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ABSTRACT

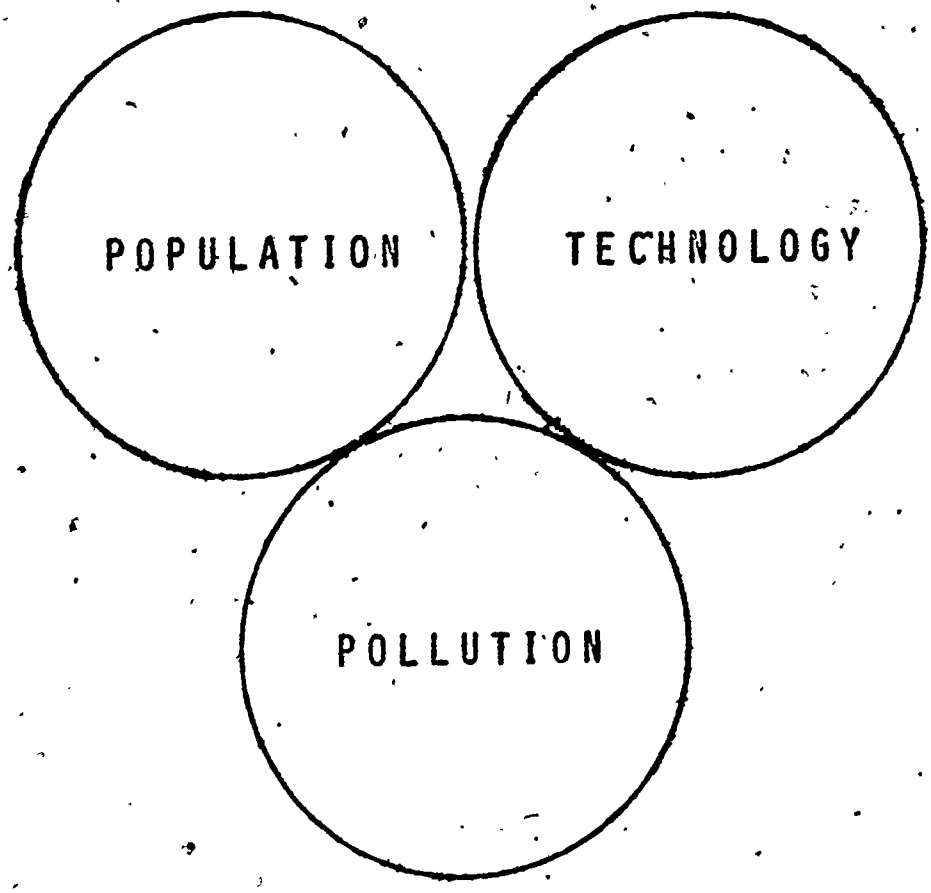
Part of a sequential series of curriculum units in environmental education for grades 4 through 12, this curriculum guide for grade 9 focuses on identifying problems, formulating hypotheses, considering alternatives, and making decisions in environmental education. The activities include the showing of films, making environmental decisions, simulations, and an off-campus field trip. The unit includes an overview, major concepts, behavioral objectives, a daily schedule, lesson plans for the classroom activities and the field trip, a pretest, and student and teacher evaluation forms. The unit is three weeks long, multidisciplinary in nature, and structured around student-centered activities in which emphasis is placed upon the study of the local environment. (Author/JR)

TEACHER'S GUIDE

FOR



# ENVIRONMENTAL DECISIONS




NINTH GRADE

ENVIRONMENTAL EDUCATION UNIT

LITTLE ROCK SCHOOL DISTRICT
ENVIRONMENTAL EDUCATION PROJECT
1975-76

# LITTLE ROCK ENVIRONMENTAL EDUCATION PROJECT

"A Multidisciplinary and Direct Experience Approach to Teaching Environmental Education"

The Little Rock Environmental Education Project was designed to develop a sequential series of curriculum units in environmental education for grades 4 through 12. Emphasis will be placed upon a different area of environmental education in each curriculum unit as shown below.

| GRADE | ENVIRONMENTAL UNIT |
|---|---|
| 4 | Nature of the Environment |
| 5 | Interdependence in the Environment |
| 8 | Types of Pollution |
| 9 | Environmental Decisions |
| 10 | The Balance of Nature. |
| 11 | Environmental Problems |
| 12 | Population Problems |
| 12 | Science and Survival |

Each curriculum unit, which will require three weeks of class time, will be multidisciplinary in nature and will be structured around student-centered activities. One off-campus field trip will be included in each unit for grades 4, 5, and 10. Each curriculum unit will include the following components:

(a) an overview of the unit,
(b) the major concepts in the unit,
(c) the behavioral objectives for the unit,
(d) a daily schedule for the unit,
(e) lesson plans for classroom activities and the field trip (if applicable),
(f) test for unit, and
(g) student and teacher evaluation of the unit.

TEACHER'S GUIDE

ENVIRONMENTAL EDUCATION UNIT

NINTH GRADE CIVICS

# ENVIRONMENTAL DECISIONS

LITTLE ROCK SCHOOL DISTRICT
ENVIRONMENTAL EDUCATION PROJECT
1975-76

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## OVERVIEW OF UNIT

The ninth grade three week Civics unit in Environmental Education deals primarily with making environmental decisions through

1. Identifying problems
2. Formulating hypotheses
3. Considering alternatives
4. Making decisions

Most of the classroom activities are centered around student involvement in making decisions. They will participate in a simulation game and consider the ecological, social, political, and economical aspects of the pollution problems in Gomston as special interest groups challenge and accuse each other.

## MAJOR CONCEPTS IN UNIT

1. Pollution is the alteration of the environment so that it is unsuitable for the well-being of organisms that live there.

2. Special interest is when a person or group has an interest in a particular part of the economy and receives or seeks special advantages which are often detrimental to the general public.

3. The decision making process involves a logical, orderly process that identifies the problem, suggests solutions and, after evaluation of each alternative, reaches a valid decision.

4. Environmental trade-offs are the processes in which one individual or group gives up one thing for another in order to improve or preserve the quality of life for all.

## OVERALL BEHAVIORAL OBJECTIVES FOR UNIT

Cognitive:

1. Given environmental problems of Gomston, the student will display comprehension of the causes and solutions as measured by pre and post tests.

2. Given possible solutions to the pollution problems of Gomston, the student will analyze the solutions to determine which would contribute most to solving the problems as measured by pre and post test results, small group discussion, and city council meetings.

3. Given some of the problems of Gomston, the students will analyze conflicts between interest groups as measured by his ability to effectively participate in the small group meetings, city council meetings, and his post test results.

4. Given a special interest group in Gomston, the student will identify the problems of that group, consider alternative solutions to the problems, make a decision, and convince the city council of the merits of his decision as measured by his participation in the simulation game and the class voting results.

Affective:

1. The student will respond positively to the desires of individuals as opposed to his own interest as measured by participation in the simulation game.

2. The student will value the welfare of others as measured by his attitudes and actions on campus.

ENVIRONMENTAL DECISIONS
NINTH GRADE CIVICS UNIT

SCHEDULE FOR UNIT

| DAY | ACTIVITY |
|---|---|
| 1 | Pre-Test<br>Film: Which is My World, Man's Effect on the Environment or An Inquiry Into the American Wildlands. |
| 2 & 3 | Decision-Making Process; How Are Things in Our Town? |
| 4 & 5 | Decision-Making Process; Environmental Sciences: Where The Action Is! |
| 6 & 7 | Start Gomstom Game |
| 8 | Assign Groups and Start Research |
| 8 & 9 | Research |
| 10 & 11 | City Council Meeting |
| 12 | City Council Meeting/Voting |
| 13 | News Media Summary Presentation |
| 14 | Summary and Review by Teacher |
| 15 | Post Test<br>Evaluation |

Film: Which is My World (9¼ minutes); Altered Environments Series:
An Inquiry Into The American Wildlands (10 minutes);
or Man's Effect on the Environment (13½ minutes).

Time Required: ½ period (last half of Day 1)

Which Is My World

Presents man's excessive use of materials and the effect of such use on the environment. Open-ended film which invites the students to explore the decisions and changes that may be necessary to correct certain environmental problems.

Man's Effect On the Environment

Two major factors - a rapidly increasing human population and an increasing technological capacity for altering the environment - have contributed to an ecological situation that may have serious consequences for us all. Everywhere around us we see disastrous effects of our activities. Lake Erie is dying. Many of our streams and lakes are poisoned. Our forest lands are being depleted. Every year we cover more of our valuable lands with asphalt and concrete. Air pollution is a serious problem in most large cities of the world. Man can and must learn to live in harmony with other living things and with his physical environment.

Altered Environments Series: An Inquiry Into The American Wildlands

Various aspects of the American wilderness are presented as key questions are asked. It is important that the student consider the problems suggested and form some ideas of his own about the wilderness - what it has meant in the past, what values it offers today, and what value it may have in the world of tomorrow.

OUR TOWN STUDENT STUDY SHEET

Time Required: 2 periods (Day 2 & 3)

Purpose: For students to learn a critical step in making decisions as a group: assimilating information about the problem. (How are things in Our Town?)

Procedure:

Before Class:

1. Read Our Town Student Study Sheet.

During Class:

1. Encourage students to list as many positive facts and feelings as they can about our town. What's going for our town? What do we like about our town?

2. Record all the student's responses on the chalk board.

3. Have students copy these for later use.

4. Encourage students to list as many negative facts and feelings as they can think of about our town. What's going against us in our town? What's standing in our way?

5. Record all responses on the chalk board.

6. Have students copy these for later use.

7. Keep in mind that what one person considers a positive point may be a negative point to someone else.

8. The lists enables the students to put the total situation in perspective. Writing this information down makes it easier to analyze, digest and handle more thoroughly.

9. Start discussing How Are Things in Our Town? Student Study Sheet.

TEACHER'S PAGE

Possible Group's list:

POSITIVE POINTS ABOUT OUR TOWN

Friendly people
Growing population
Increasing industries
Concerned citizens
Few serious environmental problems
Arkansas River
Amtrack
Shopping centers
Increasing numbers of higher educational opportunities
Technical institutes
State Capital
County seat
Council-Manager form of city gov't
Plenty of room
Centrally located
Annexed land to expand
Tree lined streets
Hospitals and medical centers

NEGATIVE POINTS ABOUT OUR TOWN

Too industrialized
Overcrowded schools
Too few recreational areas
Unemployment rising
Unconcern about environment
Sanitary landfill
No bike trails
Fuel shortage
Litter
Air pollution
Open burning
Sewage treatment inadequate at time of extended rainfall
Unplanned development
Lack of adequate public transportation
Fast becoming overpopulated
Rock Creek flooding
Corrupt government
Library downtown - no convenient parking

The liveability of a town depends to a great extent upon the way its land area is utilized. Land can be used for many purposes, for example: for people (parks, malls, housing developments, scenic easements, open spaces); for institutions (schools, libraries, museums, prisons); for industry; for transportation (parking lots, wider streets, freeways, airports.)

With our rapidly growing population, making proper land use decisions has become increasingly important and also difficult. There are many kinds and levels of land use planning done at different governmental levels. At the local level, many jurisdictions are adapting tools for land use control, such as zoning regulations, flood plain zoning, housing codes, construction codes, use permits, sanitation regulations, and pollution standards.

Thinking of our town's present land use, perhaps you will say, "If only we could start over!" You could list all the needs of your expected population and, through a process of compromising and balancing needs, design the ideal community. At the same time, you would evaluate the natural resources on your town site to determine the kinds of development that would suit each place best, and to identify those natural resources of aesthetic or environmental value which would require protection. You would establish land use and governmental controls to regulate urban growth from the beginning.

The designers of "new towns" in the United States and other countries are lucky because they can start from the beginning in planning a town. But "new towns" cannot meet all our people's needs. Those of us who live in old towns need effective land use planning and controls even more. Over a period of time, strong enforcement of these controls can help us preserve our cultural heritage while, at the same time, improving our buildings, our streets, and our open spaces to make life healthier and more pleasant for everyone.

OUR TOWN STUDY SHEETS

How are things in Our Town?

Every community, no matter what its size, has a number of environmental problems. The differences between communities are in the kinds of problems, their size, and the amount of attention they are receiving from their inhabitants. For example, nearly every town or city has a problem getting rid of its garbage and other solid wastes. And all communities have some sort of air pollution. For some small towns, this may consist of just one local manufacturing plant which produces a lot of smoke or an unpleasant odor. In larger centers, it may take the form of smoke from huge industries or the exhaust from great numbers of automobiles.

Needless to say without people, our town has no reason to exist. Today we are concerned that our town fulfill its purpose: to meet the needs of all the people who live here.

Population is more than just a certain number of residents. It is people, their similarities and their differences, that make towns interesting. That's why we have to study our population when we study Our Town.

How many people live here? _____ _____

Do a lot of people come into Our Town during the day for business, shopping, work, etc? _____ If so, where do they come from? _____

_____

Is most of the population located in the center or is it evenly spread out? _____ (hint - contact your local tax assessor.) When you receive this information, plot the population on a city map in your classroom.

How large an area does Our Town occupy? _____ See if you can determine this by looking at a map.

What areas in Our Town are the most crowded? _____

_____

Why do people live in crowded areas of a city? _____

_____

Does crowding in the city have anything to do with other problems such as poor schools, unemployment, or racial discrimination? _____ If so, how?

_____

_____

Now that we know something of our population and the area our town occupies, how does our town work and survive? How does our town supply our wants and desires?

We know that life-styles and technologies have changed with lightning-quick speed during the 20th century. You can think of many changes in clothing, food, and shelters just in your lifetime. Most of us are surrounded today, at our desk and in our homes, by so many things that we don't have time to use them! Some of us are bewildered when we accumulate these things without even trying.

Some of our resources are renewable: trees grow back if a forest is carefully managed over many years, crops can be raised year after year only if the soil is not depleted.

Other resources are non-renewable: when minerals are extracted they cannot be replaced except perhaps over geological ages of time; when open space land is converted to urbanized development it is almost impossible to recreate the original open space and natural values.

Some resources are interchangeable, too. In constructing homes we can choose from a variety of materials; we don't have to use those which are scarce. The same is true in choosing materials and fabrics for our clothing, we can select clothing and other merchandise which are produced with the least environmental damage.

There is another alternative. Can you think of it? _____
How about consuming less and doing without some of the non-essentials????????? It's bad news when we see our resources wasted when many of them could be put to good use helping other people around us to a better way of life. Today we see more public concern and joint action to conserve our natural resources and use them wisely --- but an even greater effort by everyone is needed.

Thor Heyerdahl is quoted as saying "modern man seems to believe he can get everything he needs from the corner drug store. He doesn't understand that everything has a source in the land or sea, and that he must respect these sources".

Where does everything is our town come from? Our town is composed of much more than people, businesses, and houses. It functions as a complex net

of interacting systems. These systems, when they function properly, keep you informed, housed, clothed, and well fed.

The systems of a city are sometimes like the systems of your body. If your body is not properly cared for it will not function as it should and you frequently have to seek medical help. If our cities are not properly cared for environmental problems develop.

It is important that you find out what pollution problems your community has, how serious they have become, and what people are doing to improve them. Perhaps Oscar, the ostrich, who suddenly realized that it had been a long time since he'd looked up, wondered what the town was like and if it was a good place to live?

