

Saving Pennsylvania For The Classroom

TEACHER'S GUIDE — GRADES 7 THROUGH 12



Tom Hylton, Pulitzer Prize winning journalist and host of *Saving Pennsylvania*

SAVING PENNSYLVANIA is an hour-long public television documentary that illustrates the negative impacts of sprawling development and suggests better ways to grow in the future. The program has been edited into two segments for use in middle school, high school, and college classrooms. Both segments are contained in one 40-minute tape. An optional 4-minute introduction to a homework assignment is also included.

LEARNING OBJECTIVES

Students will learn that the way we use land affects every aspect of American life. Why do so many young people have to rely on adults to take them where they want to go? Why do we have ghettos? Why are we losing farmland and open space? Why is sprawling development a threat to the environment? These are all land use issues.

THE OVERVIEW LESSON (pages 2-24)

The overview lesson can be completed in the classroom in 1-3 traditional classroom periods of 45 minutes. There is no reliance on outside sources or need for homework.

PART 1	The decline of America's cities and countryside, 1950-2000	18 minutes
PART 2	Building model communities to revive towns, preserve open space, and protect the environment	22 minutes
OPTIONAL	Homework assignment. Compare your community to Tom Hylton's benchmark of 10 rules for a quality community	4 minutes

EXTENDED ACTIVITIES (pages 25-71)

Eight "stand-alone" activities require research outside the classroom and will take several classroom periods to complete.

PENNSYLVANIA DEPT. OF EDUCATION STANDARDS COVERED (details in each individual lesson):

Environment and Ecology

Civics and Government

Reading, Writing, Speaking and Listening

Geography

Mathematics

Science and Technology

Arts and Humanities

TOWNS VERSUS SPRAWL

Traditional Towns

For more than 6,000 years of recorded history, up to the 1950s in America, most people either lived on the farm or in cities, villages, and towns. From the smallest hamlet to the largest city, towns shared five characteristics:

- 3 **They were compact:** In 1819, the year Queen Victoria was born, London was the largest city in the world with 800,000 residents. Yet people on the city's fringes were only five miles from the center of the city. That's little more than a hour's walk.
- 3 **There was a clear distinction between city and country:** At the edge of a city or town was a clear boundary where the countryside began. There were no houses or restaurants stretched along the highways between villages, and no isolated developments scattered among farms and forests.
- 3 **There was a mixture of functions:** Houses, stores, public buildings, workplaces, taverns, schools and parks were interspersed. There were no zones given over exclusively to one function.
- 3 **Most people lived within walking distance of work:** In even the largest cities, most people lived less than a mile — a 15-minute walk — from where they worked. Many artisans and professionals such as doctors and lawyers lived in the same house where they worked.
- 3 **The best homes were closest to the center:** The most fashionable people of any city or town lived closest to the center, where the palaces and churches and best stores were located. This is still often true in Europe, South America, and many other areas of the world.

Sprawl

Starting in the late 1940s, America embarked on a new development pattern that is generally known as sprawl. The widespread availability of the car and massive highway building projects made it possible to build any kind of building anywhere. Some of the major characteristics of sprawl are:

- 3 **It is spread out:** Homes, stores, schools, offices are placed on large plots of land far away from each other. This requires people to use cars for every activity. Each home has an off-street parking area; other buildings, like offices or stores, have parking lots.
- 3 **Buildings are grouped together by function in one area:** Separate areas are required for each kind of building. Houses are in one area. Stores are grouped together in another area, usually in malls or strip commercial highways; manufacturing plants are located in another area; and office buildings are in yet another area.
- 3 **Buildings are placed at random over the landscape:** There is no pattern to sprawl. Homes, stores, schools, and offices can be found anywhere, connected only by the nearest highway.
- 3 **Separation of people by income:** The homes of wealthy people are usually in different areas from the homes of middle class people. The poor often live in towns, usually in older neighborhoods or public housing projects.

OVERVIEW LESSON

This lesson is designed to give teachers maximum flexibility to use *Saving Pennsylvania for the Classroom* as a teaching tool. The video tape has two parts, and each part has three sections.

The tape can be shown in its entirety at one time (40 minutes), or teachers may want to show it in two parts (18 and 22 minutes). There is also an optional 4-minute segment at the end of the program that may be shown to introduce a homework assignment. Some teachers may wish to stop the tape after each section for questions and discussion.

An introductory exercise is provided before students view the tape, and follow up questions are suggested at the end of each section.

SUBJECTS

Environment and Ecology

Civics and Government

Reading, Writing, Speaking and Listening

Geography

Science and Technology

(For specific standards, see pages 22-24.)

PART 1 (18 minutes)

The decline of America's cities and countryside, 1950-2000

INTRODUCTION

For most of America's history, people either lived on farms or in the neighborhoods of cities and towns. Cities were places that contained houses, offices, stores, and manufacturing plants in close proximity to each other, so residents could walk everywhere they needed to go. Cities had people in every occupation, and every income level, from the poor to the very wealthy. The countryside outside the cities had very little development. Nearly all of the people who lived there were engaged either in agriculture, forestry, or recreation.

Beginning after World War II, in the late 1940s and early 1950s, Americans gradually adopted a radically different way of life. They left the cities and built new houses, stores, offices and manufacturing plants on large areas of open land in the countryside. Because everything was so far apart, it became necessary to drive everywhere.

This new way of living was designed to improve everyone's quality of life. It promised lots of open space, beauty, privacy, peaceful surroundings, and safety. As more and more people adopted this new lifestyle, however, a number of unforeseen consequences arose, such as traffic congestion, the loss of farmland and open space, air and groundwater pollution, and the physical deterioration of cities.

BACKGROUND INFORMATION

TRANSPORTATION OPTIONS

There are basically four ways people move from place to place on a daily basis:

Walk

Ride a bicycle

Ride a bus, a trolley, or a train (public transportation)

Ride in a private automobile

Since 1950, the car has come to dominate transportation.

Miles driven per person in US

<i>1950</i>	<i>1990</i>
2,500	8,500

For many decades, the US Census has kept track of how people commute to work. Each decade, the percentage of car trips has increased at the expense of walking, biking, and public transportation. Here are recent figures for how people travel (percent of total trips) in the United States and selected other countries:

Country	Car	Public Transport	Bicycle	Walking	Other
United States	84	3	1	9	3
Canada	74	14	1	10	1
Germany	53	11	10	26	0
France	47	12	5	30	6
England & Wales	62	14	8	12	4
Switzerland	38	20	10	29	3
Sweden	36	11	10	39	4
The Netherlands	45	5	30	18	9
Italy	42	16	5	28	9
Denmark	42	14	20	21	3

Introductory Exercise

Before showing the tape, ask students to describe the places they visit during a typical month: home, school, stores, workplace, the park.

How do they get to school?

How do they get other places?

Does anyone walk, ride a bike, or take public transportation for any trips?

How much time do students estimate they spend in a car in one week?

