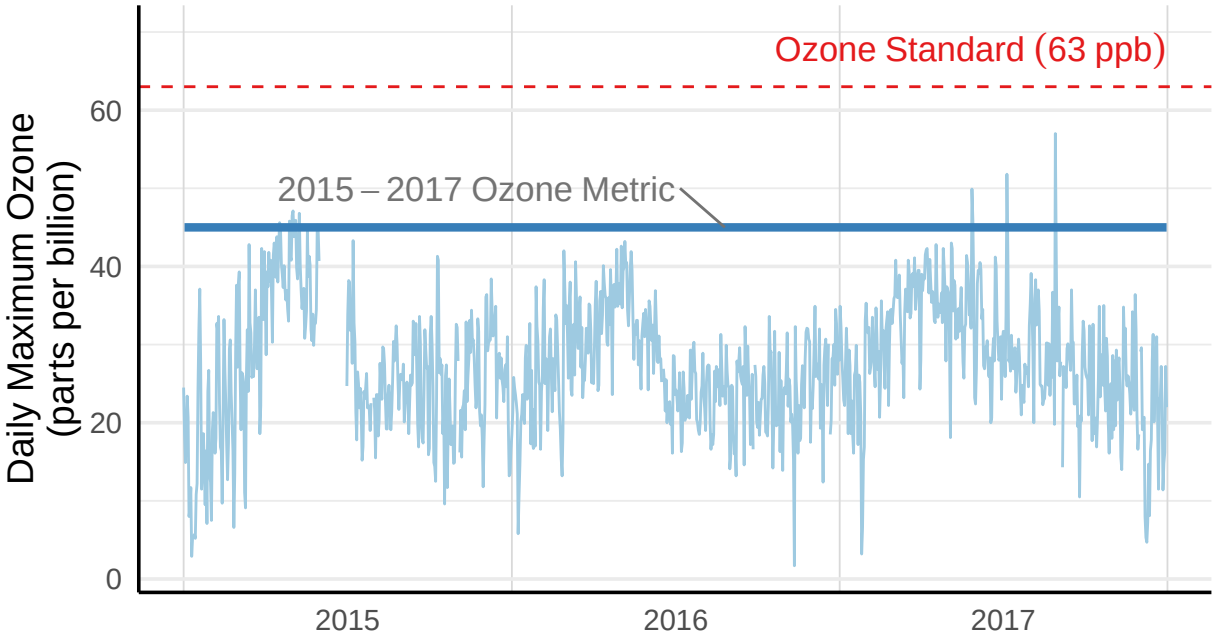
Air Zone: Lower Fraser Valley
Monitoring Station: Hope
Ozone Air Quality Standard: Not Achieved
Ozone Metric: 64 ppb (3 year average)



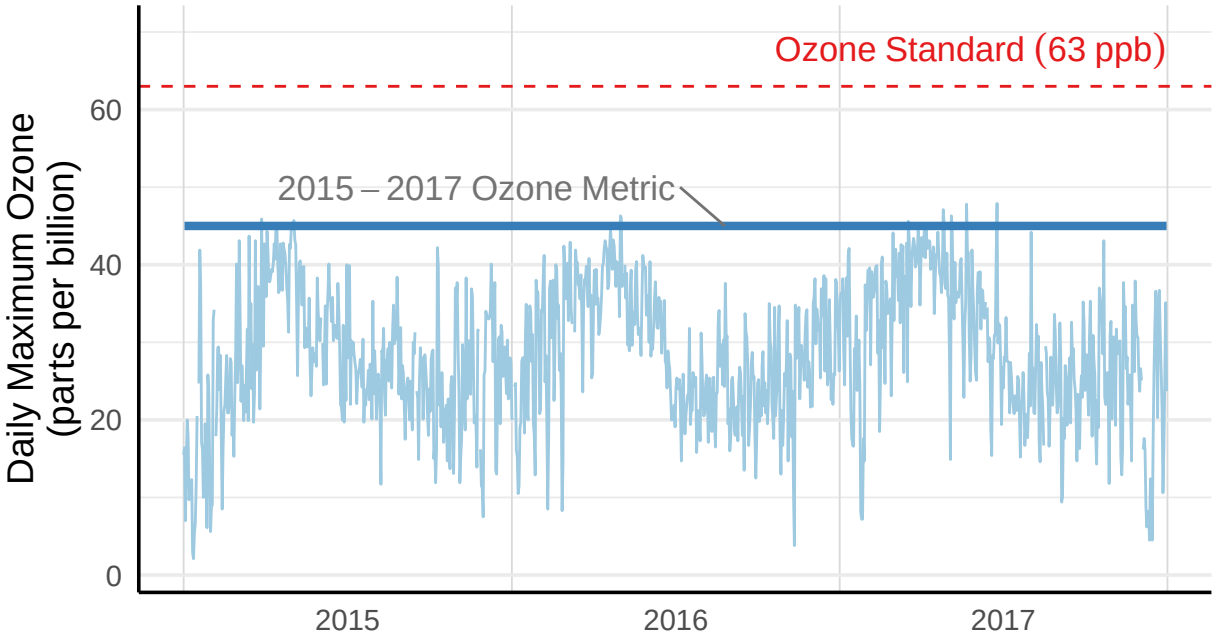
Air Zone: Georgia Strait
Monitoring Station: Whistler
Ozone Air Quality Standard: Achieved
Ozone Metric: 54 ppb (3 year average)



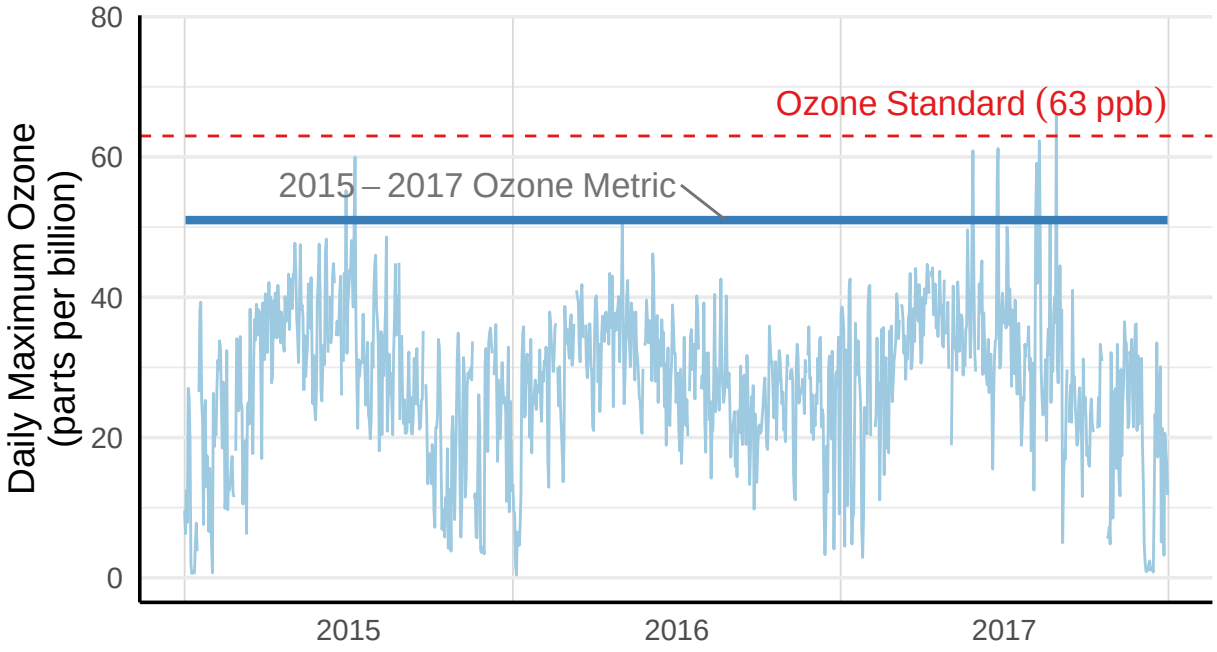
Air Zone: Georgia Strait
Monitoring Station: Nanaimo
Ozone Air Quality Standard: Achieved
Ozone Metric: 45 ppb (3 year average)



