Saskatchewan Air Quality Report

Meeting the Canadian Ambient Air Quality Standards
2019-2021, 2020-2022

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Saskatchewan

Contents

1.0 Summary

Saskatchewan is known for its natural features, including an abundance of beautiful open landscapes and scenic provincial parks. Measuring and evaluating air quality is critical to keeping our environment and people healthy and resilient.

This report summarizes the current state of ambient air quality in Saskatchewan. It describes the achievement of the Canadian Ambient Air Quality Standards (CAAQS) for 2019-2021 and 2020-2022, the associated management levels and recent and future actions designed to improve air quality in Saskatchewan. It also examines the long-term trends of the same four air pollutants that make up the CAAQS in the province:

- sulfur dioxide (SO_2);
- nitrogen dioxide (NO_2);
- ground-level ozone (O_3); and
- fine particulate matter ($PM_{2.5}$).

Overall, concentrations of SO_2, O_3, and NO_2 generally meet the Saskatchewan and Canadian ambient air quality standards in Saskatchewan and the health risk to humans from ambient air quality is generally low. The observed increase in $PM_{2.5}$ peak ambient concentrations due to wildfire activity continues to be a concern across the province, especially in the Boreal, Northeast and Western Yellowhead air zones, as this leads to an increased health risk.

Over the last 18 years:

- Provincial annual averages show a decrease in SO_2 and NO_2 concentrations compared to 2005 values, with a decrease of 32.1 per cent for SO_2 and 46.1 per cent for NO_2. These decreases in concentrations can be attributed to lower emissions from industry and mobile or transportation sources.
- The province experienced a 91.1 per cent increase in $PM_{2.5}$ concentrations. This can be attributed to above-average forest fire activities observed in the province in recent years and changes in monitoring technology.
- O_3 concentrations have increased by 56.4 per cent since 2005. The increase in O_3 concentrations may be related to a rise in average background O_3 concentrations and cross-border impacts.

Changes in pollutant concentrations since the last report:

- Provincially, there has been a slight increase in O_3 with a 6.2% increase and no significant change in SO_2 concentrations.
- NO_2 concentrations varied across the province with a 25% decrease in Buffalo Narrows, 10.6% increase in Swift Current and a 6.2% decrease in Saskatoon.
- There was an overall 14.1% increase in $PM_{2.5}$ on average in the province with a notable 38.5% increase in Buffalo Narrows and 51.4% increase in Saskatoon. This can be attributed to wildfire activity in 2021.

Some of the important provincial actions that have been or will be taken to protect air quality and prevent CAAQS exceedances include:

- Continuing to use the provincial mobile monitoring program to better characterize air pollutant concentrations in air zones.
- The Government of Saskatchewan has engaged air zone associations to assess air quality issues and collaboratively identify, prevent and mitigate risks to human health and safety.

- In 2018 and 2019, the Government of Saskatchewan enacted legislation to reduce greenhouse gas emissions, including the Methane Action Plan (MAP) January 2019. This will reduce methane emissions and emissions from electricity production. It should also result in a reduction in ground level ozone, as methane in the air can lead to ozone formation.

Additional provincial and air zone-specific actions are provided in Table 13.

This report satisfies Saskatchewan's commitment to the Canadian Council of Ministers of the Environment's (CCME) Air Quality Management System (AQMS) for monitoring and reporting to the public on air quality.

2.0 Background

2.1 Long-term Ambient Air Quality Monitoring

The Ministry of Environment, in cooperation with the National Air Pollution Surveillance (NAPS) program, operates a network of ambient air quality monitoring stations in Saskatchewan. The NAPS program is administered by Environment and Climate Change Canada (ECCC) and is managed through an agreement between the federal government and the provincial and territorial governments. The NAPS program was established to ensure quality, reliable data and to produce a standard method of obtaining measurements of ambient air quality across Canada.

Continuous ambient air quality monitoring in Saskatchewan began in the early 1970s. The number of stations and locations have varied over the years and, as of 2023, there are six NAPS stations. They are in Buffalo Narrows, Estevan, Prince Albert, Regina, Saskatoon and Swift Current. Figure 2 in Section 2.4 shows the locations of the NAPS stations.

The long-term trend analysis presented in this report is focused on the four pollutants that have CAAQS: SO_2, O_3, NO_2 and $PM_{2.5}$. As per NAPS reporting standards, only annual averages that meet 50 per cent data completeness criteria are presented.

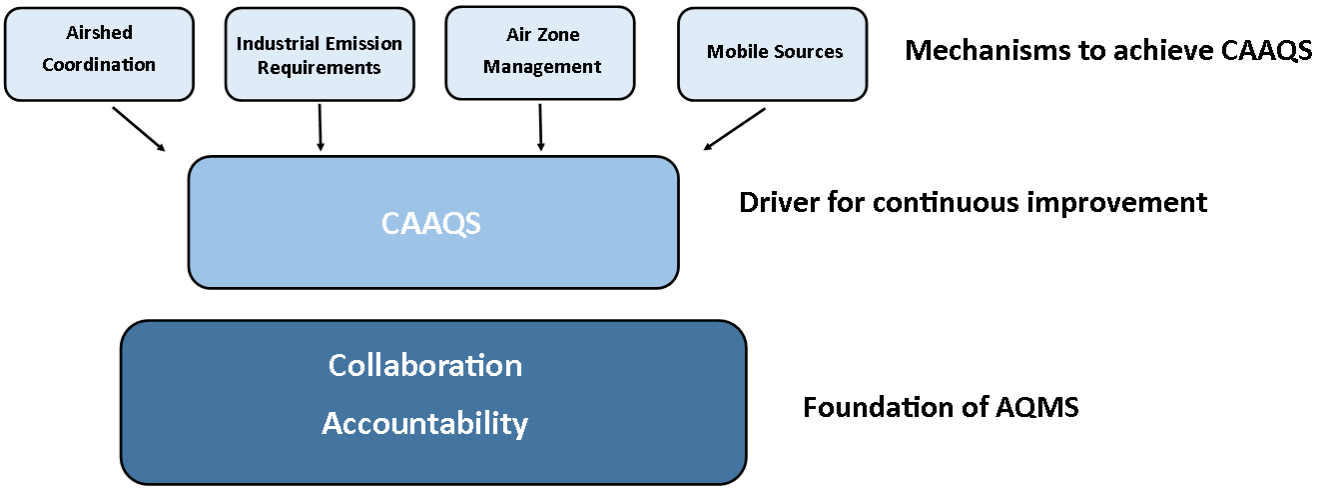
These pollutants can cause a range of negative human health effects and impacts on the environment. For instance, all four pollutants can cause irritation of the lungs, eyes, nose, throat and respiratory tract. Chronic exposure can result in decreased lung function. Sulfur dioxide and nitrogen dioxide can react with moisture in the atmosphere to produce acid rain, which in turn can damage ecosystems. Nitrogen oxides also react with hydrocarbons in the air to form O_3, which is a component of smog.

Ambient air quality data at NAPS stations is measured with analyzers that meet the United States Environmental Protection Agency Federal Equivalent Methodology (USEPA FEM) requirements for ambient air quality monitoring. To ensure ambient air quality data is scientifically defensible and comparable in all jurisdictions across Canada, the Ministry of Environment carries out all the requirements of the NAPS *Ambient Air Monitoring and Quality Assurance/Quality Control (QA/QC) Guidelines* (2019). Annual averages of each parameter were calculated for each NAPS station, and both station and network-wide trends are presented and discussed in Section 4.1.

2.2 The Air Quality Management System

The AQMS was established in October 2012 by the CCME and is the national approach to managing air quality in Canada. The AQMS is built on a foundation of collaboration, accountability and transparency. Industry, non-governmental and Indigenous organizations worked with governments to develop the AQMS. The CCME continues to develop, monitor and improve the implementation of the AQMS. More information on the AQMS can be found on the CCME website: ccme.ca/en/air-quality-report. The driver for continuous air quality improvement is the CAAQS. Figure 1 provides a visual representation of the AQMS elements. As part of its commitment to the AQMS, the Government of Saskatchewan established Saskatchewan air zones and reports to the public on air quality.

Figure 1 - Air Quality Management System Elements



2.3 The Canadian Ambient Air Quality Standards

The CAAQS are national air quality standards intended to protect human health and the environment. The CAAQS were developed collaboratively with the federal, provincial and territorial governments and stakeholders under the direction of CCME. Table 1 shows the current 2020 CAAQS for $PM_{2.5}$, O_3, SO_2, NO_2 and their respective averaging times and statistical metrics. The 2020 CAAQS are used in this report to assess achievement for the 2019-2021 and 2020-2022 reporting periods. The standards are the concentration numerical values in Table 1 and are based on associated time-averaging periods and statistical forms, which account for varying exposures that may result in acute (short-term) and chronic (long-term) effects. More information on the CAAQS can be found on the CCME website: ccme.ca/en/air-quality-report.

Table 1 - 2020 CAAQS

Pollutant	Averaging Time	Standard	Metric
		2020	
$PM_{2.5}$	24-hour	27 micrograms/cubic meter	The three-year average of the annual 98 percentile of the daily 24-hour average concentrations.
$PM_{2.5}$	Annual	8.8 micrograms/cubic meter	The three-year average of the annual average of the daily 24-hour average concentrations.
O_3	Eight-hour	62 parts per billion	The three-year average of the annual fourth highest daily maximum eight-hour average concentrations.
SO_2	One-hour	70 parts per billion	The three-year average of the annual 99 percentile of the SO_2 daily maximum one-hour average concentrations.
SO_2	Annual	5.0 parts per billion	The average over a single calendar year of all one-hour average SO_2 concentrations.
NO_2	One-hour	60 parts per billion	The three-year average of the annual 98 percentile of the daily maximum one-hour average concentrations.
NO_2	Annual	17.0 parts per billion	The average over a single calendar year of all one-hour average concentrations.

2.4 Air Zones

Air zones are established by provincial and territorial governments to define areas that exhibit similar air quality characteristics, issues and trends. These air zones form the basis for monitoring, reporting and acting on air quality issues. Saskatchewan has six air zones, each of which has at least one CAAQS reporting station, as seen in Figure 2.