BACKGROUND INFORMATION

POPULATION LOSS IN 14 US CITIES, 1950 TO 1990

City	1950	1990	Percent Lost
Atlanta	487,455*	394,017	19%
Baltimore	949,708	736,014	23%
Boston	801,444	574,283	28%
Buffalo	580,132	328,123	44%
Chicago	3,620,962	2,783,725	23%
Cleveland	914,808	505,616	45%
Detroit	1,849,568	1,027,974	45%
Minneapolis	521,718	368,383	29%
Newark	437,540	275,221	37%
Philadelphia	2,071,605	1,585,577	24%
Pittsburgh	676,806	369,879	45%
San Francisco	775,357	723,959	6%
St. Louis	856,796	396,685	54%
Washington, D.C.	802,178	606,900	24%

*Population peaked in 1960

Annexation laws:

There is a substantial difference between most cities in the East and Midwest and those in the rest of the country:

Most states in the South and West allow their cities to expand their boundaries by adding new land to their jurisdiction. This is called annexation. Thus, cities like Charlotte, N.C., Houston, Tex., and San Jose, Calif., have grown rapidly in population and land area during the past 50 years by annexing new territory.

In New England, the Mid-Atlantic states, and some Midwestern states like Michigan, it is legally difficult or impossible for cities to expand their boundaries. Cities like New York, Philadelphia, and Detroit have not expanded their boundaries for more than 50 years.

State legislatures make the laws that create or abolish local governments. Thus, it would be possible for the state legislature in Michigan, for example, to allow Detroit to expand its boundaries and annex land around it, just as North Carolina allows its cities to expand. But the legislatures in these states have chosen not to do so.

Part 1, Section 1, Lives of Quiet Desperation

Synopsis

Four people — a city dweller, two suburbanites, and a farmer — complain about aspects of their environment that degrade their quality of life.

Host Tom Hylton describes why he bought a home across from his town's old high school, which had been converted into a middle school. As more people moved out of town, the school was closed and torn down.

Hylton cannot understand why people left his town. Thinking about the small city of Reading where he grew up, Hylton fondly remembers being able to walk to school, to stores, and his friends' houses. But his city has now become deteriorated and dangerous.

Hylton visits the city of Philadelphia, where an old-timer describes how pleasant and convenient it was to grow up there. But as tens of thousands of people abandoned the city, it, too, has become a shell of a city.

Questions:

The program begins with the complaints of four different people. What are their complaints? Are they valid?

What were the advantages of cities like Reading and Philadelphia?

Why do you think people left these cities to move to the suburbs?

What, if anything, does the community lose when cities and towns decline?

FARMLAND PRESERVATION

America has 7 percent of the world's tillable land but produces 13 percent of the world's food. Americans pay a smaller percentage of their income for food (about 12 percent) than any other country.

Each year, the United States loses more than 1 million acres of farmland — an area nearly the size of Delaware — to sprawling development. California, the nation's leading agricultural state and the source of most of our fruits and vegetables, loses about 100,000 acres of farmland each year. Since 1945, America has lost nearly 20 percent of its farmland.

Although the nation has an estimated 360 million acres of cropland, only 43 million acres are considered first class farmland. Unfortunately, more than half of this farmland is adjacent to metropolitan areas where it is vulnerable to development.

Among the prime threats posed by developers to farmers:

- 3 Developers bid up prices beyond what farmers can afford
- 3 As more non-farmers move in, complaints about manure smells, chemical sprays, and other farming practices increase. This can lead to nuisance laws that restrict farmers.
- 3 As more people move in, real estate taxes increase to pay for more schools, police, and other services. Farmers can ill afford to pay these higher taxes.
- 3 As farms decrease, support services are pushed out. Remaining farmers stop investing in their land, as they anticipate selling for development.
- 3 Farmers suffer crop and livestock loss from trespassing and vandalism, and are hampered by increased traffic on the roads.

There are two major ways states can protect farmland:

- 3 **Agricultural zoning:** States can restrict the use of land to agriculture through zoning laws. States like Oregon and Hawaii have enacted statewide zoning programs to protect agriculture. In other states, counties or local municipalities sometimes zone land strictly for farming. For example, Lancaster County, Pennsylvania, is the highest producing agricultural county east of the Mississippi. There, municipalities have zoned more than 320,000 acres of land for farming. That is 54 percent of the entire county.
- 3 **Purchase of development rights:** state or local governments can also pay farmers to place a restriction on the deed to their land that legally prevents the land from ever being developed. Fifteen states currently have such farmland preservation programs. Maryland has currently preserved more farmland this way than any other state — 185,000 acres. However, this is only 8 percent of total farmland in the state.

Part 1, Section 2, Trouble in Paradise

Synopsis

A farmer describes the reasons why he sold his family farm and moved further west to keep farming. A county commissioner describes her efforts to preserve farmland in her county in the face of strong development pressures. But in spite of county and state efforts, the state is losing farmland much faster than it can be saved.

Questions:

Why do you think America is losing farmland and open space?

What are the problems faced by farmers who want to keep farming?

What, if anything, does the community lose when farmland is developed?

Government policies that have undermined cities and towns since 1950

1. The Federal Housing Administration (1934) and the Veterans Administration (1944) encouraged people to buy new homes rather than existing homes, and new homes were usually in the suburbs. Because they established housing appraisal standards, they encouraged banks and savings and loans to follow their lead. For several decades, the FHA discouraged mortgages in areas where any blacks lived. This is called redlining.

The FHA set up minimum requirements for lot size, setback from street, separation from adjacent structures, even for the width of the house itself. That eliminated whole classes of houses, like row homes. It also forbade loan guarantees for any dwelling that could also be used as a store, office, or rental unit. This prevented towns from being built.

2. The federal and state governments encouraged the construction of low-income public housing projects in the cities, but allowed suburban municipalities to avoid them. This accelerated the concentration of poor people in the cities. The government also decided that it would rent only to the lowest income people, which led to significant crime and behavioral problems in these developments.
3. The federal and state governments poured billions of dollars into new highways that encouraged the outward movement of people and industries from the city, yet declined to put funds into the public transportation that cities depend upon.
4. “Slum” clearance programs demolished long-established city neighborhoods for new projects that never materialized.

US cities lost net 200,000 housing units a year from 1950 to 1956 and 475,000 per year from 1957 to 1959. These were replaced by dense, low income high-rise projects which today are centers of crime and drugs.

5. Suburban townships were allowed to use restrictive zoning to prevent the construction of low to moderate income housing within their borders. This helped keep the poor in the cities.
6. Federal court judges ordered the desegregation of city schools, but excluded all-white suburban schools from their rulings, encouraging white families to leave the cities.
7. The federal and state governments financed the construction of water and sewer systems in the suburbs, opening vast areas for development instead of maintaining and rebuilding such systems in the cities.
8. Unlike European governments, which exercise strict control over land development, states encourage sprawling development by allowing every municipality, including those in rural areas, to promote every kind of development, instead of funneling growth back into urban areas.
9. States closed or scaled back many of their institutions for the mentally retarded and mentally ill. Many of these people end up on city streets.
10. The income tax deduction for interest paid on mortgages encourages not only home ownership, but extravagant home ownership.
11. Environmental regulations made it prohibitively expensive to redevelop older industrial areas, encouraging businesses to develop pristine rural areas for new housing, offices, and industrial parks. Although some states have passed legislation to encourage the reuse of “brownfield” sites, it is still less expensive and troublesome for industry to develop virgin fields.