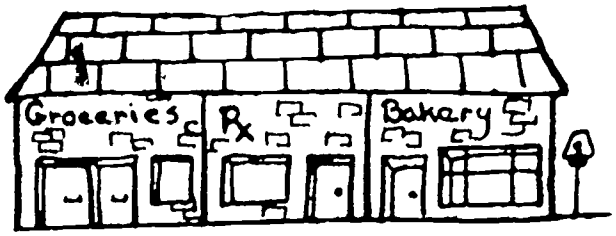
Oscar decided he would take a look and see what was going on around him. He looked

and looked.

and looked,

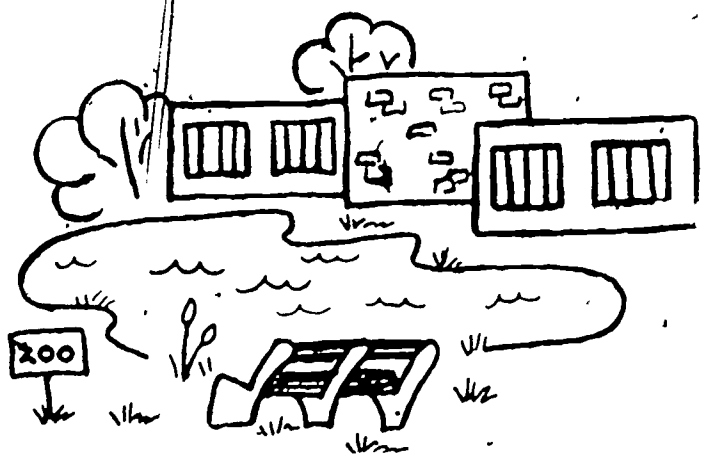
Here is what he saw in our town: He saw places where people could work

Buy things

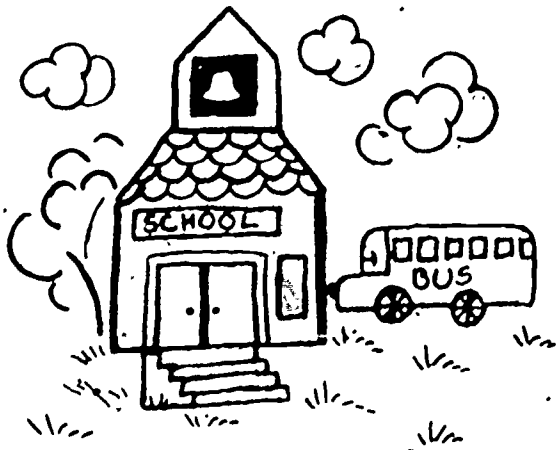




Have fun

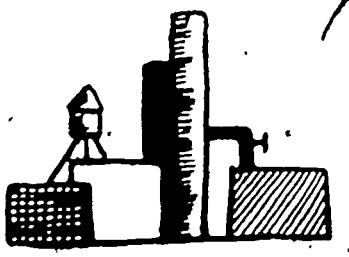



And learn something.

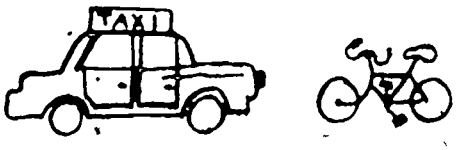


He saw much more . . .

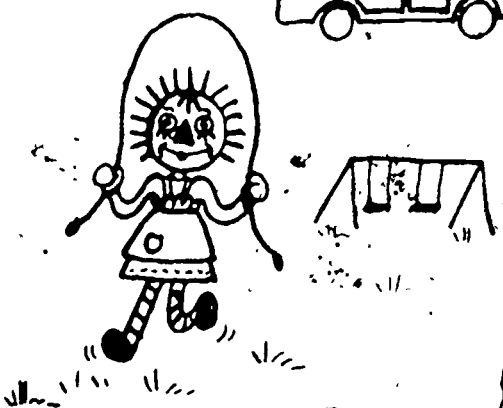
(Nice Homes)



(Industries)




(Cars, bikes)



(Kids playing)

(Dogs, cats)

(People working and playing)

PEOPLE....everywhere Oscar saw PEOPLE, people, people....he had never seen so many people as in our town. "How many people are living in this town?" wondered Oscar. Do you remember your earlier answer? _____

Yes, Oscar saw some tennis courts and ballfields, "But is that enough for the children?" he asked. Oscar remembered children like to run and jump! He said to himself, "Are there enough places in this town for children to run and jump?" Well, what would you say to this question? _____

_____

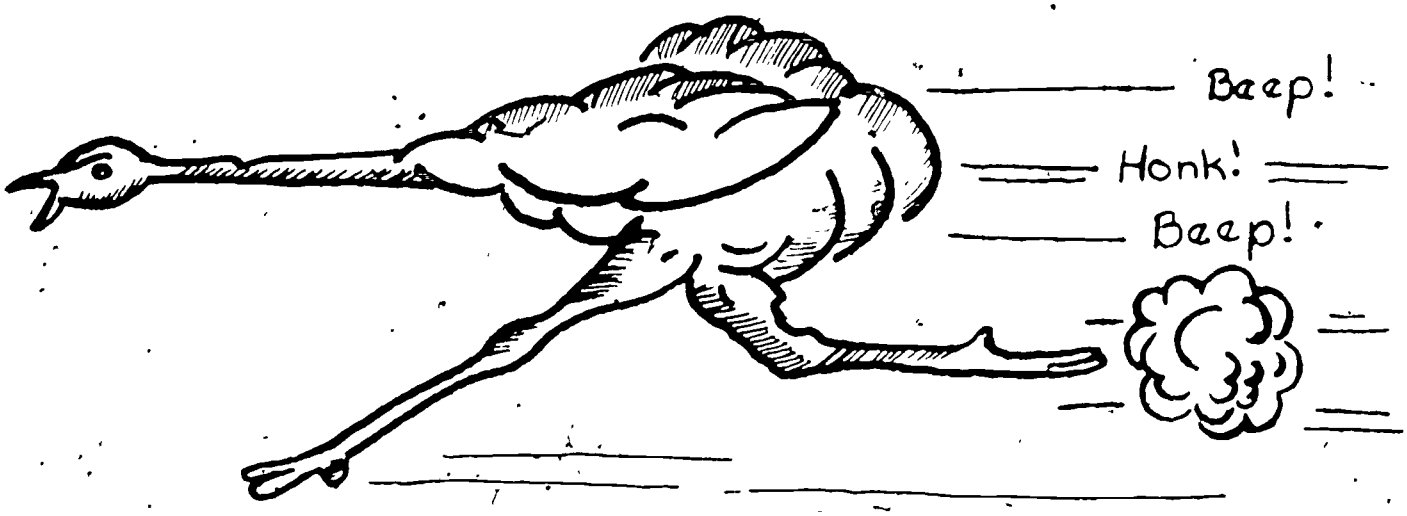
_____

Scratching his head, Oscar pondered that there were an awful lot of people "This town is having a people proolem", he muttered. "Look at all those cars on the roads; LOOK at all those BIG houses . . . houses, houses, houses everywhere I LOOK! New apartment buildings, a new shopping center, crowded school rooms Do you agree or disagree with Oscar about our town having a population problem? (Explain.)_____

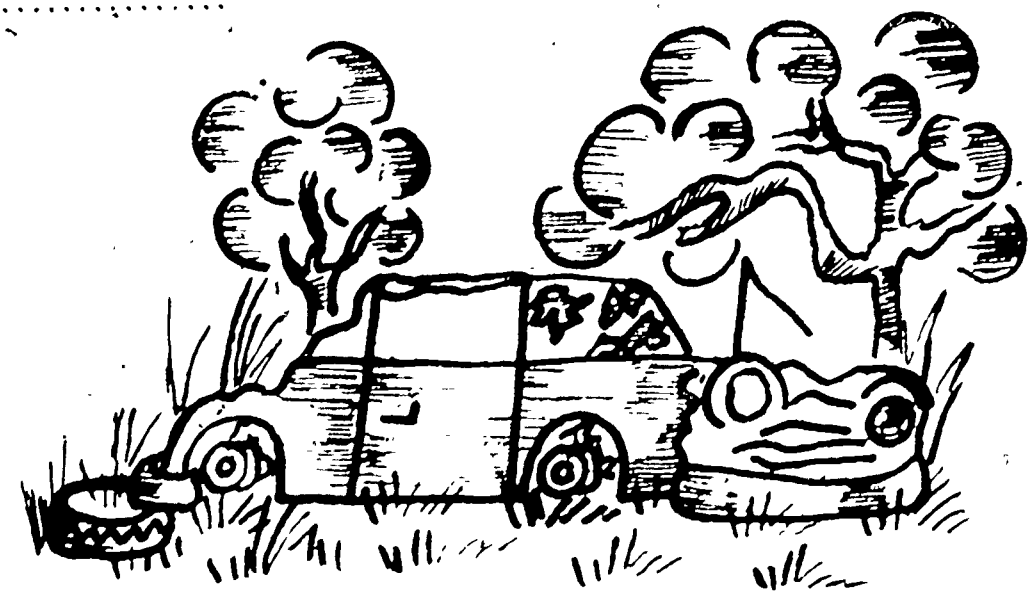
_____

_____

Have you seen any of the things he saw? _____
Other things? _____




GOOD GRIEF! Are you telling us Oscar almost got killed??? Yes, he perched in the middle of one of our highways .... but he got out of the way pretty quick! Recovering from his close call Oscar again scratched his head and wondered, "Why does anyone ever venture onto such a DANGEROUS place?" He had never seen so many cars. ZOOMM..SCREECH!!!!!ROAD...BEEPPP....the NOISE addled him, the smell ma his nose itch and drip, his eyes watered...he couldn't get away quick enough. He spied a few trees in the distance and made a beeline for them only to get greeted!



On no, Oscar ran smack-kedab into an ABANDONED CAR! This was even worse. "Is this the best this town can do with this old car? It's a rusty, crumbled up mess! Surely someone could reuse parts of this old car", thought Oscar. What are several things that could be done with this old car?

What Oscar didn't realize was that while his head had been buried a major probelm had developed in the disposal of waste. Remember -- not only do we have to worry about where to put our discarded cars and our aluminum, plastics, and glass containers but we must be concerned with the depletion of our rescources that go into making these products.

Think about the kinds of waste your household is producing per day. Why do they come into the house in the first place?

Could your household reduce the amount of waste it produces?

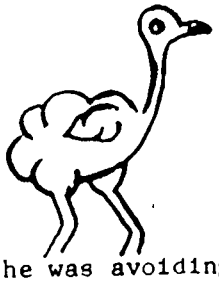
| KINDS OF WASTE | WAYS I CAN REDUCE WASTE |
|---|---|
| Cans and Metals | |
| Paper | |
| Plastic Products | |
| Food Refuse | |
| Glass | |

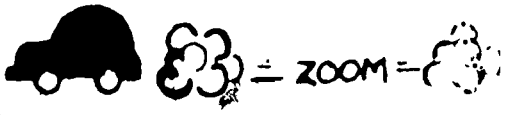
How does our town dispose of its waste?

Is this posing any problems? (e.g., transportation to site - rail?, truck?, pickup from individual homes and/or specific locations?)

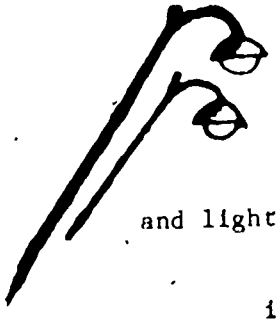
If incineration do we have air pollution?, if landfill how long will the site last and are other locations available?

Oscar moved on.

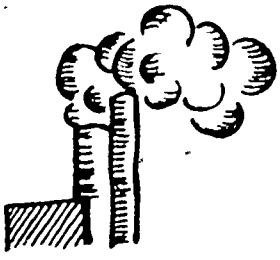





As he was avoiding cars, telephone poles

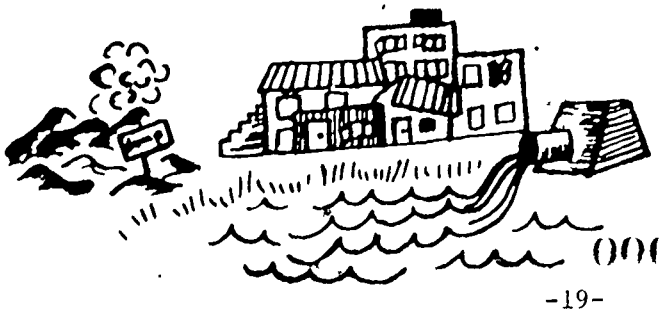


and light wires.



industrial fumes

high buildings....choking and coughing through the haze, he shook his head and thought, "Do people REALLY live in this? Do they really live where all I see, when I can, is concrete,



run-down tenements,

dirty water,

garbage dumps.

P O L L U T I O N, pollution -- where does it come from and why does it occur

You can answer these questions for yourself by looking at the process which various materials go through to become finished products. The production of goods and services for people (YOU & ME) usually has both good and bad effects. Bad effects occur in the form of pollution and good effects in the form of desirable products and employment.

EXAMPLES

AIR POLLUTION

1. Do you think smoke can be emitted in large quantities on any day without causing an air pollution problem or should the daily weather patterns be considered before allowing smoke emissions? (hint - inversion conditions.)

2. Notice what accumulates on a clean car after it is left out overnight? Do you think dirty air effects your life?

3. Now that you've thought about what dirty air does to man, what might this air do to affect other animals?

4. How do you think dirty air affects plants?

WATER POLLUTION

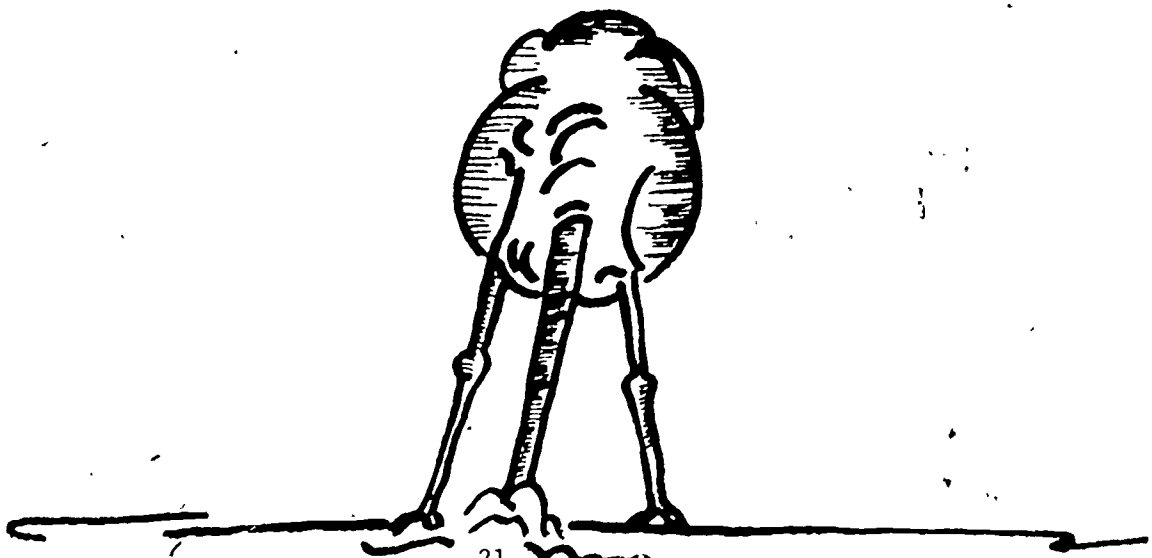
1. What river or creek runs through or near Our Town?

