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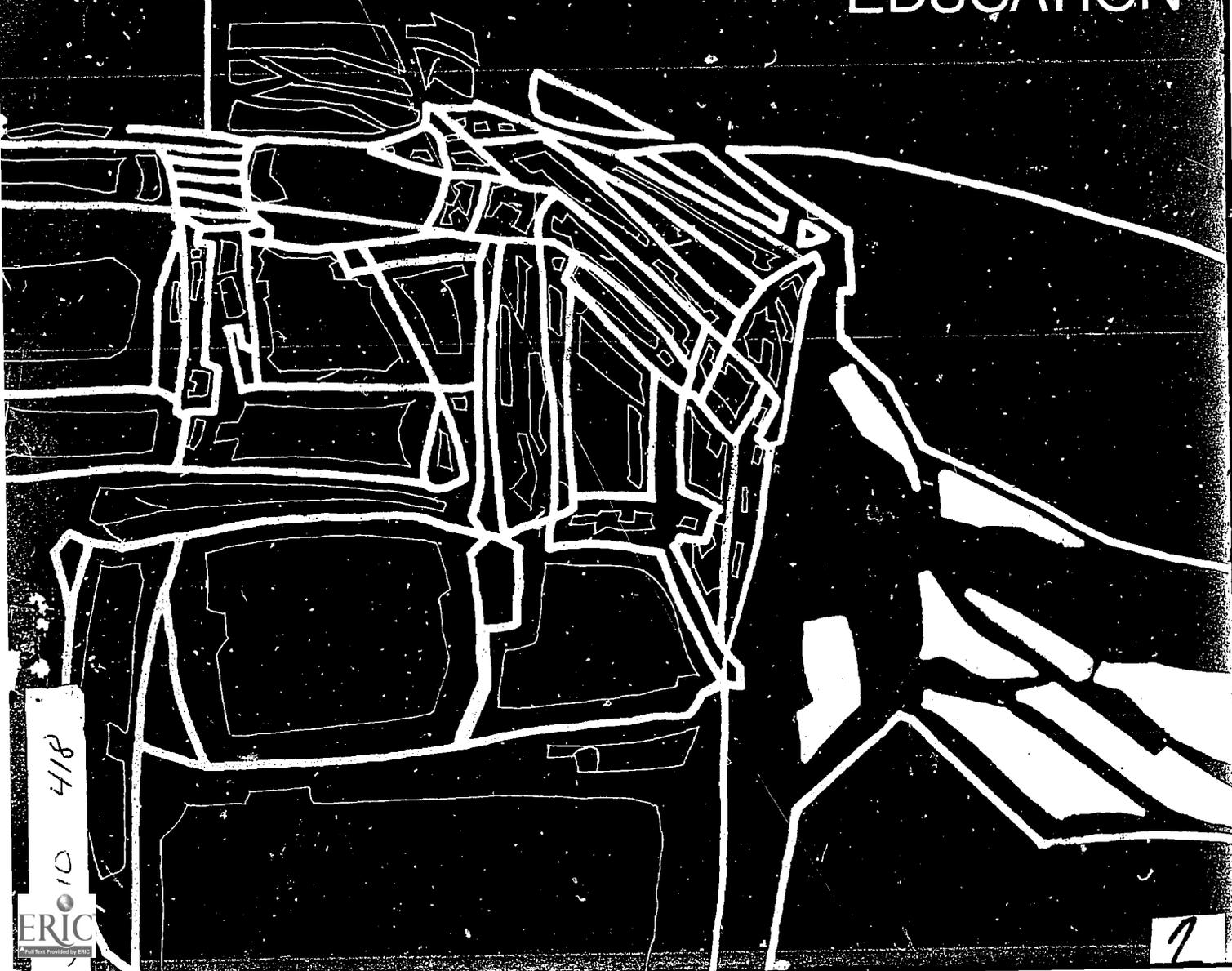
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ABSTRACT

This guide has been prepared as an aid to the teacher in organizing classroom experiences designed to focus on man and his environment. It serves to identify resources for use in stimulating student interest, to broaden their comprehension and their environment, and attain conceptual understandings. The initial section provides an orientation and definition of environmental education -- what its goals are and how they might be achieved. Subsequent sections receiving emphasis are ecosystems, natural resources, pollution, and environmental decision making. Within each area a unifying theme is selected and important concepts set forth. Each theme and group of related concepts is followed by background information. In addition, free and inexpensive books, films, filmstrips, records, tapes, booklets, units, pamphlets, and other resources are included under each area. [Page 32 is of questionable reproducibility.] (BL)

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TEACHERS GUIDE FOR environmental EDUCATION



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TEACHER'S GUIDE
FOR
ENVIRONMENTAL EDUCATION

Prepared by

THE TASK FORCE ON ENVIRONMENT AND NATURAL RESOURCES
in cooperation with
THE NORTH CAROLINA DEPARTMENT OF PUBLIC INSTRUCTION

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1970

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We must also recognize the Steering Committee of The Task Force on Environment and Natural Resources for offering guidance in the organization of this publication.

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P.B.H.
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PREFACE

If we are to provide present and future generations of North Carolinians with knowledge and skills to make and implement decisions which result in a quality environment, our schools must embark on a comprehensive interdisciplinary environmental education program that will span the curriculum, grades K - 12.

Realizing that such an endeavor is monumental, staff members of the Task Force on Environment and Natural Resources have cooperated with staff members of the State Department of Public Instruction in preparing this guide.



A. Craig Phillips

September 1970

State Superintendent of Public Instruction

CHAPTER I

A BEGINNING
A MEANS TO ~~AN END~~

INTRODUCTION

This guide has been prepared as an aid to the teacher in organizing classroom experiences designed to focus on man and his environment. It is a result of an intensive study of environmental education by the Task Force on Environment and Natural Resources.

An initial section has been included to provide the reader with an orientation to what precisely environmental education is; what its goals are and how they might be achieved. Subsequent sections of the guide have been organized according to these areas, identified by the Task Force, which should receive emphasis. They are: Ecosystems, Natural Resources, Pollution, and Environmental Decision Making. Within each area a unifying theme has been selected and important concepts set forth.

Each theme and group of related concepts is followed by background information included to bring the teacher up to date on some of the more recent findings related thereto. This information is also meant to stimulate the teacher to do personal research in each area.

In addition, free and inexpensive books, films, filmstrips, records, tapes, booklets, units, pamphlets and other resources have been included under each area.

It is hoped that the teacher will add other resources as they are discovered. Spaces have been left for the convenience of the teacher for this purpose.

The Task Force on Environment and Natural Resources feels that this guide can be an aid to the teacher in identifying resources

for use in stimulating student interest as they broaden their understanding of their environment up to and including conceptual understanding.

This guide is not a teacher. It must be used by a teacher and class prepared to go beyond the material in a textbook, to seek answers to the "why" and "how" rather than the "what" of our environment.

ENVIRONMENTAL EDUCATION: A DEFINITION

There probably are as many different definitions of environmental education as there are teachers. Cognizant of this fact, the Task Force on Environment and Natural Resources set forth the following definition. It has been followed in the preparation of this resource guide.

For the purposes of this guide environmental education is defined as education dealing with the relationship between man and his bio-physical environment and is aimed at producing a citizenry which: is aware of environmental interrelationships and processes; understands how to solve environmental problems that arise; and is motivated to work toward their solution.

It includes the study of: ecology and the interaction of events in the natural world which effect the quality of life; environmental contamination and enhancement of natural areas; as well as the impact of technology and human population on our environmental heritage.

ENVIRONMENTAL EDUCATION: OBJECTIVES

Educational objectives fall into two categories, general and behavioral. Both are essential to the development of an effective environmental education program.

General objectives help to establish the aims, goals and directions of a program. Behavioral objectives, on the other hand, are a clear statement of specific behavioral changes which the teacher is attempting to bring about in students through instruction and participation in the appropriate activities.

The following general objectives for environmental education in North Carolina have been set forth:

1. To obtain a clear understanding that man is in a symbiotic relationship with his environment.
2. To obtain a broad understanding of the inter-relations among ecosystems and natural resources.
3. To develop an understanding of man's environmental problems and the decision-making skills to cope with them.
4. To develop attitudes which will foster involvement by youth in combating environmental problems.

More specific behavioral objectives should be developed by teachers as they organize for teaching-learning experiences about the environment. Formulation of such objectives is essential to the development of an effective environmental education program.

ENVIRONMENTAL EDUCATION: THE "HOW"

In planning and organizing classroom and school activities in environmental education it is imperative that educators be cognizant of the many new developments and changes in science teaching. These include current trends, guidelines for quality teaching, ways of organizing classroom learning experiences and the setting up of environmental education programs within a school.

TRENDS

There have been, in recent years, several prominent changes in science teaching which today could be thought of as emerging trends. There is overlaying and interrelatedness between them, but all are significant and should be considered when planning and organizing environmental education programs for both classroom and school utilization.^{1,2}

Emphasis on the "Why" of Science

In years past, the emphasis in science teaching was placed upon the "what" or factual knowledge of science. Educators have, however, in recent years, redirected the idea of facts as the foci of education. There were many reasons for this new orientation. Primary among them, however, were:

1. The rapid explosion of scientific knowledge or information. Every five years, in many science areas, new findings outdate previous "truths."
2. The expanding computer industry. It has been predicted that by the year 2000, man will be beginning to live in symbiotic relationships with computers.

Such events as the aforementioned, make it evident that knowledge of facts, while beneficial, is not necessary, particularly since today's "true facts" may be "tomorrow's falsehoods" and since past and current knowledge may be stored in an electronic brain. They also reveal that a movement away from an emphasis upon "facts" was, and is, inevitable.

Instead, the trend is to utilize man's capabilities as "thinkers," to encourage him to seek the answers to the "why" behind the "what." In other words, science should be taught as an intellectual pursuit. In this manner, it allows education, as Bruner states, "to not only take us somewhere, but allow us to go further, more easily."³

In seeking the solution to the "why" of a scientific phenomenon, the learner, indirectly, learns the "what" of science. He also learns more, for this approach enables the student to learn how to think as a scientist, the ways and approaches of a scientist, and the attitudes of a scientist.

Such an approach to science instruction facilitates transfer or carryover of this process to other subject areas. Thus, this trend could affect the total school curriculum of each pupil.

The most important aspect of this trend, however, is that through seeking the "why" of phenomena, learning becomes a process of self-directed, self-discovery. In other words, it becomes personalized. It can facilitate a student's becoming totally involved in finding answers to problems, rather than having answers described to him for memorization.

The "what" of learning does not facilitate continual learning. However, through educating the learner to seek the "why" of his environment, continuous learning can be enhanced and perpetuated.

Greater Student Involvement in the Teaching-Learning Act

When a student is involved in determining "why," then he, in all likelihood, is an active, rather than passive learner; one, that is, who is involved in seeking solutions to problems rather than in causing them. If a student is totally involved in the teaching-learning act, then he will "discover" solutions to problems. He will be engaged in the process of scientific inquiry. He will become curious. He will learn how to devise, improvise, and utilize in the same manner as a scientist. When he is involved in the teaching-learning act, he learns as a scientist learns; that is, from firsthand experiences. Teachers should be cognizant of the fact that unless a student is familiar with, understands fully, and engages in learning activities similar to those of a scientist, he will not, in all probability, come to "know" science, to think scientifically and acquire the attitudes, skills, and competencies of a scientist.

As students become involved in the teaching-learning processes, and subsequently, come to understand and know science to a greater degree, they also begin to "feel" and experience success. This, in turn, fosters a desire for further learning and involvement. It also enhances the student's feelings about himself as a person and a learner. Thus, greater student involvement in the teaching-learning act is essential if students are to truly learn science and become more adequate learners and persons.

Emphasis Upon "Problem-Solving" Rather Than "Problem-Doing"

For years the term "problem-solving" has reverberated in educational circles. Its virtues have long been extolled by science educators. In

many instances, however, what actually has taken place is not "problem-solving," but "problem-doing;" that is, "cookbook" science; science experiments which follow specific, detailed, step-by-step instructions; and which, if done correctly, lead the experimenter to prepackaged solutions already determined for him.

The current trend has problem-solving being actually that. Such an approach to learning results in an open-ended type of investigation; that is, one in which the solution of one problem leads to the creation of one or more additional ones. The problem is "attacked" or approached in a variety of ways. Numerous resources and many texts are utilized. In other words, a variety of processes, skills, competencies and materials are utilized. Thus, through "true" problem-solving, the student also learns the attitudes and methods of a scientist. In addition, he learns how to acquire and utilize knowledge.

Utilization of a Multiplicity of Learning Materials

Funds made available through the Elementary and Secondary Education Acts for purchasing learning aids and materials have enabled educators to take steps toward making learning more lifelike.

The timing of this act could not have been more appropriate, particularly in light of the impact the various media such as television, movies, magazines, billboards, and music were having upon youth. Each of these media appealed to one or more of the senses. By using part of the money received for purchasing a multiplicity of learning aids and materials, educators have taken measures to insure that school, and learning, are more lifelike. Through the utilization of a variety of materials, with different

characteristics, teachers have been both able to make learning relevant, and to appeal to a variety of senses and approaches. Thus, by incorporating a multiplicity of learning aids and materials in teaching, learning can become more than just dull, dry routine which appeals to only one sense, sound, and one approach, telling.

The utilization of a variety of teaching aids and materials facilitates the processes of true problem-solving for it allows the learner to go to a variety of sources in search of solutions to problems. By appealing to a variety of senses, involvement of students can occur more readily. More important, however, it makes the teacher's task of providing for individual differences among students less difficult. One type material, or aid, might appeal to one pupil, but not to another. By incorporating a variety of materials and resources, each student's needs can be more readily met. Needless to say, this trend is a healthy one.

Emphasis Upon Individualized Instruction

The phrase "individualizing instruction," like problem-solving, has been, for years, in the educator's vocabulary. By many it has been considered "educational jargon," the ultimate, the educator's utopia, and practically nothing else. This may be true. However, with today's innovation reformation in education, many instructional, electronic and architectural changes are helping to transform this "dream" into reality.

The instructional changes which are fostering this event include independent study programs, non-graded or continuous progress programs, programmed learning and modular scheduling.

Advancement in the area of electronics has brought improvements in some of the tools or "hardware" of teaching; thus, making it possible for the teacher to better individualize selected aspects of instruction. Tapes, tape recorders, copy machines, microfilm readers, opaque projectors, filmstrips, films, simplified techniques of transparency development, computers, records, record players, slides, slide and overhead projectors have enabled teachers to find new means of reaching pupils. With the increased federal, state and local funds for education and mass production techniques, it is conceivable that the above electronic devices, instruments and materials will be available in greater quantity and to a greater number of teachers than ever before.

Also, various architectural changes are bringing needed improvements to the space in which teaching and learning take place. No longer is the four walled "Quincy Box" type classroom considered suitable for science teaching. New facilities reveal a more flexible type physical structure which may be changed as needs dictate. In addition, they provide more adequate, better planned and fully equipped laboratories and classroom space.

Changes in length of class periods, scheduling on the basis of purpose and need, pupil programs based upon maturation, interest and achievement, varied instructional tools and new physical arrangements will not, themselves, bring about individualization of science instruction by teachers. However, they will provide teachers with the opportunity to better individualize and will facilitate its actually happening. Such changes are making it possible for teachers to have the freedom to organize their teaching for individuals and small groups

rather than continually large groups. Such innovations have, and will continue to make it possible for teachers to utilize a problem-solving approach to science teaching, and allow for greater involvement of students in the teaching-learning act. In so doing, teachers will be providing greater opportunities for students to experience success in school and to develop adequate concepts of themselves as individuals.

Individualizing of instruction will not reach fruition overnight even with instructional, electronic and architectural changes. However, a good beginning has been made. Science teachers should ask themselves how they fit into this trend and what they are doing in light of the above changes. This is necessary because they represent the link which allows for individualization to actually work in practice. As this is done, the trend toward individualizing instruction will become an ever increasing force in the nation's schools.

Emphasis Upon the "Structure" of Science

With the publication of Jerome Bruner's book, THE PROCESS OF EDUCATION, in 1962, educators began to utilize its ideas regarding the "structure" of a discipline when planning their science programs. Simply stated, the structure of a discipline is those fundamental, underlying concepts or principles which "tie" or "hold" a discipline together. Thus, to grasp the structure of a subject is to know how things are related.⁴

For example, the structure of life science to one scientist might be:

All living things are characterized by orderly structure and function, both physically and chemically.

Traits are perpetuated from generation to generation and changes in plants and animals are initiated through the mechanism of heredity.

All living things have evolved from similar primitive origins into the varied complex of today's modern world and are constantly undergoing change.

Living things show similarity in the execution of life processes.

When the structure of a discipline has been identified, it is easier for both teacher and student to "see" the interrelationships and relatedness of it.

This emphasis upon the structure of a discipline has had a profound effect on curriculum development in science. Many of the new curricula studies in science have gone through the ordeal and process of identifying the basic structure of their respective disciplines.

Bruner suggests that teaching the structure:

1. Makes a discipline more understandable and comprehensible.
2. Allows for greater comprehension of detail.
3. Fosters transfer of learning.
4. Facilitates narrowing the gap between advanced and elementary knowledge.

It could be stated then, that the emphasis upon understanding the structure of a discipline encourages a pupil to develop a way of looking at, or thinking about, a subject. It encourages him to look for relationships in other science areas. Thus, as one learns the structure of a science discipline, he, in like manner, learns to examine that discipline in the same manner as a scientist.

Emphasis Upon Open-Ended Evaluations

Concurrent with the trend to individualize instruction is a movement toward open-ended evaluations. Typically teachers have used quizzes or tests as a means of evaluating pupil progress. Due to factors such as lack of time, large pupil-teacher ratios, teacher background and experience, these forms of evaluation, in many cases, have been factually oriented. For example, one question on a recent science test given in a junior high school read, "Electricity comes from _____ and _____." All pupils were given the same test and were expected to come up with identical answers. There is, however, a movement away from this type of evaluation to one in which all pupils are not expected to have the same answer, which is not factually oriented, which is dependent upon each child's abilities, and is of a problem-solving nature.

This trend away from factually oriented evaluations was influenced by the work of perceptual psychologists Maslow, Combs, and Rogers and their research findings and writings regarding self-concept. Essentially, they brought to the forefront the effect failure or success has upon the self-concept of pupils. For example, if a child has been given factual type quizzes and he does not make satisfying or adequate scores, after repeated failure, he comes to feel or believe that he cannot pass a test or learn. Thus, he develops a negative attitude toward learning and school. On the other hand, if he has been successful on factual type tests he goes into a test with self-confidence, assurance, and in all probability, will succeed on it. The problem is, however, that not all pupils can or will memorize facts.

The thinking of the perceptual psychologists is that all students in a class do not perceive a question in the same manner. Each student comes from a different background, has had different experiences; thus, all students will not perceive the same test question in a similar manner. In addition to this point, if one of the important elements in education is for students to be able to apply knowledge, a factual type evaluation would not be conducive. An open-ended type of evaluation makes allowance for individual differences, backgrounds, perceptions, and, at the same time includes questions which foster problem-solving or application type evaluations. For example, suppose a science class has been studying the cell. Rather than giving a quiz with questions such as, "What is the mitochondria?"; "Draw and label a typical cell;" or "Define deoxyribonucleic acid;" a teacher might utilize a quiz of a different nature. An appropriate quiz question could be, "Compare the organization or structure of the cell to the structure or organization of society in the United States." This type question requires that each pupil possess knowledge of the cell and its working. However, at the same time, it is of a problem-solving nature, requires application, transfer of knowledge, is open-ended and flexible enough to allow for individual differences and abilities among students in the science class. Rather than being forced to memorize and regurgitate facts about the cell, students would be encouraged to compare, draw relationships and make inferences. In other words, they would be learning to think critically while engaging in an evaluation exercise.

If the emphasis in teaching is on seeking the "why" of science, involvement of students in the learning act, upon problem-solving and

individualizing of instruction, then evaluations must be of the same nature. An examination or quiz of only a factual nature would reflect a great inconsistency.

Emphasis Upon Self-Concept Development

In recent years, educators have come to the realization that not only are they teaching science; they are teaching students-- human beings with feelings. These feelings vary with the individual. However, all possess feelings about themselves as persons and as learners. Although not the only force making this apparent, the 1962 ASCD yearbook PERCEIVING, BEHAVING, BECOMING helped to bring about the increased attention to the importance of facilitating the development of adequate self-concepts in students.

Through research it has been shown that usually students who do not possess adequate perceptions of self feel that they are less capable or adequate than their peers.^{6,7,8} This, of course, leads to an accompanying lack of achievement and self-respect. Cognizant of current research findings in this area and aware of the implications which they have for the learner, educators have become increasingly concerned with providing learning experiences which foster the development of adequate self-concepts in students.

In a classroom atmosphere in which the student has learned to accept himself, he will want to learn science. On the other hand, if he cannot accept himself as a person and learner, he will not learn. If a classroom lends itself to student involvement, pupil-performed laboratory work which is characterized by a variety of experiments utilizing varying abilities and interests, and individual pupil assignments in

lifelike situations students will, in all probability, experience success in learning. This, in turn, will foster or manifest feelings of adequacy on the part of the learner.

Emphasis Upon Development of Values

Louis E. Raths, and associates, in their book, VALUES AND TEACHING, state that there are too many children in schools who do not learn as well as they might because they are unclear about what they value.⁹ Possibly this is due in many instances, to the conflicts between the values of the home and those of the school. For example, in the lower socio-economic stratum of society, there is probably little or no value placed upon academic success. Rather, because of the struggle for existence and survival, the outstanding value held is one of economics.

What, then, does this mean for teachers? It does not mean that teachers should proceed to give moral lessons, force their value structures on students, or require students to memorize lists of desirable values. The meaning for teachers appropriately is answered in the 1962 ASCD Yearbook. It states:

In general, this means that we must find ways of creating school and classroom atmosphere which facilitates the process of exploration and discovery of personal meaning-- where there can be a freeing, expanding and changing of perception. Students need to have many choices; when they discover something of interest, they need to have plenty of time to work at it. Self-selection in an environment rich in materials, where students sense that how they feel and what they think are important, can be extremely effective in helping students to become more fully functioning. Through acceptance and trust, particularly, teachers play a strategic role in this learning process. 10

What implications does the above hold for teachers of science? Simply, that a classroom atmosphere must be provided which allows for

flexibility, freedom to experiment, to follow discovered science interests, with sufficient time and variety in materials to enable students to become involved in relevant learning situations to the extent that they discover who they are and what is important. In addition, there must be acceptance and trust by the teacher of each pupil. Unless this is forthcoming, the whole process will, in all probability, be fruitless.

The emphasis upon the development of values is a desirable trend. Moreover, it is closely interwoven and interrelated to the other trends cited in this paper. Hopefully, if all are implemented, each will facilitate the success of the other.

GUIDELINES FOR QUALITY ENVIRONMENTAL TEACHING

How does an individual learn? That, of course, depends upon one's views on learning and his philosophical and psychological orientation. To one person, it may be a process of self-growth; to another, a process of social interaction; and to still another, a process of physical interaction. To one, learning might not result in overt changed behavior; to another, it is the only way to determine if learning has taken place.

The Task Force on Environment and Natural Resources feels that learning is a process whereby, through active experience, a person changes or develops new insights and understandings as he gains an increasing awareness of himself and his psychological environment. He obtains this understanding through a combination of three complimentary, interrelated processes. They are:

1. Differentiation - Process by which a person learns to perceive or discover more specific facets of himself and his environment. For example, what were once kittens came to be cats, lions, and tigers.
2. Generalization - Process by which a person learns to group a number of objects or functions under one heading. Through the differentiation of different experiences, a person may develop a generalized concept. For example, through the process of differentiation, one might divide the physical world into animal, vegetable, and mineral.
3. Restructurization - Process by which a person learns to make greater and better sense of himself and his world. Thus, it is the way in which one sees various relationships. As a person develops, he becomes a better thinker.¹¹

For learning, as defined above, to take place, certain factors or ingredients are necessary. They are necessary if successful and meaningful learning is to take place.

Acceptance

Before meaningful learning can take place in the classroom, there must be full acceptance by the teacher of the learner. This does not mean acceptance of the fact that the teacher will be with the student for an entire academic year. Rather, it means true personal acceptance,

that is, acceptance with respect, trust, and understanding and with all his weaknesses and strengths.

Because each learner is continually striving for independence, acceptance, and self-identity, he needs to have someone in whom he can confide, who values him as a person, who accepts him, and who is interested in what he has to say, in what he does and how he does it. When a teacher takes time to be a "person" and not someone with a facade, then a trusting and accepting relationship can develop.

A student learns more than science in the science classroom. He learns who he is. If a teacher views him as one to be trusted and accepted, as one with worthy ideas, then the learner gains trust in his teacher, as well as himself. Trust and acceptance breed trust and acceptance. If a classroom possesses such an atmosphere, then dialogue and meaningful learning will take place.

If, on the other hand, the teacher is not a "real person," the student will see the facade and lack of acceptance. This only conveys to him that he is not considered acceptable to others, and in particular, the adult world.

Not only does acceptance affect the learner's sense of adequacy as a person, it provides a basis or framework upon which the teacher can better diagnose learning problems and identify needs, interests and abilities of each student. Through the dialogue which occurs with acceptance, teachers can better find out what is on a student's mind, what is of utmost importance and of little significance.

It should be evident, then, that when acceptance is manifest in the science classroom, learning becomes purposeful, meaningful, but most important, "personalized."

