

Teacher's Guide
Grades 7 to 9

Acknowledgments

The Fort Air Partnership gratefully acknowledges the participation of these Steering Committee members, members of the Teachers Working Group, video participants and funders in making the *Air- Our Invisible Connection* teachers' resources possible:

Steering Committee

Melanie Larsen,
Vice-Chairman, Fort Air Partnership
(Steering Committee Chair)

Michael Bisaga,
Air Monitoring Report Coordinator,
Regional Environmental Management,
Alberta Environment

Edna Dach,
Director, Technology Services,
Elk Island Public Schools Regional
Division No. 14

Bob Dulaba,
Director of Instructional Services,
Elk Island Catholic Separate Regional
Division No. 41

Shannon Gregg,
Public Affairs Manager,
Dow Chemical Canada Inc.

Sharon Hawrelak,
Communications Advisor,
Clean Air Strategic Alliance

Myra Moore,
Executive Director,
Fort Air Partnership,

Gerry Schick,
Director, Curriculum & Instruction,
Sturgeon School Division No. 24.

Teachers Working Group

Carmen Cornelius
Sturgeon School Division
No. 24.

Carol Gilbertson
Elk Island Public Schools
Regional Division No. 14

Phyllis Schouten
Elk Island Public Schools
Regional Division No. 14

Video Participants

Matthew Dance,
Project Manager,
Clean Air Strategic Alliance

Robert Lacroix,
Dow Canada's Fort Saskatchewan Site Leader

Myra Moore,
Executive Director,
Fort Air Partnership

Jay Nagendran,
Assistant Deputy Minister,
Alberta Environment

Keith Purves,
Chair, Fort Air Partnership

Dr. Gerry Preddy,
Medical Officer of Health,
Capital Health

Katarina Stoochnoff

Terence Wharton

Funders

Dow Canada
(curriculum guide, poster and video)

Alberta Environment
(education portion of the Fort Air Partnership
web site)

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Introduction

The purpose of the Air: Our Invisible Connection Teacher's Resource Kit is to provide junior high school teachers with the information and materials they need to link air quality to the approved Alberta Program of Studies and to easily and effectively teach their students about it as an integrated part of their language arts, science, mathematics and social studies instruction.

The Air: Our Invisible Connection Teacher's Resource Kit consists of:

- A poster
- A 20-minute video on a CD
- This Teacher's Guide

Poster

The full-colour illustration on the **poster front** is designed to introduce students to the natural phenomena and human activities that affect the quality of our outdoor air.

They include:

Natural Phenomena:

Decaying plant material
 Forest fires
 Fruits
 Flowers
 Forests
 Grasslands
 Weather phenomena
 Swamps
 Rain
 Wind

Industrial and agricultural activities:

Industrial emissions
 Power plants
 Oil & gas plants
 Oil wells
 Petroleum refineries
 Natural gas plants
 Coal burning electricity
 Agricultural chemical spraying
 Agricultural dust
 Agricultural fertilizing
 Plastics/petrochemicals manufacturing

Every-day human activities:

Cleaners
 Fertilizer activities
 Cattle feedlots
 Fireplaces
 Aircraft
 Natural gas appliances
 Vehicle exhaust
 Idling vehicles
 Solvents
 Sewer gas
 Soil dust
 Wood burning
 Cigarettes
 Burning fossil fuels
 Hazardous waste
 Landfills
 Dry cleaning
 Burning leaves
 Air conditioning
 Aerosol cans
 Family waste

The poster front also illustrates many ways in which we can monitor air quality and reduce the negative impact our daily lives have on our outdoor air quality:

Air quality monitoring station	Composting
Fort Air Partnership	Mountain biking
Electricity production plant	Skate boarding
Garage sale	Walking
Second hand store	Cycling
Reduced family waste	People riding bus – city and highway
Clothes line	Toxic round-up
Car pooling	Recycling station

The **poster back** includes information and activities that can be used in your classroom. The activities are detailed in this teacher's guide.

Video

The 20-minute video outlines why air quality is important and how air quality information is gathered and shared. It portrays two high school students whose interest in air quality is sparked by a radio news item on a forest fire. They discuss air quality and find they have a number of questions. They then explore air quality, what affects it and who manages it. During their exploration of the topic, the audience will be introduced to a number of experts who answer the students' questions. As the students gain information, their behaviour changes to reflect what they've learned.

The video content includes:

- Why air quality is important to human health
- The federal and provincial governments' roles in managing our outdoor air quality
- The Clean Air Strategic Alliance and the Alberta airshed model of monitoring air quality
- The Fort Air Partnership's role in monitoring and communicating about outdoor air quality
- Industry's role in managing air quality, using Dow's Fort Saskatchewan facility as an example
- Capital Health's role in managing outdoor air quality
- An example of an action for stewardship

Teacher's Guide

This teacher's guide includes:

- A table indicating how air quality fits with the Junior High School Curriculum General Outcomes
- Suggested classroom activities that fit with specific outcomes in the Junior High School Curriculum
- Black and white masters suitable for photocopying to support some of the suggested classroom activities
- Background information and other resources

Junior High School Curriculum Fit

Grade level, Subject, Area	Alberta Program of Studies General and Specific Outcomes
<p>Grade 7 Mathematics Strand: statistics and probability (data analysis)</p>	<p>Students will:</p> <ul style="list-style-type: none"> • Collect, display and analyze data to make predictions about a population • Formulate questions for investigation, from a real-world context
<p>Grade 7 Science Unit A: Interactions and Ecosystems (Social and Environmental Emphasis)</p>	<p>Students will:</p> <ul style="list-style-type: none"> • Describe relationships between humans and their environments • Monitor a local environment, and assess the impacts of environmental factors on it • Describe relationships in maintaining life-supporting environments
<p>Grade 7 English Language Arts General Outcome 2</p>	<p>Students will listen, speak, read, write, view and represent to comprehend and respond personally and critically to oral, print and other media texts.</p> <p>2.4 Create original text</p>
<p>Grade 8 Social Studies Topic A Geography of Canada and the United States</p>	<p>The intent of this study is to help students develop an understanding of the relationship of geography to patterns of life in Canada and the United States.</p> <p>Students will study the geography of Canada and the United States.</p>
<p>Grade 9 Science Unit C: Environmental Chemistry (Social and Environmental Emphasis)</p>	<p>Students will:</p> <ol style="list-style-type: none"> 1. Investigate and describe, in general terms, the role of different substances in the environment in supporting or harming humans and other living things 2. Identify processes for measuring the quantity of different substances in the environment and for monitoring air and water quality 3. Analyze and evaluate mechanisms affecting the distribution of potentially harmful substances within an environment
<p>Grade 9 English Language Arts General Outcome 2</p>	<p>Students will listen, speak, read, write, view and represent to comprehend and respond personally and critically to oral, print and other media texts.</p>

Grade level, Subject, Area

Alberta Program of Studies General and Specific Outcomes

Grade 9 Mathematics

Strand: Statistics and Probability
(Data Analysis)

Students will:

- collect, display and analyze data to make predictions about a population
- collect and analyze experimental results expressed in two variables, using technology, as required

Information and Communication Technology

(to be infused within core courses and programs)

Students will:

- access, use and communicate information from a variety of technologies
- seek alternative viewpoints, using information technologies
- critically assess information accessed through the use of a variety of technologies
- use organizational processes and tools to manage inquiry
- use technology to aid collaboration during inquiry
- use technology to investigate and/or solve problems
- use electronic research techniques to construct personal knowledge and meaning

Grades 7-9 Health and Life Skills: Wellness Choices

Students will make responsible and informed choices to maintain health and promote safety for self and others.



Classroom Activities

Grade 7 Mathematics

C=Communication, PS=Problem Solving, CN=Connections, R=Reasoning, E=Estimation and Mental Mathematics, T=Technology, V=Visualization

Activity - Air-borne Pollutant Monitoring

From the Fort Air Partnership web site (www.fortair.org), select one air-borne pollutant that is monitored by one of the monitoring stations. Display one month of data in a variety of ways (i.e. a spreadsheet, a chart and a graph). Once students have displayed the data they should determine the mode, median and mean of the data as well as the range, extremes, gaps and clusters. Predict what the next month's data will show (i.e. seasonal differences, weather-related differences, etc.) Determine which is the best way of displaying the data. Identify the strengths and weaknesses of the ways you've chosen of displaying data.

Alberta Program of Studies Outcomes

Develop and implement a plan for the collection, display and analysis of data, using measures of variability and central tendency. [C, CN, R]

- Display data by hand or by computer in a variety of ways, including circle graphs. [C, T, V]
- Read and interpret graphs. [C, E, PS, R]
- Determine measures of central tendency for a set of data .[PS]:
 - mode
 - median
 - mean
- Determine measures of the distribution of a set of data [PS]:
 - range
 - extremes, gaps and clusters
 - quartiles.
- Interpolate from data to make predictions. [E, PS, R]

Grade 7 Science

Teacher Tip:

Some of the following activities may be suitable to a station approach. Consider allowing two class blocks to complete six to 10 activities in stations. Allow time at the end of the last block to have the students' small groups each evaluate themselves on communication and teamwork and collaboration.

