

PAZA

Peace Airshed Zone Association



ANNUAL REPORT 2010

Breathe easy.

You might not taste it, and you can't really see it, but it's all around us every second sustaining both our own lives and the ecosystem we all depend on.

Of course we're talking about air, which is something we do a lot of at PAZA. That's because we monitor the air quality of the Peace airshed.

We believe people in the Peace region deserve the best air quality possible, and we bring industry, government, non-governmental organizations, and the public together to make sure they get it.

The Peace Airshed Zone Association

PAZA is a nonprofit, multi-stakeholder organization that conducts ambient air quality monitoring in northwestern Alberta. PAZA is an unbiased, open and transparent organization, and our members collaborate to provide local solutions to local air quality concerns. PAZA, as an independent third-party, has invested ten years into building trust among members of the public, industry, non-governmental organizations, Alberta Environment, Energy Resources Conservation Board, and Alberta Health Services.

The air quality monitoring program developed by PAZA is a resource for the public to learn about local air quality, but also ensures continuous improvement of regional air quality, protection of environmental health, and influence on public policy.

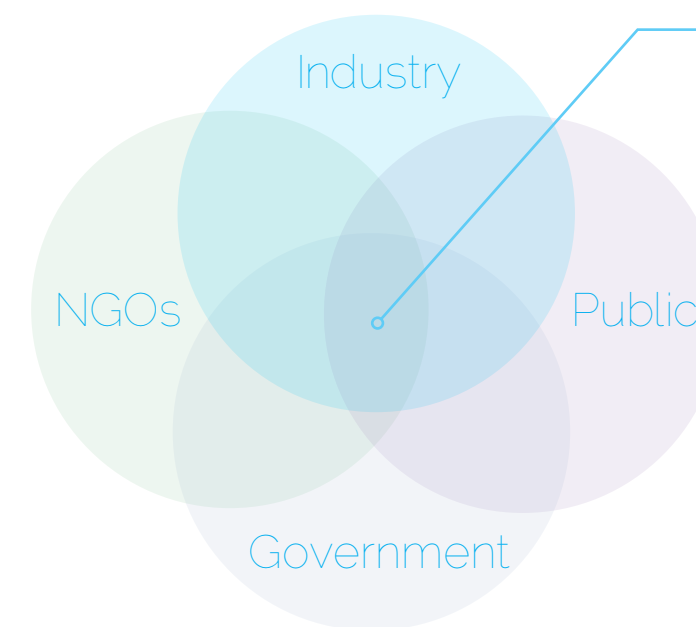
PAZA follows the guiding principle of consensus decision making. Consensus is reached when there is unanimous agreement among our stakeholders, ensuring each one can live with the outcome of the decision. Stakeholders may not achieve all their goals, but the objective is to find the optimal solution within the best interests of everyone. Decisions made through consensus processes are likely to be more innovative and longer lasting than those reached through traditional negotiation or top-down hierarchy.

In 2003, PAZA became the fifth airshed zone in Alberta recognized by the Clean Air Strategic Alliance (CASA).



OUR VISION

People living and working in the Peace region will have the best possible air quality



A Message from the Board



It is with pleasure that I invite you into the pages of our 2010 annual report. This report represents the unveiling of PAZA's new logo and visual brand identity. We undertook these changes to ensure that the outward appearance of our organization accurately reflects the professional value and integrity of PAZA's air monitoring work. We feel that PAZA's work is intimately tied to the lifestyles and economic development of the region, and the new look is meant to communicate the human side of PAZA's contribution to the Peace. I am particularly happy to say that the beautiful photographs you see throughout this report are the work of Peace Country residents, submitted as part of our annual photo contest.

PAZA recognizes that our member's needs are continually changing and as a result we must grow and adapt to remain effective. As we move into 2011, PAZA is undertaking a review of our monitoring program to ensure that we adjust to the changing needs of our stakeholders and continue to provide comprehensive air monitoring throughout the region.

As a member of PAZA since 2003, I have participated in many of PAZA's successes and trials over the past 10 years. I am proud to watch our organization grow each year to include participation from a continually expanding group of stakeholders. These people are the heart and soul of our organization, and their diversity is proof that business, community, government, and non-governmental organizations can work together for a common goal. It is their support that has made PAZA a leader in air quality monitoring in north-west Alberta. It is also thanks to the financial support of our voluntary contributors that we can continue to provide a valuable resource for air quality data. Thank you all.