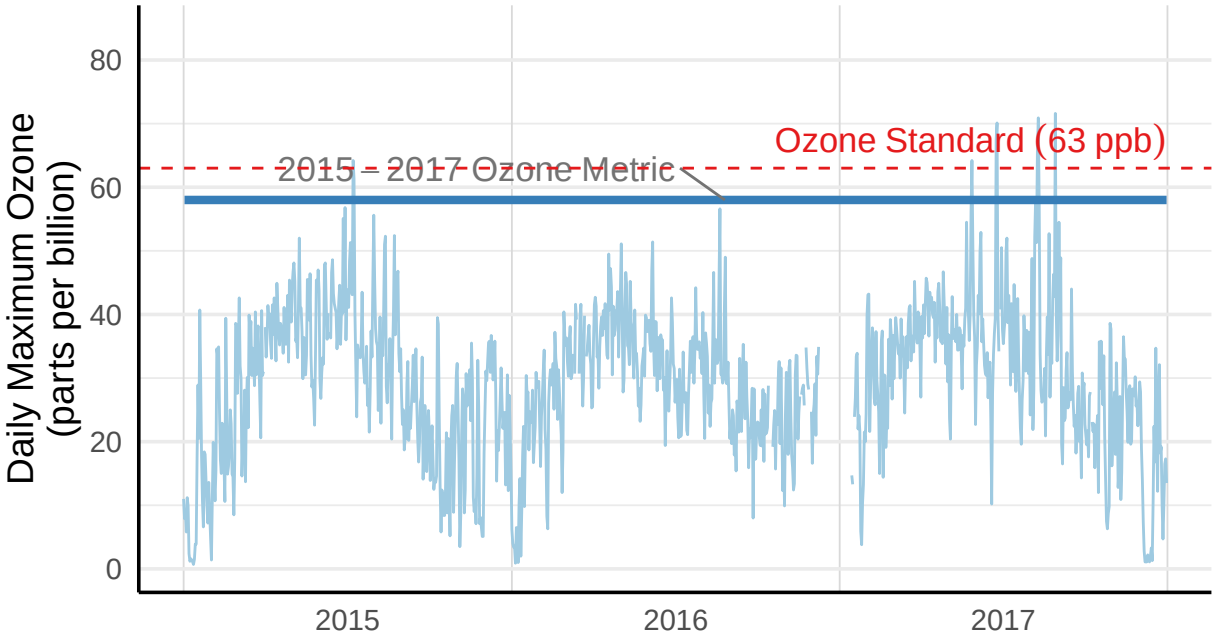
Air Zone: Georgia Strait
Monitoring Station: Victoria-Topaz
Ozone Air Quality Standard: Achieved
Ozone Metric: 45 ppb (3 year average)



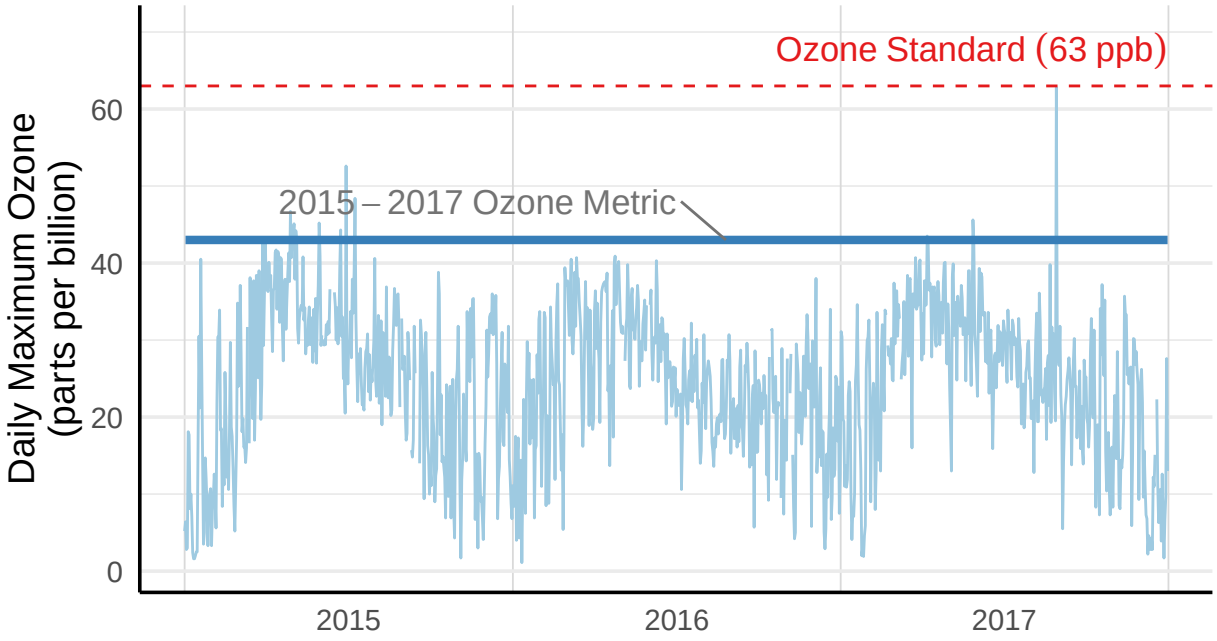
Air Zone: Lower Fraser Valley
Monitoring Station: Pitt Meadows
Ozone Air Quality Standard: Achieved
Ozone Metric: 51 ppb (3 year average)



