



Effects of the spring 2020 COVID-19 public health emergency on urban air quality in Alberta

On March 16 2020, Alberta declared a public health emergency and enacted measures to reduce the spread of COVID-19. Measures included the closure of schools and daycares, the restriction of gatherings, and mandated physical distancing. These actions were expected to temporarily decrease the concentration of air pollutants due to reduced road traffic in Alberta's urban centres.

During the public health emergency, air quality monitoring continued. Alberta Environment and Parks analyzed air quality data collected between March 16 and April 24, 2020, as shown below. Further investigation into the relationship between COVID-19 measures and air quality is ongoing.

Summary

- Weekday traffic on urban thoroughfares decreased by 8-41% during March 16 – April 24, 2020.
- Concentrations of nitrogen dioxide (NO₂) in the air in Alberta's two largest cities, Calgary and Edmonton, were at least 14% lower than in previous years.
- Satellite measurements of NO₂ were also lower than would be expected under typical conditions for urban areas across Alberta.
- NO₂ is a common indicator of air quality because of its effect on respiratory health and its ability to react in the atmosphere to form secondary pollutants such as ozone and fine particulate matter.

Pandemic response and traffic volume

Albertans responded to the spring 2020 public health emergency by taking steps to prevent the spread of COVID-19, including working from home and limiting non-essential travel. Such actions reduced weekday traffic on most urban thoroughfares by 25-41% during March 16 – April 24, 2020 (Alberta Transportation Data Source).