Involvement

An old Chinese proverb, attributed to Confucius, goes something like this:

I hear, and I forget.
I see, and I remember.
I do, and I know.

How true this proverb is today for those of us who are responsible for directing or guiding learning, particularly, in the light of recent evidence about student learning. We know that students learn ten percent of what they hear; twenty-five percent of what they simultaneously see and hear; and over seventy percent when they become involved in "doing" in order to learn. This, however, does not mean doing for the sake of doing, but rather, doing with purpose. Morris perhaps could have been giving meaning and elaborating on Confucius' proverb when he stated:

The learner in school must be encouraged to identify with his subject matter, to identify with it emotionally so that he can announce a personal reaction to it. The teacher's function is to arouse the learner intellectually, spiritually and emotionally. Arousal in the learner will quicken his inner senses to perceive what his learning materials are saying to him; the affective centers of "sensation" will then be in a better condition to react to the materials themselves. For it is in the reaction, and not in the materials, that knowing and learning really take place.

Therefore, in every subject matter a real effort must be made to involve the learner directly. He must get personally tangled up in the subject matter.¹²

This means, of course, that not only must each early adolescent be individually interested in what he is doing in class, but he must also be aware of why he is doing it. Only with this knowledge

of purpose will he be able to transfer individual and group experiences in the classroom to a developing awareness of self.

Involvement allows the learner to understand what is before him, to analyze it so as to see relationships between it and past experiences. It facilitates his evaluating his own purposes and perceptions in the learning situation.

By involving the student in learning, the teacher does not develop the subject matter to fit the student, but rather the student to the subject matter. It is through involvement in learning that the learner is better able to determine who and what he is. Thus, not only does involvement facilitate learning, but it also assists the learner in his quest for identity.

Relevance

Meaningful learning only takes place when it is relevant to the student's needs. That is, when it provides meaning to him in terms of his own needs, abilities, interests, perceptions and purposes. In other words, to provide for meaningful learning teachers must begin with the learner and not the subject matter of science. Any student only learns what he wants to learn. Therefore, if the teacher wants to facilitate desirable learning, he must relate it to the student's goals by providing classroom experiences which will satisfy his purposes. Counts makes evident and clarifies the extent of relevancy when stating:

If learning is to proceed at all, the attention of the learner must be assured and his attention can only be secured through a direct or indirect appeal to his interests. These interests must be utilized

to the fullest extent, but they cannot be accepted as positive and trustworthy guides in selecting the content of the curriculum. They constitute the raw materials and determine the conditions of education, but they cannot furnish its goals. They reveal the present psychological position of the learner; they do not indicate the direction in which he should move. Until we have found the child's interests we have not found him -- he is still lost in the educational backwoods.¹³

It is evident that, in most cases, meaningful learning must be stimulated through initial experiences which whet the appetite of the learner for learning by appealing to his interests, purposes and goals. When this is done, the teacher is beginning with the student, and not subject matter. Unless the teacher makes every effort to do this, he will find that the learner will be "turned off". He may be learning, but it will not be of a meaningful nature. Instead, it, more than likely, will be of a frustrating or degrading nature. He will learn that school is a bore, that he cannot learn, that because he cannot discuss Bernoulli's Principle that he is inadequate. Thus, the learner's whole attitude toward science, toward himself as a person and learner is dependent upon how well his interests are aroused and to the extent they meet his needs and abilities as a person. If the teacher is to assist the learner to a complete awareness of self, if he is to help him become more positive and purposeful, then he must relate science to the individual's needs, interests and abilities.

Problem-Solving

For years the term problem-solving has been tossed about educational circles as a desirable method of learning. Unfortunately,

however, for too long it has been thought of as formalized step-by-step process including the following:

1. Statement of the Problem
2. Gathering of Data
3. Analyzing Data
4. Formulating Hypotheses
5. Testing Hypotheses
6. Drawing Conclusions

Rigid use of this method resulted not in problem-solving, but in problem-doing. Creativity, critical thinking and scientific attitudes were not fostered by this structured approach.

Meaningful learning begins with a problem to be solved, but rather than rigid, controlled steps, it involves exploration and discovery of numerous approaches to the solution by the learner. It means bringing together all pertinent facts needed to solve the problem. It means searching for materials. It involves collecting and recollecting a variety of materials, facts and ideas. It means organizing, reorganizing, evaluating, reevaluating, accepting, rejecting, seeking and searching. It means finding out for one's self by taking things apart and putting them back together.

In other words, problem-solving is not a rigid, structured method. Rather, it is an approach to creative and critical thinking which results in learning. It allows for involvement of students based on needs, interests, and abilities.

Just as no two scientists go through the same identical steps to solve a problem, neither do any two students. Whereas one student

might go through certain procedures and activities to arrive at a conclusion, another student might utilize other means to obtain similar findings. In other words, problem-solving means open-endedness. It does not mean sameness. It means investigating natural phenomena by pupil-derived methods, not "cookbook" methods. It involves a certain degree of uncertainty. This is because the solution of one problem should lead to the formulation of new unanswered questions.

Through the utilization of a problem-solving approach to learning, the intellectual processes of inductive and deductive reasoning are facilitated. The former allows for intellectual reasoning from specific facts to generalizations, the latter from generalizations to specifics. Both are necessary for creative and meaningful solutions to problems. However, inductive reasoning must be considered as allowing for greater flexibility in thought and approach to solutions. Thus, it is more oriented toward, and conducive to, problem-solving.

All students want to learn, whether they admit it or not. It is up to the teacher to provide experiences in which the early adolescent is involved in seeking solutions to problems which are relevant to his needs, interests and abilities. If this is done, his horizons will broaden and his understandings possess greater depth. Thus, meaningful learning will have taken place. More important, however, such experiences will create more needs, interests, desire and thirst for further learning.

Variety of Learning Activities and Materials

If student involvement, relevance and problem-solving are to characterize the processes of learning undertaken by the early adolescent,

then there must be variety in both learning activities and materials. The activities and materials, however, must be relevant to his abilities, skills, needs and interests.

When one stops to consider how learning takes place outside of the classroom, then it becomes immediately clear why variety is essential for meaningful learning. Prior to entering school, each of us, according to some psychologists, learned fifty percent or more of all we will ever know. The startling thing, however, is to consider how we learned. In thinking about it, you would have to admit we learned through a variety of activities-- experimenting, manipulating, making things, watching television, films, movies, listening, discussing, asking questions and role playing with peers, just to mention a few. Yet, in some instances, by the time school age is reached, it is assumed that learning can only take place through listening. This is completely contradictory to the way we know people learn best. Thus, if learning is to be truly meaningful for the student, the teacher must provide a multiplicity of activities.

Through the utilization of a variety of individual, small, and large group activities, learning can be facilitated. Such activities might include pupil-performed laboratory exercises, demonstrations, panel discussions, interviews, debates, dramatizations, field trips, television programs, projects, drawings, research papers, book reviews and reports, surveys, reading assignments, making charts, graphs, models, writing plays, skits, setting up exhibits and others. Activity, small group, individual, or large group, must not be done for the sake of activity, but as it relates to the purposes of the learning experience for the learner.

There should also be variety in instructional materials. Pictures, maps, paintings, cartoons, posters, periodicals, prints, slides, filmstrips, records, tapes and supplementary books are just a few of the type materials which should be utilized. It must be remembered, however, that materials utilized should be in keeping with the purposes of the learning activities.

The science teacher should not provide the learner with meaningless repetition of the same experience. Rather, the teacher should encourage him to solve the same problem using a number of different activities, approaches, and materials.

When learning is characterized by variety of activities and materials, then the teacher is present only as a guide, stimulator of thought and resource person. When such learning activities as those described above are taking place then "real" problem-solving rather than problem-doing is taking place. As the learner seeks the solution through problem-solving he learns to disregard unrelated, unauthoritarian, irrelevant data. Thus, he learns how to think critically. He learns how to be independent. Through activities with peers he learns how to get along with others. By finding solutions to problems he experiences the success which is so important in self-concept development.

Success

Equally important and essential for meaningful learning to take place is a feeling of success on the part of the learner. Success is a very effective motivator. The learner who has experienced success, in most instances, will approach a new learning experience with eagerness, confidence and a desire to learn.

The learner who has not succeeded, however, will resist, or fail to participate for fear of further failure. Teachers must make sure that students have opportunities to excel. In doing so, they will assist each student in developing a positive self-concept and the feelings of worth and dignity which accompany it.

The more successful the learner is, the more accepting and open to experience he becomes. When he has experienced success, he is more likely to become a better student, have a more positive attitude toward learning science, and toward his peers, himself, his teacher and his school.

If each student is truly accepted by the teacher for what he is, if he is involved in solving relevant problems characterized by variety in instructional activities and materials, then he will experience success. It is the duty of the teacher to provide him such opportunities.

ORGANIZING FOR TEACHING AND LEARNING ABOUT THE ENVIRONMENT

Since the days of the Latin Grammar School, teachers have been organizing for teaching-learning. From the Herbartian Method to Unit Teaching, educators have recognized the need for some way of organizing for learning. The term most in vogue today is unit teaching. When teachers are asked what they are teaching, they, in most cases, will indicate or reply "a unit on _____." In reality, however, many times such a unit is nothing more than a chapter, chapters, or sections in a textbook. Usually, when this approach is taken, the student is little more than a passive learner and the teacher a dispenser of facts. The classroom is teacher-dominated.

The Task Force on Environment and Natural Resources prefers another approach to organizing for teaching-learning; that is, through the use of an instructional guide. An instructional guide allows for the creative designing of teaching-learning experiences. It is advantageous to both teacher and student. It enables the teacher to determine where he is headed and how he is going to get there. It forces him to focus on and plan learning experiences for and with each individual student. It is flexible enough to incorporate additional learning activities as problem-solving takes place. It provides not only day-by-day plans for teaching, but also long-range plans.

Preparation and use of an instructional guide encourages the teacher to give direction and unity to his environmental education program. It allows a course to be centered around the structure of a discipline. Moreover, it is a written framework upon which goals, objectives, concepts, problems, activities, resources and evaluation may be set forth.

It should be noted, however, that an instructional guide is not a teacher. It can be an aid to the teacher in stimulating interest in students so as to broaden their conceptual understandings and to stimulate critical thinking. It is an attempt to introduce environmental problems and set forth logical approaches leading to solutions by the class. It provides a plan of action to make the science classroom a working laboratory in which the answers to "why" and "how" rather than "what" are sought.

At the beginning of the school year, each teacher should outline, or set forth, his scope and sequence in science. He then should

prepare, on paper, an initial instructional guide. It should incorporate activities which are related to the concept or concepts which will be studied at the beginning of the school year. It should be flexible enough to allow, and provide for activities planned cooperatively between teachers and students. Subsequent, instructional guides should be developed as a result and outgrowth of the initial one. If an instructional guide is always used and the activities implemented, then, in all probability, the classroom will be a laboratory with the teacher present only as a guide or resource person. Problem-solving skills will be learned by students individually, and in small and large groups because the activities listed in an instructional guide are oriented toward finding solutions to problems through a variety of instructional approaches. Through engaging in such activities, changes in attitudes will, hopefully, also take place.

Organization of the Instructional Guide

The components or parts of the instructional guide are closely related. Their suggested sequence, given below, is a logical one in that certain sections must precede others. However, as the instructional guide becomes implemented, there may be divergence at the experience phase as problem-solving is undertaken. The various sections or stages of the instructional guide are listed below. The developmental sequence which might be followed in preparing an instructional guide is:

- I Identification and statement of the concept to be studied.
- II Explanation of the significance of the concept.
- III Statement and introduction of the problems to be studied.

- IV Proposed objectives.
- V Introductory or motivating experiences.
- VI Learning experiences:
 - A. Large group.
 - B. Small group.
 - C. Individual.
- VII Guides to conclusions and application.
- VIII Resources and teaching aids.
- IX Evaluation.
 - A. Tests.
 - B. Attitudes.
 - C. Skills.

DESIGNING A SCHOOL OR ADMINISTRATIVE UNIT
ENVIRONMENTAL EDUCATION PROGRAM¹⁴

In developing an environmental education program, at any level, it is recommended that certain procedures be followed. Utilization of these guiding principles will insure that a sound environmental curriculum is designed and implemented. The following steps and procedures should be utilized.

Developing the Program

- a. A set of guiding principles that should be included in an environmental education program must be established.
- b. The existing school instructional programs should be examined for the purpose of identifying environmental elements in the existing curriculum.
- c. Identification should be made of ways to link the various subject matter of the curriculum so as to provide the desired continuity and progression in the program.

- d. Identification should be made of ways to integrate the various disciplines related to an environmental curriculum.
- e. An organizational structure must be developed which would facilitate the integration of environmental understandings into the existing framework of a school or administrative unit.

Preparation of Materials

- a. Content material on themes and concepts identified must be developed for each grade level.
- b. Selection should be made by teachers of the content material from the curriculum to be integrated into their program.
- c. Materials, visual, manipulatory, and written. must be developed for use at each grade level.

Preparation of Teachers

- a. In-service training workshops for elementary and secondary teachers must be provided.
- b. Teachers should be provided with information on current environmental issues, in addition to the substantive material mentioned in the preparation of materials.

Evaluation of the Program

- a. An evaluation should be made of the program in terms of its purposes, goals, and objectives. It should be both quantitative and qualitative in nature.
- b. All levels of persons should be involved in evaluation efforts. This includes teachers, principals, coordinators, supervisors, assistant superintendents in charge of curriculum, parents, and students.

CHAPTER II

ECOSYSTEMS

ECOSYSTEMS

Man is in desperate need today of help in relating himself to a world that every day becomes less and less inhabitable. He is a natural creature. Yet, he needs help in recognizing his natural heritage. He has created a civilization that has the illusion of escaping the biotic environment of other natural life forms. His environmental problems may stem from a sense of lost participation with these natural balances. However, we cannot escape from the natural laws that govern us. Our lives are inextricably interwoven into that thin blanket of life that covers our planet. Our civilization continues to ignore its heritage. Environmental education should, first of all then, present the basic relationships that exist between man and his bio-physical environment. Such principles and concepts can form the factual basis for understanding how the environment works and for evolving one's own approach to the problem of identity with his environment.

Perhaps no other discipline gives man the tools for such an undertaking as Ecology. The word, formed more than 100 years ago by Ernest Haeckel, freely means "the study of the home." It is the intent of this introduction to present some understanding of the ecological relationships which exist between organisms and their environment. Such relationships do not exist independently. On the contrary, they are manifested in a physio-chemical setting of biotic and abiotic substances. Many of the basic elements and compounds comprise part of the inorganic network. Coupled with a spectrum of organic substances and the by-products of a living system, the two help form the chemical

framework of ecological systems. In addition, the physical factors and gradients such as amount of moisture, currents, wind, heat, light and solar radiation influence all aspects of the environment. Against this abiotic background the biotic components,-- plants and animals, interact in an energy-dependent role. Thus, the term ecosystem encompasses the abiotic, chemo-physical environment and the biotic, plant-animal environment of an ecological system.

The ecosystem concept is perhaps the most fundamental of ecology. Ecosystems exist in the real world. A field, a stream, a pond, or an aquarium is a real entity within our environment. The term is also a scientific construct that allows man to systematically study real systems and develop a schematic approach to understanding the functioning of that observed system.

Regardless of the size and diversity of many of the real ecosystems one encounters, there appears to be a combination of similar biotic and abiotic components. There are certain functional and structural relationships that can be recognized and it is in this direction that this introduction will proceed.

Of primary importance is the recognition that the similarities of ecosystems lie in two major principles. The first involves the consideration that any ecosystem owes its origin and continued existence to an initial influx of energy. Radiant energy from sunlight is the ultimate source for any ecosystem. This light energy is required for photosynthesis. During this process carbon dioxide along with water is synthesized into energy-rich carbon compounds, carbohydrates. Organisms responsible for this activity are considered producers or synthesizers. They are generally

the simple chlorophyll-laden plants such as pond algae, field grass, and forest trees. To a lesser degree some bacteria are capable of carbohydrate synthesis. However, such synthesis requires the existence of already existing organic compounds. In addition, a third type of producer may include the chemosynthetic bacteria which can obtain energy through the oxidation of simple inorganic compounds. This third form of producer is insignificant in the total energy factor of a system. Its significant role is developed later in the removal of nutrients from the ecosystem.

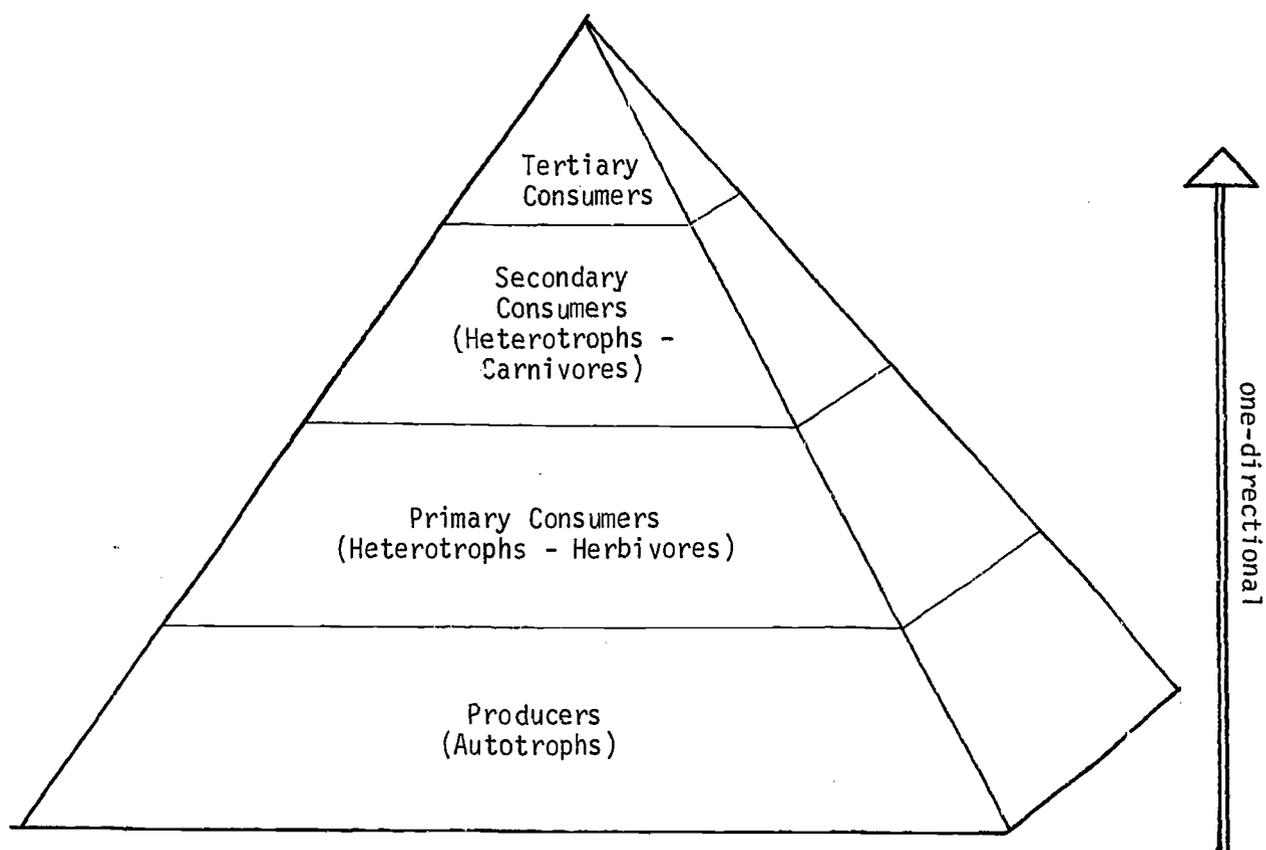
As indicated above, producers are carbohydrate producers. They are the initial converter of the sun's radiant energy into chemical energy. The producers' own nutritional needs are met by its own synthesizing efforts. For that reason, ecologists speak of such producers as autotrophs (self-feeders).

There are other members of the ecosystem that cannot supply their own metabolic needs. These nutritional needs are thus met by feeding upon other organisms. Ecologists refer to such organisms as these heterotrophs (other-feeders). Heterotrophs that feed directly from plants are called herbivores. Since they are the first heterotrophs to which the energy-laden carbohydrates pass they are often referred to as primary consumers. Later in the food pyramid, the primary consumer becomes the food supply of a carnivore, or secondary consumer. Again, the energy passes from one organism to another. One carnivore may feed upon another, extending the food pyramid and introducing tertiary and quaternary consumers.

The energy captured by photosynthesizing grass serves as the food base for the field mouse. That same mouse later serves as the food base for the owl. In this pyramid, the grass is the producer, the

Figure I

FOOD CYCLE



mouse a primary consumer, a herbivore, and the owl a secondary consumer, or a carnivore.

As can be seen in Figure I, the relationship between producer (autotroph) → primary consumer (heterotroph, herbivore) → secondary consumer (heterotroph, carnivore) is really the movement of energy through the ecosystem. This energy flow is non-cyclic and one-directional. A little energy is lost at each transfer along the pyramid, and some of it is used in the normal metabolic activity of the organism. However, the recognition of the directional energy flow is one of the more important principles in the concept of the ecosystem.

A second form of heterotrophic organism consisting of mainly bacteria and fungi are referred to by ecologists as decomposers. Their primary function is not the consumption of food. Rather, through a complex system of enzyme activity, they have the capacity to degrade and later ingest dead plant and animal material. Through their decomposing activity, the elements and compounds bound in the organic remains are released and allowed to return to the environment where they will be available for reuse by more producers.

Although the above energy release mechanism appears to be one-directional, through decomposition the movement of the elements and compounds appears to be cyclic. As carbon dioxide, water, and the essential trace elements of nitrogen, phosphorus, and magnesium are incorporated into organic matter by the producer, they become bound by the energy available to the system. As the energy is transferred from producer to consumer, the elements are transferred and pass through all the succeeding levels to the decomposer. Although there appears to be

a progressive decrease in the amount of energy along the food chain, the nutritional component is not diminished. On the contrary, it may even be concentrated in certain steps along the chain.

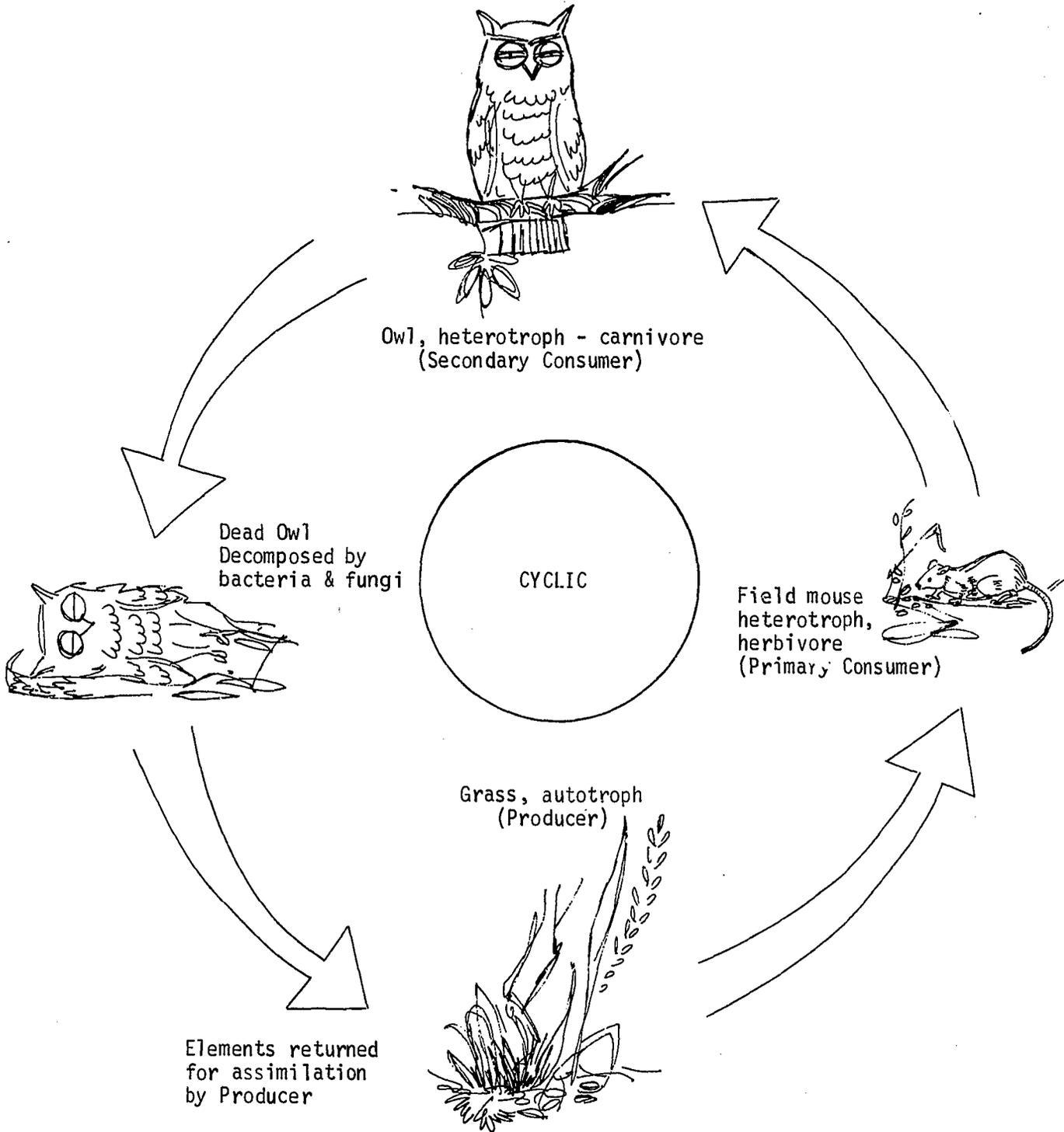
In the final analysis, the nutrients are not lost as is energy. As can be seen in Figure II with the owl, when the protoplasm of a consumer is subjected to a decomposer, the elemental constituents of the nutrients are available for recycling and reuse.

