Glossary

-A-

aerobic bacteria - bacteria living or occurring only in the presence of oxygen.

air pollution - occurs when harmful things are present or released into the air.

aquifers - rock formations that hold and transmit water.

-C-

chlorofluorocarbons (CFCs) - organic chemicals that are used to create coolants, plastic foam, and other products.

Clean Water Act - the nation's premier environmental law, passed in 1972, to protect U.S. waters including lakes, rivers, aquifers and coastal areas, by reducing discharge of pollutants, with the goal of making these waters fishable and swimmable.

closed system - a system that recycles matter over and over again and that neither gives nor receives matter from the outside.

coagulation - a gathering together of finely suspended matter by the addition of a coagulant.

composting - the practice of collecting organic materials, such as fruit, vegetables, grass clippings, or leaves, to decompose and produce fertilizer.

corrosive waste - waste that is able to eat away the containers they are in, or to eat away at flesh. Lye is corrosive.

-D-

decomposition - the process by which organic materials are consumed and broken down into soil, fertilizer or other compounds.

-E-

erosion - the wearing away of land by the action of wind or water.

exosphere - the outer layer of our atmosphere.

-F-

flammable - having the ability to catch fire and burn.

floc - small, semi-solid masses formed in a liquid when coagulants are added.

-G-

global climate change - the long-term changes in temperature occurring globally as a result of changes in the earth's atmosphere.

global warming - the observed increase in the average temperature of the troposphere, which is believed to be a result of the greenhouse effect.

greenhouse gas - any of several gases that help trap the earth's heat and contribute to the greenhouse effect.

groundwater - water that fills the spaces between rocks and soil particles underground.

-H-

hazardous - potentiality harmful to humans and other animal life.

hazardous waste - ignitable, corrosive, reactive, or toxic waste that needs special care in disposal.

household hazardous waste (HHW) - household waste products that pose a health risk if not handled or disposed of according to special instructions.

hydrocarbons - a waste product from the burning of fossil fuels.

hydrologic cycle - in nature, the cycle that water molecules go through, consisting of evaporation, condensation, percolation, precipitation. Also called the water cycle.

-I-

ignitable - having the ability to catch fire and burn.

incineration - the burning of materials to ashes.

inorganic pollution - includes litter and chemical fertilizers

ionosphere - a thin region of the thermosphere which contains charged atoms.

-L-

landfilling - the burying of waste materials.

leachate - dissolved materials that are carried by water seeping through the soil or waste.

-M-

mesosphere - the layer of the atmosphere that extends from 50 to 90 km above the earth's surface.

-N-

non-hazardous solid waste - waste that does not require special handling or disposal.

nonpoint source pollution - pollution that cannot be traced to individual sources.

-O-

organic pollution - pollution that includes human, animal and plant wastes and chemical substances created by or made from them.

ozone - the main ingredient in smog, produced when sunlight acts on oxygen in the air. A molecule made of three atoms of oxygen.

Ozone Action Days - days when the chance of serious health effects from ground-level ozone are particularly great; people are encouraged to take special steps on these days.

ozone layer - the protective layer of ozone high in earth's atmosphere that filters out much of the harmful ultraviolet light from the sun.

-P-

particulates - dust, pollen and other microscopic solids suspended in air.

particulate matter - see particulates.

parts per million (ppm) - the number of units of a substance found in a million units of surrounding air, water, or soil.

photosynthesis - the process by which plants turn sunlight into energy.

point source pollution - pollution that comes from a single identifiable source.

pollutants - any substance which makes air, land or water unhealthy.

pollution - the release or presence of harmful substances into the environment by natural or man-made means.

pollution prevention - the practice of reducing the generation of pollution and waste by changing or modifying plans, practices, or habits, or by conservation or efficient resource use.

primary source - the originating point of information.

-R-

reactive - having the ability to react with other materials. Reactive materials may explode.

recycling - breaking waste down into basic substances which can then be remade into other items.

reusing - using materials over and over, or using them for another purpose.

-S-

secondary source - a source of information once removed from the original source.

sediment - includes the buildup of silt, clay, and other particles in ways that affect the survival or health of an ecosystem.

self-efficacy - the attitude, belief or confidence that one is able to facilitate or cause change in one's life or surroundings.

smog - chiefly low-level ozone. Particulates, oxides of nitrogen and sulfer, and other pollutants in the atmosphere create a brown haze over cities.

source reduction - limiting the amount of waste produced by an activity or not creating waste in the first place.

stratosphere - the layer of the atmosphere that extends from 15 to 50 km above the earth's surface.

surface water - water in rivers, lakes, streams or ponds; distinguished from groundwater.

-T-

thermal pollution - refers to changes in the temperature of water, either warmer or colder.

thermosphere - the layer of the atmosphere that extends from 90 to 480 km above the earth's surface.

toxic - includes pesticides, insecticides, lead, and other chemicals that are directly harmful to humans or animals.

transpiration - the chemical process of water passing from the roots of a plant to its leaves.

troposphere - the lowest layer of the atmosphere that extends from Earth's surface to a height of 20km.

-W-

water cycle - see hydrologic cycle

water pollution - a change in the composition (or temperature) of water that makes it harmful to living organisms and other resources.

watershed - all of the land that drains water into a body of water such as river, lake, or wetland.

water table - the top of the groundwater

wetlands - ecosystems that are part land and part water.