PART 1, SECTION 3, PAVED WITH GOOD INTENTIONS

Synopsis:

Suburban dwellers describe some of the shortcomings of the places where they live: no sidewalks, people have to drive for every activity, the only place kids can meet each other is in school. A developer says that government regulations prevent him from building the kind of places the suburbanites have described. How did these regulations come about? A thumbnail history of several incentives for building new houses in the suburbs are described:

- Regulations by the Federal Housing Administration
- The construction of a massive highway system
- The concentration of poor people in public housing projects in the city

Hylton concludes that the mystery is not why cities have declined; it is why they have survived at all.

Questions:

Why do people leave the cities for the suburbs? What are the advantages of suburban living?

Why do you think the government encouraged people to leave the cities?

Do you think the government encouraged poor people to live in cities, or was this unintended? Why?

Is it a good idea for poor people to live in the cities and middle class people to live in the suburbs, or should all income groups live in the same communities?

A Thumbnail History of Zoning in the United States and England**The United States****Zoning laws regulate development**

Although state governments have always had the power to regulate land use, most states passed laws in the early 1900s delegating power to local municipalities — cities, towns, counties, and townships — to enact zoning laws. Zoning laws gave local governments power to determine which uses would be allowed in various districts established by the ordinance. Districts were provided for stores, offices, manufacturing plants, homes, quarries, and every other kind of land use. New York City's 1916 zoning ordinance is generally considered to be the first such comprehensive zoning law in the United States, and other cities soon followed. In 1926, in response to a lawsuit challenging the legality of zoning ordinances, the United States Supreme Court ruled that zoning is a justified use of governmental authority under the Constitution.

Zoning done by local governments

Today, there are more than 35,000 local governments in the United States with varying authority to regulate land through zoning. Although thousands of local municipalities have no zoning laws at all, many others have detailed and complex zoning laws regulating not only the use of the land, but the size of buildings, how far buildings must be set back from the property line, and other details of construction and landscaping.

England

Unlike the United States, England has no states with separate governmental authority. Although England has counties and other local governments, all these governments must follow rules established by the national government.

Green belts separate towns and countryside

In 1947, the English Parliament passed the Town and Country Planning Act, which essentially zoned all land in England for its existing use. To change that use, a property owner needs government permission. Green belts from five to 20 miles wide were established around most English cities. Used exclusively for agriculture or recreation, these green belts are designed to curb suburban sprawl, protect the health and character of existing towns, and give town dwellers easy access to the countryside.

Government decides where development will go

Using population growth forecasts, government planners decide where it makes the most sense to allow development. That's nearly always adjacent to existing towns. The first priority is to re-use vacant industrial or commercial sites, and in recent years, more than half of all new housing has been built on previously developed land. Guidelines make city centers the preferred locations for new retail development.

Burdensome as these policies might seem to Americans, they work, and the English goal of protecting their cities, towns, and countryside has been fulfilled. The policies ensure a close match between development and public infrastructure. In a democracy that treasures its heritage, they are overwhelmingly popular.

PART 2 (22 minutes)

Building model communities to revive towns, preserve open space, and protect the environment

INTRODUCTION

While Americans began to leave their cities and towns in the 1950s to move into the countryside, the English decided to stay in their cities and protect the countryside from development. The English were following the ideas of a visionary named Ebenezer Howard, who believed that people should live in small “garden cities” of 30,000 people that had all their needs within walking distance. Each city would be surrounded by a green belt of protected countryside. Thus, people could walk to places in town and also walk out into the countryside to enjoy beautiful vistas.

In America, these ideas were adapted in Oregon with “growth boundaries” placed around cities to contain development and protect the countryside outside the growth boundaries.

Several towns in North Carolina have adopted zoning regulations to ensure that new development is in the form of traditional towns. These ideas are now being debated in other states all across America. Is this a more sustainable form of development than suburban sprawl?

TEN RULES FOR A QUALITY COMMUNITY

Adapted from the book, *Save Our Land, Save Our Towns*, by Thomas Hylton

1. **Sense of Place**
Cities, villages, and towns should have clearly defined boundaries where development stops and the countryside begins
2. **Human Scale**
The places where we live and work should be built on a people scale rather than a car scale. To give us a feeling of warmth and security, we need communities with sidewalks, lots of street trees, and houses and stores drawn close to the street and to each other.
3. **Selfcontained communities**
Communities should have stores, offices, homes, schools and parks within walking distance of each other. Public safety is increased by mixing uses, because it ensures that neighborhoods remain active throughout the day. When people live and work in the same area, families benefit by avoiding the need for a second car, and communities benefit by giving people a greater stake in their town's welfare.
4. **Diversity**
Every community should have places for people of all ages and incomes to live. Communities should also reflect the racial diversity of the region where they are located.
To make that possible, every neighborhood should provide a wide range of housing types. Small apartment buildings, row houses, small houses on small lots, and large homes can be mixed attractively in the same neighborhoods, making them beautiful as well as practical.
5. **Transit-friendly design**
Every community should provide transportation alternatives for people without cars. Mobility is essential to modern life. No one should be denied that right because they are too young, too old, too poor, or too handicapped to drive a car. The same kind of design that makes walking possible helps support mass transit.
6. **Trees**
No single element will do more to improve our communities than planting a lot of shade trees. Young trees are inexpensive and require little maintenance. But as they grow they develop a beautiful and tranquil presence.
7. **Alleys, parking lots to the rear**
Communities need alleys and rear parking lots to maintain attractive streets and sidewalks. Just as we, as individuals, have goods and chattel that we put out of sight in closets and storage rooms, it is behind our houses that we should put electric poles, parking spaces, garages, trash and recycling bins, and outdoor equipment.
8. **Humane architecture**
People need to live among buildings that are beautiful and hospitable, and that harmonize with their surroundings. There's no reason why our apartment buildings, stores, schools, and offices can't be warm and inviting, constructed using materials and designs that humans have found attractive for generations.
9. **Sense of enclosure**
It is a basic human desire to feel a sense of enclosure. Traditional communities like Annapolis or Georgetown create beautiful outdoor spaces by aligning homes close together to make streets into cozy outdoor rooms. The buildings form the room's walls, while street trees create a cathedral ceiling.
10. **Maintenance and safety**
Maintenance and safety is the chief difference between some of America's most fashionable addresses and some of its worst slums. Communities must institute regular inspections of all commercial and multifamily dwellings, issue citations promptly to violators, and place liens on noncomplying properties.

Opening exercise:

Before showing the tape,

Ask students to describe what elements they think are needed for a quality community a great place to live and work. (These elements can be compared to the “10 Rules for a Quality Community” on the opposite page.)