The importance of this cycle can be seen in the plight of much of our nation's wildlife today. At present, huge amounts of the deadly pesticide DDT have been used to protect man's crops and animals from insect destruction. It is a complex chemical composed of chlorinated hydrocarbons. In nature, it is slowly broken down by physical factors of the environment. As a result, it has a half life of nearly 15 years!

Through nutritive recycling in an ecosystem, the introduction of such a long lasting poison can have disastrous results. As small plant and animal forms gather quantities of this chemical, the dangers become apparent. When eaten by larger consumers the concentrations found in the lower forms enter the larger creatures. As the chain continues, the chemical is further concentrated. Thus as a frog eats dozens of insects carrying particles of DDT, the chemical is incorporated into its tissues. Frogs are in turn eaten by bass and pike, which are in turn eaten by bird predators like the eagle or osprey. Thus, there is continual perpetuation of the cycle.

A significant example of the end result of this cyclic process can be seen in what happened at Clear Lake, California. DDD, a chlorinated hydrocarbon similar to DDT, was applied to a level of 0.02 ppm

Figure II



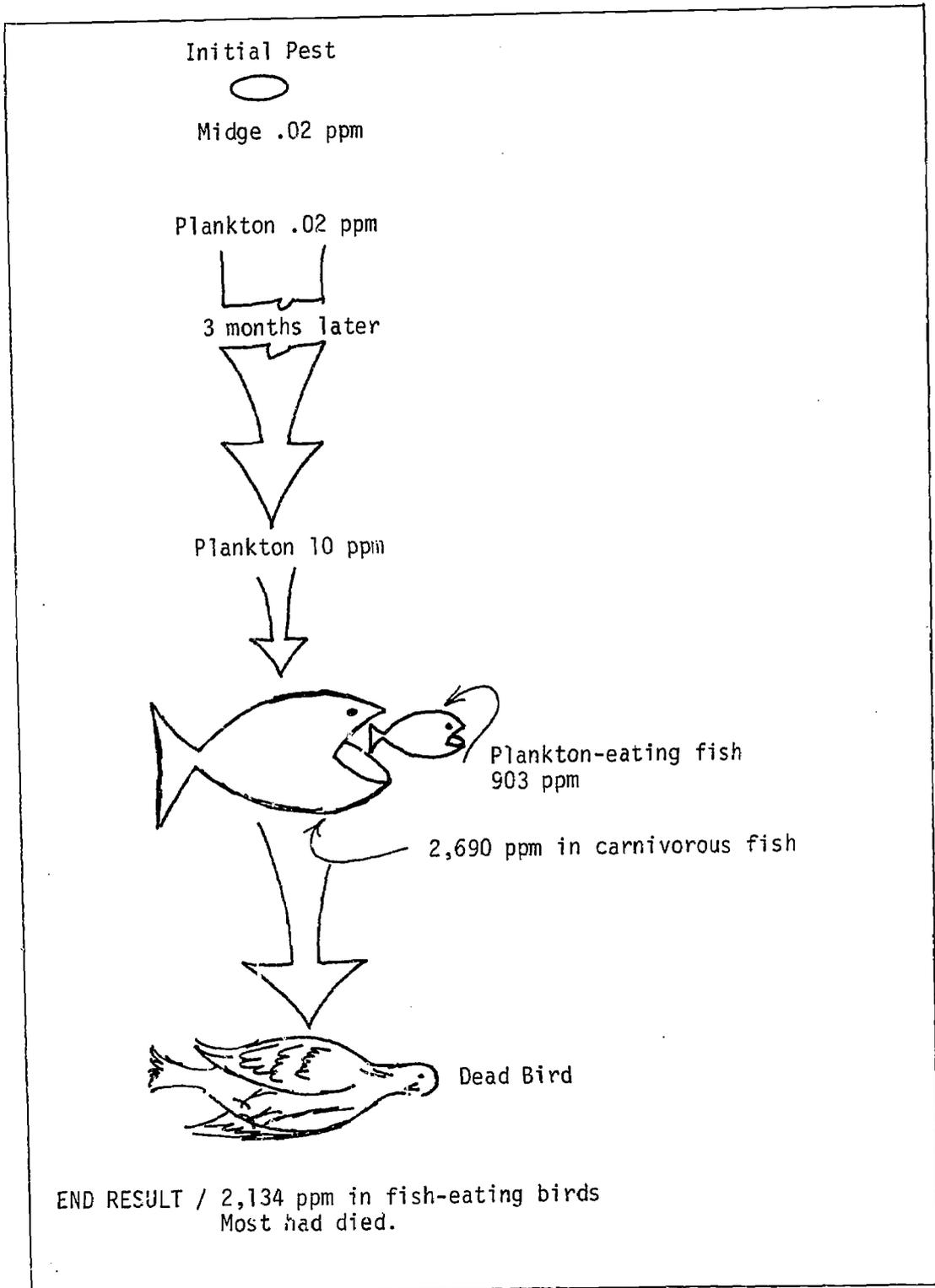
(parts per million of water) to rid the lake of midges. That was equal to a few drops of the chemical to a railroad car full of water! 13 months later, an analysis showed a residue level of 10 ppm in plankton, 903 ppm in plankton-eating fish, 2,690 ppm in carnivorous fish and 2,134 ppm in fish-eating birds, most of which had died. This represented a 100,000-fold increase in the original effect of the application! Figure III illustrates this cyclic phenomenon and the effects thereof.

It is evident that the two above stated principles have a significance of considerable magnitude when today's problems are encountered. Concomitantly noteworthy, however, is that these two physical operations function through the living organism. Each living organism has particular characteristics which also operate on the ecosystem. Each has unique morphological, physiological, and behavioral attributes. These variables also affect the ecosystem.

In addition, certain organisms have a structure, a sensitivity to physical gradients, a pattern of interaction with stimuli which produce toleration zones within a system. Accordingly, population shifts through time will be observed as corresponding physical factors undergo change. It is important to recognize that general growth patterns and regulation of populations in an ecosystem is dependent upon species' adaptability.

Environmental tolerances of organisms coupled with variations in the physical environment are likely to produce a unique ecosystem unduplicated anywhere else in the world. There are, however, many similarities in such systems that allow ecologists to categorize and organize them into recognizable entities. Such an entity may be the "temperate

Figure III



Deciduous Forest Biome," which covers most of eastern America, one of its subdivisions, "beech-maple" or "oak-hickory forests," or it may be just the pond, field, or estuary. Such organizations can be large or small, limited or expansive.

In summary, energy flows; nutrients cycle; and populations grow, zonate, and interact. Thus, ecosystems can never be discrete entities, sharply separated from an adjacent system. On the contrary, one system interacts with the other giving the ecologists an almost unlimited unit of variables, each ultimately interacting with all life upon the earth.

ECOSYSTEMS: THEME AND RELATED CONCEPTS

Theme: Biotic and abiotic factors influence our environment.

Concepts:

- A. All living things continually react to stimuli in their environment.
- B. Living things are not evenly distributed over the earth but are found in definite zones and areas where conditions are favorable to their survival.
- C. There is an interdependency of plants and animals in the ecosystem.
- D. Food, oxygen, certain optimal conditions of temperature, moisture and light are among the factors essential to the life of most living things.
- E. Ecosystem analysis will contribute to more constructive action on social and economic problems.

- F. Biochemical cycles are essential to the maintenance of ecosystems.
- G. Biological and physical factors in ecosystems are closely related to energy flow.
- H. Population growth is an important aspect of the ecosystem.
- I. Ecosystems function in response to both immediate and long-time environmental changes.

ECOSYSTEMS: RESOURCES AND INSTRUCTIONAL MATERIALS

The resources and instructional materials listed below will provide you with information as to what is available for use in developing your learning activities relating to ecosystems. The sources are organized according to books, periodicals, films, and filmstrips, plus additional learning aids including kits and games, teacher manuals, pamphlets and bulletins of an environmental nature.

Books

Teacher:

- Bates, Marston. THE FOREST AND THE SEA. New York: Random-House, 1960.
- Billings, W. D. PLANTS AND THE ECOSYSTEM. Belmont, Calif.: Wadsworth Publishing Co., 1964.
- Brennan, Matthew J. (ed.). PEOPLE AND THEIR ENVIRONMENT: TEACHERS' CURRICULUM GUIDES TO CONSERVATION EDUCATION. Chicago: J. G. Ferguson Publishing Co., 1969.
\$5.75 each volume. Eight volumes: Grades 1-3; Grades 4-6; Science, Grades 7-9; Social Studies, Grades 7-9; Social Studies, Grades 10-12; Biology; Home Economics, Grades 9-12; Outdoor Laboratory, Grades 1-12.
- Bresler, J. B. HUMAN ECOLOGY, COLLECTED READINGS. Reading, Mass.: Addison-Wesley Publishing Co., 1966.
- Brown, Harrison, James Bonner and John Weir. NEXT HUNDRED YEARS. New York: Viking Press, Inc., 1961. \$1.45.
These men have a somewhat more optimistic view of the future. They contend that science and technology have the power to avert the great tragedies of environmental degradation.
- Carson, Rachel. SENSE OF WONDER. New York: Harper & Row Publishers, Inc., 1956. \$2.50.
For the adult who wishes to introduce nature and all its wonders to the young, this is a wonderful book with excellent color and black and white photographs that help illustrate the beauties of nature.
- Chase, M. FIELD GUIDE TO EDIBLE AND USEFUL WILD PLANTS OF NORTH AMERICA. Red Wing, Minn.: NASCO Nature Study Aids, 1965.
\$4.95.

Clots, Alexander B. and Elsie B. Klonts. THE COMMUNITY OF LIVING THINGS IN THE DESERT. Mankato: Creative Educational Society, 1960.

Coker, Robert E. STREAMS, LAKES, PONDS. New York: Harper & Row Publishers, Inc., 1954. \$2.95.
One of the best books on the limnology of water. The chemistry of streams, lakes, and ponds, pollution and freshwater biology are covered in the publication.

Collins, Stephen and The National Audubon Society. THE COMMUNITY OF LIVING THINGS IN FOREST AND WOODLAND. Mankato: Creative Educational Society, 1960.

Commoner, Barry. SCIENCE AND SURVIVAL. New York: Viking Press, Inc., 1967. \$1.35.

Cooper, Elizabeth K. SCIENCE IN YOUR OWN BACK YARD. New York: Harcourt, Brace & World, Inc., 1958.

Crowe, Philip Kingsland. THE EMPTY ARK. New York: Charles Scribner's Sons, 1967. \$7.50.
Recommendations for conservation techniques and procedures.

Dasmann, Raymond F. A DIFFERENT KIND OF COUNTRY. New York: The Macmillan Co., 1968.
Dasmann, a staff member of the Conservation Foundation expresses his opinions concerning this nation.

Dubos, Rene. SO HUMAN AN ANIMAL. New York: Charles Scribner's Sons, 1969. \$2.25.
A Pulitzer Prize winner, this book may become a classic in ecological literature.

Ewald, William R., Jr. (ed.). ENVIRONMENT AND CHANGE: THE NEXT FIFTY YEARS. Bloomington, Indiana: Indiana University Press, 1968. \$4.95 paperback.
Great thinkers of the day discuss the important issues about the environment. The roles of the individual, society, youth, and technology are suggested as forces of change.

-----: ENVIRONMENT AND POLICY: THE NEXT FIFTY YEARS. Bloomington, Indiana: Indiana University Press, 1968. \$4.95 paperback.
A collection of papers which deals with the coordination of forces that shape the city.

-----: ENVIRONMENT FOR MAN: THE NEXT FIFTY YEARS. Bloomington, Indiana: Indiana University Press, 1967. \$2.95 paperback.
This collection of papers shows a concern for integrating science with society during the next half century to bring about a change in man's future environment.

- Farb, Peter. FACE OF NORTH AMERICA: THE NATURAL HISTORY OF A CONTINENT. New York: Harper & Row Publishers, Inc., 1963. \$1.95.
With the origins of the continent, the author discusses the ecology of the various types of ecosystems between the ocean and the mountain peaks. The book also describes the impact of man's influence on the continent.
- Fuller, R. Buckminster. OPERATING MANUAL FOR SPACESHIP EARTH. Carbondale, Illinois: Illinois University Press, 1968. \$4.25.
This famous architect's complex message considers the earth as a traveling spaceship and man must operate upon its resources accordingly. He has an overview which extends well into the Twenty-First Century.
- Goodman, G. T., R. W. Edwards and J. M. Lambert (eds.). ECOLOGY AND THE INDUSTRIAL SOCIETY. New York: John Wiley & Sons, Inc., 1965.
- Greulach, Victor A. and Edison Adams. PLANTS: AN INTRODUCTION TO MODERN BOTANY. New York: John Wiley & Sons, Inc., 1962.
A good college text emphasizing the physiological basis for the growth and development of plants.
- Habert, E. W. ASIDES IN THE FIELD. Washington, D. C.: The Nature Conservancy, 1969. Single copies free.
Outdoor education, field trips.
- Hylander, Clarence. THE WORLD OF PLANT LIFE. New York: The Macmillan Company, 1956.
- Kurtz, Edwin B., Jr. and Chris Allen. ADVENTURES IN LIVING PLANTS. Tucson: Arizona Press, 1965.
- Kormondy, E. J. CONCEPTS IN ECOLOGY. Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1969.
- READINGS IN ECOLOGY. Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1965.
- Lemmon, Robert S. and The National Audubon Society. THE COMMUNITY OF LIVING THINGS IN PARKS AND GARDENS. Mankato: Creative Educational Society, 1967.
- Mann, Mary Louise (ed.). A CASEBOOK FOR SCHOOL LIBRARY SERVICES. Chicago: American Library Association, American Association of School Libraries, 1970. 20¢.
Reprint of a series of articles including "The School Library Goes to Camp," an outdoor recreation project.

- Mannix, Daniel P. THE LAST EAGLE. New York: McGraw-Hill Book Company, 1966.
- Marquis, Ralph W. (ed.). ENVIRONMENTAL IMPROVEMENT (AIR, WATER AND SOIL). Washington, D. C.: Graduate School, U. S. Department of Agriculture, 1966. \$1.50.
A series of lectures are compiled on the more positive aspects of environmental improvement. Following each essay, a reaction by two other experts provides a variety of ideas and opinions on each topic.
- Marx, Wesley. THE FRAIL OCEAN. New York: Ballantine Books, Inc., 1967. 95¢.
The author fears the sea with all its splendor, fertility and value to man may be in danger today and may remain so for generations to come.
- Morholt, Evelyn, et al. A SOURCEBOOK FOR THE BIOLOGICAL SCIENCES. New York: Harcourt, Brace & World, Inc., 1966.
- Morris, Desmond. NAKED APE: A ZOOLOGIST'S STUDY OF THE HUMAN ANIMAL. New York: Dell Publishing Co., 1967.
The reader may be startled and dismayed by the author's new and challenging ideas concerning evolution, biological temperament, and physical appearance.
- Nash, Roderick (ed.). THE AMERICAN ENVIRONMENT. Menlo Park, Calif.: Addison-Wesley Publishing Co., 1968. \$2.60.
Documents illustrating the development of the American conservation movement.
- Odum, Eugene P. and Howard T. Odum. THE FUNDAMENTALS OF ECOLOGY. Philadelphia: W. B. Saunders Co., 1959.
An excellent publication introducing the concepts of ecology.
- Ogburn, Charlton, Jr. THE WINTER BEACH. New York: William Morrow & Company, Inc., 1966.
- Parker, B. M. DEPENDENT PLANTS. Evanston: Harper & Row Publishers, Inc.
- Sears, Paul B. THE LIVING LANDSCAPE. New York: Basic Books, Inc., 1966. \$4.95.
- Shepard, Paul and Daniel McKinley (eds.). THE SUBVERSIVE SCIENCE: ESSAYS TOWARD AN ECOLOGY OF MAN. Boston: Houghton-Mifflin Co., 1969.
A college text that is very informative.
- Udall, Stuart. QUIET CRISIS. New York: Holt, Rinehart & Winston, Inc., 1963. 95¢.
A historical account of man's relation to his environment in this country. From a land with an excess of natural resources to a country facing serious pollution problems, Udall calls for a feeling of stewardship in the preservation of future environments.

Watt, K. E. F. ECOLOGY AND RESOURCE MANAGEMENT, A QUANTITATIVE APPROACH. New York: McGraw-Hill Book Co., 1968.

Whittaker, Robert H. COMMUNITIES AND ECOSYSTEMS. New York: The Macmillan Co., 1970. \$3.95.

Secondary:

Amos, William H. THE LIFE OF THE SEASHORE. New York: McGraw-Hill Book Co., 1966.

Audrewartha, Herbert C. INTRODUCTION TO THE STUDY OF ANIMAL POPULATIONS. Chicago: University of Chicago Press, 1961.

Bates, Marston. THE FOREST AND THE SEA: A LOOK AT THE ECONOMY OF NATURE AND THE ECOLOGY OF MAN. New York: Random House, 1960.

Bell, Garrett de (ed.). THE ENVIRONMENTAL HANDBOOK. New York: Ballantine Books, Inc., 1970. 95¢ paperback.
This book is a collection of articles designed to provide a background on ecology for the first environmental teacher. A very readable, good book.

Benton, Allen H. and William E. Werner. FIELD BIOLOGY AND ECOLOGY. New York: McGraw-Hill Book Co., 1965.

Billings, W. D. PLANTS AND THE ECOSYSTEM. Belmont, California: Wadsworth Publishing Co., 1964. \$1.95.
A broad, concise coverage of plant ecology including an elementary survey of the physical, biological, geographical, and environmental factors involved in plant growth and development. The book also goes into a discussion of man's relation to ecology.

Black, John D. BIOLOGICAL CONSERVATION. New York: McGraw-Hill Book Co., 1954.

Bold, Harold C. THE PLANT KINGDOM. Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1964. (2nd edition).

Booolootian, Richard and June Thomas. MARINE BIOLOGY. New York: Holt, Rinehart & Winston, Inc., 1967. \$1.60.
A taxonomy and ecology of the marine environment.

Boughey, Arthur S. ECOLOGY OF POPULATIONS. New York: The Macmillan Co., 1968. \$2.50.
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438 N. Skinker
St. Louis, Missouri 63130

This is a monthly publication dealing with the effects of technology on the environment. It is published by the Committee for Environmental Information. Student subscription is \$5.00 a year.

Environmental Education

Dembar Educational Research Services, Inc.
Box 1605
Madison, Wisconsin 53701

Environmental Education is a quarterly devoted to discovery and dissemination in the field of conservation communications. The Journal attempts to act as a catalyst in encouraging and exchanging effective studies and developments toward a broad public ecological awareness, understanding, and action. Subscription is \$7.50 per year.

Population Bulletin

Population Reference Bureau, Inc.
1755 Massachusetts Avenue N.W.
Washington, D. C. 20036

Published 6 times yearly by the Population Reference Bureau, this publication has timely information and provocative issues on this general topic.

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Films

Secondary:

A STRAND BREAKS

Encyclopedia Britannica Films. Shows the consequences of a state of imbalance in nature, and how man has introduced new elements into nature's balance that cause further depletion of resources.

ADAPTATION OF ANIMALS

McGraw-Hill Text Films. 16 min. Color.

AROUND A BIG LAKE

International Film Bureau. 17 min. Color.

THE AQUARIUM

National Fisheries Center & Aquarium, Dept. of Interior. 1967. 15 min. Color. The new national aquarium is discussed by its architects.

BEACH HIKE

Northern Films. 17 min. Color.

BEAVER VALLEY

Walt Disney Productions. The relationship of the beaver to the whole wildlife community.

BIRDS OF THE SANDY BEACH: AN INTRODUCTION TO ECOLOGY

Film Associates. 1965. 10 min. Color. The characteristics of the ocean beach and the birds that live there are demonstrated.

THE BOREAL FOREST

International Film Bureau. 19 min. Color.

THE CAVE COMMUNITY

Encyclopedia Britannica Films. 13 min. Color. This film illustrates how the study of plant and animal life in the unusual and relatively unchanging environment of the cave community provides ecologists with important data for understanding some of the mechanisms of adaptation and evaluation of species.

THE COMMUNITY

Encyclopedia Britannica Films. 11 min. Color. The concept of the ecological community is introduced. Food chains, and food webs of the typical biotic communities are well illustrated.

THE DESERT

Encyclopedia Britannica Films. 22 min. Color. This film illustrates the relationships between plant and animal life and the physical environment of the desert. The geographical locations of desert areas, their ecological conditions, the causes of their formation, and their aridity are shown.

DIVERSITY AND SIMILARITIES OF PLANTS

McGraw-Hill Text Films. 28 min. Color.

DISTRIBUTION OF PLANTS AND ANIMALS

Encyclopedia Britannica Films. 16 min. Color. Traces the various factors which influence the distribution and survival of animals in a given geographic area. A fundamental film in the understanding of plant and animal ecology.

DUST BOWL

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ECOLOGICAL SYSTEMS

Imperial Film Company. A filmstrip and record.

THE EVERGLADES: CONSERVING A BALANCED COMMUNITY

Encyclopedia Britannica Films. 11 min. Color.

THE GRASSLANDS

Encyclopedia Britannica Films. 17 min. Color. Illustrates the ecological interrelationships of the grasslands biome. By showing the locations of the world's grasslands, it explains how they may have originated and describes the dependence of animal life on the dominant plants and gives examples of typical food chains.

THE HIGH ARCTIC BIOME

Encyclopedia Britannica Films. 23 min. Color. Describes the constant struggle of plants and animals for survival in the harsh environment of the biome. This film shows that a few species are adapted to live in this region of long, cold and dark winters and short, cool summers.

INTERDEPENDENCE OF LIVING THINGS

McGraw-Hill Text Films. A filmstrip series.

INTERRELATIONSHIPS FOR SURVIVAL

McGraw-Hill Text Films. 28 min. Color.

LIFE IN A WOODLOT

National Film Board of Canada. 17 min. Color.

MARINE ECOLOGY

McGraw-Hill Text Films. 28 min. Color. Good introduction to marine ecology. A good background of the physical and biological aspects of the topic are carefully introduced before getting into the complexities of the ecosystem.

MARINE ECOLOGY

American Institute of Biological Science. 28 min. Color.

MARINE SCIENCE SERIES

McGraw-Hill Text Films. Color. 4 films.

MARSHLAND IS NOT WASTELAND

New York State Conservation Department. 14 min. Color. Focuses attention on fast disappearing wild area. Clarifies the role of coastal marshes in the preservation and enhancement of many important species of fish.

MIMICRY AND OTHER EVIDENCE

McGraw-Hill Text Films. 28 min. Color.

NATURAL SELECTION AND ADAPTATION

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OUR CHANGING ENVIRONMENT

Encyclopedia Britannica Films. 17 min. Color. Man's increasing power to control his environment has created new pressures and problems for the modern city.

PATTERNS OF ENERGY TRANSFER

American Institute of Biological Science. 28 min. Color.

THE PHYSICAL ENVIRONMENT

Encyclopedia Britannica Films. 11 min. Color. Our planet Earth varies considerably in structure and in climate. Yet practically every part of it is a habitat for some form of life, even where conditions are extreme. The film shows how organisms adapted to varied physical conditions in the past as well as in the present.

PLANKTON AND THE OPEN SEA

Encyclopedia Britannica Films. 19 min. Color. The importance of the minute plankton organisms to marine food chains is demonstrated. Typical forms of plankton are shown.

PLANT, ANIMAL COMMUNITIES--PHYSICAL ENVIRONMENT

Coronet Films. 11 min. Color.

POPULATION ECOLOGY

American Institute of Biological Science. 28 min. Color.

POPULATION ECOLOGY

Encyclopedia Britannica Films. 21 min. Color. Analyzes the biological principles of environment as they relate to surplus or decline of births over deaths. The current population explosion by man is briefly examined.

THE PRAIRIE

International Film Bureau. 18 min. Color.

S. O. S. GALAPAGOS

Contemporary Films. 1965. 17 min. Color. A project to preserve the Galapagos is undertaken by UNESCO, Ecuador and the Charles Darwin Foundation. The animals are threatened with extinction by the intrusion of man.

THE SEA

Encyclopedia Britannica Films. 26 min. Color. The interrelationships between living things in the sea, their dependence on each other and on the conditions of the marine environment are illustrated. The diversity of free-swimming animals is shown. The film has some good illustrations of some of the basic concepts of marine ecology.

THE STREAM

International Film Bureau. 15 min. Color.

SUCCESSION FROM A SAND DUNE TO FOREST

Encyclopedia Britannica Films. 16 min. Color. Illustrates the process and general principles of ecological succession by which an area slowly and continuously changes until it becomes a stable natural community.

SURVIVAL IN THE SEA-- THE LIFE CYCLE

Indiana University Audio-Visual Center. 29 min. Color. The movie handles producers, consumers, and decomposers. Much emphasis is placed on feeding mechanisms.