Consider these teaching tips for group work:

Group work can be a great opportunity to teach students the attitude outcomes of collaboration and mutual respect. The success

of group work depends in large part on the intentionality of the teacher in forming good groups, teaching group skills and helping students practice these skills.

Have students brainstorm answers to these questions:

- What does group work look like?
- What does group work sound like?

Forming Groups

1. Be intentional about creating successful groups
2. Do not make the groups too large
3. Assign groups according to the students'

giftedness. If possible, include in each group a strong academic student, a student who is a good encourager, a student who can “think outside of the box” and a student who will be a good team player

Roles

Each group member should be assigned to one or more of these specific role(s):

1. Recorder - to record data or results
2. Reporter - to report the results to the larger group/class
3. Materials manager - to collect and return all required supplies
4. Encourager - to keep the overall tone of the group positive
5. Group Manager/Timer - to keep the group on task and ensure that the project gets finished on time

Specific Skills

1. Everyone should be doing the same thing at the same time
2. If one group member has a question, he/she should ask the group before asking the teacher

3. Group members should be encouraging and supporting each others' works
4. Everyone should contribute to the overall success of the group
5. Each member should be fulfilling his/her assigned role.

Reward groups for displaying appropriate skills according to the following guidelines:

- When a group is demonstrating a specific skill (i.e. everyone is doing the same thing at the same time) give the group one jellybean.
- The goal of the group is to collect as many jelly beans as possible.
- The group may decide how the jellybeans will be distributed among its members.

Evaluation

Have students do a self-report in which each member daily evaluates his/her own success.

See Master #1 - Student Self-Evaluation

Activity - Motivational set (anticipatory set)

To get students thinking about air quality, consider:

- have students simulate asthma - breathe through a straw, or have a guest in with breathing difficulties
- brainstorm: do a KWL chart: what do we know, what we want to learn about air quality
- take a tour/field trip to a local air monitoring station

Alberta Program of Studies Outcomes

Students will:

Investigate and describe relationships between humans and their environments, and identify related issues and scientific questions.

- illustrate how life-supporting environments meet the needs of living things for nutrients, energy sources, moisture, suitable habitat, and exchange of gases

- describe examples of interaction and interdependency within an ecosystem (e.g., identify examples of dependency between species, and describe adaptations involved; identify changing relationships between humans and their environments, over time and in different cultures-as, for example, in aboriginal cultures)
- identify examples of human impacts on ecosystems, and investigate and analyze the link between these impacts and the human wants and needs that give rise to them (e.g., identify impacts of the use of plants and animals as sources of food, fibre and other materials; identify potential impacts of waste products on environments)
- analyze personal and public decisions that involve consideration of environmental impacts, and
- identify needs for scientific knowledge that can inform those decisions

Activity - Kites and Downdrafts Boardgame

In small groups have students play the board game to explore environmental impacts and mitigation factors, or choices- link to video.

See Master #3 or the poster back for the Kites and Downdrafts Board Game

Note: 1 die is required

Activity - Video Anticipation Guide

In pairs, students answer 10 true or false statements before watching the video, then watch the video, then check their answers.

See Master #4 or Video Anticipation Guide

Identify questions arising from practical problems and issues:

- use of various forms of transportation (SUV vs. smart cars vs. public transit vs. bicycling, vs. walking) Predict the change in outdoor air quality if:
 - single occupant vehicles were not allowed on our roadways
 - if families were limited to one vehicle per household
- discuss the number of students in the class who have asthma or another respiratory ailment and possible links to air quality (teacher tip: introduce questions about how much time students spend indoors vs. outdoors) - design and conduct a survey as a first step in investigating this issue - look for other sources of information related to this topic, based on the number of students in your class who have a respiratory ailment, estimate the total number of students in your school who do

Alberta Program of Studies Outcomes

Describe the relationships among knowledge, decisions and actions in maintaining life-supporting environments.

- identify intended and unintended consequences of human activities within local and global environments
- describe and interpret examples of scientific investigations that serve to inform environmental decision making

- illustrate, through examples, the limits of scientific and technological knowledge in making decisions about life-supporting environments
- analyze a local environmental issue or problem based on evidence from a variety of sources, and
- identify possible actions and consequences

**Skill outcome:
Initiating and Planning**

Students will:

Ask questions about the relationships between and among observable variables, and plan investigations to address those questions.

- identify science-related issues
- identify questions to investigate arising from practical problems and issues
- state a prediction and a hypothesis based on background information or an observed pattern of events
- select appropriate methods and tools for collecting data and information

**Skill outcome:
Performing and Recording**

Students will:

Conduct investigations into the relationships between and among observations, and gather and record qualitative and quantitative data.

- research information relevant to a given problem or issue
- select and integrate information from various print and electronic sources or from several parts of the same source
- use tools and apparatus effectively and accurately for collecting data
- estimate measurements

Activity - Displaying Data

In small groups, find one month of data on ground level ozone concentrations from the Fort Air Partnership web site (www.fortair.org). Display one month of data in a variety of ways (i.e. a spreadsheet, a chart or a graph). Determine which is the best way of displaying the data. Identify the strengths and weaknesses of the ways you've chosen of displaying data.

See Masters #1 and #2 or Student Self Evaluation and Student Group Self Evaluation.

Alberta Program of Studies Outcomes

Skill outcome: Analyzing and Interpreting

Students will: Analyze qualitative and quantitative data, and develop and assess possible explanations.

- identify strengths and weaknesses of different methods of collecting and displaying data

- compile and display data, by hand or computer, in a variety of formats, including diagrams, flow charts, tables, bar graphs and line graphs

Skill outcome: Communication and Teamwork

Students will:

Work collaboratively on problems; and use appropriate language and formats to communicate ideas, procedures and results.

- communicate questions, ideas, intentions, plans and results, using lists, notes in point form, sentences, data tables, graphs, drawings, oral language and other means
- evaluate individual and group processes used in planning, problem solving, decision making and completing a task
- defend a given position on an issue, based on their findings (e.g., *make a case for or against an issue, such as: "Should a natural gas plant be located near a farming community?"*)

Activity - Discussion Starter

From the poster, identify five human activities that have an impact on air quality and also identify alternatives that would lessen the impact on air.

Take home and complete a quiz with 15 questions and "always," "sometimes," "never" answers. Then set one family goal to reduce your family's negative impact on air quality. Share your results with your buddy. Family log that the students keep for one month. Each week evaluate on progress toward your goal, discuss it with a parent or guardian, and have them sign it. Each week, teacher collects the completed goal sheet.

See Master #5 or family quiz and goal setting sheet.

Alberta Program of Studies Outcome

Attitude outcome: stewardship, demonstrate sensitivity and responsibility in pursuing a balance between the needs of humans and a sustainable environment (e.g., assume personal responsibility for their impact on the environment; predict consequences of proposed personal actions on the environment; consider both immediate and long-term consequences of group actions; identify, objectively, potential conflicts between responding to human wants and needs and protecting the environment)

The following attitude outcomes from the Alberta science program of studies should be achieved through the activities and discussions listed above:

Interest in Science

- Students will be encouraged to:

- Show interest in science-related questions and issues, and pursue personal interests and career possibilities within science-related fields

Scientific Inquiry

- Students will be encouraged to:

- Seek and apply evidence when evaluating alternative approaches to investigations, problems and issues

Mutual Respect

- Students will be encouraged to:

- Appreciate that scientific understanding evolves from the interaction of ideas involving people with different views and backgrounds

Collaboration

- Students will be encouraged to:

- Work collaboratively in carrying out investigations and in generating and evaluating ideas

See Master #2 for a Student Group Evaluation that students can use to self-assess these outcomes.

Grade 7 English Language Arts

Activity - Poem

Use the individual words supplied to create a poem on air quality.

See master #6 - Individual Words

Activity - Brochure or Poster

Develop a brochure or poster that warns of unsafe situations related to air pollution (e.g., warning to asthma sufferers to remain indoors when a health alert has been issued).

Activity - Story

Write a story about an ecological footprint Superhero.

Activity - RAFT Model

Using the RAFT model (role, audience, format, topic) create a text on an air quality topic.

See master #7 or R.A.F.T. assignment

Alberta Program of Studies Outcomes

Generate ideas:

- choose appropriate strategies for generating ideas and focusing topics for oral, print and other media texts

Elaborate on the expression of ideas:

- use suspense, exaggeration, foreshadowing, dialogue and description to show rising action and develop conflict

Structure texts:

- create oral, print and other media texts that are unified by point of view, carefully developed plot and endings consistent with previous events
- create a variety of oral, print and other media texts to explore ideas related to particular topics or themes

Activity - Air Quality and Community

Explore and map the location of industry, population centers and air monitoring sites in your region.

