Executive Summary

The 2018-2020 air zone reporting period is the first to apply the 2020 Canadian Ambient Air Quality Standards (CAAQS) for fine particulate matter ($PM_{2.5}$) and ozone, and the first to include nitrogen dioxide (NO_2) and sulphur dioxide (SO_2). In this report, the Southern Interior Air Zone is assigned "red" management levels for $PM_{2.5}$ and sulphur dioxide, "orange" management level for NO_2, and "yellow" management level for ozone. The Southern Interior did not achieve the 2020 CAAQS for $PM_{2.5}$ and SO_2.

Table 1. Management levels in the Southern Interior based on the 2018-2020 air zone reporting period**.**

Air Zone	$PM_{2.5}$	Ozone	NO_2	SO_2
Southern Interior	Red	Yellow	Orange	Red

Introduction

This is the eighth annual air zone report for the Southern Interior Air Zone. Air zone reporting is a commitment under the national Air Quality Management System (AQMS). This report describes achievement of the Canadian Ambient Air Quality Standards (CAAQS) for fine particulate matter ($PM_{2.5}$), ground-level ozone (O_3), nitrogen dioxide (NO_2), and sulphur dioxide (SO_2), the associated management levels and recent actions to improve air quality.

Air Quality Management System

The AQMS is the comprehensive and collaborative approach of managing air quality by federal, provincial, and territorial governments in Canada. Under the AQMS, the CAAQS are developed to drive actions to protect human health and the environment based on the principles of continuous improvement and keeping clean areas clean. Air zones are defined under the AQMS as areas with similar air quality characteristics, issues, and trends, and serve as the basis for monitoring, reporting, and actions to improve air quality. Under the AQMS, progressively more rigorous actions are expected as air quality approaches or exceeds the CAAQS. The level of action is guided by the Air Zone Management Framework (Table 2).

Table 2. AQMS management levels and objectives for air pollutants based on the 2020 CAAQS.

Management Level	Objectives	$PM_{2.5}$		Ozone	NO_2		SO_2	
		Annual ($\mu g/m^3$)	24-hour ($\mu g/m^3$)	8-hour (ppb)	Annual (ppb)	1-hour (ppb)	Annual (ppb)	1-hour (ppb)
Red	Achieve CAAQS	>8.8	>27	>62	>17.0	>60	>5.0	>70
Orange	Prevent CAAQS Exceedance	>6.4 and ≤8.8	>19 and ≤27	>56 and ≤62	>7.0 and ≤17.0	>31 and ≤60	>3.0 and ≤5.0	>50 and ≤70
Yellow	Prevent Air Quality Deterioration	>4.0 and ≤6.4	>10 and ≤19	>50 and ≤56	>2.0 and ≤7.0	>20 and ≤31	>2.0 and ≤3.0	>30 and ≤50
Green	Keep Clean Areas Clean	≤4.0	≤10	≤50	≤2.0	≤20	≤2.0	≤30

Southern Interior Air Zone

The Southern Interior Air Zone (see Figure 1) is one of seven broad air zones across B.C. It is located in the southeast part of the province covering parts of the Thompson-Okanagan Region, and the Kootenay-Boundary Region. It covers a broad area of southern BC between the Coast Mountains and the Alberta border. The Southern Interior Air Zone includes major population centres such as Kamloops, Kelowna, Vernon, Penticton, and Cranbrook.

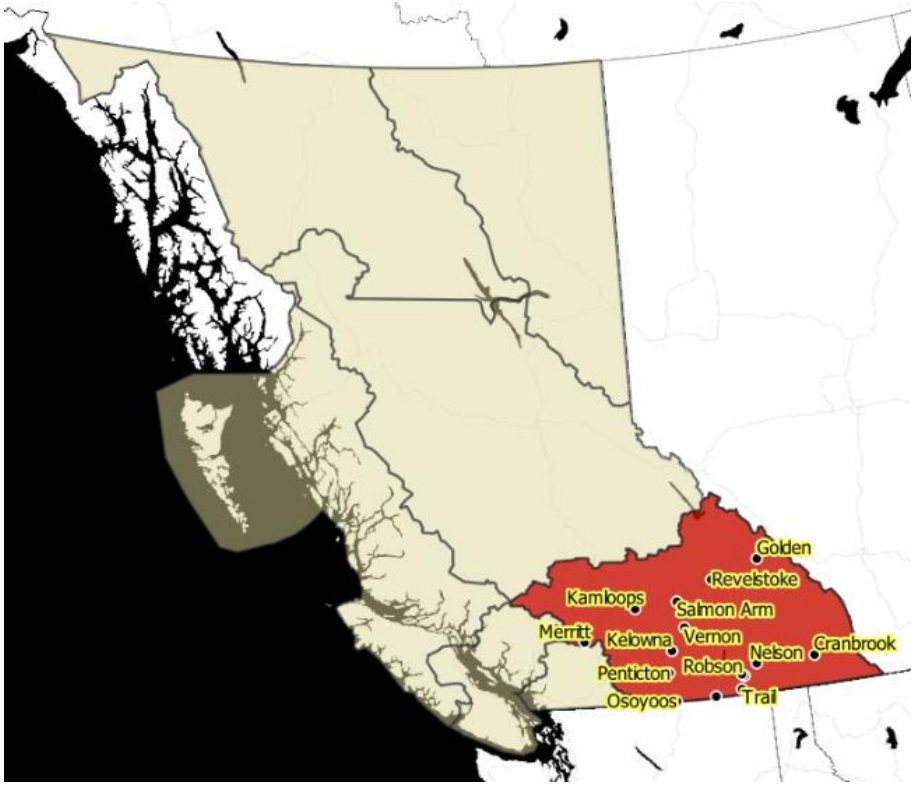

Figure 1. Map of B.C. highlighting the Southern Interior Air Zone and its major population centres.

$PM_{2.5}$ Levels

$PM_{2.5}$ or fine particulate matter refers to solid particles and liquid droplets suspended in air that are smaller than or equal to 2.5 micrometres (µm) in diameter. These particles when inhaled, travel deep into the lungs and the bloodstream, and can cause adverse health effects like cardiovascular and respiratory diseases. $PM_{2.5}$ is considered a non-threshold pollutant, that is, there are no safe limits for exposure.

Air zone reporting of $PM_{2.5}$ summarizes the 24-hour[1] and annual[2] metrics to estimate the short-term and long-term exposures of the pollutant, respectively. In the 2018-2020 reporting period, there are seven locations in the Southern Interior with sufficient data to calculate these metrics (Figure 2). All sites except Cranbrook exceeded the new national standards defined by the 2020 CAAQS. In the Southern Interior, the 24-hour metric varied from 15 µg/m^3 at Cranbrook to 74 µg/m^3 at Castlegar, while annual metrics varied from 5.6 µg/m^3 at Cranbrook to 12.3 µg/m^3 at Grand Forks. Unadjusted, all sites except Cranbrook exceeded the 2020 CAAQS of 27 µg/m^3 for the 24-hour and 8.8 µg/m^3 for the annual metrics, respectively. Due to the impact of the 2018 wildfire season in B.C., and the transported smoke from the 2020 wildfires in the western United States, the metrics are adjusted following the methodology for transboundary flow/exceptional event (TF/EE) adjustment (Appendix I). After adjustment, Grand Forks remains the only site to exceed the 2020