SURVIVAL IN THE SEA-- WHERE LAND AND WATER MEET

University of Miami. 29 min. Color. The film attempts to cover all the habitats where the water ends and the land begins. Spray zone, surf zone, mangrove swamp, rocky zone, and tide pool are some of the habitats covered.

THE TEMPERATE DECIDUOUS FOREST

Encyclopedia Britannica Films. 17 min. Color. Illustrates the complex network of plant and animal relationships that make up the temperate deciduous forest community. It shows typical deciduous forest plants and animals and their adaptations to seasonal change.

THE TROPICAL RAIN FOREST

Encyclopedia Britannica Films. 17 min. Color. The interrelationships between the rich variety of plant and animal life and the warm, humid environment of the rain forest are illustrated. The film shows the layered structure of tropical rain forest vegetation, describes conditions of temperature and rainfall, and provides examples of both typical and rare species of plant and animal life.

THIS VITAL EARTH

Encyclopedia Britannica Films. This program portrays both the beauty and logic of the balance in nature and the organization of the living community.

WHAT IS ECOLOGY?

Encyclopedia Britannica Films. Illustrates the variety of inter-relationships among the plants and animals in the environment. The concept of an ecosystem is presented.

WORLD IN A MARSH

National Film Board of Canada. 1958. 22 min. Color. The activities in a marsh by its inhabitants create the subject of this film.

Elementary:**A HOME FOR HOPPY: BUILD YOUR OWN TERRARIUM**

McGraw-Hill Text Films. 14 min. Color.

A TREE IS A LIVING THING

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ADAPTATIONS OF PLANTS AND ANIMALS

Coronet Films. 14 min. Color.

ADAPTING TO CHANGES IN NATURE.

Journal Films. 10 min. Color.

ADVENTURES OF A CHIPMUNK FAMILY

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ANIMAL HOMES

McGraw-Hill Text Films. A good filmstrip for the primary grades.

ANIMALS AND THEIR HOMES

Coronet Films. 11 min. Color.

BALANCED AQUARIUM

Encyclopedia Britannica Films. 11 min. Color.

CARNIVOROUS PLANTS

Moody Institute of Science. 10 min. Color.

DISCOVERY

Tennessee Valley Authority. 21 min. Color. Follows a group of elementary school pupils and their teachers as they observe plant and animal life, erosion, and reforestation in TVA's Conservation Education Center, Land Between the Lakes.

- FRESHWATER POND
Encyclopedia Britannica Films. 13 min. Color.
- THE GRASSLAND STORY OF A MAJOR COMMUNITY
Encyclopedia Britannica Films. A filmstrip useful in the intermediate grades.
- GREEN PLANTS AND SUNLIGHT
Encyclopedia Britannica Films. 11 min. Color.
- HOW TO MAKE AN AQUARIUM
Jam Handy Films, Inc. A filmstrip useful in the primary grades.
- HUNGER SIGNS
National Fertilizer Association. 15 min. Color.
- INSECT COMMUNITIES
Coronet Films. Excellent filmstrip on insects for primary grades.
- LEARNING ABOUT FLOWERS
Encyclopedia Britannica Films. 11 min. Color.
- LIFE IN A CUBIC FOOT OF SOIL
Coronet Films. 11 min. Color.
- LIFE IN A POND
Coronet Films. 10 min. Color.
- LIFE IN THE DECIDUOUS FOREST
International Film Bureau. 19 min. Color.
- LIFE IN THE OCEANS
Film Associates of California. 15 min. Color. Presents many of the more common forms of organisms found in the oceans. Some definitions and descriptions are added to the advantage of the elementary teacher.
- LIVING AND NONLIVING THINGS
Coronet Films. 11 min. Color.
- MAN MAKES A DESERT
Film Associates of California. 11 min. Color.
- MARINE ANIMALS AND THEIR FOOD
Coronet Films. 8 min. Color. Shows the general food cycle of the sea. Primary producers, secondary producers.
- NATURE'S HALF ACRE
Walt Disney Productions. 10 min. Color.
- PARTNERSHIPS AMONG PLANTS AND ANIMALS
Coronet Films. 11 min. Color.

PATTERNS OF THE WILD

U. S. Dept. of Agriculture, Forest Service. 25 min. Color.

PETS TO MAKE AN AQUARIUM

Jam Handy Films. A filmstrip with helpful hints for the aquarium in the primary grades.

PLANT-ANIMAL COMMUNITIES-- THE CHANGING BALANCE OF NATURE

Coronet Films. 11 min. Color.

PLANT-ANIMAL COMMUNITIES-- THE PHYSICAL ENVIRONMENT

Coronet Films. 11 min. Color.

PLANT TRAPS (INSECT CATCHERS OF THE BOY JUNGLE)

Encyclopedia Britannica Films. 11 min. Color.

SECRETS OF THE UNDERWATER WORLD

Walt Disney Productions. 16 min. Color. Illustrates the adaptations of fresh and salt water organisms. A good example of the variety of life and habitats found in fresh and salt water.

SNUFFY, SMOKEY BEAR'S PAL

U. S. Department of Agriculture, Forest Service. 4 min. Color.

WE EXPLORE THE STREAM

Coronet Films. 11 min. Color.

WHAT'S ALIVE?

Film Associates of California. 14 min. Color.

WHAT IS SOIL?

Encyclopedia Britannica Films. 12 min. B/w.

WILDFLOWERS OF THE FIELD AND MEADOW

Coronet Films. 11 min. Color.

WILDLIFE AND THE HUMAN TOUCH

U. S. Department of Agriculture. 19 min. Color.

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Additional Learning Aids

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c/o Lyle Johnson
5804 Stewart Avenue
Minneapolis, Minnesota 55424

"1969 Catalog of Camping Publications"

Committee for Environmental Education
438 N. Skinker Boulevard
St. Louis, Missouri 63130

"Index for the Publication of the Committee for Environmental Education" (Ask also for accompanying checklist of available back issues.)

Consumer Protection and Environmental Health Service
U. S. Department of Health, Education and Welfare
(Regional Office)
220 Seventh Street, N. E.
Charlottesville, Virginia 22901

- 1) "We Will Have to Run Very Hard Just to Stay Even"
(Reprint from Engineering Opportunities.)
- 2) "Needed: Clean Air"
- 3) "The Air Quality Act of 1967"
- 4) "The Ambient Air" (Reprint from The New Yorker.)
- 5) "We Can Have Clean Air" (Reprint from Country Beautiful.)
- 6) "Air Pollution" (Reprint from Ranger Rick's Magazine.)

Environmental Science Center
5400 Glenwood Avenue
Minneapolis, Minnesota 55422

- 1) "List of paperbacks or otherwise inexpensive volumes on environment and conservation"
- 2) "List of available curriculum materials and teaching units"
- 3) Environmental Lessons (Write for a description of each program.)
 - a) Brine Shrimp (1-2;3-5) \$1.00
 - b) Population Variation (4-7) \$1.00

- c) Minnows and Models (4-6) \$1.00
- d) Color and Change (K-2) \$1.00
- e) Soil Sampling - Water Holding Capacity (1-6) \$.50
- f) Soil Sampling - Acidity/Alkalinity (K-6) \$.50
- g) Stream Profiles (4-9) \$1.00
- h) Plant Puzzles (1-6) \$1.00
- i) Variations Within a Species (4-8) \$.50
- j) Contour Mapping (4-9) \$1.00
- k) Succession in a Micro-Aquarium (5-9) \$.50
- l) Measuring Techniques (3-9) \$.50
- m) Button Bogs (3-9) \$1.00
- n) Population Sampling (3-8) \$.50
- o) Liquids and More Liquids (2-6) \$.50
- p) Population Growth (6-12) \$1.00
- q) Snow and Ice (1-6) \$1.00
- r) Shadows (1-6; 5-8) \$1.00
- s) Wind (3-6) \$1.00
- t) Plants in the Classroom (3-6) \$1.00
- u) Nature's Art (3-6) \$1.00
- v) Tree Watching (K-6) \$1.00
- w) Habitat Study - Transect Study \$1.00
(3-7) (5-9)
- x) Salts (5-12) \$.50
- y) Transect Activities I (4-9) \$1.00
- z) Transect Activities II (4-9) \$.50
- aa) Vacant Lot Studies (5-9) \$1.00
- bb) Outdoor Activities Collection (1-12) \$2.00
- cc) Man's Habitat - The City (4-9) \$1.00
- dd) Field Activities Package:
Soil Acidity, Life Forms Survey, Watershed,
Slopes, Nitrogen Content \$1.00
- ee) Nature Hunt (K-1 and Special Education) \$1.00
- ff) Photography for Kids (4-8) \$1.00
- gg) Trash Is Taking Over (5-9) \$.50

National Audubon Society
1130 5th Avenue
New York, New York 10028

"Audubon Aids in Natural Science" are available to elementary and secondary teachers.

Portland Center for Continuing Education
P. O. Box 1491
Portland, Oregon 97207
Attention: Mr. Lawless

The Portland Center for Continuing Education will supply for \$3.00 "Observing Our Environment" which will help relate the environment to elementary students.

Project Man's Environment
 NEA Center
 1201 16th Street N. W.
 Washington, D. C. 20036

Prepared by the AAPHER (American Association for Health, Physical Education, and Recreation), this program is an attempt to acquaint children with human environmental problems.

Society of American Foresters
 1010 16th Street N. W.
 Washington, D. C. 20036

"Bibliography of Reading Materials on Forestry and Forestry Careers"

Kits and Games:

Audubon Ecology Chart
 National Audubon Society. 1966. \$2.15. Colored map of North America showing the principal biomes, with paintings representing each biome with its principal plants and animals. 33 x 50 in.

BUDDING TWIGS, EARTHWORMS, and STARTING FROM SEEDS
 Education Development Center
 Elementary Science Study
 55 Chapel Road
 Newton, Massachusetts 02160
 1969. \$1.00 each. See also ANIMAL ACTIVITY and other books published for the Elementary Science Study by McGraw-Hill, Webster Division. These three titles contain activities and experiments.

Conservation Chart and Text
 R. W. Eschmeyer. Sport Fishing Institute. 1969. \$1.00.
 Elementary grades.

Outdoor Education Literature
 Pennsylvania Outdoor Education Resources Center
 112 Recreation Building
 University Park, Pennsylvania 16802
 23 items. Current. Free. Includes plans for building weather station, a water ecology resource kit, also Insect Unit and Collecting Net plans, Understanding Maps.

"Outdoor Study Units"
 Knight, Hill, Freund. Tri-District Outdoor Education. 1969.
 \$2.00. Activities and experiments, interdisciplinary.

"Possum Creek Valley", a classroom game on environmental management
 Southern Forest Institute
 Atlanta, Georgia
 A simulation game for use in the classroom to impart forestland-
 management concepts in relation to modern social needs.

Wall Charts on Pond Life, Oceanography, Seeds, and Ecology
 Grade Teacher Reprints
 23 Leroy Avenue
 Darien, Connecticut 06820
 1967-69. 70¢ each, except for Ecology, 40¢. Grades K-6.

"Wildlife Week Kit"
 National Wildlife Federation. New edition each year.
 Poster and environment information for display and classro-
 use.

Manuals and Bulletins:

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Set includes: Important Characteristics of a Good Local Program, Planning a State Program of Conservation Education, Guides for Preparing Publications and Visual Aids, Evaluating a Program in the Elementary School, List of Filmstrips.

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THE MOON OF THE ALLIGATORS
THE MOON OF THE OWLS
THE MOON OF THE MONARCH BUTTERFLIES
THE MOON OF THE WILD PIGS
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CHAPTER III

NATURAL RESOURCES

NATURAL RESOURCES

The concern for America's natural resources has been voiced for a very long time. Unfortunately, however, there have been very few individuals joining together to form that voice, let alone even to act upon their concern for the conservation of America's rich fund of natural resources.

Our forefathers came to this country and found a beautiful land rich in nearly everything a man could want; that is, one with pure air, clean water, teeming wildlife, dense forests, open meadows, and fertile soil composing a balanced community of life.

In a little more than 300 years, that way of life has changed. The new occupants of this land had a new ethic which unleashed a driving force to "tame" that wilderness. The resources were discovered and consumed as if they were unlimited. Forests were removed and the rich land cultivated. When the land was robbed of its strength, new land was cut and the old abandoned to the erosive effects of the elements. The land of North Carolina once blessed with at least nine inches of topsoil is now struggling to retain the few inches that remain. The wildlife, too, sustained the same abuse. Examples of many of our beautiful wild creatures have completely disappeared, and nearly 1,000 of today's wildlife species are on the verge of extinction.

As towns grew, refuse and sewage disposal became a problem. The expedient, and cheapest method was to dump the debris into the nearest stream, lake or river. Suddenly, some of the fresh water streams, once teeming with wildlife, could no longer support even the most adaptable living creature. Huge earth-moving projects supporting real estate

development, and drainage for farming gradually encroached upon the breeding grounds of many of the country's most beautiful species of plants and animals.

Such technological miracles have supported the thought that man has risen above nature. It has led civilized man to pat himself on the back thinking he had conquered nature, risen above it, and escaped his total dependence upon his environment. Water comes from the tap, not the spring; food from the store, not the earth; warmth from machines, not the sun; and transportation involves riding in air-conditioned comfort, not walking. But the cold fact of the matter is that such a civilization has been enjoyed at a severe cost to the original paradise first encountered on these shores. Today's "good life" involves breathing the smog-laden air, drinking treated industrial waste, observing the country's past and scarce wildlife-- in books-- and watching lakes and streams filling with the once fertile soil of our state. Such selfish and ignorant exploitation cries out for attention.

Man is now beginning to recognize his mistakes. He is asking such questions as: How do we stand in the battle for clean air, pure water, the maintenance of our fish, wildlife, and fertile soil?

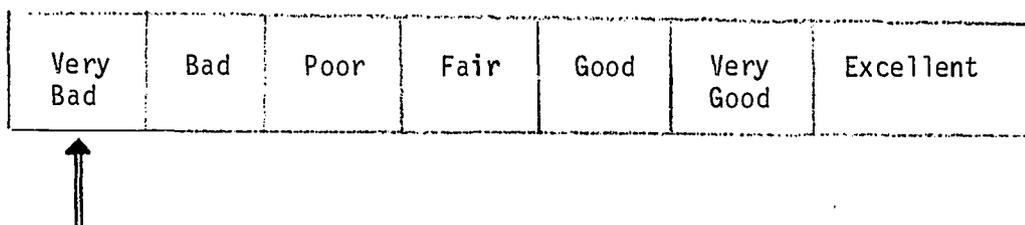
The National Wildlife Federation has designed an Index of Environmental Quality¹ in an attempt to establish where we are today, and whether we are winning or losing the battle for survival in these areas. The subsequent sections present an overview of the present status and problem.

Air .

Air pollution is a threat to the public health, and it is no longer exclusively found in cities. It is the silent killer that hovers

Figure IV

1969 AIR QUALITY INDEX



over every city in the country. It is not a regional resource. On the contrary, city air moves out into the countryside. It has even touched the creatures of the polar life zones. Figure IV reflects the present Air Quality Index.

Since 1965 our nation has lost ground to this frightening kind of pollution that colors the skies, burns our eyes, blackens our lungs, discolors paint, dissolves nylon stockings, hardens rubber, and coats everything with a fine coat of dust. So dense is this dust in the air that it even affects the formation of rain.

Clouds can become so over-seeded that no rain falls. This can occur when pollution generates so many particles that none of them can attract enough moisture to grow to raindrop size. Instead of downpours, we get fine, misty rains in which the drops are so small they tend to drift down rather than fall. Rain water, once a cleanser, can now become a contaminant.

Air pollution is even worse than it at first appears. One can see the particulate matter but not the invisible, deadly gases. It is suspected that such air is a contributing factor causing emphysema, bronchitis, and even lung cancer. An estimated 3,500 to 4,000 persons died when London was hit by a "killer smog" in December of 1952. Stagnant air over Donora, Pennsylvania, in 1948 killed 20 and left more than 6,000 sick. Figure V reveals the cities in the United States which contain a high level of air pollution.

Figure V

Rating list of 12 cities with the most polluted air:

1. New York
2. Chicago
3. Philadelphia
4. Los Angeles
Long Beach
5. Cleveland
6. Pittsburgh
7. Boston
8. Newark
9. Detroit
10. St. Louis
11. Gary-Hammond
East Chicago
12. Akron

As indicated in Figure VI, cars are probably the greatest polluter of the air. They are followed by home heating, industry, and open burning of waste disposal. All expand and perpetuate the problems of air pollution and ways of controlling it.

The National Air Pollution Control Administration is tackling the problem. But to date it has been on a regional basis with the prime

Figure VI

Source of Air Pollution in Millions of Tons/Year	Carbon Monoxide CO	Sulfur Oxides SO ₂	Nitrogen Oxides NO ₂	CHO	Hydrocarbons	Particulate Matter	Totals
Motor vehicles	66	1	6	12		1	86
Industry	2	9	2	4		6	23
Power plants	1	12	3	1		3	20
Space heating	2	3	1	1		1	8
Refuse disposal	1	1	1	1		1	5
TOTALS	72	26	13	19		12	142

Source: U. S. Department of Health, Education and Welfare, Public Health Service.

responsibility still residing with state and local governments. Fifty-seven Urban-Industrial Air Quality Regions will soon be organized. Local governments will soon establish air quality standards to be observed. State and local officials, with Federal Aid, will insure the enforcement of such standards.

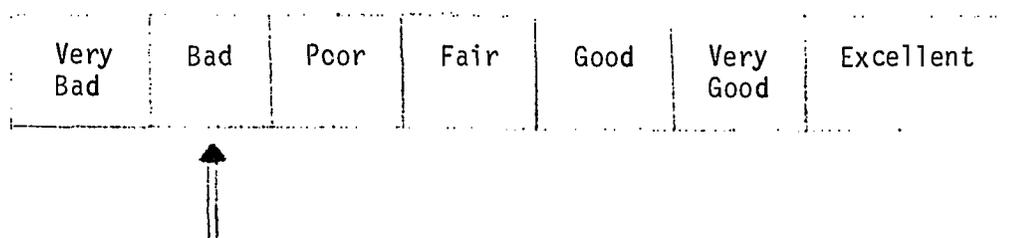
Once pollution is allowed to enter the atmosphere, man is helpless and must rely on the natural processes of nature to correct the abuse. This means that the pollutant eventually is washed down to our land, deposited on every exposed object, eventually entering the rivers and on to the sea. So long as man is short-sighted and continues to use the atmosphere as his personal garbage dump, the air will continue to become more undesirable and more dangerous!

Water

Water, one of the factors essential for life, is rapidly becoming a conveyor of death. Nearly every stream, river, lake and estuary is becoming less attractive, and more dangerous! The National Wildlife Federation Water Quality Index, shown in Figure VII, provides indication that water pollution is very much a reality. Since 1965, the Water Quality trend has progressively worsened.

Figure VII

1969 WATER QUALITY INDEX



Nearly every aquatic source in America is polluted to some degree. The Great Lakes, for example, worsen every year. In our lifetime we have witnessed the tragic death of one of the lakes, Erie. Figure IX dramatically illustrates what has happened to the fish population of Lake Erie. It can no longer support its once great commercial and sport fishing industry. Lakes Ontario, Michigan, Huron, and Superior are following a similar path. Lake Michigan's life is presently threatened by the DDT contamination.

Water pollution takes several forms: municipal wastes and industrial effluents; pesticides and fertilizer runoff from agricultural operations; thermal pollution released through cooling operations; and radiation at atomic energy generating stations. The effect of each pollutant upon

Figure VIII

FISH KILLED BY WATER POLLUTION IN U.S.

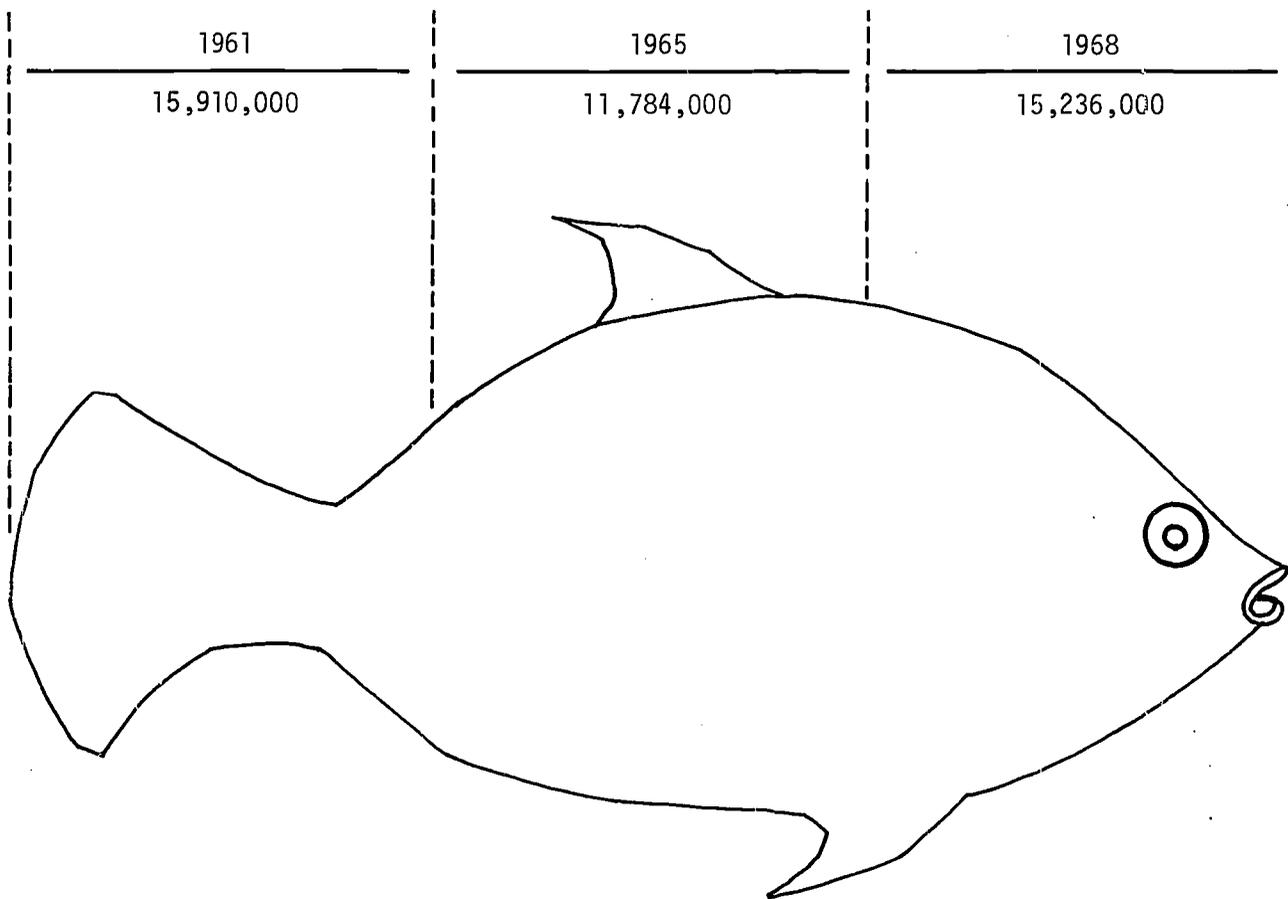


Figure IX

FISH PRODUCTION IN LAKE ERIE 1870-PRESENT



Adapted from Edward J. Kormondy, CONCEPTS OF ECOLOGY, Prentice-Hall, 1969.

human health is still largely unknown. From time to time the report of "fish kills" jars a region by exposing the results of years of neglect.

There has been some progress toward upgrading the quality of our water. Federal Water Pollution Control legislation requires each state to establish its own water quality standards or have the Federal Government do it for them. The progress is slow and many states allow "exceptions" to the standards. As a result, more than 2,600 communities still discharge raw sewage into the nation's waterways! In addition, some standards are set

so low that pollution levels can continue to deteriorate and still remain within the state's water quality standards.

To combat this, the Department of the Interior is supporting "non-degradation" policies which would place the standard at least at the present level allowing no further deterioration. Unfortunately, some 30 states are yet to adopt such a program. Figure X reveals those states with and without non-degradation water quality standards.

Figure X

NON-DEGRADATION WATER QUALITY STANDARDS

<u>States With</u>		<u>States Without</u>		
Washington	Nebraska	New York	Maine	Vermont
*Oregon	*Kansas	Rhode Island	Delaware	Maryland
*California	*Missouri	Connecticut	Virginia	Tennessee
Nevada	*Illinois	Kentucky	North Carolina	Georgia
Utah	Wisconsin	Texas	Alabama	Arkansas
Montana	*Michigan	Louisiana	South Dakota	North Dakota
Colorado	Ohio	Oklahoma	Alaska	Hawaii
*New Mexico	Florida	Iowa	West Virginia	Idaho
Arizona	*New Jersey	Wyoming	Kansas	Pennsylvania
*New Hampshire	Massachusetts	Indiana	Mississippi	
*South Carolina				

* Approved standards include exceptions.

The biggest problem facing water pollution is money; or, rather, the lack of it. To overcome this barrier, the Federal Government has provided matching funds and grants to spur local government action. As can be seen in Figure XI, the cost of obtaining clean water over the next five years is estimated at 26.3 billion dollars.