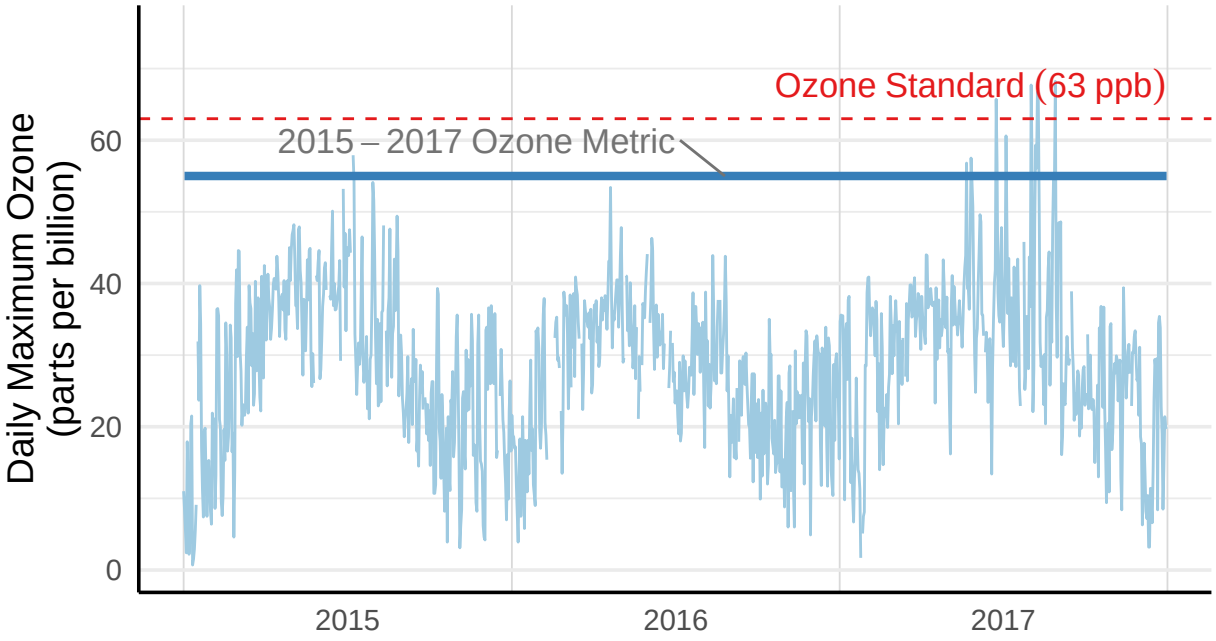
Air Zone: Lower Fraser Valley
Monitoring Station: Maple Ridge
Ozone Air Quality Standard: Achieved
Ozone Metric: 58 ppb (3 year average)



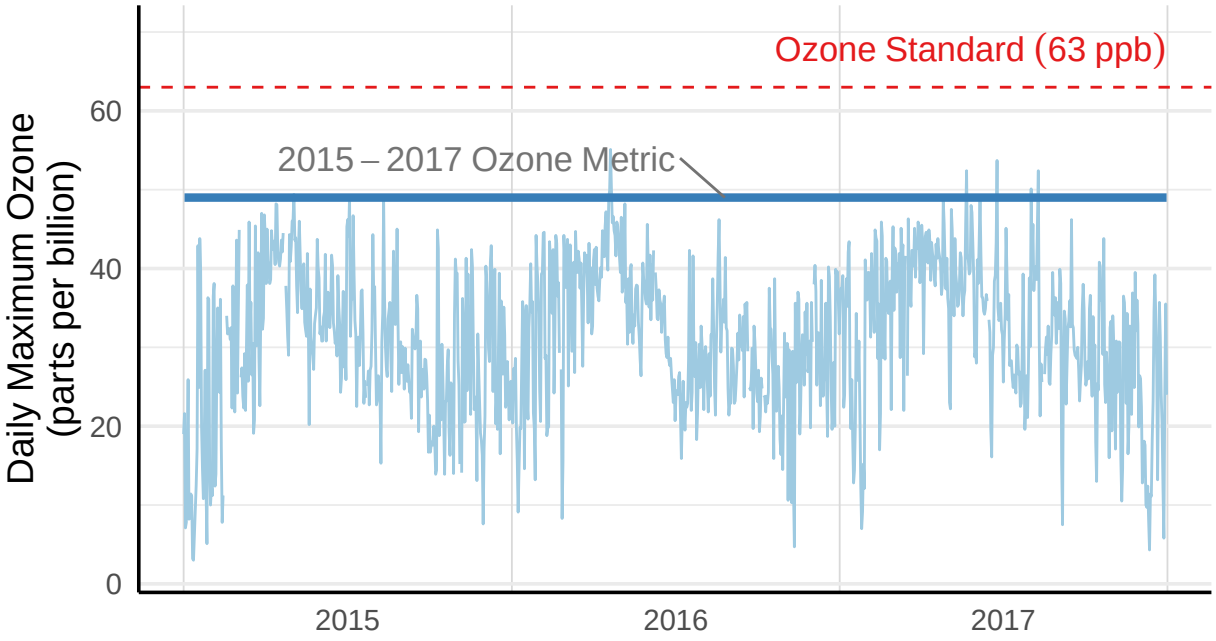
Air Zone: Lower Fraser Valley
Monitoring Station: Richmond-Airport
Ozone Air Quality Standard: Achieved
Ozone Metric: 43 ppb (3 year average)



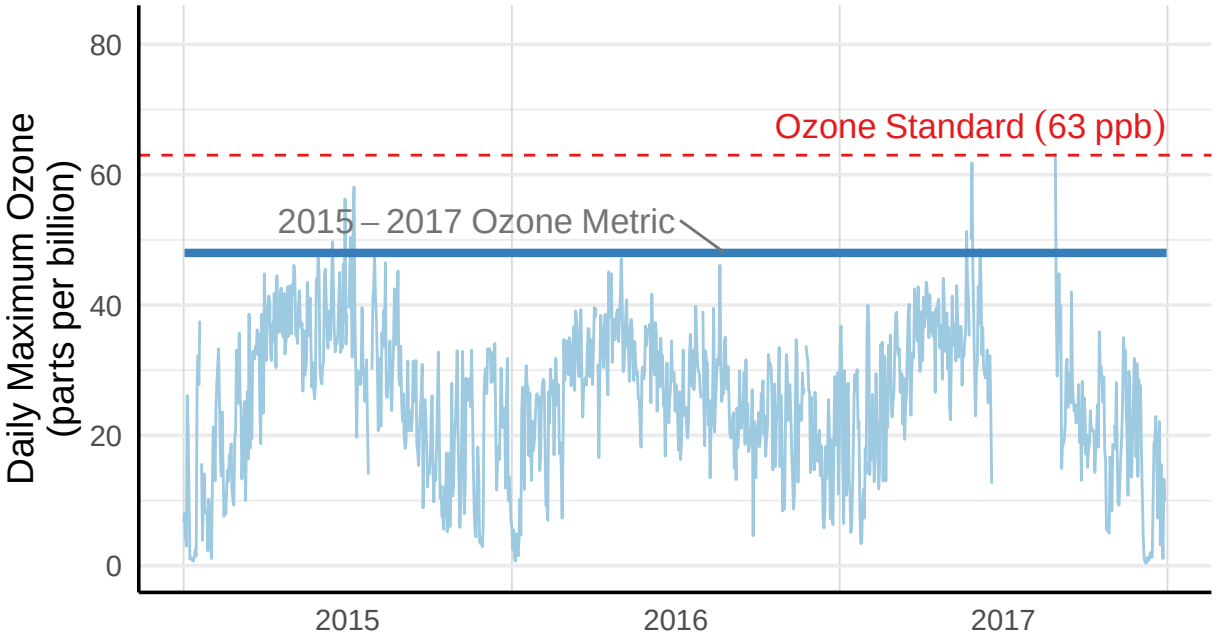
Air Zone: Lower Fraser Valley
Monitoring Station: Abbotsford-Mill Lake
Ozone Air Quality Standard: Achieved
Ozone Metric: 55 ppb (3 year average)