Conceptual Framework

Pollution, like most environmental issues, is a complex topic. It can be complicated to understand and teach since comprehension requires understanding of a number of concepts from a variety of disciplines. To make this easier the Development Team has designed a framework that breaks the topic down into teachable concepts that help the material developer, teacher and student organize and structure their thinking.

The framework is organized under four question-structured themes that build on one another from ecological knowledge to personal and societal issues. Each of the themes: 1) What Is Pollution? 2) Why Is Pollution An Issue? 3) What Kinds of Pollution Issues Affect Illinois? 4) What Can We Do About Illinois Pollution Issues? is followed by concepts that address the question.

1. What is Pollution?
- Definition of Pollution
- Basic Ecological Principles
- Important Pollution Related Definitions

2. Why is Pollution an Environmental Issue?
- Effects on Human Health and Quality of Life
- Effects on Communities
- Effects on Economy
- Effects on Ecosystems

3. What Kinds of Pollution Issues Affect Illinois?
- Air
- Land
- Water

4. What Can We Do About Illinois Pollution Issues?
- Studying Issues and Innovations
- Skills for Understanding Environmental Issues
- Decision-Making and Citizenship Skills
- Personal and Civic Responsibility

1. What is Pollution?

These concepts will help students understand what pollution is and the different forms it takes.

Definition of Pollution

A) Pollution is the presence or release of substances into the environment in quantities or concentrations that are harmful to living organisms and other resources.

B) Air, land, and water pollution affect and are connected to each other; they are not separate and distinct forms of pollution.

C) Air pollution is a change in the composition of air that makes it harmful to living organisms and other resources.

D) Water pollution is a change in the composition (or temperature) of water that makes it harmful to living organisms and other resources. Water pollution can be further classified as: Organic- living things or their waste products (e.g. animal waste, leaves, nutrients, bacteria); Inorganic - human-made chemicals or products (e.g., synthetic fertilizers, litter); Thermal - a change in the water temperature to the extent that it affects the quality of the ecosystem (e.g., power plant warm water discharge into a lake or river); Toxic - any chemical that causes death or harm to humans, animals or plants (e.g., PCBs, copper, lead, zinc); Sediment - soil, sand, and other minerals from the land that other pollutants can attach to.

E) Waste is something that is discarded or is an unwanted by-product of some activity or process. Waste can be classified as hazardous or non-hazardous. Waste is considered hazardous if it is toxic (poisonous), corrosive (can eat away the container which holds it), ignitable (can catch fire and burn), or reactive (can explode). Non-hazardous waste can be recycled, reused, composted, safely stored in sanitary landfills or incinerated.

Basic Ecological Principles

F) The ecosystem components of water, rock, air and life are continually changing through natural processes and cycles.

G) Energy is required to change components of one form into another.

H) Earth's resources are limited and can be overused or misused.

I) Some resources are renewable whereas other cannot be renewed or replaced.

J) Humans and natural systems can produce harmful by-products, which can enter ecosystems in many forms and whose effects can be local or global.

K) Pollution can affect forms of life and their relationships.

L) Ecosystems possess measurable indicators of environmental health.

Important Pollution Related Definitions

M) ppm - (parts per million) and ppb - (parts per billion) Measures of the amount of a substance (part) found in a million units of air, land or water.

N) Pollutant - Any substance, natural or man-made, that causes pollution.

O) Contaminant - A harmful impurity in the air, land, or water.

P) Toxics or toxins - Substances that are poisonous to some animals or plants.

Q) Closed System - A system that recycles matter over and over again and that neither gives nor receives matter from the outside.

R) Monitoring - Checking air, land and water samples for pollution.

2. Why is Pollution an Environmental Issue?

Concepts in this section can help students understand and investigate how pollution may affect themselves and others.

Effects on Human Health and Quality of Life

A) Pollution can negatively affect people's ability to engage in normal daily activities.

B) Pollution can cause or contribute to a wide range of human ailments (e.g., eye and skin irritation, breathing difficulties, cancer).

Effects on Communities

C) The effects of pollution can be found on local, regional, national and global scales.

D) Pollution affects rural, suburban, and urban areas and all are affected differently.

E) Pollution may affect the economic base of communities.

Effects on Economy

F) The use of technology may have benefits as well as unintended side-effects.

G) Individuals, businesses and governments spend money to research, prevent, control and clean up pollution.

H) Our economic system is based on use of resources, both natural and human. Economic systems may be affected if resources are damaged, unhealthy, or polluted.

Effects on Ecosystems

I) Pollution affects ecosystems, whether they are naturally occurring (e.g., woodlands, wetlands, grasslands, lakes, rivers, streams) or human made (e.g., vacant lots, developed areas).

J) Pollution may affect the reproductive ability of species.

K) Pollution can affect many aspects of an ecosystem due to the cycling of nutrients and other substances.

3. What Kind of Pollution Issues Affect Illinois?

In order for students to be able to respond to pollution issues they must first understand what issues affect their community and state.

AIR

A) Air pollution can be produced by humans (e.g., industrial, mobile [cars, trucks], non-road [bulldozers, boats, lawn mowers])or by natural sources (forest fires, dust storms).

B) Air is composed of colorless, odorless gases, the most prevalent being nitrogen, with oxygen, carbon dioxide and small amounts of other gases and particulates.

C) Earth's atmosphere is composed of different layers of gases which serve different functions.

D) Ozone can be considered either good or bad, depending on where in the atmosphere it is found and how it was formed.

E) Air pollution caused by industrialization (motor vehicles, coal-burning power plants, and other manufacturing processes) has been linked to far reaching environmental problems including global climate change, acid rain and the greenhouse effect.