Figure XI

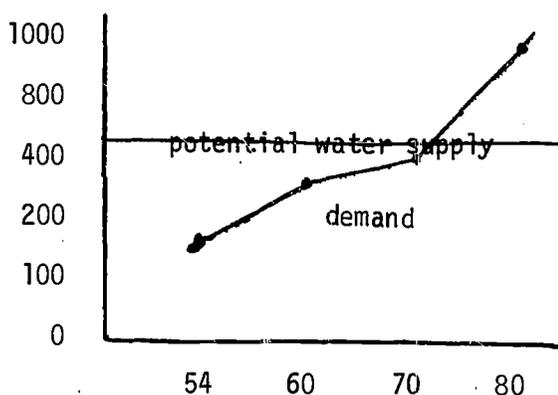
COST OF CLEAN WATER FOR THE NEXT
5 YEARS IN THE U. S.

	\$8 billion	Municipal Treatment Works
	6.2 billion	Sanitary Sewer Construction
	4.6 billion	Industrial Waste Treatment
	1.8 billion	Industrial Cooling Equipment
	5.7 billion	Municipal and industrial operating and maintenance cost
TOTAL	\$26.3 billion	

While the quality of our water is deteriorating, our nation's demand for water is increasing. Figure XII reveals that soon, our consumption will exceed our supply of water. We must begin immediately to expend all our energies and the financial resources available to us or suffer the consequences.

Figure XII

billions of
gallons used
daily



DAILY WATER USE VS. SUPPLY IN U. S.

Soil

The rich soil which nourished the plants and supported wildlife through the early developing years of our nation has been subjected to a reckless and wasteful abuse by man. The loss of soil through erosion has been great. Fortunately, as indicated in Figure XIII, the Soil Quality Index is higher than that of the aforementioned natural resources of air and water. We must act immediately, to maintain and improve the quality of our soil.

Figure XIII

1969 SOIL QUALITY INDEX

Very Bad	Bad	Poor	Fair	Good	Very Good	Excellent
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An even greater loss of soil has been consumed through the development of roads, airports, and cities. The U. S. Soil Conservation Service has estimated that 180,000,000 acres of crop land are affected by the erosive forces of wind and water at a staggering loss of nearly \$1 billion yearly!

The North Carolina Wildlife Foundation has estimated that we had nine inches of good productive topsoil when settlers first arrived. A good vegetative cover protected the land and North Carolina was a beautiful state of forests, wooded streams and mountains. By 1923, only seven inches remained. In some areas, more than 75% of the topsoil has been eroded away! The

vegetative cover had been removed with no thought of replacement. Since that time our state has lost another inch of its irreplaceable topsoil! The erosion has been slowed through conservation practices but much remains to be done.

The Conservation Needs Inventory of 1967 revealed that three-fourths of the cultivated soil of our state is yet to receive adequate conservation protection. Figure XIV indicates the specific acreage involved.

Figure XIV

TYPE OF TREATMENT NEEDED	ACRES
Soils with adequate erosion control and drainage	1,146,372
Soils needing one or more conservation practices for erosion control	4,015,777
Soils needing artificial drainage to improve productivity	991,780
	<hr/>
TOTAL	6,153,929

One does not have to go far to find evidence of poor soil conservation still practiced. The improper use of fertilizers, herbicides and pesticides has produced a new and increasing concern-- land pollution. Airports, highways and suburbs encroach upon hundreds of acres of land. Unlike some of our nation's other problems, we do have the technology to stop this waste. However, we lack the commitment.

Land, and thusly soil, utilization statistics in the United States reveal that only eight percent of our total acreage is taken up with cities and related uses. The majority of our land, as seen in Figure XV, is still

in forests, grazing land, and croplands. Our Soil Quality Index is fair. However, without proper planning and zoning of our existing soil resources, we will see them disappear forever.

Figure XV

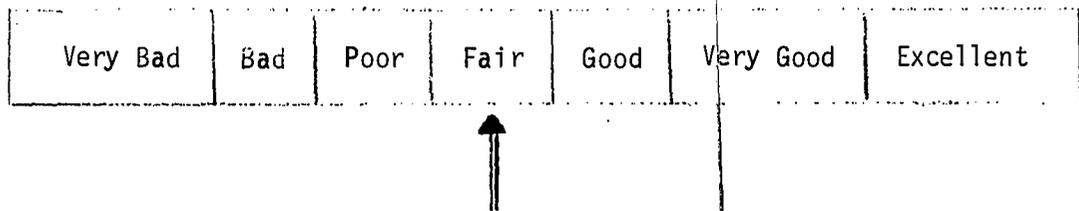
MAJOR LAND USES: U. S. *more?*
cast

Type Land	Acreage	Percent of Acreage
Forests	732 Million Acres	32%
Grazing Land	640 Million Acres	28%
Cropland	444 Million Acres	20%
Parks, Refuges, Cities & Other	173 Million Acres	8%
Limited Surface Use (Deserts, Mountains, Tundra, etc.)	277 Million Acres	12%
TOTAL	2,266,000,000	100%

Forests

As seen in the Forest Quality Index in Figure XVI, we are holding our own in the area of Forest Resources. However, we have great reason to be concerned and alarmed at present trends which affect this great resource.

Figure XVI



As our nation's population skyrockets, the demand for lumber for construction of homes and offices rises. At present, only one-third of our nation remains covered by forests but the supply is diminishing. Figure XVII reveals that since 1952 there has been a small reduction in the billions of board feet of standing timber.

Figure XVII

BILLIONS OF BOARD FEET OF STANDING TIMBER

Year	Billions of Board Feet
1952	2,528.2 billion
1962	2,501.4 billion
1968	2,490.2 billion

The trend at present concerning our forest resources can give us a little comfort. The annual harvest of timber usually equals the "allowable

cut." That is the cutting of every board foot allowed by good forest management. However, as seen in Figure XVIII, as late as 1966 the harvest exceeded the allowable cut and standing timber declined.

Figure XVIII

ALLOWABLE VS. ACTUAL CUT
(Measured in billions of board feet)

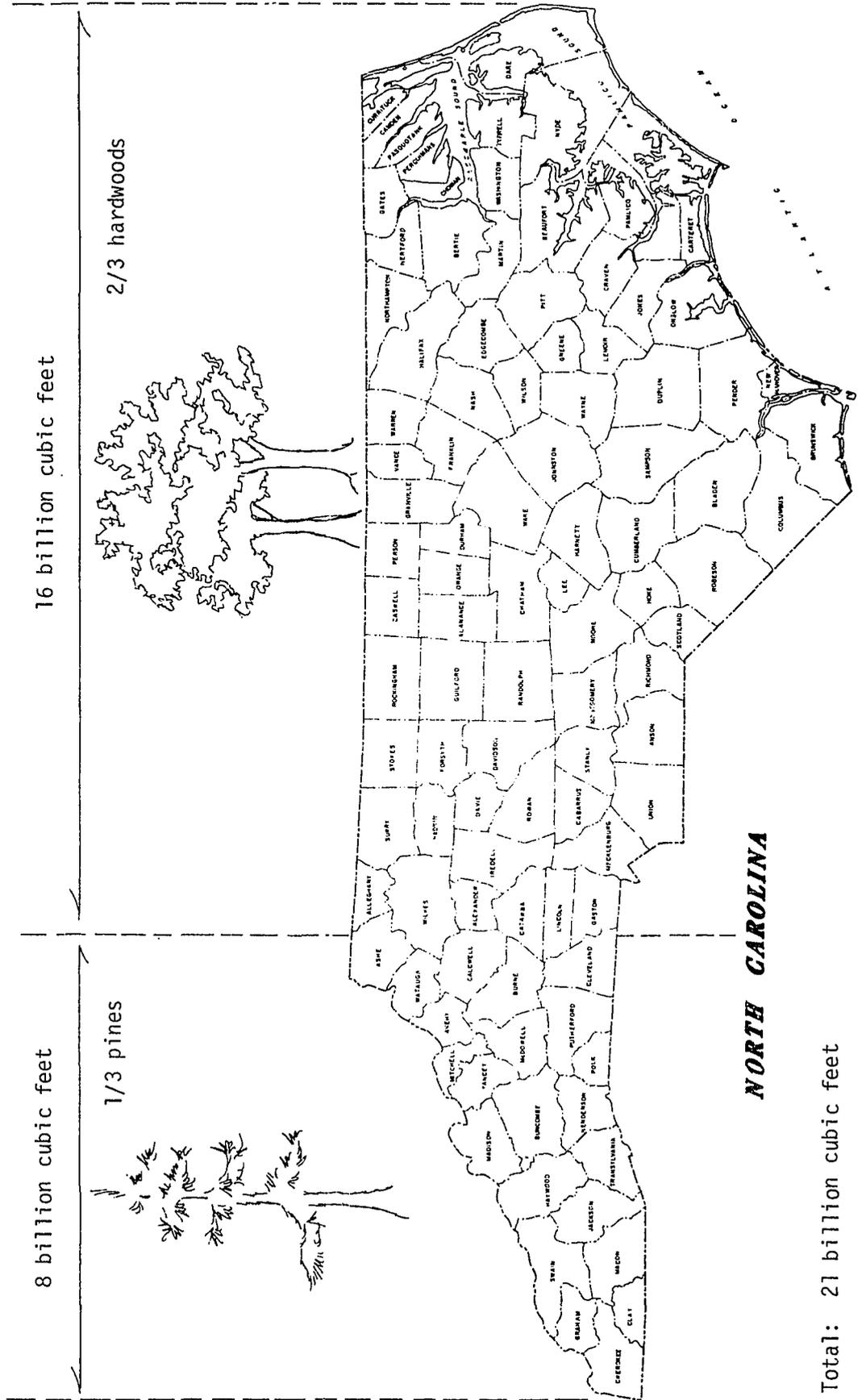
Year	Allowable Cut	Actual Cut
1963	11.3	10.0
1966	11.9	12.1
1968	12.3	12.1

North Carolina has a total of 31.3 million acres of land with 20 million or sixty-five percent in commercial forest land. As can be seen in Figure XIX, the pine tree makes up only one-third of North Carolina's forests. The remainder is in hardwood trees. Seventy-nine percent of this commercial forest land is owned by small landowners. Much of this acreage is not under scientific management. Thus, only a fraction of the benefits that could be obtained with proper management is actually realized. Twelve percent of North Carolina's forests belong to industry. Another nine percent is in federal and local government ownership.

North Carolina generally maintains a surplus margin of annual allowable cut over actual cut of its timber resources. However, of that

Figure XIX

TIMBER VOLUME IN NORTH CAROLINA



Total: 21 billion cubic feet

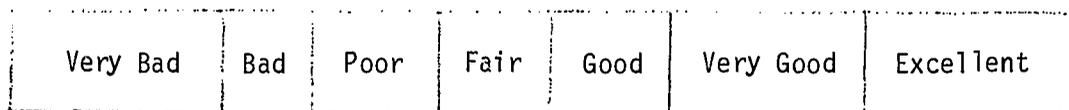
timber which is harvested, one-half is cut into lumber, two-thirds of which is pine for building construction. This is enough for 60,000 new homes each year. The other one-third is hardwood for flooring and furniture. North Carolina is the nation's leader in furniture manufacturing. Of the remaining fifty percent harvested, one-third is utilized by the pulp and paper industry. The rest finds many other uses.

The climate and soil of North Carolina favor more than 100 commercial species of trees, more than any other state in the nation. With proper management and care, hybrid trees, insect control and fertilization, North Carolina's forests will create new jobs for our expanding population.

Our forests are for the people. Some need management, others need to be kept in a primeval state for ecological study, while others need to be set aside for recreation and soil control. We must recognize that our forest resource is one of the most valuable the state possesses.

Wildlife

Figure XX



Wildlife is a sensitive indicator of a healthy human environment. As can be seen in Figure XX, the Wildlife Quality Index stands at fair. However, if the conditions which were allowed to exist in the past are allowed to continue, the trend cannot be very hopeful.

It is frightening to think what has happened to nearly 40 species of birds and mammals in the United States in the last 150 years. For a local example, the Carolina Parakeet comes to mind. Perhaps one of the most beautiful birds in the southern states, it has been extinct for nearly half a century.

The population of passenger pigeons during the early part of the Nineteenth Century was estimated at nearly two billion birds. Those birds were killed by the thousands each week and shipped to metropolitan areas, sold very cheaply to help provide fancy menus. Millions more were killed and used to fatten hogs! Conservationists warned their ultimate extinction was inevitable but no one would listen. The last passenger pigeon died in 1914, a beautiful and harmless life forever gone from this earth. At present there are nearly 89 more birds and mammals on the "Endangered Species List" in the United States. Internationally, the list is over one thousand. Being lower on the food chain, wild animals are among the first to feel the effects of any type of pollution.

? (Dirty water kills) millions of fish each year. The draining and filling of wet lands reduces waterfowl production. The increased use of pesticides has a harmful effect upon the breeding potential of many birds of prey and possibly other forms of life, including humans.

Ocean species of fish are under a great deal of pressure from the loss of estuarine breeding grounds, damaged by pollution, dredging and filling. Some of the large marine animals have been over-hunted. Certain whales and seals are in real danger of extinction.

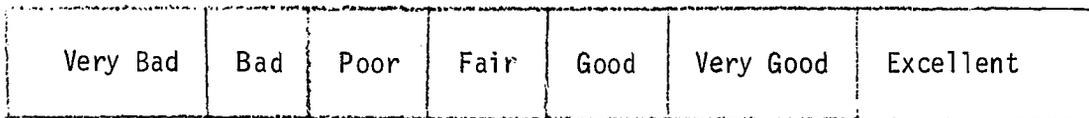
To date, hunters and fishermen have paid for the bulk of most wildlife conservation efforts. The task is now becoming too great. As the

burden becomes greater, the general public will have to assume more and more of the responsibility for the management job, particularly of non-game species.

Minerals

Figure XXI

1969 MINERAL INDEX



The nation's minerals are not renewable. It is possible to grow more trees, produce more wildlife, fertilize the soil, and clean the air and water. But when our minerals are depleted, they are gone forever! As Figure XXI reveals, to date we are in good shape regarding our mineral resources.

Before we experience a further reduction of these resources, a new policy of mineral use must become a reality. All future mineral exploitation should be done under a leasing arrangement, where the surface values once present in the land may be preserved or restored for growing timber, wildlife and recreation. Figure XXII indicates the status of land disturbed due to mineral exploitation. New laws and regulations could dramatically improve this status.

Figure XXII

STATUS OF LAND DISTURBED BY SURFACE MINING

Unreclaimed lands				66%
Reclaimed lands:				
	Nature			46%
	Industry - voluntary			40%
	Industry - by law			11%
	Federal, state, local government			3%
	Total		100%	of 34%
TOTAL				100%

Another great challenge facing us today is the recovery of minerals from our waste. In a normal year, the unburned residues of our trash in the municipal incinerators contain more than 6 billion pounds of iron, and 400 million pounds of aluminum, copper, zinc, and other non-ferrous metals. These valuable wastes are presently being plowed into the ground at dumps and landfills.

Our estimated domestic mineral resources may be seen in Figure XXIII. These represent a mineral-rich heritage. We must avoid wasting them. We must reclaim and reuse every feasible portion. The state of our mineral resources has an enemy. He is us! As our nation's population and gross national product continue to soar, some citizens rejoice in the progress the nation is making. Unless we can reclaim and reuse our mineral and other natural resources, man, our great state and nation, must suffer the consequences.

Figure XXIII

ESTIMATED DOMESTIC RESOURCES

Aluminum ore	300 million short tons
Copper	65 million short tons
Iron ores	121 billion short tons
Lead	15 million short tons
Oil, natural gas	481 billion barrels
Phosphate rock	53 billion short tons
Zinc	60 million short tons

NATURAL RESOURCES: THEME AND RELATED CONCEPTS

Theme: Natural resources influence ecosystems.

Concepts:

- A. Every human being is in constant contact with the world's natural resources.
- B. All natural resources are interrelated; injury to one may effect another.
- C. The economy of a region depends on the wise use of management of its natural resources.
- D. Establishing a balanced cycle of harvest and renewal will insure a continuous yield of natural resources.
- E. Natural resources are renewable and non-renewable factors that influence ecosystems.

FOOTNOTES

¹National Wildlife Federation, OUR NATIONAL E.Q.: THE FIRST NATIONAL WILDLIFE FEDERATION INDEX OF ENVIRONMENTAL QUALITY, (Washington, D. C.: National Wildlife Federation), 1969.

NATURAL RESOURCES: RESOURCES AND INSTRUCTIONAL MATERIALS

The resources and instructional materials listed below will provide you with information as to what is available for use in developing your learning activities relating to natural resources. The sources are organized according to books, periodicals, films, and filmstrips, plus additional learning aids including kits and games, teacher manuals, pamphlets and bulletins of an environmental nature.

BooksTeacher:

out of print
Ashbaugh, Byron and Muriel Beuschlein. THINGS TO DO IN SCIENCE AND CONSERVATION. Danville, Illinois: Interstate Printers and Publishers, Inc., 1960.

out of print
AASA (AMERICAN ASSOCIATION OF SCHOOL ADMINISTRATORS), CONSERVATION EDUCATION IN AMERICAN SCHOOLS, 29th Yearbook. Washington, D. C.: AASA, 1951.

out of print
AASA, CONSERVATION...IN THE PEOPLE'S HANDS. Washington, D. C.: AASA, 1964.

Bale, Robert O. CONSERVATION FOR CAMP AND CLASSROOMS. Minneapolis: Burgess Publishing Co.

Berger, Kermit C. INTRODUCTORY SOILS. New York: The Macmillan Co., 1965.

Brown, Robert E. and G. W. Mouser. TECHNIQUES FOR TEACHING CONSERVATION EDUCATION. Minneapolis: Burgess Publishing Co., 1964.

Clawson, Marion, et al. LAND FOR THE FUTURE. Baltimore: Johns Hopkins Press, 1960.

Clepper, Henry E. ORIGINS OF AMERICAN CONSERVATION. New York: Ronald Press, 1966. \$4.50.
The history of the growth of conservation is covered in this book. Each chapter can stand alone or all the chapters used together can give an informative discussion of the origins, actions, policies, and programs of the conservation movement.

- Cooley, Richard A. ALASKA: A CHALLENGE IN CONSERVATION. Madison, Wisconsin: University of Wisconsin Press, 1966. \$1.95.
With the state of Alaska in need of operating capital, Cooley feels the state's resources may be endangered in an attempt to solve the financial problems on a short-term basis at the expense of sound resource management. He also feels this is the time for a new and imaginative resource policy.
- Freeberg and Taylor. PROGRAMS IN OUTDOOR EDUCATION. Minneapolis: Burgess Publishing Co.
- Gabrielson, Ira N. WILDLIFE CONSERVATION. New York: The Macmillan Co., 1959.
Good for the elementary teacher.
- Gross, M. Grant. OCEANOGRAPHY. Merrill Physical Science Series. Columbus: Charles E. Merrill Publishing Co., 1967. A college level book in this physical science series for non-science majors.
- Hamm, Russell and Larry Nasan. AN ECOLOGICAL APPROACH TO CONSERVATION. Minneapolis: Burgess Publishing Co., 1964.
- Hubbard, Alice Harvey. THIS LAND OF OURS. New York: The Macmillan Co., 1960. \$4.95.
Community and conservation projects for citizens.
- League of Women Voters. LAND AND WATER FOR TOMORROW, HANDBOOK FOR COMMUNITY LEADERS. Washington, D. C.: League of Women Voters Education Fund, 1967.
- Leopold, Aldo. A SAND COUNTY ALMANAC, AND SKETCHES HERE AND THERE. New York: Oxford University Press, 1949. \$1.75.
This is a classic in conservation literature. The author expresses beautifully his feelings in terms of a naturalist's view of the environment and what is happening to it.
- Mattison, C. W. and Joseph Alvarez. MAN AND HIS RESOURCES. Mankato: Creative Educational Society, 1967.
Good for the elementary teacher.
- Matthiessen, Peter. WILDLIFE IN AMERICA. New York: Viking Compass Books, 1964. \$1.95.
A narrative of the effect upon wildlife of the coming of the white man to this hemisphere. From pre-white man to the present, almost every species of wildlife has been affected in some manner. The book is illustrated and well written.
- Parson, Ruben L. CONSERVING AMERICAN RESOURCES. Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1964.
Good for the elementary teacher.
- Richl, Herbert. INTRODUCTION TO THE ATMOSPHERE. New York: McGraw-Hill Book Co., 1965.

Riley, Charles M. OUR MINERAL RESOURCES: AN ELEMENTARY TEXTBOOK ON ECONOMIC GEOLOGY. New York: John Wiley & Sons, Inc., 1959.

Smith, Frank E. THE POLITICS OF CONSERVATION. New York: Random-House, 1966.

Stapp, William. CONSERVATION EDUCATION K-12. Minneapolis: Burgess Publishing Co., 1964.

Swift, Ernest F. A CONSERVATION SAGA. Washington, D. C.: National Wildlife Federation, 1967.
A good resource for the elementary teacher.

Udall, Stuart. 1976: AGENDA FOR TOMORROW. New York: Harcourt, Brace & World, Inc., 1968.

Weaver, Richard L. MANUAL FOR OUTDOOR LABORATORIES. Danville, Illinois: Interstate Printers and Publishers. \$1.25.

Ziswiler, Vinzeny. EXTINCT AND VANISHING ANIMALS: A BIOLOGY OF EXTINCTION AND SURVIVAL. New York: Springer-Verlag New York, Inc., 1967. \$3.40.

This book discusses the many ways man, directly and indirectly, eliminated many of the world's animals. The book also covers the methods man has used to rescue species bordering on the edge of extinction.

Secondary:

Becker, Henry I. RESOURCES FOR TOMORROW. New York: Holt, Rinehart & Winston, Inc., 1964.

Beiser, Arthur. THE EARTH. New York: Time, Inc., 1962.

Bernarde, Melvin A. OUR PRECIOUS HABITAT. New York: W. W. Norton & Co., 1970. \$2.95.
Complex interactions in the environment.

Boerker, R. H. D. BEHOLD OUR GREEN MANSIONS. Chapel Hill: University of North Carolina Press.

Brandwein, Paul, et al. YOU AND YOUR RESOURCES. New York: Harcourt, Brace & World, Inc., 1960.

Clawson, Marion. LAND FOR AMERICANS: TRENDS, PROSPECTS AND PROBLEMS. Chicago: Rand McNally & Co., 1963.

Clipper, Henry (ed.). ORIGINS OF AMERICAN CONSERVATION. New York: Ronald Press, 1966.

- Cocannouer, Joseph A. WATER AND THE CYCLE OF LIFE. New York: The Devin-Adair Co., 1962.
- Collins, Henry Hills. COMPLETE FIELD GUIDE TO AMERICAN WILDLIFE. New York: Harper & Row Publishers, Inc.
- Conant, Roger. FIELD GUIDE TO REPTILES AND AMPHIBIANS. Boston: Houghton-Mifflin Co., 1958.
- Cowen, Robert C. FRONTIERS OF THE SEA. Garden City, N. Y.: Doubleday & Co., Inc., 1960.
- Davis, Kenneth S. and John A. Day. WATER: THE MIRROR OF SCIENCE. Garden City, N. Y.: Anchor Enterprises, 1961.
- Douglas, William O. A WILDERNESS BILL OF RIGHTS. Boston: Little, Brown & Co., 1965.
- Farb, Peter. THE LAND AND WILDLIFE OF NORTH AMERICA. New York: Time, Inc., 1966.
- Finch, V. C. et al. THE EARTH AND ITS RESOURCES. New York: McGraw-Hill Book Co., 1959.
- Gaskell, Thomas Frohock. WORLD BENEATH THE OCEANS: THE STORY OF OCEANOGRAPHY. New York: Doubleday & Co., Inc.
- Heffernan, Helen and George Shaftel.
 THE ENERGY STORY
 THE FISHERIES STORY
 THE FORESTRY STORY
 THE MINERAL STORY
 THE SOIL STORY
 THE WATER STORY
 THE WILDLIFE STORY
 Syracuse: L. W. Singer Co., 1963.
- Helfman, Elizabeth S. WATER FOR THE WORLD. New York: David McKay Co., Inc., 1960.
- Highsmith, Richard M. et al. CONSERVATION IN THE U. S. Chicago: Rand McNally & Co., 1962.
- Hillcourt, William. FIELD BOOK OF NATURE ACTIVITIES AND CONSERVATION. New York: G. P. Putnam's Sons, 1961.
- Hitch, Allen S. and Marian Sorenson. CONSERVATION AND YOU. Princeton: Van Nostrand-Reinhold Books, 1964.