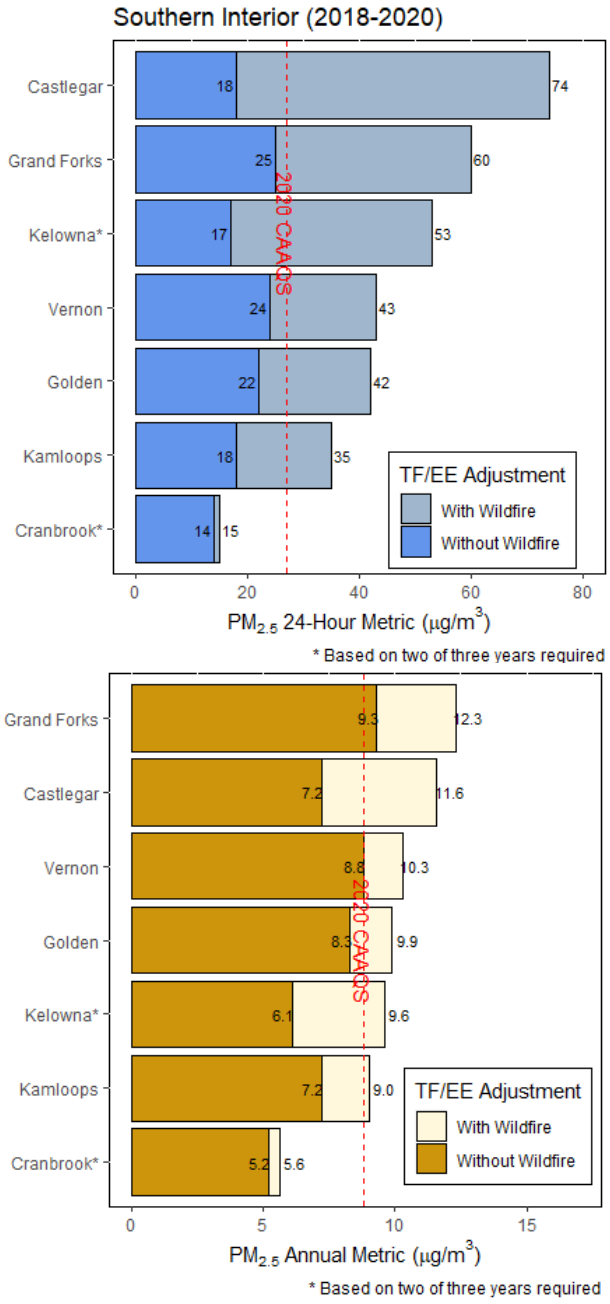

Figure 2. $PM_{2.5}$ concentrations in the Southern Interior Air Zone based on the 24-hour (top) and annual (bottom) metrics. The red dashed lines identify the 2020 CAAQS of 27 µg/m^3 for the 24-hour metric, and 8.8 µg/m^3 for the annual metric.

[1] $PM_{2.5}$ 24-hour metric are based on the annual 98th percentile of the 24-hour value, averaged over three years (2018-2020).

[2] $PM_{2.5}$ annual metric are based on the annual average of 24-hour values, averaged over three years (2018-2020).

CAAQS, reporting an annual metric of 9.3 µg/m^3

Figure 3 shows the wildfire adjusted levels and trends of the 24-hour and annual metric in the Southern Interior Air Zone. The figure features the 2015 and 2020 CAAQS and the reporting period where these standards apply. Figure 3 also shows the recommended management levels based on either metric. Table 2 shows the AQMS management levels for the Southern Interior air zone communities through various reporting periods. The overall management level for the entire air zone is based on the community that reported the highest metric. Before the 2018-2020 reporting period, most sites in the Southern Interior are assigned "orange" management levels for $PM_{2.5}$ with a few sites that are within "yellow" management levels. As a result, the Southern Interior Air Zone had been under "orange" management level before the 2018-2020 reporting period. In the 2018-2020 period, the more stringent 2020 CAAQS for $PM_{2.5}$ was implemented. Under the new standards, the 24-hour metric is moderately lowered from 28 to 27 µg.m^3 while the annual metric is significantly lowered from 10 to 8.8 µg/m^3. As a result, Grand Forks exceeded the standards for the first time, reporting an annual metric of 9.3 µg/m^3.

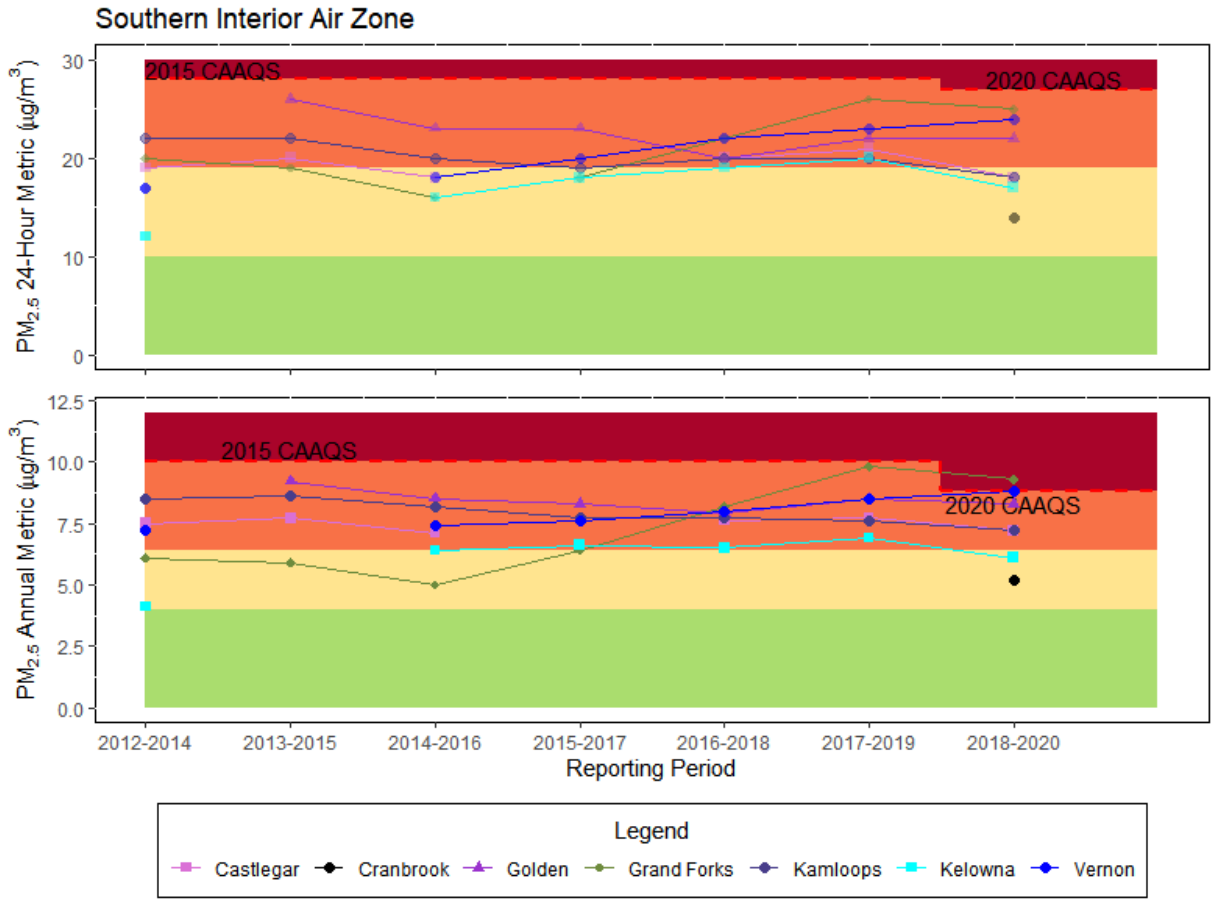

Figure 3. Wildfire-adjusted trends in the 24-Hour and annual metrics of $PM_{2.5}$ from 2012 to 2020 for the communities in the Southern Interior. The red dashed lines and background colours define the applicable CAAQS and AQMS management levels based on the metric.

Overall, the Southern Interior air zone is assigned “red” management level for PM2.5 for the first time because of non-achievement of the 2020 CAAQS in Grand Forks. Under a “red” management level, the most stringent air quality action for PM2.5 are recommended in order to achieve the CAAQS in the future. This includes actions that will reverse the increasing trends in the annual metrics observed in Grand Forks since the 2014-2016 reporting period and ensuring annual metrics at all sites are below 8.8 µg/m3 while keeping the 24-hour metrics below 27 µg/m3.

Table 2. Summary of $PM_{2.5}$ metrics (shown below in 24-hour/annual metrics) and air zone management levels for the Southern Interior Air Zone.

	2012-2014	2013-2015	2014-2016	2015-2017	2016-2018	2017-2019	**2018-2020**
SOUTHERN INTERIOR (CAAQS)	ORANGE (2015)	ORANGE (2015)	ORANGE (2015)	ORANGE (2015)	ORANGE (2015)	ORANGE (2015)	RED (2020)
Castlegar	19/7.5	20/7.7	18/7.1		20/7.6	21/7.7	18/7.2
Cranbrook							14/5.2
Creston PC School	13/4.4	14/4.5					
Golden		26/9.2	23/8.5	23/8.3	20/7.9	22/8.5	22/8.3
Grand Forks	20/6.1	19/5.9	16/5	18/6.4	22/8.2	26/9.8	25/9.3
Kamloops	22/8.5	22/8.6	20/8.2	19/7.7	20/7.7	20/7.6	18/7.2
Kamloops Aberdeen				13/3.8	13/3.8		
Kelowna			16/6.4	18/6.6	19/6.5	20/6.9	17/6.1
Lavington				21/7.2	22/7.7	25/8.4	
Nelson	12/3.9	12/4					
Vernon			18/7.4	20/7.6	22/8	23/8.5	24/8.8

Management Goals for $PM_{2.5}$ based on the Air Quality Management System

Achieve CAAQS	Prevent CAAQS Exceedance	Prevent Air Quality Deterioration	Keep Clean Areas Clean	Not Available

Ozone Levels

Ground-level ozone is a colourless and irritating gaseous pollutant. It forms just above the earth's surface through chemical reactions between "ozone precursor" emissions. Unlike naturally occurring ozone in the ozone layer, ground-level ozone can be harmful to people, animals, and plants.