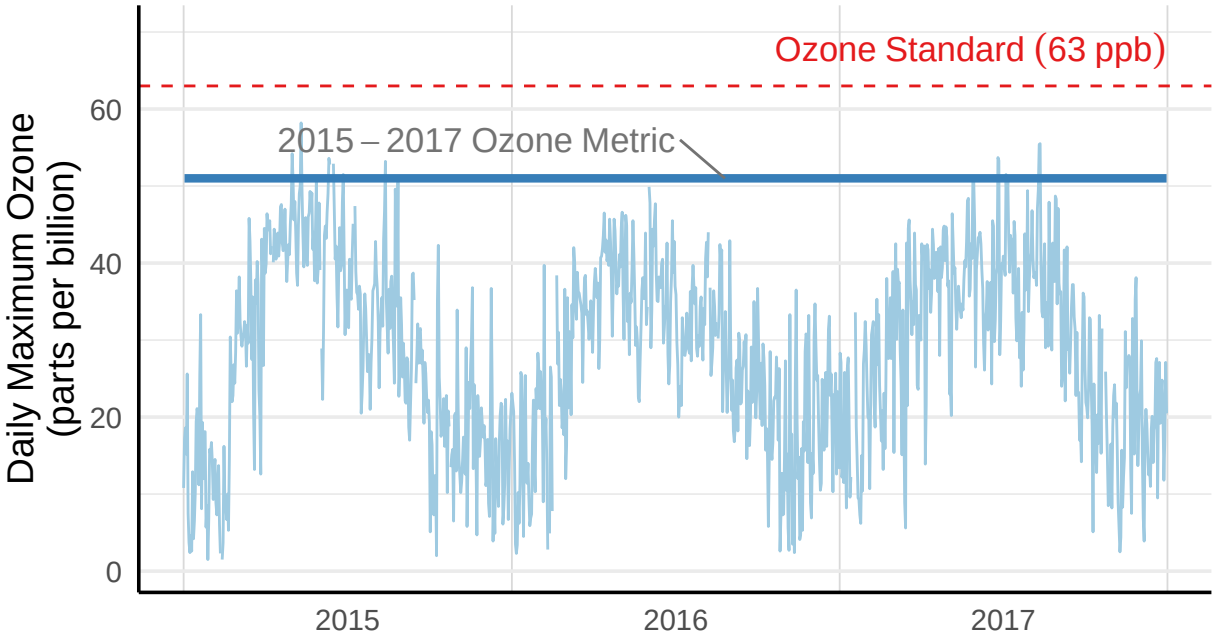
Air Zone: Georgia Strait
Monitoring Station: Colwood
Ozone Air Quality Standard: Achieved
Ozone Metric: 49 ppb (3 year average)



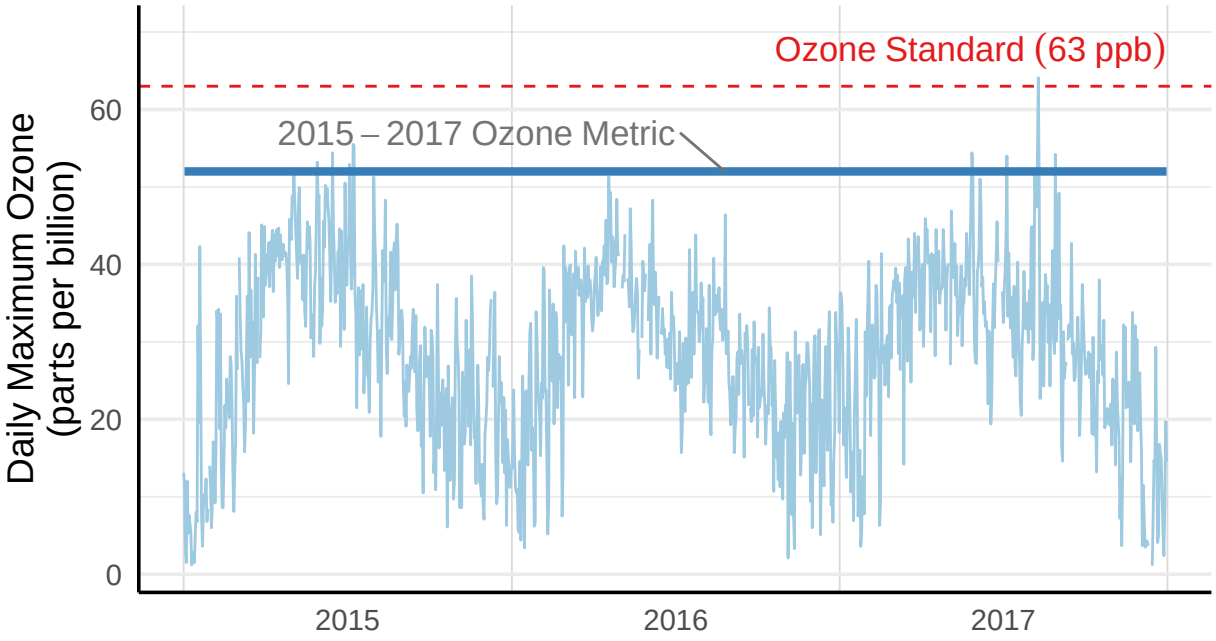
Air Zone: Lower Fraser Valley
Monitoring Station: Coquitlam
Ozone Air Quality Standard: Achieved
Ozone Metric: 48 ppb (2 year average)



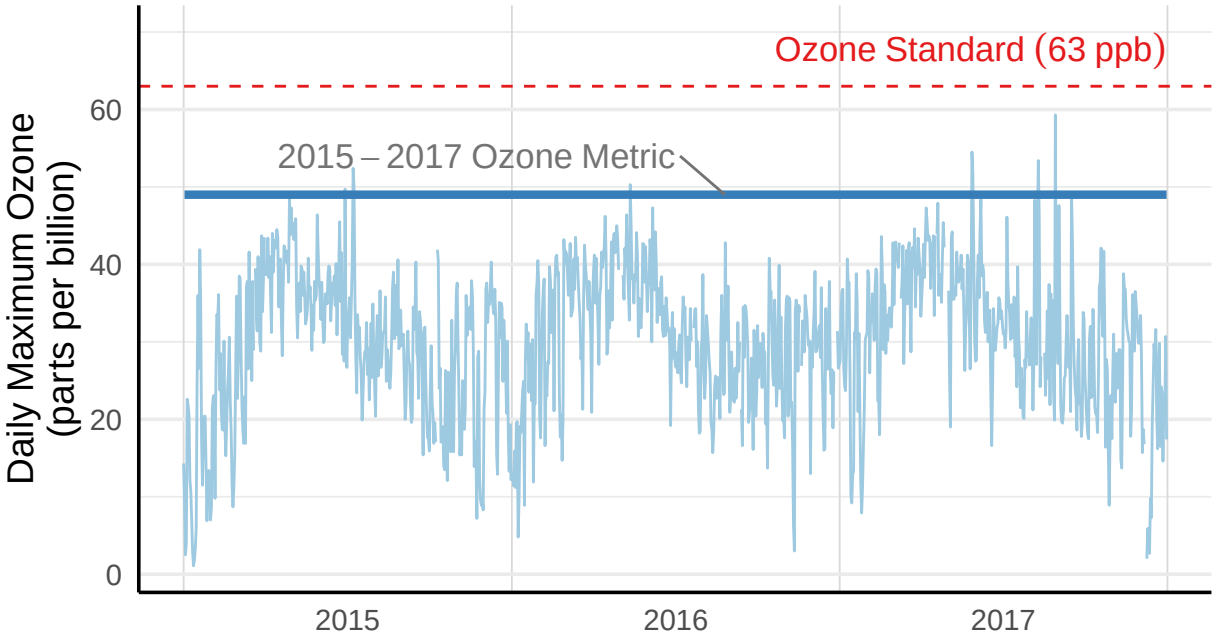
Air Zone: Southern Interior
Monitoring Station: Vernon
Ozone Air Quality Standard: Achieved
Ozone Metric: 51 ppb (3 year average)