My wish is that you enjoy reading about the many accomplishments of PAZA in 2010 and continue to support our journey into 2011, and beyond.

Sincerely,

A handwritten signature in blue ink that reads "Robert A. Cameron".

Bob Cameron
PAZA Board Chair

We're walking on air.

Our extensive regional ambient air quality monitoring network operates with an annual budget of over \$700,000, funded largely by voluntary contributions. In 2010, our members committed 1,700 hours of volunteer time and resources, totalling over \$86,000 worth of in-kind support.

This commitment not only allowed us to continue monitoring the Peace airshed, but we were able to expand our network resources as well.

Thank you to our supporters!



2010: A Year in Review

The past twelve months characterised an important phase of house cleaning and catch up for PAZA. Our focus was on completion of ongoing projects such as publishing the 2006 Boundary Expansion Study and the 2007-2008 Girouxville Monitoring Project Report, and investing in our network to maintain a high level of air quality monitoring. These improvements streamline the data collection system and will minimize operational downtime. The work completed in 2010 strongly positions PAZA to move into the future, where 2011 should see the completion of a network and station objective review project, as well as a Board of Directors workshop to revisit our vision, mission, public brand, and to set our priorities for the next 3 years.

January

Consensus Decision Making Review: Early in 2010, PAZA thought it important to review the principles of consensus decision-making. Facilitated by CASA, the review helped our board of directors understand the process and the importance of everyone's role.

March

Passive Air Quality Monitoring Data Summary 2002-2009: PAZA released a summary of the passive monitoring data from 2002-2009 to provide the public a visual summary of air quality in their community.

- 1 **Grande Prairie Regional College Student Tour:** PAZA partnered with Science students at the Grande Prairie Regional College to discuss air quality in our region, including a station tour.

Clean Air Strategic Alliance (CASA) Board Approved the Alberta Airsheds Council (AAC) and CASA Joint Standing Committee: The purpose of the committee is to strengthen the relationship between CASA, the AAC and the individual airshed zones, and will provide a forum for discussing and addressing strategic issues related to effective air quality management in Alberta.

Upstream Oil & Gas Well Blowout in the Region: PAZA data was provided to local regulatory agencies during the incident to monitor regional air quality impacts.

April

CASA Data Warehouse Audit Complete: The CASA Data Warehouse is the central repository for air quality data in Alberta. An audit, completed by Alberta Environment, identified that the quality assurance program PAZA utilizes today is very detailed and effective in ensuring high quality air monitoring data.

May

Alberta Environment Annual Audit: Alberta Environment conducted an audit of our continuous monitoring stations from May 10 to 13. Overall the audit was a success. Of the twenty nine parameters measured in the audit one analyzer observed a leak that required repair. The leak occurred over a short period of time resulting in minimal data loss and would have been detected at the subsequent monthly calibrations and station checks.

Three Creeks Area Open House Information Session: PAZA members continued to provide educational support on airshed development and process to stakeholders outside our boundaries where currently no airshed exists.

- 2 **Photo Contest:** PAZA's annual photo contest brought in over 50 entries this year. The calibre of entries was astounding (you are looking at the results in the pages of this annual report). A special thanks to all the participating artists.

June

- 3 **Rover Station Relocation to Bonanza:** The portable air monitoring station complements PAZA's monitoring network and allows us to collect air quality data in areas of the network where technical and geographic data gaps exist or where there are local air quality concerns. This station collected data in the Kinuso area until June when it was relocated to the community of Bonanza.



Lloyd Dykstra/PAZA Photo Contest



July

- ④ **Valleyview Station Building Replacement:** The aging Valleyview Station was replaced with a new aluminum structure.

August

Provincial Air Quality Advisories: Alberta Health issued province-wide air quality advisories due to high levels of fine particulate matter as a result of wildfires burning in northern Alberta and BC. PAZA monitored the air quality very closely and provided news releases through local media during these events.

September

Data Acquisition Systems Upgrade and Communications Upgrade Commenced: We began replacement of the network data loggers and upgraded site communications at the stations. These improvements will streamline the data collection system and minimize operational downtime.