Garden Cities

In 1902, an English social reformer named Ebenezer Howard published a book called *Garden Cities of Tomorrow*, which contained his ideas for the ideal city of tomorrow. At the time of the book, English cities were overcrowded, unsanitary, and polluted.

Howard believed that new cities should be built in the countryside so their residents could breathe fresh air and live in green surroundings. He suggested that each city should have about 30,000 people, enough to make it feasible to have a diversity of stores, schools, homes, and jobs. At the same time, he wanted the cities to be small enough so people could walk straight out into the countryside. He therefore suggested each “Garden City” should have 1,000 acres for homes and businesses, to be surrounded by a ring of countryside, called a green belt, that would contain 5,000 acres of land and be owned by the city.

New towns built in countryside

Unlike many visionaries, Howard actually lived to see several Garden Cities built and occupied in the countryside surrounding London. The first, Letchworth Garden City, was built starting in 1903, and the second, Welwyn Garden City, was underway in 1919. Within 30 years Letchworth grew to a town of 15,000 people with 150 shops and 60 industries.

An international organization was formed to promote Garden Cities, which still exists today as the Town and Country Planning Association with headquarters in England.

Garden City concept influences England

Howard’s ideas heavily influenced the physical environment of England today. Rather than spread development in large lots all over the countryside, as Americans have done, the English have retained distinct towns surrounded by Green Belts of open countryside where most development is prohibited.

At the end of World War II, the English decided to create more than 25 new towns based on the Garden City concept. The government bought huge tracts of land in the countryside and built new towns from scratch. Each town was designed to be self-sufficient, with a large number of residents living and working in the same town, to cut down on long commutes. The towns are also connected to nearby citizens by trains and bus lines.

Green Belts in America

There is only one city in the United States with a green belt. Boulder, Colorado, a city of 90,000 people, has a publicly owned green belt that is nearly twice as large as the city itself. Since 1967, the city has used tax revenues to purchase land immediately outside its borders to preserve it from development.

Growth Boundaries

Several American cities and states enforce growth boundaries. A growth boundary is a line that shows where development is permitted and where it is not. Among the cities with growth boundaries are Lexington, Kentucky; San Jose, California; and Lincoln, Nebraska.

The states of Washington and Oregon require their cities to create growth boundaries. For example, each of Oregon’s 242 cities and 36 counties is required by state law to draw up growth boundaries around the cities to accommodate all foreseeable development for 20 years. Development is encouraged inside the growth boundaries and virtually forbidden outside the growth boundaries. The growth boundaries are adjusted every 10 years.

PART 2, SECTION 1, REVELATION

Synopsis:

Hylton visits London, England, and is amazed to find how many famous landmarks are located in a small area, within walking distance of each other. This leads him to realize how much space cars, highways, and parking lots consume. Continuing to travel in England, he finds a carefully planned town designed so people can walk, surrounded by permanently protected open space. In fact, he discovers most English cities are surrounded by green belts, areas where development is not allowed.

Questions:

What are the advantages of placing homes, stores, and offices within walking distance of each other? Can this be done attractively? What are the disadvantages?

The English designated green belts to curb suburban sprawl, protect the health and character of existing towns, and give town dwellers easy access to the countryside. Do you think this is a good idea? Could green belts work in America?

PART 2, SECTION 2, MADE IN THE USA

Synopsis:

Returning to the United States, Hylton visits an Oregon farmer who became a lawmaker to try to protect farmland from development. The law he wrote places “growth boundaries” around all Oregon cities. Development is encouraged inside the growth boundaries and discouraged outside of them. In North Carolina, several towns have written new zoning laws to ensure that new development is in the form of traditional towns, so people can walk as well as use public transportation. Hylton visits a new town like this in Florida, called Celebration, where people enjoy knowing their neighbors and feeling a sense of community.

Questions:

Do you think growth boundaries are a good idea? What are their advantages and disadvantages?

Should new development be in the form of traditional towns, with sidewalks and the option to walk?

Neo traditional zoning, or new urbanism

For decades, zoning laws have required that different land uses should be in different zones. For example, municipalities have a separate zone for housing, a separate zone for industry, another zone for offices, and yet another zone for shopping malls. This segregation of zones requires people to drive for every activity and makes it necessary for every building to have its own parking lot.

In the last decade, the consequences of such zoning laws — among them, the loss of open space, the ugliness of strip development, the time and money consumed in constant driving — have led architects and planners to rediscover the advantages of traditional towns.

Nationwide, a growing number of municipalities are changing their zoning laws to encourage new development patterned after traditional towns. Homes, stores, and offices can be built within walking distance of each other, connected by sidewalks lined by street trees. Buildings are placed close to the street, with parking lots to the rear, to make a pleasant environment for pedestrians. As of the year 2000, more than 250 such developments were either planned or under construction.

This kind of development is called neo-traditional, or the new urbanism. The largest such development in the United States is Celebration, Florida, a \$2.5 billion town being built by the Disney Development Corp. near Orlando. Celebration has a small downtown with stores on the first floor and offices and apartments on upper floors. Surrounding the downtown are dwellings of every kind mixed together in small neighborhoods, including apartments, rowhouses, bungalows and palatial homes. Children walk to a public school that houses grades K-12 in one building.

Many states are beginning to encourage this kind of development because it consumes far less land than suburban sprawl and provides places for people of all incomes to live.

Environmental Costs of Sprawl

One of the greatest negative impacts of sprawling development is environmental degradation.

By spreading out land uses and forcing people to drive for everything, suburban sprawl requires far more roads and parking lots than towns. When meadows are stripped, woodlands cut, and wetlands drained in the course of “development,” natural ecological cycles are disrupted. The ability of native plant and animal species is threatened.

But woodlands and wetlands do more than protect biological diversity. They act as sponges that soak up rainwater, replenishing the groundwater supply and limiting the sediment that flows into our rivers and streams. As more land is paved over, the water runs directly into rivers and streams without soaking into the ground. A one-acre parking lot, for example, produces 16 times more runoff than a one-acre meadow. This increases flooding and droughts.

In addition, rainfall runoff picks up soil that it carries into streams, clouding the water and smothering life underwater. It also carries pollutants directly into streams and rivers.

Environmental protection agencies are beginning to recognize the damage caused by sprawl. In Pennsylvania, for example, a special environmental task force appointed by the governor, called the 21st Century Environment Commission, concluded that sprawling development will be the greatest threat to Pennsylvania’s environment in the 21st Century.

PART 2, SECTION 3, COMING HOME

Synopsis:

Returning to his home state of Pennsylvania, Hylton looks at its richest farming county, Lancaster, which is trying to save its towns and countryside. He learns that changes are needed in state laws to allow growth boundaries in his state.

He also learns of a new program to encourage the re-use of vacant industrial lands for new development. Pennsylvania's highest environmental official says that sprawling development is the greatest threat to his state's environment in the coming century because of the air and groundwater pollution it causes and the land it consumes. Reclaiming vacant land in the cities is the best way to curb sprawl, he says.

The program ends in Hylton's study, where he points out numerous efforts across the country that are trying to change the pattern of development. He argues that cities and towns are a time-tested way of life that should be rediscovered and revived.

