Fort Air Partnership
Fine Particulate Monitoring Project
Elk Island National Park Campground

October 2022

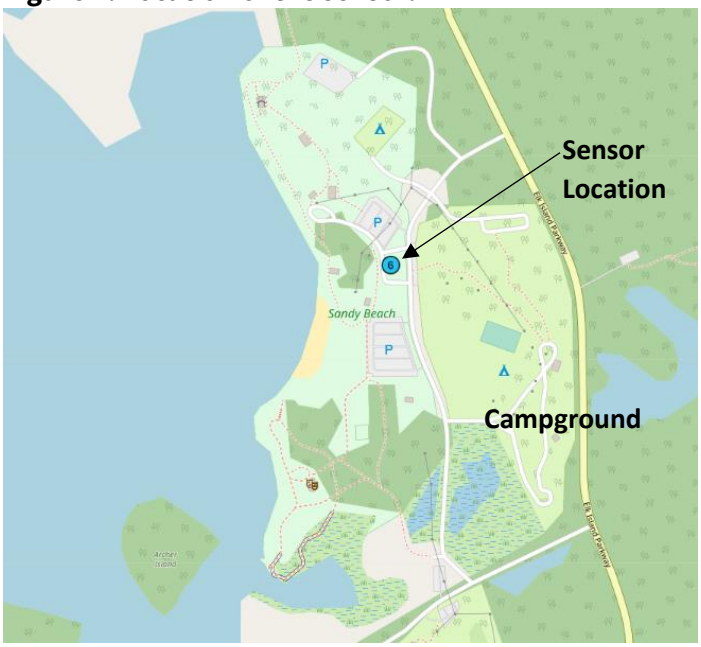
Summary of Results

The Elk Island Fine Particulate Air Monitoring Project

Fort Air Partnership (FAP), in cooperation with Parks Canada and Environment and Climate Change Canada, measured fine particulate matter ($PM_{2.5}$) from May 5 to October 11, 2022, using a small air quality sensor on the Astotin Lake campground registration office. The sensor provided measurements of $PM_{2.5}$ in the campground and picnic areas of the park in near real-time. Of particular interest for this project was measuring the concentration of fine particulate matter resulting from campfire smoke during summer evenings when the campground was at full capacity.

Figure 1: Mounted sensor at the registration office

Figure 2: Location of the sensor.



What are PurpleAir sensors?

PurpleAir sensors are small (only 3.5” in diameter), inexpensive, and easy to install. They operate requiring only a power source and Wi-Fi connection. PurpleAir sensors can provide a valuable assessment of levels of fine particulate matter. Fine particulate matter is an important component in calculating the Air Quality Health Index at FAP continuous air monitoring stations.

Why monitor Fine Particulate Matter ($PM_{2.5}$)?

$PM_{2.5}$ can be harmful to human health. It is generally the largest contributor to poor air quality during episodes of wildfire smoke. $PM_{2.5}$ is made up of very small particles, with a size of 2.5 micrometres or smaller. $PM_{2.5}$ can be inhaled into the lungs and may cause symptoms such as coughing or may worsen existing heart and lung conditions.

$PM_{2.5}$ is an important component in calculating the Air Quality Health Index (AQHI). The data from FAP's continuous air monitoring station, located across Astotin Lake near the Elk Island Park administration office, is used to calculate an AQHI for the local area.

Data Summary

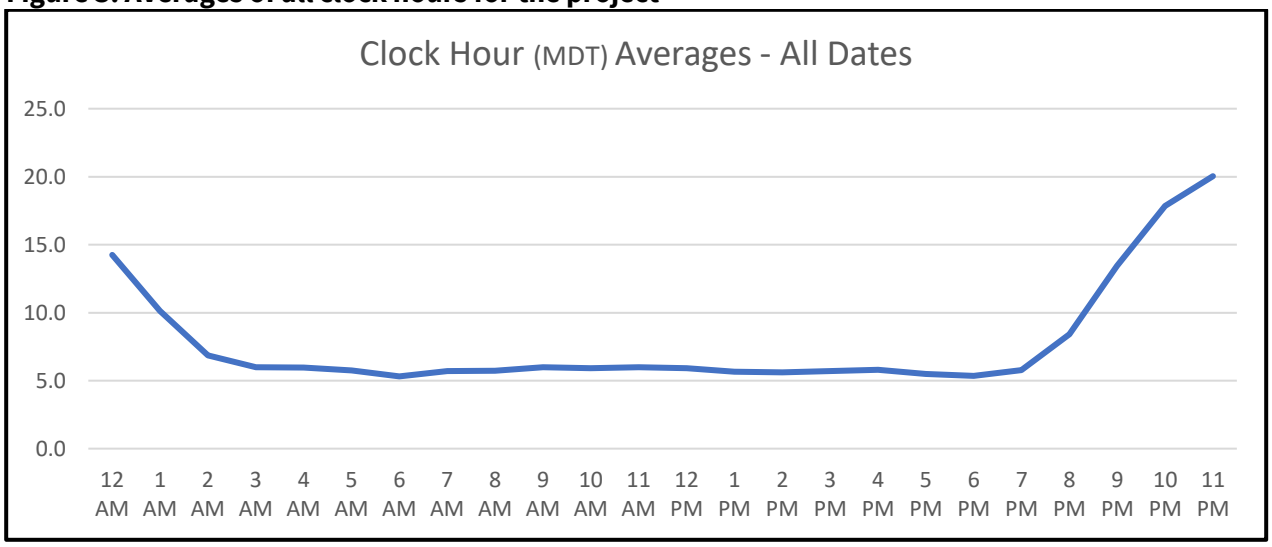
Several significant episodes of smoke from wildfires originating outside of FAP were measured across all FAP monitoring stations throughout the summer of 2022. These episodes were removed from the Elk Island PurpleAir sensor dataset for this analysis.