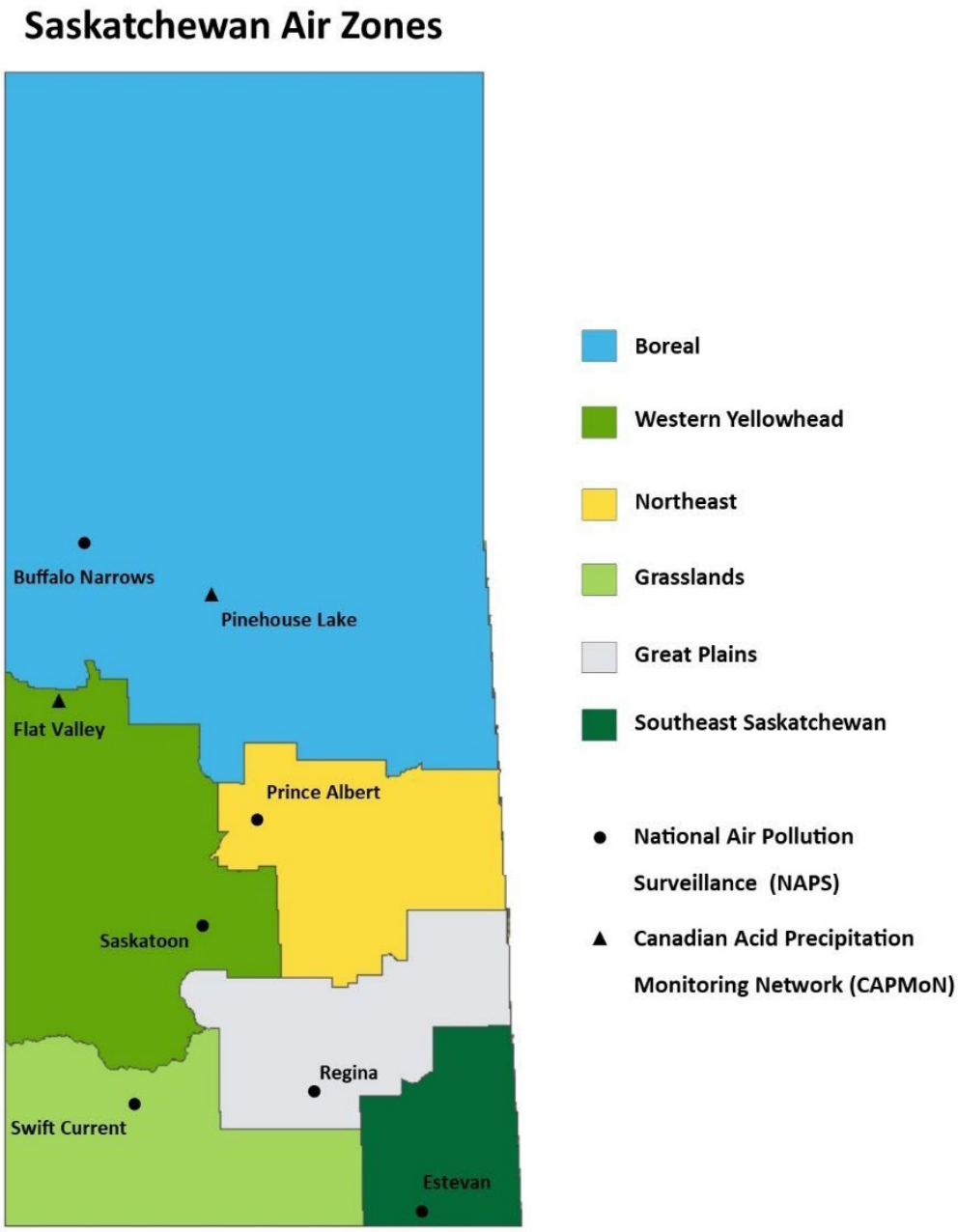


Figure 2 - Saskatchewan Air Zones and CAAQS Reporting Stations

2.5 Air Zone Management Levels

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 outlined in Tables 2 through 5 and Figure 3.

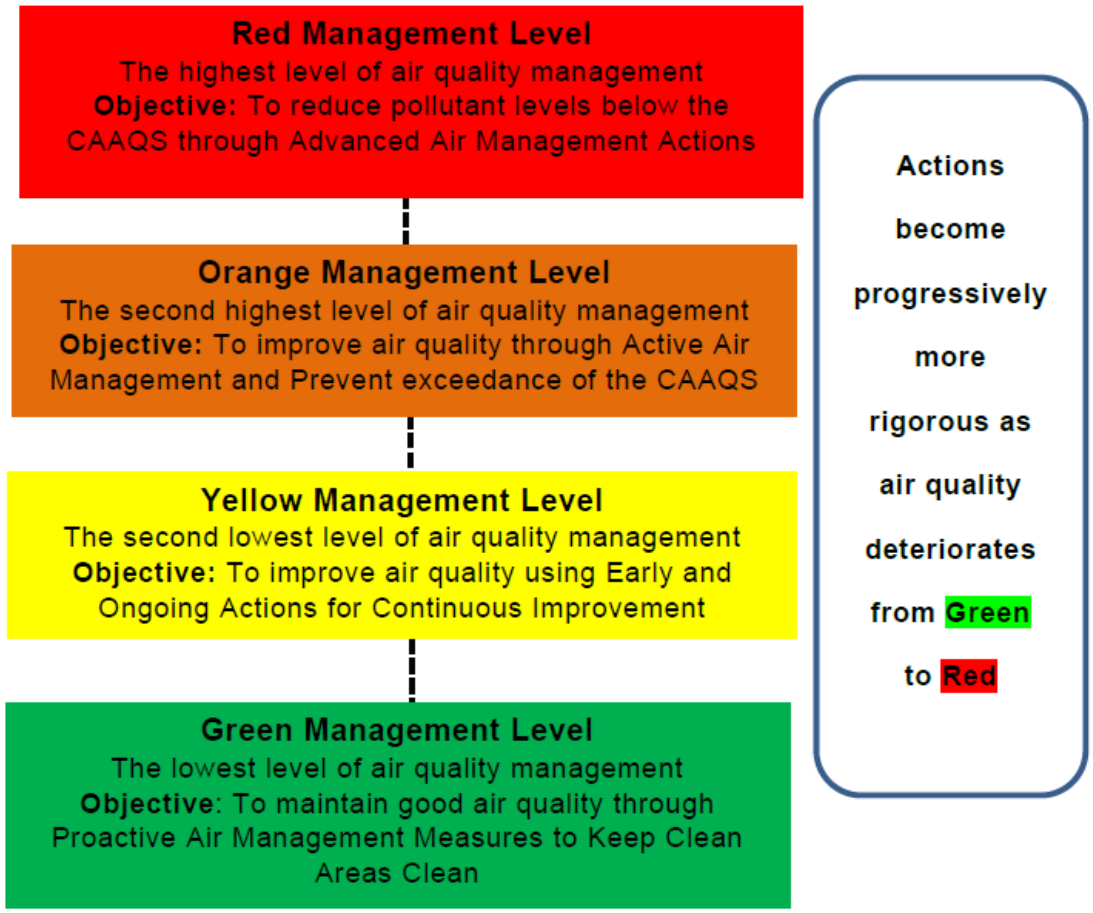


Figure 3 – The Air Zone Management Framework

Table 2 - Management levels for O_3 (8-hour average)

Management level	2020
Red	> 62 ppb
Orange	57 to 62 ppb
Yellow	51 to 56 ppb
Green	≤ 50 ppb

Table 3 - Management levels for $PM_{2.5}$

Management level	$PM_{2.5}$ 24-hour	$PM_{2.5}$ annual
	2020	2020
Red	> 27 µg/m^3	> 8.8 µg/m^3
Orange	20 to 27 µg/m^3	6.5 to 8.8 µg/m^3
Yellow	11 to 19 µg/m^3	4.1 to 6.4 µg/m^3
Green	≤ 10 µg/m^3	≤ 4.0 µg/m^3

Table 4 - Management levels for SO_2

Management level		SO_2 1-hour	SO_2 annual
		2020	2020
Red		> 70 ppb	> 5.0 (CAAQS)
Orange		51 to 70 ppb	3.1 to 5.0 ppb
Yellow		31 to 50 ppb	2.1 to 3.0 ppb
Green		≤ 30 ppb	≤ 2.0 ppb

Table 5 - Management levels for NO_2

Management level	NO_2 1-hour	NO_2 annual
	2020	2020
Red	> 60 ppb	> 17.0 ppb
Orange	32 to 60 ppb	7.1 to 17.0 ppb
Yellow	21 to 31 ppb	2.1 to 7.0 ppb
Green	≤ 20 ppb	≤ 2.0 ppb

Each management level has associated actions. The *Guidance Document on Air Zone Management (CCME, 2019)* suggests air zones in all management levels should:

- Prepare and publish annual reports on current ambient air quality levels and trends, air zone management levels and management actions to reduce air pollutant levels; and
- Educate the public on local air quality.

Air zones assigned management levels other than green have additional emphasis on active management to improve air quality, both to prevent deterioration in air quality and to achieve the CAAQS. Yellow and orange levels initiate actions such as:

- Ensure air pollutant monitoring is adequate to capture variability in concentrations over time and in different locations.
- Compile, as required, emissions inventories for air zones to evaluate main sources of air pollutants.
- Engage local stakeholders as appropriate.
- Develop, implement and release air zone management plans to prevent air quality deterioration, taking into consideration all important sources of air pollutants and provincial and territorial policies and assess progress.

2.6 Transboundary Flows and Exceptional Events

Measured concentrations of air pollutants may reflect human activity, transboundary flows (TF) and exceptional events (EE). The achievement status and management levels of the CAAQS must be reported regardless of the pollutant source. However, adjusted metric values and management levels may be reported when considering TF or EE, when supported by evidence, in addition to the CAAQS values of all measured concentrations.

Transboundary flows (TF) refer to emissions of air pollutants related to human activity released in one jurisdiction and transported or moved by winds and weather systems into another. Exceptional events (EE) typically refer to smoke from forest fires or other non-controllable or accidental causes. For more information on TF or EE, please refer to the Guidance Document on Transboundary Flows and Exception Events (CCME 2019), which provides guidance on the procedures to use for considering the influences of TF-EE on CAAQS exceedances and management levels.

3.0 CAAQS Assessment Methodology

3.1 Saskatchewan CAAQS reporting stations for 2019-2021 and 2020-2022.

Saskatchewan CAAQS achievement reporting for the 2019-2021 and 2020-2022 reporting periods were accomplished using data from the NAPS program and the Canadian Acid Precipitation Monitoring Network (CAPMoN). The NAPS ambient air monitoring program is operated by the Government of Saskatchewan and provides accurate, long-term air quality data. The CAPMoN program is operated by the federal government and collects continuous O_3 data, in addition to monitoring for wet deposition.

Based on data availability in the 2019-2021 and 2020-2022 reporting periods, the following air quality stations were used to calculate the CAAQS metric values:

- **Boreal** – NAPS monitoring station, Buffalo Narrows; CAPMoN site, Pinehouse Lake.
- **Western Yellowhead** – NAPS monitoring station, Saskatoon; CAPMoN site, Flat Valley.
- **Grasslands** – NAPS monitoring station, Swift Current.
- **Southeast Saskatchewan** –NAPS monitoring station, Estevan.
- **Great Plains** – NAPS monitoring station, Regina.
- **Northeast** – NAPS monitoring station, Prince Albert.

3.2 Achievement Assessment

Data from the NAPS and CAPMoN reporting stations is assessed for completeness and used to calculate the metric values as specified in the appropriate *Guidance Document on Achievement Determination for Canadian Ambient Air Quality Standards* for $PM_{2.5}$, O_3, NO_2 and SO_2. These calculated values are then compared against the CAAQS standards, which are provided in Table 1, Section 2.3.

An air zone achieves the standard if the calculated metric value is equal to or less than the standard. An air zone does not achieve the standard if the metric value is greater than the standard.