2. What happens to this river or creek as it flows to join a larger body of water?

3. What do you think happens to this river or creek as it runs through Our Town? _____
What materials will probably be added to it? _____
_____Do you see in and along the water materials which don't really belong there? (e.g., old tires or cans.) _____If so, what can you do to correct this problem? _____
_____

Remember, all life needs oxygen in order to live. POLLUTION reduces the amount of oxygen in the water.

"Oh, me," moaned Oscar, "I can't take anymore. I'm going back to my warm, cozy world RIGHT NOW! These people can have this town and all its problems. They created them. Let them solve them."



Yes, Oscar's right. We do have a lot of bad things in our town. Can you think of any he overlooked?

But there's also some good things. What are some of the good things about our town?

Another thing Oscar was right about --- it's up to the people to change the town. People are trying to make changes in our town, but it's not easy! Changes have to be planned. To bring about the changes people need money and power. Planning can't give you these. But it can help you to get them. With a good plan for change, people are more willing to listen to you. They are also more likely to give your town or group money. That money can be used in getting materials to solve the problem.

Are the problems of our town unique? (Explain.)

Have cities always had problems? (Explain.)

Yes, cities have always had problems. Man builds and lives in cities. Man causes the problems. Let's take a look at some historical cities and their problems.

During the first century B.C. cities begin to appear in Greece. Cities in Greece grew and spread out starting other cities. The early Greeks regarded such cities as Athens and Corinth as the mothers, or the sources of their civilization. Most cities had no more than 5,000 people. Their size was no greater than the walking distance from one end of the city to the other. At the height of its power Athens held nearly 300,000.

Do you think the Athenians planned and solved the "growth problem" of their city? _____ How? _____

_____

Another famous city was Rome. Rome had many, many problems. It became so large that its problems finally caused it to be conquered by tribes from Asia and northern Europe who began to surround the Roman empire about AD 400. Below are examples of some of Rome's problems. On the line to the right tell in one or two words the conditions explained in the left column.

1. Julius Caesar forbids carts in the center of Rome during the day. _____

2. A few rich people had their own manisons in the city. Some people lived in apartments. The poor lived in the more than 40,000 tenements. Tenements of Rome had the same problems as tenements in our large cities today. (What are some of these?_____ _____.) _____

3. Sickness spread quickly and plagues came to Rome almost as often as great fires. In the space of 100 years, three plagues killed over 100,000 Romans. _____

4. As early as 500 BC, the Cloaca Maxima, the great sewer was built. But there were not enough sewers in Rome. _____

5. Emperor Augustus had rebuilt Rome shortly after the birth of Christ. He said, "I found it a city of brick and left it a city of marble." Truly, the rulers of Rome had built great buildings, roads, and aqueducts. _____

6. People paid high rent to live in places with foul air. _____

During the Industrial Revolution of the 1800's many cities became industrialized. What does "became industrialized" mean? _____

_____

_____

With the beginning of the Industrial Revolution, everyone thought they would achieve and benefit from the "good life". Many people moved into the cities. The cities became crowded. People lived anywhere possible.

The Industrial Revolution saw the beginning of environmental pollution as a serious health hazard. Factories polluted the air with gases; they polluted the waterways with chemical wastes; they created huge dumps of discarded materials and other wastes. Insects and rats were active in spreading illness. Because of this overcrowding, pollution, and poor sanitation, disease was rampant; and cities had extremely high death rates.

The problems of the industrialized city were many. Unfortunately the problems of the industrialized cities have multiplied and are much more serious today. Why do our cities still have the same problems?_____

_____

The cities discussed are similar to cities today. The problems are similar but some of the problems are worse today! Why have we allowed these old problems to continue to exist? _____

_____

Does our town have any of the problems that were present in the cities? If so, what problems? _____

Additional problems? _____

Is it possible some things could be changed for the better in our town? (How?) _____

Remember, it isn't easy to CHANGE. It's especially hard to CHANGE cities because there are many different groups who control various jobs. Therefore, it is necessary for you to learn how these groups make decisions and how you can have a say in them. You've learned a decision-making process that will help. You may be shaky about some of the steps, so during the next few days we will continue to work on the process using the simulation game, Gomston, as our source of information. Remember, it will not be easy, but we must try because if we don't .....

ENVIRONMENTAL DECISIONS

Time Required: 2 Periods (Day 4 & 5)

Purpose: To encourage students to think about the decision making process and to make decisions in a logical, rational manner.

Materials Needed:

1. Scissors
2. String or yarn for each student
3. Student Study Sheet No. 1
4. Student Study Sheet No. 2

Procedure:

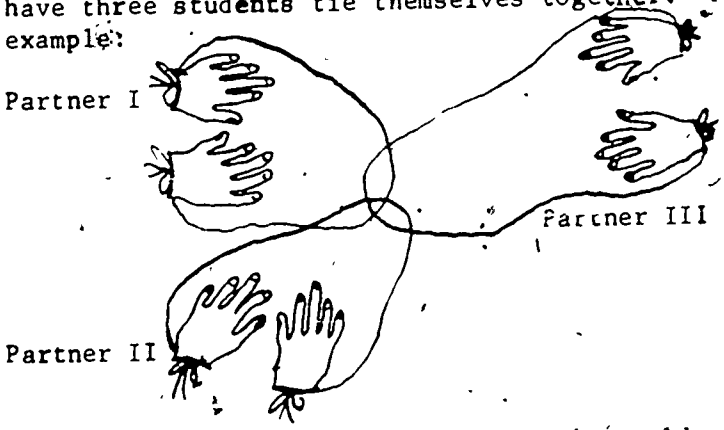
Before Class:

1. Cut strips of string or yarn about 100 cm in length.
2. Obtain one copy per student of Study Sheet No. 2.
3. Read student study sheet.

During Class:

1. Encourage students to generate ideas and to think through the problem in a logical manner.
2. Encourage students not to become discouraged if "at first they don't succeed" because this indicates they are not generating enough ideas about the problems.
3. Distribute student study sheets. Explain that this contains a problem which they are to try and solve in a logical manner. Remind them to generate unique ideas before taking any action toward solving the problem.
4. Direct the student to first read and answer any questions contained in their worksheet. As the students begin to select a partner and get the necessary materials, explain the importance of not breaking, cutting, untying, or slipping the string off a wri You will note that as the students attack the probl most of them really didn't LISTEN when you encourag them to think or let their imagination work for an an answer to the problem. You'll find that most groups will generate ideas but they will not take time to write these down on the worksheet - Step No. 2. Consequently, the groups which don't write down their ideas will continue to do the same things over and over and not solve the problem. Therefore, as the students tackle the problem continously move from group to group encouraging the students to complete the information on the worksheets. Call special attention to Step No. 2 and encourage them to write down all their ideas about the problem in this space before they take action. When they have written down as many ide as possible, then they test each one. If one fails, they simply mark it off. This process will help the students realize what things they can and can't do.

Expect the room to be noisy; to have frustrated students, and some who will not pick a partner. In the case of an odd number of students, simply have three students tie themselves together. For example:




Generally the students do not solve the problem during a fifty minute period. It is good to allow a few minutes during the next class session to try and solve the problem.

5. Solution: Slip the string under the back of a partner's wrist and over his hand.

Post Inquiry Discussion:

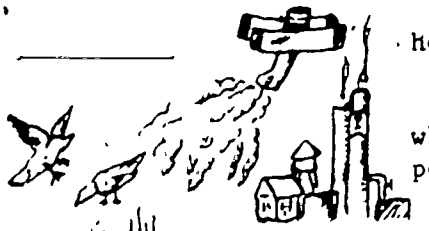
1. Review the complete worksheets. Key section is Page 2, the BASIC RULES.

Assignment: Distribute Student Study Sheet No. 2.

STUDENT STUDY SHEET NO. 2

Environmental Science: Where the Action Is!

Environmentalists are people who study their environment - or all the happenings that occur around them. They seek to understand such things as:



How DDT gets into food chain;

what are the effects of burning high sulfur coal in a power generating plant;

what effect steel mills have on the quality of water?

how water becomes unfit to drink;

why some people think marshes are great, and others think they stink,

AND MANY OTHER THINGS !!!

How do environmentalists (Psst....you and I) learn about all these things?

Great! See it's not so difficult because you care about your world and w... to learn to make the best

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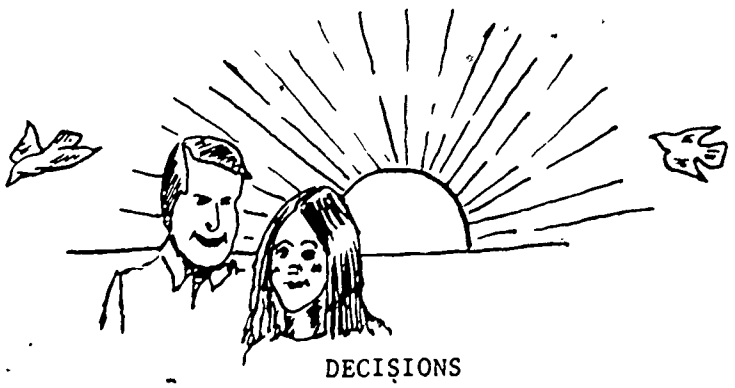


DECISIONS

BESIDES....its' exciting learning why we make certain decisions about our world. BESIDES....the things man (that's us) has done and is doing have changed our ENVIRONMENT and our LIFE greatly, and will continue to affect us.

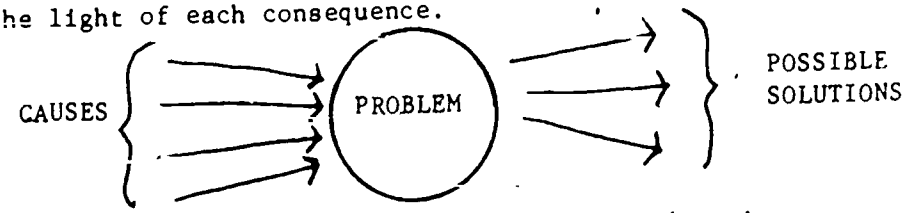
The most striking change may be in yourself..., how you think and act toward our world. No matter how you look at it, you are....and will be....living in an age of ENVIRONMENTAL AWARENESS.

You'll face many problems - some easy, some difficult. So....how is the best way to go about solving these problems?

1. Recognize and identify the problem; (what do you want to know?).

2. Formulate a hypothesis or make an "educated guess" of all possible solutions or alternative courses of action. (What could you do to solve the problem?)

3. Consider these alternatives - advantages and disadvantages - in the light of each consequence.




4. Make a decision, choice or generalization. (How does your hypothesis in step 2 look in light of the alternatives?)

These four main steps can be used in making daily decisions.

Select a partner. Write down the name of your partner_____.

Why did you pick your partner? _____.

Here's What You and Your Partner Do:

1. Get 2 pieces of string 100cm in length.

2. Tie a piece of string to both wrists of your partner.

3. Tie the other piece of string to one of your wrists.

4. Take the loose end and pass it behind the loop of string tied to your partner's wrists.

5. Now tie the loose end to your wrist.

THE PROBLEM:

6. Free yourself and your partner without untying, breaking, or slipping the string off a wrist! GO AHEAD, TRY IT!

WAIT!!! WHAT DID YOU FORGET TO DO?? Yes, that's right you forgot to tackle the problem using those basic ground rules. So <u>now</u> list the way you plan to solve this problem:

1st (What do I want to do?)

_____

2nd (What can I do to solve the problem?)

_____

3rd (What do I want the solution to do for me?)

_____

4th (How do I bring together what I want and the ways of getting done what I want?)

_____

_____

5th (How can I sell someone else my solution?)

_____

_____

What happened? It didn't work!

What do you do now? _____

_____

_____

You don't just stop when your attempts to solve a problem fail. You try again. How much would we know about our world if ecologists had quit because of failure? You keep trying until you find the right solution to the problem. Failure means you haven't yet found the best solution.

On the other hand, learning about your environment doesn't stop when one problem is successfully solved. Solved problems may lead to further problems. New problems may arise.

But, learning to solve problems in a logical manner can help all human relationships (even getting untied!) Problems can be solved when our actions are the end results of critical thinking instead of greed, hate, or fear.

Which way are you going to act?

Key to Student Study Sheet No. 2

How do environmentalists learn about all these things?

ANSWER: Research, experiments, reading, discussions with other people, on-site observations.

1st (What do I want to do?)

ANSWER: The student should state the problem: to get loose.

2nd (What could I do to solve this problem?)

ANSWER: The student should write down as many ideas as possible about the problem. (e.g. step through the string, pull it over the nand, turn around)

3rd (What do I want the solution to do for me?)

ANSWER: The student should write down his criteria. (e.g. to get loose, to get praise from friends, etc.)

4th (How do I bring together what I want and the ways of getting done what I want?)

ANSWER: The students probably will not have any idea about how to answer this question. Attempt to get them to make some suggestions about how to put their wants and solutions together.

5th (How can I sell someone else my solution?)

ANSWER: Convince the person of the value, then take action.

What do you do now?

ANSWER: Try another approach; generate more ideas.

Gomston Game

Time Required: 2 periods (Day 6 & 7)

Purpose: For students to gain an understanding of the interaction of forces within a community during a time of decision making.

To aid students in learning to work together in making compromises and arriving at solutions beneficial to the majority.

Introduction:

This is a role-playing fame in which students make decisions that affect a city's environment (natural and man-made). The entire class can participate in this game which is designed to generate conflict.

Materials Needed:

Provided by Project:

1. Information packet about Gomston (40 per teacher)
   a. Map of Gomston
   b. A case study of Gomston
   c. Air and Water Pollution
   d. Population exodus
   e. Map of Little Rock
   f. Gomston - Little Rock Parallels
   g. Proposed Budget for Gomston and budgets for select Arkansas cities
   h. Suggested goals for the Special Interest Groups
   i. Representative cost for new facilities
2. Gomston Transparency (same as Gomston map in packet)
3. Gomston filmstrip

Provided by Classroom Teacher:

1. Overhead projector
2. Cassette player

Procedure:

Before Class:

1. Obtain overhead projector
2. Obtain cassette player
3. Read over information packet

During Class

1. Distribute for use during the class period an information packet to each student
2. Show transparency of Gomston
3. Read the letter from the Local Geographer to the class as they view the Gomston transparency
4. Show filmstrip about Gomston
5. Use questions on the page following the letter from the local geographer to analyze Gomston
6. Have students read information packet and refer to it as they study Gomston
7. Collect all information packets for use with your next class

City Council of GOMSTON
City Hall
GOMSTON, U.S.A.

Dear City Council of the city of GOMSTON

It has come to my attention that some of your members do not understand the grave pollution problems that your city presently suffers. For this reason, I have compiled the following letter which should help you better understand the causes and effects of the pollution in and around GOMSTON.

GOMSTON, a small city, has a population of approximately 75,000 people. The city covers an area of just over thirty (30) square miles and lies mainly within the valley of the GOMSTON River. GOMSTON is served by a transportation complex comprised of several major highways (I-20, U.S. 60 and State Highway 20), several commercial trucking firms, a trunk rail line (The GOMSTON, Central, and Western), river barge lines, and various airlines.