Brownfields versus Greenfields

In the last 50 years, as America lost millions of manufacturing jobs, thousands of factories and other industrial sites were closed across the country — most of them in cities and towns. Nearly all these sites were used in an era when there wasn't much concern about the environment, and consequently the ground and buildings had some form of contamination, such as asbestos-laden rubble, leaky underground storage tanks, spilled chemicals, or hazardous waste.

These sites are known as brownfields, in contrast with farmfields and other open land which have never been built upon, which are often called greenfields.

In the 1970s and early 1980s, state and federal laws were passed that established a complicated legal process to determine who polluted the ground and force the polluters to clean it up — an enormously costly process. Rather than provide much environmental clean-up, these laws instead led to the abandonment of many of these sites and expensive lawsuits to assess blame for the pollution rather than actually clean it up.

As a result, there are an estimated 130,000 to 500,000 vacant brownfields, most located in older population centers where there are highways, water and sewer lines, and other infrastructure already in place.

In recent years, business leaders, environmentalists, and government officials have reached a consensus that it is foolish to allow these brownfields to remain vacant while prime open lands in the countryside are developed. In fact, the re-use of these brownfields is seen as an important way to revitalize older cities and towns, curb suburban sprawl, and protect farms and forests.

Many states, such as Michigan, Illinois, and Pennsylvania, have passed laws making it easier for private businesses to re-use these lands.

A central idea behind these laws is to stop worrying about who polluted the land in the first place, but to focus on clean-up and re-use. The laws also recognize that it is not necessary to clean up a site to the pure condition it was in before settlers arrived centuries ago, but to make it safe enough for people to live and work there. Increasingly, grants and loans are being provided by the state and federal government to private industry or local governments to assess environmental problems at brownfield sites and clean them up sufficiently so they can be re-used.

In England, more than half of all new housing is built on sites that were previously developed for something else, in keeping with the English philosophy of continually rebuilding cities and towns and protecting the countryside around them.

Questions:

How much responsibility does government have to protect farmland and forests from development?

How much responsibility does government have to provide a decent environment for everyone to live?

Most states consist of farmland, forests, waterways, and developed land. How can your state accommodate new development — people, stores, offices, plants — and still protect its farms and forests?

Do you think more effort should be made to revive cities and towns? If so, what steps might be taken?

What are the best ways to protect farms and forests?

HOMEWORK ASSIGNMENT

Show the optional 4-minute tape in which Tom Hylton describes what he likes about his hometown of Pottstown.

Give each student a photocopy of “Ten Rules for a Quality Community” (page 14 of this teacher’s guide). Using these rules as a benchmark, students will walk or drive around their community and determine how well their community meets the “10 rules.”

Students may take photographs to illustrate ways the community meets or fails to meet the “10 rules.”

FOLLOW-UP DISCUSSION

Students report on their findings, either in a 300 word paper, or informally, and discuss whether the ten rules do make for a quality community, or what other rules might be considered.

SUBJECTS AND STANDARDS for OVERVIEW LESSON:

Reading, Writing, Speaking and Listening

1.6.8 Speaking and Listening

A. Listen to others.

- Ask probing questions.
- Analyze information, ideas and opinions to determine relevancy.
- Take notes when needed.

D. Contribute to discussions.

- Ask relevant, probing questions.
- Respond with relevant information, ideas or reasons in support of opinions expressed.
- Listen to and acknowledge the contributions of others.
- Adjust tone and involvement to encourage equitable participation.
- Clarify, illustrate or expand on a response when asked.
- Present support for opinions.
- Paraphrase and summarize, when prompted.

E. Participate in small and large group discussions and presentations.

- Initiate everyday conversation.
- Organize and participate in informal debates.

Reading, Writing, Speaking and Listening

1.6.11 Speaking and Listening

A. Listen to others.

- Ask clarifying questions.
- Synthesize information, ideas and opinions to determine relevancy.
- Take notes.

D. Contribute to discussions.

- Ask relevant, clarifying questions.
- Respond with relevant information or opinions to questions asked.
- Listen to and acknowledge the contributions of others.
- Adjust tone and involvement to encourage equitable participation.
- Facilitate total group participation.
- Introduce relevant, facilitating information, ideas and opinions to enrich the discussion.
- Paraphrase and summarize as needed.

E. Participate in small and large group discussions and presentations.

- Initiate everyday conversation.
- Organize and participate in informal debate around a specific topic.

Civics and Government

5.3.9 How Government Works

A. Explain the structure, organization and operation of the local, state and national governments including domestic and national policy-making.

D. Explain how independent government agencies create, regulate and enforce regulatory policies.

- Local (e. g., Zoning Board)

Civics and Government

5.3.12 How Government Works

A. Analyze and evaluate the structure, organization and operation of the local, state and national governments including domestic and national policy-making.

D. Interpret how independent government agencies create, regulate and enforce regulations.

Environment and Ecology

4.2.10 Renewable and Nonrenewable Resources

C. Analyze how man-made systems have impacted the management and distribution of natural resources.

- Analyze the costs and benefits of different man-made systems and how they use renewable and nonrenewable natural resources.

Environment and Ecology

4.4.10 Agriculture and Society

A. Describe the importance of agriculture to society

- Identify laws that affect conservation and management of food and fiber production in the local area and analyze their impact.

Environment and Ecology

4.4.12 Agriculture and Society

B. Analyze and research the social, political and economic factors that affect agricultural systems.

- Analyze the costs and benefits associated with agriculture practices and how they affect economic and human needs.

Environment and Ecology

4.8.7 Humans and the Environment

A. Describe how the development of civilization relates to the environment.

- Explain how people use natural resources in their environment.
- Explain how natural resources and technological changes have affected the development of civilizations.

C. Explain how human activities may affect local, regional and national environments.

- Explain how a particular human activity has changed the local area over the years.

D. Explain the importance of maintaining the natural resources at the local, state and national levels.

- Explain how human activities and natural events have affected ecosystems.
- Explain how conservation practices have influenced ecosystems.
- Define the roles of Pennsylvania agencies that deal with natural resources.

Environment and Ecology

4.8.10 Humans and the Environment

A. Analyze how society's needs relate to the sustainability of natural resources.

- Describe how uses of natural resources impact sustainability.
- Analyze how human activities may cause changes in an ecosystem.
- Analyze and evaluate changes in the environment that are the result of human activities.
- Identify natural resources for which societal demands have been increasing.
- Identify specific resources for which human consumption has resulted in scarcity of supply (e.g., buffalo, lobsters).
- Describe the relationship between population density and resource use and management.

Environment and Ecology

4.9.12 Environmental Laws and Regulations

A. Analyze environmental laws and regulations as they relate to environmental issues.

- Compare and contrast environmental laws and regulations that may have a positive or negative impact on the environment and the economy.