F) Air is monitored for concentrations of particles and gases that affect the health of humans and other organisms.

G) People have developed and continue to develop ways to try to minimize the production and effects of air pollution.

LAND

H) Waste is generated by nature and as a by-product of human consumption (residental, agricultural, commercial, institutional, industrial).

I) Waste can be categorized as either hazardous or non-hazardous depending upon how it is generated or handled.

J) Non-hazardous waste can be handled through a variety of means including source reduction, recycling, composting, incineration and landfilling.

K) Hazardous waste can be handled either through treatment, incineration or through storage.

L) People have developed and continue to develop ways to try to minimize the production and effects of hazardous and non-hazardous waste.

WATER

M) Our water supply consists of water that is visible (surface water) and water that cannot be seen because it is underground (groundwater).

N) Polluted water can smell or be visibly contaminated, but even clear, odorless water can be contaminated.

O) Water pollution can be classified as point source (pollution that comes from a single clearly identifiable source, such as a pipe which discharges material into a lake, stream or river) or nonpoint source (pollution that originates over a broader area or from a variety of causes).

P) Polluted water can find its way into the water system that is relied on by humans for drinking, bathing, irrigation and recreation.

Q) Water is the original renewable resource. It has its own cycle in which water is naturally moved and purified.

R) Humans have developed ways to prevent and reverse the contamination of water by watershed management and water treatment processes.

4. What Can We Do About Illinois Pollution Issues?

The following concepts help students identify ways that pollution solutions can be approached. For students to willingly and effectively take action to prevent and/or control pollution they must have a thorough understanding of what pollution is, why it is an issue, how it affects them, their community and the state of Illinois, and what people can do to protect the air, land, and water. Students should also begin to understand the ecological, social, economic, and political connections of this important issue.

Studying Issues and Innovations

A) Science, technology, and society contribute to our understanding of pollution and the reasons for its production.

B) We are still learning about ecological systems and the consequences of human actions on these systems. As a result, many people differ in their interpretations of scientific evidence and other data.

C) Because issues related to pollution are complex and require the combination of information gathered by scientists from different fields, pollution research involves professionals with backgrounds in agriculture, biology, botany, engineering, history, planning, psychology, science, and sociology.

D) Historically, environmental protection has controlled pollution after it has been generated. New approaches called pollution prevention are beginning to emerge which seek to anticipate and prevent pollution before it happens.

Skills for Understanding Environmental Issues

E) The better we understand Earth and its many ecosystems, the better we can manage our resources and reduce our impact on the environment.

Decision-Making and Citizenship Skills

F) Individuals develop skills for crystallizing and formulating their beliefs and values regarding pollution issues and ways to address them.

G) Individuals in a democracy have a right and responsibility to participate in the development of policies that influence pollution prevention and production.

H) Individuals, acting on their own or as part of a group or organization, can make lifestyle choices and take actions that affect pollution.

I) Individuals can affect the actions of other individuals, families, groups, or organizations to prevent and reduce pollution.

Personal and Civic Responsibility

J) Choices made today about consumption will affect the future quality of life and the global environment.

K) It takes less energy and fewer resources to prevent pollution than it does to restore an ecological system that has been polluted.

L) Every part of society influences pollution to some extent and can work to prevent it through policy initiatives, media campaigns and other public activities.

M) Individuals understand that what they do or don't do can have far-reaching consequences and that they are responsible for those consequences.

ACTIVITY OVERVIEW

Section 1: What is Pollution?

Activities	Overview	Objectives	Concepts	
"Drawing Out" Pollution (pages 18-24)	Students share what they know about pollution, identify pollution in their community and expand their understanding of different types of pollution.	Students will: 1) identify forms of pollution and describe the effects that various pollutants can have on people, wildlife and plants. 2) describe relationships between various forms of pollution and human actions.	1. A, B, C, D, E	
"Sock It" to Air Pollution (pages 25-28)	Students will observe that air pollution is not always visible and that not all vehicles produce the same amount of pollutants.	Students will: 1) be able to describe different sources of air pollution and some of the effects of air pollution. 2) recognize that some types of air pollution are invisible or visible only under certain circumstances.	1. A, C, N, R 3. A, F, G	
Charting the Water (pages 29-32)	Students classify and graph the pollutants found in a hypothetical river and hypothesize what caused the pollution in the first place.	Students will: 1) identify forms of pollution and describe the effects that pollutants can have on people, wildlife and plants. 2) describe relationships between various forms of pollution and human actions.	1. A, D, F, J, N, P, R 2. B 3. R	

Section 2: Why is Pollution an Environmental Issue?

Leggo My Ozone (pages 35-42)	Students first develop a model of the Earth's atmosphere and then participate in a simulation which illustrates the difference between "good" and "bad" ozone.	Students will: 1) understand the different layers of the atmosphere and the importance of each. 2) understand the difference betwen good and bad ozone and where each is located. 3) understand how choices made on Earth affect the atmosphere.	1. A, C, F, J 2. B, F 3. C, D, E, G	
Playing with Food...Waste (pages 43-46)	Students analyze a pollution issue dealing with the trash generated by a school cafeteria, and will consider the obstacles to reducing the amount of trash and food waste.	Students will: 1) recognize there are costs associated with pollution remedies. 2) analyze and compare their values regarding pollution issues.	1. G 2. F, G 3. H 4. L, M	
On Illinois Pond (pages 47-51)	Students take part in a role playing exercise in order to understand the interests of different groups and different causes of pollution in a land development issue.	1) understand that different land uses can affect the types of pollution in a given area. 2) recognize that people have different and sometimes conflicting interests in how land is used.	2. C, D, E, H, I 3. A 4. H, I, J	