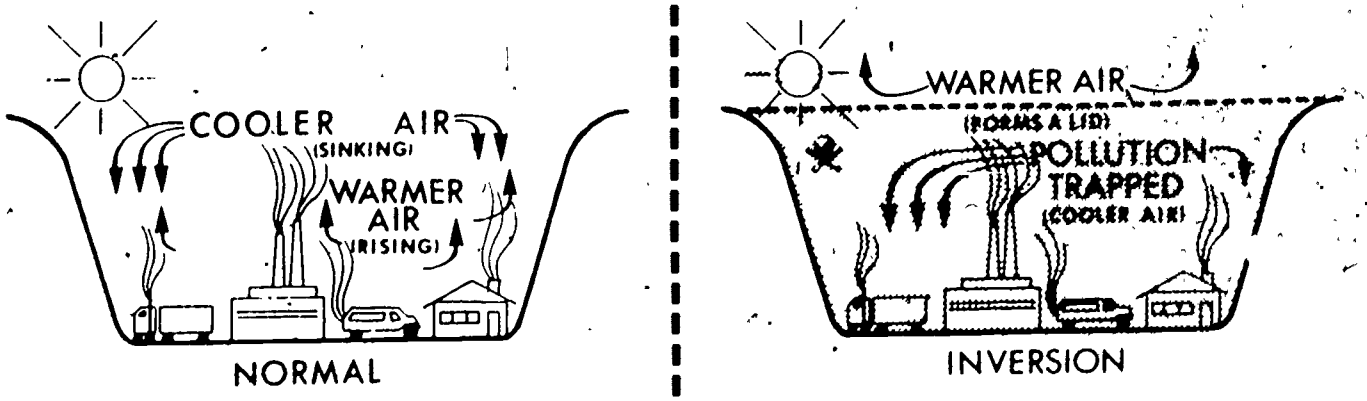
GOMSTON has many different industries. It is important to notice that some of the major industries are located within the city while others are located outside of the city. Note that the Electric and Power Company, which depends on the burning of coal (high sulfur types) for power production, and the Department of Water and Sewage are both located on the GOMSTON River at the south end of town. Cherry Canyon Dam forming Cherry Canyon Lake is primarily used for flood control.

GOMSTON was not planned very well. This is made perfectly clear when you think about pollution problems in and around GOMSTON.

## AIR POLLUTION

GOMSTON is located in the zone of the Prevailing Westerly Winds. The movement of gases and dust particles from Steel Mill B, the Electric and Power Company, the Corn Processing Company, the Private Dumps (owner – George Arbage), the stockyards and the Chemical Plant affect the city much of the year. See the GOMSTON City Map. Sometimes, southerly and northerly winds also move airborn pollutants over and through the city.

Furthermore, GOMSTON is located in the valley of the GOMSTON River which makes air inversions very common. The diagram below will help to explain what an air inversion is and why it is dangerous



Moreover, GOLSTON is affected by exhaust emissions from local and through traffic which makes air pollution quite prevalent, dangerous and obnoxious.

Finally, the city does not have any law or ordinances which control leaf and trash burning by the local citizens. All city trash disposal is contracted through the private business of George Arbage. The trash is burned on Arbage's property located to the west of the GOLSTON City Limits.

The overall conditions are.

a. Unhealthy and unsafe living conditions
b. Movement of people to other towns
c. Decreased property values around the city
d. Death and destruction of wildlife
e. Adverse farming conditions in surrounding areas

WATER POLLUTION

Water Pollution in the GOLSTON River is at an all-time high. Wastes are dumped in the river (with LITTLE or NO treatment) by the Chemical Plant, oil refinery, steel mills, Corn Processing Company, and the Sewage Department. Of course, the towns down stream aren't too happy about this pollution and are demanding that the state take action. Other pollutants are contributed by the barges on the river. To further complicate matters, all of the industries on the river are disposing of the hot water that they use to cool their equipment by dumping it into the river. This is known as Thermal Pollution. In addition, the farmers in the area use harmful fertilizers and pesticides which run into the river along with the rain water. All of the above problems are causing the destruction of the ecology of the GOLSTON River and increasing the growth of undesirable fish and algae.

The effects of Water Pollution in and around GOLSTON are

a. High cost to purify water
b. Pollution of well water used on farms and in nearby towns
c. Disease dangers in the immediate area of GOLSTON
d. Decreased property values
e. Death and destruction of fish and wildlife
f. Destruction of beach and recreation areas

This is the frightening condition in GOLSTON today. You, the city council, are the only people who can improve your city.

There is much you can do. Only you can do it. There is much you must do, and you must begin before it's TOO LATE.

Respectfully submitted,

The Local Geographer

# GOMSTON ENVIRONMENTAL ANALYSIS

1. Describe the setting of GOMSTON, its area, population, transportation, industries, and conditions in relation to pollution.

2. What fuel does the Electric Company (Commonwealth of GOMSTON) burn to make electricity? What other methods of making electricity might be used in the city of GOMSTON? Explain completely.

3. What is the purpose of Cherry Canyon Dam? What are some other uses it might be adapted to? How would these new uses help the situation of pollution in GOMSTON?

4. What is Thermal Pollution? Which industries in GOMSTON cause this kind of pollution? How does Thermal Pollution affect the environment?

5. GOMSTON is located within a river valley. This makes the possibility of air inversion likely. What is air inversion and what are its effects?

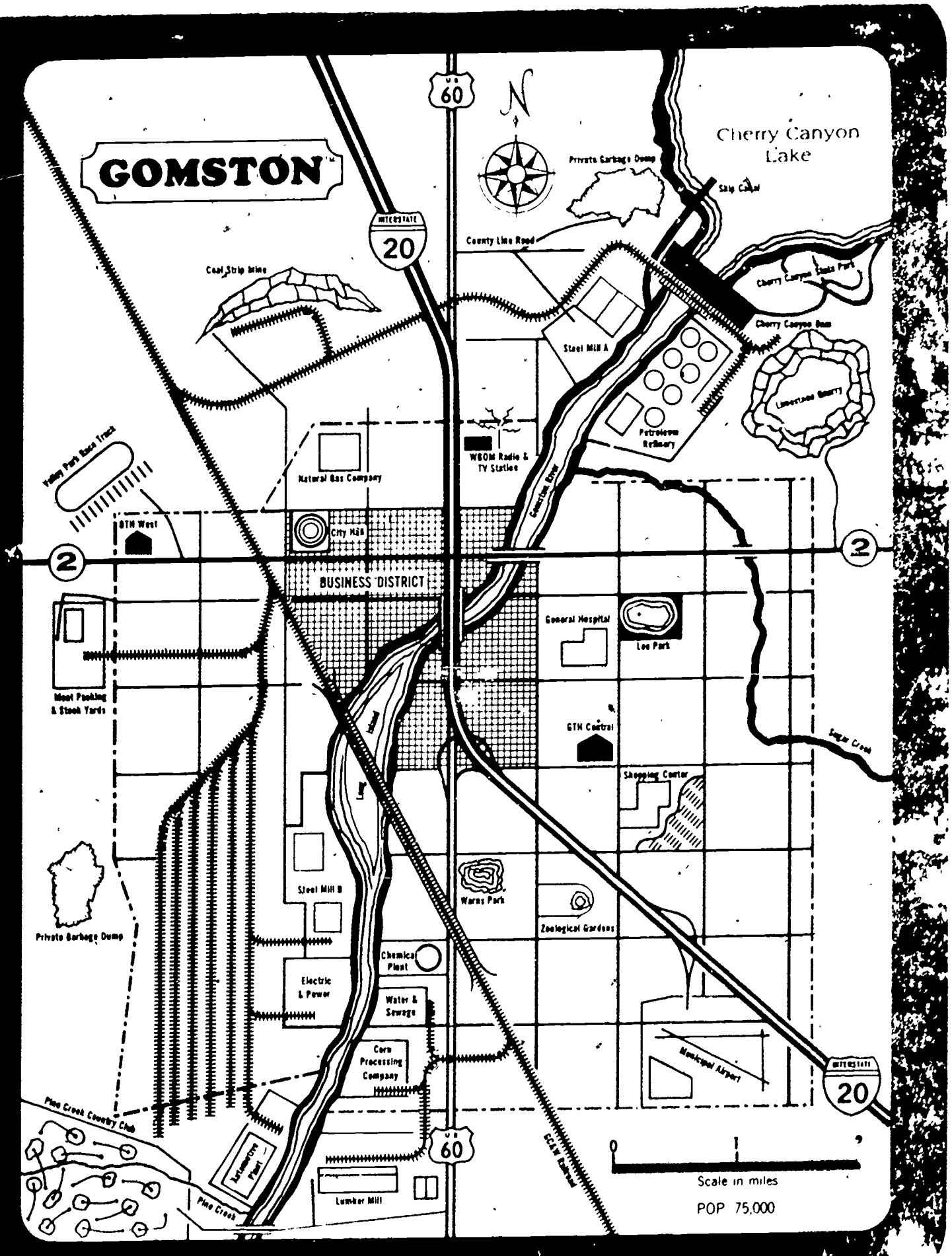
6. Name eight (8) sources of air pollution in the greater GOMSTON area.

7. What effects does air pollution have on the city and its people? What effects does it have on the total natural environment of the GOMSTON regions?

8. Name eight (8) sources of water pollution in the greater GOMSTON area.

9. What effects does water pollution have on the city and its people? What effects does it have on the total natural environment of the GOMSTON region?

10. What farming practices cause water pollution? What would you do if given the chance. Be realistic and complete with this last answer.




NO 1055 GOMSTON



00037

# A CASE STUDY OF GOMSTON

GOMSTON, a small city, has a population of approximately 75,000 people. The city occupies an area just over thirty (30) square miles and lies mainly within the floodplain of the GOMSTON River. GOMSTON is served by a well integrated transportation complex comprised of Interstate and Federal highways (I-20 and U.S. 60), several commercial trucking firms, a trunk rail line (The GOMSTON, Central, and Western R.R.), river barge lines and various airlines.

GOMSTON industry is quite diversified. It is important to note that some of the major industries are located within the city limits. These industries are under the direct jurisdiction of the GOMSTON City Government. Others are located outside the city limits, and, while they are within the GOMSTON Metropolitan Area, they are only indirectly within the jurisdiction of the city government. Note that the Electric and Power Company, which depends on the burning of coal (high sulfur types) for power production, and the Department of Water and Sewage are both located on the GOMSTON River at the south end of town. Cherry Canyon Dam, forming Cherry Canyon Lake, is used primarily for flood control.

When considered within an environmental context, it's rather obvious that the planning of GOMSTON was very poorly conceived. This is especially evident when one looks at the GOMSTON Metropolitan Area with regards to the following environmental conditions.

## Air Pollution

GOMSTON is located in the prevailing zone of Westerly Winds. The movement of gaseous and particulate emissions from industry, business and residential areas definitely affect the city during most of the year. Sometimes during the year, southerly and northerly winds also move airborn pollutants over and through the city.

Furthermore, GOMSTON is located within the river valley and floodplain of the GOMSTON River. The surrounding bluff areas hinder free movement of air which increases the likelihood of the formation of air inversions (See diagram 1).

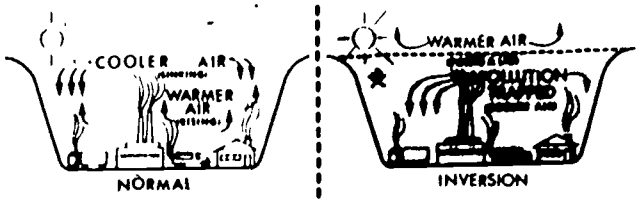



*Diagram 1.*

To complicate matters further, GOMSTON is located on a major interstate highway system. Thus, hydrocarbon and nitrogen emissions from local as well as through traffic are quite prevalent.

The local city ordinances have not done anything to control the environmental problems - even to the extent of leaf and trash burning by the local private citizens. All city trash disposal is contracted through the private concern of George Arbage. The trash is burned on Arbage's two property locations - one to the west of the GOMSTON City Limits and one to the north.

The overall resultant conditions in GOMSTON are:

a. Unhealthy and unsafe living conditions
b. Population exodus
c. Depreciating property values
d. Wildlife destruction
e. Adverse farming conditions in surrounding areas

## Water Pollution

Water Pollution in the GOMSTON River is at an all-time high. Wastes are dumped in the river (with LITTLE or NO treatment) by the chemical plant, petroleum refinery, steel mills, corn processing company, and the sewage department. Other pollutants are contributed by the shipping industry on the river. To further complicate matters, many of the business firms and industries located on the river are disposing of hot process water into the river causing a rise in its temperature. This is known as Thermal Pollution. Area farmers, through poor land and farming practices, produce run-off heavily charged with silt, pesticides, herbicides, and phosphate compounds. All of the above are contributing to the destruction of the GOMSTON River eco-system and to the increase in the growth of algae. Of course, the towns located downstream are strongly effected by this pollution and are demanding positive action.

The effects of Water Pollution in the region of GOMSTON are:

a. High cost of water purification
b. Pollution of underground water sources causing difficulty and risk for the resident of nearby towns and for those farmers in the area who are dependent on wells
c. Disease dangers in the immediate area of GOMSTON
d. Depreciating property values in the area

e Loss of fish and wildlife

f Loss of water recreation areas in the town (Long Island) and the lowering of the quality of the facilities in the surrounding area

The above case study would indicate an obviously bleek picture for the future of GOMSTON. It opens the door to zoning restrictions and local and state government interaction.

NOTE Noise Pollution, as such, is not dealt with in this case study. Little scientific evidence is available at the time of this writing concerning the qualitative and quantitative harms of excess noise. This may be injected into the simulation at the teacher's discretion. In as far as GOMSTON is concerned, Noise Pollution is the "Silent Menace".

# INFORMATION SHEETS - AIR AND WATER POLLUTION

Air and water pollution can affect the quality of human life as well as that of wildlife. They cause problems of health, money, aesthetics and wildlife survival. Pollution is no respecter of persons, it affects us all.

The following information sheets are designed to give you some basic information on the various effects of air and water pollution on you and your city and state. These same problems plague most cities, including Gomston, the hypothetical city you will be investigating later.

# AIR POLLUTION - A HAZARD TO YOUR HEALTH

## Air Pollution - Is it Hurting You?

Very likely - especially if you live in a city. Because you breathe don't you?

The air you and most other Americans breathe is foul. Fouled by some 200 million tons of harmful gases and particles a year.

## Air Pollution.

Air pollution can make your eyes burn. Your nose run. Your head ache. Your throat sore.

It can make you cough. Tire you out. Make breathing a chore. Blur your vision and get you dizzy.

Air pollution can affect your whole breathing system.

Your heart, too.

## That's Not All!

Your heart and your lungs work together.

When you have a respiratory disease, when your lungs can't do the job of getting enough oxygen into your bloodstream, your heart has to make up for it. It has to pump harder.

The extra work puts a strain on your heart.

For people with a heart disease, the strain can be too great.

On a number of occasions, heavy air pollution has killed people with respiratory or heart disease.

Example: a study of New York City death rates over a five year period showed 10 to 20 more deaths a day than normal when sulfur dioxide levels rose to a certain point. That point was reached at least one day in ten!

## Air Pollution Encourages Disease

Air pollution is connected with a number of diseases.

It can cause asthma.

It can make you more susceptible to such infectious respiratory diseases as the common cold, influenza, and pneumonia.

Air pollution can also contribute to many chronic diseases, in which a single cause is hard to find. Emphysema (the decay of the Alveoli, the tiny air pockets of the lungs), chronic bronchitis, lung cancer, and heart disease are all associated with air pollution.

A recent study concludes that illness and death from respiratory diseases would be reduced by 25 percent if air pollution in big cities could be cut in half.

Yes, air pollution can even kill.

## More trouble?

Scientists keep finding harmful effects. Two new possibilities: 1. Air pollution may contribute to stomach cancer. 2. Air pollution may affect a child's growth and development.

What can you do about it? You can reduce your own polluting. You can help get rid of air pollution.