Figure 4 is the 2018-2020 summary of ozone levels in the Southern Interior Air Zone. Concentrations ranged from 48 parts per billion (ppb) at Castlegar to 51 ppb at Vernon and Kelowna.[3] All sites achieved the new national standard of 62 ppb. There were no adjustments made on the ozone data for transboundary flow and exceptional events (TF/EE) as levels did not exceed the standard.

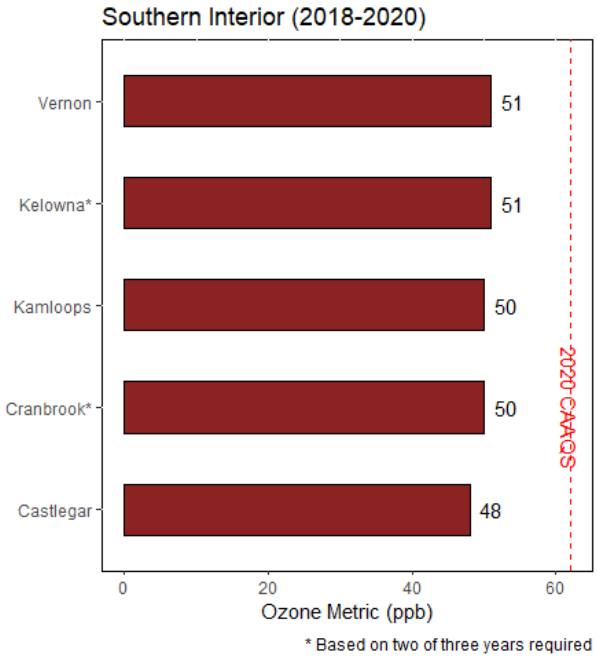

Figure 4. Ozone concentration in the Southern Interior Air Zone based on the annual 4th highest daily 8-hour maximums averaged over 2018-2020. Red dashed line identifies the 2020 CAAQS of 62 ppb.

Annual trends and associated AQMS management levels for ozone are presented in Figure 5 and summarized in Table 3. All the CAAQS-reporting stations in the Southern Interior achieved CAAQS throughout all reporting periods and had been under "green", "yellow", or "orange" management levels.

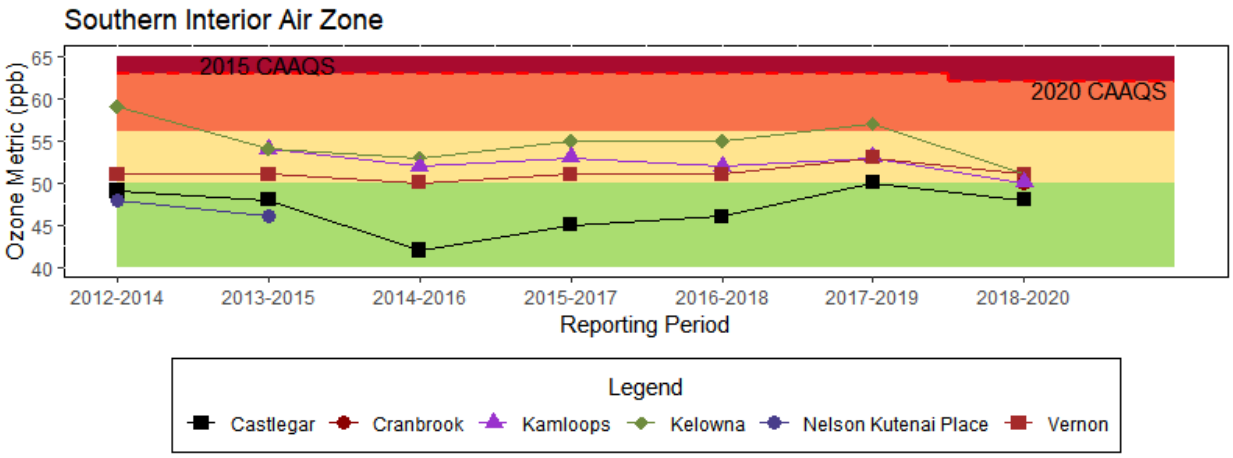

Figure 5. Trends in ozone concentrations based on the annual 4th highest daily 8-hour maximums averaged over three consecutive years. Red dashed line identifies the 2015 and 2020 CAAQS on the reporting period where it applies**.** Background colour shows management levels for the metric.

[3] Ozone 8-hour metric are based on the 4th highest daily 8-hour maximum, averaged over three years (2018-2020).

The highest values are observed at Kelowna, which had been under "orange" management levels during the 2012-2014 and the 2017-2019 reporting periods. In the 2018-2020 reporting period, Kelowna and Vernon are assigned "yellow" management levels for reporting 51 ppb for ozone. Other locations, including Castlegar, Cranbrook, and Kamloops are assigned "green". Overall, the Southern Interior is assigned "yellow" management level in the 2018-2020 period. A "yellow" management level indicates that any ozone-related actions should focus on preventing further air quality deterioration.

Table 2. Summary of ozone metrics and air zone management levels for the Southern Interior Air Zone.

	2012-2014	2013-2015	2014-2016	2015-2017	2016-2018	2017-2019	2018-2020
SOUTHERN INTERIOR (CAAQS)	ORANGE (2015)	YELLOW (2015)	YELLOW (2015	YELLOW (2015	YELLOW (2015	ORANGE (2015)	**YELLOW (2020)**
Castlegar	49	48	42	45	46	50	48
Cranbrook							50
Kamloops		54	52	53	52	53	50
Kelowna	59	54	53	55	55	57	51
Nelson	48	46					
Vernon	51	51	50	51	51	53	51

Management Goals for Ozone based on the Air Quality Management System

Achieve CAAQS	Prevent CAAQS Exceedance	Prevent Air Quality Deterioration	Keep Clean Areas Clean	Not Available

Nitrogen Dioxide Levels

Nitrogen Dioxide (NO_2) is a gaseous pollutant formed along with other nitrogen oxides (NO_x) during the high temperature combustion of fossil fuels. It plays a major role in atmospheric reactions that form ground-level ozone and smog.

There are five stations in the Southern Interior with enough data to report NO_2 for the 2018-2020 CAAQS period. These measurements are summarized in Figure 6 showing 1-hour metrics ranging from 26.4 ppb to 41 ppb, and annual metrics ranging from 3.9 ppb to 10.5 ppb. These are below the 2020 CAAQS of 60 ppb for the 1-hour metric[4], and 17 ppb for the annual metric[5]. The 2018-2020 reporting period is the first period to include NO_2 in air zone reporting.

[4] NO_2 1-hour metrics are based on the 98th percentile of daily 1-hour maximum over three consecutive years (2018-2020).

[5] NO_2 annual metrics are based on the average of 1-hour readings over a single calendar year (2020).

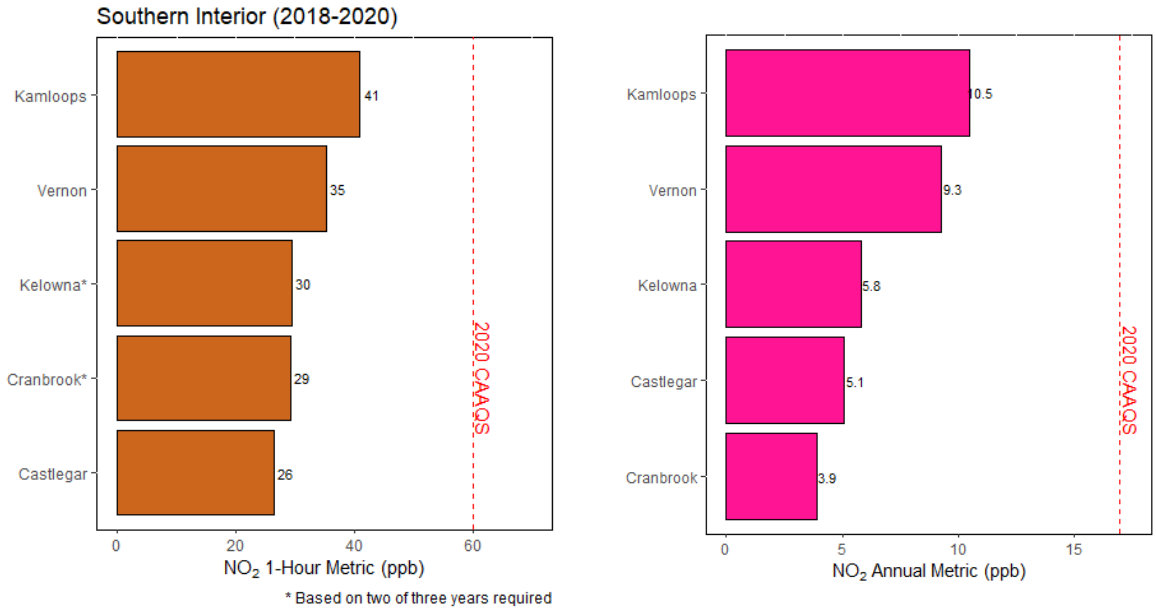

Figure 6. NO_2 concentrations in the Southern Interior Air Zone during the 2018-2020 reporting period based on the 1-hour (left) and annual (right) metrics. The red dashed lines identify the 2020 CAAQS of 60 ppb for the 1-hour metric, and 17 ppb for the annual metric.