Report on whether you feel the locations of air monitoring sites in your region are appropriate given the location of industry and population centers.

Tip:

There is a map of the Fort Air Partnership's monitoring stations on their web site at: www.fortair.org (Click on Air Quality, then Current Data).

Alberta Program of Studies Outcomes

Acquire information to find answers to questions through listening, observing, reading and utilizing community resources.

Construct maps (including contour maps) demonstrating use of symbols, location, direction, distance, scale and physical geography.

Determine values underlying a position (identify, define, describe-value priorities, value conflicts).

Categorize information to develop concepts-regions, location, place, movement, environmental interaction.

Make generalizations by stating relationships among concepts about interactions of people with their physical environment.

Activity - Air Quality and Human Health

Identify sources of information about air quality and its potential impacts on human health in your community.

Explore whether the air quality in your area poses potential risks to your health.

Make a list of five things you and your family could do to reduce the risk.

Alberta Program of Studies Outcomes

W-8.10 develop strategies to effectively access health information and health services in the community.

W-8.8 identify potentially unsafe situations in the community, and begin to develop strategies to reduce risk.

Grade 9 Science

Teacher Tip:

The following activities may be suitable to a station approach. Consider allowing two class blocks to complete six to 10 activities in stations. Allow time at the end of the second block to have the students' small groups each evaluate themselves on communication and teamwork and collaboration.

Consider these tips for managing group work:

Group work can be a great opportunity to teach students the attitude outcomes of collaboration and mutual respect. The success of group work depends in large part on the intentionality of the teacher in forming good groups, teaching group skills and helping students practice these skills.

Have students brainstorm answers to these questions:

- What does group work look like?
- What does group work sound like?

Forming Groups

1. Be intentional about creating successful groups
2. Do not make the groups too large
3. Assign groups according to the students' skills. If possible, include in each group a strong academic student, a student who is a good encourager, a student who can "think outside of the box" and a student who will be a good team player

Roles

Each group member should be assigned to one or more of these specific role(s):

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Specific Skills

1. Everyone should be doing the same thing at the same time
2. If one group member has a question, he/she should ask the group before asking the teacher
3. Group members should be encouraging and supporting each others' works
4. Everyone should contribute to the overall success of the group
5. Each member should be fulfilling his/her assigned role.

Rewards

Reward groups for displaying appropriate skills according to the following guidelines:

- When a group is demonstrating a specific skill (i.e. everyone is doing the same thing at the same time) give the group one jellybean.
- The goal of the group is to collect as many jelly beans as possible.
- The group may decide how the jellybeans will be distributed among its members.

Evaluation

Have students do a self-report in which each member daily evaluates his/her own success.

See Master #1 - Student Self-Evaluation form

See also Master #2 - Student Group Self-Evaluation

Activity - Motivational Set

Motivational set (anticipatory set) to get students thinking about air quality, consider:

- have students simulate asthma – breathe through a straw, or have a guest in with breathing difficulties
- brainstorm: do a KWL chart: what do we know, what we want to learn about air quality
- take a tour/field trip to a local air monitoring station

Activity - Kites and Downdrafts Game

Have students play the Kites and Downdrafts game on environmental impacts and mitigation factors.

See Master #3 - Kites and Downdrafts Game

Activity - Video Anticipation Guide

Video anticipation guide: in pairs, students answer 10 true or false statements before watching the video, then watch the video, then check their answers.

See Master #4 - Video Anticipation Guide

Activity - Crossword Puzzle

Complete a crossword puzzle on air quality vocabulary.

See Master # 11 - Crossword Puzzle

See also Glossary

Activity - Word Game

Have students complete the Air: Our Invisible Connection Word Game.

See Master #8 - Word Game

Activity - Word Search

Have students complete the Air: Our Invisible Connection Word Search.

See Master #9 - Word Search

Alberta Program of Studies Outcomes

Students will:

1. Investigate and describe, in general terms, the role of different substances in the environment in supporting or harming humans and other living things.
 - describe and illustrate processes by which chemicals are introduced to the environment or their concentrations are changed
 - identify questions that may need to be addressed in deciding what substances—in what amounts—can be safely released into the environment

Activity - Discussion Starter

Have students list at least 20 factors shown on the poster that affect air quality (5 minute time limit), divide into categories (could be natural and human, divide into positive and negative impacts) describe and defend the categories you chose to use.

See master #10 - Factors Affecting Air Quality

Activity - Data Conversion

From the Fort Air Partnership web site (www.fortair.org) find an example of an air pollutant reported in parts per million and convert the data into parts per billion.

Activity - Acid Rain

In small groups, research acid rain. Describe how it is formed, and the effects it has on living things. Identify some of the pollutants

monitored by the Fort Air Partnership that are components of acid rain.

Alberta Program of Studies Outcomes

Identify processes for measuring the quantity of different substances in the environment and for monitoring air and water quality

- identify chemical factors in an environment that might affect the health and distribution of living things in that environment
- apply and interpret measures of chemical concentration in parts per million, billion or trillion
- describe effects of acids and bases on living things

Activity - Discussion Starter 2

Looking at the poster, identify as many factors as possible that transfer pollutants through air.

Activity - Research

Identify and evaluate information and evidence that vehicular, industrial and household emissions affect our air quality.

What are the emissions, what are their effects?

Alberta Program of Studies Outcomes

Analyze and evaluate mechanisms affecting the distribution of potentially harmful substances within an environment.

- describe mechanisms for the transfer of materials through air, water and soil; and identify factors that may accelerate or retard distribution (e.g. wind speed)
- investigate and evaluate potential risks resulting from consumer practices and industrial processes, and identify processes used in providing information and setting standards to manage these risks
- identify and evaluate information and evidence related to an issue in which environmental chemistry plays a major role

Activity - Defend Findings

Defend a given position on an issue or problem, based on your findings:

Based on what you've found on the Fort Air Partnership website (www.fortair.org) research this statement: "The outdoor air in our area is healthy." (tip: air quality index)

Compare to three other Alberta communities and provincial standards to defend your position.

Alberta Program of Studies Outcomes

Skill Outcome:

(focus on the use of research and inquiry skills to inform the decision-making process): Initiating and Planning

Students will:

Ask questions about the relationships between and among observable variables, and plan investigations to address those questions

- identify science-related issues
- identify questions arising from practical problems and issues
- state a prediction and a hypothesis about the concentration or dispersal of a chemical substance within an environment
- select appropriate methods and tools for collecting data and information and for solving problems

Activity - Displaying Data

From the Fort Air Partnership web site (www.fortair.org), select one air-borne pollutant that is monitored by one of the monitoring stations. Display one month of data in a variety of ways (i.e. charts, various graphs). Determine which is the best way of displaying the data. Identify the strengths and weaknesses of different ways of displaying data.

Activity - Research Questions

Looking at the front of the poster, come up with three questions concerning air quality that you'd like to research.

Alberta Program of Studies Outcomes

Skill Outcome

Analyzing and Interpreting

Students will:

Analyze qualitative and quantitative data, and develop and assess possible explanations

- identify strengths and weaknesses of different ways of displaying data
- identify and suggest explanations for discrepancies in data (e.g., identify possible reasons for variation in the measured concentration of a chemical, where one sample is very different from others or where one group has a very different result from others)
- identify the line of best fit on a scatterplot, and interpolate or extrapolate based on the line of best fit
- apply given criteria for evaluating evidence and sources of information
- identify new questions and problems that arise from what was learned

Activity - Stewardship

Provide students with information about the skill outcome "Communication and Teamwork" and the attitude outcomes "Collaboration" and "Stewardship" before beginning your coverage of air quality. Let them know that they will be evaluating their small groups on each element at the end of the air quality section. Have them complete one evaluation per small group.

See Master #2 - Group Evaluation Form

Alberta Program of Studies Outcomes

Skill Outcome: Communication and Teamwork

Students will:

- work collaboratively on problems; and use appropriate language and formats to communicate ideas, procedures and results
- work cooperatively with team members to develop and carry out a plan, and troubleshoot problems as they arise
- receive, understand and act on the ideas of others, defend a given position on an issue or problem, based on their findings

Attitude Outcome: Collaboration

Students will be encouraged to:

Work collaboratively in carrying out investigations and in generating and evaluating ideas (e.g., assume responsibility for their share of work in preparing for investigations and in gathering and recording evidence; consider alternative ideas and approaches suggested by members of the group)

Attitude Outcome: Stewardship

Students will be encouraged to:

Demonstrate sensitivity and responsibility in pursuing a balance between the needs of humans and a sustainable environment (e.g., show respect for all forms of life; modify their behaviour in light of an issue related to conservation and protection of the environment; recognize that the materials people use may have environmental consequences when people dispose of them)

Activity - Air Quality and Values

Viewing the poster, can you identify an activity that shows people value:

- Recreational
- Economic values
- Environmental (ecological) values
- Political values
- Egocentric values
- Educational values
- Health values
- Scientific values
- Technological values
- Ethical values

Alberta Program of Studies Outcomes

Attitude Outcome: Mutual Respect

Students will be encouraged to:

Appreciate that scientific understanding evolves from the interaction of ideas involving people with different views and backgrounds (e.g., consider more than one perspective when formulating conclusions, solving problems or making decisions on environmental quality issues).