3.3 Management Levels Assignment

For this report, fine particulate matter values that were equal to or greater than the orange management level threshold values and that were identified as being influenced by transboundary flows and exceptional events, were removed from the dataset as described in Appendix B. The metric values were recalculated without the influenced data to assign management levels and are referred to as the adjusted metric values. Since the management level dictates the types of actions the province should take, long-term management strategies should be developed based on factors the province can influence. Fine particulate matter was the only parameter that this process applied to as being influenced by transboundary flows and exceptional events.

4.0 Results

4.1 Long-term Ambient Air Quality Trends

Long-term trends were evaluated for SO_2, O_3, NO_2, and $PM_{2.5}$ for the period of 2005 to 2022, and are presented in Figures 4 to 7 for each station and for each pollutant. Network wide annual average concentrations and change in concentrations since 2005 are presented in Appendix A and graphically in Figure 8. Overall, concentrations of these pollutants are generally low in Saskatchewan and the health risk to humans from ambient air quality is generally low. There have been some changes in measured concentrations over the last 18 years. Provincial annual averages show a decrease in SO_2 and NO_2 concentrations compared to 2005 values, with a decrease of 32.1 per cent for SO_2 and 46.1 per cent for NO_2. These decreases in concentrations can be attributed to lower emissions from industry and mobile or transportation sources.

Ground level O_3 and $PM_{2.5}$ concentrations have increased throughout the province in the last 18 years. The province experienced a 91.1 per cent increase in $PM_{2.5}$ concentrations. This can be attributed to above-average forest fire activities observed in the province in recent years and changes in monitoring technology. Ground level O_3 concentrations have increased by 56.4 per cent since 2005. The increase in O_3 concentrations may be related to a rise in average background O_3 concentrations and cross-border impacts. Background O_3 includes naturally occurring ozone. The formation of O_3 is complex and dependent on a chemical reaction involving NO_x and hydrocarbons in the presence of sunlight. When low levels of NO are present there is less of what is referred to as O_3 scavenging, which can result in levels of O_3 remaining high and even increase in concentration.