Table 4. Summary of NO_2 metrics and air zone management levels for the Southern Interior Air Zone. Data before the 2018-2020 reporting period are for illustration only and not applied towards CAAQS achievement determination.

	2012-2014	2013-2015	2014-2016	2015-2017	2016-2018	2017-2019	2018-2020
SOUTHERN INTERIOR (CAAQS)	2020 CAAQS for NO_2 not applicable before 2018-2020 period. Data shown for illustration only.						**ORANGE (2020)**
Castlegar	26/6.1	26/-		-/6.4	29/6.4	28/5.4	26/5.1
Cranbrook						-/4.5	29/3.9
Kamloops	-/11.8	36/11.2	36/10.1	38/11.3	42/11.8	44/10.9	41/10.5
Kelowna	31/6.7	30/7.1	30/6.8	32/7.6	32/7.2	34/-	30/5.8
Vernon	34/9.6	33/9.8	33/-	36/10.4	38/9.8	36/8.7	35/9.3

Management Goals for NO_2 based on the Air Quality Management System

Achieve CAAQS	Prevent CAAQS Exceedance	Prevent Air Quality Deterioration	Keep Clean Areas Clean	Not Available

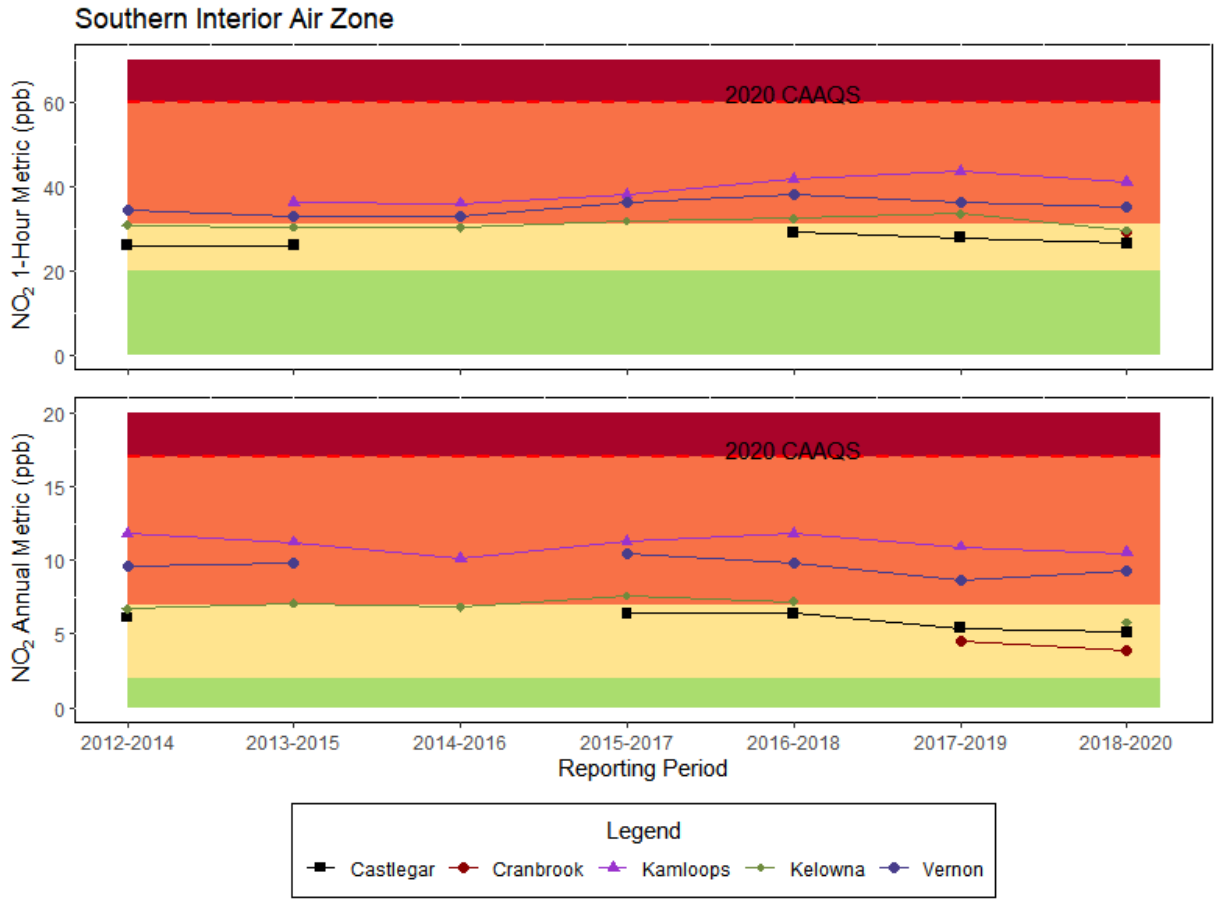

Figure 7. Trends in the 1-hour and annual metrics of NO_2 in the Southern Interior Air Zone. The 2020 CAAQS for NO_2 (red dashed lines) only applies during the 2018-2020 reporting period but presented throughout all reporting periods to visualize trends. The background colour shows the AQMS management levels.

Figure 7 and Table 4 contains summary of NO_2 metrics, CAAQS achievement, and management levels. Reporting from all periods are included to illustrate annual trends even though 2020 CAAQS for NO_2 are not implemented before the 2018-2020 reporting period. Kamloops and Vernon are consistently within "orange" management levels for NO_2, while Castlegar has remained in the "yellow" management levels. Kelowna is mostly within "orange" management level because of the 1-hour metric exceeding 31 ppb in several periods. There is a downward trend in the 2018-2020 reporting period for most sites that may be due to the reductions in vehicular emissions as a result of the COVID-19 pandemic. Overall, the Southern Interior Air Zone is assigned an "orange" management level for the 2018-2020 reporting period based on reporting from Kamloops and Vernon. An "orange" management level means that NO_2-related actions are recommended to prevent the future exceedance of CAAQS. To progress to the next management level, the 1-hour metric must be reduced below 31 ppb and annual metric reduced below 7 ppb.

Sulphur Dioxide Levels

Sulphur dioxide (SO_2) is a toxic gas produced from volcanic eruptions, use of sulphur-bearing fossil fuels, and industrial emissions. Aside from toxicity, SO_2 can also form secondary fine particulate matter and acid rain.

There are several stations in the Southern Interior that are equipped to monitor SO_2. Most of these stations are located near major industrial emission sources in the Southern Kootenays, and some are in urban centres in the Okanagan. Figure 8 shows the levels of SO_2 based on the 1-hour and annual metrics. The figure shows extreme range of values from 1.7 ppb to 209.3 ppb for the 1-hour metric[6], and 0.3 ppb to 7.9 ppb for the annual metric[7]. The 2020 CAAQS of 70 ppb for the 1-hour metric and 5 ppb for the annual metric are exceeded in the Southern Kootenays at the stations in Birchbank, Trail, and Warfield. The 2020 CAAQS for SO_2 are achieved at Castlegar, Kamloops, and Kelowna but since air zone achievement is based on the highest reported metric, the Southern Interior Air Zone did not achieve CAAQS.