Note:

The Attitude Outcome: Interest in Science should be achieved through the activities listed above.

Students will be encouraged to:

Show interest in science-related questions and issues, and confidently pursue personal interests and career possibilities within science-related fields (e.g., actively participate in extracurricular activities, such as science fairs, science clubs, or science and technology challenges)

Grade 9 English Language Arts

Activity - Poem

Use the individual words supplied to create a poem on air quality based on your own experience.

See Master #6 - Individual Words

Activity - RAFT Assignment

Using the RAFT model (role, audience, format, topic) create a text on an air quality topic

See Master # 7 - Air Quality R.A.F.T. Assignment

Alberta Program of Studies Outcomes

Generate Ideas:

- generalize from own experience to create oral, print and other media texts on a theme

Elaborate on the expression of ideas:

- create oral, print and other media texts on common literary themes

Structure texts:

- create oral, print and other media texts that interrelate plot, setting and character, and reveal the significance of the action
- create oral, print and other media texts that include main and minor characters, and show how the main character develops and changes as a result of the action and events

Activity - Air-borne Pollutant Monitoring

From the Fort Air Partnership web site (www.fortair.org), select one air-borne pollutant that is monitored by one of the monitoring stations. Display one month of data in a variety of ways (i.e. a spreadsheet, a chart or graph). Once students have displayed the data they should determine the mode, median and mean of the data as well as the range, extremes, gaps and clusters. Predict what the next month's data will show (i.e. seasonal differences, weather-related differences, etc.) Determine which is the best way of displaying the data. Identify the strengths and weaknesses of the ways you've chosen to display the data.

Data from the Fort Air Partnership web site can also be used to achieve these outcomes:

Alberta Program of Studies Outcomes

1. Design, conduct and report on an experiment to investigate a relationship between two variables. [C, CN, PS]
2. Create scatterplots for discrete and continuous variables. [C, V]
3. Interpret a scatterplot to determine if there is an apparent relationship. [E, R]
4. Determine the lines of best fit from a scatterplot for an apparent linear relationship, by [E, PS, T]:
 - inspection using technology (equations are not expected).
5. Draw and justify conclusions from the line of best fit. [C, R]
6. Assess the strengths, weaknesses and biases of samples and data collection methods. [C, R, T]
7. Critique ways in which statistical information and conclusions are presented by the media and other sources. [C, CN]

Information and Communication Technology (to be infused within core courses and programs)

Activity - Multi-media Presentation

Have student create a multi-media presentation (advertisement/poster/commercial) to educate and motivate change in behaviours that will have a positive impact on air quality.

Depending on the scope of this project, it may achieve any or all of these outcomes

Alberta Program of Studies Outcomes

3.1 plan and conduct a search, using a wide variety of electronic sources

3.2 refine searches to limit sources to a manageable number

3.3 access and operate multimedia applications and technologies from stand-alone and online sources

3.4 access and retrieve information through the electronic network

3.5 analyze and synthesize information to create a product

3.6 communicate in a persuasive and engaging manner, through appropriate forms, such as speeches, letters, reports and multimedia presentations, applying information technologies for content, audience and purpose

3.1 access diverse viewpoints on particular topics by using appropriate technologies

3.2 assemble and organize different viewpoints in order to assess their validity

3.3 use information technology to find facts that support or refute diverse viewpoints

3.1 evaluate the authority and reliability of electronic sources

3.2 evaluate the relevance of electronically accessed information to a particular topic

3.1 create a plan for an inquiry that includes consideration of time management

3.2 develop a process to manage volumes of information that can be made available through electronic sources

3.3 demonstrate the advanced search skills necessary to limit the number of hits desired for online and offline databases; for example, the use of “and” or “or” between search topics and the choice of appropriate search engines for the topic

3.1 access, retrieve and share information from electronic sources, such as common files

3.2 use networks to brainstorm, plan and share ideas with group members

3.1 articulate clearly a plan of action to use technology to solve a problem

3.2 identify the appropriate materials and tools to use in order to accomplish a plan of action

3.3 evaluate choices and the progress in problem solving, then redefine the plan of action as appropriate

3.1 identify patterns in organized information

3.2 make connections among related, organized data, and assemble various pieces into a unified message

Air: Our Invisible Connection

Glossary

- acid rain:** industrial processes and fuel combustion (in vehicles, etc.) produce large quantities of CO₂, SO₂ and NO₂; in the air these chemicals dissolve in water droplets to form acids; acid rain is harmful to the environment
- airshed zone:** designated district for the monitoring, analysis, reporting and making recommendations for action
- air quality:** is determined by measuring the number and concentration of potentially harmful substances in the air
- air quality index:** a way of describing our outdoor air quality. Each hour, Alberta Environment calculates the Air Quality Index in a number of locations by converting the local concentrations of carbon monoxide, fine particulate matter, nitrogen dioxide, ground-level ozone and sulphur dioxide to an Air Quality Index number:
- a rating of 0 to 25 indicates good air quality. This is the best possible rating and means there are no known harmful effects to human or environmental health.
 - a rating of 26-50 is fair air quality, which means there is adequate protection against harmful effects.
 - a rating of 51-100 indicates poor air quality and not all aspects of the environment are adequately protected from possible adverse effects.
 - a rating of more than 100 is very poor air quality, which means continued high readings could pose a risk to human health.
- ambient air:** the condition of the air in the surrounding environment.
- catalytic converter:** a reaction chamber into which exhaust gases from an automotive engine are passed together with excess air so that carbon monoxide and hydrocarbon pollutants are oxidized to form carbon dioxide and water
- carbon monoxide (CO):** colourless, odourless gas; produced by incomplete combustion of chemicals containing carbon (e.g., hydrocarbons); major source: motor vehicles
- CFCs:** chlorofluorocarbons; used in refrigerators, aerosol cans and fire extinguishers; these chemicals move slowly from the lower atmosphere into the upper atmosphere where they destroy the ozone
- diffusion:** process in which molecules move from an area of higher concentration to one of lower concentration
- dispersion:** scattering of a substance away from its source
- emissions:** pollution released from sources such as industrial plants
- enhanced greenhouse effect:** greenhouse effect made greater by human activities, such as burning fossil fuels and clearing land, that add greenhouse gases to the atmosphere
- fly ash:** fine airborne ash produced by burning coal or other solid fuels

fossil fuel:	fuel formed from dead plants and animals; coal, oil, natural gas
global warming:	increased average temperatures worldwide caused by the enhanced greenhouse effect
greenhouse gases:	gases in earth's atmosphere that trap the heat that forms when radiant energy from the sun reaches earth's surface; water vapour, carbon dioxide, methane, and nitrogen oxide are all greenhouse gases
ground level ozone:	colourless, odourless gas; at ground level, it's a pollutant produced as a result of industrial processes and the use of motor vehicles;
inversion:	a meteorological phenomenon where temperature increases with height; a warm air mass moving over a colder one can "shut off" the convection effects, keeping the cooler trapped air below; effect is general "stillness" of the air which traps dirty or foggy air at the earth's surface
issue:	any subject of importance about which people have strong, conflicting points of view
monitoring:	keeping track of something for a specific purpose; certain compounds are monitored in the environment to ensure they do not exceed safe levels
nitrogen oxides:	major air pollutants; forms when nitrogen combines with oxygen as a result of fuel combustion; gives smog its characteristic brown colour; major source: motor vehicles
stratospheric ozone:	colourless, odourless gas; high in the atmosphere, it forms a layer protecting Earth from the Sun's ultraviolet radiation; 15 to 50 km above Earth's surface
particulates:	tiny particles of solid or liquid suspended in the air; biggest human sources are burning of fossil fuels in vehicles and power plants
parts per million:	(ppm) measurement used to describe very small concentrations of chemicals; a solution having a concentration of 1 ppm has one part of solute per million parts of solution
pH:	measure of the concentration of hydrogen ions in a solution; most solutions have a pH in the range of 0 to 14; 0 is very acid, 14 is very basic, and 7 is neutral
pollution:	any change in the environment that produces a condition that is harmful to living things
scrubbers:	devices used by industrial and electrical generating plants to reduce sulfur dioxide emissions
smog:	air pollution by a mixture of smoke and fog
sour gas:	natural gas that contains hydrogen sulfide
sulphur dioxide (SO₂):	forms when sulphur combines with oxygen in the air; major air pollutant that forms both smog and acid rain; major source: industrial processes
toxic:	poisonous
toxicity:	how poisonous a substance is
troposphere:	this layer is nearest the surface of Earth and most "weather" occurs here. It extends up from 8 to 12 km