Network and Station Objective Review and Development

Commenced: A committee was established and tasked with the review of the network and station objectives. Moving into our tenth year of operation, PAZA felt it timely to reassess the air quality monitoring needs of the region and modernize our objectives according to regional changes.

December

Draft Girouxville Area Ambient Air Monitoring Summary Released: There is an ongoing history of odour and air quality complaints regarding confined feeding operations (CFOs) south of Girouxville, Alberta. In 2007, PAZA responded to landowner concerns by implementing a sub-regional monitoring network consisting of six strategically distributed hydrogen sulphide passive monitors and one continuous monitoring station equipped to monitor hydrogen sulphide, total reduced sulphur compounds, sulphur dioxide, ammonia, and meteorology. This report, finalized in March 2011, summarized this project.

2006 Boundary Expansion Feasibility Assessment Released: In 2006 PAZA conducted a study to explore the feasibility of expanding the airshed boundaries to include areas to the north, east and south where there is no organized regional air quality monitoring. This report summarized this project.



4

Did you know? You're in PAZA airspace.

PAZA operates a network of six continuous monitoring stations and 49 passive monitoring stations that collectively monitor air quality across the Peace region.

The PAZA boundary encompasses approximately 38,000-square-kilometers, with a population of approximately 100,000 people living and working in the region.

PAZA Ambient Air Quality Monitoring Network

The regional Air Quality Monitoring (AQM) Program commenced operation in 2002, developed in accordance with Alberta's Clean Air Strategy.

PAZA's ambient air monitoring program was implemented to provide scientifically credible air quality data to assess short and long term air quality on a regional scale. It is designed to respond to local and regional air quality issues and concerns in relation to human and ecosystem health.

The goal of the monitoring program is to collect reliable, representative, scientifically credible data in an efficient and economically sustainable manner and to ensure the data is available and easily accessible to all stakeholders.

What happens to the data?

The monitoring stations are operated in accordance with Alberta's Air Monitoring Directive. All data undergoes a rigorous quality assurance and quality control program, including daily equipment checks, monthly multipoint calibrations, and annual government audits conducted by Alberta Environment. PAZA also conducts frequent data review for variances and trends.

The data is compared against Alberta Ambient Air Quality Objectives (AAAQO) as defined in the Alberta Environment Protection and Enhancement Act. The AAAQO are intended to provide protection of the environment and human health. PAZA reports any exceedences of AAAQO and submits monthly and annual air quality monitoring reports to Alberta Environment.

PAZA also provides near instantaneous air quality data for public viewing online. For the calculation of the Air Quality Index (AQI) measurements, PAZA submits up to the hour data to Alberta Environment. The AQI is updated hourly, 24-hours-a-day, and can be viewed on our website and the Alberta Environment website.

In addition, the Grande Prairie Henry Pirker and Beaverlodge stations are part of the National Air Pollution Surveillance Program, which monitors and assesses the quality of outdoor air in populated regions of Canada.



WE DEAL IN DATA

Data from all PAZA stations is compared against Alberta Ambient Air Quality Objectives (AAAQO) as defined in the Alberta Environment Protection and Enhancement Act, and any exceedences of AAAQO are reported.

PAZA also submits monthly and annual air quality monitoring reports to Alberta Environment.

PAZA Boundary and Monitoring Stations

PAZA operates a network of six continuous monitoring stations and 49 passive monitoring stations that collectively monitor the air quality across the region. The PAZA boundary encompasses approximately 38,000-square-kilometers, with a population of approximately 100,000 people living and working in the region.



PASSIVE vs. CONTINUOUS

There are six continuous (opposite page) and 49 passive monitoring stations (above) dotted throughout the Peace region.

What affects air quality?

Air quality can be impacted by many sources both through human activity and natural phenomenon.