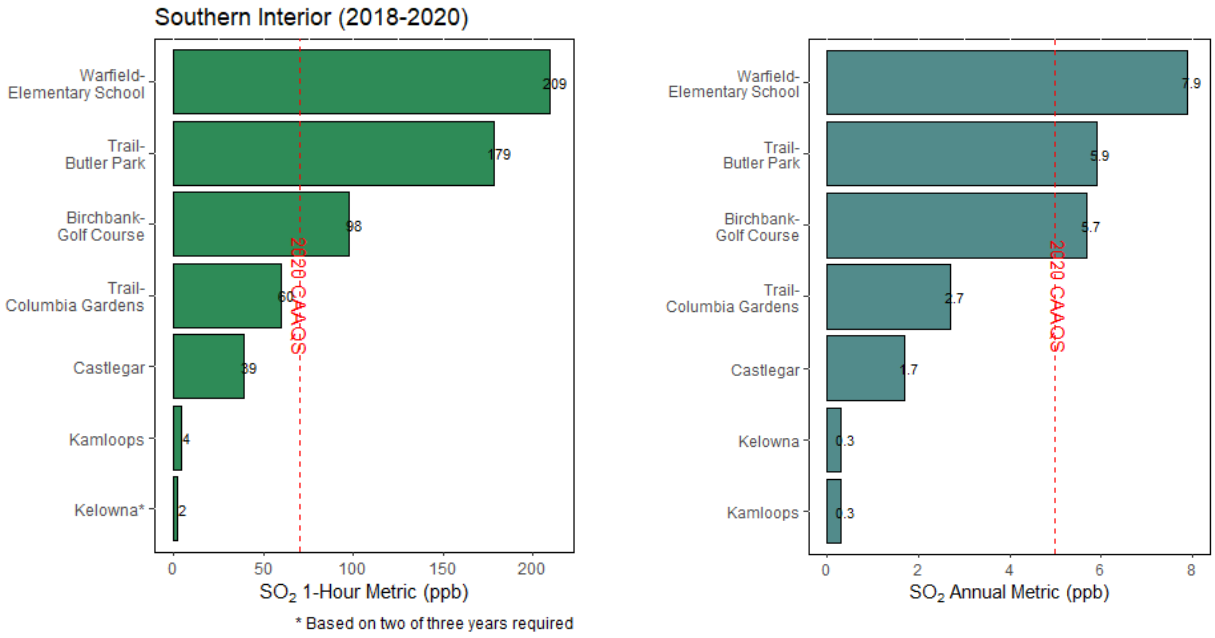

Figure 8. SO_2 concentrations in the Southern Interior Air Zone based on the 1-hour (left) and annual (right) metrics. The red dashed lines identify the 2020 CAAQS of 70 ppb for the 1-hour metric, and 5 ppb for the annual metric.

[6] SO_2 1-hour metrics are based on the 98th percentile of daily 1-hour maximum over three consecutive years (2018-2020).

[7] SO_2 annual metrics are based on the average of 1-hour readings over a single calendar year (2020).

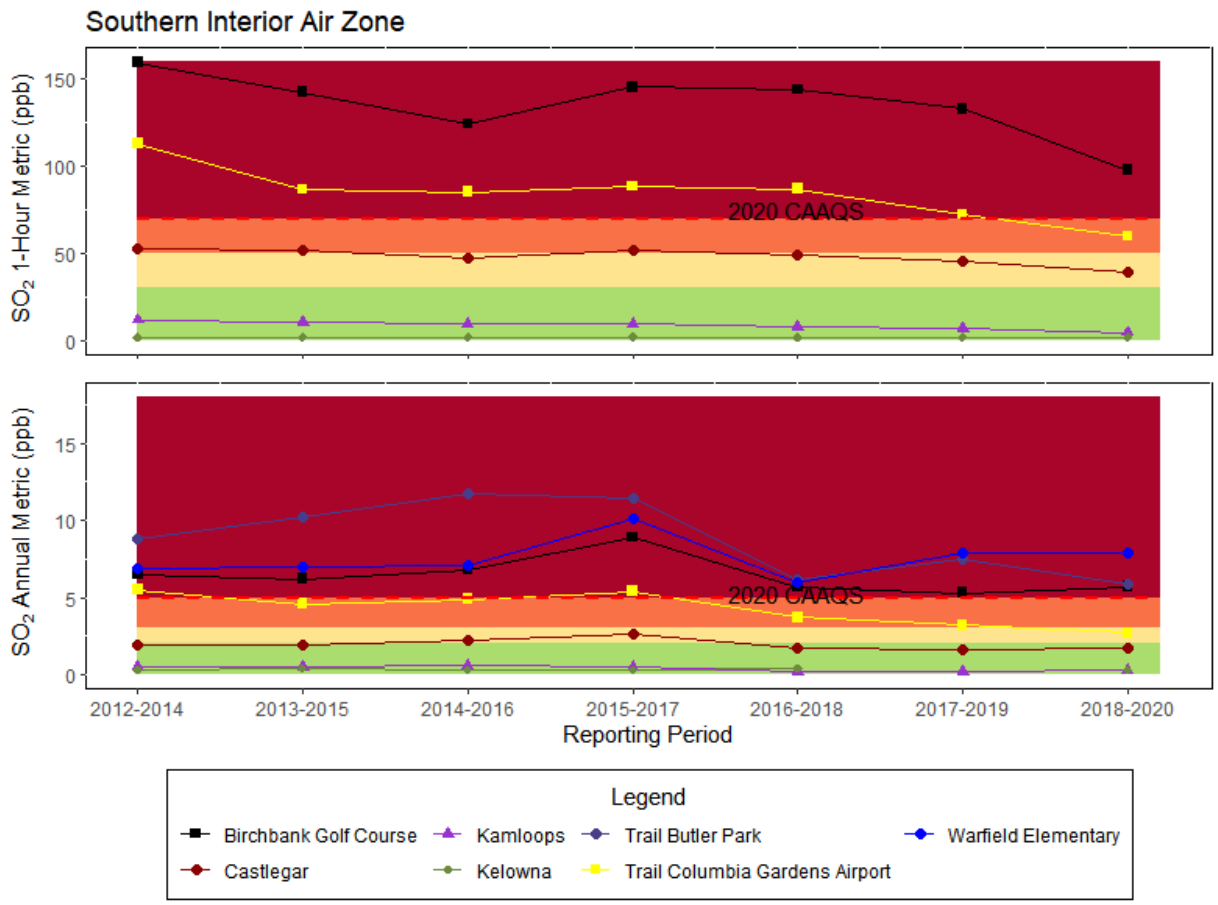

Figure 9. Trends in the 1-hour and annual metrics of SO_2 in the Southern Interior Air Zone. The 2020 CAAQS for SO_2 (red dashed lines) only applies during the 2018-2020 reporting period but presented throughout all reporting periods to visualize trends. The background colour shows the AQMS management levels

The 2018-2020 air zone report is the first to implement the 2020 CAAQS and include SO_2. The assessment for CAAQS achievement of SO_2 and assignment of management levels on earlier reporting periods are not required but presented in Figure 9 and Table 5 to illustrate trends. Figure 9 shows the trends in the 1-hour and annual metrics varies widely in the Southern Interior. It shows stations in the Southern Kootenays at Birchbank, Trail, and Warfield report the highest levels of SO_2 in the air zone and in the Province, consistently exceeding the 70 ppb defined for the 1-hour metric and 5 ppb for the annual. Birchbank is consistently exceeding both standards, while Trail-Butler Park and Warfied Elementary consistently exceeds only the annual standards. Through several reporting periods, Kamloops and Kelowna are consistently within the “green” management levels while Castlegar varies between “orange” and “yellow”. Castlegar, Trail, and Warfield are observed to have decreasing levels of SO_2 but have remained above the standards.

Table 5. Summary of SO_2 metrics and air zone management levels for the Southern Interior Air Zone. Data before the 2018-2020 reporting period are for illustration only and not applied towards CAAQS achievement determination.

	2012-2014	2013-2015	2014-2016	2015-2017	2016-2018	2017-2019	2018-2020
SOUTHERN INTERIOR (CAAQS)	2020 CAAQS for SO_2 not applicable before 2018-2020 period. Data shown for illustration only.						RED (2020)
Birchbank Golf Course	160/6.5	143/6.2	125/6.8	146/8.9	144/5.7	133/5.3	98/5.7
Castlegar	52/1.9	52/1.9	48/2.2	52/2.6	49/1.7	45/1.6	39/1.7
Kamloops	12/0.5	10/0.5	10/0.6	9/0.5	7/0.2	7/0.2	4/0.3
Kelowna	2/0.3	2/0.4	2/0.3	2/0.3	2/0.4	2/-	2/0.3
Trail Butler Park	227/8.8	222/10.2	212/11.7	258/11.4	243/6.2	211/7.5	179/5.9
Trail Columbia Gardens Airport	113/5.5	87/4.6	85/4.9	89/5.4	87/3.7	72/3.2	50/2.7
Warfield Elementary	275/6.9	264/7	212/7.1	248/10.1	248/6	242/7.9	209/7.9

Management Goals for SO_2 based on the Air Quality Management System

Achieve CAAQS	Prevent CAAQS Exceedance	Prevent Air Quality Deterioration	Keep Clean Areas Clean	Not Available

Overall, as shown in Table 5, the Southern Interior Air Zone is assigned a “red” management level of SO_2 for exceeding the 2020 CAAQS at monitoring stations in the Southern Kootenays. Under “red” management level, the highest SO_2-related air quality management actions are recommended to achieve CAAQS. This requires achieving CAAQS in Trail, Warfield, and Birchbank by ensuring 1-hour and annual metrics are below 70 ppb and 5.0 ppb, respectively.

