

Air quality patterns in Lawrence

Spatial PM₁₀ study: 2012

Study objective

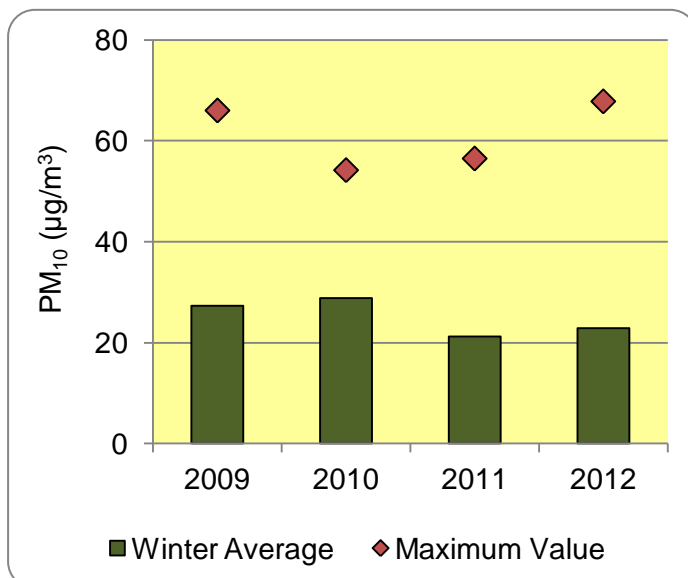
Lawrence occasionally experiences poor air quality during winter months due to residents' widespread use of solid-fuel burners to heat their homes. ORC has been measuring PM₁₀ (small particles suspended in the air) at the bowling club since 2009. Results indicate that PM₁₀ concentrations exceed the limit set in the National Environmental Standard (50µg/m³ daily average) a few days each winter.

In winter 2012, ORC completed a spatial air quality study using a portable monitor to sample PM₁₀ at 17 locations throughout Lawrence. This study aimed to provide a broad context for the stationary monitor's results by identifying the overall pattern and magnitude of PM₁₀ concentrations across the town.

Background

Lawrence, with a population of approximately 430, is located in a low-lying area approximately 45km inland from Milton. The area experiences a continental-style climate and is relatively sheltered by the hills to the north and west. Consequently, the town is subject to extremely low winter temperatures and relatively calm conditions. These two factors can lead to smoke being trapped near the surface for short periods during the morning and evening, when emissions are at their highest.

Air quality monitoring results from 2009 – 2012 indicate that PM₁₀ levels are considered to be high (over 50µg/m³) about three days per winter, on average. Maximum daily values are generally 20% higher than the National Environmental Standard threshold of 50µg/m³.



Measurements taken at the bowling club on the main road into town show a consistent pattern from year to year. The graph shows the winter's daily average PM₁₀ in green and the maximum daily value for each year as a red diamond.

To understand more about the nature of Lawrence's air quality, a spatial study was designed and carried out during the winter of 2012.

Study design

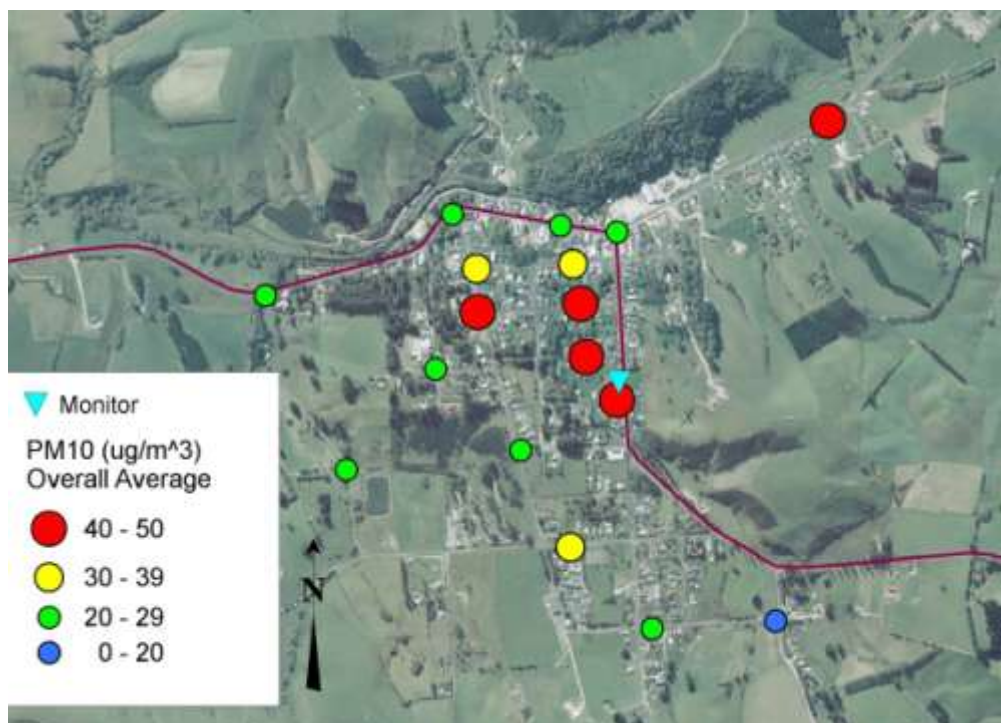
Using a portable air monitor, samples were taken at 17 locations around Lawrence during various times of day over five days. The real-time optical PM₁₀ sensor unit, (DustTrak 8532), was mounted in a vehicle with the intake on the roof bar at about 1.5m above the ground. The monitor logged five-second PM₁₀ data for about a minute at every site. Typically, two runs per session were done to ensure robust data collection. Finally, an overall spatial pattern was developed by averaging the data from all sampling runs.

Results

The map shows the average of all data collected; the highest PM₁₀ levels are shown in red and the lowest in blue.

For the most part, the highest PM₁₀ levels appear in the central part of town. This corresponds to a 6-8 square block area of houses whose emissions tend to get trapped at ground level when it is cold and calm. PM₁₀ from those houses on the hill will also sink down to streets at lower elevations, adding to the existing smoke. Farther out from this central area, PM₁₀ reduces to lower levels. The permanent air monitor's location provides a good representation of the ambient air in Lawrence.

Although the higher PM₁₀ levels were, on average, under 50µg/m³, values from measurements taken directly downwind of individual chimneys were as high as 160µg/m³ on occasion.



For further information call Dr. John Threlfall or Deborah Mills at ORC: 0800 474 082.