	Skills	Time	Location	Subject	Illinois Learning Standards
	• Observing • Comparing/ Contrasting • Organizing • Researching	One or two class periods	Indoor and outdoor	Art Science	Science: 11.A.2 b, c, d, e Social Science: 17.C.2 c Physical Dev. & Health: 22.C.3 a
	• Predicting • Interpreting	One class period	Indoor and outdoor	Science	Science: 11.A.2 b, c, d 13.B.2 b
	• Classifying • Comparing/ Contrasting • Computing • Matching	One class period	Indoor	Mathematics Science	Mathematics: 10.A.2 a, c Science: 11.A.2 c, d 13.B.2 e, f Social Science: 17.C.2 c Physical Dev. & Health: 22.C.3 a
	• Measuring • Creating models • Critical thinking • Classifying • Role playing	Two class periods	Indoor and outdoor	Art Physical Education Science Social Studies	Science: 11.A.2 c, 12.E.2 b, 13.B.2 b, e, f Social Science: 17.B.2.c, 17.C.2 c Physical Dev. & Health: 22.C.2
	• Analyzing • Problem solving	One class period	Indoor	Language Arts Science Social Studies	English Language Arts: 2.B.2 a Science: 12.E.2 c, 13.B.2 d, f Social Science: 15.B.2 c
	• Public speaking • Problem solving • Planning • Comparing/ Contrasting	One class period	Indoor	Language Arts Science Social Studies	English Language Arts: 4.B.2b, 5.C.2 b Science: 13.B.2 f Social Science: 14.D.2, 15.B.2 c, 17.C.2 b,c

ACTIVITY OVERVIEW Continued

Section 3: What Kind of Pollution Issues Affect Illinois?

Activities	Overview	Objectives	Concepts	
What's Blowin' in the Air (pages 58-62)	Students collect particulate matter from the air at different locations around the school and analyze particles collected.	Students will: 1) analyze collected particles and draw conclusions about them. 2) identify areas of the school where air pollution might be a problem.	1. C, J, L, R 2. I 3. A , F	
It's Warm in Here, or Is It? (pages 63-68)	Students read two differing articles on the concept of global climate change and determine how or if air pollutants may be affecting our climate.	Students will: 1) judge the strengths and weaknesses of information. 2) discuss the causes and possible effects of global climate change.	1. C, F, J, 2. C, F, E, G 3. A, E 4. B	
Where Water Wanders (pages 69-72)	Students will research, create and develop a presentation in which they explain how water gets to them and where it goes after being used.	Students will: 1) understand where their domestic water originates, how it reaches them and where it goes after use. 2) be able to explain the movement and management of water in their own words.	3. M, P, R	
Pointing to Point and Nonpoint Pollution (pages 73-79)	Students will read a mystery story involving numerous types of water pollution and will use their knowledge and reasoning skills to solve the mystery.	Students will: 1) understand the difference between point and nonpoint source water pollution. 2) identify types of point and nonpoint source water pollution.	1. A , E 2. J, K 3. A, D, J, O,P	
Hasting to Waste (pages 80-86)	In this activity students will design models of leakproof landfills and will observe how each functions.	Students will: 1) design a landfill and observe what happens to materials when placed in it. 2) recognize that materials and design can affect the integrity of a landfill.	1. D, P, R 3. H, J, L	
Common Household Hazardous Waste (pages 87-91)	Students identify and discuss various types of household hazardous waste (HHW) and disposal methods. They then complete a home inventory with the help of their parents or guardians.	Students will: 1) be able to identify common household products that contain hazardous waste properties. 2) identify proper storage and disposal methods for household hazardous waste.	1. E, P 2. B 3. K, L	
Illinois Pollution Jeopardy (pages 92-97)	Students take part in developing a game that will help the entire class to understand what types of pollution affect Illinois.	Students will: 1) identify and research different forms of pollution. 2) present a short report on their research. 3) understand how different types of pollution are related to and differ from each other.	1. A-F 2. C 3. A, E, G, I, M, O, R	

	Skills	Time	Location	Subject	Illinois Learning Standards
	• Analyzing • Comparing/ Contrasting • Drawing conclusions • Collecting • Hypothesizing	Two class periods one week apart	Indoor and outdoor	Mathematics Science	Mathematics: 10.B.2 c Science: 13.A.2 b, c
	• Analyzing • Comparing/ Contrasting • Drawing conclusions	One class period	Indoor	Language Arts Science Social Studies	Language Arts: 2.B.2 a 5.B.2 a Science: 13.B.2 b,c Social Studies: 17.C.2 b, c
	• Creative thinking • Reporting/ Presenting • Researching • Collaborating • Evaluating	One week or more	Indoor and outdoor	Language Arts Science	Language Arts: 4.B.2 b 5.C.2 b Science: 11.A.2 c, d, e
	• Analysis • Reading • Deductive reasoning • Problem solving	One class period	Indoor	Language Arts Science	Language Arts: 1.B.2 b, d 1.C.2 d Science: 13.B.2 b, f Social Studies: 17.B.2 f
	• Observing • Hypothesizing • Measuring • Comparing/ Contrasting	One class period for set up, one period three weeks later and 10 minutes every other day	Indoor	Science	Science: 11.B.2 c, d, e 11.A.2 a, b, c, d, e
	• Researching • Classifying • Analyzing	Two class periods	Indoor and home	Science Social Studies	Language Arts: 1.A.2 a Science: 11.A.2 b 13.A.2 a 13.B.2 a, f Social Studies: 17.C.2 c
	• Teamwork • Researching • Comparing/ Contrasting • Public speaking • Problem solving	Five class periods	Indoor	Language Arts Science Social Studies	Language Arts: 4.A.2 b 4.B.2 b & 5.A.2 a, b Science: 12.E.2 a & 13.B.2 f Social Studies: 17.B.2 a 17.C.2 a Physical Dev. & Health: 22.C.2

ACTIVITY OVERVIEW Continued

Section 4: What Can We Do About Illinois Pollution?