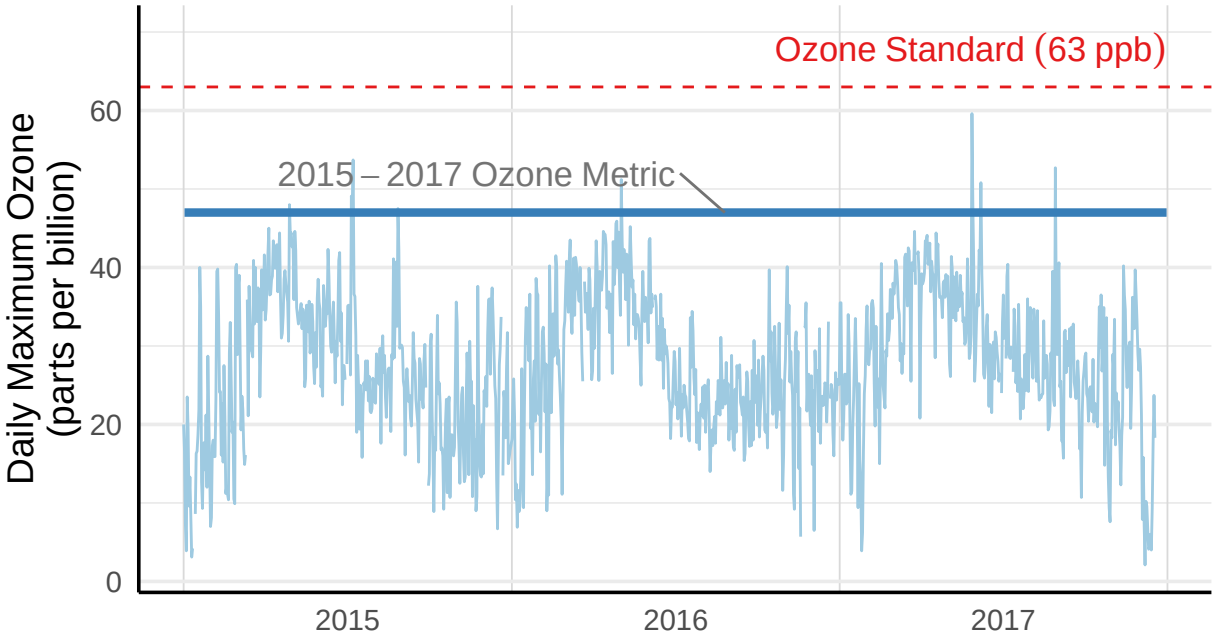
Air Zone: Georgia Strait
Monitoring Station: Duncan-Cairnsmore
Ozone Air Quality Standard: Achieved
Ozone Metric: 52 ppb (3 year average)



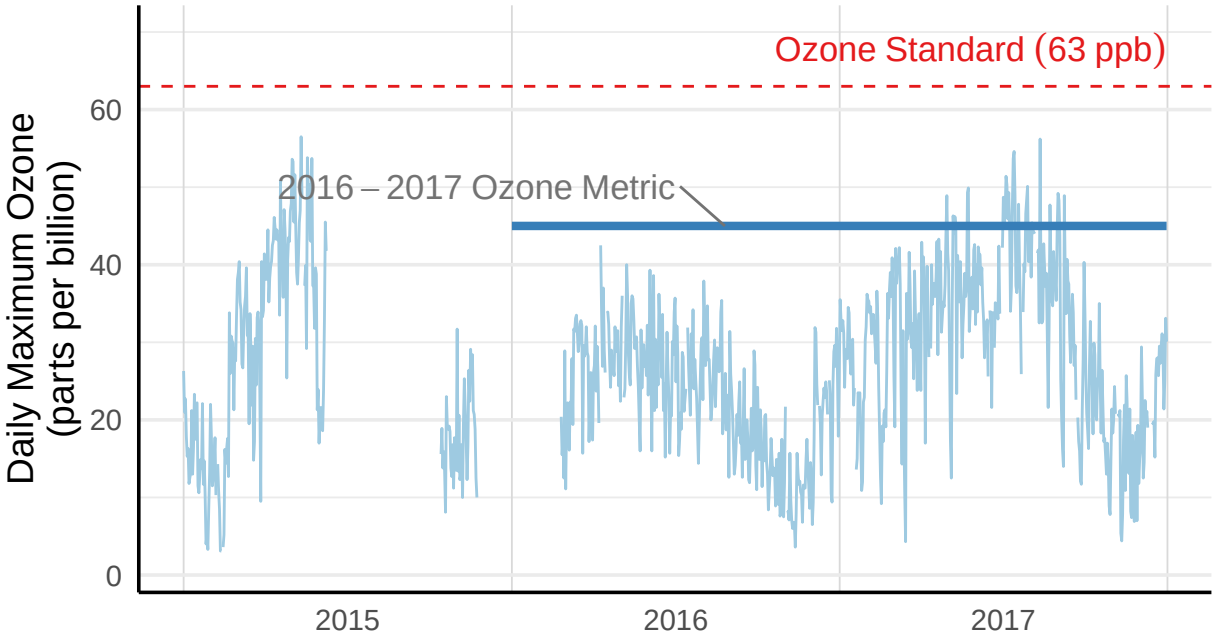
Air Zone: Lower Fraser Valley
Monitoring Station: Tsawwassen
Ozone Air Quality Standard: Achieved
Ozone Metric: 49 ppb (3 year average)