- **Point Sources:** factories, industry, power plants, home and business heating and cooling
- **Mobile Sources:** transportation, vehicles, aircraft
- **Natural Sources:** trees, vegetation, wetlands, gas seeps, forest fires
- **Area Sources:** small sources, BBQs, firepits, drycleaners, pesticide use

In addition to wind speed and direction and important meteorological parameters that affect the transport and dispersion of air, monitoring at the stations is based on what is expected to be present in an area and available technology. For example, monitoring stations in urban centres typically measure for nitrogen oxides, carbon monoxide, particulate matter, and ozone, the parameters commonly associated with vehicle emissions and home heating and cooling. In an industrial area we may monitor for sulphur dioxide, total reduced sulphurs, hydrogen sulphides, total hydrocarbons or fine particulate matter, depending on the industry. In rural areas we may monitor for particulate matter, ozone, or nitrogen oxides.



24/7 MONITORING

PAZA technicians like Grover Christiansen perform regular calibration and maintenance to ensure PAZA's six continuous monitoring stations operate day in and day out, year-round.

Our network's average instrument uptime was 98.7% during 2010.

What does PAZA monitor?

Passively monitored parameters:

- Sulphur dioxide
- Nitrogen dioxide
- Ozone
- Hydrogen sulphide

Meteorological parameters (that affect the transportation and dispersion of compounds):

- Wind speed and direction
- Solar Radiation
- Outdoor Temperature
- Relative Humidity

Continuously monitored parameters :

- Sulphur dioxide (SO₂)
- Total reduced sulphur (TRS)
- Hydrogen sulphide (H₂S)
- Oxides of nitrogen (NO₂, NO and NO_x),
- Carbon monoxide (CO)
- Total hydrocarbons (THC)
- Ozone (O₃)
- Fine particulate matter (PM_{2.5})

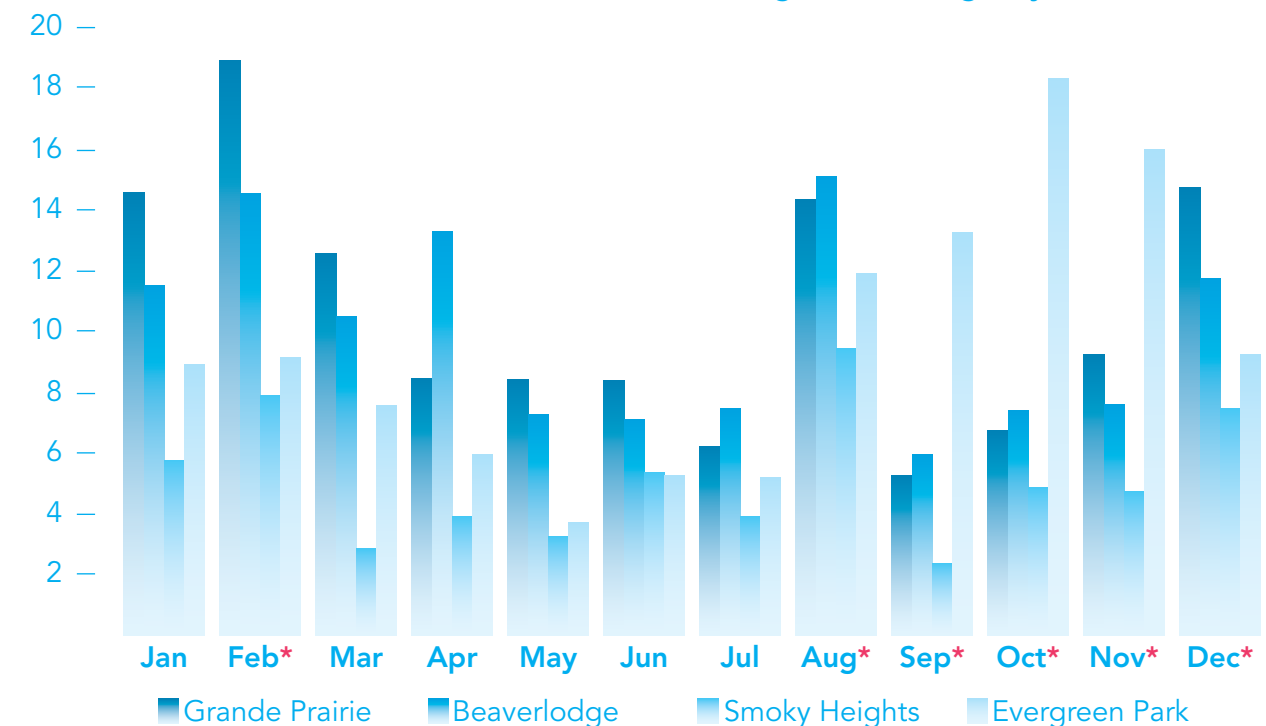
What did the data tell us in 2010?