## AIR POLLUTION -- DEPRECIATING PROPERTY VALUES

In addition to their adverse effects on people, pollutants in the air damage vegetation, crops, livestock, clothing, home furnishings, metals, masonry and paint.

Air pollution has a corroding and an erroding effect on materials. Metals, even the strongest steel, corrode many times faster in polluted air than in clean air. Millions of dollars of public and private funds are spent annually in repairing, replacing and cleaning roofing materials, building stone, mortar and cement.

Officials in Washington, D.C., are faced with the problem of rapid deterioration of national shrines. The Lincoln Memorial and other monuments are in need of major repairs for damaged caused by air pollution.

In polluted air, household goods and fabrics are weakened, nylons run, leather becomes brittle, rubber cracks, and cars, homes and textiles become tinted. In areas where the solid and gaseous pollutants are numerous, property decreases in value drastically. The decreases in property values are caused by an actual deterioration of the property and by a hesitancy of people to purchase property in a location where a hazard to the health is present.

Facts:

The U.S. Department of Health, Education and Welfare says that increased property damage has been reported at sulfur dioxide levels of .12ppm. Electric power plants produce sulfur dioxide.

In Pittsburgh, a three-fold reduction in the concentration of sulfur dioxide in the atmosphere led to a four-fold reduction in the corrosion rate of zinc.

A study of overhead lines in Pittsburgh showed that the life of materials in severly polluted areas was reduced to about 2/3 that of materials in areas of average pollution.

Studies in Chicago and St. Louis indicate that carbon-steel panels corrode faster as sulfur dioxide concentrations in the atmosphere increase.

## AIR POLLUTION -- DESTRUCTION OF PLANTS AND ANIMALS

Animals, (humans included), may sicken and die from air pollutants during inversions, from accidental industrial emission, and from normal emissions deposited on their foodstuffs. Air pollution can also diminish milk production, fertility, and size of offspring. Just as the death of fish may attest to traces of water contaminants, so plant injuries may indicate the presence and concentration of low levels of air pollutants. The pollutants injure plants by destroying chlorophyll, disrupting photosynthesis, and retarding stem, root, and leaf growth.

Pollutants in the air are not just annoying; they can adversely affect the functioning of plant and animal systems. They are a threat to human health. For example, it has been estimated that breathing in New York City for a dog has the same impact on the respiratory system as smoking a pack of cigarettes a day has for a man.

In the Philadelphia Zoo several years ago, a Siberian tiger died of lung cancer. Zoo officials think that air pollution may have caused the cancer. The tiger was an eight year old female named Pasha. The Zoo director said that lung cancer was on the rise among the birds in the Zoo, as well as among other animals that spend a lot of time out doors. It was noted that animals living indoors had been relatively free of lung cancer.

In the Cooper Hill district of Tennessee, the smelting of copper resulted in the release of sulfur dioxide into the atmosphere. The sulfur dioxide affected the crops of nearby farmers and killed vegetation for miles around the smeltery.

Ozone causes the upper portion of grape leaves to appear splotched or stippled. PAN (peroxyacetal nitrate) makes the underside of sensitive leaves turn silver or bronze. Both PAN and ozone are formed by the action of ultraviolet radiation on automobile exhaust.

Ethylene, a product of automobile exhuast, can produce damage to plants in concentrations as small as a few parts per million. Ethylene damages plants by withering sensitive parts, causing blossoms to fall off, and preventing buds from opening.

## AIR POLLUTION -- ADVERSE FARMING CONDITIONS

Facts:

An iron smelter in WaWa, Ontario, emits 100,000 tons of sulfur dioxide per year. Within five miles of the plant, downwind, vegetation is almost entirely wiped out. Up to 11 miles away the over story of the forest has been killed, and now the lower vegetation stories are beginning to die off. Up to 20 miles away sulfur dioxide symptons are visible, and white pine, which is particularly susceptible, won't grow any closer than 30 miles from the plant.

A smelter in British Columbia emits 10,000 tons of sulfur dioxide a month, and has caused damage to vegetation as far away from the plant as 50 miles.

The National Industrial Pollution Control Council reports that chronic symptons and excessive leaf drop in plants have been reported in the locations where the mean annual sulfur dioxide concentration is below .03ppm.

The U.S. Department of Agriculture has reported damage to vegetation due to an annual sulfur dioxide concentration of .023ppm.

A member of the University of Utah Department of Natural Resources told the U.S. Senate that in the eastern U.S., white pine is unusually susceptible to low concentrations of sulfur dioxide, in the range of .05ppm after one hour exposure.

A study by the government of Sweden found that an annual mean concentration in the air of .02ppm sulfur dioxide led to a drop of a few percent in the growth rate of the forest.

The National Environmental Protection Agency reports that one study found over one-third of home gardens in the study were damaged by sulfur dioxide concentrations which averaged annually .009ppm.

A German study indicates that long term exposure to sulfur dioxide concentrations at or even below the federal ambient air standards has an appreciable effect on the growth, yield, and quality of certain plant species.

A professor at the University of California Statewide Air pollution Center writes that, "In many agricultural areas, losses to growers are of considerable economic importance. In some localized regions, where concentrated industrial operations emit very large tonnages of sulfur dioxide, vegetation over a considerable acreage has been destroyed, and the top soil has eroded away."

The California Department of Agriculture estimates that visible damage to crops in California amounts to $8 million a year, and along the eastern coast, to $18 million a year. And, "no estimates have yet been made of the real economic loss due to growth suppression, delayed maturity and the attendant increased cost of crop damage and reduced yield."

The following article reprinted from the Washington Post, August 12, 1971, well illustrates the effect of air pollution on agriculture.

## Air Pollution Damaging Nation's Vegetable Crops

By Barry Siegel
Washington Post Staff Writer

While Washington area residents were sneezing and coughing through four severe days of pollution in July, 1970, much of the local vegetation was turning brown and yellow.

This news - revealed in a national Park Service report last week - is a recorded first for Washington. But it's been happening in nearby areas and throughout the nation for some time, according to Howard Heggestad, head of the Agriculture Department's Air Pollution Laboratory in Beltsville, Md.

Maryland tobacco crops are regularly suffering from weather fleck, a disfiguring disease marked by white spots and dark lesions, indicating damage to tissue and food-processing elements.

Up and down the Eastern Seaboard, other crops have been curtailed or even eliminated in some areas: spinach in New Jersey, cigar-wrapper tobacco in the Connecticut Valley, lettuce and many vegetables near all the urban centers.

In 1969, Connecticut Valley toba[illegible] losses were estimated at $5 million - with most of that coming from a single weekend of heavy pollution.

Nationwide, Heggestad and other scientists currently estimate an annual $500 million crop loss due to air pollution.

The result for the public, if not evident in another health hazard, is felt in the pocketbook and the taste buds, according to Heggestad. The reasons air pollution, besides visible damage, stunts crop growth, quality and total yield. That can mean higher prices in the supermarket, Heggestad said, for worse-tasting and looking food.

In other parts of the country, scientific reports reveal damage to:

*Timber more than 60 miles from metropolitan Los Angeles.

*Vegetation in the Yosemite and Sequoia National Parks in California.

*Timber and plant growth in the Appalachian mountains.

*Peaches in Utah.

*Timber - especially pine - in East, West and Canada.

## WATER POLLUTION - HIGH COST OF WATER PURIFICATION

Rapidly growing urban populations and a mounting volume of waste discharges in municipal sewer systems have placed an overload on our water supply. In many rivers and lakes, natural water purification processes are unable to cope with the massive volume of waste and sewage being dumped.

Communities have not been able to build new waste treatment facilities or expand old facilities quickly enough to meet the increased need for clean water.

About 30% of our population lives in communities [illegible] providing primary treatment only. Primary treatment is largely a mechanical process. Larger floating objects and debris are removed from the water by a filtering screen. The waste and sewage then pass through settling chambers where impurities settle to the bottom and become sludge. Only about one-third of the impurities and contaminants are removed from the water by primary treatment.

Approximately 50% of the communities with sewer systems provide secondary treatment of water. In the secondary treatment process, water flows over a bed of rocks three to ten feet deep. As the water trickles through the rock bed, the bacteria found in the sewage multiply rapidly. These bacteria cover the surfaces of the rocks and consume most of the organic waste found in the water. Secondary treatment reduces the organic waste by 90% or more.

One of the current national goals is to provide secondary treatment to at least 90% of the municipalities within the next five years. Over 10 billion dollars will be required to accomplish this goal. The costs of water treatment rise as treatment becomes more complex. The combination of primary and secondary treatment costs about 12¢ per 1,000 gallons of waste water. Advanced treatment methods can raise the cost to 30¢ per 1,000 gallons. The cost of cleaning our waters will continue to increase as our waters become more polluted and as we turn to more sophisticated treatment methods.

## WATER POLLUTION - UNDERGROUND WATER TABLE POLLUTION

Some of the water which falls to the earth as rain or snow sinks into the soil and becomes part of a hugh underground water supply. It has been estimated that ground water supplies in the United States exceed 50 million acre feet. This quantity of water would make a layer about 25 feet thick over the surface of the earth. Pollution of such a hugh amount of water might seem very unlikely. However, man uses water at a tremendous rate. This means that water is used over and over again. Each time it is used, it becomes more polluted.

Contamination of ground water adds to the overall water pollution problem in two main ways:

1. Ground water which becomes polluted can no longer be tapped for wells and other uses.
2. Contaminated ground water will eventually rejoin streams, rivers, and oceans adding to the already serious pollution problems in these bodies of water.

## WATER POLLUTION - DISEASE DANGERS IN THE IMMEDIATE AREA

Polluted water may harbor a number of disease organisms. Virus-caused diseases such as hepatitis may be spread through polluted water. The number of cases of hepatitis is increasing. In 1954, 50,000 cases of infectious hepatitis were reported in the United States. By 1962, 73,000 cases were reported.

Some epidemics of polio may have resulted from water pollution. Polio viruses, viruses which cause respiratory and eye disease, and viruses which cause flu-like symptons may be transmitted through our water supply.

Disease-causing bacteria may also be found in polluted water supplies. Before chlorination of water supplies, cholera and typhoid were common diseases. While bacteria in the home water supply can be controlled, the amount of bacteria in open bodies of water is difficult to control. As rivers and lakes become increasingly polluted, the natural processes of purification are slowed down or halted. In time, serious epidemics could be caused by the use of untreated surface water.

## WATER POLLUTION - DEPRECIATING PROPERTY VALUES

Like air pollution, water pollution can cause property values to drop. Very few people want to own property that borders on stagnant, polluted rivers or lakes. Likewise, people don't want to live in areas where the water is unsafe to drink. Since property values depend on "supply and demand" and the demand for property containing polluted water is low, the value of that property is lowered proportionately.

## WATER POLLUTION - LOSS OF FISH AND WILDLIFE

Water quality has a great effect on the kinds and numbers of fish and other wildlife in an area. Polluted water can damage wildlife in several ways. First, many pollutants remove oxygen from the water. This suffocates fish and other aquatic organisms. Rivers and lakes that have a deficiency of oxygen become stagnant and smelly. This makes terrestrial wildlife like deer, racoons, foxes, etc., look elsewhere for living quarters.

Secondly, polluted water may contain chemicals which are poisonous to wildlife. Pesticides like DDT, endrin, and aldrin can build-up in wildlife to the extent killing them. Persons that eat oysters, fish, fowl, or game containing pesticides may become sick and die.

Thirdly, polluted water may contain disease carrying organisms. Viruses and bacteria that cause numerous human and wildlife diseases are found in polluted waters. Epidemics may wipe out large numbers of our wildlife.

## WATER POLLUTION - LOSS OF WATER RECREATION AREAS

Our oceans, rivers, streams and lakes provide many valuable opportunities for recreation. These bodies of water are used for water skiing, fishing, swimming, boating and skin diving. Most of us need to get away from the pressures of our busy lives. Unfortunately, because of increased pollution, our opportunities for water sports and recreation are becoming fewer and fewer. Many recreation areas have been abandoned because of pollution.

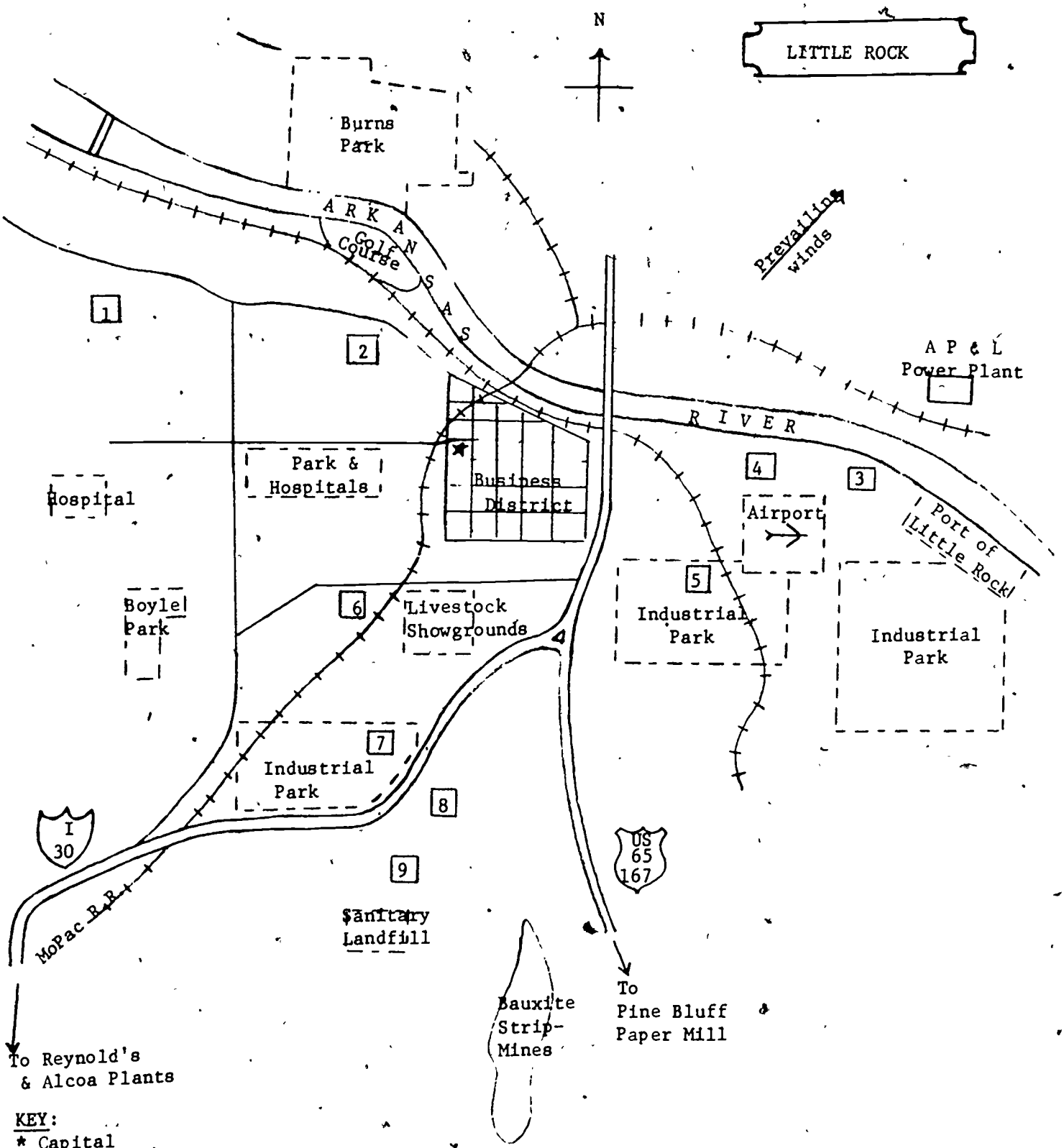
The recreation industry stands to lose a lot of money because of the closing of recreational facilities. People will spend less money on boats, fishing equipment, camping equipment, and related recreational goods if pollution forces them to stay home on week-ends instead of going on that camping, boating or fishing trip.