Actions to Protect Air Quality

The reduction of $PM_{2.5}$ emissions continues to be a major air quality priority in many areas of B.C., including the Southern Interior Air Zone.

In 2016, the Province adopted a new Solid Fuel Burning Domestic Appliance Regulation that requires nearly all wood burning appliances sold in B.C. to be certified to meet particulate emissions standards set by the US Environmental Protection Agency (EPA) in 2015, or equivalent standards set by the Canadian Standards Association (CSA) in 2010. The regulation also specifies the types of fuels that can be burnt and has provisions around the sale and installation of outdoor wood boilers. For more information on the regulation, see: https://www2.gov.bc.ca/gov/content/environment/air-land-water/air/air-pollution/smoke-burning/regulations/solid-fuel-burning-domestic-appliance-regulation.

In 2019 the Ministry updated the Open Burning Smoke Control Regulation (OBSCR) to reduce the smoke from open burning. The revised OBSCR has shorter burn periods to discourage smoldering piles. It also increases the required setbacks between open burning and neighbouring residences and businesses. The OBSCR allows a Ministry director to prohibit open burning when there is a risk of pollution and also to vary requirements of the regulation when doing so is necessary to protect the environment or to meet the intent of the regulation.

The Provincial Wood Stove Exchange Program encourages residents to change out their older, smoky wood stoves for low-emission appliances including new CSA-/EPA-certified clean-burning wood stoves. Between 2017 and 2019, wood stove change-out programs were carried out in the Regional Districts of Kootenay-Boundary, Central Kootenay and Central Okanagan as well as in Golden and District, City of Kamloops, Coldstream, Lavington and Lumby.

Strategies and actions to reduce $PM_{2.5}$ emissions have been documented in local airshed plans that have been developed for the Central Okanagan Regional District,[8] City of Kamloops,[9] the Boundary airshed,[10] and Merritt.[11] Golden is host to an active air quality committee.[12]

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[8] http://www.regionaldistrict.com/media/217275/RDCO_2015_Clean_Air_Strategy_Final_DRAFT_2015_02_03_final.pdf

[9] http://www.kamloops.ca/environment/pdfs/13-05-AirshedManagementPlan.pdf

[10] http://www.grandforks.ca/air/aqmplans/GrandForksAQMP-Oct22.pdf

[11] http://www.env.gov.bc.ca/epd/bcairquality/reports/pdfs/merritt_aqmp.pdf

[12] http://www.goldenairquality.ca/

Appendix I – Approach to Identify Wildfire-influenced Data

Summertime air quality in British Columbia is periodically influenced by wildfire smoke – from local fires as well as long-range transport from outside of the province. The wildfire season in B.C. typically occurs between May and September, when warm and dry conditions prevail.

A myriad of different pollutants is emitted from wildfires. These include $PM_{2.5}$ and gases such as nitrogen oxides and volatile organic compounds that can react in the atmosphere to form ground-level ozone and additional $PM_{2.5}$.

Given that smoke-affected areas may be extensive, and that smoke may linger for days before being fully dispersed from an airshed, the current analysis has focussed on those periods when wildfire smoke may have contributed to an exceedance of the CAAQS levels for ground-level ozone or $PM_{2.5}$. Criteria used to flag and evaluate wildfire-influenced data included the following:

- 24-hour $PM_{2.5}$ concentrations in excess of the CAAQS level of 27 $\mu g/m^3$ and/or 8-hour daily maximum ozone concentrations in excess of the CAAQS level of 62 ppb between May and September;
- Wildfires of interest identified based on data from the B.C. Wildfire Management Branch;
- Smoky Skies bulletins issued by the Ministry to notify the public of rapidly changing smoke conditions;
- NASA satellite images showing smoke impacts over the region; and
- Multiple monitoring sites in the area of concern showing elevated pollutant levels, suggesting a common or contributing source.

Wildfire-influenced data were excluded from the calculation of air zone management levels. Excluded data are as summarized in Appendix II.

Appendix II – Wildfire-influenced Data in the Southern Interior Air Zone (2018-2020)

Ozone and $PM_{2.5}$ data from 2018-2020 for the Southern Interior Air Zone were evaluated based on the criteria outlined in Appendix I for TF/EE influences. Various pieces of evidence were used to support identification of wildfire-influenced periods. These included the following:

- Notable wildfires due to size or proximity to populated areas are compiled by the BC Wildfire Service[13] and the US National Interagency Fire Center[14].
  - The 2018 wildfire season was a record-breaking year with 1.35 million hectares of land area burned from several large fires (see Table II-1)
  - The 2020 wildfire season was severe in the Western United States. Smoke from major fires there impacted air quality in southern British Columbia.
- Days flagged as wildfire-influenced (Table II-2) generally coincided with Smoky Skies Bulletins issued by the Ministry, and in a handful of cases, occurred the day before or after a bulletin was announced or ended.

Table II-1. Examples of notable wildfires in the central and Southern Interior Air Zone from 2018-2020.[15]

Date Discovered	Size (ha)	Geographic Location	Description
2018-07-17	19,226	Placer Mount Complex-Snowy Mountain	Lightning-caused
2018-07-17	2,372	Placer Mountain Complex-Placer Mountain	37 km south of Princeton; lightning-caused
2018-07-17	1,370	Okanagan Complex-Goode's Creek	21 km south of Kelowna; lightning-caused
2018-07-17	1,790	Okanagan Complex-Mount Eneas	4 km south of Peachland; lightning-caused
2018-07-17	119	Okanagan Complex-Mount Conkle	6 km southwest of Summerland; lightning-caused
2018-07-18	2,363	Syringa Complex-Blacktail Mountain	8 km southeast of Silverton; lightning-caused
2018-07-29	703	Syringa Complex-McArthur Creek	13 km southeast of Salmo, lightning-caused
2018-07-31	1,370	Monashee Complex-Mabel Creek	6.5 km east of Mabel Lake; lightning-caused

[13] See: https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/wildfire-history/wildfire-season-summary
[14] See: https://www.nifc.gov/fire-information/statistics
[15] See: https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/wildfire-history/wildfire-season-summary

Table II-1 (continued)

Date Discovered	Size (ha)	Geographic Location	Description
2018-07-31	394	Monashee Complex-Sugar Mtn	4 km east of Sugar Lake; suspected lightning-caused
2018-08-01	9,284	Syringa Complex-Meachen Creek	Located within Kianuko Provincial Park, 25.5 km southwest of St. Mary's Lake; lightning-caused
2018-08-02	3,015	Syringa Complex-Cross Creek	23 km northeast of Radium; lightning-caused
2018-08-07	6,798	Syringa Complex-Blazed Creek	20 km west of Creston; lightning-caused
2018-08-12	1,181	Syringa-Randal Creek	17 km southeast of Yahk, on Canada/U.S. border; lightning-caused
2018-08-09	642	Okanagan Complex-Gottfriedsen Mountain Creek	24 km west of West Kelowna, 8 km north of Hwy 97; lightning-caused
2018-08-11	2,227	Syringa Complex-Bulldog Mountain	5 km south of Renata; lightning-caused
2018-08-15	13,626	Placer Mountain Complex-Cool Creeek	20 km northeast from Eastgate; lightning-caused
2019-05-12	350,135	Chuckegg Creek wildfire HWF042 – High Level, Alberta	Lightning-caused; uncontrolled over 98 days due to extremely dry conditions
2020-09-07	130,000	Cold Springs, Washington, USA	Historic fire event caused by extreme drought conditions in the Pacific Northwest
2020-08-16	162,000	Santiam Fire, Oregon, USA	Lightning-caused; Started as three separate fires near Mount Jefferson Wilderness in Oregon.

Table II-2 – Wildfire-influenced $PM_{2.5}$ data from 2018-2020. Al dates shown coincided with a Smoky Skies Bulletin for the area of interest except values highlighted in red.