Although the data was largely consistent with monitoring data from the previous years, in 2010 there were two exceedances of the one-hour hydrogen sulphide Alberta Ambient Air Quality Objective (AAAQO) of 10 parts per billion (ppb) and 29 exceedances of the 24-hour AAAQO for fine particulate matter of 30 ug/m³.

The two one-hour hydrogen sulphide exceedances were measured at the Valleyview station on January 6. The winds were calm and out of the south/southeast. A source to the exceedance was identified to be a leaking gasket at an upstream oil and gas wellsite approximately 1,200 metres from the station.

The 29 fine particulate matter exceedances were observed at all stations measuring fine particulate matter in the network. The concentrations ranged between 30 and 134 ug/m³ and were measured in the months of February, August, September, October, November, and December. Wildfires burning in northern Alberta and northeast British Columbia in August contributed to 18 of the exceedances. The eight exceedances between September through November were observed at the Evergreen Park station with corresponding winds from a westerly direction. There were industrial sources operating primarily during this time frame west of the station that may have contributed to the increase. The exceedance observed in December was measured at the Grande Prairie Henry Pirker station and was attributed to the New Year's Eve fireworks.

Fine Particulate Matter in ug/m³ (Average by Month)



*Denotes months which experienced AAAQO exceedances

NOTE: Graphs and graphic representations of data in this report were created for graphical illustration based on PAZA's official 2010 data. If you would like more detailed data, including official reports, please contact PAZA.

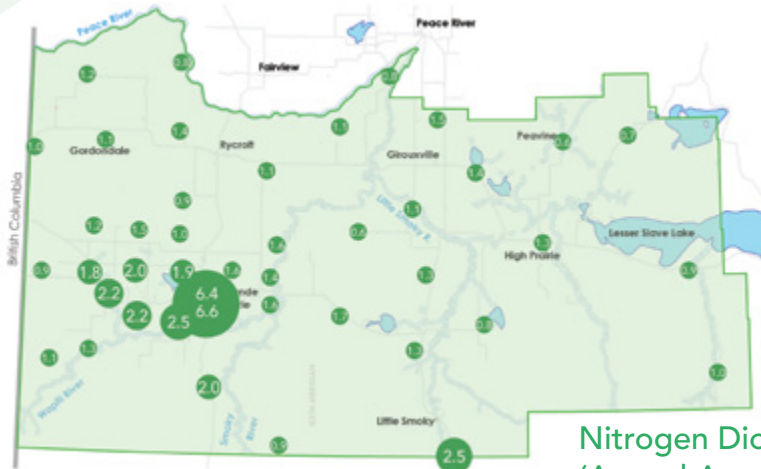
Additional 2010 Data

Nitrogen Dioxide (NO₂)

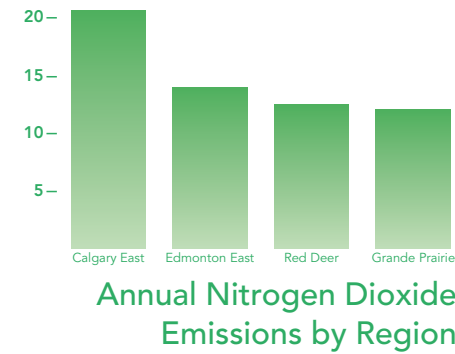
Nitrogen dioxide emissions across the zone are highest along major transportation routes and urban centres. This is visible in the passive annual average bubble map below, and explains why major cities such as Edmonton and Calgary experience much higher overall missions, as indicated in the graph below.

Increases in NO₂ emissions are observed during colder ambient temperatures when there is increased vehicle idling and residential/commercial heating. At the same time, weather conditions inhibit mixing and dispersion of air and air pollutants.

Approximate diameter of Annual Alberta Air Quality Objective (32 ppb) relative to the bubbles on the map below.