## URBAN POLLUTION - POPULATION EXODUS FROM THE CENTRAL CITY

Some 70% of all Americans currently live in an urban environment. By the year 2000, it is anticipated that approximately 245,000 residents of the United States will live in urban regions - an increase of slightly under 100% from the ubran population in 1960. While people are moving in mass to the cities, people in the inner cities are moving in mass to the suburbs, the outer fringes of the city.

Pollution in urban areas directly affects more people than any other single problem, largely because almost all varieties of pollution - air, water, land and noise - are found there.

The central city is plagued most with pollution problems. The noise, smog, litter and dilapidated buildings are more severe there than in the suburbs. Thus, people are moving out of the central city and finding a quieter more pollution free environment in the suburbs or rural areas.




KEY:

* Capital
1 Water Treatment Plant #1
2 Water Treatment Plant #2
3 Sewage Treatment Plant
4 Wrape Stave Company
5 A F C O
6 Finkbeiner's Meats
7 Brown's Meats
8 Big Rock Stone & Gravel
9 Stauffer Chemical Company

## LITTLE ROCK INDUSTRIES THAT PARALLEL THOSE IN GOMSTON

| | Little Rock Area | Arkansas |
|---|---|---|
| 1. Steel Mills | AFCO | |
| 2. Electric & Power Company | A P & L | |
| 3. Corn Processing Plant | Adkins-Phelps Livestock Feeds | |
| 4. Chemical Plant | Stauffer Chemical | Alcoa, Reynolds |
| 5. Petroleum Refinery | | South Arkansas Refineries |
| 6. Meat Packing Plant and Stockyards | Brown's, Finkbeiner's Livestock Showgrounds | |
| 7. Private Dumps | Sanitary Landfill | |
| 8. Transportation Industries | 1. Central Arkansas Transit<br>2. Little Rock Municipal Airport--various airlines<br>3. Port of Little Rock - barge traffic<br>4. MoPac Railroad | |
| 9. Lumber Mill | Wrape Stave Company | International Paper Company Pine Bluff |
| 10. Water and Sewage | 1. Little Rock Sewage Treatment<br>2. Little Rock Water Treatment | |
| 11. Coal Strip Mine | Bauxite Strip Mines | |
| 12. Limestone Quarry | Big Rock Stone & Gravel | |

| TYPE OF CITY GOVERNMENT | CITY | POPULATION |
|---|---|---|
| City Administrator | Fort Smith | 65,393 |

(The mayor is elected at large; 4 aldermen are elected for each of 4 wards and 3 aldermen are elected at large.)

1975 BUDGET SUMMARY

| FUNDS | REVENUES | APPROPRIATIONS |
|---|---|---|
| General | 3,758,900 | 3,834,990 |
| Street | 1,387,100 | 1,307,510 |
| Airport | 1,153,600 | 1,148,110 |
| Sanitation | 1,084,500 | 992,690 |
| Sewer | 1,432,400 | 1,442,620 |
| Water | 1,696,600 | 1,674,500 |
| Fed. Revenue Sharing | 890,000 | 820,000 |
| TOTAL | 10,583,100 | 10,400,420 |

NOT ONLY IS THIS THE 1975 BUDGET FOR FORT SMITH -- IT IS ALSO TO BE USED AS GOMSTON'S BUDGET -- AND IT IS TO BE COMPARED WITH BUDGETS FOR LITTLE ROCK, FAYETTEVILLE, MONTICELLO, AND STUTTGART.

# FORT SMITH 1975 BUDGET

## Anticipated General Revenues:

| | |
|---|---|
| **Government Agencies:** | |
| State Turnback | 614,700 |
| County Health Participation | 75,000 |
| Fed. Participation - Emergency Services | 10,000 |
| | $699,700 |
| **Taxes, Franchise & Related** | |
| Ad Valorem Tax | 489,200 |
| Franchise Tax | 650,000 |
| Privilege License | 400,000 |
| Mixed Drink Tax | 15,000 |
| | $1,554,200 |
| **Fines, Forfeitures & Parking** | |
| Municipal Court | 520,000 |
| Parking Meter Revenue | 45,000 |
| Parking Penalties | 20,000 |
| | $585,000 |
| **Licenses & Permits** | |
| Electrical Insp. Fees | 40,000 |
| Building & Insp. Fees | 35,000 |
| Plumbing Insp. Fees | 30,000 |
| Liquor License | 7,500 |
| Animal License | 6,600 |
| Fire Protection Contract | 6,000 |
| Beer License | 9,500 |
| Miscellaneous | 8,000 |
| Lunch Counter License | 7,000 |
| Soft Drink License | 1,800 |
| Taxicab License | 1,000 |
| Mixed Drink License. | 2,000 |
| License Penalties | 500 |
| | $154,900 |

| | |
|---|---|
| **Service Charges & Fees** | |
| Health Dept. Fees | 25,100 |
| Municipal Auditorium | 60,000 |
| Creekmore Park | 15,000 |
| Port Rental | 12,000 |
| Oak Cemetery | 6,000 |
| Animal Pound | 4,000 |
| | $122,100 |
| **Other Revenue:** | |
| Interest Earned | 7,000 |
| Photo & Certified Copies | 3,200 |
| Miscellaneous | 12,800 |
| | $23,000 |
| TOTAL REVENUE | $3,138,900 |
| **Inter-Fund Transfer:** | |
| General Rev. Sharing | 620,000 |
| Total Available Resources | $3,845,650 |
| **LESS EXPENDITURES:** | |
| Administration | 376,420 |
| Public Safety | 2,630,860 |
| Public Works | 134,110 |
| Community Services | 664,800 |
| Debt Service Requirement | 28,800 |
| TOTAL EXPENDITURES | $3,834,990 |

## Anticipated Sanitation Fund Revenues:

| | |
|---|---|
| Residential Coll. | 650,000 |
| Comm'l Coll. | 350,000 |
| Sanitary Landfill Chgs. | 72,000 |
| Interest Earned | 10,000 |
| Hauling Fees | 1,500 |
| Miscellaneous | 1,000 |
| TOTAL REVENUE | $1,084,500 |
| **LESS EXPENDITURES** | |
| Administration | 101,830 |
| Public Works | 112,760 |
| Comm. Serv. | 678,100 |
| Debt Serv. Req. | 100,000 |
| | $992,690 |

## Anticipated General Revenue Sharing

| | |
|---|---|
| **Revenues:** | |
| Fed. Grant | 740,000 |
| Interest Earned | 50 000 |
| Repayment from Sanitation Fund | 100,000 |
| | $890,000 |
| **LESS EXPENDITURES:** | |
| Transfer to Gen'l Fund | 620,000 |
| Transfer to Street Fund | 200,000 |
| | $820,000 |

# FORT SMITH 1975 BUDGET

## Anticipated Water Fund Revenue:

| | |
|---|---|
| Sale of Water | 1,271,900 |
| Contract Sales | 366,800 |
| Fire Protection | 17,200 |
| Sale of Meters | 6,200 |
| Installations | 5,500 |
| Service Charges | 9,000 |
| Interest Earned | 15,000 |
| Miscellaneous | 5,000 |
| Total Revenue | $1,696,600 |

LESS EXPENDITURES:

| | |
|---|---|
| Administration | 375,230 |
| Public Works | 805,550 |
| Debt Serv. Requirement | 493,720 |
| Total Expenditures | $1,674,500 |

## Anticipated Airport Fund Revenue:

| | |
|---|---|
| Sale of Gasoline | 800,000 |
| Office & Space Rental | 64,600 |
| Landing Fees | 75,000 |
| Airline Contracts | 100,000 |
| Flowage Fees | 35,000 |
| Aircraft Storage | 23,000 |
| Gas Royalties | 25,000 |
| National Guard | 20,000 |
| Interest Earned | 5,000 |
| Fixed Base | 3,000 |
| Sales Tax | 2,000 |
| Miscellaneous | 1,000 |
| Total Revenue | $1,153,600 |

LESS EXPENDITURES:

| | |
|---|---|
| Administration | 23,570 |
| Public Safety | 35,340 |
| Community Services | 1,062,700 |
| Debt Service Requirement | 26,500 |
| Total Expenditures | $1,148,110 |

## Anticipated Sewer Fund Revenue:

| | |
|---|---|
| Sewer Service | 1,355,400 |
| Sewer Connection Fees | 50,000 |
| Paid out Sewer Dist. | 1,000 |
| Interest Earned | 25,000 |
| Contract Tie-On | 1,000 |
| Total Revenue | $1,432,400 |

LESS EXPENDITURE

| | |
|---|---|
| Administration | 101,830 |
| Public Works | 715,790 |
| Debt Serv. Req. | 625,000 |
| Total Expenditure | $1,442,620 |

## Anticipated Street Fund Revenue:

| | |
|---|---|
| State Turnback | 1,020,100 |
| Ad Valorem | 150 000 |
| Interest Earned | 14,000 |
| Street Cuts | 1,500 |
| Miscellaneous | 1,500 |
| | $1,187,100 |
| Inter-Fund Transfer: Rev. Sharing | 200,000 |
| Total Available Resources | $1,405,170 |

LESS EXPENDITURES:

| | |
|---|---|
| Administration | 55,220 |
| Public Works | 1,252,290 |
| Total Expenditures | $1,307,510 |

| TYPE OF CITY GOVERNMENT | CITY | POPULATION | 1975 BUDGET SUMMARY |
|---|---|---|---|
| City Manager | Fayetteville | 32,000 | |

(The mayor is elected from the Board of Directors; seven people are elected at large to be directors.)

| FUNDS | REVENUES | APPROPRIATIONS |
|---|---|---|
| General | 1,372,721 | 1,657,495 |
| Public Works | 1,101,177 | 1,098,240 |
| Sanitation | 569,550 | 569,887 |
| Revenue Sharing | 507,000 | 600,000 |
| Total Operating Funds | $3,550,448 | $3,925,622* |

* There was a $782,607 balance from 1974 not reflected as carry over in the 1975 Budget. Therefore we need to add the $782,607 to the 1975 Revenues and then we will have for the total operation fund $4,333,055 and an ending balance of $407,433.

| TYPE OF CITY GOVERNMENT | CITY | POPULATION | 1975 BUDGET SUMMARY |
|---|---|---|---|
| City Manager | Little Rock | 169,700 (1972 Census) | |

(The mayor is elected from the Board of Directors; seven people are elected at large to be the directors.)

| FUNDS | REVENUES | APPROPRIATIONS |
|---|---|---|
| General * | 17,173,314 | 16,773,314 |
| Revenue Sharing | 3,390,000 | |
| Bonds & Interest | 1,900,000 | |
| Port Operation | 119,000 | |
| Model Cities | 1,151,089 | |
| Transit Co. City's Share of Operation (Rev. Sharing) | 300,000 | |
| Library | 548,700 | |
| Water | 3,522,245 | |
| Sewer | 1,729,840 | |
| Airport | 1,479,800 | |
| Advertising & Promotion | 754,639 | |
| Manpower Programs (2) | 2,515,590 | |
| | $34,584,217 | |

* LITTLE ROCK'S MUNICIPAL GOVERNMENT OPERATES ON A NUMBER OF INDIVIDUAL FUNDS. THERE ARE SEPARATE SUMS OF MONEY AND OTHER RESOURCES THAT HAVE BEEN ESTABLISHED TO FINANCE SPECIFIC ACTIVITIES. THE GENERAL FUND PROVIDES FOR MOST OF THE CITY'S DAY TO DAY OPERATIONS. OTHER INDIVIDUAL FUNDS FINANCE ADDITIONAL PROGRAMS SUCH AS WATER, SEWER, STREET AND FEDERALLY FUNDED PROJECTS.

| TYPE OF CITY GOVERNMENT | CITY | POPULATION | 1975 BUDGET SUMMARY |
|---|---|---|---|
| Mayor/ Council | Monticello | 5,085 (1970 Census) | |

| FUNDS | REVENUE | APPROPRIATIONS |
|---|---|---|
| Water | 303,600 | 303,500 |
| Sewer | 106,000 | 105,650 |
| Street | 139,600 | 139,300 |
| General | 283,350 | 283,350 |
| TOTAL | $832,550 | $831,570 |

| TYPE OF CITY GOVERNMENT | CITY | POPULATION | 1975 BUDGET SUMMARY | | |
|---|---|---|---|---|---|
| | | | FUNDS | REVENUE | APPROPRIATIONS |
| Mayor/ Council | Stuttgart | 10,477 | | | |
| | | (1970 Census) | Hall | 418,963 | 188,354 |
| | | | Police | | 135,987 |
| | | | Fire Department | | 75,881 |
| | | | Street | 205,000 | 204,150 |
| | | | S.W.M.S. | 213,372 | 213,135 |
| | | | Cain Park | 3,500 | 14,860 |
| | | | Bryant Park | 900 | 7,588 |
| | | | Mosquito | 26,784 | 26,000 |
| | | | TOTALS | $868,519 | $865,955 |

# SUGGESTED GOALS FOR THE SPECIAL INTEREST GROUPS

## FORESTRY AND WILDLIFE

Congratulations! You are members of the group representing the forestry and wildlife departments of the government.

More than any other group, you realize the dangerous threat to the survival of the fish and wildlife in and around GOMSTON because of environmental destruction. You should do as much as you possibly can to encourage the city of GOMSTON and the surrounding area to stop polluting the local environment.

Your goals as representatives of Forestry and Wildlife are:

1. To encourage and recommend a realistic plan to improve the environment in GOMSTON and the surrounding area.
2. To encourage immediate implementation of all workable solutions for the protection of the wildlife and forests.

P.S. Good Luck!

## AGRICULTURE AND LUMBER

Congratulations! You are representatives of the agricultural and lumber industries in the GOMSTON area.

As you know, many of your people harm the environment through a variety of ways. For example, the farmers pollute the water by using harmful fertilizers and pesticides which run into the rivers and streams when it rains. They use poor plowing techniques which cause much land erosion. The lumber mill is cutting many trees and not planting new ones to replace the trees.

Even though you must take action to resolve these problems by using new methods and techniques, it might be wise to draw attention away from yourselves by attacking the other groups for doing very little about their pollution.

Your goals as representatives of Agriculture and Lumber are:

1. To make a fair profit for distribution to your stockholders and to provide for future expansion.
2. To constantly improve the quality and quantity of the crops and/or lumber.

P.S. Good Luck!

## CHAMBER OF COMMERCE

Congratulations! You are members of the group representing local business and the professional people of GOMSTON.

The population movement from GOMSTON is increasing because of environmental pollution. You stand to lose many of your practices and businesses. It's extremely important that you take immediate steps to do something about the problem. Consider, too, the many ways which you contribute to pollution - the sale of phosphate detergents, the use of non-returnable bottles and other wasteful materials; many of which can be re-cycled.

As leaders of the community, you should speak out and try to convince the residents of GOMSTON and the surrounding community that pollution is very real and dangerous. You may want to encourage the local schools to include a course of study on ecology in the curriculum

Your goals as representatives of the Chamber of Commerce are:

1. To make a fair profit while recognizing your community responsibility for environmental improvement.
2. To alert the public to the dangers of pollution.