Activities	Overview	Objectives	Concepts	
Piecing Together the Future (pages 107-109)	Students speculate what the future will be like if local pollution problems are or are not remedied.	Students will: 1) Identify pollution problems in their community. 2) Identify steps that can remedy the problems. 3) Identify long term consequences if the problems are not addressed. 4) Recognize that people may disagree on the problems and the solutions.	2. D 4. F, H, I, M	
Living with Wants and Needs (pages 110-113)	Students examine the concepts of wants and needs and determine ways that their personal choices can affect pollution.	Students will: 1) identify the difference between wants and needs in their own lives. 2) learn that they have choices as consumers related to their needs and wants.	2. F 4. H, J, M	
Looking Locally (pages 114-116)	Students will research different aspects of a local community issue that they have selected.	Students will: 1) learn that there are many aspects to an issue. 2) develop and implement a research plan on an issue in their community.	2. C 4. A, B, C	
Be Your Own Action Figure (pages 117-119)	Students will plan and undertake an action project of their choosing that will have a positive impact on their school or local community.	Students will: 1) identify a problem involving pollution in their community. 2) use critical and creative thinking to solve the problem or improve the situation. 3) successfully carry out the project. 4) evaluate the process by which they tried to solve the problem or improve the situation.	4. F, G, I, L, M	

	Skills	Time	Location	Subject	Illinois State Standards
	• Predicting • Creative thinking • Comparing/ Contrasting • Creating	Three class periods	Indoor	Art Language Arts Science Social Studies	Language Arts: 1.C.2 a, b 4.A.2 a,b 4.B.2 b Science: 13.B.2 b, d, f Social Studies: 15.B.2 c 17.C.2 c 17.D.2 a
	• Analyzing • Classifying • Creative thinking	Two class periods	Indoor	Language Arts Mathematics Science Social Studies	Language Arts: 4.A.2 b,c Mathematics: 6.C.2 a & 7.A.2 b Science: 11.A.2 c & 13.B.2 f Social Studies: 15.B.2 a, b, c 15.D.2 a, b 15.E.2 a
	• Prioritizing • Researching • Evaluating • Other skills depending on the type of research conducted	Five or more class periods	Indoor	Language Arts Science Social Studies	Language Arts: 1.C.2 a, 3.B.2 a, b, 4.B.2 a, 5.A.2 a, b & 5.C.2 a, b Science: 11.A.2 a, b, c, d, e Social Studies: 14.B.2 15.E.2 a, b 18.B.2 a, b
	• Creative thinking • Organizing • Planning • Other skills dependent on the project chosen	Dependent on project	Indoor and outdoor	Language Arts Science Social Studies	The basic standards addressed by this activity are noted below. Others will be addressed based on the type of problem chosen and how the students decide to carry out the project. Language Arts: 1.C.2 a, 3.B.2 a 4.A.2 b & 5.A.2 a, b Science: 11.B.2 b & 13.B.2 f Social Studies: 14.D.2 18.B.2 a

ACTIVITY BY TOPIC AREA

Pollution Effects On Our Environment (Overview)

Activities	Overview	Objectives	Concepts	
"Drawing Out" Pollution (pages 18-24)	Students share what they know about pollution, identify pollution in their community and expand their understanding of different types of pollution.	Students will: 1) identify forms of pollution and describe the effects that various pollutants can have on people, wildlife and plants. 2) describe relationships between various forms of pollution and human actions.	1. A, B, C, D, E,	
Illinois Pollution Jeopardy (pages 92-97)	Students take part in developing a game that will help the entire class to understand what types of pollution affect Illinois.	Students will: 1) identify and research different forms of pollution. 2) present a short report on their research. 3) understand how different types of pollution are related to and differ from each other.	1. A-F 2. C 3. A, E, G, I, M, O, R	
Piecing Together the Future (pages 107-109)	Students speculate what the future will be like if local pollution problems are or are not remedied.	Students will: 1) identify pollution problems in their community. 2) identify steps that can remedy the problems. 3) Identify long term consequences if the problems are not addressed. 4) recognize that people may disagree on the problems and the solutions.	2. D 4. F, H, I, M	
Living with Wants and Needs (pages 110-113)	Students examine the concepts of wants and needs and determine ways that their personal choices can affect pollution.	Students will: 1) identify the difference between wantts and needs in their own lives. 2) learn that they have choices as consumers related to their needs and wants.	2. F 4. H, J, M	
Looking Locally (pages 114-116)	Students will research different aspects of a local community issue that they have selected.	Students will: 1) learn that there are many aspects to an issue. 2) develop and implement a research plan on an issue in their community.	2. C 4. A, B, C	
Be Your Own Action Figure (pages 117-119)	Students will plan and undertake an action project of their choosing that will have a positive impact on their school or local community.	Students will: 1) identify a problem involving pollution in their community. 2) use critical and creative thinking to solve the problem or improve the situation. 3) successfully cary out the project. 4) evaluate the process by which they tried to solve the problem or improve the situation.	4. F, G, I, L, M	