Geography

9.1.12 Basic Geographic Literacy

B. Analyze the location of places and regions.

- Changing regional characteristics (e.g., short- and long- term climate shifts; population growth or decline; political instability)
- Criteria to define a region (e.g., the reshaping of south Florida resulting from changing migration patterns; the US-Mexico border changes as a function of NAFTA; metropolitan growth in the Philadelphia region)

Geography

9.3.9 The Human Characteristics of Places and Regions

A. Explain the human characteristics of places and regions by their population characteristics.

- Effects of different types and patterns of human movement
- Mobility (e.g., travel for business)
- Migration (e.g., rural to urban, short term vs. long term, critical distance)

C. Explain the human characteristics of places and regions by their settlement characteristics.

- Current and past settlement patterns in Pennsylvania and the United States
- Forces that have re- shaped modern settlement patterns (e.g., central city decline, suburbanization, the development of transport systems)
- Internal structure of cities (e.g., manufacturing zones, inner and outer suburbs, the location of infrastructure)

E. Explain the human characteristics of places and regions by their political activities.

- Political and public policy that affect geography (e.g., open space, urban development)

Geography

9.3.12 The Human Characteristics of Places and Regions

- A. Analyze the significance of human activity in shaping places and regions by their population characteristics:
- Demographic trends and their impacts on patterns of population distribution (e. g., overpopulation, carrying capacity, changes in fertility, changes in immigration policy, the mobility transition model)
- B. Analyze the significance of human activity in shaping places and regions by their cultural characteristics.
- Cultural conflicts (e. g., over language [Canada], over political power [Spain], over economic opportunities [Mexico])
 - Forces for cultural convergence (e. g., the diffusion of foods, fashions, religions, language)
- C. Analyze the significance of human activity in shaping places and regions by their settlement characteristics. Description of current and past settlement patterns at the international scale (e. g., global cities)
- Forces that have reshaped settlement patterns (e. g., commuter railroads, urban freeways, the development of megalopoli and edge cities)

Science and Technology

3.8.10 Science, Technology and Human Endeavors

- A. Analyze the relationship between societal demands and scientific and technological enterprises.
- Identify past and current tradeoffs between increased production, environmental harm and social values (e.g., increased energy needs, power plants, automobiles).
 - Describe and evaluate social change as a result of technological developments.
 - Analyze a recently invented item, describing the human need that prompted its invention and the current and potential social impacts of the specific invention.
- C. Evaluate possibilities consequences and impacts of scientific and technological solutions.
- Relate scientific and technological advancements in terms of cause and effect.
 - Describe and evaluate the impacts that financial considerations have had on specific scientific and technological applications.
 - Compare and contrast potential solutions to technological, social, economic and environmental problems.
 - Analyze the impacts on society of accepting or rejecting scientific and technological advances.

Science and Technology

3.8.12 Science, Technology and Human Endeavors

- A. Synthesize and evaluate the interactions and constraints of science and technology on society.
- Evaluate technological developments that have changed the way humans do work and discuss their impacts (e.g., geneticallyengineered crops).
- C. Evaluate the consequences and impacts of scientific and technological solutions.
- Analyze and communicate the positive or negative impacts that a recent technological invention had on society.
 - Evaluate and describe potential impacts from emerging technologies and the consequences of not keeping abreast of technological advancements (e.g., assessment alternatives, risks, benefits, costs, economic impacts, constraints).

PRESQUE ISLE BAY: AREA OF CONCERN (AOC) TO AREA OF RECOVERY (AOR)

GRADE LEVEL/SUBJECT Grade 7: Ecology/Environmental Science

TIME Two Class Periods

OVERVIEW Presque Isle Bay is located along the Pennsylvania shores of Lake Erie, and provides the City of Erie with a protected harbor. The bay is widely used for recreational boating activities and is also a regular recipient of runoff, industrial discharge, sewage effluent, and other toxic pollutants from the City of Erie. In 1991, Presque Isle Bay was designated the 43rd Area of Concern (AOC) due to its contaminated sediments and incidence of tumors on brown bullheads. Because of this designation, numerous organizations in Presque Isle Bay and its tributaries began to take action to develop studies on the issues going on in Presque Isle Bay. Because of their hard work, in 2002 Presque Isle bay became the very first Area of Recovery (AOR) in the Great Lakes.

PURPOSE The purpose of this lesson is to introduce students to Presque Isle Bay and to inform them as to why it was named an AOC and what impact it had on the Erie community.

OBJECTIVES

At the end of this lesson students will be able to:

- Define what an AOC is.
- State ways that designation as an AOC affects the ecosystem of Presque Isle Bay.
- State ways that designation as an AOC affects the Erie community.
- Understand the effect that sources of point and nonpoint pollution have on Presque Isle Bay.
- Identify steps they can take to make Presque Isle Bay a cleaner environment.

RESOURCES/MATERIALS

Map of Presque Isle State Park/Presque Isle Bay
Topographical map of Presque Isle Bay watershed
Worksheet for each student
Computer with Internet access-optional

PRIOR KNOWLEDGE

Concept of watersheds
Point and nonpoint source pollution

MOTIVATION

- Who washes their family car in the street in the summer?
- Who likes to swim at the beaches on Presque Isle?
- Who likes to fish?

BACKGROUND INFORMATION**Presque Isle Bay**

The Presque Isle ecosystem contains an ecological resource that is unique within the state and rare within the Great Lakes basin. Covering approximately 3,718 acres, Presque Isle Bay is formed by a natural sand spit to the north. It is a shallow embayment with an average depth of 13 ft. The bay is a relatively sheltered body of water that has a restricted exchange of water with its outer harbor and Lake Erie. Because of this, the bay has a "**flushing time**" of almost 2.5 years, short in comparison to Lake Superior, with a flushing time of 191 years. This long time period allows the pollutants entering the bay as runoff to settle in the primarily fine and organically rich bottom sediments. However, large rocks and sand persist in certain areas where currents have restricted the settlement of finer sediments. The animal and plant population of Presque Isle Bay consist of different types of fish, birds, plants and mammals. Some examples of fish include yellow perch, bluegill, rock bass and, largemouth bass.

What is a watershed?

Humans need water for drinking, irrigation and industry, yet we have a very casual attitude toward water pollution. Every day, wastes are poured down the sink, flushed down the toilet, or dumped into rivers and lakes without ever considering where they will end up. We all depend on Lake Erie as a water supply so we can take our shower in the morning and wash our dishes at night. Much of the water we use comes from Presque Isle Bay and Lake Erie. And they both depend on the network of streams or **watershed** that replenishes their water.

A watershed, also known as a drainage basin, includes the entire land area drained by a particular creek or river. Precipitation that falls in this area runs off as surface water into a stream channel, lake, reservoir, or other body of water. Stand along any stream and look upstream. All of the water flowing in that stream has fallen on an area of land, which by the nature of its topography, has caused the water to drain to that particular point of the stream. The area that drains to that point is called the stream's watershed.