P.S. Good Luck!

## UTILITIES

Congratulations! You are representatives of the utility companies of the city of GOMSTON - gas, electric, water and sewage and telephone/telegraph.

As you know, your firms are causing much of the air and water pollution in and around GOMSTON. Even though you must resolve your pollution problems by installing new equipment and techniques, it might be wise for you to draw attention away from yourselves by attacking the other groups for doing very little about their pollution.

Your goals as representatives of the utility companies are.

1. To satisfy the demands of your customers.
2. To make a fair profit for distribution to your stockholders and to provide for future expansion.

P.S. Good Luck!

## COAL AND PETROLEUM

Congratulations! You are the representatives of the coal and petroleum industries in the GOMSTON area.

As you know, your companies damage the environment quite severely with your coal mining and oil pumping operations. In fact, you indirectly pollute the air when your products are burned as fuel by home owners for heating and cooking, by automobiles, by businesses, etc. Even

though you must resolve some of your own pollution problems through the use of new methods and techniques, it might be wise for you to draw attention away from yourselves by attacking the other groups for doing very little about their pollution.

Your goals as representatives of the coal and petroleum industries are:

1. To satisfy the demands of your customers.
2. To make a fair profit for distribution to your stockholders and to provide for future expansion.

P.S. Good Luck!

## STEEL AND CHEMICALS

Congratulations! You are the representatives of the steel and chemical firms in the GOMSTON area.

As you know, your firms are causing much of the air and water pollution in and around GOMSTON. Even though you must resolve your own pollution problems by installing new equipment and techniques, it might be wise for you to draw attention away from yourselves by attacking the other groups for doing very little about their pollution.

Your goals as representatives of the steel and chemical companies are:

1. To satisfy the demands of your customers.
2. To make a fair profit for distribution to your stockholders and to provide for future expansion.

P.S. Good Luck!

## TRANSPORTATION

Congratulations! You are representatives of the transportation industries in the GOMSTON area.

As you know, your firms are causing much of the air and water pollution in and around GOMSTON. In fact, your firms and the automobiles of the residents of GOMSTON cause about 65% of the air pollution. Even though you must resolve your own pollution problems by installing new equipment and techniques, it might be wise for you to draw attention away from yourselves by attacking the other groups for doing very little about their pollution.

Your goals as representatives of the transportation industries are:

1. To satisfy the demands of your customers.
2. To make a fair profit for distribution to your stockholders and to provide for future expansion.

P.S. Good Luck!

## GAP

## GROUP AGAINST POLLUTION

Congratulations! You are members of the local civic group in GOMSTON.

You, more than any other group, should demand immediate action to halt pollution in GOMSTON. After all, you and the other residents of GOMSTON may lose your homes and your property if environmental destruction continues. Put pressure on the Mayor of GOMSTON and the city council to take Action and Now!

Your goals as members of GAP are:

1. To encourage immediate action for the improvement of the environment of GOMSTON.
2. To help make GOMSTON a better place to live and work.

P.S. Good Luck!

## NEWS MEDIA

Congratulations! You are members of the group representing the news services in the city of GOMSTON.

You have the very important job of keeping the residents of GOMSTON informed of the discussions and the action taken in the city council meetings. You will keep a record of what happens at every meeting. Record the facts fast and accurately and then present them well on your news broadcasts and in your newspapers. If a tape recorder is available, tape a news broadcast. Remember, you are the eyes and ears of the people of GOMSTON!

Your goals as representatives of the news media are:

1. To quickly and accurately report the news in relation to pollution in and around GOMSTON.
2. To quickly and accurately report the actions of the various groups at the city council meetings.

P.S. Good Luck!

## STATE GOVERNMENT

Congratulations! You are members of the group representing the state government in the GOMSTON city council.

Even though you do not live in GOMSTON, the city is in your state. You are greatly responsible for the people in GOMSTON whom you represent. You must consider what you need to do to help the city of GOMSTON, such as enacting state laws against the causes of some of the pollu . Remember, whatever action you take could very well affect you in the next election.

Your goals as representatives of state government are:

1. To satisfy the greatest number of citizens (voters and taxpayers).

2. To improve conditions in the state in order to make it a better place to live, work and visit.
3. To improve the effectiveness of government at the state level.

P.S. Good Luck!

## GOMSTON CITY GOVERNMENT

Congratulations! You are members of the group representing the city government of GOMSTON.

You are very much responsible for the future of your city. Severe environmental conditions are destroying your city and it's time that you take some much needed action. You will have to work very hard to improve conditions in GOMSTON. You will also need to regain the confidence of the residents who lack faith in your ability to make GOMSTON a better place to live and work. Remember, election time will soon be here.

Your goals as representatives of the city government are:

1. To satisfy the greatest number of residents (voters) in GOMSTON.
2. To make GOMSTON a better place to live, work and visit.
3. To provide better leadership.

P.S. Good Luck!

## THE HONORABLE MAYOR OF GOMSTON

Congratulations! You are the Mayor of GOMSTON!

What happens to GOMSTON depends more on you than on any single person. You must maintain order at the city council meetings in such a way as to allow the ideas of the members of the council to be heard by all.

In addition to the goals of the city government, you must try to accomplish the following:

1. Maintain an atmosphere of order at the city council meetings that will allow discussion of the problems of pollution in GOMSTON and what can be done about them.
2. Use the power of your office to see that the situation of GOMSTON is improved.

Good luck, you'll need it!

## THE LOCAL GEOGRAPHER

You, the Local Geographer, do not have a voting option at the city council meetings. You simply act in an advisory capacity.

Your goals as the Local Geographer are

1. To use your knowledge of the situation and aid members of the city council in acting upon the feasibility of many of their ideas. Nothing is technologically possible in GOMSTON that is not possible anywhere else in the world.
2. Advise the Mayor on procedural matters.
3. Advise the various groups in possible matters of indecision and awareness.

P.S. Enjoy the simulation!

## REPRESENTATIVE COSTS FOR NEW FACILITIES AND OTHER CHANGES FOR GREATER GOMSTON

| | |
|---|---|
| Hydroelectric Power Plant (New) | - $2,000,000 (Trade in - $200,000) old plant |
| Recycling plant (paper & glass) | - $1,500,000 |
| Private dumps (Arbage's price - he will bargain) | - $77,000 each |
| Hospital addition | - $15,000,000 |
| Precipitators (factories) | - $200,000 each |
| Filters for autos | - $300 each |
| Bicycles | - $50 each |
| Electric automobiles | - $18,000 each |
| Move a steel plant in entirety | - $2,000,000,000 |
| Modern sewage plant (Tertiary Treatment) | - $2,000,000 |
| Low sulfur coal | - 3 times as expensive as the high sulfur coal from the mine near GOMSTON |
| Coal gasification equipment | - $500,000 per installation |
| Resident property taxes | - $2.62/$100 present assessed valuation |
| Resident vehicle taxes | - $4.00/sticker (present cost) |
| Trash compactor | - $300 |
| Jet engine anti-pollution device | - $20,000/engine |
| Nuclear power plant (with safety devices) | - $2,600,000 |
| Leaf collection truck (vacuum type) | - $82,000 |
| City garbage incinerator (ecologically acceptable type) | - $1,600,000 |

GOMSTON ROLE PLAYING ASSIGNMENTS

Time Required: 1 period (Day 8)

Purpose:
1. For students to analyze and assimilate information collected about Gomston.
2. For students to gain an understanding of the interaction and complexity of solving the problems of Gomston and all towns.
3. For students to gain an understanding of the interaction and conflict of values among individuals within an environment.

Materials Needed:

Provided by the project:
1. Research Game Plan for each student
2. Basic Principles of Parliamentary Procedure for each student

Provided by teacher and/or students:
1. aluminum pie tin
2. pliers
3. cotton rag
4. a string
5. piece of paper
6. peanut butter sandwich

Procedure:
1. Assign students to play a specific role (we realize that the state and city representative should be elected by the entire class and the other students should determine the role they want to play but to conserve time we are asking you to assign students to one of the eleven interest groups and one to be the mayor. You are to be the geographer.)
2. Distribute Research Game Plan to each student
3. Have students assemble in assigned interest groups and discuss what they want the city council to do about Gomston's problems, and what they think is needed to make this a better place to live.
4. Distribute Principles of Parliamentary Procedure to each student.
5. Have groups select one member as spokesman before the city council and one member as a city councilman. The councilman will be the voting member of the city council when they vote on day 13. He will have to vote according to the desires of the group he represents.

SOME POSSIBLE PROBLEMS:

a. An industry in Gomston is putting out great quanities of black smoke as a result of the burning of its waste products. (Remember, Gomston is located in a valley which means the smoke is not blown away easily - - - inversion.) A town group has been formed to stop pollution of the air. This group is complaining to the city council about the smoke problem.

The industry says it cannot afford to change its method of waste disposal. Other people in town oppose the control of the smoke because they feel it will discourage industry from moving to their city. They say this would prevent economic development.

b. The steel industry as well as other industries and business firms are disposing of hot process water into the river. Even a small increase in temperature can eventually destroy some of the fish and other organisms in the water. Less desirable species often proliferate. The rise in temperature will help deplete the river of the oxygen it needs in order to clean itself. And of course, the steel industry is only one culprit in Gomston.

c. If George Arbage continues his private dumps and the burning of the refuse, Gomston's plight will continue to deteriorate. To illustrate the multiple effects of burning garbage on individuals, a classroom, a school, and/or a city, try this experiment. Burn a cotton rag, a piece of string, a piece of paper and a peanut butter sandwich over an aluminum pie tin. (Be sure and hold with a pair of pliers and keep students at a safe distance.)

Research Game Plan

1. Each group has received the suggested goals for the special interest groups. Read the information on each group. This should be your "scouting report". It should give you an idea of the interests (vested?) of the other groups.

2. Each group should receive the group strategy sheet for his group only. This sheet will offer additional information on the goals of the group. Read the sheet and plan your strategy for the Town Council Meeting.

3. Examine the reference materials available. You may want to use additional reference materials in the school library during your study hall. It might be to your advantage to consult with some local authority concerned with you interest area.

   Learn as much about your area (and other areas if time permits) as possible. Any argument at the town council meeting will be weak if not backed up by considerable research.

4. Use the information you've obtained and your strategy plan to prepare for the first town council meeting. You must be convincing enough to "sell" the council members on your point of view.

5. On succeeding research days, seek additional information if needed, revise your strategy if necessary, and work out possible compromise solutions.

GOMSTON'S CITY COUNCIL MEETINGS

## BASIC PRINCIPLES OF PARLIAMENTARY PROCEDURE

1. Courtesy and justice to all
2. Consider one thing at a time
3. The minority must be heard
4. The majority must prevail

NOTE: Parliamentary Law is common sense used in a gracious manner.

## BASIC CHART FOR PROCESSING A MAIN MOTION OR RESOLUTION

1. A member secures the floor
2. A member introduces business
   Member makes a motion ("I move"), another member seconds the motion, and the Chair (Presiding officer - in your case the Mayor) states the motion, which opens the question presented to discussion.
3. The chair puts the questions to vote.
   Chair takes the affirmative vote; takes the negative vote; and must announce the result (carried or lost).

## BASIC RULES FOR THE MAYOR IN PROCESSING A MAIN MOTION

1. A member secures the floor
   Member rises, addresses you and gives name. Recognize the member by repeating the name and nodding to members.
2. A member introduces business
   Member makes a motion, another member seconds - if not at once you say, "Is there a second?" --if no second, "For want of a second, the motion is not before the assembly." (At least two members must express the desire by motion and second to discuss a question.) It has been moved and seconded that .....Is there any discussion?" You, the Presiding officer, must by a statement open the discussion BUT you do not discuss.
3. The chair puts the question.
   You wait until there is no more discussion, then you take the vote which you preface by "There being no further discussion the Chair will put the question to vote, those in favor will say "aye"..,those opposed will say "no"... the motion is carried (or lost)," as the case may be.

RESEARCH DAYS

Time Required: 2 periods (Days 8 & 9)

Purpose:

1. To acquire basic knowledge about pollutants and their sources.
2. To apply the problem solving technique to environmental problems.

Materials Needed:

Group Strategy Sheet

Procedure:

1. Give each interest group two copies of his strategy sheet.
2. Have each group plan its presentation before the city council.

STRATEGY SHEET

ENVIRONMENT - ORIENTED GROUPS: (Forestry and Wildlife; GAP)

Pollution is doing great harm to the city of Gomston, its people, and nearby wildlife. You are charged with the responsibility of seeing to it that the pollution stops, and soon, before it's too late.

Find out how plants and animals (and people) are affected by pollution. Find out who the main polluters in Gomston are and how they damage the environment. Use the problem solving approach to formulate solutions to the environmental problems of Gomston.

Plants and wild animals cannot talk. You are representing them. Don't let them down!

REMEMBER.....

A. Forestry and Wildlife:
   1. Water pollution effects contribute to the loss of fish and wildlife.
   2. There is a loss of water recreation areas in Gomston.
   3. Air pollution contributes to wildlife destruction.

B. GAP
   1. You believe that a clean environment is more important than a profitable industry in town.
   2. You also believe that the waste products being burned could be put to a valuable use.
   3. Most of your group do not depend on industry for their jobs.

STRATEGY SHEET

Chamber of Commerce:

You and your committee are in a real dilemma. You represent the business and industrial interests in Gomston. The businesses and industries are polluting the city, causing many people to move out of the city. When people leave the city, the businesses and industries lose customers.

It is your job to try to attract people and new industries to the city. You want to see the city grow, with new jobs opening up, new buildings being built and better services provided the people in Gomston. Pollution will not help you in your crusade to make Gomston a bigger, better, and richer city. But remember, you must keep the interests of the people you represent in mind, and these are the same people who are polluting the city.

Use the problem solving approach to try to find possible solutions to the environmental problems of Gomston. Keep in close contact with the groups you represent. Try to find solutions that would benefit these groups and the city as a whole.

STRATEGY SHEET

PROFIT-ORIENTED GROUPS: Agriculture and Lumber, Utilities, Coal and Petroleum, Steel and Chemicals, and Transportation

Learn as much about your interest group (agriculture and lumber, etc.) as possible. You must have facts favorable to your group to serve as a defense in the city council meeting if another group attacks you.

At the same time, be realistic. How does your group damage the environment? What can you do to minimize the pollution your group causes? How much will this cost? Remember, you're in business to make as much money as possible, so don't agree to any solutions that would cause bankruptcy.

Your problem is how to make as much money as possible without damaging the environment excessively. Use the problem solving approach to establish several ideas for solutions to this problem. Bargain with the other groups at the city council meeting to ensure a compromise solution that will still allow you to make a profit and satisfy the demands of your customers.

REMEMBER.....

A. Agriculture & Lumber:
   1. Gomston lies mainly in the flood plains.
   2. There is a lumber mill south of the business district and near the river.
   3. Occasionally there are southerly winds moving airborn pollutants over and through the city.
   4. Adverse farming conditions in surrounding areas.
   5. Farm land is heavily charged with silt, pesticides, herbicides, and phosphate compounds.

B. Utilities:
   1. The electric and power company depends on the burning of high sulfur coal for power production.
   2. The electric and power company, as well as other business firms and industries located on the river, disposes of hot water into the river causing what is known as Thermal Pollution.

C. Coal & Petroleum:
   1. The coal strip mine is northwest of the interstate.
   2. The petroleum refinery is northeast of the interstate.
   3. Both are located on railway lines.