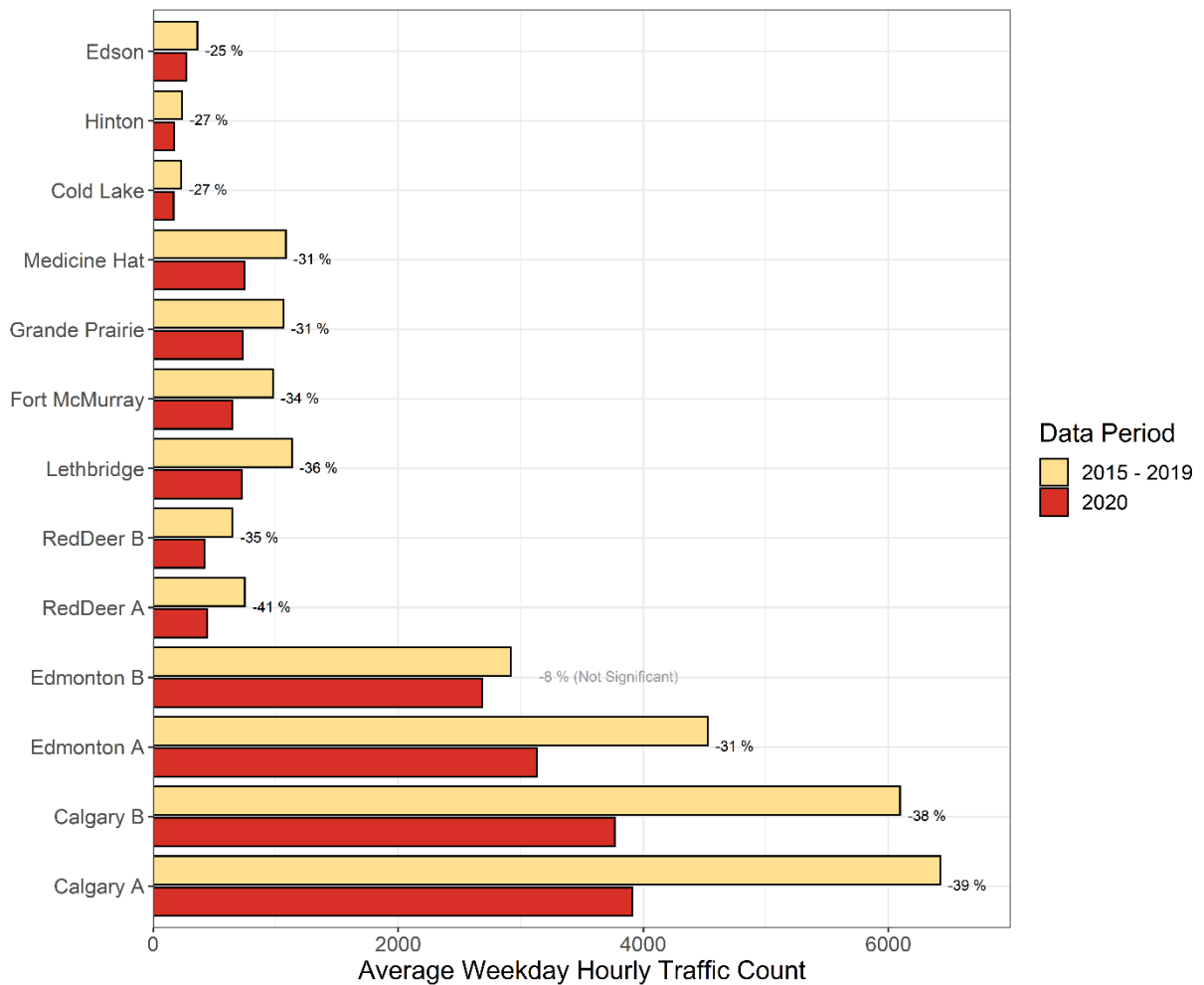


Figure 1 – Change in weekday traffic. Data from Alberta Transportation. Data include sample period between March 16 – April 24 (excluding weekends and holidays). Significance was tested using Mann Whitney u test (p value ≤ 0.05). This test compares the distribution of the two data sets.

Effect of the pandemic response on air quality in large Alberta cities

NO₂ is a major component of oxides of nitrogen—a group of pollutants emitted by many sources including motor vehicles and industrial activity. Because motor vehicles are one source of NO₂, particularly in cities, it is a useful metric to understand how reduced traffic affects air quality.

NO₂ decreased at air monitoring stations in urban centres

Alberta Environment and Parks, in partnership with Airshed Organizations, measure NO₂ and other pollutants across the province using air quality monitoring stations.

Larger cities can experience higher concentrations of NO₂ owing to a higher volume of vehicle traffic. Stations near downtown Calgary and Edmonton saw mean NO₂ concentrations decrease by 19-23% or ~3 parts per billion (ppb) during March 16 – April 24, 2020 compared to the same period between 2015 and 2019.

In Alberta's smaller urban centres concentrations of NO₂ are normally lower. Most centres saw a decrease of 1 ppb or less.