The topography of the land determines the boundaries of the watershed. These boundaries are the highest points and ridges surrounding a watershed and are called "divides". The city of Erie is perched on an elevated lake plain (*Trails of Geology* page 5). Presque Isle Bay sits at the lowest

point in the elevation of the plain. Further inland and at the higher elevations is the **drainage basin divide** (Map 1). This divide separates the Lake Erie Basin (streams that flow north toward the lake) from the Allegheny Basin (streams that drain south.) Streams in the Lake Erie Basin drain into either Lake Erie and/or Presque Isle Bay. Watersheds can range in size from the smallest mountain stream that drains only an acre of land to huge river systems such as the Susquehanna, which drains over 27,000 square miles. The Presque Isle Bay watershed spans approximately 25 square miles. Its primary tributaries are Cascade Creek and Mill Creek, which together account for about two-thirds of the water flowing into the bay. Additional inflow of water comes from precipitation directly on the surface of the bay, **combined sewage outfalls** (CSO's), groundwater discharge, and wastewater discharges.

Presque Isle Bay's watershed

Presque Isle Bay is the oldest U.S. Harbor on the Great Lakes, appropriated in 1824 from the national legislature for harbor improvements. The city of Erie, founded in 1792 has grown up around its port. Historically, Erie experienced the growth and decline of the steel industry in the U.S., together with its related heavy manufacturing. Much of the surrounding land has become urbanized with manufacturing industries that coexist with the residential and commercial neighborhoods. The surrounding watershed of Presque Isle Bay (See Topo map) is directly impacted by the use of this land. In the past, both industrial and domestic wastewater was discharged directly into the bay or into streams leading to the bay. At this time, many of the urban streams were looked at as sewers rather than as natural resources.

The main tributaries of Presque Isle Bay, Cascade and Mill Creek, account for two-thirds of Presque Isle Bay's water supply and receive runoff from the surrounding land and carry it directly into the bay. This urban runoff contains contaminants that affect fish and other aquatic life, drinking water, and recreation. Fertilizers and pesticides applied to agricultural lands and residential lawns can be carried into the streams after a rain event. The discharging of excess phosphorus and other nutrients that are in fertilizers can actually accelerate the natural aging process of the bay (eutrophication). This inflow of excess nutrients benefits some plants and causes them to overpopulate, harming other plants and animals living in the bay. When the excess aquatic plant growth dies and decomposes it uses up the available oxygen in the water. This decreases the amount of available oxygen for other aquatic organisms and many of them die as a result. The natural decay of plants and nutrients is called biodegradation.

Because 80 percent of the surrounding land use within the Presque Isle Bay watershed is urban, Presque Isle Bay receives high levels of nonpoint source pollutants from runoff. The most significant amount comes from residential areas. Land developed with asphalt parking lots and buildings contribute oils and greases from cars that get into the surrounding streams after a rain event.

AOC Designation to AOR designation

This unique ecosystem of Presque Isle Bay has been subjected to pollution from both point and nonpoint sources (Figure 1). Because of this pollution, the U.S. Department of State designated Presque Isle Bay as the forty-third Great Lakes [AOC](#) in January 1991. The AOC designation is used to indicate severely degraded geographic areas within the Great Lakes Basin. A designation as an AOC has serious environmental implications. As an AOC, the bay received priority attention from the Pennsylvania Department of Environmental Protection to restore its impaired beneficial uses. The International Joint Commission (IJC) lists 14 beneficial use impairments for AOCs. A water body may be designated as an AOC if certain beneficial uses are determined to be impaired.

In Presque Isle Bay, the two impaired beneficial uses were: Restrictions on dredging of sediments, and fish tumors and other deformities. Since Presque Isle Bay’s designation of an AOC, numerous organizations within the Bay and its’ watershed decided to take action. They developed studies on the two beneficial use impairments present in Presque Isle Bay. Because of their hard work, in 2002, Presque Isle Bay was designated as the first Great Lakes Area of Recovery (AOR). In February, 2007, Presque Isle Bay delisted the restrictions on dredging beneficial use impairment; however, Presque Isle is still listed for having fish tumors. The fish tumors are thought to be related to elevated levels of organic contamination from nitrosamines or Polycyclic Aromatic Hydrocarbons (PAHs) in the sediments. Nitrosamines can be naturally produced in sediments when *anaerobic* (no oxygen) conditions exist along with an available source of excess nitrogen. Excess sources of nitrogen could come from sewage, fertilizers, or large fish kills. PAHs can come from the combustion of fossil fuels such as coal and petroleum. Other sources include asphalt and tar used to pave roads and parking lots and to waterproof the roofs of houses. PAHs are believed to have detrimental effects on the aquatic life in the bay.

Brown bullheads (at right), a member of the catfish family, live in Presque Isle Bay and have been found to have skin tumors and



liver tumors. Scientists test the bile of the fish (located in the gall bladder) to look for the presence PAH metabolites. PAH metabolites are suspected to be the cause of liver tumors in the Presque Isle Bay brown bullheads. Research studies pertaining to Presque Isle Bay are reviewed by the Presque Isle Bay Advisory Committee (PAC). The PAC is comprised of representatives from local, state and federal agencies, environmental and civic organizations, academia and industry and was developed in order to identify the problems within the AOC and to develop remediation plans to correct them. Since its inception, the PAC has made considerable progress in improving the health of Presque Isle Bay.

Time, experience and change bring understanding

Today, we have a better understanding about the effects that pollution can have on the watershed of Presque Isle Bay. When you remember that even a small watershed can have a great impact on the entire drainage system downstream, you start to realize just how important it is to understand what is going on in the watershed area where you and your neighbors live. Understanding how our actions affect the environment will help us take action to change those activities that are detrimental to our environment.

PROCEDURE

1. Review information: **Presque Isle Bay**. Display map of Presque Isle Bay and point out the State Park, the City of Erie, Lake Erie and the channel. Ask the students how many of them can name any other bays. Comparing what they know about those bays, what do they think makes Presque Isle Bay unique?
2. How many of the students have a stream or creek by their house? When they wash their family cars or sprinkle their lawns with fertilizer where do they think all of the excess water containing those pollutants goes? Review information: **What is a Watershed?**
Hint: To illustrate better the effect that pollution can have on the surrounding watershed, draw a sample watershed on the board so students can see how a watershed forms somewhat of a webbing pattern that leads to one common body of water (Refer to Map 1).
3. Ask the students to name any streams that they can think of that are in their neighborhood. Write the names on the board. Try and locate the stream on the map of the Presque Isle Bay watershed.
4. Review information: **Presque Isle Bay's watershed**. Display map of Presque Isle Bay watershed. Point out Cascade Creek, Mill Creek and Garrison Run.
5. Have students attempt to locate their street on the map so they see where they live in their watershed. What is the nearest stream located to their house?

6. Discuss with students what impact washing their cars in the street could have on the watershed. (*They might think that if they live in the city and are not close to a stream that they are not polluting the bay. Most don't realize where the water runs to after they see it disappear from their driveway. In many cases it disappears into the storm drains and eventually gets filtered and dumped into the bay.*) Ask the students how many storm sewer drains are near their house?
7. Review information: **AOC Designation**. Ask students how they think Presque Isle Bay got this designation? Is this designation cause for concern? Would any of them go swimming in Presque Isle Bay? Why or why not?
8. Review information: **Time, experience and change bring understanding**. It is obvious that taking action has made a difference in protecting and restoring Presque Isle Bay. Ask students what they think they can do to make a difference? Have them make a list on paper.