- Justice, William S. and C. Ritchie Bell. WILDFLOWERS OF NORTH CAROLINA. Chapel Hill: University of North Carolina Press, 1968. \$8.50.
Color photographs of major N. C. varieties of wildflowers.
- Leopold, Luna B., Kenneth S. Davis and the Editors of LIFE. WATER. New York: Time, Inc., 1966.
- Mattison and Alvarez. MAN AND HIS RESOURCES. Mankato, Minnesota: Creative Educational Society, 1967. \$5.95.
- McNall, P. E. OUR NATURAL RESOURCES. Danville, Illinois: Interstate Printers and Publishers, 1969. \$4.95.
- Palmer, E. L. PALMER'S FIELD BOOK OF MAMMALS. New York: E. P. Dutton & Co., Inc., 1957.
- Palmer, Ralph S. THE MAMMAL GUIDE. New York: Doubleday & Co., Inc., 1954.
- Radford, A. E. et al. GUIDE TO THE VASCULAR FLORA OF THE CAROLINAS. Chapel Hill: University of North Carolina Press, 1968.
Key for plant identification in North and South Carolina.
- Riley, Charles M. OUR MINERAL RESOURCES. New York: John Wiley & Sons, Inc., 1963.
- Shepard, Francis P. THE EARTH BENEATH THE SEA. Baltimore: Johns Hopkins Press, 1959.
- Smith, G. CONSERVATION OF NATURAL RESOURCES. New York: John Wiley & Sons, Inc.
- Smith, Frank E. THE POLITICS OF CONSERVATION. New York: Random-House, 1966.
- Stephens, William M. SCIENCE BENEATH THE SEA. New York: G. P. Putnam's Sons, 1966.
- Thompson, Phillip D., Robert O'Brien and the Editors of LIFE. WEATHER. New York: Time, Inc., 1965.
- Vogel, Helen Wolff and Mary L. Caruso. OCEAN HARVEST. New York: Alfred A. Knopf, Inc., 1961.
- Weaver, Richard L. et al. CONSERVATION HANDBOOK...NABT. Danville, Illinois: The Institute of Printers and Publishers. \$4.50.
- Wright, Jim. THE COMING WATER FAMINE. New York: Coward-McCann, Inc., 1966. \$5.00.

Elementary:

- Bartlett, Margaret F. DOWN THE MOUNTAIN. New York: Scott Publishing Co., 1963.
Useful in the primary grades.
- Bendick, Jeanne. ALL AROUND YOU: A FIRST LOOK AT THE WORLD. New York: McGraw-Hill Book Co., 1951.
Good for primary students.
- Bonsall, G. THE HOW AND WHY WONDER BOOK OF WEATHER. Columbus: Merrill Publishing Co., 1960.
Can be used with primary students.
- Brantley, Franklin M. AIR IS ALL AROUND YOU. New York: Crowell, 1964.
Useful with primary children.
- Chandler, T. J. THE AIR AROUND US AND FRESH WATER. Garden City, N. Y.: Doubleday & Co., Inc., 1969. \$5.95
Grades K-8.
- Cheney, Cora and Ben Partridge. UNDERSEAS: THE CHALLENGE OF THE DEEP FRONTIER. New York: G. P. Putnam's Sons, Inc., 1961.
- Clark, Mary Lou. YOU AND HOW THE WORLD BEGAN. Chicago: Children's Press, Inc., 1965.
A good publication for K-4.
- Forrester, Frank H. EXPLORING THE AIR OCEAN. New York: G. P. Putnam's Sons, Inc., 1960.
- Friskey, Margaret. THE TRUE BOOK OF BIRDS WE KNOW. Chicago: Children's Press, Inc., 1954.
Useful in the primary grades.
- THE TRUE BOOK OF THE AIR AROUND US. Chicago: Children's Press, Inc., 1964.
Useful in the primary grades.
- Frome, Michael. WHOSE WOODS THESE ARE. Garden City: Doubleday & Co., Inc., 1962.
- Gates, Richard. THE TRUE BOOK OF CONSERVATION. Chicago: Children's Press, Inc.
Good for primary students.
- Hagaman, Adaline P. WHAT IS WATER? Chicago: Benefic Press, 1960.
Can be used with primary students.
- Halley, Naomi. TO SAVE THE SOIL. New York: The Dial Press, 1965.

- Harris, Miles F. MAN AGAINST STORM: THE CHALLENGE OF THE WEATHER. New York: G. P. Putnam's Sons, Inc., 1962.
- Harrison, C. William. CONSERVATION: THE CHALLENGE OF RECLAIMING OUR PLUNDERED LAND. New York: Nessner, 1963.
- Hausman, Leon A. THE BOOKS OF SONGBIRDS (with records). New York: Grosset and Dunlap, Inc., 1956.
- Hine, Al. WHERE IN THE WORLD DO YOU LIVE? New York: Harcourt, Brace & World, Inc., 1962.
This book deals with a geographical approach valuable for making a child aware of the physical world which surrounds him and his place in that world.
- Keene, Melvin. THE BEGINNER'S STORY OF MINERALS AND ROCKS. New York: Harper & Row Publishers, Inc., 1966.
- May, Julian. YOU AND THE EARTH BENEATH US. Chicago: Children's Press, Inc., 1958.
Useful with primary children.
- Parson, Ruben. CONSERVING AMERICAN RESOURCES. New York: Prentice-Hall, Inc., 1965.
- Peterson, Ottis. JUNIOR SCIENCE BOOK OF WATER. Scarsdale: Garrard Publishing Co., 1966.
- Pine, Tillie S. WATER ALL AROUND. New York: McGraw-Hill Book Co., 1959.
Good for use in the primary grades.
- Podendorf, Illa. THE TRUE BOOK OF ROCKS AND MINERALS. New York: Children's Press, Inc., 1958.
A helpful guide in the primary grades.
- Preston, Eda M. AIR. Chicago: Follett Publishing Co., 1965.
Primary students will find this book useful.
- Schapp, Martha and Charles Schapp. LET'S FIND OUT WHAT'S IN THE SKY. New York: Franklin Watts, Inc., 1962.
Primary students should enjoy this publication.
- Sellers, Archer. RAIN, RIVERS, AND RESERVOIRS: THE CHALLENGE OF RUNNING WATER. New York: G. P. Putnam's Sons, 1963.
- Shannon, Terry. ABOUT THE LAND, THE RAIN, AND US. Chicago: Children's Press, Inc., 1963.
An easily understood book for primary children.

Shomon, Joseph J. MANUAL OF OUTDOOR INTERPRETATION. New York:
National Audubon Society, 1968. \$3.00.
Elementary-junior high level.

Smith, Guy H. CONSERVATION OF NATURAL RESOURCES. New York: John
Wiley & Sons, Inc., 1965.

Sollers, Allan A. OURS IS THE EARTH. New York: Holt, Rinehart
& Winston, Inc., 1963.

Syrocki, B. John. WHAT IS SOIL?. Chicago: Benefic Press, 1961.

THE FOLLOWING SPACE IS AVAILABLE FOR ADDITIONAL BIBLIOGRAPHICAL
ENTRIES:

PeriodicalsAmerican Forests

American Forestry Association
919 17th Street, N. W.
Washington, D. C. 20006

Monthly. \$6.00 per year. Articles on all resources and parks and recreation subjects.

Audubon

National Audubon Society
1130 Fifth Avenue
New York, New York 10028

Bi-monthly magazine. \$8.50 yearly.

The Conservationist

State of New York Conservation Department
Albany, New York 12226

Bi-monthly magazine. \$2.00 per year.

Earth and Sky

Outdoor Publishing Company
P. O. Box 589
Pasadena, California

Published monthly, September to June. Subscription \$1.50 per year.

Earth Science

Earth Science Publishing Company, Inc.
Box 1357
Chicago, Illinois

This is the official publication of the Midwest Federation of Mineralogical Society. Published bi-monthly. Subscription \$2.50 per year.

Field and Stream

Holt, Rinehart and Winston, Inc.
383 Madison Avenue
New York, New York

Published monthly. \$5.00 per year.

Geotimes

American Geological Institute
2101 Constitution Avenue
Washington, D. C.

This news magazine is a professional publication of the American Geological Institute. Published 8 times per year. Subscription \$2.00.

Izaak Walton Magazine

Izaak Walton League of America
719 13th Street N. W.
Washington, D. C. 20005

Monthly publication. \$2.50 per year.

Journal of Forestry

Society of American Foresters
1010 16th Street N. W.
Washington, D. C. 20036

Monthly. \$12.00 per year. Articles on forest resources and related subjects.

NASA Facts

National Aeronautics and Space Administration
400 Maryland Avenue N. E.
Washington, D. C. 20002

Free.

National Parks Magazine

National Parks Association
1701 18th Street N. W.
Washington, D. C. 20009

Monthly. \$6.50 per year. Covers parks and wilderness, outdoor recreation, the protection and restoration of the outdoor environment generally.

National Wildlife Magazine

National Wildlife Federation
1412 16th Street
Washington, D. C.

\$5.00 annually includes membership in the federation. Dedicated to the wise use of natural resources.

Wildlife in North Carolina

North Carolina Wildlife Resources Commission
P. O. Box 2919
Raleigh, North Carolina 27602

Monthly. \$1.00 per year.

Outdoor Life

Popular Science Publishing Company
355 Lexington Avenue
New York, New York 10017

Monthly publication. \$5.00 per year.

Ranger Rick's Nature Magazine

National Wildlife Federation
1412 16th Street
Washington, D. C.

\$6.00 annually includes membership in Ranger Rick's Nature Club.
Special group rate, \$5.00 per year. Elementary level.

Science and Children

National Science Teacher's Association
1201 16th Street N. W.
Washington, D. C. 20036

75¢. Features a chart which lists educational facilities and programs in each of the parks, also a list of materials available to teachers. Articles on individual parks, environmental education. The publication is written for the elementary school teacher. Special issue on the national parks, March, 1970.

Soil and Water Conservation

Soil Conservation Society of America
7515 N. E. Ankeny Road
Ankeny, Iowa 50021

Monthly journal. \$7.50 per year.

Soil Conservation

Soil Conservation Service
U. S. Department of Agriculture
Superintendent of Documents
Washington, D. C. 20402

Monthly magazine of the Soil Conservation Service. \$1.75.

S. C. Wildlife Magazine

South Carolina Wildlife Resource Department
1015 Main Street
Columbia, South Carolina 29202

Quarterly. Free.

Virginia Wildlife Magazine

Virginia Commission of Game and Land Fisheries
Box 1642
Richmond, Virginia 23230

Monthly publication. \$1.50 per year.

Water Pollution Control Federation Journal

Water Pollution Control Federation
3900 Wisconsin Avenue N. W.
Washington, D. C. 20016

Monthly publication. \$18.50 per year.

Weatherwise

American Meteorological Society
45 Beacon Street
Boston, Massachusetts

This popular magazine includes articles on such topics as weather satellites and weather control. Subscription price \$4.00 per year.

THE FOLLOWING SPACE IS AVAILABLE FOR ADDITIONAL BIBLIOGRAPHICAL ENTRIES:

FilmsSecondary:

THE BEACH -- A RIVER OF SAND

Encyclopedia Britannica Films. 20 min. Color. The film examines the makeup of a beach, its dynamics, movement of waves and sand, littoral current and drift. Later, the film introduces some of man's devices for stabilizing the beach.

CONSERVATION AND BALANCE IN NATURE

International Film Bureau. 18 min. Color.

CONSERVATION AND OUR FORESTS

Film Associates. 15 min. Color.

CONSERVATION OF NATURAL RESOURCES

Encyclopedia Britannica Films. Early wastes in the lumber industry and agriculture are represented. The efforts to check the abuses are noted and a sequence on conservation and development on aesthetic resources is presented.

CONSERVING OUR NATURAL RESOURCES

Film Associates. 17 min. Color.

CONSIDER THE CHALLENGE

Film Associates. 14 min. Color.

THE EARTH: RESOURCES IN ITS CRUST

Coronet Films. 11 min. Color.

GIVING OUR WILDLIFE A CHANCE

Encyclopedia Britannica Films. A filmstrip advocating wildlife conservation.

GRAND CANYON

Encyclopedia Britannica Films. 26 min. Color.

THE INCONSTANT AIR

National Academy of Science. 27 min. Color. An excellent account of weather, climate and current research in the area.

THE MEANING OF CONSERVATION

Coronet Films. This film shows what is being done to maintain the nation's resources and natural beauty by limiting the taking of wildlife, flood control practice, forestry practices, and implementing new farming methods.

NATURE'S PLAN

Encyclopedia Britannica Films, 1963. 15 min. Color. The natural water cycle from sea to air to earth is shown in principle.

THE RIVER

U. S. Department of Agriculture. 32 min. B/w.

WILDLIFE RESOURCES

Curriculum Films, Inc. A filmstrip urging the wise use of our wildlife resources.

Elementary:

AIR AND WHAT IT DOES

Encyclopedia Britannica Films. 11 min. Color. K-4.

ANIMALS OF PREHISTORIC AMERICA

McGraw-Hill Text Films. 15 min. Color.

ATTRACTING BIRDS IN WINTER

International Film Bureau. 6 min. Color. K-4.

BIRDS OF OUR STORYBOOKS

Coronet Films. 11 min. Color. K-4.

CAMPING, A KEY TO CONSERVATION

Indiana University, Audio-Visual Center. 23 min. Color.

CHALLENGE OF THE OCEANS

McGraw-Hill Text Films. 29 min. Color. An excellent film for the introduction to a unit on oceanography. It stresses techniques and training necessary for oceanologists.

"Conservation for Today's America Series"

SOIL CONSERVATION TODAY

FOREST CONSERVATION TODAY

WATER CONSERVATION TODAY

WILDLIFE CONSERVATION TODAY

MINERAL CONSERVATION TODAY

URBAN CONSERVATION TODAY

LAND CONSERVATION TODAY

Society for Visual Education. A filmstrip series useful for Grades 4-8.

THE CONSERVATION ROAD

20th Century Fox Films. 18 min. B/w.

TO CONSERVE OUR HERITAGE

Society for Visual Education. 37 min. Color.

CONSERVING OUR MINERAL RESOURCES TODAY

Coronet Films. 11 min. Color. Grades K-4.

- CONSERVING OUR SOIL TODAY
Coronet Films. 11 min. Color.
- THE DUST IS DYING
U. S. Department of Agriculture. 14 min. Color.
- EARTH'S CHANGING SURFACE
McGraw-Hill Text Films. 11 min. Color.
- FACE OF THE EARTH
Encyclopedia Britannica Films. 12 min. Color. Wearing down forces on the earth.
- THE FOREST
U. S. Department of Agriculture. 29 min. Color.
- FOREST CONSERVATION
Encyclopedia Britannica Films. 11 min. Color. Grades K-4.
- GRAND CANYON
Walt Disney Productions. 29 min. Color.
- THE GREAT LAKES, HOW THEY WERE FORMED
Encyclopedia Britannica Films. 11 min. Color.
- LANDS AND WATERS OF OUR EARTH
Coronet Films. 11 min. Color. Grades K-4.
- LITTLE SMOKEY
U. S. Department of Agriculture, Motion Picture Service. 14 min. Color. Grades K-4.
- THE MUDDY RAINDROPS
Society for Visual Education. A good filmstrip for use in the primary grades.
- OUR PART IN CONSERVATION
McGraw-Hill Text Films. 11 min. Color.
- RAINDROPS AND SOIL EROSION
Du Art Film Laboratories. 21 min. Color.
- REALM OF THE WILD
U. S. Department of Agriculture. 28 min. Color.
- THE RESTLESS SEA
Southern Bell Telephone and Telegraph. 60 min. Color.
- ROCKS: WHERE THEY COME FROM
Coronet Films. 11 min. Color. Grades K-4.

- SEEDS OF DESTRUCTION
Encyclopedia Britannica Films. 10 min. Color.
- SMOKEY THE BEAR
U. S. Department of Agriculture, Motion Picture Service. 5 min.
Color. Grades K-4.
- STORY OF SOIL
Coronet Films. 11 min. Color.
- UNCHAINED GODDESS
American Telephone and Telegraph Company. 60 min. Color.
An excellent film on meteorology in general.
- UNDERSTANDING OUR EARTH: HOW ITS SURFACE CHANGES
Coronet Films. 11 min. Color.
- UNDERSTANDING OUR EARTH: SOIL
Coronet Films. 11 min. Color.
- WATER AND WHAT IT DOES
Encyclopedia Britannica Films. 11 min. Color.
- WATER FOR FARM AND CITY
U. S. Department of Agriculture. 14 min. B/w.
- WEATHER: UNDERSTANDING STORMS
Coronet Films. 11 min. B/w.
- WILDERNESS TRAIL
U. S. Department of Agriculture. 15 min. Color.
- WILDLIFE AND THE HUMAN TOUCH
U. S. Department of Agriculture. 19 min. Color.
- WIND AND WHAT IT DOES
Encyclopedia Britannica Films. 11 min. Color. Grades K-4.
- WISE USE OF WATER RESOURCES
United World Films, Inc. 14 min. Color.
- WOODLAND MANNERS
U. S. Department of Agriculture. 20 min. Color.
- VISION IN THE FOREST
U. S. Department of Agriculture, Motion Picture Service.
5 min. Color. Grades K-4.
- YELLOWSTONE: OUR FIRST NATIONAL PARK
Grey D. Haselton. 15 min. Color.

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YOSEMITE: END OF THE RAINBOW
Grey D. Haselton. 22 min. Color.

THE FOLLOWING SPACE IS AVAILABLE FOR ADDITIONAL BIBLIOGRAPHICAL
ENTRIES:

Additional Learning Aids

Bibliographical Sources:

U. S. Department of Agriculture
Fourteenth Street & Independence Avenue S. W.
Washington, D. C. 20250

"Science" and "Improving Our Environment" and other titles. 1968-70. Single copies free. "Science and Consumers," "Science and Food for Freedom," "Science and Saving Water and Soil," "Science and America's Beauty." Free reprints from the Agricultural Yearbooks are available on air and water pollution, other environmental topics.

American Forest Products Industries, Inc.
1916 North Street N. W.
Washington, D. C.

AMERICA'S STRENGTH GROWS IN HER FORESTS
THE STORY OF FORESTS
IT'S A TREE COUNTRY

American Petroleum Institute
1271 Avenue of the Americas
New York, New York 10020

- 1) Report on "Air and Water Conservation Expenditures of the Petroleum Industry in the U. S.". August, 1968.
- 2) "A Primer on Oil Spill Cleanup". December, 1968. 25¢.
- 3) "Clearing the Air".
- 4) "Conserving Our Waters".
- 5) "Conserving Our Waters and Clearing the Air". 75¢.
(Designed for high school.)
- 6) "Publications and Materials 1969".

Atomic Energy Commission
Educational Services
Oak Ridge, Tennessee 37830

- 1) "Educational Services Provided by the U. S. Atomic Energy Commission"
- 2) "Atmospheric Radioactivity and Fallout"
- 3) "Atoms, Nature, and Man"

- 4) "Radioactive Wastes"
- 5) "The Atom and the Ocean"
- 6) "Fallout From Nuclear Tests"
- 7) "The Atom and Your Health"
- 8) "Science, Technology, and the Citizen"
- 9) "Biological, Medical and Environmental Research Program"
- 10) "Nuclear Power and the Environment"
- 11) "Environmental Aspects of Operation of Central Power Plants"
- 12) "The Environment-- And What to Do About It"
- 13) "Radiation Protection-- Past, Present, and Future"
- 14) "The Natural Radiation Environment"
- 15) "Your Body and Radiation"

Boy Scouts of America
1005 Wade Avenue
Raleigh, North Carolina

- 1) "Soil and Water Conservation" 45¢
- 2) "Conservation of Natural Resources" 45¢

Bureau of Land Management
Box 2237
Boise, Idaho

"Bibliography of Conservation Teaching References"

The Conservation Foundation
1250 Connecticut Avenue
Washington, D. C. 20036

"Concepts of Conservation" 50¢

The Conservation Library Center
Denver Public Library
Denver, Colorado 80202

Started in 1962 with the support of the American Conservation Association, the Center collects and makes available books, periodicals, and other publications, motion pictures, and drawings and paintings on natural resource subjects.

Forest Service
U. S. Department of Agriculture
50 Seventh Street N. E.
Atlanta, Georgia 30323

Single copies free. For more than one copy a Forest Service Price List (Bulletin FS-28) is available.

Forest Service Bulletins:

AIB 83 "Highlights in the History of Forest Conservation"
 AIB 305 "Your Water Supply and Forests"
 P. A. 457 "Forestry Activities"
 P. A. 613 "Trees of the Forest-- Their Beauty and Use"
 Unnumbered "Conservation Activities for Young People"

Leaflets and Pamphlets:

FS-22 "You Can Be a Conservationist"
 FS-25 "National Forest Wilderness and Primitive Areas"
 FS-26 "Memorial Forests"
 FS-37 "Forests and Wildlife"
 K-6 "Edible Fruits of Forest Trees"
 K-19 "State Trees"
 O-4 "Forests and the Natural Water Cycle"
 O-28 "Forests and Water"
 O-30 "Conservation Fact Sheet"
 O-32 "Suggestions for Integrating Forestry in a Modern Curriculum"

Charts and Posters:

FS-8 "How a Tree Grows"
 M-5154 "Forest Regions of the U. S."
 FS-31 "Forest Service Films, Trees of the Southern U. S."

(Yearbook Separate #3573) "Air Pollution Detectives"

Office of the Secretary
 Department of the Interior
 Washington, D. C. 20240

The 1969-70 listing of "Publications on Conservation" and related Department of the Interior subjects is available.

Izaak Walton League of America, Inc.
 1130 5th Avenue
 New York, New York 10028

- 1) "Clean Water-- It's Up to You"
- 2) "Recommended Books on Conservation" (Available for grades 1-12)
- 3) "Guidelines to Conservation Education Action"

Sierra Club
Mills Tower
San Francisco, California 94104

The Club furnishes a list of publications, pollution and population information and is dedicated to the protection of scenic areas.

Sierra Club Books:

Beard, Daniel, et al. MEANING OF WILDERNESS TO SCIENCE.
Brower, David (ed.). WILDERNESS--AMERICA'S LIVING HERITAGE.
-----, WILDLANDS IN OUR CIVILIZATION.
Leydet, Francois. THE LAST REDWOODS. 1964.
----- (ed.). TOMORROW'S WILDERNESS.

Society of American Foresters
1010 16th Street, N. W.
Washington, D. C. 20036

"Forest Policies." 1968. 7¢ per copy.

Soil Conservation Service
U. S. Department of Agriculture
Fourteenth Street & Independence Avenue, S. W.
Washington, D. C. 20250

- 1) "The Big Conservation Job Is on Private Land" (Picture Story #142)
- 2) "That Land Down There" (Agriculture Bulletin #255)
- 3) "Soil Erosion--The Work of Uncontrolled Water" (Agriculture Information Bulletin #260)
- ? -4) "The Valley of Tomorrow"
- 5) "Rural Recreation" (Miscellaneous Publication #930)
- 6) "An Outline for Teaching Conservation in High Schools" (PA-201)
- 7) "Soil and Water Conservation in Suburbia" (Reprint from Soil Conservation)
- 8) "Help Keep Our Land Beautiful" (Prepared by Soil Conservation Society of America)
- 9) Packet: "The Community School Site"
- 10) "Community Planning for Resource Development"
- 11) "Snow Survey"
- 12) "Water Facts"
- 13) "Know the Soil You Build On"
- 14) "Conservation and the Water Cycle"
- 15) "Grass--The Rancher's Crop"
- 16) "Farmlands and Water Quality"

Numbered Bulletins, U. S. Soil Conservation Service:

- P. A. 201 "Outline for Teaching Conservation in High Schools"
 P. A. 341 "Teaching Soil and Water Conservation"
 M-286 "What Is Soil Erosion?"
 M-394 "Farms The Rain Can't Take"
 M-449 "Early American Soil Conservationists"
 M-596 "Our American Land, The Story of Its Abuse and Its Conservation"
 P. A. 71 "Use the Land and Save the Soil" — *out of print since 1951*
 L-249 "What is a Conservation Farm Plan?"
 AIS 99 "Conquest of the Land Through 7,000 Years" — *out of print since 1962*
 A+B AIS 78 "From the Dust of the Earth" —
 A+B AIS 95 "The Soil Went to Town"

Superintendent of Documents
 U. S. Government Printing Office
 Washington, D. C.

- Leopold, Luna B. and W. B. Langbein. A PRIMER ON WATER. Geological Survey Publication.
 EDUCATION AND OUTDOOR RECREATION. Bureau of Outdoor Recreation, 1968. 75¢.
 IT'S YOUR WORLD-- THE GRASSROOTS CONSERVATION STORY. U. S. Department of the Interior, 1969. \$2.00. This is the newest conservation yearbook of the Department of the Interior. This document contains many of the current ideas on conservation and what the Department is doing to conserve the natural resources of the nation.
 NATION'S WATER RESOURCES. U. S. Water Resources Council, 1968. \$4.25. A report to the nation on how water is used and managed in the main river basins of the U. S. The approach to various aspects of water supply, water pollution, wild rivers, flooding, agricultural and recreational uses give a good overview of the country's water resources.
 Taber, Robert W., Leon R. LaPorte and Ellsworth C. Smith. AN OCEANOGRAPHIC CURRICULUM FOR HIGH SCHOOLS. U. S. Naval Oceanographic Office, 1968. 35¢. An outline.
 Dubach, Harold and Robert Taber. QUESTIONS ABOUT THE OCEANS. U. S. Naval Oceanographic Office, 1968. 55¢. 100 questions and their answers.

National Audubon Society
 1130 Fifth Avenue
 New York, New York 10028

- AUDUBON NATURE BULLETIN #2, 14 GOOD TEACHING AIDS. \$3.00.
 Covers a wide range of subjects and activities in the field of natural science.

- Shomon, Joseph J. MANUAL OF OUTDOOR CONSERVATION EDUCATION.
\$2.00.
- Peterson, Roger T. NATIONAL AUDUBON SOCIETY, BIRD STUDY FOR
SCHOOLS. Single copies 10¢.
- NATURE CENTERS AND OUTDOOR EDUCATION FACILITIES. 1969 \$1.00.
A listing by state.
- Ashbaugh, Byron L. PLANNING A NATURE CENTER. \$2.00.