The analysis shows a trend to higher $PM_{2.5}$ levels during the evenings. In the evenings, wind speeds drop, and many campers start and maintain campfires. Parks staff have indicated the campground was fully booked on weekends from May through Thanksgiving in 2022.

Figure 3 shows all $PM_{2.5}$ measurements for each clock hour averaged together for the entire project.

The plot shows that $PM_{2.5}$ measurements were fairly consistent throughout the day, from the early morning hours until approximately 8 p.m. From 8 p.m. on, the hourly $PM_{2.5}$ averages increase until tapering off after midnight.

Figure 3: Averages of all clock hours for the project



Figures 4 and 5 show the averages of each clock hour plotted by month. Figure 4 plots the hours from 2 a.m. to 5 p.m., while Figure 5 plots the hours from 6 p.m. to 1 a.m.

Figure 4: Daytime averages by month

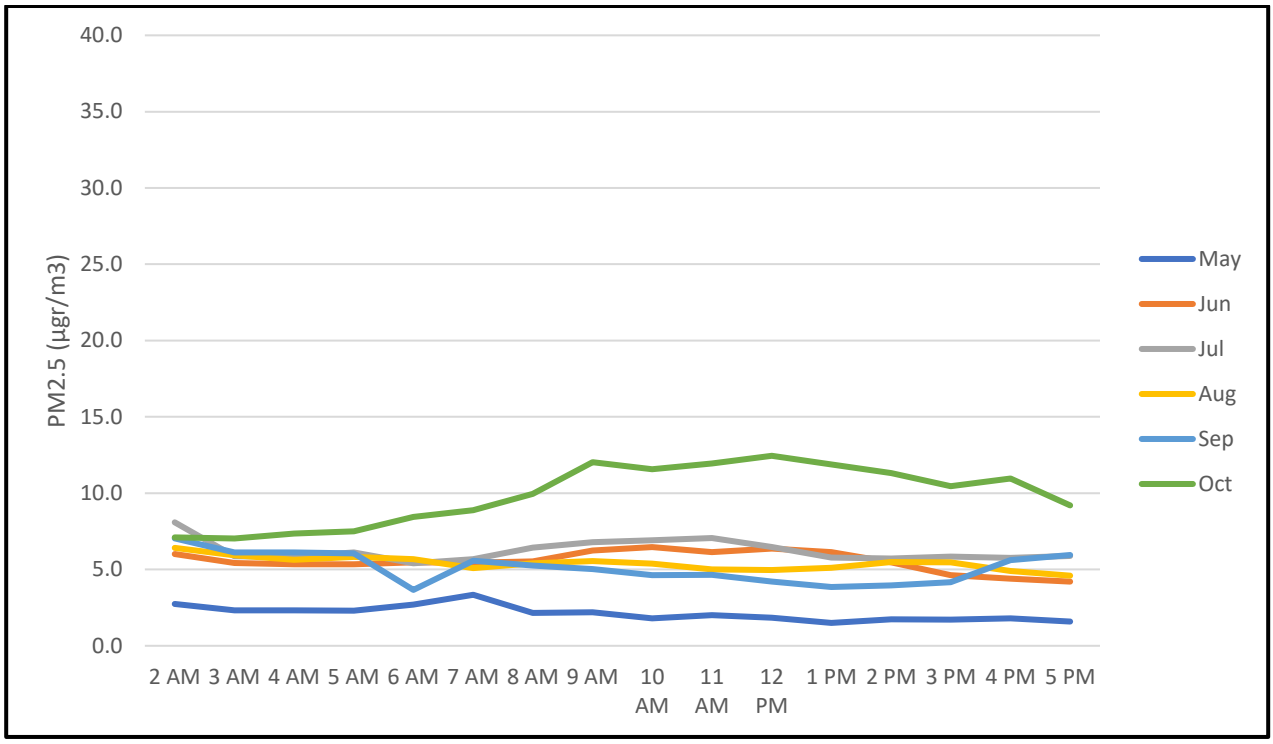
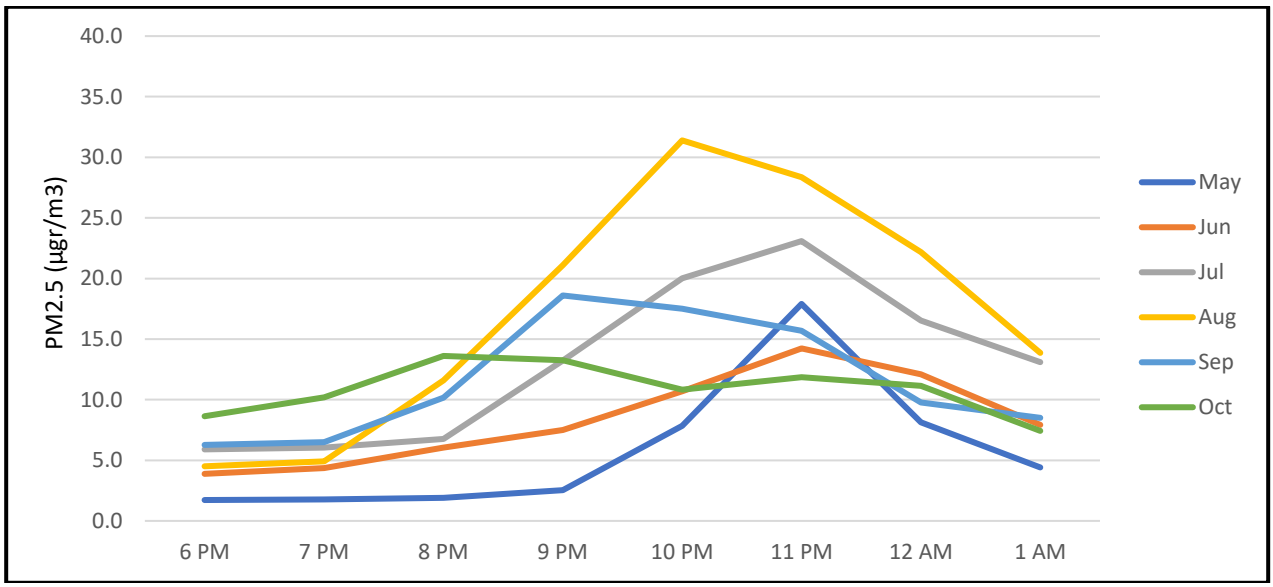


Figure 5: Evening averages by month



Data from PurpleAir sensors does not meet Government of Alberta regulatory standards and is not used to make regulatory decisions or issue air quality advisories. However, the University of Northern British Columbia has developed AQMap, a tool which shows $PM_{2.5}$ concentrations from PurpleAir sensors and associated health messaging. The AQMap health messaging is intended as guidance since individuals can react differently to air pollution.

Throughout the project term, which included over 3800 hours of $PM_{2.5}$ measurements, there were 16 hourly $PM_{2.5}$ averages above 80 µgr/m^3. Levels of 80 µgr/m^3 and above can be considered high risk to human health as categorized by the national Air Quality Health Index (AQHI). Of the 16 hourly averages, 13 occurred on weekends (Friday to Sunday) between 9 p.m. and 1 a.m.

About Fort Air Partnership
FAP is a not-for-profit organization that monitors the air people breathe within a 4,500 square kilometre area north and east of Edmonton encompassing Alberta's Industrial Heartland. Ten continuous air monitoring stations monitor and report on 18 different substances and several weather conditions. The collected data is used to compare to government standards. The Government of Alberta also uses data to calculate an AQHI, a general measure of air quality pertaining to human health.

The PurpleAir sensor was donated to FAP by Environment and Climate Change Canada (ECCC). The recorded information was validated and made available in real-time on an AQMap operated by the University of Northern British Columbia (UNBC), which continues to provide measurements for the five permanent PurpleAir sensors located in the FAP Airshed.

Website: https://www.fortair.org/monitoring/stations/
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