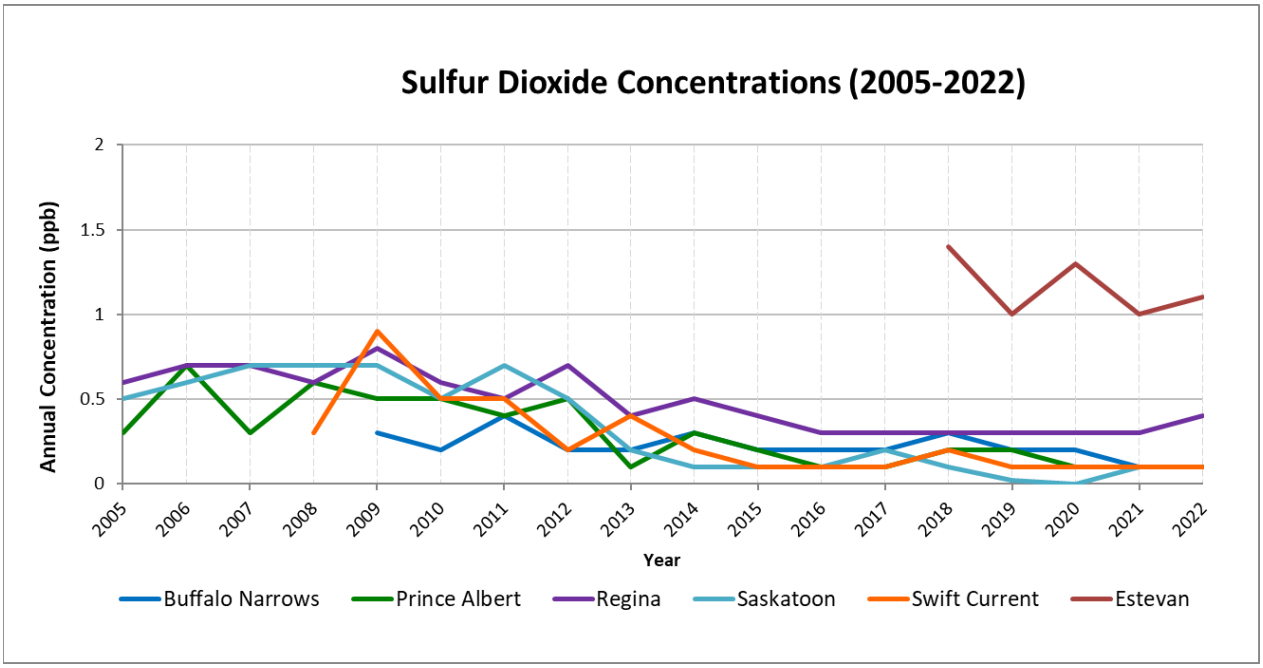


Figure 4 - Annual Average Concentrations of SO_2 Since 2005

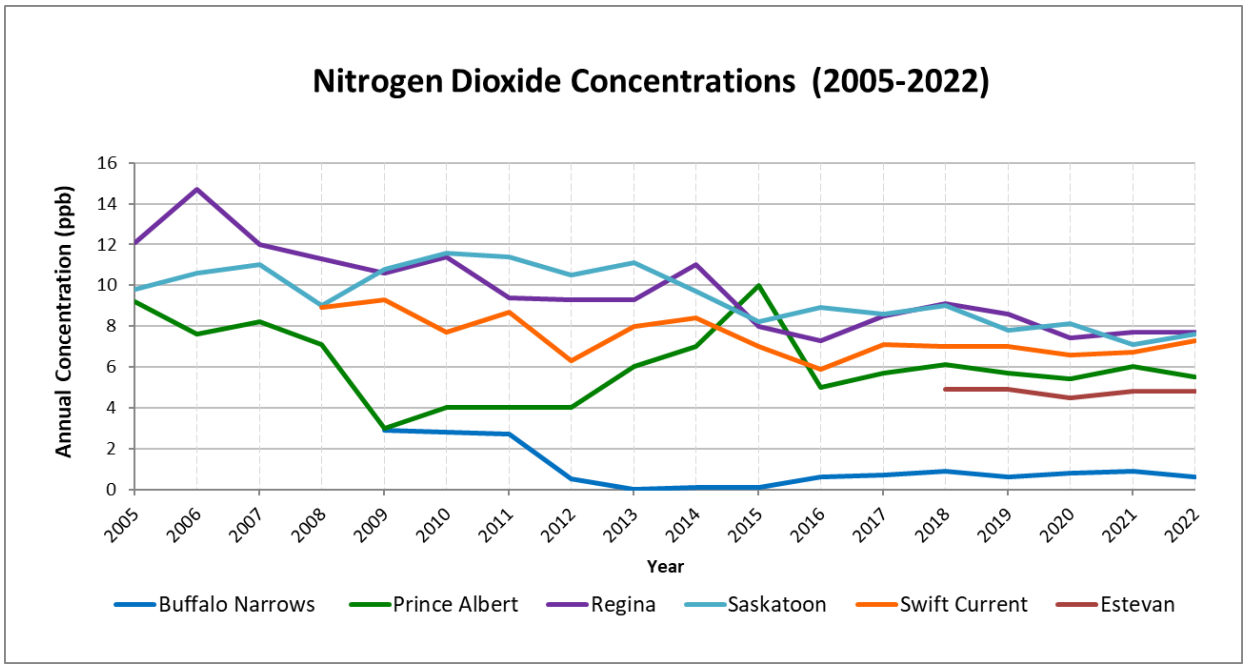


Figure 5 - Annual Average Concentrations of NO_2 Since 2005

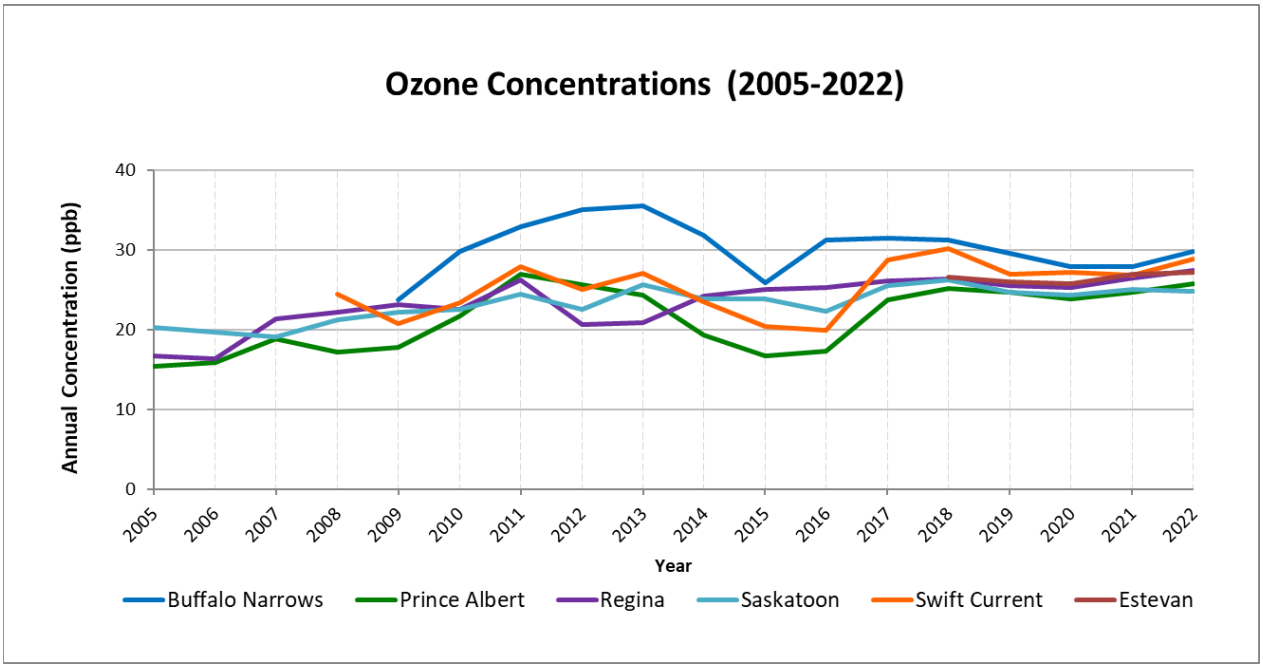


Figure 6 - Annual Average Concentrations of O_3 Since 2005

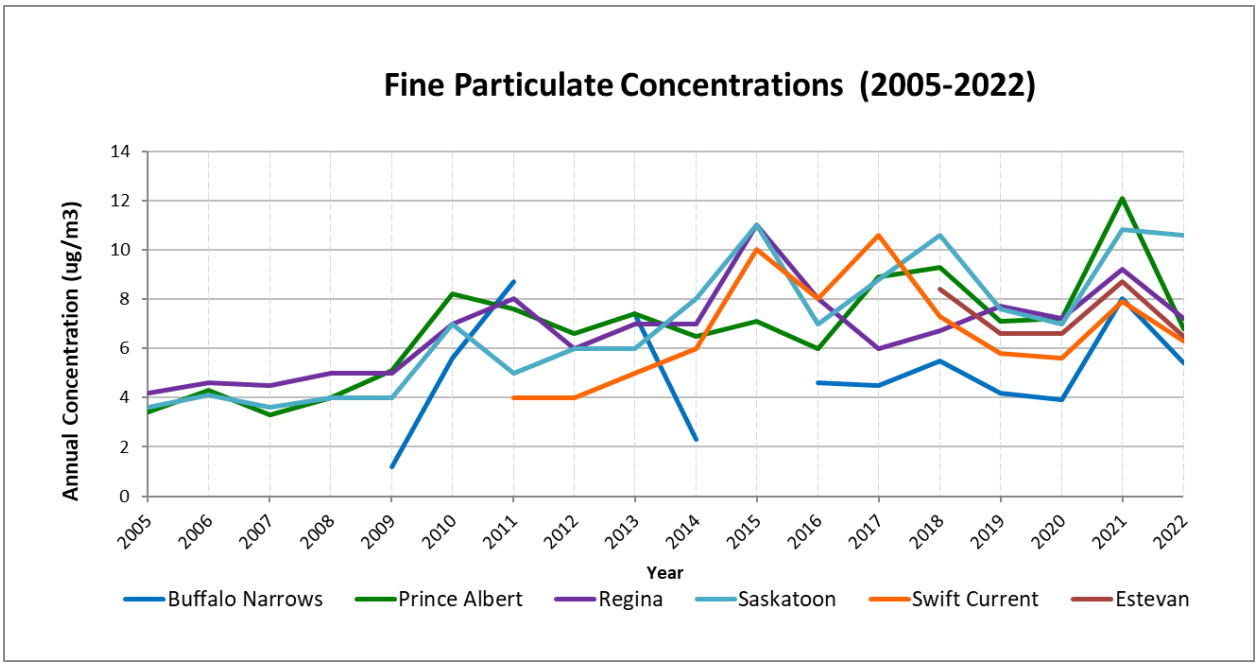


Figure 7 - Annual Average Concentrations of $PM_{2.5}$ Since 2005

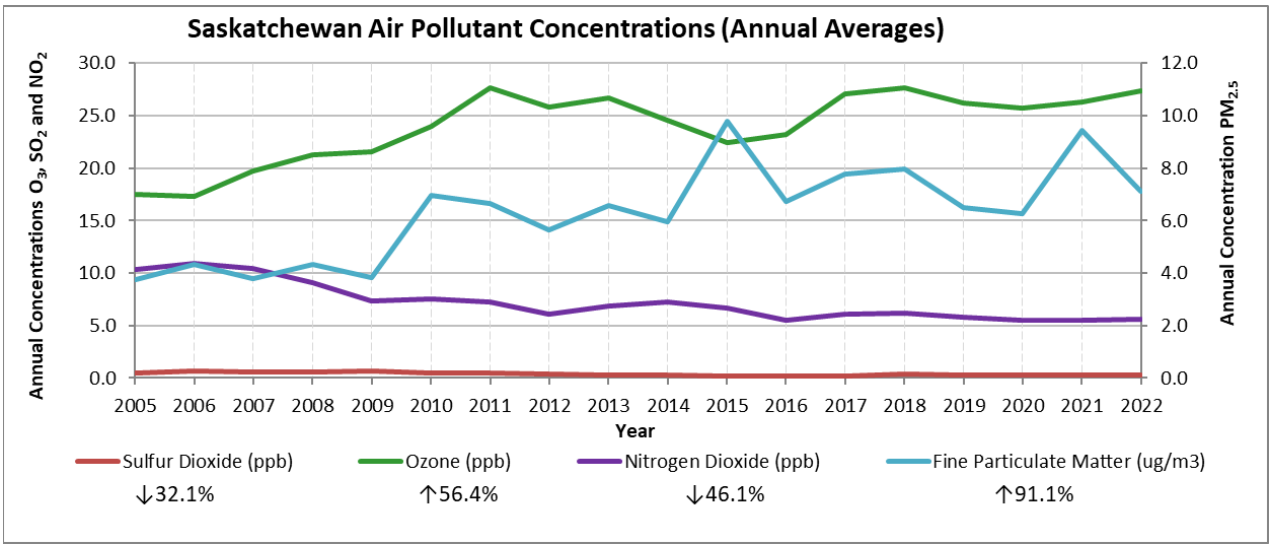


Figure 8 - Network-wide annual average concentrations of O_3, SO_2, NO_2 and $PM_{2.5}$ and percentage change in concentrations since 2005

4.2 CAAQS Achievements and Management Levels

Maps of the effective station management levels in Saskatchewan for 2019-2021 and 2020-2022 reporting periods are provided in **Figures 9, 10, 11 and 12.**

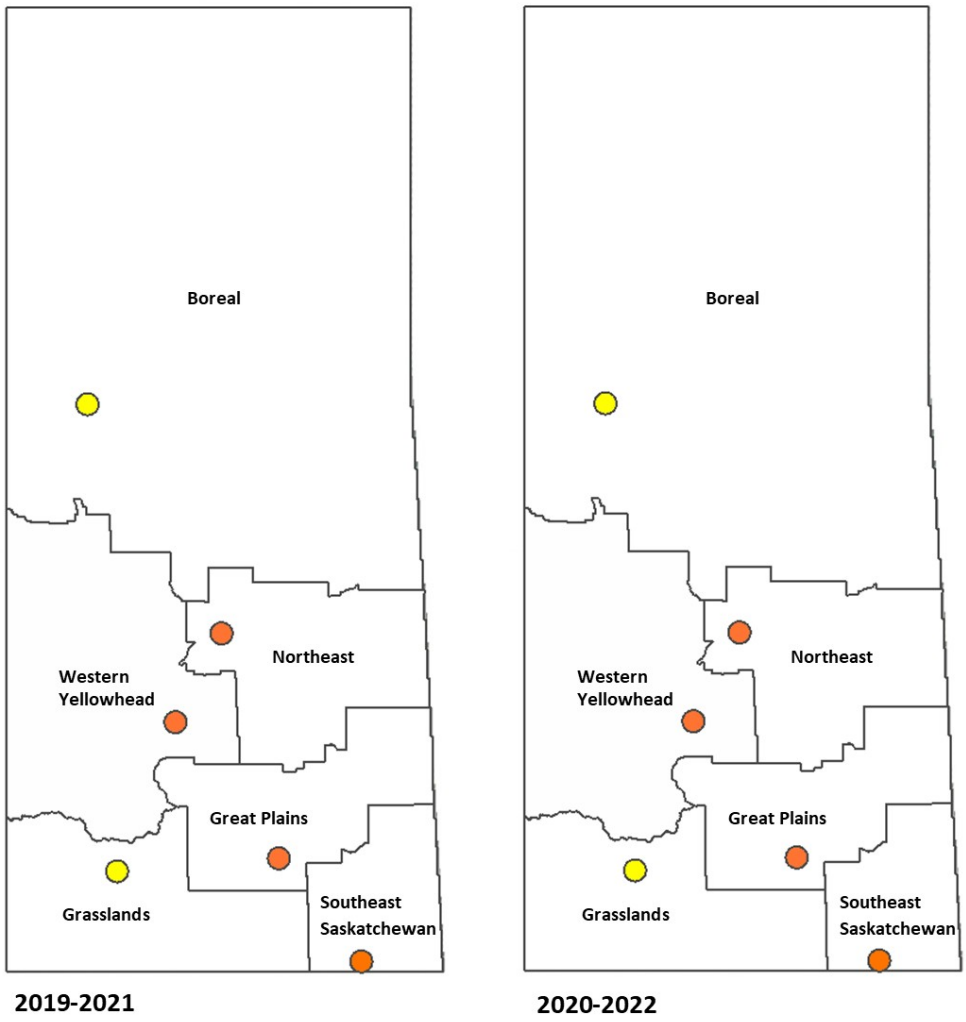


Figure 9 – CAAQS Reporting Station Management Levels of $PM_{2.5}$

After adjusting for wildfire influence, four CAAQS reporting stations were assigned the $PM_{2.5}$ orange management level and two stations were assigned the yellow management level for both the 2019-2021 and 2020-2022 reporting periods. The Buffalo Narrows station has adjusted $PM_{2.5}$ metric values in the low range of values captured by the yellow management level.

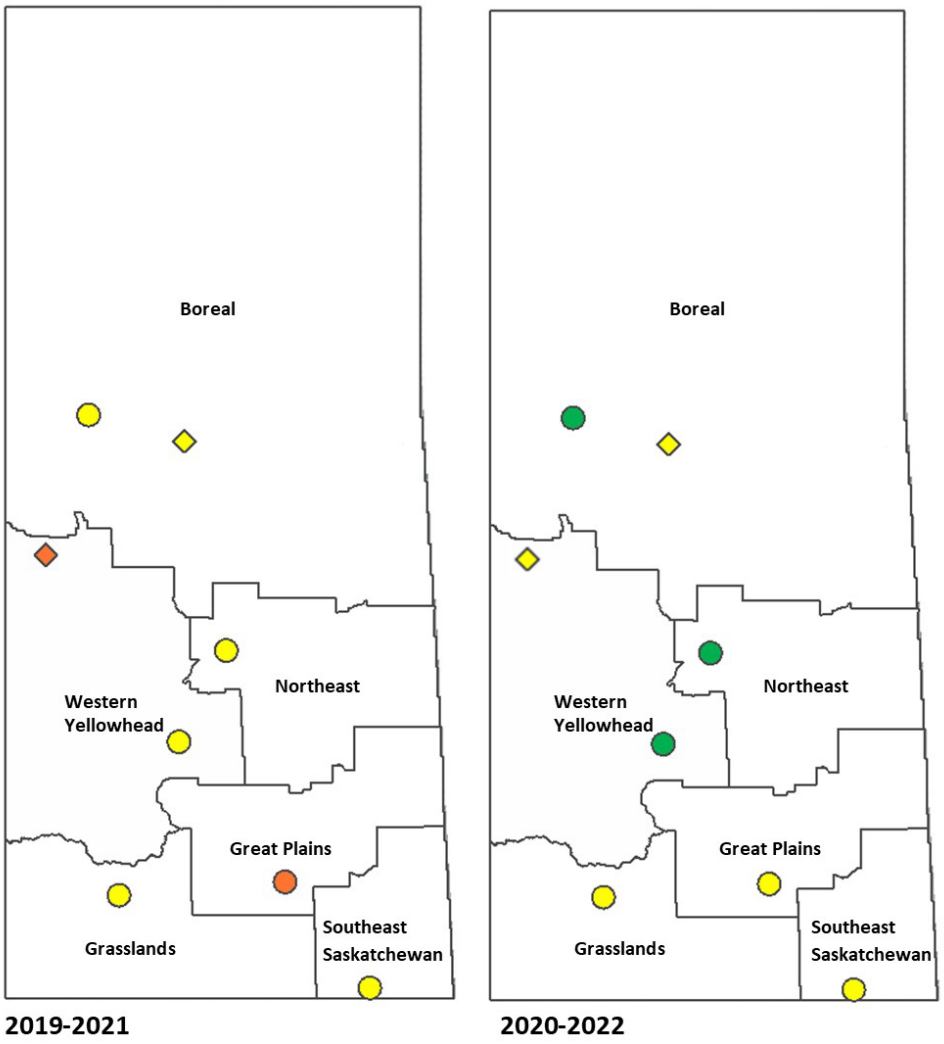


Figure 10 CAAQS Reporting Station Management Levels of O_3

For O_3 CAAQS metric calculations, data from CAPMoN stations (represented by diamond symbols) were also used in addition to the NAPS stations (represented by circular symbols). The O_3 effective management levels varied slightly between the 2019-2021 and 2020-2022 reporting periods. For 2019-2021 two of the CAAQS reporting stations were assigned the orange management level and six of the stations were assigned the yellow management level. For 2020-2022, the Flat Valley CAPMoN station and the Regina NAPS station improved from an orange management level to yellow and the Prince Albert and Buffalo Narrows NAPS stations improved to the green management level. The remaining three reporting stations remained at the yellow management level. Management actions for ground level O_3 in Table 13 are based on 2019-2021 management levels.

