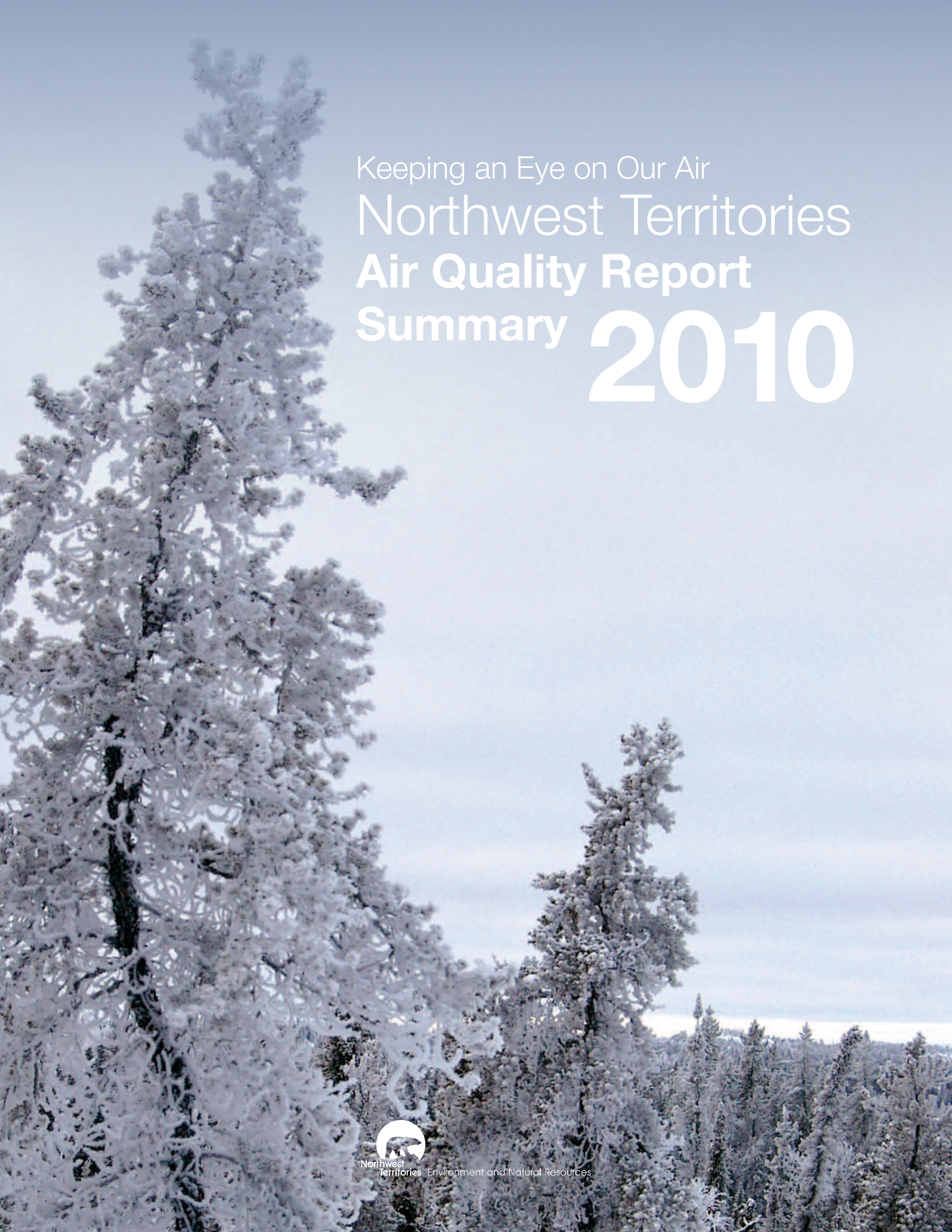
Keeping an Eye on Our Air

Northwest Territories Air Quality Report Summary 2010



Northwest Territories Environment and Natural Resources

TABLE OF CONTENTS

Introduction 3

Our Network 4

The Pollutants We Monitor and the Problems They Can Cause 5

Highlights in 2010 6

Equipment and Quality Control 7

Need More Information? 8

INTRODUCTION

The Department of Environment and Natural Resources (ENR) watches for changes in air quality. ENR monitoring stations located throughout the NWT have highly specialized instruments to collect and measure pollutants, including gaseous substances and particulate matter (i.e. 'dust'), that are in the air. This information is sent electronically to the ENR office in Yellowknife. The public, environmental consultants and other interested people can find this information on our web site at http://www.air.enr.gov.nt.ca/NWTAQ/NetworkSummary.aspx.