STRATEGY SHEET

News Media:

A good newsman knows what he's talking about. If you're to give good news broadcasts, you need to study the pollution problems of Gomston. Who's causing the pollution? What effect does it have on the city? Investigate these questions, and report on them - fairly.

You should report the results of all town council meetings in your newspaper. Interview members of various committees to get their ideas on environmental problems in Gomston and any progress that's being made to solve them.

You should be gathering information each day to include in your radio (tape recording) broadcast the 13th day of the unit. If any member of the news media has a polaroid camera, he can take photographs to be included in a poster of news events. You have a big job. You must keep the people well informed of news happenings.

STRATEGY SHEET

State and City Government:

Investigate the pollution problems in Gomston. You are responsible for the future of your city and state. It is up to you to determine what city and state laws need changed, strengthened, or enacted to help solve the pollution problems of Gomston.

You want to get rid of pollution. Remember, though, you are elected by the people. Any action you take could possibly affect your chances for re-election.

In town council meetings you should suggest laws that might help solve some of the environmental problems of Gomston. Use the problem solving approach to formulate possible solutions (laws) to these problems.

CITY COUNCIL MEETING

Time Required: 3 periods (Day 10, 11, & 12)

Purpose:

To aid students in learning to work together in making compromises and arriving at solutions beneficial to the majority.

Procedure:

Before Class:

1. Make sure the Mayor is aware of parliamentary procedure.
2. Arrange 13 chairs in a circle. This is for the Mayor, the representative from each group and the geographer.

During Class:

1. Distribute name tags from Comston Game to representatives in circle.
2. Have the Mayor call the meeting to order.
3. Call CAP representative to speak and proceed until all groups have been heard. At this point everyone will seem to be pointing his finger at the others.
4. After listening to the representatives from the different interest groups, the city council should come up with a list of priorities - - a list of what it is going to act upon first, second, etc.
5. At the end of Day Eleven (the second day of the City Council Meeting) have the Mayor congratulate all groups on their presentation of factual information, but ask them to go back to their groups and perfect their solutions and make necessary concessions for final presentation before the council on Day 12.
6. Voting during first half of Day 13.

NEWS MEDIA SUMMARY PRESENTATION

Time Required: ½ period (last half of day 13)

Purpose:

1. For students role playing members of the news media to observe the interaction within and among groups during a time of decision making.

2. For students to report factually the events leading up to the city council meeting, the meeting itself and the results of the votes.

Materials Needed:

Depends on whether the student wants to represent the Newspaper, TV, radio or a news magazine.

Procedure:

1. Encourage students to decide the means of reporting the events to the class.

2. Have students present to the class members at the beginning of each period the results of the activities the day before.

3. Remind students representing the news media they are to present a complete summary of Day 13.

REVIEW AND SUMMARY

Time Required: 1 Period (Day 14)

Materials Needed:

1. Filmstrip: Beer Can By The Highway (12 Min.)
2. Filmstrip Projector

Procedure:

1. Clarify any confusion the students might have concerning the decision-making process.
2. Make sure the students understand the concepts of trade-offs, special interest and conflicts.
3. Show filmstrip
4. Discuss filmstrip using booklet that accompanies Beer Can By The Highway.
5. Remind student of post test tomorrow.

## APPENDIX

1. Pre-Test and Post Test Instructions.
2. Pre-Test (Including answer and Tally Sheet).
3. Evaluation Instructions.
4. Student Evaluation Form (Including Tally Sheet).
5. Teacher Evaluation Form.

PRE-TEST / POST TEST

**Time Required:** ½ Period (Day 1 and 15)

Procedure:

1. Project the Map of Gomston transparency
2. Distribute pre/post test.
3. Have students write on their own paper.
4. Collect answer sheets and all tests.
5. Return test to Environmental Education office.
6. Record students correct responses. (e.g., if John Doe makes 7 out of a possible 20, then on the tally sheet record the 7 beside John's name.)
7. After the post test is given and the correct responses are recorded for each student, send the completed Pre-test/Post Test Tally Sheet to the Environmental Education Office.

TEST

ENVIRONMENTAL EDUCATION UNIT

NINTH GRADE-CIVICS

Write the letter of the answer that best answers the question.

DO NOT WRITE ON THE TEST.

1. Which of the following is a likely result of the air pollution caused by the Electric and Power Plant?

   a. contaminated ground water
   b. a fish kill
   c. depreciated (lower) property values
   d. outbreak of hepatitis (liver disease)

2. Which of the following best illustrates the poor long range planning by city developers in the location of the Electric & Power Plant?

   The location of the plant:
   a. on the river where it can pollute the water.
   b. so that westerly winds can spread air pollution over the city.
   c. only a few miles from the central city.
   d. so that the source of fuel, the coal strip mine, is six miles away.

3. Which of the following is not a likely effect of water pollution on aquatic life?

   a. depletes their oxygen supply.
   b. is toxic (poisonous).
   c. transmits disease carrying organisms.
   d. causes respiratory ailments.

4. If water and sewage plants provide secondary treatment to Gomston's waste water, what percentage of the organic pollution is removed?

   a. 90%
   b. 100%
   c. 30%
   d. 75%

5. Gomston strip mines for high sulfur coal. What material is strip-mined in Central Arkansas?

   a. low sulfur coal
   b. bauxite
   c. iron ore
   d. limestone

6. Which of the following methods is most widely used to dispose of solid waste in Little Rock?

   a. city dump
   b. sanitary landfill
   c. incinerator
   d. recycling

7. Which is the greatest source of air pollution?

a. internal combustion engines
b. electric power plants
c. industrial manufacturing plants
d. chemical manufacturing plants

8. Temperature inversions contribute to

a. water pollution
b. air pollution
c. solid waste pollution
d. noise pollution

9. Which of the following facilities in Gomston is most likely to cause a water pollution problem?

a. North garbage dump
b. West garbage dump
c. Valley Park Race Track
d. Shopping center

10. Which of the following is not a primary reason for most of Gomston's industries locating on the river?

a. the river can be used as a sewer in which to dump waste products.
b. the industry can be served by river barges.
c. the water current turns turbines which furnish power to the factories.
d. the river water can be used to cool machinery used in the factories.

11. In an air inversion situation, what is the condition of the air above the location of the inversion?

a. colder air forms a lid over warmer air.
b. warmer air forms a lid over colder air.
c. cold air is mixing with warm air.
d. warm air is mixing with cold air.

12. The sequence of steps used in the problem solving method is

a. (1) making decisions
(2) considering alternatives
(3) identifying problems
(4) formulating hypotheses

b. (1) formulating hypotheses
(2) considering alternatives
(3) identifying problems
(4) convincing others

c. (1) investigating problems
(2) making decisions
(3) formulating hypotheses
(4) considering alternatives

d. (1) identifying problems
(2) formulating hypotheses
(3) considering alternatives
(4) making decisions

13. Gomston contains approximately 75,000 people and has transportation problems. Many people believe that in the future they will have to depend upon mass transit rather than the private automobile for much of their transportation (because of energy consumption, air pollution, and parking space problems). The Central Gomston Transit Authority is a step in this direction. In order to expand mass transit in the Gomston area, more money would have to be spent by the Federal, state and/or local governments. The central Gomston Transit Authority would promote all of the below except.

a. expand and improve the present bus system.
b. build subway and/or above ground railways.
c. build more highways and parking facilities for private cars.
d. restrict the use of private automobiles for certain areas in Gomston and/or during certain hours.

Read the paragraph below and use.

Arkansas contains approximately two million people. Little Rock has approximately 165,000. Arkansas Power & Light Company ( A P & L) has proposed a new coal-fired power generating plant just south east of Little Rock at Redfield. They plan to burn low-sulfur coal brought to the White Bluff plant by rail. There is a question as to the amount of sulfur dioxide that will be emitted into the atmosphere. ACORN, a civic group concerned with a quality environment, has submitted arguments to the Public Service Commission against the proposed plant at Redfield.

14. Which of the below arguments would ACORN not use?

a. no estimates have been made of the hidden economic loss due to crop damage but visible damage has been estimated.
b. the life of buildings and equipment in severly polluted areas will be reduced to about 2/3 that of materials in areas of average pollution.
c. sulfur dioxide increase chronic respiratory disease and adds to the risk of chronic bronchitis.
d. the installation of sulfur dioxide is not economically feasible.

15. In which of the following areas would the "special" interest of A P & L fall?

a. economy
b. pollution control
c. safety
d. conservation

16. Which of the following would have the least effect on solving the pollution problems of a modern city?

a. include in the price of a product the cost of reclaiming and recycling it.
b. provide tax relief to various industries that stop polluting the environment
c. pass municipal laws and ordinances against pollution with exemptions for industries that might lose money through compliance.
d. organize public awareness groups to remind the residents of their own harmful practices and habits.

ENVIRONMENTAL EDUCATION

NINTH GRADE CIVICS

Test Answer Sheet

NAME: _____

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____

NINTH GRADE CIVICS

TEST KEY

1. c
2. b
3. d
4. a
5. b
6. b
7. a
8. b
9. a
10. c
11. b
12. d
13. c
14. d
15. a
16. c

Tally Sheet

Pre-Test and Post Test Scores

Ninth Grade Civics

School _____ Teacher _____

Number of students in class _____ Date _____

| Student's Name | Pre-Test Score | Post Test Score | Do Not Write in This Column |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| 12. | | | |
| 13. | | | |
| 14. | | | |
| 15. | | | |
| 16. | | | |
| 17. | | | |
| 18. | | | |
| 19. | | | |
| 20. | | | |

## EVALUATION

Time Required: ½ Period (Day 15)

Procedure:

1. Distribute to each student a copy of the Student Evaluation.
2. Have student respond.
3. Collect sheets and tally response on Student Evaluation Tally Sheet.
4. Return Student Evaluation Tally Sheet to the Environmental Education Office.
5. Complete Teacher Evaluation and return the form to Environmental Education Office.

School _____ Teacher _____ Date _____

# STUDENT EVALUATION
# ENVIRONMENTAL EDUCATION UNIT
# NINTH GRADE CIVICS

| | YES | NO |
|---|---|---|
| **A. Overall Program** | | |
| 1. Did you enjoy studying this unit? | ___ | ___ |
| 2. Do you feel that the unit was worthwhile? | ___ | ___ |
| 3. Do you feel that you now know more about your environment and its problems than you did before studying the unit? | ___ | ___ |
| 4. Did it increase your desire to want to help in trying to improve your environment? | ___ | ___ |
| 5. Did you learn about some actual ways that you can help in improving your environment? | ___ | ___ |
| 6. Would you like to study another unit about the environment in one of your classes next year? | ___ | ___ |

B. Activities - To what extent did you find the following activities interesting?

| | Very Interesting | Interesting | Dull |
|---|---|---|---|
| Classroom Activities: | | | |
| 1. Film: Mark the one you saw<br>a) Which Is My World<br>b) Inquiry into the American Wildlife<br>c) Man's Effect on the Environment. | 1. a) _____<br>b) _____<br>c) _____ | _____<br>_____<br>_____ | _____<br>_____<br>_____ |
| 2. String Problem | 2. _____ | _____ | _____ |
| 3. Our Town Worksheet | 3. _____ | _____ | _____ |
| 4. Gomston Game<br>(a) Small group work<br>(b) City Council Meeting | 4. _____<br>_____<br>_____ | _____<br>_____<br>_____ | _____<br>_____<br>_____ |
| 5. Filmstrip: Beer Can By The Highway | 5. _____ | _____ | _____ |

C. Materials - Rate the following according to the amount of help they were to you in learning the material in the unit.

| Classroom | Very Helpful | Helpful | Little or No Help |
|---|---|---|---|
| 1. Introductory Film | ____ | ____ | ____ |
| 2. String Problem | ____ | ____ | ____ |
| 3. Our Town Worksheet | ____ | ____ | ____ |
| 4. Gomston Game | ____ | ____ | ____ |
| 5. Concluding Filmstrip | ____ | ____ | ____ |

D. Suggestions for Improvements:

School _____ Teacher _____ Date _____

TALLY SHEET FOR STUDENT EVALUATION - NINTH GRADE CIVICS

| Question | Student Response | |
|---|---|---|
| | YES | NO |
| A. | | |
| 1. | ____ | ____ |
| 2. | ____ | ____ |
| 3. | ____ | ____ |
| 4. | ____ | ____ |
| 5. | ____ | ____ |
| 6. | ____ | ____ |

| | Very Interesting | Interesting | Dull |
|---|---|---|---|
| B. | | | |
| 1. | ____ | ____ | ____ |
| 2. | ____ | ____ | ____ |
| 3. | ____ | ____ | ____ |
| 4. | ____ | ____ | ____ |
| 5. | ____ | ____ | ____ |

| | Very Helpful | Helpful | Little or No Help |
|---|---|---|---|
| C. | | | |
| 1. | ____ | ____ | ____ |
| 2. | ____ | ____ | ____ |
| 3. | ____ | ____ | ____ |
| 4. | ____ | ____ | ____ |
| 5. | ____ | ____ | ____ |

D.

School _____ Date _____

# TEACHER EVALUATION
# ENVIRONMENTAL EDUCATION UNIT
# NINTH GRADE

| | YES | NO |
|---|---|---|
| **A. Overall Program** | | |
| 1. Do you feel that the unit was effective in your class? | ✓ | ✓ |
| 2. Did the activities used in the unit adequately cover the major concepts? | ___ | ___ |
| 3. Were the objectives relevant to the concepts and the activities in the unit? | ___ | ___ |
| 4. Were the objectives realistic? | ___ | ___ |
| 5. Do you feel that most of these objectives were achieved in your class? | ___ | ___ |
| 6. Was the material used relevant to the student and his local environment? | ___ | ___ |
| 7. Did you have enough time for the unit? | ___ | ___ |
| 8. Omitting the time factor, was the schedule easy to follow? | ___ | ___ |
| 9. Were the resource materials provided adequate? | ___ | ___ |
| 10. Were your classroom facilities adequate for the activities used? | ___ | ___ |
| 11. Was the teacher's guide adequate? | ___ | ___ |
| 12. Did you receive adequate assistance from the project staff? | ___ | ___ |
| 13. Do you feel that your students have become more aware of their environment and its problems? | ___ | ___ |
| 14. Can you see any carry over into the student's activities outside the classroom? | ___ | ___ |
| 15. Has there been any carry over in other subjects that you teach or that the student's have? | ___ | ___ |
| 16. Do you feel that this unit should be continued next year? | ___ | ___ |

B. Effectiveness of Program Components

Please rate the effectiveness of the following components.

| AREA | Very Good | Good | Fair | Poor |
|---|---|---|---|---|
| 1. Introductory film | ____ | ____ | ____ | ____ |
| 2. Environmental Decisions | ____ | ____ | ____ | ____ |
| 3. Our Town Study Sheet | ____ | ____ | ____ | ____ |
| 4. Gomston Game | ____ | ____ | ____ | ____ |
| a. transparency | ____ | ____ | ____ | ____ |
| b. information packet | ____ | ____ | ____ | ____ |
| c. role-playing | ____ | ____ | ____ | ____ |
| d. group strategy sheet | ____ | ____ | ____ | ____ |
| e. city council meetings | ____ | ____ | ____ | ____ |
| 5. Beer Can By The Highway filmstrip | ____ | ____ | ____ | ____ |
| 6. Pre-test and post-test | ____ | ____ | ____ | ____ |
| 7. Student evaluation | ____ | ____ | ____ | ____ |
| 8. Teacher evaluation | ____ | ____ | ____ | ____ |

C. Suggestions:

1. What suggestions do you have for improving the unit?

2. Comments.