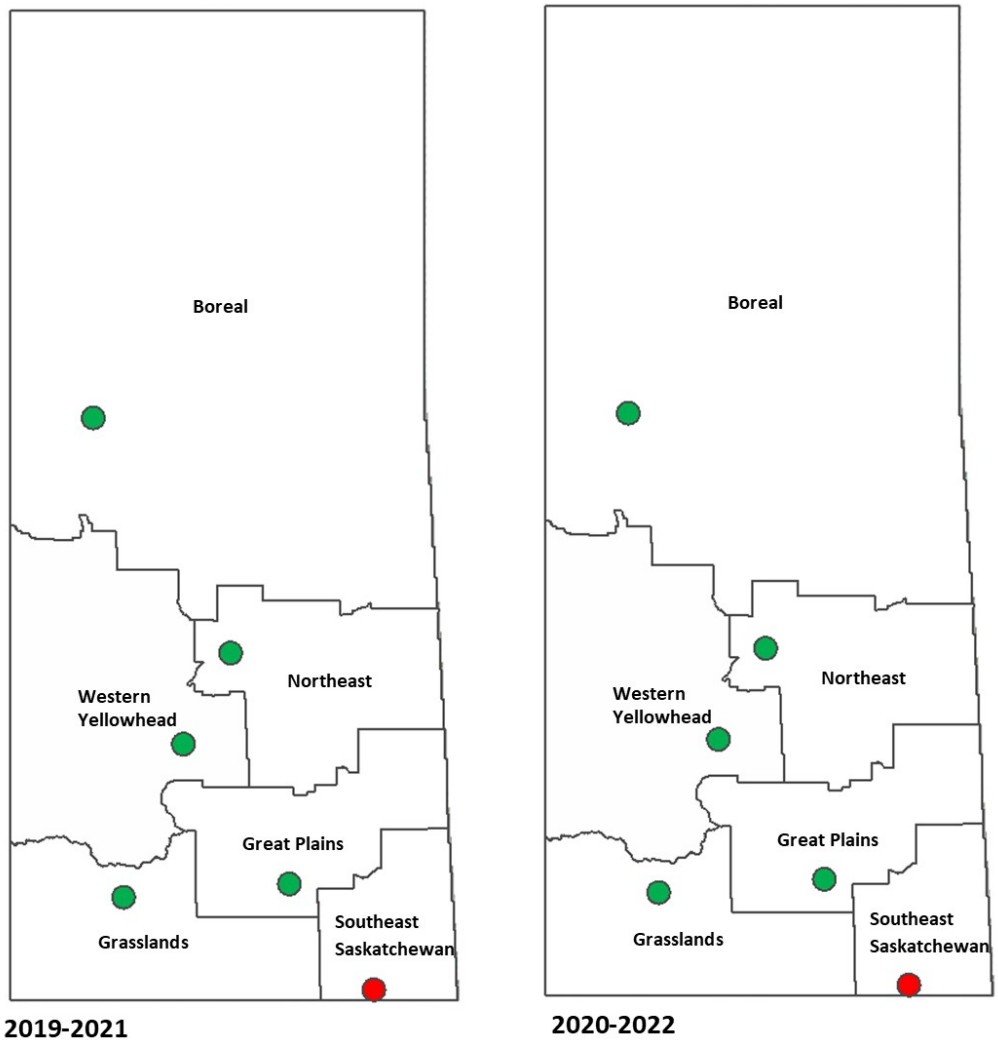


Figure 11 – CAAQS Reporting Station Management Levels of SO_2

For SO_2, there was no change in management levels for the province compared to past reports and from 2019-2021 to 2020-2022. All CAAQS reporting stations were assigned the green management level with the exception of the Estevan station, which is assigned the red management level for SO_2 due to its exceedance of the 1-hour CAAQS.

Figure 12 – CAAQS Reporting Station Management Levels of NO_2

For NO_2, there was no change in management levels for the province compared to past reports and from 2019-2021 to 2020-2022. All CAAQS reporting stations were assigned the orange management level with the exception of the Boreal station, which was assigned the green management level. While the reported 1-hour NO_2 metric value decreased slightly between 2019-2021 and 2020-2022, the annual NO_2 metric value increased slightly in the Great Plains, Grasslands and Western Yellowhead air zones.

4.2.1 $PM_{2.5}$ Achievement and Air Zone Management Levels

Wildfire smoke was the largest contributor to $PM_{2.5}$ in the 2019-2021 and 2020-2022 reporting periods and the only pollutant for which the guidelines for removing exceptional events was triggered and an adjusted metric value calculated.

For the 2019-2021 reporting period, before the removal of wildfire influenced data:

- All six air zones achieved the $PM_{2.5}$ annual standard of 8.8 micrograms per cubic meter.
- Four air zones achieved the $PM_{2.5}$ 24-hour standard of 27 micrograms per cubic meter: Great Plains, Grasslands, Western Yellowhead, and Southeast Saskatchewan.
- Two air zones exceeded the $PM_{2.5}$ 24-hour standard of 27 micrograms per cubic meter: Boreal and Northeast.

For the 2020-2022 reporting period, before the removal of wildfire influenced data:

- Five air zones achieved the $PM_{2.5}$ annual standard of 8.8 micrograms per cubic meter.
- The Western Yellowhead air zone exceeded the annual standard with a metric value of 9.4 micrograms per cubic meter.
- Three air zones achieved the $PM_{2.5}$ 24-hour standard of 27 micrograms per cubic meter: Great Plains, Grasslands, and Southeast Saskatchewan.
- Three air zones exceeded the $PM_{2.5}$ 24-hour standard of 27 micrograms per cubic meter: Boreal, Western Yellowhead, and Northeast.

After the removal of data influenced by wildfires, the resulting adjusted metric values achieved the $PM_{2.5}$ 24-hour CAAQS in all six air zones.

Table 6 and Table 7 present each air zone's 2019-2021 and 2020-2022 actual $PM_{2.5}$ metric values, their adjusted metric values and their associated $PM_{2.5}$ air zone management level. Since there are two CAAQS averaging periods for $PM_{2.5}$ (24-hour and annual), the management level is determined as the most stringent of the two adjusted levels.

Table 6 - $PM_{2.5}$ CAAQS RESULTS 2019-2021

Air Zone	Station	Type of Station	# of Valid Years	PM 2.5 24-hour micrograms/cubic meter		PM 2.5 Annual micrograms/cubic meter		Air Zone Management Level
				Actual	Adjusted	Actual	Adjusted	
Great Plains	Regina	NAPS	3	26	17	8.0	7.1	Orange
Northeast	Prince Albert	NAPS	3	31	19	8.8	7.5	Orange
Southeast Saskatchewan	Estevan	NAPS	3	21	16	7.3	6.6	Orange
Grasslands	Swift Current	NAPS	3	21	14	6.4	5.5	Yellow
Boreal	Buffalo Narrows	NAPS	3	29	13	5.4	4.1	Yellow
Western Yellowhead	Saskatoon	NAPS	3	25	17	8.5	7.3	Orange

Table 7 - $PM_{2.5}$ CAAQS RESULTS 2020-2022

Air Zone	Station	Type of Station	# of Valid Years	PM 2.5 24-hour micrograms/cubic meter		PM 2.5 Annual micrograms/cubic meter		Air Zone Management Level
				Actual	Adjusted	Actual	Adjusted	
Great Plains	Regina	NAPS	3	25	17	7.8	6.9	Orange
Northeast	Prince Albert	NAPS	3	32	19	8.7	7.2	Orange
Southeast Saskatchewan	Estevan	NAPS	3	22	16	7.3	6.5	Orange
Grasslands	Swift Current	NAPS	3	23	15	6.6	5.6	Yellow
Boreal	Buffalo Narrows	NAPS	3	31	13	5.8	4.3	Yellow
Western Yellowhead	Saskatoon	NAPS	3	30	17	9.4	7.7	Orange

4.2.2 O_3 Achievement and Air Zone Management Levels

All air zones achieved the O_3 eight-hour standard of 62 parts per billion. Table 8 and Table 9 present the 2019-2021 and 2020-2022 O_3 metric values for each air zone and their associated air zone management level.

Table 8 - O_3 CAAQS RESULTS 2019-2021

Air Zone	Station	Type of Station	# of Valid Years	O_3 8-hr Metric parts per billion	Air Zone Management Level
Great Plains	Regina	NAPS	3	57	Orange
Northeast	Prince Albert	NAPS	3	52	Yellow
Southeast Saskatchewan	Estevan	NAPS	3	56	Yellow
Grasslands	Swift Current	NAPS	3	53	Yellow
Boreal	Buffalo Narrows	NAPS	3	52	Yellow
	Pinehouse	CAPMoN	3	54	
Western Yellowhead	Flat Valley	CAPMoN	3	58	Orange
	Saskatoon	NAPS	3	53	

Table 9 - O_3 CAAQS RESULTS 2020-2022

Air Zone	Station	Type of Station	# of Valid Years	O_3 8-hr Metric parts per billion	Air Zone Management Level
Great Plains	Regina	NAPS	3	55	Yellow
Northeast	Prince Albert	NAPS	3	49	Green
Southeast Saskatchewan	Estevan	NAPS	3	54	Yellow
Grasslands	Swift Current	NAPS	3	52	Yellow
Boreal	Buffalo Narrows	NAPS	3	50	Yellow
	Pinehouse	CAPMoN	3	53	
Western Yellowhead	Flat Valley	CAPMoN	3	55	Yellow
	Saskatoon	NAPS	3	50	

4.2.3 SO_2 CAAQS Achievement and Air Zone Management Levels

Achievement of the SO_2 CAAQS is summarized below.

- All six air zones achieved the SO_2 annual standard of 5.0 parts per billion.
- Five air zones achieved the SO_2 one-hour standard of 70 parts per billion: Great Plains, Northeast, Grasslands, Boreal, and Western Yellowhead.
- One air zone exceeded the SO_2 one-hour standard of 70 parts per billion: Southeast Saskatchewan.

Table 10 and Table 11 present the 2019-2021 and 2020-2022 SO_2 values for each air zone and their associated air zone management level.