Nitrogen Dioxide Concentrations in ppb (Annual Average by Station)

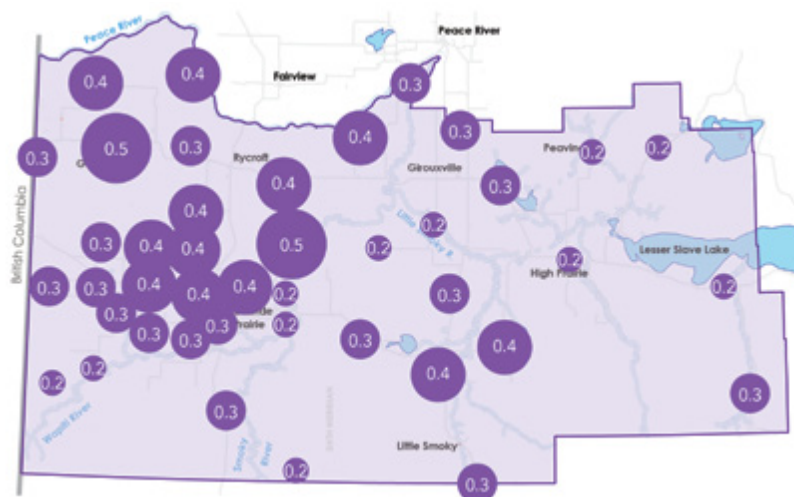


Annual Nitrogen Dioxide Emissions by Region

Sulphur Dioxide (SO₂)

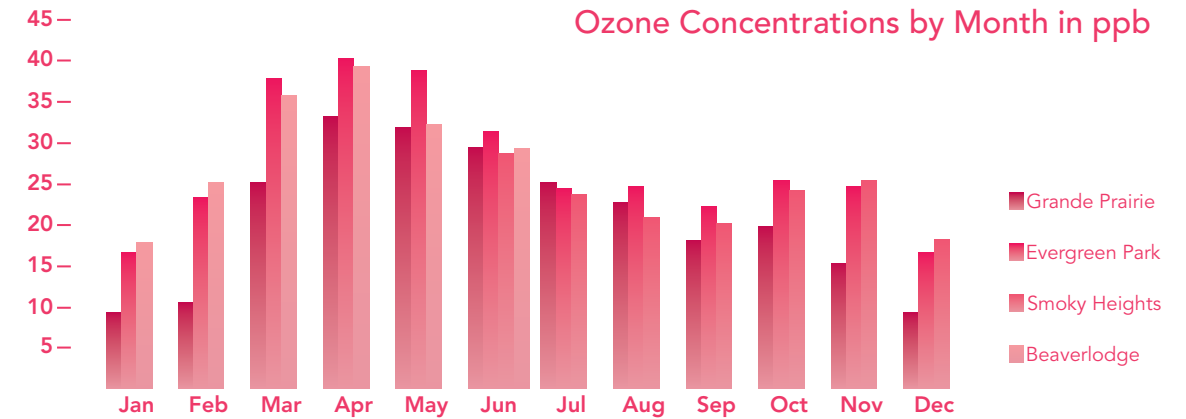
Sulphur dioxide concentrations tend to increase during colder ambient temperatures when weather conditions inhibit mixing and dispersion of air and air pollutants. Sulphur dioxide concentrations tend to be higher at the stations located in areas where industrial facilities involve the burning of fossil fuels, as indicated on the map below.

Sulphur Dioxide Concentrations in ppb (Annual Average by Station)



Approximate diameter of Annual Alberta Air Quality Objective (8 ppb) relative to the bubbles on the map at right. As you can see, annual averages are well within AAAQO parameters.

Ozone Concentrations by Month in ppb



Ozone (O₃)

Ozone and particulate matter are the key components of smog. These pollutants can have a significant impact on human health. They mainly affect the lowest part of the atmosphere, which holds the air we breathe. Particulate matter is a significant problem in rural areas, as well, due to wood burning.

The O₃ concentrations are highest in the spring and early summer when O₃ production at ground level is at a maximum due to higher levels of sunlight. Increased O₃ values during the winter months may be caused by weather conditions such as temperature inversions that trap stagnant air close to ground level.