Outside air, surrounding us on the land and in our communities is called "ambient" air. It contains nitrogen, oxygen, a small amount of carbon dioxide and water vapour. It also has traces of particulate and other chemicals. There are standards that describe the maximum amount of chemicals and particulate that are allowable in ambient air. The naturally occurring levels of 'dust' and chemicals in the air are called "background levels". Human activities and unusual natural events such as forest fires can cause pollution and raise these background levels.

By monitoring the levels of chemicals and particulate in the air, we can report pollution when it happens. Smoke from fires burning in Alberta, Alaska, Yukon and the NWT caused fine particulate pollution at all of the NWT stations in the past. This year, as in 2009, there was minimal pollution from forest fires.

We also watch for trends over the years. One change we have seen has been in Yellowknife. When the local gold mines were operating, they released arsenic and sulphur dioxide that polluted Yellowknife's air, but since the mines have closed that air pollution has largely disappeared.

OUR NETWORK

Environment and Natural Resources' permanent monitoring stations are located in:

- Yellowknife
- Inuvik
- Norman Wells
- Fort Liard

The stations are small trailers that hold equipment that are continuously collecting and measuring particulate and chemicals in the air. In these four communities we watch for the following substances:

- Fine-particulate matter, i.e. 'dust' ($PM_{2.5}$)
- Coarse-particle 'dust' (PM_{10})
- Sulphur dioxide (SO_2)
- Nitrogen oxides (NO_x)
- Ground level ozone (O_3)

Also, testing is done for the following substances at selected stations:

- Hydrogen sulphide (H_2S)
- Carbon monoxide (CO)
- Acidic Deposition at Snare Rapids

We determine the significance of measured levels by comparing them to the *NWT Ambient Air Quality Standards* adopted under the NWT *Environmental Protection Act*. In some cases, standards have not been developed for the NWT and so we use limits set by the federal and other provincial governments.

We also work with Canada-wide air quality networks:

- The Yellowknife and Inuvik stations are part of the National Air Pollution Surveillance (NAPS) Network. NAPS tests air quality in cities throughout Canada.
- Rainwater and snow sampled at Snare Rapids is part of the Canadian Air and Precipitation Monitoring Network (CAPMoN).

THE POLLUTANTS WE MONITOR AND THE PROBLEMS THEY CAN CAUSE

Our job is to watch for pollution and we do that by monitoring particulate, or 'dust', and gaseous substances.

'Dust' comes in different particle sizes. 'Dust' of all sizes is called Total Suspended Particulate (TSP), and 'dust' that is about 30 times smaller than the width of a human hair is called $PM_{2.5}$. High levels of $PM_{2.5}$ can cause health problems because the particles are so small they get through our nose and throat defences and get deep into our lungs. PM_{10} particles are slightly larger than $PM_{2.5}$ particles, but are still inhalable and, therefore, they also cause health concerns.

We monitor the following gaseous substances:

Sulphur Dioxide

SO_2 can come from building heating, power generating plants, gas plant flares, oil refineries, and from forest fires. High levels can cause lung problems, especially for people with asthma. SO_2 can affect plants, especially lichens, and lead to the formation of other pollutants.

Nitrogen Oxide

The sources of NO_x are the same as SO_2 as well as vehicle emissions. High levels can cause serious breathing problems that can be ongoing. NO_x can also lead to formation of other pollutants.

Hydrogen Sulphide

H_2S smells like rotten eggs and can come from oil and gas activities, sewage treatment plants as well as from natural sources such as swamps. High levels can cause eye irritation and stomach sickness.