Table 10 – SO_2 CAAQS RESULTS 2019-2021

Air Zone	**Station**	**Type of Station**	**# of Valid Years**	**SO_2 1-hr Metric** parts per billion	**SO_2 Annual Metric** parts per billion	**Air Zone Management Level**
Great Plains	Regina	NAPS	3	13	0.3	Green
Northeast	Prince Albert	NAPS	3	1	0.1	Green
Southeast Saskatchewan	Estevan	NAPS	3	104	1.0	Red
Grasslands	Swift Current	NAPS	3	3	0.1	Green
Boreal	Buffalo Narrows	NAPS	3	3	0.1	Green
Western Yellowhead	Saskatoon	NAPS	3	1	0.1	Green

Table 10 – SO_2 CAAQS RESULTS 2020-2022

Air Zone	**Station**	**Type of Station**	**# of Valid Years**	**SO_2 1-hr Metric** parts per billion	**SO_2 Annual Metric** parts per billion	**Air Zone Management Level**
Great Plains	Regina	NAPS	3	16	0.4	Green
Northeast	Prince Albert	NAPS	3	1	0.1	Green
Southeast Saskatchewan	Estevan	NAPS	3	96	1.1	Red
Grasslands	Swift Current	NAPS	3	3	0.1	Green
Boreal	Buffalo Narrows	NAPS	3	3	0.1	Green
Western Yellowhead	Saskatoon	NAPS	3	1	0.1	Green

4.2.4 NO_2 CAAQS Achievements and Air Zone Management Levels

All six air zones achieved the NO_2 one-hour standard of 60 parts per billion. Table 11 and Table 12 present the 2019-2021 and 2020-2022 NO_2 values for each air zone and their associated air zone management level.

Table 11 - NO_2 CAAQS RESULTS 2019-2021

Air Zone	Station	Type of Station	# of Valid Years	NO_2 1-hr Metric parts per billion	NO2 Annual Metric parts per billion	Air Zone Management Level
Great Plains	Regina	NAPS	3	43	7.1	Orange
Northeast	Prince Albert	NAPS	3	35	6.0	Orange
Southeast Saskatchewan	Estevan	NAPS	3	33	4.8	Orange
Grasslands	Swift Current	NAPS	3	38	6.8	Orange
Boreal	Buffalo Narrows	NAPS	2	10	0.9	Green
Western Yellowhead	Saskatoon	NAPS	3	42	7.1	Orange

Table 12 - NO_2 CAAQS RESULTS 2020-2022

Air Zone	Station	Type of Station	# of Valid Years	NO_2 1-hr Metric parts per billion	NO2 Annual Metric parts per billion	Air Zone Management Level
Great Plains	Regina	NAPS	3	42	7.7	Orange
Northeast	Prince Albert	NAPS	3	36	5.5	Orange
Southeast Saskatchewan	Estevan	NAPS	3	32	4.8	Orange
Grasslands	Swift Current	NAPS	3	36	7.3	Orange
Boreal	Buffalo Narrows	NAPS	2	9	0.6	Green
Western Yellowhead	Saskatoon	NAPS	3	40	7.6	Orange

5.0 Air Zone Management Plan

Saskatchewan's air zone management plan is provided in Table 13. The management plan is a compilation of targeted actions that will improve air quality and will help to identify air quality issues that may require further assessment. Actions include Saskatchewan and federal regulations to reduce emissions, past, current and planned ambient air quality monitoring special studies to capture spatial and temporal variability in concentrations, and stakeholder engagement.

Table 13 - PROVINCIAL AND AIR ZONE MANAGEMENT PLAN

	Current Reporting Period Management Levels (2020-2022)				Action	Action Category	Status
	$PM_{2.5}$	O_3	NO_2	SO_2			
Saskatchewan	Yellow and Orange	Yellow and Orange	Green and Orange	Green and Red	In January 2019, the Government of Saskatchewan adopted *The Oil and Gas Emissions Management Regulations.* This regulation will lead to an annual reduction of flared and vented methane emissions of 40 to 45 per cent by 2025. The reduction in methane emissions should result in a reduction in ground level O_3 as methane can lead to the formation of O_3.	Actions to be undertaken by governments and stakeholders to reduce emissions with short, medium and long-term milestones and targets.	Regulations adopted 2019. Canada-Saskatchewan equivalency agreement respecting the release of methane from the oil and gas sector signed 2020. Annual reports on progress published for 2020, 2021 and 2022 show the province should meet reduction goals by 2025.
					In January 2018, the Government of Saskatchewan adopted *The Management and Reduction of Greenhouse Gases (General and Electricity Producer) Regulations*. This is anticipated to lead to 40 per cent emissions reduction of greenhouse gases from electricity generation by 2030. The reduction of greenhouse gases may lead to the reduction in methane, which should result in a reduction in ground level ozone as methane can lead to the formation of ozone.	Actions to be undertaken by governments and stakeholders to reduce emissions with short, medium and long-term milestones and targets.	Regulations adopted 2018. Supporting regulations (Reporting and General) and (Standards and Compliance) in place 2023. Canada-Saskatchewan equivalency agreement regarding greenhouse gas emissions from electricity producers signed 2020.
					The federal government has adopted the *Regulations Respecting Reduction in the Release of*	Actions to be undertaken by governments and	First set of requirements were implemented in 2020. Second set of requirements

					Methane and Certain Volatile Organic Compounds (Upstream Oil and Gas Sector). These regulations detail requirements for the upstream oil and gas industry with respect to the reduction of targeted methane and other VOC emissions. This targeted reduction should help to improve ambient air quality.	stakeholders to reduce emissions with short, medium and long-term milestones and targets.	implemented in 2023. Amendments to the regulations were proposed December 2023 to build on existing regulations and introduce a new performance-based compliance option designed to focus on emissions outcomes, rather than prescribing a specific pathway to compliance.
					The federal government has published Canada's 2030 Emissions Reduction Plan (ERP), that provides a roadmap to reach its climate commitments, such as reducing national GHG emissions by 40 to 45% below 2005 levels by 2030 and achieving net-zero emissions by 2050. This commitment is anticipated to further reduce the emissions of greenhouse gases may lead to the reduction in methane, which should result in a reduction in ground level ozone as methane can lead to the formation of ozone.	Actions to be undertaken by governments and stakeholders to reduce emissions with short, medium and long-term milestones and targets.	Plan published 2022
					The Government of Saskatchewan will review air quality trends to identify any air quality deterioration concerns, with a specific focus on the orange management level zones.	Characterizing Air Pollutant Concentrations in Air Zones	2022-2025
					The Government of Saskatchewan will improve its collaborative efforts with air zone associations.	Stakeholder Engagement	2022-2025
					The Ministry of Environment has completed a review of Saskatchewan's air zone association model. Recommendations and actions from the review are intended to improve air quality monitoring, stakeholder engagement and air quality management in the province.	Characterizing Air Pollutant Concentrations in Air Zones Stakeholder Engagement	2021-2025

					The Government of Saskatchewan will engage the air zone association to collaboratively identify air quality issues related to NO_2 with a focus on understanding the risk of exceeding the CAAQS. Saskatchewan will also work to identify air quality issues related to O_3 and $PM_{2.5}$ with a focus on evaluating and assessing existing data.	Stakeholder Engagement	2023-2025
Great Plains	Orange	Orange	Orange	Green	A mobile air quality monitoring station was set up on the west side of Regina to get baseline data before the construction and operation of industrial operations west of the city. Pollutants measured were: sulphur dioxide, hydrogen sulphide, ozone, carbon monoxide, nitrogen dioxide, and fine and course particulates	Characterizing Air Pollutant Concentrations in Air Zones	Study completed September, October 2022. All pollutants measured were all below the Saskatchewan Ambient Air Quality Standards (SAAQS).
Southeast Saskatchewan	Orange	Yellow	Orange	Red	SESAA will engage with operators of industrial SO_2 sources and work with its members to inform and identify conditions or factors leading to high SO_2 events and identify mitigation measures for future similar conditions.	Characterizing Air Pollutant Concentrations in Air Zones	2022-2025
					SESAA will engage other significant SO_2 emitters in the air zone to encourage membership and partnership in SESAA, determine future activity/emissions trends relating to SO_2 emissions and determine the feasibility of additional monitoring of SO_2 nearer to these sources.	Characterizing Air Pollutant Concentrations in Air Zones	2022-2025

					The Government of Saskatchewan will engage the air zone association to collaboratively identify air quality issues related to O_3 and $PM_{2.5}$ with a focus on evaluating and assessing existing data.	Stakeholder Engagement	2022-2025
					Mobile air quality monitoring station was set up in the Lampman area in collaboration with the Ministry of Energy and Resources.	Characterizing Air Pollutant Concentrations in Air Zones	Study Completed June – September 2023. All pollutant concentration considered typical for a rural setting and indicate a low health risk.
Grasslands	Yellow	Yellow	Orange	Green	The Government of Saskatchewan will evaluate the physical placement of the NAPS Station in Swift Current to ensure it provides representative data.	Characterizing Air Pollutant Concentrations in Air Zones	2022-2024
					The Government of Saskatchewan will temporarily monitor for $PM_{2.5}$, O_3, NO_2 and SO_2 using its mobile air quality station at targeted locations.	Characterizing Air Pollutant Concentrations in Air Zones	2022-2025
					The Government of Saskatchewan will assess if the operation of an air zone association in this air zone could help to prevent air quality deterioration.	Stakeholder Engagement	2022-2025
Boreal	Yellow	Yellow	Green	Green	The provincial monitoring station in Buffalo Narrows will continue to monitor under the NAPS network. This will ensure the data quality for this air zone will meet AQMS requirements for reporting.	Characterizing Air Pollutant Concentrations in Air Zones	Added to NAPS Network in 2018
Western Yellowhead	Orange	Orange	Orange	Green	The Government of Saskatchewan will engage the air zone association to collaboratively identify air quality issues related to O_3 and $PM_{2.5}$ with a focus on evaluating and assessing existing data.	Stakeholder Engagement and Characterizing Air Pollutant Concentrations in Air Zones	2022-2025

A mobile air quality station was sited in Meadow Lake to evaluate ambient air quality near an industrial facility.	Characterizing Air Pollutant Concentrations in Air Zones	Study complete. Winter 2022-Spring 2023 Most pollutant concentrations were considered typical for a rural setting. There were exceedances of particulate and hydrogen sulphide.
The Government of Saskatchewan/Western Yellowhead Air Management Zone (WYAMZ) will evaluate the physical placement of the NAPS station in Saskatoon to ensure it provides representative data. A mobile air quality station has been deployed to Saskatoon to evaluate the placement of the NAPS station.	Characterizing Air Pollutant Concentrations in Air Zones	Ongoing. Fall 2023-Spring 2024.
WYAMZ will review air quality trends to identify any air quality deterioration concerns with a specific focus on the orange management level zones.	Characterizing Air Pollutant Concentrations in Air Zones	2022-2025
The Government of Saskatchewan will work with the Government of Alberta to establish a NAPS monitoring station in Lloydminster, SK.	Characterizing Air Pollutant Concentrations in Air Zones	2023-2024

6.0 Conclusion

The Government of Saskatchewan is committed to the AQMS and will continue to collaborate with stakeholders to ensure Saskatchewan has a healthy, resilient environment.

