

Looking at Data



Target Grade Levels

Sixth - Eighth

Time

Two Class Periods

Materials

- handout/overhead: Looking at Data: Monitoring Network
- handout/overhead: Looking at Data: Monitoring Data

Knowledge and Skills (TEKS)

- Language Arts:
 - Demonstrates effective communication skills during interviewing, reporting, providing information, role playing, or answering questions;
 - Writes complete sentences accurately, using various types of sentences and both dependent and independent clauses;
 - Conducts research using multiple sources such as electronic texts, experts, and non-print resources to locate information relevant to research;
 - Produces research projects and reports in effective formats for various audiences;
 - Uses writing as a tool for research, for example, learning logs, posters, timelines, outlines, and summaries; and
 - Evaluates own research for accuracy and completeness and then frames questions for further study.

Overview

Understanding the causes of pollution – from industrial to natural sources – can be challenging to students. Studying the atmosphere, urban life, and weather helps to put things in perspective, providing opportunities for education in science, math and environment.

Background Information

Air pollution comes from many different sources such as factories, power plants, dry cleaners, cars, buses, trucks and even windblown dust and wildfires. Air pollution can threaten the health of human beings, trees, lakes, crops, and animals, as well as damage the ozone layer and buildings. Air pollution also causes haze, which reduces visibility in national parks and wilderness areas.

Procedure

1) Vocabulary

- | | |
|------------------|-----------------------|
| a) atmosphere | e) CAMS |
| b) ozone | f) ground-level ozone |
| c) anthropogenic | g) Air Quality Index |
| d) biogenic | |

2) Activities

- Have a class discussion about ozone and the effects on the health, and the environment.
- Talk to the class about the air quality program and how choices that people make that can contribute to ground-level ozone.
- Distribute the monitoring network worksheet. The picture on the left indicates where all the monitors are in San Antonio and Austin areas. The pictures on the right indicate the highest eight hour levels that were recorded on September 13, 2002. Have the students answer the questions. For current ozone levels go to www.tnrcc.state.tx.us/cgi-bin/monops/select_curlev?region13_cur.gif.

- d) Distribute the Monitoring Data worksheet. Have students create graphs showing each monitor's reported ozone concentration for every hour of the day. This sheet shows the ozone levels at different times throughout the day. Have the students answer the questions. For current local ozone levels go to www.tnrcc.state.tx.us/cgi-bin/monops/select_curlev?region13_cur.gif.

3) Review

- a) Discuss students' answers to questions and students' graphs.
- b) Discuss differences in monitor readings and what might have affected those differences.

4) Evaluation

- a) Students' in-class work can be performed as a graded exercise.
- b) Extension activities can be performed as a graded exercise.

5) Extension

- a) Have students do web research as a class and choose another day for which each student will, as homework, produce a report containing the following data:
 - i) A bar graph of hourly ozone levels at all of the region's ozone monitors.
 - ii) The highest recorded hourly ozone level at each monitor.
 - iii) The highest eight-hour average ozone level at each monitor.
 - iv) The maximum AQI category reached for the day
 - v) Maximum temperature for the day
 - vi) Wind speed and wind direction for the day
 - vii) Difference in maximum ozone concentration from the upwind to the downwind monitor.
 - viii) Student's conclusions as to why ground-level ozone did or did not build up that day, whether significant pollution was transported into the area from somewhere else (and if so, where else), and the health advisory associated with the maximum AQI category for that day.

Notes:

A table of all of these parameters can be generated for any day for which records exist at the following TCEQ website: www.tnrcc.state.tx.us/cgi-bin/monops/daily_average.

These reports may lead students to ask questions about transported pollution and what can be done about it. Students should be encouraged to investigate the Clean Air Act's stance on transported pollution – that exceptional, international incidents can be excused from regulatory oversight and control measures, but that, in essence, no region is exempt from their responsibility to reduce their own pollution

because they receive significant transported pollution. The concept is that San Antonio (for example) can't become exempt from clean air laws by blaming their bad air on pollution transported from Houston, because then Houston might blame Baton Rouge and Baton Rouge might blame Atlanta – thus playing a national “blame game” while the air gets no cleaner. Each region must protect the health of its citizens by reducing its contribution to pollution.