Location	Date	Daily $PM_{2.5}$ ($\mu g/m^3$)
Castlegar	2018-08-08	35
Castlegar	2018-08-09	37.7
Castlegar	2018-08-10	42.1
Castlegar	2018-08-11	35.7
Castlegar	2018-08-12	96.1
Castlegar	2018-08-13	94.4
Castlegar	2018-08-14	71.6
Castlegar	2018-08-15	109
Castlegar	2018-08-16	114.5
Castlegar	2018-08-17	108.5
Castlegar	2018-08-18	265.2
Castlegar	2018-08-19	420.2
Castlegar	2018-08-20	177.5
Castlegar	2018-08-21	172.5
Castlegar	2018-08-22	217.3
Castlegar	2018-08-23	66.6
Castlegar	2018-08-24	143.1
Castlegar	2018-08-25	211.7
Castlegar	2018-08-26	139.2
Castlegar	2018-09-01	37.4
Castlegar	2018-09-02	88.6
Castlegar	2018-09-03	52.5
Castlegar	2018-09-04	66.5
Castlegar	2018-09-05	137.7
Castlegar	2018-09-06	130.8
Castlegar	2018-09-07	77.9
Castlegar	2018-09-11	35.7
Castlegar	2020-09-11	28.7
Castlegar	2020-09-12	228.4
Castlegar	2020-09-13	423.5
Castlegar	2020-09-14	316.3
Castlegar	2020-09-15	227.0
Castlegar	2020-09-16	123.4
Castlegar	2020-09-17	68.6
Castlegar	2020-09-18	60.5

Location	Date	Daily $PM_{2.5}$ ($\mu g/m^3$)
Castlegar	2020-09-19	60.0
Cranbrook	2018-08-23	93.3
Cranbrook	2018-08-24	86.6
Cranbrook	2018-09-02	30.2
Cranbrook	2019-05-31	36.0
Cranbrook	2020-09-12	73.1
Cranbrook	2020-09-16	63.2
Cranbrook	2020-09-17	58.5
Cranbrook	2020-09-18	63.4
Cranbrook	2020-09-19	40.3
Golden	2018-08-08	50.8
Golden	2018-08-09	65.4
Golden	2018-08-10	70.7
Golden	2018-08-11	77.4
Golden	2018-08-13	30.1
Golden	2018-08-14	36.9
Golden	2018-08-15	90.8
Golden	2018-08-16	73.1
Golden	2018-08-17	56.8
Golden	2018-08-18	159.7
Golden	2018-08-19	152.6
Golden	2018-08-20	42.9
Golden	2018-08-21	40.3
Golden	2018-08-22	59.5
Golden	2018-08-23	86.1
Golden	2018-08-24	76.4
Golden	2018-08-25	96.5
Golden	2018-08-26	60.6
Golden	2018-09-01	32.6
Golden	2018-09-02	41.2
Golden	2020-09-13	67.1
Golden	2020-09-14	135.7
Golden	2020-09-15	100.4
Golden	2020-09-16	45.4
Golden	2020-09-17	30.6

Table II-2 (continued)

Location	Date	Daily $PM_{2.5}$ ($\mu g/m^3$)
Golden	2020-09-18	38.9
Golden	2020-09-19	41.8
Grand Forks	2018-07-31	29.9
Grand Forks	2018-08-07	37
Grand Forks	2018-08-08	35.6
Grand Forks	2018-08-09	37.3
Grand Forks	2018-08-10	34.3
Grand Forks	2018-08-11	87.6
Grand Forks	2018-08-12	95.8
Grand Forks	2018-08-13	92.7
Grand Forks	2018-08-14	57.8
Grand Forks	2018-08-15	81.9
Grand Forks	2018-08-16	75.2
Grand Forks	2018-08-17	80.5
Grand Forks	2018-08-18	200.3
Grand Forks	2018-08-19	409.8
Grand Forks	2018-08-20	92.4
Grand Forks	2018-08-21	86
Grand Forks	2018-08-22	73
Grand Forks	2018-08-23	100.9
Grand Forks	2018-08-24	102.6
Grand Forks	2018-08-25	113.2
Grand Forks	2018-08-26	35.5
Grand Forks	2018-09-06	29
Grand Forks	2020-09-08	64.5
Grand Forks	2020-09-09	36.6
Grand Forks	2020-09-12	274.5
Grand Forks	2020-09-13	374.7
Grand Forks	2020-09-14	323.5
Grand Forks	2020-09-15	166.8
Grand Forks	2020-09-16	65.6
Grand Forks	2020-09-17	60.6
Grand Forks	2020-09-18	77.5
Grand Forks	2020-09-19	71.6
Kamloops-Fed. Bldg	2018-08-07	67.2
Kamloops-Fed. Bldg	2018-08-08	47.2
Kamloops-Fed. Bldg	2018-08-11	68.4
Kamloops-Fed. Bldg	2018-08-12	125.2

Location	Date	Daily $PM_{2.5}$ ($\mu g/m^3$)
Kamloops-Fed. Bldg	2018-08-13	144.3
Kamloops-Fed. Bldg	2018-08-14	66.1
Kamloops-Fed. Bldg	2018-08-15	68.3
Kamloops-Fed. Bldg	2018-08-16	55.3
Kamloops-Fed. Bldg	2018-08-17	143.6
Kamloops-Fed. Bldg	2018-08-18	326.6
Kamloops-Fed. Bldg	2018-08-19	161
Kamloops-Fed. Bldg	2018-08-20	33.1
Kamloops-Fed. Bldg	2018-08-22	56
Kamloops-Fed. Bldg	2018-08-23	166.3
Kamloops-Fed. Bldg	2018-08-24	135.4
Kamloops-Fed. Bldg	2018-08-25	53.5
Kamloops-Fed. Bldg	2020-09-13	58.6
Kamloops-Fed. Bldg	2020-09-14	97.6
Kamloops-Fed. Bldg	2020-09-15	56.4
Kamloops-Fed. Bldg	2020-09-16	46.9
Kamloops-Fed. Bldg	2020-09-17	41.8
Kamloops-Fed. Bldg	2020-09-18	53.0
Kelowna	2018-07-19	48.6
Kelowna	2018-08-07	28.2
Kelowna	2018-08-08	47.8
Kelowna	2018-08-09	40
Kelowna	2018-08-10	49
Kelowna	2018-08-12	96.3
Kelowna	2018-08-13	127.8
Kelowna	2018-08-14	57.6
Kelowna	2018-08-15	81.9
Kelowna	2018-08-16	71.2
Kelowna	2018-08-17	122.1
Kelowna	2018-08-18	308.1
Kelowna	2018-08-19	299.2
Kelowna	2018-08-20	82.2
Kelowna	2018-08-21	51.5
Kelowna	2018-08-22	61.9
Kelowna	2018-08-23	65.3
Kelowna	2018-08-24	118.9
Kelowna	2018-08-25	38.3
Kelowna	2020-09-08	49.2

Table II-2 (continued)

Location	Date	Daily $PM_{2.5}$ ($\mu g/m^3$)
Kelowna	2020-09-13	207.8
Kelowna	2020-09-14	263.7
Kelowna	2020-09-15	137.1
Kelowna	2020-09-16	65.0
Kelowna	2020-09-17	50.8
Kelowna	2020-09-18	55.9
Lavington	2018-08-07	40.2
Lavington	2018-08-08	57
Lavington	2018-08-09	51.4
Lavington	2018-08-10	64.8
Lavington	2018-08-11	64.8
Lavington	2018-08-12	107.3
Lavington	2018-08-13	124
Lavington	2018-08-14	72.9
Lavington	2018-08-15	96.2
Lavington	2018-08-16	63.3
Lavington	2018-08-17	119.3
Lavington	2018-08-18	257.9
Lavington	2018-08-19	292.3
Lavington	2018-08-20	100.1
Lavington	2018-08-21	62.1
Lavington	2018-08-22	92.2
Lavington	2018-08-23	86.6
Lavington	2018-08-24	146.9
Lavington	2018-08-25	88.7
Lavington	2018-09-07	37.6
Vernon	2018-08-07	36.4
Vernon	2018-08-08	52.3
Vernon	2018-08-09	39.3
Vernon	2018-08-10	43
Vernon	2018-08-11	48.6
Vernon	2018-08-12	111.3
Vernon	2018-08-13	117.8
Vernon	2018-08-14	59.1
Vernon	2018-08-15	77.5
Vernon	2018-08-16	58.1
Vernon	2018-08-17	139
Vernon	2018-08-18	284.6
Vernon	2018-08-19	264.6
Vernon	2018-08-20	80.3
Vernon	2018-08-21	46.9
Vernon	2018-08-22	68.8
Vernon	2018-08-23	86.7
Vernon	2018-08-24	138.7
Vernon	2018-08-25	76.5
Vernon	2018-09-07	29.8