National Parks Association
1701 18th Street N. W.
Washington, D. C. 20036

The National Parks Association produces free and low cost Pamphlets and articles on thermal pollution, noise pollution, pesticides, and basic ecology. Excellent.

National Wildlife Federation
1412 16th Street N. W.
Washington, D. C. 20036

The Federation produces a CONSERVATION DIRECTORY-- a guide to all state and national sources of conservation and environment information for \$1.50. Also, they produce informational packets on ecology, and pollution, special packets from elementary to adult, and a newsletter.

- "Conservation Education Pamphlets"
"Teacher and Leader's Guide"
Ernest Swift. THE GLORY TRAIL.
"My Land and Your Land Series". \$1.00 for set of 4.
WOULD YOU LIKE TO HAVE LIVED WHEN?
RAINDROPS AND MUDDY RIVERS
PLANTS AND ANIMALS LIVE TOGETHER
NATURE'S BOOK, THE SOIL
"Children's Wildlife Books". \$2.50 each.
ANIMAL BABIES
BIRDS AT HOME
FRIENDLY ANIMALS
HOMES AND HABITS OF WILD ANIMALS
TRAVELING WITH BIRDS
FREDDY FOX SQUIRREL
MAC MALLARD
TOMMY TROUT
WILLIE WHITETAIL
WOODY WOODCHUCK

The Wilderness Society
729 15th Street N. W.
Washington, D. C. 20005

The Society produces reports, pamphlets, and reprints on the preservation and use of our natural heritage.

Women's Christian Association
National Board, YWCA
600 Lexington Avenue
New York, New York 10022

Whyte, William H. COMMUNITY ACTION FOR OUTDOOR RECREATION AND CONSERVATION. 1965. \$1.00. Groundwork, action and follow through: how to go about it.

Kits and Games:

"Conservation"

American Petroleum Institute. Revised edition, 1970. Free. A picture and discussion kit of color plates with descriptive copy. Suggests projects. Grades 7-9.

"Forest Conservation Packets For Teachers"

These packets contain a teacher's manual, bibliographies, bulletins and colorful wall charts. Free on request from American Forest Products Industries, 1816 N Street N. W., Washington, D. C.

Kit: "Emphasis on Air Conservation"

Kit: "Water Pollution Abatement" \$2.00

These two kits are available from the American Petroleum Institute, 1271 Avenue of the Americas, New York, New York 10020.

"Teacher and Leader's Kit"

National Wildlife Federation. Revised annually. Single copies free, additional copies 10¢ each. Conservation, pollution, outdoor and urban education. Grades 7-12. National Wildlife Federation, 1412 16th Street N. W., Washington, D. C. 20036.

"Nature Study Aids"

Conservation Education. Series of visual aids and student activities. NASCO Nature Study Aids. Sold by volume or by set of 6 volumes. Exact replicas of leaves, plant structures and feet of wildlife that make up our environment. Grades 7-12.

Packet of Materials from Various Sources
Shoreline Public Schools. 50¢. Interdisciplinary outdoor education.

"The World Around You"

The Garden Club of America. Current. First kit is free of charge. Additional kits are 50¢ each. Study guide 35¢. Individual leaflets, 3¢ each. Study guide contains articles on all phases of outdoor education. Also lists films, books, and summer workshops. Eleven leaflets on conservation include: "Our Wildlife Heritage," "Water Pollution," "Berried Treasure for Your Birds."

Color Transparencies

3 M Company, Visual Products Division, 3 M Center, St. Paul, Minnesota 55101. "The Land That Supports Us," "Our Soil Resources," "Our Water Resources," "Our Plant Resources," "Our Animal Resources."

Manuals and Bulletins:

ANIMAL ACTIVITY and other titles. McGraw-Hill Book Company, Webster Division, Manchester Road, Manchester, Missouri, 1968-70. Activities and experiments in this book and other titles include: BRINE SHRIMP, BUTTERFLIES, CHANGES, EGGS AND TADPOLES. Enrichment reading in HOW BARN OWLS HUNT, HOW A MOTH ESCAPES FROM ITS COCOON.

THE BEHAVIOR OF MEALWORMS. Janey Knaack. Shoreline Public Schools, 1968. 50¢. Interdisciplinary outdoor education.

CLOUDS, EARTHQUAKES, HURRICANE INFORMATION BOOKLETS. Department of Commerce. Environmental Science Services Administration (ESSA), Rockville, Maryland 20852.

COMMON FOREST TREES OF N. C., HOW TO KNOW THEM. Department of Conservation and Development, Raleigh, N. C. A pocket manual.

A COURSE OF STUDY FOR RESIDENT OUTDOOR EDUCATION and other titles. Flour Bluff Independent School District, 2505 Waldron Road, Corpus Christi, Texas 78418. 1966-67. Free. Others include: CONSERVATION AND GEOLOGY IN SOUTH TEXAS. MENTAL HEALTH FACTORS PERTAINING TO HUMAN DEVELOPMENT IN AN OUTDOOR ORIENTED CURRICULUM. FLORA OF THE TEXAS GULF COAST AREA. MARINE INVERTEBRATE FAUNA OF THE TEXAS GULF COAST AREA. PERSONNEL AND OPERATIONS EQUIPMENT REQUIREMENTS FOR RESIDENT CAMPING AND PRIMITIVE CAMPING FOR FIFTY STUDENTS.

- EARTH SCIENCE-- A HANDBOOK ON THE GEOLOGY OF WEST VIRGINIA. Raymond E. Janssen. West Virginia Department of Education, 1964. Free.
- FIRST BOOK OF CONSERVATION and other titles. Franklin Watts, Inc., 1964-70. \$2.17 each. Other titles: OF WILDLIFE SANCTUARIES, AIR, NATIONAL PARKS, RIVERS, LUMBERING, SWAMPS AND MARSHES, WATER. Elementary.
- GEOLOGIC FIELD TRIP GUIDES. This is a series of field trip guides describing the geologic features of many of the counties of N. C. The guides were prepared under grants from NSF to the N. C. Academy of Science in cooperation with the N. C. State Departments of Public Instruction and Curriculum Study and Research. These materials are for free distribution to schools, teachers, and students. At present the supply is limited. Write: Dr. Herbert E. Speece, Director; Geologic Field Trip Guides; North Carolina State University; Raleigh, N. C. 27602.
- GSTA NEWSLETTER. Special conservation issue. November 1969. Guam Science Teachers' Association, Box 2872, Agana, Guam 96910. Contains reprints of articles about the Giant African Snail, and an interview with Martin Schein about teaching conservation.
- GUIDE BOOK TO THE STUDY OF MINERALS. Oscar E. Randolph. Randolph Minerals, Morganton, N. C., 1959.
- GUIDE TO ENVIRONMENTAL EDUCATION. Madison Public Schools, 1970. \$3.00. Grades K-6. Conservation of natural resources.
- AN INTERDISCIPLINARY OUTDOOR EDUCATION PROGRAM. Shoreline Public Schools (in cooperation with other school districts in the state of Washington), 1966. \$2.00.
- INVESTIGATING THE EARTH: EARTH SCIENCE CURRICULUM PROJECT. Houghton Mifflin Company, 1968. \$8.40 for text, \$5.28 for guide. Laboratory oriented interdisciplinary program.
- LABORATORY EXERCISES IN MARINE SCIENCE. S. Lavene (ed.). Martin County High School, Stuart, Florida 33494, 1970. Free. Collection of original laboratory exercises written by high school students.
- LAND AND WATER FOR TOMORROW: TRAINING COMMUNITY LEADERS, A HANDBOOK. League of Women Voters. This volume was produced as a result of a series of workshops funded by the Federal Water Pollution Control Administration. The handbook can easily be adapted to a small conference locally funded, to an inter-county or state-wide project, or to a still broader one of river basin or even national or international scope. The technique could be used equally well in projects with widely different objectives and subject content.
- LET'S GO SHELLING. Mattern, Walker, Robeson. Science Department, Martin County High School, Val's Bookstore, Stuart, Florida. 1969. \$1.00. Written by members of the high school marine science class for elementary school students.

- LET'S GO TO THE BEACH. Walker, Penick, Mattern, Gunsolus. Roberts (ed.). Science Department, Martin County High School, Val's Bookstore, Stuart Florida. 1969. 50¢. Members of the high school marine science class created a book about the seashore for grades 2 and 3.
- LIMNOLOGY: AN INTRODUCTION TO THE FRESH WATER ENVIRONMENT. William H. Amos. LaMotte Chemical Products Company, 1969. 50¢. Curriculum guide, activities and experiments. Grades 7-12.
- MAPPING. David Greenwood. University of Chicago. \$2.95. A book which serves to introduce map use, construction and meaning. Maps carry much information about the earth's resource potential and use. Grades 4-12.
- MARINE SCIENCE-- DEVELOPING A MARINE SCIENCE PROGRAM. Oceanography Unlimited, Inc., 1969. Single copies free. Curriculum guide for all grades.
- MARINE SCIENCE FIELD TRIPS. Dale E. Rose and Jacques S. Zaneveld. Old Dominion College, Institute of Oceanography, Norfolk, Virginia. 1968. Free. Biology and oceanography.
- THE NATURE OF A TIDAL MARSH. New York State Conservation Department, Division of Conservation Education, Albany, New York, 1966. High School.
- NINE VOCATIONAL HORTICULTURAL MATERIALS. Donald Bigler. Southeast Pennsylvania Outdoor Education Center, 1967. Free, supply limited. Vocational school 3-year sequence for high school.
- OBSERVING OUR ENVIRONMENT THROUGH OUR FIVE MAJOR SENSES-- SEE, HEAR, FEEL, SMELL, AND TASTE. Handicapped Children's Nature Study Center, Muscatine-Scott County School System, 1523 S. Fairmount St., Davenport, Iowa 52802, 1970. For teachers of handicapped students in outdoor education; though suitable for other outdoor programs.
- OCEANOGRAPHIC FIELD COURSE. Forbes, Thompson and Turgeon. Oceanographic Education Center, 1969. Free. Grade 8.
- OUTDOOR EDUCATION IN MONMOUTH COUNTY PARKS, OUTDOOR EDUCATION IN YOUR COUNTY PARK. Monmouth County Park System, P. O. Box 326, Lincroft, New Jersey 07738. Free. Conservation and recreation, nature walks.
- Peterson Field Guide Series. Boston: Houghton-Mifflin Company.
 A FIELD GUIDE TO THE BIRDS.
 A FIELD GUIDE TO THE SHELLS OF OUR ATLANTIC AND GULF COASTS.
 A FIELD GUIDE TO THE MAMMALS.
 A FIELD GUIDE TO ROCKS AND MINERALS.
 A FIELD GUIDE TO TREES AND SHRUBS.
 A FIELD GUIDE TO REPTILES AND AMPHIBIANS OF THE U. S. AND EAST CANADA.

- PROGRAM ON OUTDOOR EDUCATION. Charlie Clark. Snake River Center for Improvement of Instruction, Idaho Falls, Idaho, 1967. Single copies free. Grades 10-12.
- SCIENTIFIC EXPERIMENTS IN ENVIRONMENTAL POLLUTION. Elbert C. Weaver (ed.). New York: Holt, Rinehart and Winston, Inc., 1968. Teacher's manual.
- SIMPLE INTRODUCTION TO ROCKS AND MINERALS OF NORTH CAROLINA. Oscar E. Randolph. Randolph Minerals, Morganton, N. C.
- SINGLE UNIT CURRICULUM MATERIALS, LEVEL 1 (ANIMAL THEME). Southeast Pennsylvania Outdoor Education Center, 1968. Free, supply limited. Curriculum guide, activities and experiments. Elementary.
- THE STORY OF NEW JERSEY FORESTS IN NINE EASY LESSONS. Donald Calderon and Austin Lentz. Austin N. Lentz, Specialist in Forest Resources and Recreation Management, Cooperative Extension Service, College of Agriculture and Environmental Science, Rutgers University, Blake Hall, Room 105, New Brunswick, New Jersey 08903. 10¢. Written to help children of ages 9-12 understand the importance of New Jersey forest resources.
- A STUDY OF SOIL SCIENCE. Henry D. Foth. LaMotte Chemical Products Co., 1969. 50¢. Curriculum guide, activities and experiments. Grades 7-12.
- A STUDY OF WATER QUALITY. Charles E. Renn. LaMotte Chemical Products Co., 1969. 50¢. Curriculum guide, activities and experiments. Grades 7-12.
- SOURCEBOOK OF MARINE SCIENCE. Golden, Beakley, Roberts, Renwick, Taylor. Florida State Department of Education, Tallahassee, Florida, 1968. Free. High school activities and experiments.
- TEACHERS' CURRICULUM GUIDE TO CONSERVATION EDUCATION. J. G. Ferguson Publishing Co., 6 North Michigan Avenue, Chicago, Illinois 60602. The South Carolina Curriculum Improvement Project has produced an excellent series of Teacher's Guides. The series of eight guides covers the following areas: Grades 1-3, grades 4-6, science 7-9, social studies 7-9, social studies 10-12, outdoor laboratory, home economics 9-12, and biology.
- TEACHING TRIPS AND TIPS. John S. Williams. Springfield Public Schools, John S. Williams, Science Consultant, Aurora Public Schools, West Side District #129, P. O. Box 552, Aurora, Illinois 60507, 1967. Outdoor education, activities and experiments. Grades K-12.
- WATCHING FOR THE WIND. James G. Edinger. Doubleday and Company, 1967. \$1.25. Junior high and above.
- WEATHER AND CLIMATE IN N. C. Agricultural Extension Service, North Carolina State University, Raleigh, North Carolina, 1958.

WEATHER AND HEALTH: AN INTRODUCTION TO BIOMETEOROLOGY. H. E. Landsberg.
Doubleday & Company, 1969. \$1.25 paperback.

WILD ANIMALS OF NORTH AMERICA. National Geographic Society, Washington,
D. C.

WILD PLANTS OF N. C. N. C. State Board of Health, Box 2091, Raleigh,
N. C. 27602. Prepared by Orange, Person, Chatham, and Lee District
Health Departments, this brochure illustrates how to identify,
prepare, and enjoy local, wild plants.

YOUR FABULOUS FRIENDS. Southern Forest Institute, Atlanta, Georgia,
1970. Single copies free. The story of a tree.

THE FOLLOWING SPACE IS AVAILABLE FOR ADDITIONAL BIBLIOGRAPHICAL ENTRIES:

CHAPTER IV

POLLUTION

POLLUTION

Our civilization is affected by a fast-spreading disease. Although it produces fewer headlines than many of the earth's natural disasters, it is really one of the greatest dangers to human life the world has yet faced. If present trends continue for another generation, environmental pollution will probably accomplish what no war has done to date.¹ It will make all of the world's urban areas and most of its countryside uninhabitable!

In our urban areas, toxic gases and acid vapors visibly affect the environment. The color of the sky is changed, eyes are reddened from exposure, nylon stockings are literally dissolved, bronze statues are corroded and pitted, rubber hardens and paint peels from buildings and autos. Minute particulate matter, suspended in the air, blackens the lungs and darkens the landscape. The effect upon humans is devastating: thousands of Americans each year die from the polluted atmosphere. A closer look at these air pollutants reveals that this condition has come about as an indirect result of our pursuit of an even higher standard of living.

Carbon monoxide, in heavy traffic, produces headache, loss of visual acuity, and decreased muscular coordination. Sulfur oxides, not removed by the petroleum refining process, corrode metal and stone. At concentrations frequently found in our larger cities, they actually reduce visibility, injure vegetation, and contribute to the incidence of respiratory disease and to premature death.

Hydrocarbons, in particulate form, have produced cancer in laboratory animals. Other hydrocarbons, released by the automobile, play a major role in the formation of photochemical smog which plagues cities on still

days when there is little movement of the atmosphere. Photochemical smog is a complex mixture synthesized from atmospheric pollutants by the light energy of the sun. Such smog can severely damage crops, trees, and readily reduces human resistance to respiratory diseases. In terms of dollars, the U. S. Public Health Service estimates the yearly loss to America totals \$11 billion.² To urban families the average annual cost of air pollution, including lost time from work due to illness, is over \$500 per family.

The U. S. Public Health Service lists the major sources of this pollution as Motor Vehicles. Federal standards will bring about a gradual reduction in automotive pollution, through increases in required installation of anti-pollution devices. However, the increase in the number of vehicles will overtake any progress we make. To combat this pollution problem, free power sources will be required. As can be seen in Figure XXIV, America's auto industries have only begun to tackle this problem and its solution is a long way off.

Industry, power plants, space heating, and refuse disposal compose the other sources of air pollutants. There are ways to counteract such stationary sources. To counteract particulate matter, smokestacks can be fitted with filters and electrostatic precipitators that intercept the particles before they can enter the atmosphere. Gases pose another problem. Sulfur oxides are by-products of burned petroleum used in electric generating stations and home furnaces. The best way to eliminate this menace is to remove the sulfur at the oil refinery. A good example is New York City's leading utility, Consolidated Edison. Cooperating with city officials, it switched to low-sulfur fuels and the pollution rate dropped by twenty-eight percent.

Figure XXIV

<u>Auto</u>	<u>Speed</u>		<u>Range</u> (miles)	<u>Cost/Mile</u>	<u>M/Gal</u>	<u>Parts/Million</u> <u>Pollution*</u>	
	<u>Top</u>	<u>Cruising</u>				CHO	CO
ELECTRIC							
G. E.	55	30-35	30-120	1.1¢	0	0	0
Henney-Killowatt	40	30-35	40-60	2¢	0	0	0
Markette	25	25	50	1¢	0	0	0
Mars II-A	85	60	150-175	1.4¢	0	0	0
Rowan	45	35	35-100	.60¢	0	0	0
STEAM							
Thermal Kinetics Corp.	80	50	260-400	.65¢	18-20	20-30	5-10
Thermodynamics Systems, Inc.	150	70	200-250	1.3¢	7-10	30	8
Williams Engine Co., Inc.	100	75	400-500	1¢	20-25	20	500
INTERNAL COMBUSTION							
Chevrolet Impala	110	60-65	300-360	2.3¢	15	180**	10,000**
Ford Maverick	97	55-60	300-400	1.6¢	22.5	180	10,000
Volkswagen Sedan	78	78	250-300	1.3¢	27	285	17,000

* Parts per million

** With anti-pollution device

Source: TIME-LIFE, Inc.

What about water pollution? The nation was shocked by the Santa Barbara oil situation in 1967. But this was an unknown and inadvertent result of poor planning. It was not deliberate like the long-range policies of dumping pollutants into our rivers and streams by many of the nation's communities. The indiscriminate dumping of raw sewage into the Hudson River has long been a menace to health. The by-products of people suffering from hepatitis, dysentery, tuberculosis and other diseases are well represented in the Hudson's flow.

Two major mistakes have created a disaster in and around the waters of the nation's largest city, New York. Operating on the old adage that "dilution is the solution to our pollution," the city used the Hudson River and Harbor as a sewer. By 1915, however, 540 miles of the 570 miles of waterfront surrounding New York had to be declared unfit for bathing. So the city spent \$500 million to establish new sewage treatment facilities. But it made a second environmental error. In an attempt to save money, the city allowed the new pipes to double as storm drains to carry rain water away from the streets and curbs. However, when the rains came, the plants could not handle the flow. They were forced to release raw sewage into the harbor. Replacement of the storm drains, was, by then, a prohibitive \$2.5 billion. The end result haunts New Yorkers today. The city spends nearly \$100 million yearly on new sewage treatment facilities but its waters are now more polluted than they were 50 years ago! One-half of New York's billion gallons daily output of sewage must go untreated.

In 1963, a pesticide [?]flow, primarily DDT, was responsible for the killing of five million fish. The annual runoff of other pesticides and farm animal wastes results in severe damage to other fresh water resources. ?

DDT is found in the Antarctic Ocean, thousands of miles from any area where it has ever been used. It is found in the fish life of the oceans. It is found in the eggs of eagles, ospreys, and falcons. This, in turn, affects the eggs of these birds, causing them not to hatch. Thus, their numbers are rapidly declining. Several years ago, the U. S. Public Health Service revealed that the average American had gathered twelve parts per million of DDT into his fatty tissues. Nursing mothers imparted .08 of a part per million quarts of DDT in the human milk they gave their infants. No one really knows what twelve parts per million in human fat means, but we do know smaller concentrations have had awesome consequences for many smaller creatures. DDT has even been found in rain.

The concern over DDT is based upon its slow deterioration process. After doing its intended job of pest control, it remains to work insidious changes upon the rest of our environment. Such changes can exert lasting effects on birds, fish, soil organisms, and other elements of the living community. DDT is most persistent. It has a half life of ten to fifteen years. This is a dramatic factor when one considers that if the production of such hard chemicals were eliminated now, we would still have to live with the excesses of the past for more than a generation!

More than 2 billion tons of livestock wastes are produced each year in this country. Stated another way, that much waste production is equivalent to a human population of 1.9 billion! Half of the waste is confined to the feedlot, but the remaining amount finds its way into the nation's waters. Such a large contribution coupled with other forms of pollution results in the accumulation of nitrates and phosphates in lakes and streams.

This over-fertilization produces an abundance of algae which causes the ultimate eutrophication of valuable water resources.

Synthetic detergents are also not without blame. They contain large amounts of phosphates, an essential nutrient for algae. When dumped into the nation's waterways, the nutrient results in the large growth of algae, which removes large amounts of oxygen from the water and results in killing the fish. Coupled with other non-biodegradable factors, detergents produce suds of foam as water flows from its source to the sea. There is scarcely a private well that does not have a dangerous amount of detergent in its water as a result of the failure to filter it out of water destined to enter the ground water table.

The nation is in real danger of being submerged under its own garbage. Failure of government action, sluggishness of industrial investment in non-profit oriented abatement, and historical factors such as those cited in the above paragraphs are creating a different physical environment.

Noise pollution is but another new problem. Human well-being can be impaired by sound so loud that the organism is uncomfortable. Any noise above eighty decibels produces physiological effects. With that as a base, compare the noise of: a conversation (60), heavy traffic (80), a moving train (100), a rock band (100-138), and a jet plane at close range (150).⁴

The world is rapidly arriving at the point in time where the fight against pollution must be fought on a world-wide scale. Atmospheric nuclear testing was a large radiation polluter before 1963. Yet China and France failed to sign the test ban treaty and have continued to pollute the atmosphere with radiation and all its hazards.

*Why
not
ban it*

Inside our nation, the fight must be waged by multi-agency, multi-slate organizations. There is no point in cleaning up one source of pollution and have a nearby source contaminate what has just been cleaned. Technology is one way to attack the problem. The problems are too great for such a short-sighted effort. It will need action on the political level as well. It may be necessary, for the public health, for some industries to be phased out and whole sources of pollution eliminated. Difficult decisions and choices will have to be made. Above all, the health of the country is perhaps its best and most cherished Gross National Product!

POLLUTION: THEME AND RELATED CONCEPTS

Theme: Pollution results in changes within the environment.

Concepts:

- A. Pollution may bring about the removal of a species of organism from a community.
- B. The development of an ecological community may be limited by an increase in population.
- C. Pollution reduces the amount of water available to man.
- D. Pollution, unless limited, will affect the natural resources of a community.
- E. Pollution may create harmful effects on a species or organism.
- F. Polluted water is unsuitable for consumption or recreation by living organisms.

FOOTNOTES

¹Seymour Kurtz (ed.), THE NEW YORK TIMES ENCYCLOPEDIA ALMANAC, 1970, (New York: The New York Times Company), 1969, p. 499.

²Ibid.

³Charles Osborne (ed.), NATURE/SCIENCE ANNUAL, (New York: Time, Inc.), 1969, p. 43.

⁴Kurtz, op. cit., p. 500.

POLLUTION: RESOURCES AND INSTRUCTIONAL MATERIALS

The resources and instructional materials listed below will provide you with information as to what is available for use in developing your learning activities relating to pollution. The sources are organized according to books, periodicals, films and filmstrips, plus additional learning aids including kits and games, teacher manuals, pamphlets and bulletins of an environmental nature.

Books

Teacher:

- Battan, Louis J. UNCLEAN SKY: A METEOROLOGIST LOOKS AT AIR POLLUTION. Garden City, N. Y.: Anchor-Doubleday, 1966. \$1.25.
This book covers the sources and sizes of pollutant particles, methods for their deletion, and the damage they do as the author stresses the relationship between air pollution and weather. The book suggests techniques for improving the situation.
- Carr, Donald E. THE BREATH OF LIFE. New York: W. W. Norton & Co., 1965.
- , DEATH OF THE SWEET WATERS. New York: W. W. Norton & Co., 1966.
- Darling, F. E. and J. P. Milton (eds.). FUTURE ENVIRONMENTS OF NORTH AMERICA. Garden City, N. Y.: Natural History Press, 1966.
- Dasmann, Raymond F. DESTRUCTION OF CALIFORNIA. New York: The Macmillan Company, 1965. \$1.50.
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Pringle, Laurence. THE ONLY EARTH WE HAVE. New York: The Macmillan Co., 1969.

This book focuses on the problems of water, air, and other pollution problems caused by today's technology. It is well illustrated with photographs.

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PeriodicalsLand Pollution Reporter

Freed Publishing Co.
P. O. Box 1144
FDR Station
New York, New York 10022

Four-page newsletter issued bi-monthly. \$15.00 per year.
Special rate for bulk quantities as follows: 25, \$5.00.
50, \$9.00. 75, \$12.50. 100, \$15.00. Deals with land
pollutants (solid waste, litter, abandoned cars, etc.)
and efforts to eliminate them.