Worksheet

Looking at Data: Monitoring Network



200	Very Unhealthy/Hazardous
150	Unhealthy
100	Unhealthy for Sensitive Groups
50	Moderate
	Good

Reporting for September 13, 2002														
			September	13	2002	Select a Different Date								
Monitoring Sites in the San Antonio Metro Area	Air Quality	Critical Pollutant	Air Quality Index Rating											
			Ozone				Carbon Monoxide		Sulfur Dioxide		PM-10		PM-2.5	
			1-Hour		8-Hour		8-Hour		24-Hour		24-Hour		24-Hour	
			AQI	ppb	AQI	ppb	AQI	ppm	AQI	ppb	AQI	ug/m3	AQI	ug/m3
Bexar County	Unhealthy for sensitive groups	Ozone	*	104	132	97	22	1.9	1	1			105	42.8
San Antonio Northwest C23	Unhealthy for sensitive groups	Ozone	*	99	124	94								
San Antonio Downtown C27	Good	Carbon Monoxide					18	1.6						
Camp Bullis C58	Unhealthy for sensitive groups	Ozone	*	104	132	97								
Calaveras Lake C59	Unhealthy for sensitive groups	Ozone	*	101	114	90							92	36.5
Selma C301	Unhealthy for sensitive groups	PM-2.5											104	42.0
Elm Creek Elementary C501	Moderate	Ozone	*	86	92	81								
Fair Oaks Ranch C502	Unhealthy for sensitive groups	Ozone	*	92	101	85								
CPS Pecan Valley C678	Unhealthy for sensitive groups	PM-2.5	*	91	100	84	22	1.9	1	1			105	42.8
Comal County	Unhealthy for sensitive groups	Ozone	*	106	124	94								
Bulverde Elementary C503	Unhealthy for sensitive groups	Ozone	*	106	124	94								
Guadalupe County	Unhealthy for sensitive groups	Ozone	*	116	150	104								
New Braunfels Airport C504	Unhealthy for sensitive groups	Ozone	*	116	150	104								

* There is no AQI associated with hourly ozone averages less than 0.125 ppm (125 ppb).

- 1) What monitor recorded the highest ozone levels?
- 2) According to the Air Quality Index for ozone what category would the highest monitor fall into (Good, Moderate, Unhealthy for Sensitive Groups, Unhealthy, Very Unhealthy)?
Generally, an AQI of 100 for ozone corresponds to an ozone level of 0.08 parts per million.
- 3) What monitor recorded the lowest ozone levels?
- 4) According to the Air Quality Index, what category would the lowest monitor fall into (Good, Moderate, Unhealthy for Sensitive Groups, Unhealthy, Very Unhealthy)?

Worksheet Looking at Data: Monitoring Data

Area	CAMS	Morning											Afternoon											CAMS		
		Mid	1	2	3	4	5	6	7	8	9	10	11	Noon	1	2	3	4	5	6	7	8	9		10	11
<u>San Antonio</u>																										
	<u>23</u>	5	7	7	7	9	6	6	7	24	69	88	92	99	99	99	97	96	88	70	43	36	15	9	5	<u>23</u>
	<u>58</u>	8	9	8	7	7	4	4	10	30	65	84	94	99	103	104	103	100	90	63	35	25	11	9	5	<u>58</u>
	<u>59</u>	35	40	25	8	9	16	4	7	26	43	74	87	94	94	99	101	93	79	47	23	17	17	39	35	<u>59</u>
	<u>501</u>	4	5	4	5	4	3	2	12	31	63	73	81	83	86	86	84	82	74	47	19	10	9	6	7	<u>501</u>
	<u>502</u>	26	23	17	18	22	13	9	21	40	63	78	78	81	83	90	92	90	88	72	47	41	39	29	30	<u>502</u>
	<u>503</u>	12	14	10	6	4	3	2	6	22	65	74	83	89	101	106	102	101	94	81	60	34	22	20	12	<u>503</u>
	<u>504</u>	3	3	4	4	3	3	5	9	38	69	85	98	105	110	111	116	107	100	79	60	42	38	44	49	<u>504</u>
	<u>678</u>	0	0	0	0	0	0	0	0	8	55	71	88	86	86	86	91	89	82	60	25	4	2	0	0	<u>678</u>

- 1) At 2a.m., what was the ozone level?
- 2) Why do ozone levels get higher in the afternoon?
- 3) What was the highest recorded value at the Holland monitor?
- 4) Why do the ozone levels go down in the evening?
- 5) At what time did the Muskegon monitor record its highest reading?
- 6) What others things are happening at this time that may contribute to higher ozone levels?