	Skills	Time	Location	Subject	Illinois Learning Standards
	• Observing • Comparing/ Contrasting • Organizing • Researching	One or two class periods	Indoor and outdoor	Art Science	Science: 11.A.2 b, c, d, e Social Science: 17.C.2 c Physical Dev. & Health: 22.C.3 a
	• Teamwork • Researching • Comparing/ Contrasting • Public speaking • Problem solving	Five class periods	Indoor	Language Arts Science Social Studies	Language Arts: 4.A.2 b 4.B.2 b & 5.A.2 a, b Science: 12.E.2 a & 13.B.2 f Social Studies: 17.B.2 a 17.C.2 a Physical Dev. & Health: 22.C.2
	• Predicting • Creative thinking • Comparing/ Contrasting • Creating	Three class periods	Indoor	Art Language Arts Science Social Studies	Language Arts: 1.C.2 a, b 4. A. 2 a, b 4.B. 2 b Science: 13.B.2 b, d, f Social Studies: 15.B.2 c 17.C.2 c 17.D.2 a
	• Analyzing • Classifying • Creative thinking	Two class periods	Indoor	Language Arts Mathematics Science Social Studies	Language Arts: 4.A.2 b, c Mathematics: 6.C.2 a & 7.A.2 b Science: 11.A.2 c & 13.B.2 f Social Studies: 15.B.2 a, b, c 15.D.2 a, b 15.E.2 a
	• Prioritizing • Researching • Evaluating • Other skills depending on the type of research conducted	Five or more class periods	Indoor	Language Arts Science Social Studies	Language Arts: 1.C.2 a, 3.B.2 a, b 4.B.2 a, 5.A.2 a, b & 5.C.2 a, b Science: 11.A.2 a, b, c, d, e Social Studies: 14.B.2 15.E.2 a, b 18.B.2 a, b
	• Creative thinking • Organizing • Planning • Other skills dependent on the project chosen	Dependent on project	Indoor and outdoor	Language Arts Science Social Studies	The basic standards addressed by this activity are noted below. Others will be addressed based on the type of problem chosen and how the students decide to carry out the project. Language Arts: 1.C.2 a, 3.B.2 a 4.A.2 b & 5.A.2 a, b Science: 11.B.2 b & 13.B.2 f Social Studies: 14.D.2 18.B.2 a

ACTIVITY BY TOPIC AREA Continued

Pollution Effects On Air

Activities	Overview	Objectives	Concepts	
"Sock It" to Air Pollution (pages 25-28)	Students will observe that air pollution is not always visible and that not all vehicles produce the same amount of pollutants.	Students will: 1) be able to describe different sources of air pollution and some of the effects of air pollution. 2) recognize that some types of air pollution are invisible or visible only under certain circumstances.	1. A, C, N, R 3. A, F, G	
Leggo My Ozone (pages 35-42)	Students first develop a model of the Earth's atmosphere and then participate in a simulation which illustrates the difference between "good" and "bad" ozone.	Students will: 1) understand the different layers of the atmosphere and the importance of each. 2) understand the difference between good and bad ozone and where each is located. 3) understand how choices made on Earth affect the atmosphere.	1. A, C, F, J 2. B, F 3. C, D, E, G	
What's Blowin' in the Air (pages 58-62)	Students collect particulate matter from the air at different locations around the school and analyze particles collected.	Students will: 1) analyze collected particles and draw conclusions about them. 2) identify areas of the school where air pollution might be a problem.	1. C, J, L, R 2. I 3. A, F	
It's Warm in Here, or Is It? (pages 63-68)	Students read two differing articles on the concept of global climate change and determine how or if air pollutants may be affecting our climate.	Students will: 1) judge the strengths and weaknesses of information. 2) discuss the causes and possible effects of global climate change.	1. C, F, J 2. C, F, E, G 3. A, E 4. B	

Pollution Effects on Land

Playing with Food...Waste (pages 43-46)	Students analyze a pollution issue dealing with the trash generated by a school caferteria, and will consider the obstacles to reducing the amount of trash and food waste.	Students will: 1) recognize there are costs associated with pollution remedies. 2) analyze and compaire their values regarding pollution issues.	1. G 2. F, G 3. H 4. L, M	
Hasting to Waste (pages 80-86)	In this activity students will design models of leakproof landfills and will observe how each functions.	Students will: 1) design a landfill and observe what happens to materials when placed in it. 2) recognize that materials and design can affect the integrity of a landfill.	1. D, P, R 3. H, J, L	
Common Household Hazardous Waste (pages 87-91)	Students identify and discuss various types of household hazardous waste (HHW) and disposal methods. They then complete a home inventory with the help of their parents or guardians.	Students will: 1) be able to identify common household products that contain hazardous waste properties. 2) identify proper storage and disposal methods for household hazardous waste.	1. E, P 2. B 3. K, L	