GROUP ACTIVITY: Students may form groups of five and work together to write down things they would do to change how we use and abuse our streams. Have them research local pollution incidents that have occurred in their neighborhood or school neighborhood. Put together a presentation for the class detailing the changes you would make. Use specific examples.

9. Pass out student worksheet: Presque Isle Bay: AOC

VOCABULARY

Beneficial uses
Biodegradation
Combined sewage outfalls
Drainage basin divide
Eutrophication
Flushing
Nonpoint source pollution
Point source pollution
Polycyclic aromatic hydrocarbons (PAHs)
Urban runoff
Watershed

QUESTIONS/INQUIRY

- ✓ What effects does development of land near streams or creeks have on the surrounding watershed? If the surrounding land does have to be developed, what are some things that can be done to protect the stream or creek from pollution due to the development?
- ✓ Brainstorm ways that pollution affects the animals in the streams and bay. List them.

ASSESSMENT

- ✓ Students should have gained an understanding of what a watershed is, and they should be able to identify where their watershed is located. They should

also have gained an understanding of how polluting streams can affect their community.

- ✓ Students will present their ideal watershed to the class. Assess for organizational skills, content, and accuracy.
- ✓ Students will be assessed for completion and correctness of their worksheet.

GLOSSARY

Beneficial use: Impaired beneficial use means a change in the chemical, physical, or biological integrity of the Great Lakes system sufficient to cause detrimental changes to the ecosystem.

Biodegradation: The natural process of plant decay and decomposition.

Combined sewage outfalls: Under "non- rain event" situations (normal flow conditions) the wastewater flows to the wastewater treatment plant to be processed. During large rain events, the excess flow causes the rainwater and wastewater to be mixed and a portion of the wastewater flows directly into the bay.

Drainage basin divide: A ridge that separates one drainage basin from another. One example is the ridge that separates the Lake Erie Basin drainage from the Allegheny Basin drainage.

Eutrophication: The natural aging process of a lake whereby the lake goes from low production to high production as a result of enrichment by nutrients.

Flushing: The natural process of water replacement in an estuary; for example, Presque Isle Bay is flushed every 2.5 years by lake water and other runoff. In other words, it takes 2.5 years for water entering Presque Isle Bay from a storm to get to Lake Erie.

Nonpoint source pollution: Pollution that results from runoff of melting snow or rainwater picking up pollutants as it is carried to streams and lakes. These pollutants consist primarily of sediments and nutrients, but can carry bacteria, viruses, oils, grease, toxic chemicals, and heavy metals. The number one source of nonpoint source pollution is crops and livestock.

Point source pollution: Pollution that originates from a specific identifiable source such as a pipe from a factory. Other sources could be discharge from wastewater treatment plants, or other industrial sources.

Polycyclic Aromatic Hydrocarbons (PAHs): A family of organic compounds derived from fossil fuels and their combustion. The higher molecular weight PAHs are an environmental concern because they can cause cancer in humans and animals.

Watershed: The land area drained by a river or stream. The watershed is the natural hydrologic unit associated with numerous ecological and physical processes involving water. Increasingly, the watershed is being accepted as the most appropriate geographic unit for management of water quality.

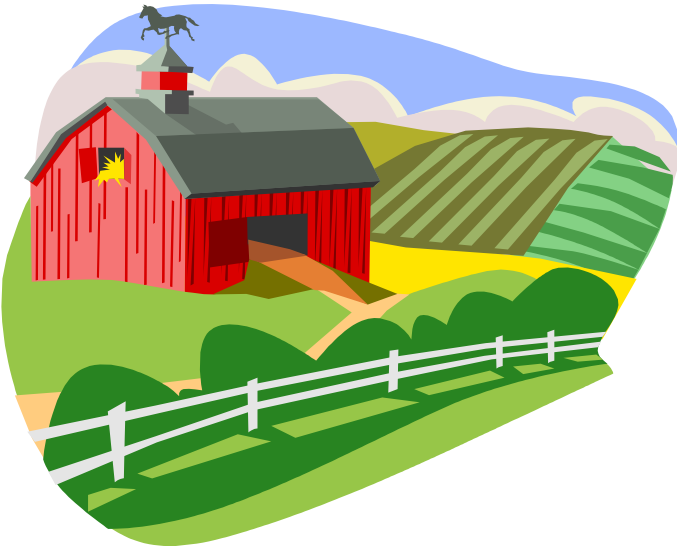
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- ✓ Environmental Protection Agency: Presque Isle Bay 43rd Area of Concern

<http://www.epa.gov/glnpo/aoc/presque>

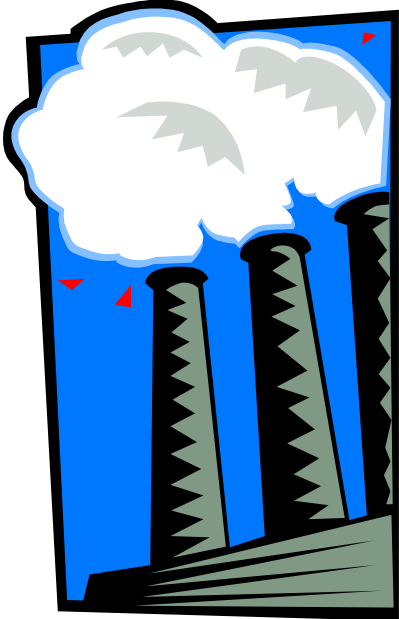
- ✓ Nyer, Randy EES Presque Isle State Park; DCNR/PA Bureau of State Parks/Environmental Education and Information Division; Watershed Curriculum, 2000.

Figure 1: Point & Non-Point Pollution



NON POINT SOURCE

Runoff from Farm
and Lawn Nutrients



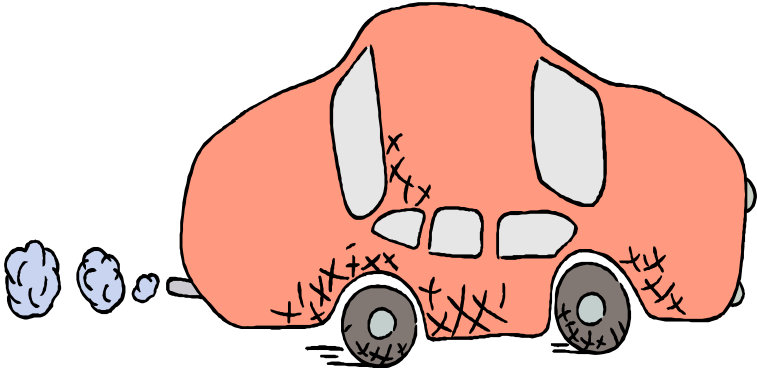
POINT SOURCE

Emissions from Factories



POINT SOURCE

Discharge Pipe



NON-POINT??

Emissions from Automobiles