Long-term trends in annual concentrations of O_3 and $PM_{2.5}$ suggest the province might be challenged to meet future CAAQS as the standards become increasingly more stringent in the future. While exceptional events such as wildfires are removed from the dataset when determining air zone management levels, wildfire smoke continues to negatively impact Saskatchewan's air quality. The province will continue to work internally, with stakeholders and with other jurisdictions to ensure high quality $PM_{2.5}$ data is available to inform decision-making and protect the health of Saskatchewan citizens.

The NO_2 long-term trend suggests NO_2 concentrations are decreasing as best management practices and pollution abatement technology improves. However, except for the Boreal air zone, the province is in the orange management level for NO_2, suggesting additional long-term management strategies may need to be developed. The Government of Saskatchewan will work with the air zone associations to develop management strategies to improve air quality.

Saskatchewan air zones achieved the green management level for SO_2 for the 2019-2021 and 2020-2022 reporting periods except for the Southeast Saskatchewan air zone. The Southeast Saskatchewan air zone exceeded the SO_2 CAAQS one-hour standard of 70 ppb, remaining in the red management level from the previous reporting period. It should be noted Southeast Saskatchewan achieved the annual CAAQS standard of 5 ppb with a metric value of 1.0 ppb and 1.1 ppb, respectively. This suggests only a small number of isolated incidents of one-hour SO_2 concentrations greater than 70 ppb in the Southeast Saskatchewan air zone, specifically in Estevan, caused the one-hour CAAQS metric value to be exceeded. The method by which the management level is assigned to an air zone dictates the reporting station with the highest metric value will determine the management level for the entire air zone. This does not necessarily represent a fair evaluation of the pollutant levels of the air zone. In this case, the metric values for SO_2 at all the other monitoring locations in the Southeast Saskatchewan air zone, which are operated by the Southeast Saskatchewan Airshed Association (SESAA), are in the green management level for SO_2. The only elevated SO_2 values are observed at the Estevan air monitoring station and so truly only represents Estevan and is not representative of the rest of the entire air zone.

The Saskatchewan Health Authority has indicated there are potential health impacts associated with elevated levels of SO_2, including respiratory adverse effects and aggravation of existing cardiac disease particularly for the at-risk population - asthmatics, elderly and young children [(1)]. The Government of Saskatchewan will continue to work with SESAA to develop management strategies for the continuous improvement of air quality in the Estevan area.

Saskatchewan's ambient air monitoring data is available to the public so residents have the information they need to make informed decisions about their activities: Saskatchewan Air Quality Map. Residents concerned about air quality, especially during wildfire events, should check the Air Quality Health Index for their community and follow Health Canada's recommendations on how to reduce their exposure.

For more information on this report, please contact the Ministry of Environment Inquiry Centre at centre.inquiry@gov.sk.ca or 1-800-567-4224.

References

1. Available at https://www.canada.ca/en/health-canada/services/publications/healthy-living/human-health-risk-assessment-sulphur-dioxide-executive-summary.html

Appendix A

Network-wide annual average concentrations of O_3, SO_2, NO_2 and $PM_{2.5}$ concentrations since 2005.

Province Wide Averages	SO_2 (ppb)	O_3 (ppb)	NO_2 (ppb)	$PM_{2.5}$ (µg/m^3)
2005	0.5	17.5	10.4	3.7
2006	0.7	17.3	11.0	4.3
2007	0.6	19.8	10.4	3.8
2008	0.6	21.3	9.1	4.3
2009	0.6	21.5	7.3	3.8
2010	0.5	24.0	7.5	7.0
2011	0.5	27.7	7.2	6.7
2012	0.4	25.8	6.1	5.7
2013	0.3	26.7	6.9	6.6
2014	0.3	24.6	7.2	6.0
2015	0.2	22.4	6.7	9.8
2016	0.2	23.2	5.5	6.7
2017	0.2	27.1	6.1	7.8
2018	0.4	27.7	6.2	8.0
2019	0.3	26.2	5.8	6.5
2020	0.3	25.7	5.5	6.3
2021	0.3	26.3	5.5	9.5
2022	0.3	27.3	5.6	7.1

Station and Network-wide change (percentage) in O_3, SO_2, NO_2 and $PM_{2.5}$ concentrations since 2005

Percentage change since 2005	SO_2	O_3	NO_2	$PM_{2.5}$
Buffalo Narrows*	-66.7%	25.7%	-79.3%	350.0%
Prince Albert	-66.7%	67.5%	-40.2%	100.0%
Saskatoon	-80.0%	22.2%	-22.4%	194.4%
Regina	-33.3%	64.1%	-36.4%	71.4%
Swift Current*	-66.7%	18.4%	-18.0%	57.5%
Estevan **	-21.4%	2.3%	-2.0%	-22.6%
Network-wide	**-32.1%**	**56.4%**	**-46.1%**	**91.1%**

* (monitoring began 2008 and 2009)

**(monitoring began 2018)

Appendix B

A weight of evidence approach to assessing transboundary flow and exceptional events (TF/EE) is outlined in the *Guidance Document on Transboundary Flows and Exceptional Events for Air Zone Management (2019).* This section describes TF/EE influences that were removed to determine fine particulate ($PM_{2.5}$) management levels.

Wildfire smoke, both from forest and grass fires, was the largest contributor to $PM_{2.5}$ TF/EE events in Saskatchewan during this reporting period. Many of the wildfires occurred in jurisdictions outside of Saskatchewan, including Alberta, British Columbia and the United States. TF/EE influences were identified using:

- Maps of fire hot spots from the Canadian Wildland Fire Information System, Natural Resources Canada (CWFIS).
- Annual reports from the Canadian Interagency Forest Fire Centre and provincial ministries.
- Environmental and Climate Change Canada Special Air Quality Alerts; and
- Smoke forecasts provided by FireSmoke Canada.

$PM_{2.5}$ 24-hour metric 2019-2021, 2020-2022 TF/EE Assessment

$PM_{2.5}$ 24-hour data that was identified as influenced by wildfire and had values greater than 19 micrograms per cubic meter (the orange management level threshold) was removed. The $PM_{2.5}$ 24-hour and $PM_{2.5}$ annual metrics were then re-calculated and the adjusted metrics used to determine $PM_{2.5}$ management levels.

Example of TF/EE assessment

On July 12, 2021, two monitoring stations reported $PM_{2.5}$ concentrations that were greater than the orange management threshold value of 19 micrograms/cubic meter.

TABLE A-2

Air Zone	Station	July 12, 2021 PM2.5 Concentration ($PM_{2.5}$ 24-hour)
Great Plains	Regina	17.2
Northeast	Prince Albert	39.8
Southeast Saskatchewan	Estevan	12.6
Grasslands	Swift Current	9.9
Boreal	Buffalo Narrows	55.1
Western Yellowhead	Saskatoon	17.2

* Data listed is in micrograms/cubic meter

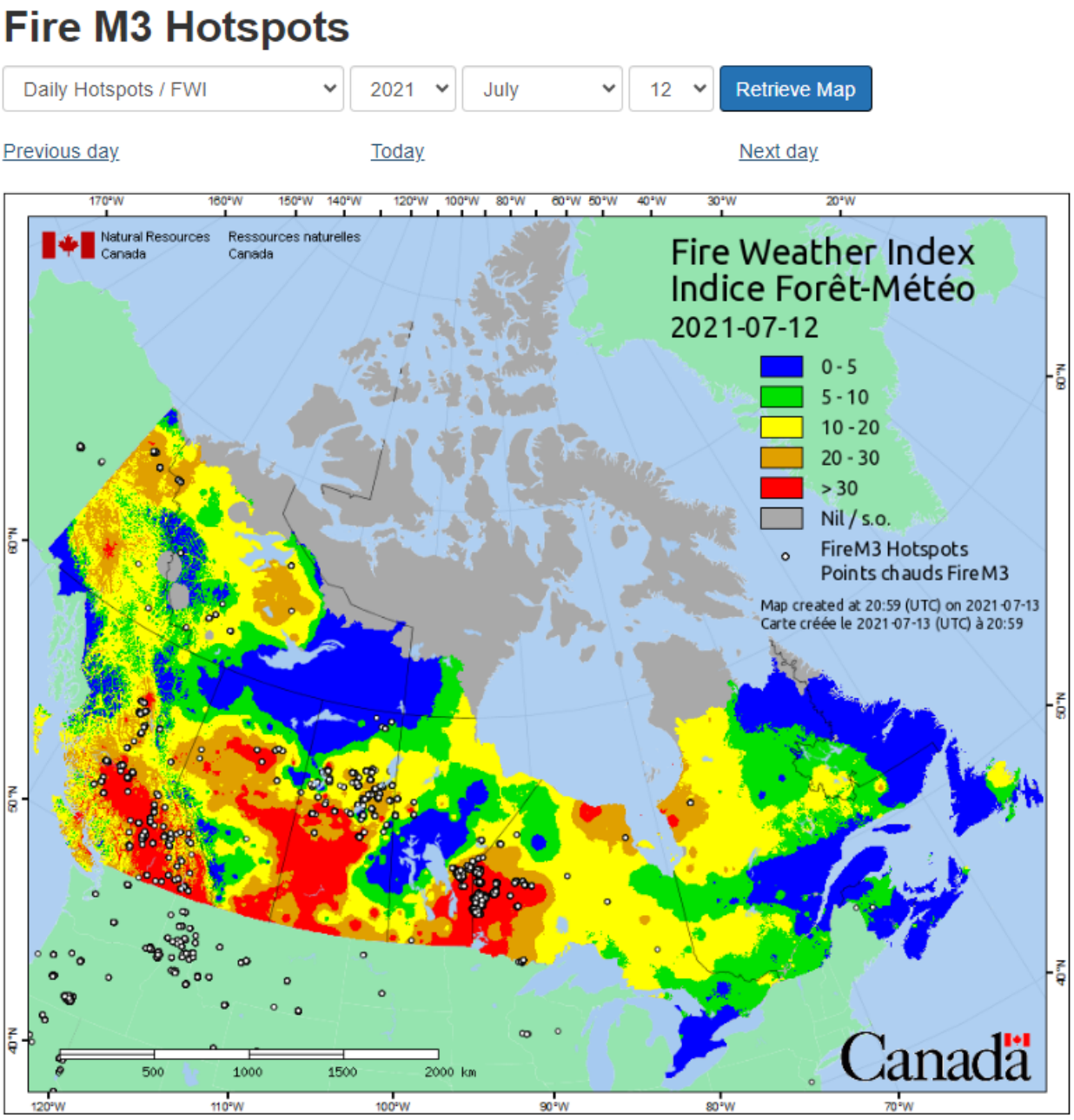


Figure A-1 - Map of fire hot spots for July 12, 2021, from the CWFIS.