	Skills	Time	Location	Subject	Illinois Learning Standards
	• Predicting • Interpreting	One class period	Indoor and outdoor	Science	Science: 11.A.2 b, c, d 13.B.2 b
	• Measuring • Creating models • Critical thinking • Classifying • Role playing	Two class periods	Indoor and outdoor	Art Physical Education Science Social Studies	Science: 11.A.2 c, 12.E.2 b, 13.B.2 b, e, f Social Science: 17.B.2.c, 17.C.2 c Physical Dev. & Health: 22.C.2
	• Analyzing • Comparing/ Contrasting • Drawing conclusions • Collecting • Hypothesizing	Two class periods one week apart	Indoor and outdoor	Mathematics Science	Mathematics: 10.B.2 c Science: 13.A.2 b, c
	• Analyzing • Comparing/ Contrasting • Drawing conclusions	One class period	Indoor	Language Arts Science Social Studies	Language Arts: 2.B.2 a 5.B.2 a Science: 13.B.2 b, c Social Studies: 17.C.2 b, c
	• Analyzing • Problem solving	One class period	Indoor	Language Arts Science Social Studies	English Language Arts: 2.B.2 a Science: 12.E.2 c, 13.B.2 d, f Social Science: 15.B.2 c
	• Observing • Hypothesizing • Measuring • Comparing/ Contrasting	One class period for set up, one period three weeks later and 10 minutes every other day	Indoor	Science	Science: 11.B.2 c, d, e 11.A.2 a, b, c, d, e
	• Researching • Classifying • Analyzing	Two class periods	Indoor and home	Science Social Studies	Language Arts: 1.A.2 a Science: 11.A.2 b 13.A.2 a 13.B.2 a, f Social Studies: 17.C.2 c

ACTIVITY BY TOPIC AREA Continued

Pollution Effects on Water

Activities	Overview	Objectives	Concepts	
Charting the Water (pages 29-32)	Students classify and graph the pollutants found in a hypothetical river and hypothesize what caused the pollution in the first place.	Students will: 1) identify forms of pollution and describe the effects that pollutants can have on people, wildlife and plants. 2) describe relationships between various forms of pollution and human actions.	1. A, D, F, J, N, P, R 2. B 3. R	
On Illinois Pond (pages47-51)	Students take part in a role playing exercise in order to understand the interests of different groups and different causes of pollution in a land development issue.	Students will: 1) understand that different land uses can affect the types of pollution in a given area. 2) recognize that people have different and sometimes conflicting interests in how land is used.	2. C, D, E, H, I 3. A 4. H, I, J	
Where Water Wanders (pages 69-72)	Students will research, create and develop a presentation in which they explain how water gets to them and where it goes after being used.	Students will: 1) understand where their domestic water originates, how it reaches them and where it goes after use. 2) be able to explain the movement and management of water in their own words.	3. M, P, R	
Pointing to Point and Nonpoint Pollution (pages 73-79)	Students will read a mystery story involving numerous types of water pollution and will use their know ledge and reasoning skills to solve the mystery.	Students will: 1) understand the difference between point and nonpoint source water pollution. 2) identify tpes of point and nonpoint source water pollution.	1. A, E 2. J, K 3. A, D, J, O, P	

	Skills	Time	Location	Subject	Illinois State Standards
	• Clasifying • Comparing/ Contrasting • Computing • Matching	One class period	Indoor	Mathematics Science	Mathematics: 10.A.2 a, c Science: 11.A.2 c, d 13.B.2 e, f Social Science: 17.C.2 c Physical Dev. & Health: 22.C.3 a
	• Public speaking • Problem solving • Planning • Comparing/ Contrasting	One class period	Indoor	Language Arts Science Social Studies	English Language Arts: 4.B.2 b 5.C.2 b Science: 13.B.2 f Social Science: 14.D.2 15.B.2 c, 17.C.2 b, c
	• Creative thinking • Reporting/ Presenting • Researching • Collaborating • Evaluating	One week or more	Indoor and outdoor	Language Arts Science	Language Arts: 4.B.2 b 5.C.2 b Science: 11.A.2 c,d,e
	• Analysis • Reading • Deductive reasoning • Problem solving	One class period	Indoor	Language Arts Science	Language Arts: 1.B.2 b, d 1.C.2 d Science: 13.B.2 b, f Social Studies: 17.B.2 f

Illinois Learning Standards

Activities	English Language Arts	Mathematics	Science	
"Drawing Out" Pollution (pages 18-24)		10.A.2 a, c	11.A.2 b, c, d, e	
"Sock It" to Air Pollution (pages 25-28)			11.A.2 b, c, d 13.B.2 b	
Charting the Water (pages 29-32)		10.A.2 a, c	11.A.2 c, d 13.B.2 e, f	
Leggo My Ozone (pages 35-42)			11.A.2 c 12.E.2 b 13.B.2 b, e, f	
Playing with Food...Waste (pages 43-46)	2.B.2 a		12.E.2 c 13.B.2 d, f	
On Illinois Pond (pages 47-51)	4.B.2 b 5.C.2 b		13.B.2 f	
What's Blowin' in the Air (pages 58-62)		10.B.2 c	13.A.2 b, c	
It's Warm in Here, or Is It? (pages 63-68)	2.B.2 a 5.B.2 a		13.B.2 b, c	
Where Water Wanders (pages 69-72)	4.B.2 b 5.C.2 b		11.A.2 c, d, e	
Pointing to Point and Nonpoint Pollution (pages 73-79)	1.B.2 b, d 1.C.2 d		13.B.2 b, f	
Hasting to Waste (pages 80-86)			11.B.2 c, d, e 11.A.2 a, b, c, d, e	
Common Household Hazard-ous Waste (pages 87-91)	1.A.2 a		11.A.2 b 13.A.2 a 13.B.2 a, f	
Illinois Pollution Jeopardy (pages 92-97)	4.A.2 b 4.B.2 b 5.A.2 a, b		12.E.2 a 13.B.2 f	
Piecing Together the Future (pages 107-109)	1.C.2 a, b 4.A.2 a,b 4.B.2 b		13.B.2 b, d, f	
Living with Wants & Needs (pages 110-113)	4.A.2 b,c	6.C.2 a 7.A.2 b	11.A.2 c 13.B.2 f	
Looking Locally (pages 114-116)	1.C.2 a, 3.B.2 a, b, 4.B.2 a, 5.A.2 a, b & 5.C.2 a, b		11.A.2 a, b, c, d, e	
Be Your Own Action Figure (pages 117-119)	1.C.2 a, 3.B.2 a 4.A.2 b & 5.A.2 a, b		11.B.2 b 13.B.2 f	