Interesting Air Facts

- The atmosphere extends outwards from the Earth's surface for several hundred kilometers and is made up of four layers. The first layer, called the troposphere, is where all the weather takes place and is the only layer to support life.
- A person breathes about 16 kg of air everyday. As a comparison, we consume 0.7 kg of food and 1.4 kg to 2.3 kg of water per day. Needless to say, the quality of the air around us does have a significant impact on our health.
- Air pollution from natural sources has been a feature of the earth for millions of years. Volcanic smoke and dust, sand and dust storms and wild fires are all sources of natural air pollution.
- The idea that polluted air can be harmful to man humans dates back to the Middle Ages. Direct evidence of bad effects from polluted air began to accumulate after the first use of coal around the beginning of the fourteenth century.
- One of the worst air pollution disasters occurred in London in December of 1952. Five days of stagnant and poor-quality air brought about by high pressure weather systems caused between 3,500 and 4,000 deaths.
- In our day-to-day lives each of us adds to air pollution. Nearly everything we do and every product we buy creates some pollution. We all bear some responsibility for reducing air pollution.
- In spite of the many improvements to the engines of vehicles, they are still the major contributor to air pollution in Alberta. Exhaust fumes contain CO₂, SO₂, NO_x and particulate matter. A single engine gives off relatively small amounts of pollutants. However, there are so many vehicles that the small amounts add up to a significant pollution problem.
- The warming of the atmosphere by heat reflected back to Earth by gases in the upper atmosphere is called the greenhouse effect. Many scientists have linked the increase in atmospheric carbon dioxide with the rise in the earth's temperature over the last century.
- Large amounts of CO₂ have been released into the atmosphere by burning coal, oil, gas and wood. This adds to the greenhouse gases in the atmosphere.
- A very small rise in the air temperature may have a very great change on Earth. A rise of 3°C in average annual temperature would make the grain growing areas of southern Alberta and Saskatchewan unsuitable for agriculture.
- Industries spend several billion dollars each year on pollution control and abatement.
- In an effort to control the concentration of air pollutants at ground level, some companies have built smoke stacks up to 300 metres high.
- Air pollution causes rubber tires on automobiles to crack and become porous.
- It is estimated that a fleet of 500 SST jets over a period of years could increase the water content of the stratosphere by 50 to 100%, which could result in a rise of average temperature on the surface of the Earth by 0.2°C and could cause destruction of the stratospheric ozone.

Background

Air Quality and Human Health

With few exceptions, all living things depend on air. A person breathes about 16 kg of air everyday. As a comparison, we consume 0.7 kg of food and 1.4 kg to 2.3 kg of water per day. Needless to say, the quality of the air around us does have a significant impact on our health.

There are several reasons why outdoor air pollution is a public health concern. First, many pollutants are produced in populated areas where harm to human health is most likely. Second, air pollutants can travel great distances affecting large geographic areas and human populations. Third, air pollution is an inevitable part of modern life and the health effects of many chemicals are still unknown. In the interest of public health protection, it is vital that we continue to seek knowledge on outdoor air quality and its effects on human health.

It is now recognized that air pollution can play a role in exacerbating heart and lung diseases and contribute to the premature death of those who are seriously ill. Children, elderly, and people with asthma, heart or lung disease are more susceptible to air pollution. The health effects of air pollution depend on the toxicity of the pollutant, amount of exposure (i.e., concentration and time) and an individual's susceptibility.

If you are in good health, the levels of air pollution normally found in Alberta are unlikely to result in any adverse health effects. Occasionally, there may be conditions such as weather inversions, forest fires or accidental release of substances that result in higher air pollution levels. On these occasions, some people may experience eye, nose or throat irritation, coughing, or may find breathing difficult.

Air Quality in Alberta

Air quality is a measure of how clean the air is. In Alberta, we use the Air Quality Index as a measure of outdoor air quality. The Air Quality Index gives us a meaningful measure of outdoor air quality. Air quality is rated as:

- **Good** (Desirable range: no known harmful effects to soil, water, vegetation, animals, materials, visibility or human health)
- **Fair** (Acceptable range: adequate protection against harmful effects to soil, water, vegetation, animals, materials, visibility and human health)
- **Poor** (Tolerable range: not all aspects of human health or the environment are adequately protected from possible adverse effects)
- **Very Poor** (Intolerable range: in this range, continued high readings could pose a risk to public health).

The accumulation of pollutants, no matter the source, depends on the rate at which they are emitted into the atmosphere and how quickly they are dispersed. The dispersion of pollutants is influenced by wind, temperature, turbulence and the changes in these factors caused by local topography.

Natural sources of air pollution, such as the occasional forest fire caused by lightning, motor vehicles and industrial emissions affect our air quality. It is important that we are aware of what and how much these sources emit.

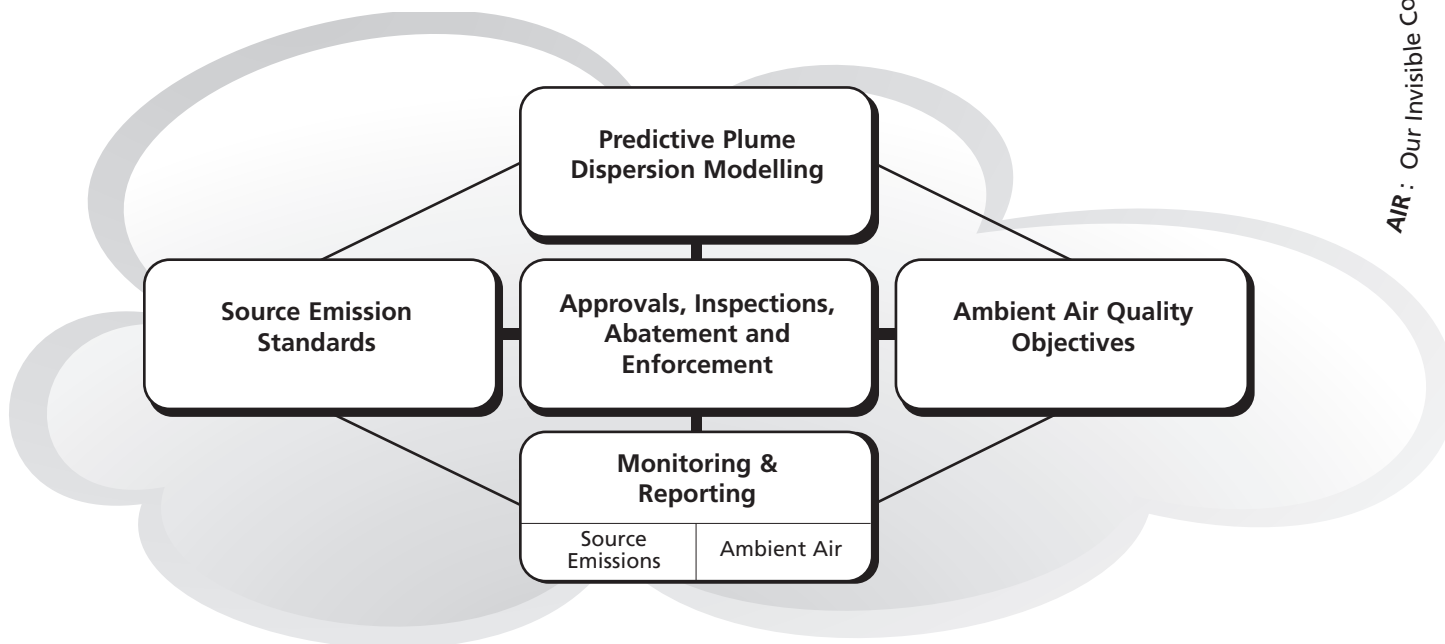
There are many things we can do every day about other sources right here in our area. Each of us adds to air pollution on a daily basis. Almost every thing we buy and everything we do creates some pollution. For example, vehicle exhaust is the major source of pollution in Alberta cities. Therefore, it is important to maintain our vehicles, practice good driving habits and consider walking, cycling or public transit. The cumulative effect of our individual efforts has a significant impact.

The federal and provincial governments' role in monitoring and managing air quality

The Government of Canada's 10-year Action Plan on Clean Air is a commitment to improve air quality for all Canadians. Sound science provides the basis for developing policy and regulations to protect public health, guarding the environment and promoting sustainable economic growth. The Government of Canada is committed to working with the provinces, territories and the private sector to develop strategies that will ensure cleaner air and a cleaner environment for all Canadians.