a. NASA EOSDIS, 7 August 2018

b. NASA EOSDIS, 10 August 2018

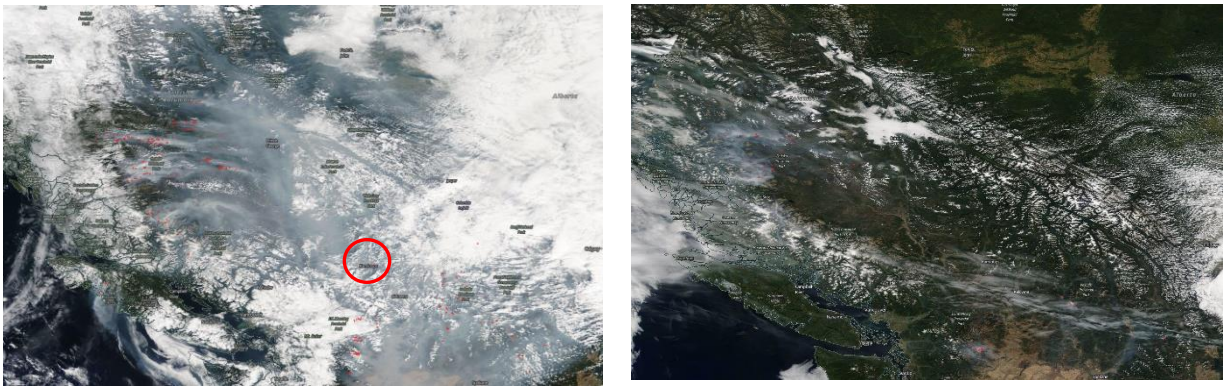
c. NASA EOSDIS, 14 August 2018

d. NASA EOSDIS 17 August 2018

e. NASA EOSDIS, 20 August 2018

f. NASA EOSDIS, 22 August 2018

Figure II-1. Corrected reflectance satellite images from NASA's Earth Observing System Data and Information System (EOSDIS) from August 7-22, 2018 showing wildfire smoke (grey plumes) over the province including the Southern Interior Air Zone. Red dots indicate fires and thermal anomalies. Source of images: NASA EOSDIS Snapshots at: https://worldview.earthdata.nasa.gov/.



a. NASA EOSDIS, 24 August 2018 b. NASA EOSDIS, 4 September 2018

Figure II-2. Corrected reflectance satellite images from NASA's Earth Observing System Data and Information System (EOSDIS) from August 24-and September 4, 2018 showing wildfire smoke (grey plumes) over the province including the Southern Interior Air Zone. Red dots indicate fires and thermal anomalies. Source of images: NASA EOSDIS Snapshots at: https://worldview.earthdata.nasa.gov/.

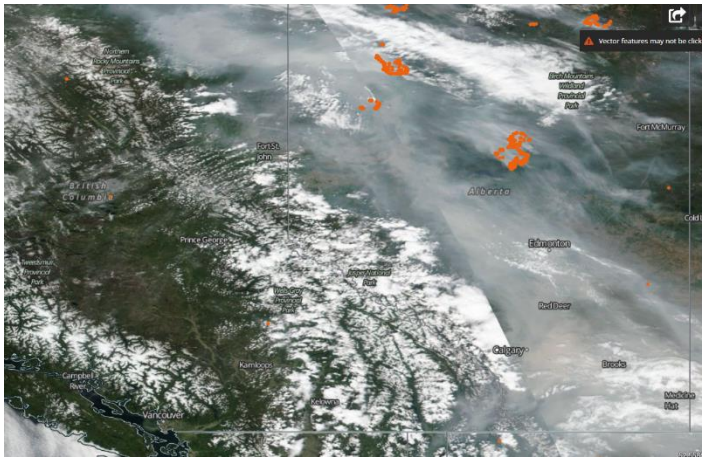
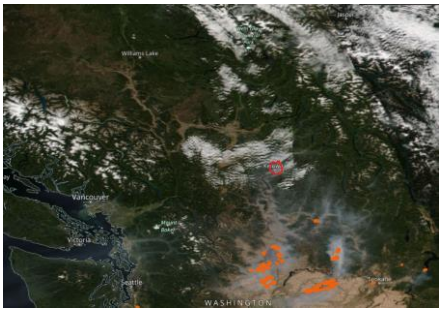
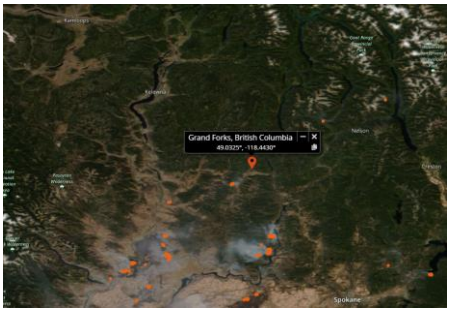


Figure II-3. Satellite images taken on May 25, 2019 showing wildfire smoke over parts of B.C. including the Southeastern part of the province. Small orange dots indicate thermal anomalies from wildfires in High Level, Alberta.

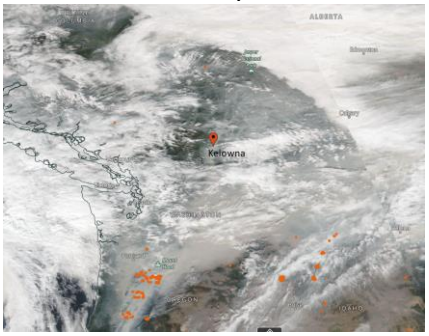


NASA EOSDIS, 8 September 2020

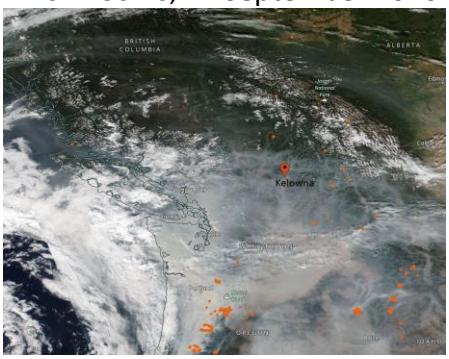


NASA EOSDIS, 9 September 2020

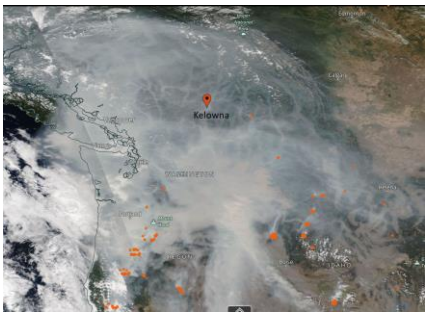
NASA EOSDIS, 11 September 2020



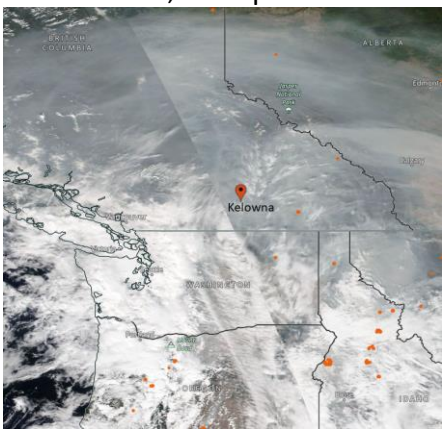
NASA EOSDIS, 14 September 2020



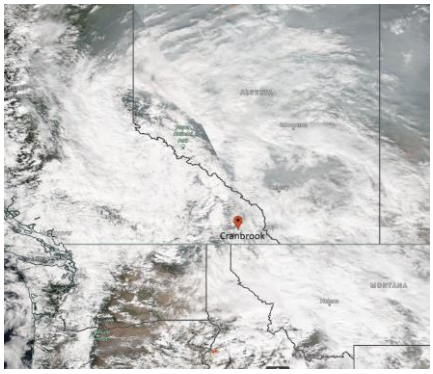
NASA EOSDIS, 16 September 2020



NASA EOSDIS, 17 September 2020



NASA EOSDIS, 18 September 2020



NASA EOSDIS, 19 September 2020

Figure II-4. Corrected reflectance satellite images from NASA's Earth Observing System Data and Information System (EOSDIS) from September 8-19, 2020 showing wildfire smoke (grey plumes) over the province including the Southern Interior Air Zone. Red dots indicate fires and thermal anomalies. Source of images: NASA EOSDIS Snapshots at: https://worldview.earthdata.nasa.gov/.