Ground Level Ozone

This is the same gas (O_3) that is found higher up in the atmosphere, where it is called stratospheric ozone. High in the atmosphere, O_3 is a good thing – it protects the planet from the sun's harmful ultraviolet rays. However, at ground level, O_3 can be harmful to humans and plants. High levels can be created in the lower atmosphere by sunlight and heat causing chemical reactions with other gases (NO_x and substances called volatile organic compounds or VOCs). High levels can lead to chest tightness, coughing, wheezing and other heart and lung problems. The effect of O_3 on plants can be seen as discoloured leaves and general poor vegetation growth.

Carbon Monoxide

CO comes from a number of sources, including home heating, vehicle exhaust and forest fires. Extremely high levels of CO in our air can be poisonous and can cause headaches, shortness of breath and stomach sickness.

HIGHLIGHTS IN 2010

Throughout the NWT we continue to enjoy clean air with minimal effects from pollution. The 'dust' and chemicals we find in the air are usually well below the amounts allowed by our standards.

The main causes of pollution we observe at our stations are from forest fires and springtime/summer 'dust' events. Fine particle 'dust' ($PM_{2.5}$) levels in 2010 did not reach levels of significant concern because there were few major forest fire events. *Note that the PM_{10} monitor in Norman Wells was not operational*. Coarse particle 'dust' (PM_{10}) affected air quality in Yellowknife, Inuvik and Fort Liard throughout the summer. Other readings show us the effects on air quality from burning petroleum for heating and in our vehicles during the cold days of winter.

Yellowknife

Yellowknife air quality remained good for the most part, although the effects of forest fires were noticeable on occasion, similar to previous years.

- Forest fire smoke, measured as fine 'dust' ($PM_{2.5}$), was elevated in the air in Yellowknife on occasion in June and August.
- The coarse particle 'dust' (PM_{10}) monitor showed some high readings in June, corresponding with the forest fires.

Inuvik

Air quality in Inuvik remained good for the most part, although the effects of 'dust' were noticeable throughout the summer.

- Fine 'dust' ($PM_{2.5}$) levels increased mainly in June and July, primarily from forest fires in the Inuvik region. However, their impacts did not exceed the standard.
- The coarse particle 'dust' (PM_{10}) monitor showed the usual high readings in the spring months related to the residual gravel on the roads following the snow melt. There were seven exceedances of the adopted standard, which generally occurred in the snow-free months.

Fort Liard

Fort Liard air quality remained good, with only some small effects of forest fire smoke measured in the summer.

The 'dust' from the gravel roads was measurable as PM_{10} in the snow-free months, with only one exceedance of the adopted standard, in April.

Norman Wells

Norman Wells air quality remained good for the most part, although the effects of forest fire were noticeable in June through August, at levels similar to previous years. There were no exceedances of the NWT Air Quality Standards.

EQUIPMENT AND QUALITY CONTROL

Our Air Quality Monitoring Network uses a variety of monitoring equipment to collect information on pollutants.

Analyzers and Monitors

To test gaseous substances in the air, analyzers are constantly drawing in air, measuring chemical content and providing “real time” data. To measure particulate matter in the air, ENR uses machines called Beta-Attenuation Mass Monitors (BAM) that draw in air and collect samples continuously on a specialized filter. This provides almost real-time $PM_{2.5}$ and PM_{10} data to ENR.

Quality Assurance

ENR uses a number of methods to ensure they have correct, scientifically valid information. ENR follows Environment Canada guidelines and installs and operates equipment according to manufacturers’ recommendations and maintenance plans. Analyzers are self-calibrating and our technologist also checks measurements on a daily basis.

ENR stations also track wind speed, wind direction and temperature.

Analyzers

Bam Head

NEED MORE INFORMATION?

After reading this summary, if you would like to find out more about air quality you can find the NWT Air Quality Report for 2010 on the Internet at:
http://www.enr.gov.nt.ca/_live/pages/wpPages/publications.aspx

or check out ENR's air quality web site at:
http://www.air.enr.gov.nt.ca/NWTAQ/NetworkSummary.aspx

You can also contact our Environment Division:
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