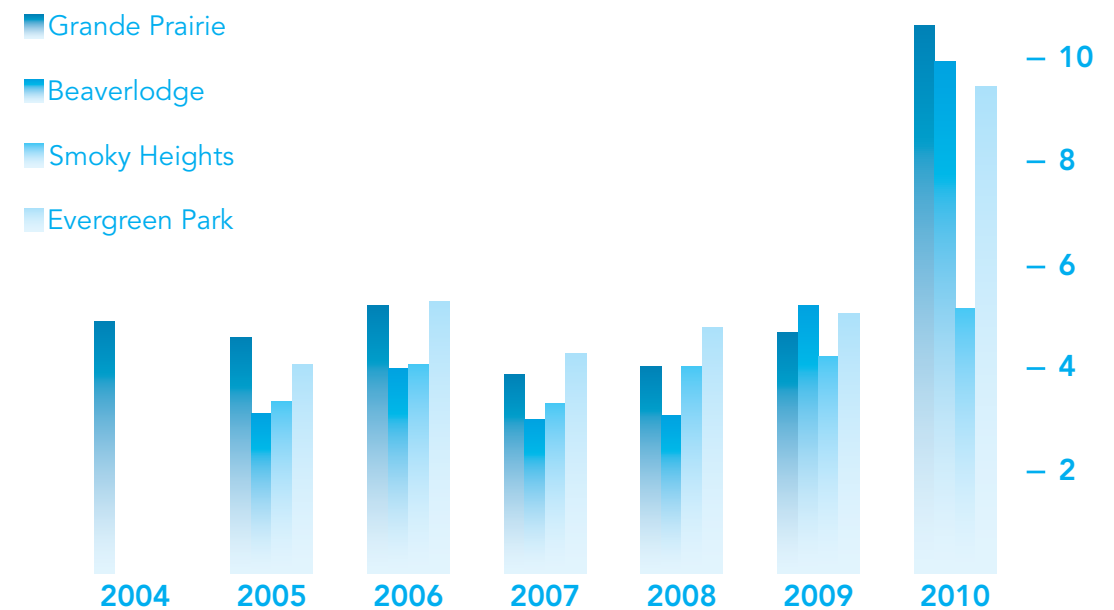
Nitrogen oxides emitted from fossil fuel combustion can both create and break down ozone. In urban areas, where there are higher emissions of nitrogen oxides from traffic, they tend to break it down. Overall across the PAZA zone, ozone concentrations tend to be higher in rural areas and lower in urban centres for this reason.

Fine Particulate Matter (PM_{2.5})

This year saw increased levels of PM_{2.5} across the province, mainly due to wildfires burning. Concentrations almost doubled from those measured last year at Henry Pirker, Beaverlodge, and Evergreen Park stations, as evidenced in the graph below. PAZA measured 29 Alberta Ambient Air Quality 24-hour Objective exceedances for PM_{2.5} in 2010.

The highest maximum hourly average concentration in our network was at Evergreen Park, where several industrial sources located west of the station may have contributed to the PM concentration (winds at the Evergreen Park station were from a westerly direction 63.18% of the year).

Fine Particulate Matter in ug/m³ (Average by Year)



Air Quality Index

An advantage of continuous monitoring is the ability to calculate an Air Quality Index (AQI). An AQI is a tool designed by Alberta Environment to provide individuals and organizations with an hourly measure of outdoor air quality. PAZA measures the AQI at the Henry Pirker and Beaverlodge stations.

The AQI is calculated from the concentrations of the following five parameters, measured continuously:

- Fine Particulate Matter
- Nitrogen dioxide
- Ozone
- Sulphur dioxide
- Carbon monoxide

The highest calculated AQI value of the five parameters becomes the AQI for that station for the hour.

All of the poor and very poor AQI ratings were dictated by fine particulate matter. With the exception of one very poor rating at the Grande Prairie Henry Pirker station from the New Year's Eve fireworks, the poor and very poor air quality ratings in the region occurred in August when wildfires had an impact on air quality in the region.



AQI: AN HOURLY MEASURE OF OUTDOOR AIR QUALITY

In 2010, Alberta enjoyed AQI ratings of "Good" or "Fair" over 98% of the time.

The Peace region experienced limited "Poor" and "Very Poor" ratings due to wildfires burning in Alberta and B.C., and during the New Year's Eve fireworks near the Henry Pirker station in Grande Prairie.