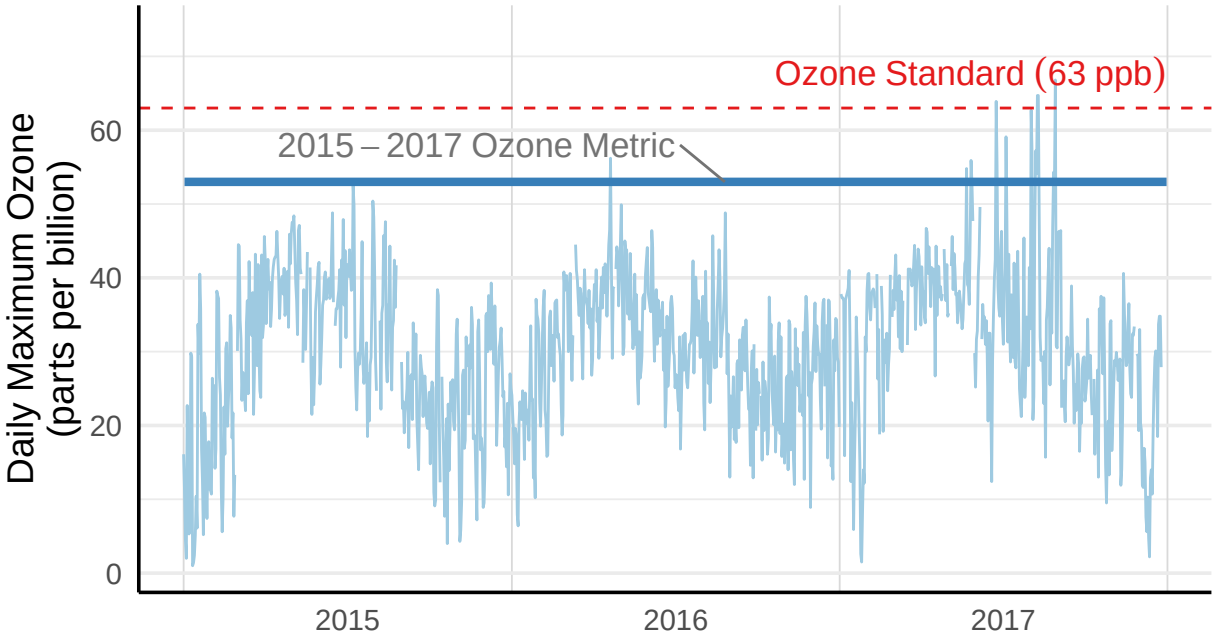
Air Zone: Georgia Strait
Monitoring Station: Courtenay
Ozone Air Quality Standard: Achieved
Ozone Metric: 47 ppb (3 year average)



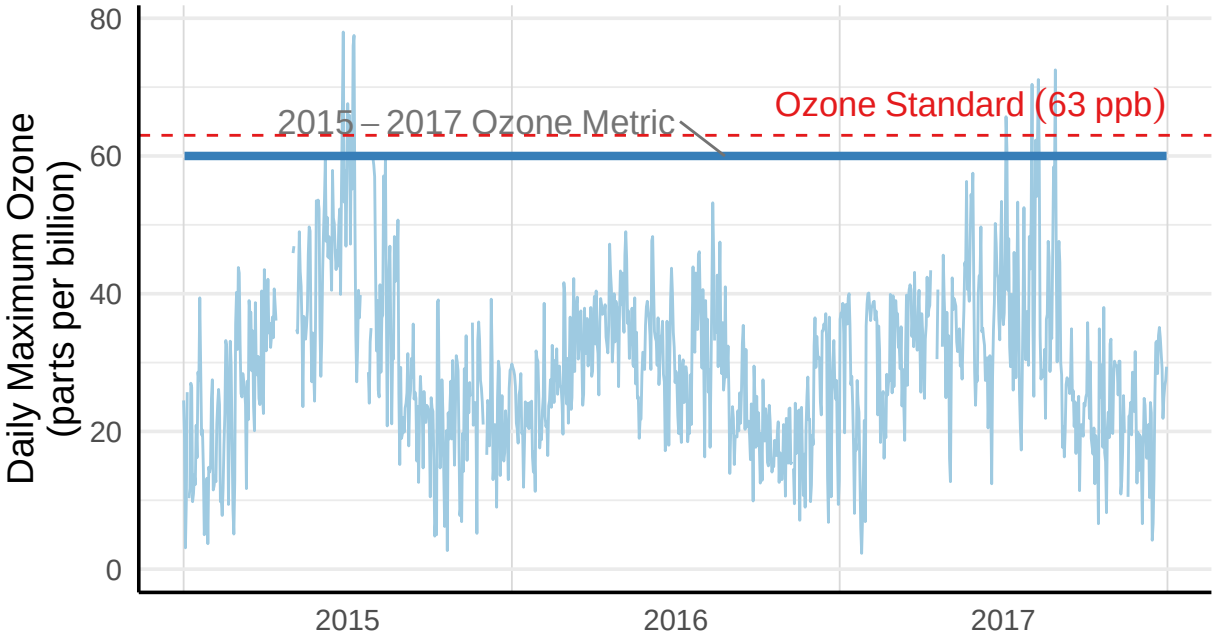
Air Zone: Southern Interior
Monitoring Station: Castlegar
Ozone Air Quality Standard: Achieved
Ozone Metric: 45 ppb (2 year average)



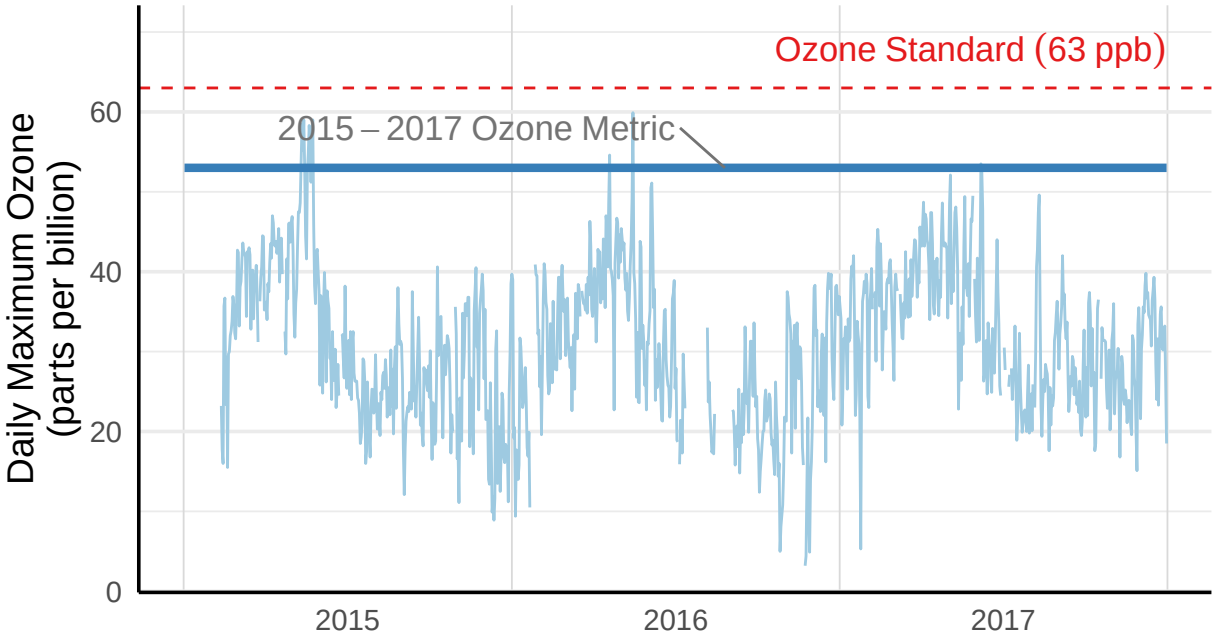
Air Zone: Lower Fraser Valley
Monitoring Station: Abbotsford-Airport
Ozone Air Quality Standard: Achieved
Ozone Metric: 53 ppb (3 year average)