	Social Science	Physical Development & Health	Fine Arts	Foreign Languages
	17.C.2 c	22.C.3 a		
	17.C.2 c	22.C.3 a		
	17.B.2 c 17.C.2 c	22.C.2		
	15.B.2 c			
	14.D.2 15.B.2 c 17.C.2 b,c			
	17.C.2 b, c			
	17.B.2 f			
	17.C.2 c			
	17.B.2 a 17.C.2 a	22.C.2		
	15.B.2 c 17.C.2 c 17.D.2 a			
	15.B.2 a, b, c 15.D.2 a, b 15.E.2 a			
	14.B.2 15.E.2 a, b 18.B.2 a, b			
	14.D.2 18.B.2 a			

Excellence in Environmental Education—

This chart notes the guidelines addressed by the Excellence in Environmental Education—Guidelines for Learning (K-12). This document

+ = addressed well

✓ = addressed minimally

Guidelines	Strand 1							Strand 2.1			Strand 2.2						
Activities	Questioning	Designing Investigations	Collecting Information	Evaluating Accuracy & Reliability	Organizing Information	Working w/ Models & Simulations	Developing Explanations	Processes that Shape the Earth	Changes in Matter	Energy	Organisms, Pop. & Communities	Heredity & Evolution	Systems & Connections	Flow of Energy & Matter	Individuals & Groups	Culture	
"Drawing Out" Pollution (pp. 18-24)			+		+			✓									
"Sock It" to Air Pollution (pp. 25-28)			+		+	✓			+	✓							
Charting the Water (pp. 29-32)	✓				✓	✓								✓			
Leggo My Ozone (pp. 35-42)					+	+		✓	✓								
Playing with Food...Waste (pp. 43-46)				✓	+	✓	+						✓	✓			
On Illinois Pond (pp. 47-51)						+	✓						✓		+		
What's Blowin' in the Air (pp. 58-62)			+	✓	+		✓										
It's Warm in Here, or Is It? (pp. 63-68)					✓			+	✓								
Where Water Wanders (pp. 69-72)	+		+				+										
Pointing to Point & Nonpoint Pollution (pp. 73-79)						✓	+						✓	✓			
Hasting to Waste (pp. 80-86)		✓	+		✓	+	+		✓					✓			
Common Household Hazardous Waste (pp. 87-91)			+		✓												
Illinois Pollution Jeopardy (pp. 92-97)	✓		+		+		✓	✓					✓	✓			
Piecing Together the Future (pp. 107-109)	✓	✓			✓		✓										
Living with Wants & Needs (pp. 110-113)					✓		+							✓	+		
Looking Locally (pp. 114-116)	+	+	+														
Be Your Own Action Figure (pp. 117-119)	+		+	✓													

—Guidelines for Learning (K-12)

is available from the North American Association for Environmental Education (706) 764-2926 or www.naaee.org

Political & Economic Systems	Global Connections	Change & Conflict	Human/Environment Interactions	Places	Resources	Technology	Environmental Issues	Identifying & Investigating Issues	Sorting Consequences	Alternative Solutions	Flexibility, Creativity & Openness	Forming & Eval. Personal Views	Need for Citizen Action	Planning & Taking Action	Evaluating Actions	Societal Values & Principles	Citizen Rights & Responsibility	Recognizing Efficacy	Accepting Personal Responsibility
Strand 2.3			Strand 2.4					Strand 3.1				Strand 3.2				Strand 4			
			+	+															
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		✓	✓				✓	✓	+	+	✓	✓	+	+	+	✓	+	+	+

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Environmental Pathways Feedback Form

Please take a few minutes to give us feedback on *Environmental Pathways—Youth Investigating Pollution Issues in Illinois*. Your comments will be used when we reprint this document and as we develop new ones. Thank you for taking time to assist us!

Please answer the following (1 being strongly agree and 5 strongly disagree):

Did the material help your students to:

• gain an understanding of the complexity of pollution?	1	2	3	4	5
• strengthen their perception of their ability to influence the outcome of a situation?	1	2	3	4	5
• study outside of the classroom?	1	2	3	4	5

Do you find that the subject matter is pertinent to 5th and 6th graders?_____

_____

Was the material layout clear and logical?_____

If not, what would be helpful?_____

_____

_____

Did you use the supplied posters?

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Water Quality: Sources of Pollution	**1**	**2**	**3**
Groundwater and Land Use in the Water Cycle	**1**	**2**	**3**
Good/Bad Ozone	1	2	3

What part(s) of the material did you find most useful? _____

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What recommendations do you have to improve *Environmental Pathways*? Please be specific.

_____

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