Alberta Environment carries out its work under the authority of the Environmental Protection and Enhancement Act, and the Climate Change and Emissions Management Act. Through stringent monitoring, inspection and enforcement procedures Alberta Environment promotes – and expects – responsible stewardship of Alberta's resources. The present system has evolved over time and continues to do so. Alberta Environment works with Albertans to protect and enhance the quality of the air through its management approach.

Alberta's Industrial Air Quality Management System



The Fort Air Partnership's role in monitoring and managing air quality

The public is asking questions about the cumulative effects of emissions on air quality and human health in our region. The Fort Air Partnership was formed to provide reliable information that the public can use to address their air quality concerns. Since air quality issues are local, the Fort Air Partnership provides a forum for stakeholders to work together to identify air quality concerns and implement plans to assess them and influence policy.

Air monitoring

The Fort Air Partnership operates eight continuous air monitoring stations in the region. Each station is equipped with a variety of instruments to monitor air quality.

Providing Air Quality Information

Through its web site at www.fortair.org the Fort Air Partnership provides public access to hourly air quality updates from their eight monitoring stations. They also distribute semi-annual community reports and weekly air quality reports through local papers.

Capital Health's role in monitoring and managing air quality

Health response/Health monitoring procedures

Environmental Health Services staff deal with environmental health issues related to air quality. They:

- monitor and work to improve air quality
- assess risks and manage hazards to the environment
- promote health and well-being through public education
- monitor the health of residents in the Capital Health Region
- prevent disease, illness and injury through education and preventative methods
- support change in the community based on factors that affect health, including legislation that promotes health. An example is Edmonton's no-smoking bylaws.

Health Surveillance and Community Assessments

Community exposure assessments provide measures of potential exposure to environmental hazards and help determine if industrial development is affecting the health of those communities. Identifying differences in disease rates helps detect potential causes for these differences.

Industry's role in monitoring and managing air quality

Doing good for the environment is not just driven by moral considerations. It simply makes good business sense as well. To monitor and manage air quality, industries participate in regulatory activities, partnerships with governments and play a role as members of multi-stakeholder Airshed zone management organizations like the Fort Air Partnership.

Industry's commitment to reducing environmental impacts and safeguarding people and the environment is demonstrated through pollution control and abatement, improved operating processes, research, emergency preparedness and community dialogue. As members of the Canadian Chemical Producers' Association (CCPA),

many industrial companies are committed to Responsible Care(r), a set of initiatives undertaken by all CCPA members to help safeguard employees, the environment and the communities in which they operate.

Clean Air Strategic Alliance Role in monitoring and managing air quality

The Clean Air Strategic Alliance was established in March 1994 as a new way to manage air quality issues in Alberta. It is a non-profit association composed of diverse stakeholders from three sectors – government, industry and non-government organizations such as health and environmental groups. CASA is responsible for strategic planning related to province-wide air quality issues in Alberta.

CASA promotes the locally-driven establishment of airshed zones, like the Fort Air Partnership, to address local air quality issues when and where appropriate. An airshed zone can enable local stakeholders to design local solutions to address local air quality issues. Airshed zones work within a designated area to monitor, analyze, and report on air quality and they recommend and implement actions to improve air quality within that zone. Airshed zones supply data to the CASA data warehouse at www.casadata.org.

Other Resources

Web sites

Fort Air Partnership: www.fortair.org

Members of the Fort Air Partnership:

- **Alberta's Industrial Heartland Association:** www.industrialheartland.com
- **Alberta Environment:** www.gov.ab.ca/env
- **Capital Health:** www.capitalhealth.ca
- **Northeast Capital Industrial Association:** www.ncia.ab.ca
- **Clean Air Strategic Alliance:** www.casahome.org
- **Clean Air Strategic Alliance Data Warehouse:** www.casadata.org

Other Airsheds in Alberta:

- **Lakeland Industry and Community Association:** www.lica.ca
- **Parkland Airshed Management Zone:** www.pamz.org
- **Peace Airshed Zone:** www.pasza.ca
- **Palliser Airshed Zone:** www.palliserairshed.ca
- **West Central Airshed Society:** www.wcas.ca
- **Wood Buffalo Environmental Association:** www.wbea.org

Municipal Governments:

- **Lamont County:** www.countylamont.ab.ca
- **Strathcona County:** www.strathcona.ab.ca/Strathcona
- **Sturgeon County:** www.sturgeoncounty.ab.ca
- **City of Fort Saskatchewan:** www.fortsask.ca

Provincial Government:

- **Government of Alberta:** www.gov.ab.ca
- **Alberta Environment:** www3.gov.ab.ca/env/

Federal Government:

- **Canadian Environmental Assessment Agency:** www.ceaa.gc.ca
- **Environment Canada - The Green Lane:** www.ec.gc.ca

- **Environment Canada's National Pollutant Release Inventory** www.ec.gc.ca/pdb/npri
- **Health Canada - Healthy Environments and Consumer Safety Branch - Health and Air Quality:** www.hc-sc.gc.ca/hecs-sesc/air_quality
- **Environmental Protection Agency - USA:** www.epa.gov

Industry:

- **Dow Canada:** www.dowcanada.com
- **Canadian Chemical Producers' Association:** www.ccpa.ca
- **Canadian Petroleum Products Institute:** www.cppi.ca

Organizations - Environmental, Academic:

- **Air and Waste Management Association:** www.awma.org
- **Alberta Environmental Law Centre:** www.elc.ab.ca
- **Alberta Environmental Network:** www.aenweb.ca
- **Climate Change Central:** www.climatechangecentral.com
- **Envirolink - The EnviroWeb:** www.envirolink.org
- **Pembina Institute:** www.pembina.org
- **Pollution Probe:** www.pollutionprobe.org

Publications

Fort Air Partnership reference binder
(can be found in junior high school libraries and public libraries in the Fort Air Partnership region)

Smog - Let's Clear the Air
6-page brochure available from Environment Canada at 1-800-668-6767

The Atmosphere - Out of sight, out of mind
6-page brochure, available from Environment Canada at 1-800-668-6767

Clean Air Strategy for Alberta - To the Teacher
12-page booklet available from Clean Air Strategy for Alberta (780) 427-9793

A Traveller's Guide to Spaceship Earth - Atmospheric Change and Personal Action - Teacher's Guide Grades 4-6
51-page guide available from Alberta Environment at (780) 427-6310

Focus on Air Quality
6-page fact sheet available from Alberta Environment at (780) 944-0313

Blackline Master #1

Student Self Evaluation Form

Name: _____

Rank yourself from **0 (never)** to **4 (always)** on the factors in the table below. Describe how you will make the next class more successful by improving “never” or “sometimes” scores.

Date	I worked hard & was on-task for the entire class.	I contributed to the overall success of our group.	Our group made sufficient progress.	I will make the next class more successful by...
	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4	
	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4	
	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4	
	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4	

Blackline Master #2

Student Group Self-Evaluation

Names: _____

Communication/Collaboration/Teamwork

Choose the description that best matches your group:

Score	Descriptor
4	We cooperated to work through the stations. We were on task and completed all tasks. All group members participated and contributed. Group members were prepared with materials and stayed with the group. Members did their assigned roles well.
3	Our group did most of the above. We were on task most of the time. The description above would describe us MOST of the time.
2	The above description would describe us SOME of the time. We could cooperate more and use our time more effectively
1	The above description would apply to us LITTLE of the time.

Here's how we would describe what we could do differently to learn the material better in a group: _____

Stewardship

Now that I have learned about air quality, I will:

- | | | | |
|--|---------------|------------------|--------------|
| a) Walk or ride my bike rather than getting a ride. | Always | Sometimes | Never |
| b) Organize car pool opportunities with my friends. | Always | Sometimes | Never |
| c) Share information with my family and encourage them to have a positive impact on air quality. | Always | Sometimes | Never |

As a group, list five ways you could have a positive impact on air quality either individually or with your families:

1. _____
2. _____
3. _____
4. _____
5. _____

Blackline Master #3

Kites and Downdrafts Board Game

AIR: Our Invisible Connection • Teacher's Guide • Grades 7 to 9

36	37 Your brother let the car warm up for 15 minutes	38	39	40 You ask your family to drive you 3 blocks to school - go back to 19	FINISH Congrats! You can now breathe easy!
35	34	33	32	31	30 There is no public transit where you live
24 Your parents burned all of your newspapers in your backyard fire pit	25	26	27	28 Your mother dried the laundry on a clothesline - Move to 31	29
23	22 Your father just had his car tuned up	21	20	19	18
12	13	14	15 Your Sister used aerosol hair spray	16	17 Your family replaced your gas mower with a push mower
11	10	9	8	7	6
START How can I make a difference?	1	2 Your family sold the SUV and just bought a Smart Car	3	4	5

Rules

- 1 Roll die to see who goes first - highest goes first.
- 2 Go up and down kites from tail to diamond shape.
- 3 To finish the game, you must throw the exact number to land on the finish square.
- 4 The winner is the first player to land on the finish square.