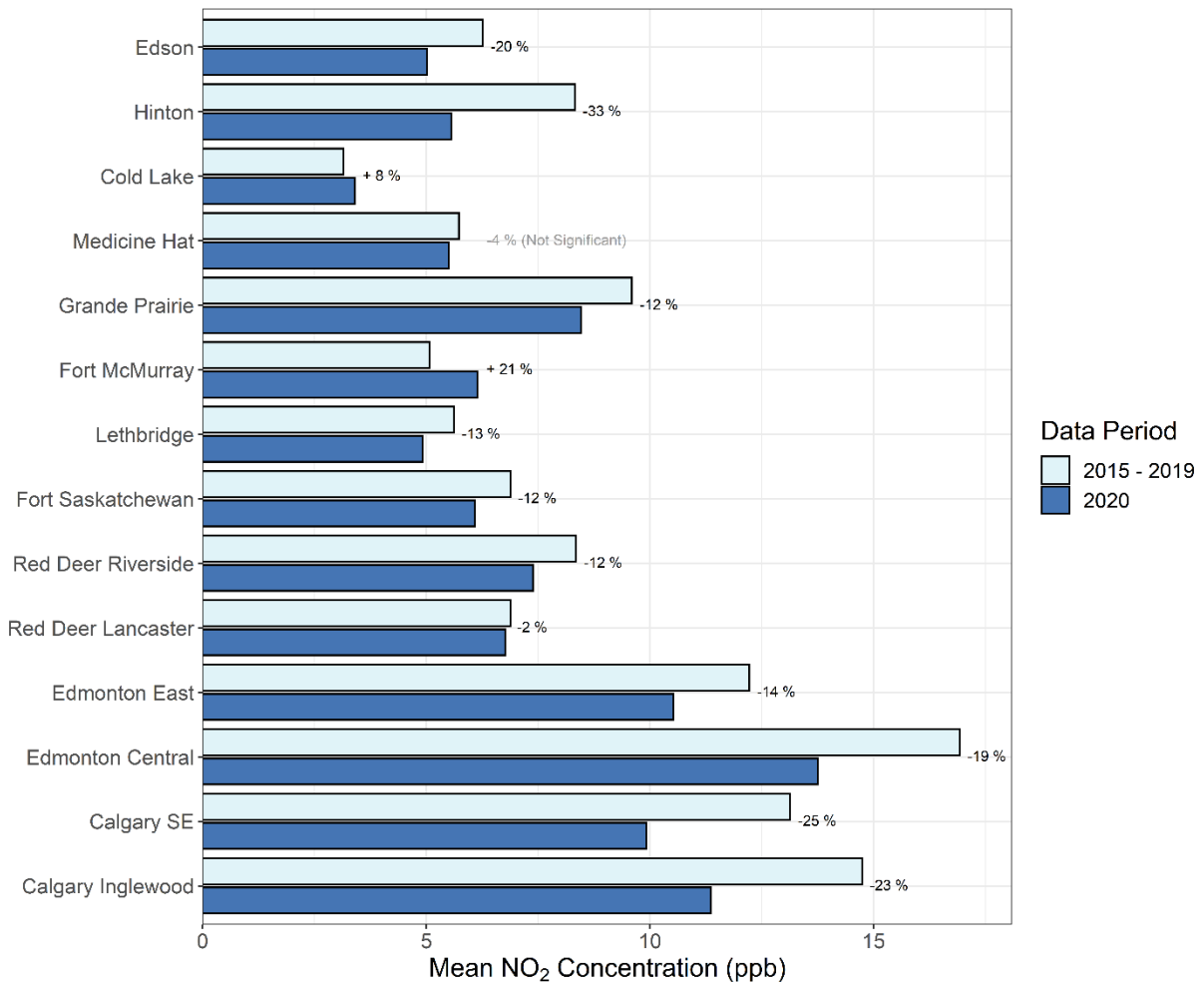


Figure 2 – Mean NO₂ concentrations in a number of urban centres. Data were obtained from: <https://www.alberta.ca/access-air-quality-and-deposition-data.aspx>. Data include sample period between March 16 – April 24 (excluding weekends and holidays). Significance was tested using Mann Whitney u test (p value ≤ 0.05). This test compares the distribution of the two data sets.

Lower levels of NO₂ are observed from satellites

Levels of NO₂ measured by satellite during the spring 2020 public health emergency were also lower than would be expected under typical conditions for urban areas across Alberta. Work is ongoing to determine the amount of change in the satellite NO₂ measurements.

Similar decreases in urban air pollution have been observed for other urban areas across Canada.¹