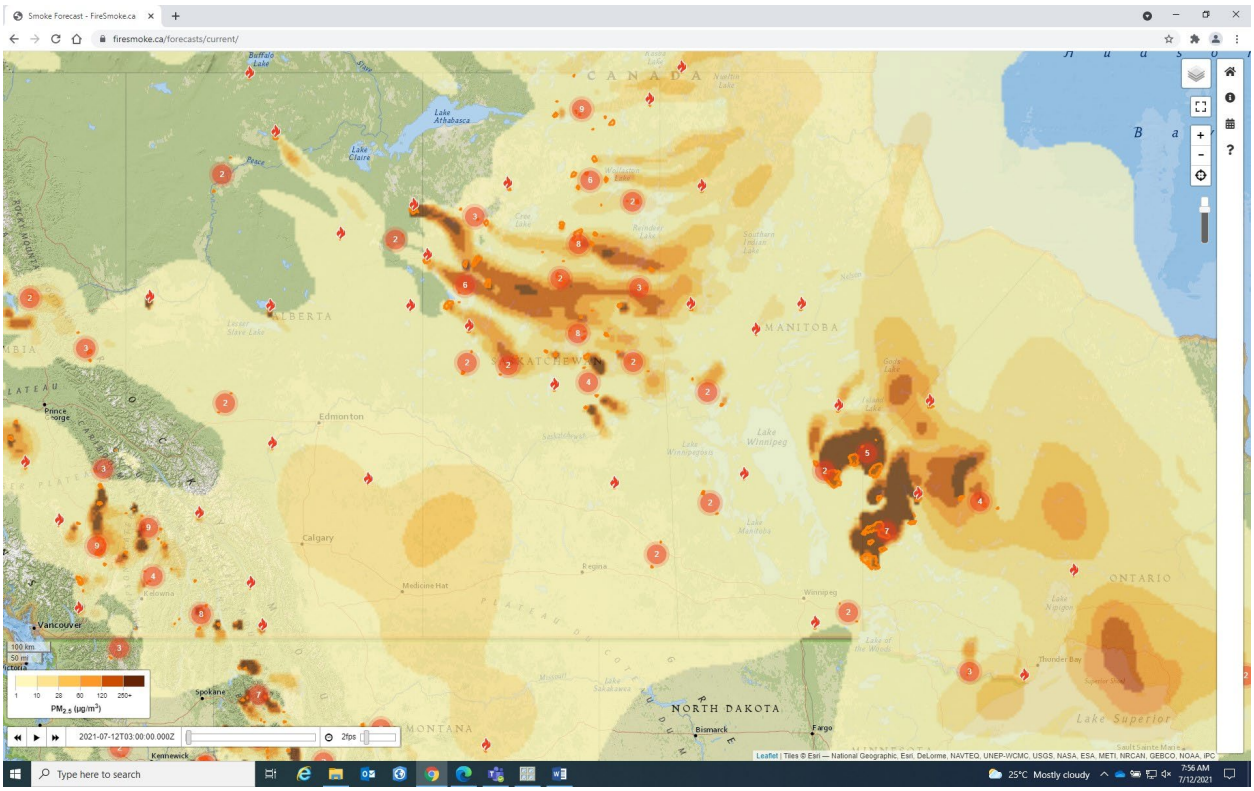


Figure A-3 - Screenshot of Smoke Forecasts for July 12, 2021, from Firesmoke.ca

With this evidence, $PM_{2.5}$ 24-hour values for July 12, 2021 reported by Buffalo Narrows and Prince Albert were removed to determine effective management levels.

Wildfire-Influenced $PM_{2.5}$ Data for 2019-2021 and 2020-2022 reporting periods (consolidated)

Table A-3 Wildfire influenced $PM_{2.5}$ data for Boreal Air Zone	
Buffalo Narrows NAPS Station	
Date	**$PM_{2.5}$ 24-hour (micrograms/cubic meter)**
5/27/2019	37.9
5/28/2019	48
5/29/2019	49.8
9/20/2020	29.5
7/9/2021	29.5
7/10/2021	46.7
7/11/2021	96.7
7/12/2021	55.1
7/14/2021	43.6
7/15/2021	89.4
7/16/2021	103.4
7/17/2021	152.9
7/18/2021	146.5
7/19/2021	46.0
7/20/2021	32.6
7/21/2021	56.0
7/22/2021	41.0
8/1/2021	35.2
8/2/2021	62.2
8/3/2021	34.5
8/4/2021	63.1
8/5/2021	45.1
8/6/2021	28.4
7/29/2022	29.9
8/21/2022	111.2
8/22/2022	27.3
8/23/2022	30.2
8/24/2022	30.8
8/25/2022	21.2
9/5/2022	28.0
9/10/2022	19.3
10/19/2022	31.6

Table A-4 Wildfire influenced $PM_{2.5}$ data for Northeast Air Zone	
Prince Albert NAPS Station	
Date	**$PM_{2.5}$ 24-hour (micrograms/cubic meter)**
5/22/2019	20.5
5/27/2019	22.7
5/28/2019	46.5
5/29/2019	21.2
9/19/2020	24.5
9/20/2020	20.4
5/18/2021	26.4
7/10/2021	23.8
7/11/2021	23.4
7/12/2021	39.8
7/13/2021	46.1
7/14/2021	59.2
7/15/2021	21.5
7/16/2021	117.4
7/17/2021	146.6
7/18/2021	59.6
7/20/2021	31.4
7/21/2021	55.5
7/22/2021	31.2
8/2/2021	30.9
8/3/2021	84.2
8/4/2021	37.9
8/5/2021	34.2
8/6/2021	27.8
8/7/2021	32.1
10/5/2021	94.4
10/6/2021	149.0
10/8/2021	33.3
10/9/2021	35.9
10/13/2021	45.5
7/30/2022	20.8
8/23/2022	22.5
8/24/2022	24.6
8/25/2022	27.5
8/26/2022	20.5
9/5/2022	19.4

Table A-4 Wildfire influenced $PM_{2.5}$ data for Northeast Air Zone - continued	
Prince Albert NAPS Station	
Date	**$PM_{2.5}$ 24-hour (micrograms/cubic meter)**
9/11/2022	30.4
10/4/2022	25.4
10/19/2022	24.6
10/20/2022	19.8

Table A-5 Wildfire Influenced $PM_{2.5}$ Data for Great Plains Air Zone	
Regina NAPS Station	
Date	**$PM_{2.5}$ 24-hour (micrograms/cubic meter)**
5/28/2019	27.4
5/29/2019	26.5
5/30/2019	23.9
6/1/2019	21.5
6/2/2019	19.1
6/3/2019	20.8
9/19/2020	19.0
9/20/2020	24.5
7/13/2021	27.3
7/14/2021	32.2
7/15/2021	21.7
7/16/2021	20.1
7/18/2021	24.8
7/19/2021	39.0
7/20/2021	39.1
7/21/2021	36.8
7/22/2021	25.0
7/23/2021	28.7
7/27/2021	22.7
8/1/2021	22.4
8/2/2021	23.5
8/3/2021	59.6
8/4/2021	38.3
8/5/2021	57.1
8/6/2021	42.9
8/7/2021	39.9
8/15/2021	21.1
8/16/2021	50.7

Table A-5 Wildfire Influenced $PM_{2.5}$ Data for Great Plains Air Zone - continued	
Regina NAPS Station	
Date	**$PM_{2.5}$ 24-hour (micrograms/cubic meter)**
10/7/2021	53.5
10/8/2021	51.9
10/9/2021	20.3
8/24/2022	23.4
8/25/2022	23.1
9/5/2022	20.8
9/5/2022	22.3
10/19/2022	29.5
10/20/2022	25.6

Table A-6 Wildfire influenced $PM_{2.5}$ data for Western Yellowhead Air Zone	
Saskatoon NAPS Station	
Date	**$PM_{2.5}$ 24-hour (micrograms/cubic meter)**
5/28/2019	22.2
5/30/2019	20.3
9/19/2020	19.5
9/20/2020	19.8
7/13/2021	40.0
7/14/2021	31.0
7/15/2021	24.9
7/16/2021	129.1
7/17/2021	124.5
7/18/2021	74.1
7/20/2021	26.8
7/21/2021	36.0
7/22/2021	26.9
7/23/2021	24.2
7/30/2021	23.6
8/1/2021	21.7
8/2/2021	31.8
8/3/2021	37.7
8/4/2021	38.9
8/5/2021	42.1
8/6/2021	34.1
8/7/2021	31.6

Table A-6 Wildfire influenced $PM_{2.5}$ data for Western Yellowhead Air Zone	
Saskatoon NAPS Station	
Date	**$PM_{2.5}$ 24-hour (micrograms/cubic meter)**
8/15/2021	32.0
8/16/2021	31.5
10/4/2021	70.0
10/5/2021	99.7
10/6/2021	55.9
10/7/2021	23.9
10/8/2021	23.6
10/14/2021	34.9
7/30/2022	37.9
7/31/2022	23.3
8/19/2022	21.5
8/22/2022	36.1
8/23/2022	29.9
8/24/2022	43.1
8/25/2022	43.5
8/26/2022	19.0
9/4/2022	36.2
9/5/2022	42.3
9/6/2022	23.4
9/7/2022	28.9
9/11/2022	27.3
9/12/2022	25.6
10/3/2022	21.1
10/4/2022	28.8
10/8/2022	23.0
10/9/2022	33.2
10/10/2022	23.8
10/19/2022	44.9
10/20/2022	32.3

Table A-7 Wildfire influenced $PM_{2.5}$ data for Southeast Saskatchewan Air Zone	
Estevan NAPS Station	
Date	**$PM_{2.5}$ 24-hour (micrograms/cubic meter)**
5/29/2019	24.9
5/30/2019	20.0
6/1/2019	19.1
9/20/2020	19.7
9/21/2020	19.0
5/20/2021	35.1
5/21/2021	24.4
7/14/2021	28.4
7/19/2021	45.4
7/20/2021	25.8
7/23/2021	22.1
7/24/2021	24.9
7/25/2021	25.2
8/15/2021	30.2
8/16/2021	81.7
8/17/2021	30.9
10/2/2021	62.8
10/3/2021	34.8
10/5/2021	23.2
10/6/2021	21.0
10/7/2021	55.9
10/8/2021	58.2
8/24/2022	21.2
8/25/2022	19.8
9/7/2022	21.3
10/19/2022	20.7
10/20/2022	22.4

Table A-8 Wildfire influenced $PM_{2.5}$ data for Grasslands Air Zone	
Swift Current NAPS Station	
Date	**$PM_{2.5}$ 24-hour (micrograms/cubic meter)**
5/31/2019	28.7
6/1/2019	38.4
6/2/2019	20.6
9/19/2020	22.2
9/20/2020	35.2
7/15/2021	26.2
7/16/2021	100.7
7/17/2021	46.3
7/18/2021	42.3
7/19/2021	24.5
7/20/2021	29.6
7/21/2021	24.8
7/22/2021	23.2
7/23/2021	36.6
7/24/2021	34.4
7/25/2021	26.9
7/27/2021	25.7
7/30/2021	25.3
7/31/2021	20.0
8/1/2021	27.3
8/2/2021	27.5
8/3/2021	34.5
8/4/2021	32.9
8/5/2021	29.8
8/6/2021	30.7
8/7/2021	35.7
8/15/2021	51.7
8/16/2021	63.0
10/6/2021	24.5
10/7/2021	33.8
8/24/2022	20.2
9/4/2022	54.1
9/5/2022	28.1
9/7/2002	19.5
9/12/2022	31.4
10/19/2022	24.5
10/20/2022	21.8