Blackline Master #4

Video Anticipation Guide

Names: _____

In pairs, you should predict the answers to these 10 true or false statements before watching the video. After watching the video, check your answers.

Before Viewing		Statement	After Viewing	
True	False		True	False
		1. Only government and big polluters are responsible for managing air pollution.		
		2. A forest fire in a distant area of the province can affect your health.		
		3. Reducing pollution makes good business sense for industry.		
		4. Only the provincial government monitors air quality in Alberta.		
		5. Our individual life style choices do not affect air quality.		
		6. Our regional health authorities are not involved in monitoring or managing air quality.		
		7. There are three established airsheds in the province.		
		8. The Fort Air Partnership has eight continuous outdoor air quality monitoring stations.		
		9. Alberta Environment has developed an Industrial Air Quality Management System		
		10. Many of Alberta's air quality issues are local or regional in nature and therefore require local or regional solutions.		

Blackline Master #5 - Family Quiz and Goal Setting Sheet

Name: _____

Complete this quiz as a family. Based on your results, set one goal your family can achieve to reduce your negative impact on air quality.

Statement	Points		
	Always	Sometimes	Never
1. We walk or ride a bike when traveling short distances.	2	1	0
2. We wear extra clothing instead of turning up the heat.	2	1	0
3. We have small campfires for cooking or comfort rather than large, long-burning ones.	2	1	0
4. We turn off lights when we leave a room.	2	1	0
5. We use pump containers rather than aerosols for hair or cleaning products.	2	1	0
6. We recycle or re-use materials.	2	1	0
7. We only warm up our car or let it idle for a few minutes.	2	1	0
8. We keep our vehicles tuned up and regularly maintained (tires properly inflated).	2	1	0
9. We use timers for outside lights, Christmas lights, car plug-ins, etc.	2	1	0
10. We consider fuel efficiency or energy consumption rating when purchasing a vehicle or large appliance.	2	1	0
11. We take short showers or use water-saver showerheads.	2	1	0
12. We car pool or use public transit whenever possible (to get to sports, lessons, etc.)	2	1	0
Total Score			

If you scored 16-24 points: You care about the air! Keep it up.

If you scored 10-15 points: You have some good air quality habits. Research some ways you could improve air quality.

If you scored below 10 points: The Air: Our Invisible Connection poster gives suggestions on how to start having a positive effect on air quality.

Family Goal Setting

Based on your quiz score, set one family goal to reduce your family's negative impact on air quality. Complete a progress report on your family goal once a week for one month and have it signed each time by a guardian.

(Example: Goal: Turning off lights when we leave rooms. Progress Check - Our family was somewhat successful at working towards this goal. We need to remind each other and help each other out.)

Goal: _____

Progress Checks	Date	Signature
#1		
#2		
#3		
#4		
#5		

Blackline Master #6 - Individual Words For Poetry Assignment

Cut this sheet into individual words. Have students use the individual words supplied to create a poem on air quality based on their own experience. Students may use the blanks as any words they need to complete their poems.

I	We	They	You	Together
Wind	Rain	And	If	It
Or	Could	Take	Bus	Create
Lessen	Improve	Have	Positive	Carpool
Skateboard	Negative	Affect	On	The
World	Run	Play	Earth	Neighbourhood
Outdoor	Air	Quality	Work	Car
Pollution	Monitor	Manage	Acid	Rain
Fair	Wear	Breathe	Breathing	Human
Being	Health	Forever	Recycle	Does
Yes	No	Doesn't	Can	Re-use
Can	Weather	Whether	Not	Care
About	Do	Things	Air	Air
Family	Household	A	Everything	Me
Some	Do	Don't	Smog	Forest
Good	Positive	Fire	Burn	Standards
Emissions	Atmosphere	Habits	Learn	Asthma
Vehicles	Exhaust	Wind	Clean	About
How	Good	Alternative	Bad	Ecological
Footprint	Can	Make	Ride	My
Bike	Walk	Instead	Different	Choices
Of	Turn	Off	Lights	Change
Now	Future	Behaviour	Industry	Government
Just	Not	In	Do	Personal
Responsibility	Because	Do	Don't	Buy
Garbage	Our	Share	Our	Invisible
Connection	Reduce	Impact	Can't	Live
With	Without	Carpool	Smokestack	What

Blackline Master #7

Air Quality R.A.F.T. Assignment

Directions:

Your task is to create an original composition related to air quality. You will use the acronym R.A.F.T. to guide your writing.

R = Role of the writer (Who is the writer? What role does he/she play?)

A = Audience for the writer (To whom are you writing? Who will read your writing?)

F = Format (What form will your writing take?)

T = Topic (What will you be writing about?)

Select one role, audience, format and topic from this table to guide your writing:

Role	Audience	Format	Topic
Ecologist	Premier	Letter	Respiratory illness
S.U.V.	Parents	Diary entry	Acid rain
Chemical company manager	Rancher	Poem	Ecological footprint
Smokestack	Junior high school students	Letter to the Editor	Smog
Ground Level Ozone	Tourism company	Advice column	Electricity production
Junior high school student	City planners	Cartoon	Alternate energy sources
Asthmatic	Specific industry	Soliloquy	Impact of recreation on the environment
Air quality technician	Lungs	Interview	Environmental responsibility
Long distance runner/cyclist	Motorists	One-act play	Air quality in our region

Blackline Master #9

Air: Our Invisible Connection Word Search

Name: _____

C	O	V	P	O	T	K	W	L	O	R	U	P	U	A
A	O	Z	N	U	F	A	X	G	F	K	R	C	E	P
R	E	N	O	Z	D	E	H	S	R	I	A	X	A	V
B	H	A	W	N	Y	H	M	R	A	R	K	R	N	E
O	N	K	D	H	E	O	L	T	B	E	T	G	N	H
N	I	T	R	O	G	E	N	O	X	I	D	E	S	I
M	A	S	H	H	F	E	N	H	C	J	M	M	S	C
O	R	Y	S	N	I	D	A	U	B	G	T	I	E	L
N	D	V	B	B	I	U	L	T	X	P	Q	S	A	E
O	I	R	M	O	S	A	P	Q	H	F	J	S	P	S
X	C	A	X	T	T	P	O	L	L	U	T	I	O	N
I	A	I	I	E	R	E	H	P	S	O	P	O	R	T
D	D	P	O	J	N	O	I	S	R	E	V	N	I	X
E	D	I	X	O	I	D	R	U	H	P	L	U	S	J
U	R	R	T	S	L	Y	P	U	A	I	X	D	R	Z

Find and circle these words in the square above:

Acid Rain

Emission

Particulate

VOC

Airshed zone

Exhaust

Pollution

Vehicles

Ambient air

Inversion

Smog

Carbon dioxide

Nitrogen oxides

Sulphur dioxide

Carbon monoxide

Ozone

Troposphere

Blackline Master #10

Factors affecting air quality (from the poster)

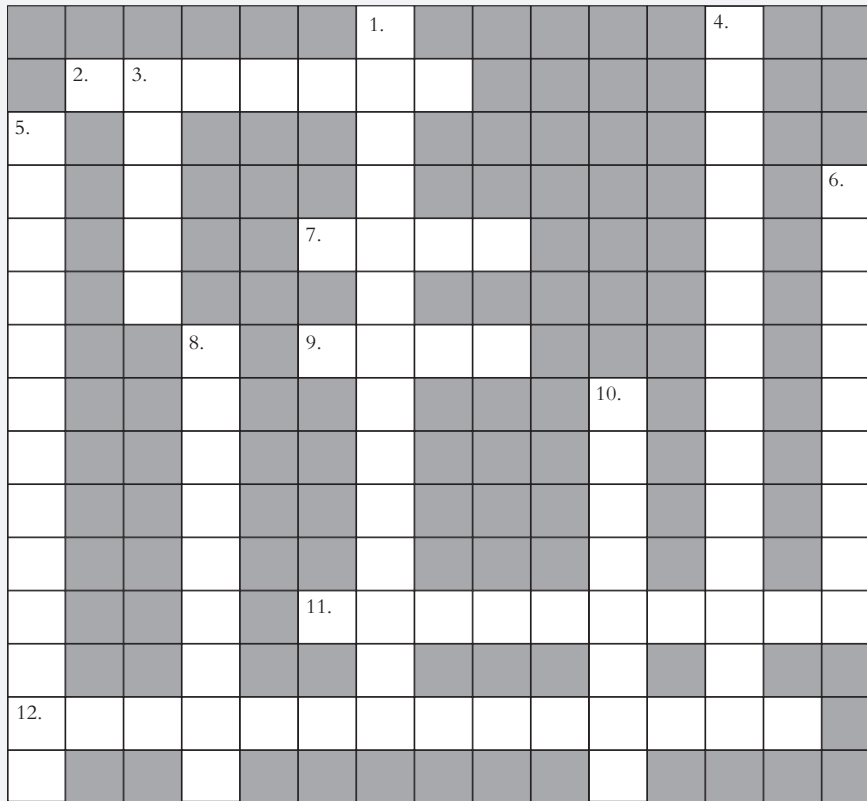
List at least 20 factors shown on the poster that affect air quality.