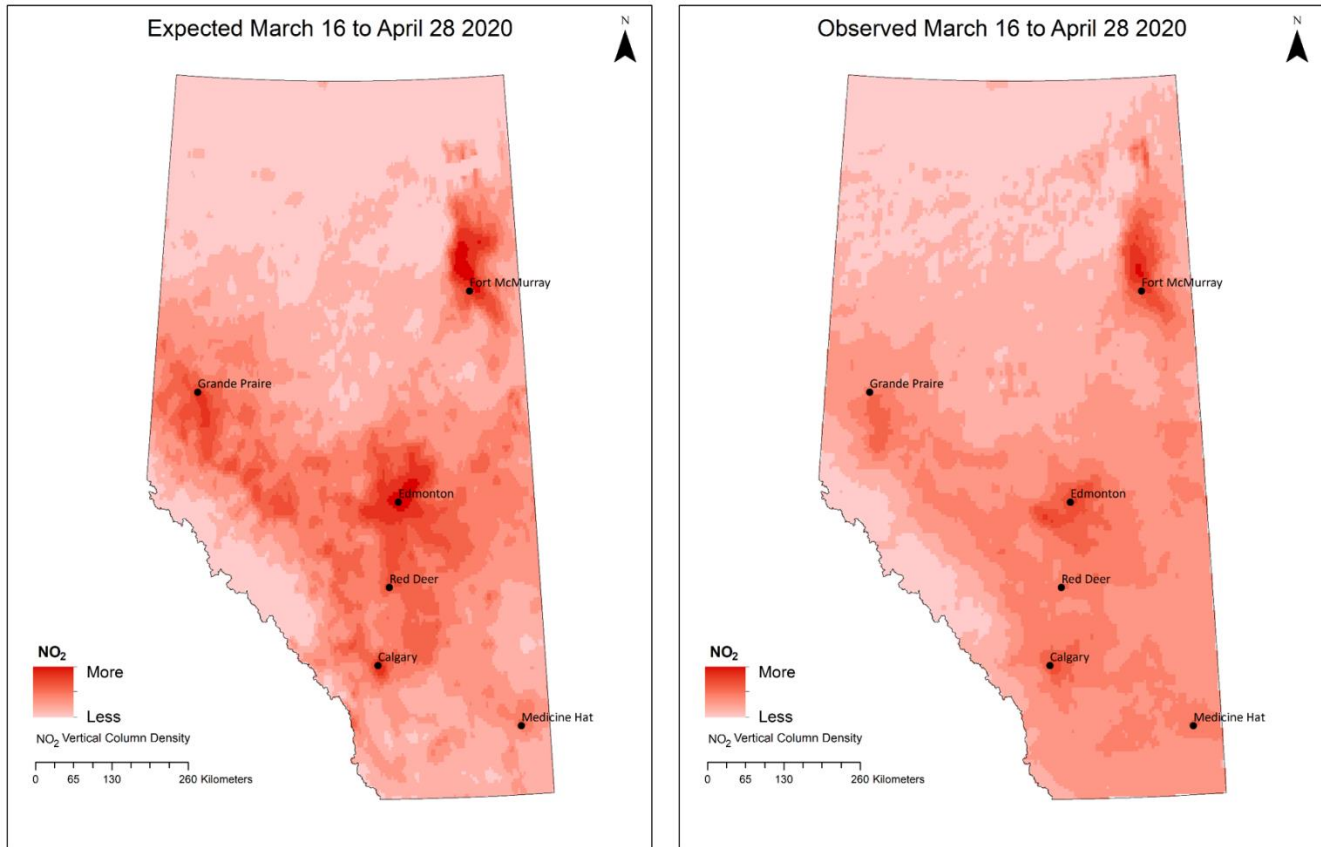


Figure 3 – NO₂ measured by satellite. Produced by the Air Quality Research Division at Environment and Climate Change Canada (ECCC) using satellite observations from the European Space Agency's Tropospheric Monitoring Instrument (TROPOMI) with post-processing performed by ECCC. The expected NO₂ levels (left panel) are based on observations prior to the spring 2020 public health emergency, seasonally adjusted to represent expected observations and the observed NO₂ levels (right panel) are data for the days after the public health emergency.

Air quality monitoring, evaluation, and reporting continue during the public health emergency

Other indicators of air quality (ozone and fine particulate matter) appear to also be affected, and additional work is ongoing to better understand air quality changes during the public health emergency. For current information on air quality in your area visit [Alberta's Air Quality Health Index](#).

¹ Goldberg, D. L., Anenberg, S. C., Griffin, D., McLinden, C. A., Lu, Z., & Streets, D. G. (2020). Disentangling the impact of the COVID-19 lockdowns on urban NO₂ from natural variability. *Geophysical Research Letters*, 47, e2020GL089269. <https://doi.org/10.1029/2020GL089269>