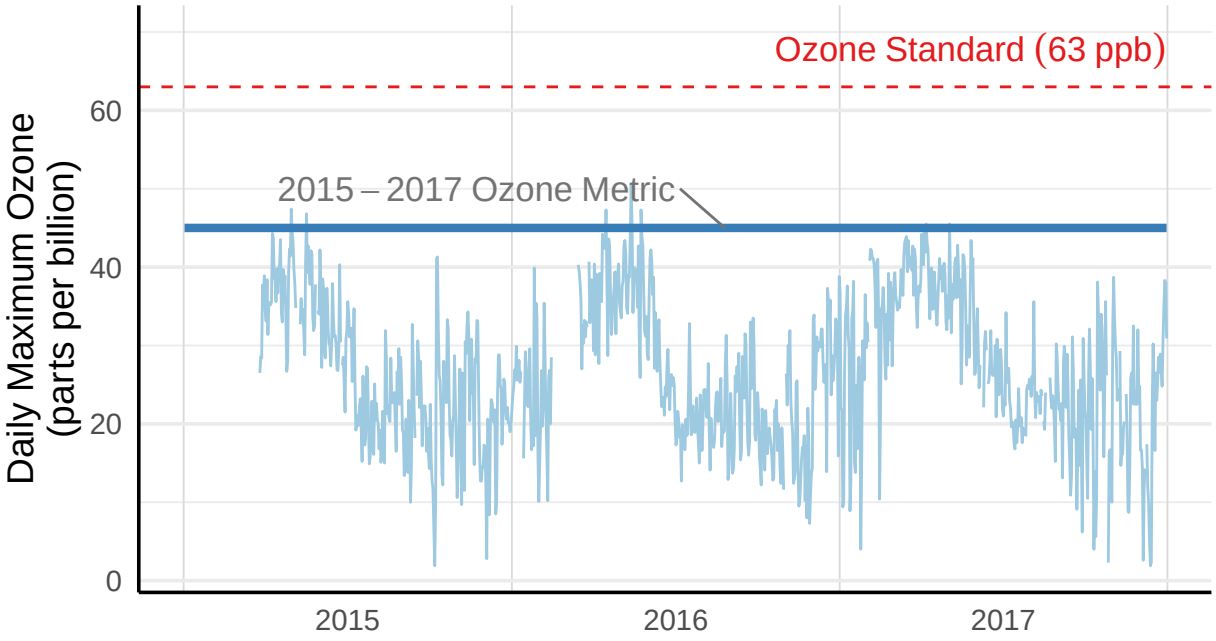
Air Zone: Lower Fraser Valley
Monitoring Station: Agassiz
Ozone Air Quality Standard: Achieved
Ozone Metric: 60 ppb (3 year average)



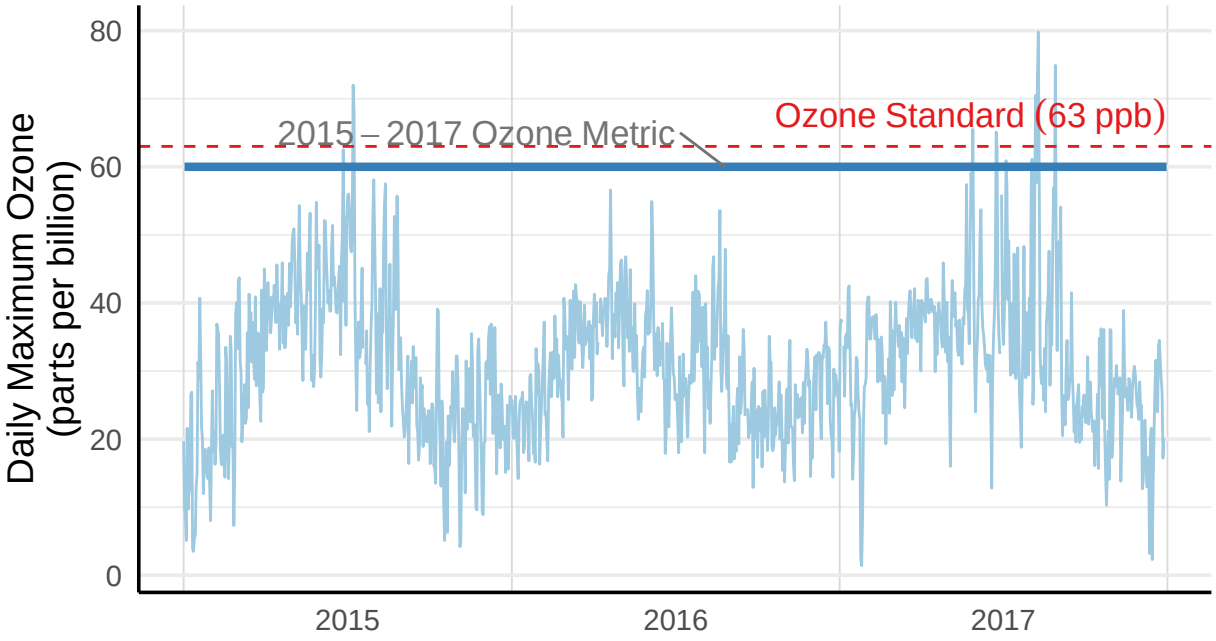
Air Zone: Northeast
Monitoring Station: Fort St. John
Ozone Air Quality Standard: Achieved
Ozone Metric: 53 ppb (3 year average)



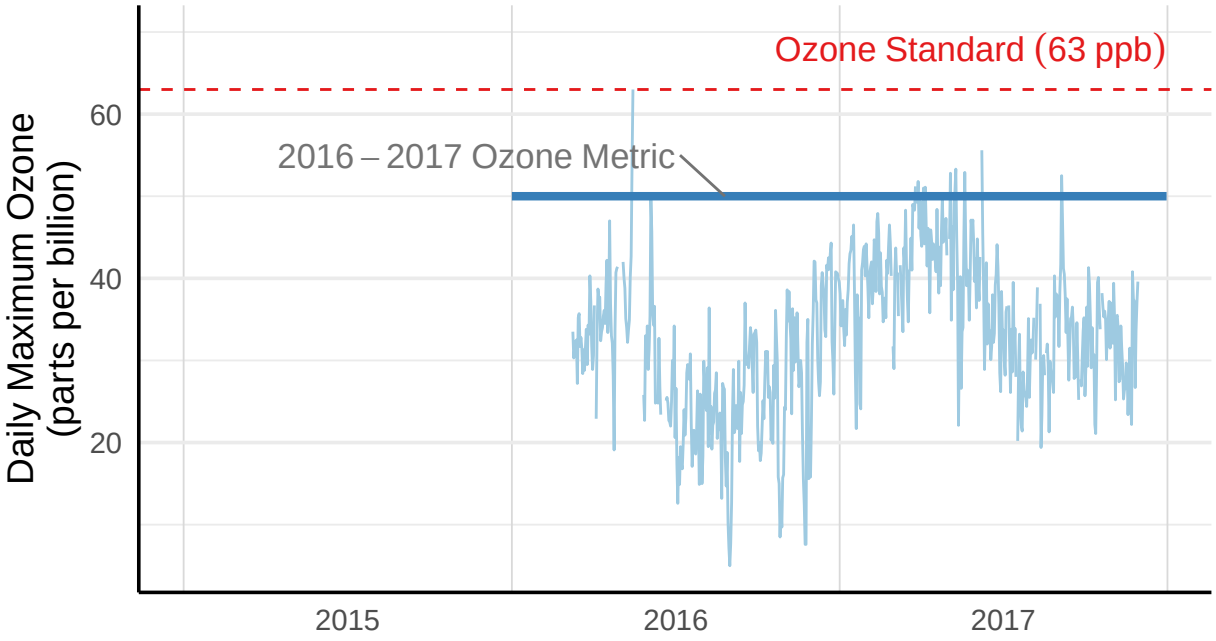
Air Zone: Coastal
Monitoring Station: Terrace-Skeena
Ozone Air Quality Standard: Achieved
Ozone Metric: 45 ppb (3 year average)