AQI Annual Percentages by Region



UNDERSTANDING THE GRAPHS
 Each graph represents the rate of one of the AQI ratings by region as a percentage of the year. The relative scales of the four graphs have been exaggerated, but each is accurate in and of itself. As you can see, all regions enjoyed "Good" or "Fair" air quality for over 98% of 2010.

<p>Almost all the time (>90%) Desirable range: No known harmful effects to soil, water, vegetation, animals, visibility or human health.</p>	Good (0-25)
<p>Occasional (<10%) Acceptable range: Adequate protection against harmful effects to soil, water, vegetation, animals, materials, visibility and human health.</p>	Fair (26-50)
<p>Seldom (<1%) Tolerable range: Not all aspects of the environment are adequately protected. Long-term action may be necessary, depending on frequency, duration and circumstances of the readings.</p>	Poor (51-100)
<p>Very rare Intolerable range: In this range, continued high readings could pose a risk to public health.</p>	Very Poor (>100)

What can I do?

Learn

PAZA has detailed resources available on the education section of our webpage. Think for yourself! Learn about air quality.

Get Involved

PAZA welcomes anyone with an interest in air quality to our regular meetings. The schedule is posted online. Join us!

Get Active

Small changes can have the biggest cumulative impact:

- Walk, bike, car pool, or use public transportation
- Reduce vehicle idle time
- Keep your vehicle tuned up and ensure proper tire pressure for better fuel efficiency and reduced emissions
- Install a programmable thermostat
- Turn down your hot water tank
- Turn off lights and electronics when not in use
- Reduce, reuse, then recycle
- Use energy-efficient appliances
- Buy local and reduce your carbon footprint
- Start a compost and garden organically

Contact us for more information:
780.833.4343 or 1.866.764.2681

www.paza.ca

Members Support

The Peace Airshed Zone Association (PAZA) thanks our members for their previous support and look forward to their continued support in 2011. Our regional ambient air quality monitoring network has an annual budget of over \$700,000 funded largely by voluntary contributions. Without the valuable support of our members, PAZA would be unable to operate the air quality monitoring network with such a high level of scientific credibility.

Individual members representing various stakeholder groups regularly attended meetings, participated on committees and provided their time and resources. Sincere thanks to all our members for the 1,700 hours of volunteer time and resources, totalling over \$86,000 worth of in-kind support.

Advanced Flush Systems Inc.
Advantage Oil & Gas Ltd.
Alberta Health Services
Altagas Ltd.
ARC Resources Ltd.
Arcan Resources Ltd.
ATCO Power Canada
Barb Ringle
Barrick Energy Parntership
Bellamont Exploration Ltd.
Birchcliff Energy Ltd.
Black Pearl Resources Inc.
Bob Cameron
Bonavista Petroleum
BP Canada Energy Company
Cequence Energy Ltd.
ConocoPhillips Canada Resources
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DARK Consulting
Dark Energy Ltd.
Daylight Energy Ltd.
DeeThree Exploration Ltd.
Delphi Energy Corp.
Devon Canada
EnCana
EnerMark Inc.
Enterra Energy Corp.
EOG Resources
Fairborne Energy Ltd.
Friends of an Unpolluted Lifestyle
Galleon Energy
Glenogle Energy Inc.
Grande Prairie Generation Inc.
Great Plains Oil & Gas Partnership

Hanna Oil & Gas Company
Hunt Oil Company of Canada Inc.
Hyperion Exploration Ltd.
Insignia Energy Ltd.
KinMerc Oil & Gas Inc.
Marble Point Energy
Maxim Power Corp.
Municipal District of Big Lakes
Municipal District of Greenview
Municipal District of Smoky River
Municipal District of Spirit River
Nuloch Resources Inc.
Oban Energy Ltd.
Penn West Petroleum Ltd.
PNB Partnership
Polar Star Canadian Oil & Gas Inc.
Profound Energy Inc.
Progress Energy Ltd.
Prosper Petroleum Ltd.
Provident Energy Resources Inc.
Reber Exploration Ltd.
Saddle Hills Awareness Committee
Saddle Hills County
Shell Canada Energy
Spectra Energy Midstream
Suncor Energy
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TAQA North
Town of Sexsmith
Town of Valleyview
Trilogy Energy Ltd.
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Weyerhaeuser Canada
Zargon Oil & Gas Ltd.



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