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Divide your list into categories. Describe and defend the categories you chose to use.

Blackline Master #11 - Air: Our Invisible Connection Crossword Puzzle

Name: _____



ACROSS

2. natural gas that contains hydrogen sulphide
7. organic chemicals that evaporate easily
9. a low lying area of visible pollution
11. scattering of a substance away from its source
12. forms when nitrogen combines with oxygen

DOWN

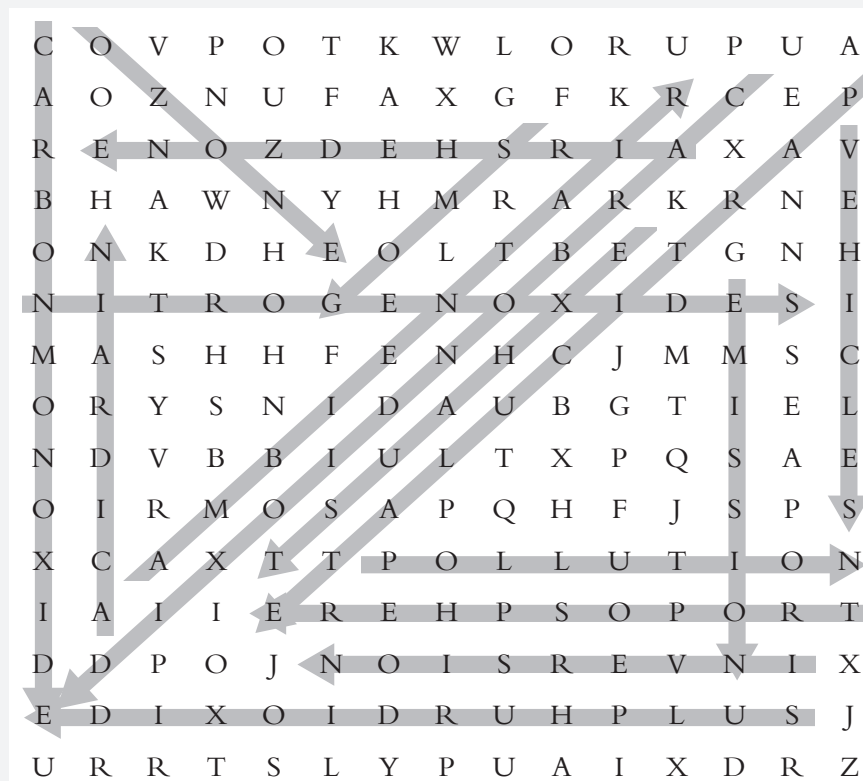
1. produced by incomplete combustion of chemicals containing carbon
3. forms a protecting layer against ultraviolet radiation
4. forms when sulphur combines with oxygen in the air
5. worldwide increase in temperature caused by human activities
6. the movement of molecules from an area of higher concentration to one of lower concentration as a result of fuel combustion
8. used by industrial and electrical generating plants to reduce sulphur dioxide emissions
10. formed in the air when some chemicals combine with water to form acids.

Answer Keys

Air: Our Invisible Connection Word Game

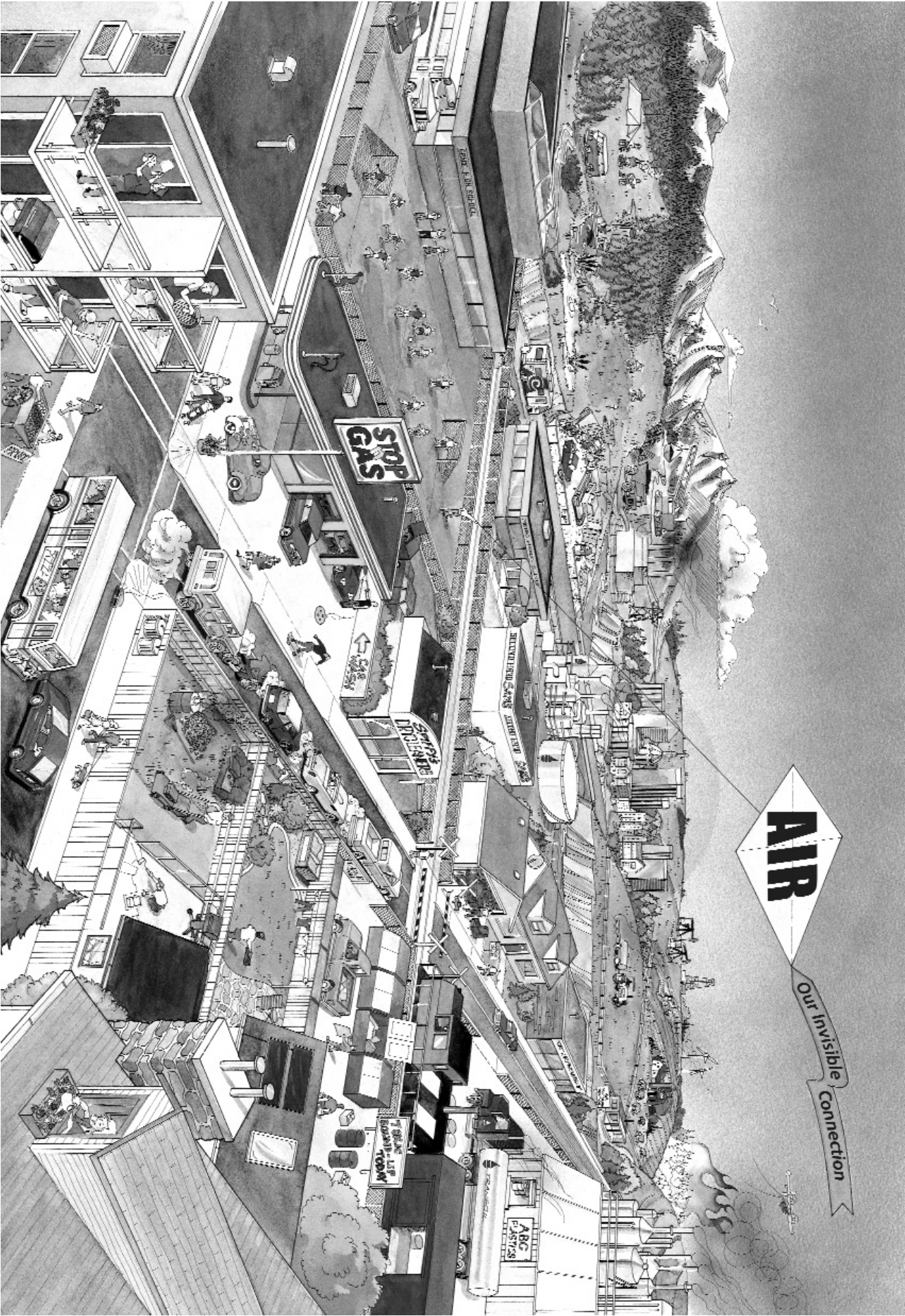
1. t r o p o s p h e r e
2. o z o n e
3. v e h i c l e s
4. g l o b a l w a r m i n g
5. d i f f u s i o n
6. a m b i e n t a i r
7. a c i d r a i n
8. e m i s s i o n s
9. c a r b o n m o n o x i d e

Air: Our Invisible Connection Word Search



Air: Our Invisible Connection Word Search

						1. C							4. S		
	2. S	3. O	U	R	G	A	S						U		
5. G		Z				R							L		
L		O				B							P		6. D
O		N			7. V	O	C	S					H		I
B		E				N							U		F
A			8. S		9. S	M	O	G					R		F
L			C			O				10. A			D		U
W			R			N				C			I		S
A			U			O				I			O		I
R			B			X				D			X		O
M			B		11. D	I	S	P	E	R	S	I	O		N
I			E			D				A			D		
12. N	I	T	R	O	G	E	N	O	X	I	D	E	S		
G			S							N					



AIR

Our Invisible Connection



Project Contractors

The Fort Air Partnership was pleased to contract with these firms whose expertise contributed to the teachers' resources:

Elk Island Public Schools Video Productions - video

Medium : Green Inc. Strategic Communications - project facilitation and writing

North Design Group - graphic design and production for the Teacher's Guide, poster and packaging of the video