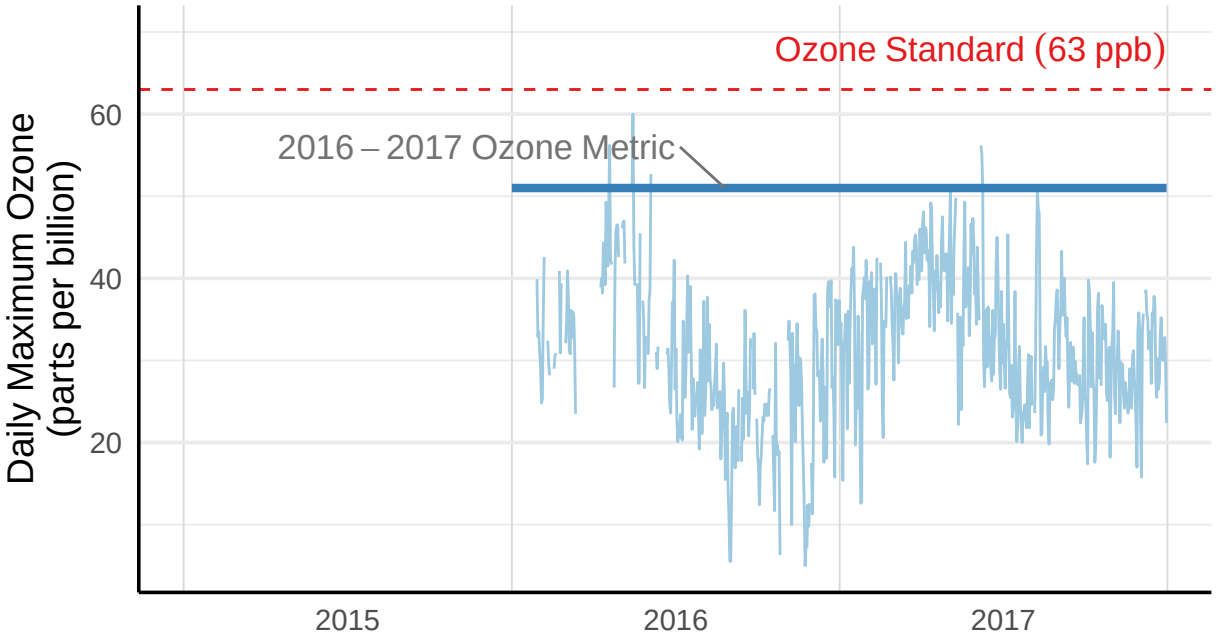
Air Zone: Lower Fraser Valley
Monitoring Station: Mission
Ozone Air Quality Standard: Achieved
Ozone Metric: 60 ppb (3 year average)



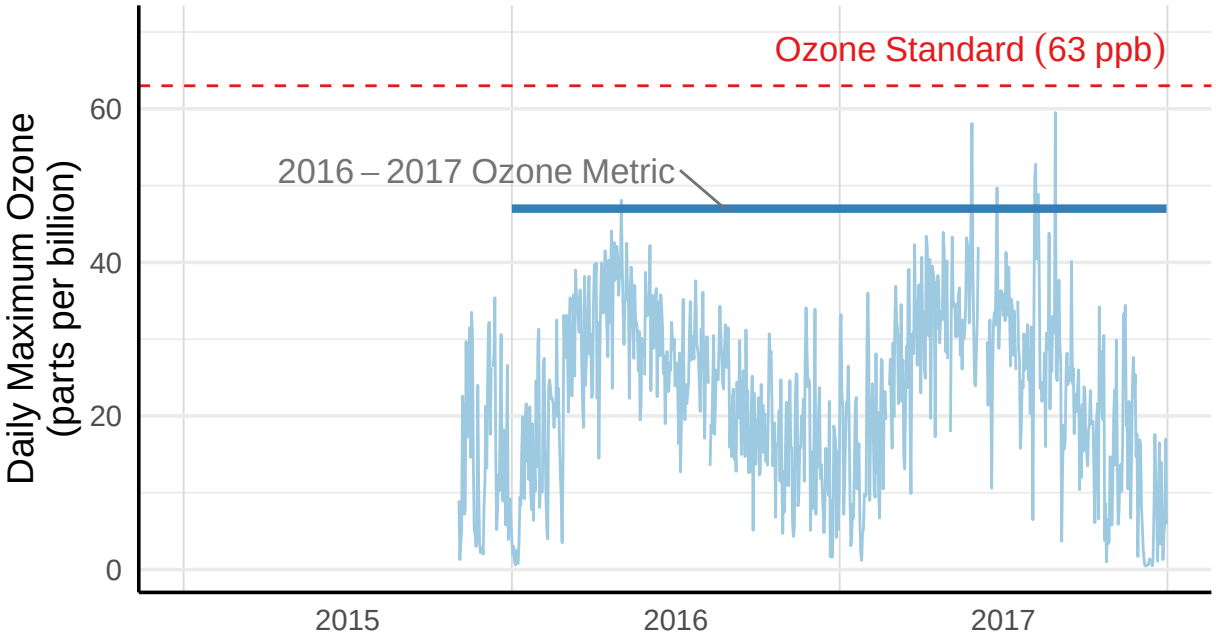
Air Zone: Northeast
Monitoring Station: Rolla
Ozone Air Quality Standard: Achieved
Ozone Metric: 50 ppb (2 year average)



Air Zone: Northeast
Monitoring Station: Taylor
Ozone Air Quality Standard: Achieved
Ozone Metric: 51 ppb (2 year average)



Air Zone: Lower Fraser Valley
Monitoring Station: New Westminster
Ozone Air Quality Standard: Achieved
Ozone Metric: 47 ppb (2 year average)



Air Zone: Lower Fraser Valley
Monitoring Station: Vancouver Clark Drive
Ozone Air Quality Standard: Achieved
Ozone Metric: 42 ppb (3 year average)