THE FOLLOWING SPACE IS AVAILABLE FOR ADDITIONAL BIBLIOGRAPHICAL
ENTRIES:

FilmsSecondary:

A MATTER OF TIME

Conservation Foundation. 27 min. Color. An historical approach to environmental deterioration.

AIR POLLUTION

Encyclopedia Britannica Films. 15 min. Color. The health problems posed by water pollution and the steps being taken to correct them.

AIR POLLUTION: TAKE A DEEP DEADLY BREATH

Contemporary Films. An ABC Documentary of Air Pollution. 54 min. Color.

BEARGRASS CREEK

Stuart Finley Productions. 19 min. Color. The poignant tragedy of a small tributary stream, its promising start, and its sad end due to pollution.

BY LAND, SEA AND AIR

Oil, Chemical and Atomic Workers International Union. 31 min. Color. The effects of pesticides on farm workers and the environment of California are discussed.

CAMPING-- A KEY TO CONSERVATION

Indiana University, Audio-Visual Center. 1963. 23 min. A view of the widespread misuse of public recreational facilities by careless citizens. A thirteen-year old boy takes his first overnight trip and is discouraged by what he sees.

CASE OF THE DISAPPEARING POISON

Eastman Chemical Corp. Problems encountered through the use of poisonous materials, particularly toxic residues, which linger on crops after harvesting.

CHALLENGE TO MANKIND

Contemporary Films. 28 min. B/w. Five world experts speak of the threat of over-population.

CITIES IN CRISIS

Extension Media Center, University of California. 22 min. Color. Impressionistic film of urban sprawl and unplanned growth. (Order #6812).

CLEAN WATERS

Extension Media Center, University of California. 20 min. Color. Illustrates the dangers of water pollution and shows proper sewage treatment. (Order #3972).

FIRST MILE UP

Contemporary Films. 28 min. B/w. Problems of air pollution and its effect on human health. Toronto and Los Angeles are used as examples.

HERITAGE OF SPLENDOR

Alfred Higgins Productions. 1963. 18 min. Color. Designed to augment the need to conserve parks and recreational areas and keep them free from litter, this beautifully photographed film shows the importance of these natural resources for man.

NOISE: THE NEW POLLUTANT

N. E. T. Film Service, University of Indiana. 30 min. B/w. Reports on research into harmful effects of noise on human beings.

NO TIME FOR UGLINESS

American Institute of Architects. 1965. 24 min. Color. This film explores the population explosion and indiscriminate construction of living quarters that have spoiled the landscape. By using various communities throughout the country, the film shows land misuse and river pollution and gives a plea for citizens to clean up their environment.

PANDORA'S EASY OPEN POP-TOP BOX

Environmental Control Administration. 15 min. Color. A dramatic presentation of the effects of uncontrolled urbanization. Free.

PARADISE POLLUTED

Wilcox Productions.

THE POISONED AIR

Carousel Films, Inc. 60 min. B/w. CBS Documentary.

POISONS, PESTS AND PEOPLE

Contemporary Films. 55 min. B/w. The grim results of indiscriminate use of pesticides on wildlife and people. It is coupled with a plea for an intelligent approach to the problem.

POLLUTION

Astra Films, Inc. 1968. 4 min. Color. Tom Lehrer sings the satirical lyrics describing the extent and the threat of air and water pollution in the U. S. The camera scans the filth, garbage, smoke, water, and industrial waste to produce a memorable, effective message.

THE PROBLEM WITH WATER IS PEOPLE

Contemporary Films. 30 min. B/w and color. The film traces the route of the Colorado River from beginning to ocean and discusses its pollution and misuse.

THE THIRD POLLUTION

Environmental Control Administration. 30 min. Color. An excellent film which graphically describes America's \$4 billion solid waste problem and demonstrates new techniques of solid waste management. Free.

TO CLEAR THE AIR

American Petroleum Institute.

TOM LEHRER SINGS POLLUTION

Public Health Service. 3 min. B/w. (Public Health Service also has many other heavily subscribed air pollution films.) Free.

TWENTY-FOURTH AND TOMORROW

Frederick Martin. ACI Productions. 22 min. The story of a one-man crusade to clean up his neighborhood. Later, joined by others, they turn their attention to refuse disposal, housing, litter, and even tree-planting. The area becomes more attractive as the grass-roots project takes hold.

VANISHING BIRDS

Pictura Film Corporation. 11 min. Color. A report of the effect of civilization on some of our most beautiful birds.

WASTAGE OF HUMAN RESOURCES

Encyclopedia Britannica Films. Waste through war, alcohol, drug addiction, crime and unemployment.

Elementary:**CONTROL OF AIR POLLUTION**

U. S. Public Health Service. 5 min. Color.

DOWN THE ROAD

McGraw-Hill Text Films. 20 min. Color. Young people show concern about pollution and other problems to an original folk-rock ballad background.

EFFECTS OF AIR POLLUTION

U. S. Public Health Service. 5 min. Color.

FOREST MURMURS-- PROBLEMS OF LITTER
Interlude Films. 9 min. Color.

MAN'S PROBLEM
Encyclopedia Britannica Films. 20 min. Color.

THE SOIL MAKERS
Martin Moyer Productions.

SOURCES OF AIR POLLUTION
U. S. Public Health Service. 5 min. Color.

WOODLAND MANNERS
U. S. Department of Agriculture, Forest Service. 20 min. Color.

THE FOLLOWING SPACE IS AVAILABLE FOR ADDITIONAL BIBLIOGRAPHICAL ENTRIES:

Additional Learning Aids

Bibliographical Sources:

American Association of University Women
2401 Virginia Avenue N. W.
Washington, D. C. 20036

A RESOURCE DIRECTORY on pollution control and an ANTI-POLLUTION STUDY GUIDE are available for 75¢ each.

Citizens for Clean Air
598 Madison Avenue
New York, New York 10022

Offer suggestions about what communities can do to combat water pollution. Free.

Federal Water Pollution Control Administration
U. S. Department of the Interior
918 Emmet Street
Charlottesville, Virginia 22901

- 1) "Showdown for Water"
- 2) "A New Era for America's Waters"
- 3) "What You Can Do About Water Pollution"
- 4) "About Boats and Water Pollution"
- 5) "Heat Can Hurt"
- 6) "Water Quality Standards"
- 7) "Pollution Caused Fish Kills"
- 8) "Clean Water", (poster)

Izaak Walton League of America
1326 Waukegan Road
Glerview, Illinois 60025

The League will furnish free "Clean Water-- It's Up to You", an excellent pamphlet on what local citizens can do about water pollution. A monthly conservation newsletter is also published.

Keep America Beautiful, Inc.
99 Park Avenue
New York, New York 10016

"Litter Prevention-- An Aid to Conservation"

Manufacturing Chemists Association
1825 Connecticut Avenue N. W.
Washington, D. C. 20009

"Everyday Facts About Air Pollution"

Planned Parenthood-- World Population
151 Madison Avenue
New York, New York 10022

- 1) Lyle, David. "The Human Race Has, Maybe, 35 Years Left". (#950). 25¢.
- 2) "Can World Food Supply Keep Pace with Population Growth?". (#880). 25¢.
- 3) Hatcher, Robert, M. D. "The People Problem". (#979). 25¢.
- 4) Best, Einifield. "Are Smaller Families Coming Back in Style?". (#773). 25¢.
- 5) Lilienthal, David E. "300,000,000 Americans Would Be Wrong". (#545). 25¢.
- 6) Day, Alice. "Parenthood, Its New Responsibilities". (#782). 25¢.
- 7) Ehrlich, Paul. "Eco-Catastrophe".
- 8) Film Guide.

Population Reference Bureau
1955 Massachusetts Avenue N. W.
Washington, D. C. 20036

Good bibliography, source list, and film guide on population, at minimal costs.

National Air Pollution Control Administration
Publications Unit
Department of Health, Education and Welfare
801 N. Randolph Street
Arlington, Virginia 22203

- "The Federal Air Pollution Program"
- "Clean Air for Your Community"
- "Take Three Giant Steps to Clean Air"
- "Today and Tomorrow in Air Pollution"
- "The Effects of Air Pollution"
- "The Sources of Air Pollution"
- "A Digest of State Air Pollution Laws"

Public Affairs Committee, Inc.
381 Park Avenue South
New York, New York 10016

- 1) Edelson, Edward. "The Battle for Clean Air". (#403). 25¢.
- 2) Dasmann, Raymond F. "An Environment Fit for People". (#421). 25¢.
- 3) Stewart, Maxwell. "A New Look at Our Crowded World". (#393). 25¢.

Scientists' Institute for Public Information
30 East 68th Street
New York, New York 10021

- 1) "Air Pollution"
- 2) "Water Pollution"
- 3) "Environmental Effects of Weapons Technology"
- 4) "Hunger"
- 5) "Nuclear Explosions in Peacetime"
- 6) "Pesticides"
- 7) "Environmental Costs of Electric Power"
- 8) "Environmental Education 1970"

Each title, \$1.00; 10-99, 75¢; 100+, 50¢; 1,000+, 30¢.
All eight titles (one set), \$5.00.

Superintendent of Documents
Washington, D. C. 20402

Air Pollution Publications, Public Health Service:

Bibliography with Abstracts

AUTOMOBILE DISPOSAL: A NATIONAL PROBLEM. Bureau of Mines, Department of the Interior, 1967. \$4.50. Case studies in selected areas of factors influencing accumulation of junked autos.

"Citizen's Manual For Community Action". Prepared by Citizen's Advisory Committee on Recreation and Natural Beauty, 1968. This practical handbook covers action for open space and recreation, townscape, and landscape, clean air and water, training of young people and includes plain-talk advice on solving problems, from scenic easements to bond issues.

"The Struggle for Clean Water". U. S. Department of Health, Education and Welfare, Departmental Committee on Health for the School-Aged Child, 1962. 15¢.

- "Troubled Air". (Public Health Service Publication #977).
U. S. Department of Health, Education and Welfare,
Public Health Service, Division of Air Pollution, 1962.
25¢.
- "Wastes in Relation to Agriculture and Forestry". 60¢.
Sorts out the sources and effects of ten major types of
pollution including chemicals, sediment, organic wastes,
and airborne dust, and tells how agriculture and forestry
both suffer from pollution and contribute to it.

Zero Population Growth
367 State Street
Los Altos, California 94022

Produces brochures, ecology leaflets, reprints and a newsletter.

Kits and Games:

- "Kits for Science"
Bethlehem Area School District. Stephen Rituper, Jr., 1330 Church
Street, Bethlehem, Pennsylvania 18015. Free. Model nongraded
individualized taped kit.
Titles:
"Awareness of Heat Pollution"
"Factory Heat and Water"
"Factory Heat and Air"
- "Pollution"
C. Abbot Association, Inc., 55 Wheeler Street, Cambridge, Mass.
02138. Grades 4-6. About \$6.00. This is a game designed to
teach the social, political, and economic problems that are
involved in any attempt to control environmental pollution.
- "Synopsis of Games and Simulations in ERCA Life Science"
Fred A. Rasmussen. Educational Research Council of America,
Rockefeller Building, Cleveland, Ohio 44113, 1969. Free.
Interdisciplinary approach. One game is "The Pollution Game."
All six games will eventually be available from Houghton-Mifflin
Co. as part of the Investigating Life Science Series.

Manuals and Bulletins:

- ACTIVITIES RELATED TO THE AEROSPACE SCIENCES. Paul S. Frank, Jr.
Garrett County Science Center, P. O. Box 73, Oakland, Maryland
21550. 1968. Free. Curriculum guide and experiments. Grades
K-12. Sections on weather and biology.

- AIR POLLUTION EXPERIMENTS. High School Edition Cooperative Extension Service, College of Agriculture and Environmental Science, Rutgers University, New Brunswick, N. J. 08903.
- AIR POLLUTION EXPERIMENTS FOR JUNIOR AND SENIOR HIGH SCHOOL SCIENCE CLASSES. Hunter and Wohlers (eds.). Air Pollution Control Association, 4400 Fifth Avenue, Pittsburgh, Pennsylvania 15213. 1969. \$1.00.
- AUDUBON NATURE BULLETIN. BULLETINS ON CONSERVATION. National Audubon Society. \$1.55. Data on air and water pollution and the preservation of natural areas of wildlife.
- CURRICULUM GUIDES TO ACCOMPANY ONTARIO SCIENCE COURSE OF STUDY. Wentworth, et al. Hamilton Board of Education, D. F. Wentworth, Science Consultant, Education Center, 100 Main Street West, Hamilton 10, Ontario, Canada. 1967-69. Free. Conservation, outdoor and urban education, pollution for grades K-8.
- DETECTION AND ANALYSIS OF PARTICULATE CONTAMINATION. Millipore Corp., 1969. Free. Pollution, curriculum guide and experiments. Grades 7-12.
- EXPERIMENTS IN MICROBIOLOGY. Millipore Corp, 1969. 50¢. Pollution experiments, activities. Grades 7-12.
- MICROBIOLOGICAL ANALYSIS OF WATER. Millipore Corp., 1969. Free. Advanced manual for water pollution analysis.
- NOISE: AN OCCUPATIONAL HAZARD AND PUBLIC NUISANCE. Public Health Paper #30. Alan Bell. World Health Organization, Geneva: Columbia University Press. International Documents Service, 2960 Broadway, New York, New York 10027. \$2.00.
- NUCLEAR POWER AND THE ENVIRONMENT. U. S. Atomic Energy Commission, 1969. Free. Research on and control of radiological and thermal effects on the environment from nuclear power plants.
- OUR ENVIRONMENT BATTLES WATER POLLUTION. Charles E. Renn. LaMotte Chemical Products Co., 1969. 50¢. Curriculum guide, activities and experiments. Grades 7-12.
- RESOURCE MANUAL. Stockwell Woods and Wesselman Park, Science Teachers, Evansville-Vanderburgh School Corp., Science Dept., 1 S. E. Ninth Street, Evansville, Indiana 47708. 1969. \$1.75. A life-science oriented resource manual including conservation, pollution, outdoor education, curriculum guide, activities and experiments, enrichment reading. Grades K-12.
- SCIENCE FOR NON-SCIENCE MAJORS (SNSM) and SNSM SCALE. Pennsylvania Department of Education, 1969. Free. Emphasis on pollution and population. Grade 11.

SCIENTIFIC EXPERIMENTS IN ENVIRONMENTAL POLLUTION. Elbert C. Weaver (ed.). Holt, Rinehart and Winston, Inc., 1968. \$1.10. Grades 7-12. Teacher's guide free with purchase of classroom order.

UNIT 4 OF AN INTEGRATED SCIENCE COURSE FOR GRADE 10. David Cox et al. Portland Project, Michael Fiasca, Director, David Cox, Rex Putnam High School, 4950 S. E. Rothe Road, Milwaukee, Oregon 97222. 1970. \$2.00. Introduction to environmental problems with the emphasis on pollution. Text, laboratory, and discussion topics.

THE FOLLOWING SPACE IS AVAILABLE FOR ADDITIONAL BIBLIOGRAPHICAL ENTRIES:

CHAPTER V

ENVIRONMENTAL DECISION-MAKING

ENVIRONMENTAL DECISION-MAKING

Man today seems to be overwhelmed by his own technological genius. He has constructed great civilizations, magnified thousands of times his physical strength, improved the sight of his eyes to peer out to the very edge of space, developed electronic machines capable of completing enormous jobs in microseconds and channeled the energy forces of his surroundings to serve nearly his every command. His capacity for invention appears to have no limits. Yet, he is not in command of the by-products of his works. With the urge for progress driving his ambition, the problem of coping with his environment is emerging with the same destructive power once feared by his ancestors. The fears of wind, heavy rains, lightning, fire and earthquakes that ancient man experienced have been replaced by new fears. The difference between the present situation and that of the past is that the environmental threats of today are the result of man's own making.

Today man impairs the ability of plants to replace the atmospheric oxygen by leveling forests, paving streets and driveways, and poisoning the algae of lakes and oceans. He puts poisons into the air in greater concentrations than his lungs can combat. He fouls the land and water with contaminants that ultimately reduce his food supply. He is doing this on a worldwide basis, yet he fails to recognize that this planet is his only place to live.

Man, today, must develop a new awareness if he is again to move toward a better life. He must begin to act on his beliefs. He must develop a commitment to create an environmental awareness among his fellow man, and follow through with this commitment. He must question his values. He

needs to begin to wonder again about the wonder and purpose of man. What constitutes the "good life," the "good society?"

Science does not have all the answers. Environmental awareness may provide the rationale for action but not the will or the desire. The final decisions lie in the realm of man. As Stuart Udall, former Secretary of the Interior has made evident, our priorities and values must change. The following statement by Udall reveals man's current code of environmental ethics.

- I. "The Gross National Product is our Holy Grail: the economists and the statisticians its keepers. Statistics concerning auto output, steel production, heavy construction, housing starts, freight car loadings, have become the indices of the American advance.
- II. "We have no environmental index, no census statistics to measure whether this country is more or less liveable from year to year.
- III. "A tranquility index, a cleanliness index, a privacy index, might have told us something about the condition of man, but a fast growing country bent on piling up material things has been indifferent to the little things that add joy to everyday life.
- IV. "We have perfected the concept of the land's carrying capacity for animals, the principles of sustained yield in the management of trees and plants. Yet we abandon the idea of natural balance when we come to our own species. Unless we take into account that the time has come to evolve an ecology of man in harmony with the constantly unfolding ecologies of other living things; unless we develop a science which will enhance the condition of man, we will destroy ourselves." 1

Man's present technology may well be the source of his extinction. By the end of this century, if it is allowed to continue, we may well live in a world without happiness or richness. Although we are beginning to

recognize the real reason for our unrest and dissatisfaction, we still have the monumental task of doing something about it. To change people is difficult. To remove the idea of an ever expanding Gross National Product and the blind devotion to and faith in science and technology as a panacea for our problems will take dedication, wisdom, and education.

Difficult decisions about our present life style will have to be made. Decisions involving political action is one place to start. The process by which large and small governing bodies operate is known as politics. Most of us leave this political activity to the "experts." We assume the welfare of our country is determined by the majority. This is not entirely so. A slightly different look at the procedure will show that policy is actually determined by, not just the majority, but by the majority of those who are politically active. An old saying reminds us that "politics is the art of the possible."

A second area needing attention immediately is one's own personal demands upon the energy sources of his environment. No one would recommend we return to the life-style of primitive man. That would be absurd. However, at the same time, greedy and gluttonous consumption of the earth's store of energy is not the answer either. A life-style that reduces its energy demands is a place for everyone to start. "Labor-saving" machines, some of which are needed, some of questionable value, are creating huge demands upon the power suppliers of our nation. Our power output now doubles every ten years. By 2000, the nation's electricity is expected to increase six-fold. Steam power generators need water for cooling. Such energy utilization will raise the temperature of nearly every water supply in the country, as well as the tons of carbon-dioxide and other pollutants dumped into the atmosphere as a result.

Metal production is an area which should be of concern to every citizen. A ton of aluminum takes 17,000 kilowatt hours of power. By contrast, steel requires only 2,700 kilowatt hours per ton. Yet, Americans continue to replace the tin-coated steel cans with bright, shiny, never-rust, indestructible aluminum cans. Tin cans could be expected to rust and deteriorate after a few years, but the litter of aluminum cans will shine by the roadside for many, many years to come.

Are we willing to rescind our demands upon the energy sources of our environment for the benefit of all? Are we willing to convince others of the ramifications of the uses of such energy? In other words, are we willing to act on our commitments?

Paul Brandwein, in a recent lecture asked if we have always informed our conscience.

"Who is it who buys and drives cars, consumes gasoline, requires drilling in off-shore areas? And, who is it, by so doing, adds to the nitric oxide and other pollutants in the air?

"Who is responsible for the smog? Who is responsible for the use of pesticides-- of any kind-- to destroy rodents, insects, or fungi?

"Who is it that builds houses and cements the driveways and the sidewalks?

"Who is it (saying that the valley of the river belongs to the river), nevertheless, builds houses in the river valleys?

"Who is it that uses non-biodegradable detergents?

"Who is it who sends effluents into our lakes and rivers? Who is it who throws beer cans into trout streams? Who is it who uses incinerators? Who is responsible for eutrophication? Who is responsible for biological magnification?

"Do we not use the products of technology? Do we not-- as we make our notes on paper-- recognize that trees were sacrificed for that paper?"²

A new conservation will have to be developed to make the best and most efficient use of the valuable products of our technology. The aim should be for the greatest good for the greatest number. Man is not alone in his environment. However, other life forms will be dependent upon him to face and overcome this enemy to life. And who is the enemy? According to Pogo, "We have met the enemy, and he is us!"³

ENVIRONMENTAL DECISION-MAKING: THEME AND RELATED CONCEPTS

Theme: Man's decision about the environment will determine his future.

Concepts:

- A. Each individual in America has a privilege and obligation to make decisions which will affect the environment.
- B. Decisions concerning the environment today will affect future generations.
- C. Each individual must behave according to decisions made concerning the environment.
- D. All elements of society, economic, legal, medical, political, artistic, educational and all others must be involved in environmental decisions.

FOOTNOTES

¹Stuart Udall, (as quoted by Sigurd F. Olson in his address to the Wilderness Conference of the Sierra Club, 1967).

²Paul F. Brandwein, "Thirteen Propositions for a Better Conservation" (paper delivered at the Southern Forest Institute, Atlanta, Georgia, November, 1969).

³Richard R. Wilkinson, et al., "Suggestions for the Development of a New Environmental Awareness", (Raleigh, N. C.: Group for a New Environmental Awareness, 1970), p. 1, (mimeographed).

ENVIRONMENTAL DECISION-MAKING: RESOURCES AND INSTRUCTIONAL MATERIALS

The resources and instructional materials listed below will provide you with information as to what is available for use in developing your learning activities relating to environmental decision-making. The sources are organized according to books, periodicals, films, and filmstrips, plus additional learning aids including kits and games, teacher manuals, pamphlets and bulletins of an environmental nature.

Books

- American Chemical Society. CLEANING OUR ENVIRONMENT-- A CHEMICAL BASIS FOR ACTION. Washington, D. C.: American Chemical Society, 1969. \$2.75.
- Ardrey, Robert. THE TERRITORIAL IMPERATIVE. New York: Atheneum Books, 1966.
- Ashbaugh, Byron and Muriel Buschlein. THINGS TO DO IN SCIENCE AND CONSERVATION. Danville, Illinois: Interstate Printers and Publishers.
- Commoner, Barry. SCIENCE AND SURVIVAL. New York: Viking Press, Inc., 1967. \$1.35.
- Donaldson, George W. SCHOOL CAMPING. New York: Association Press, 1952.
- Douglas, William O. FAREWELL TO TEXAS. New York: McGraw-Hill Book Co., 1967.
A plea for conservation and preservation.
- Freeberg, William H. and Loren E. Taylor. PROGRAMS IN OUTDOOR EDUCATION. Minneapolis, Minnesota: Burgess Publishing Co., 1963.
- Gregor, Arthur. HOW THE WORLD'S CITIES BEGAN. New York: E. P. Dutton & Co., Inc., 1967.
This book discusses the gradual development of the first cities and how they were founded and settled. The latter part of the book covers some of the problems of today's fast-growing cities and the challenge presented to man today.
- Hammerman, Donald and William M. Hammerman. TEACHING IN THE OUTDOORS. Minneapolis, Minnesota: Burgess Publishing Co., 1964.

- Hone, E. B., A. Joseph, E. Victor, and P. Brandwein. A SOURCE BOOK FOR ELEMENTARY SCIENCE. New York: Harcourt, Brace & World, Inc., 1962.
- Hugh, John W. and Phyllis J. Wilson. CURRICULUM ENRICHMENT OUTDOORS. New York: Harper & Row Publishers, Inc., 1965.
- Joseph, A., P. Brandwein, E. Morholt, H. Pollack, J. Castka. A SOURCE BOOK FOR THE PHYSICAL SCIENCES. New York: Harcourt, Brace & World, Inc., 1961.
- Morholt, E., P. Brandwein, A. Joseph. A SOURCE BOOK FOR THE BIOLOGICAL SCIENCES. New York: Harcourt, Brace & World, Inc., 1958.
- Smith, Julian W. et al. OUTDOOR EDUCATION. Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1963.
- Spencer, J. E. and William L. Thomas. CULTURAL GEOGRAPHY. New York: John Wiley & Sons, Inc., 1969.
A good reference book or text which uses an evolutionary rather than regional approach to studying the surface of the earth. The planet's human occupation is studied through a time span. A basis for the study of man and society's accomplishments are based on the limits of the earth's physical and biological resources.
- Stapp, William B. INTEGRATING CONSERVATION AND OUTDOOR EDUCATION INTO THE CURRICULUM K-12. Minneapolis, Minnesota: Burgess Publishing Co., 1965.
- Udall, Stewart L. THE QUIET CRISIS. New York: Holt, Rinehart & Winston, Inc., 1963.
- UNESCO, 700 SCIENCE EXPERIMENTS FOR EVERYONE. Garden City, N. Y.: Doubleday & Co., Inc., 1958.
- Victor, E. SCIENCE FOR THE ELEMENTARY SCHOOL. New York: The Macmillan Co., 1965.

THE FOLLOWING SPACE IS AVAILABLE FOR ADDITIONAL BIBLIOGRAPHICAL ENTRIES:

PeriodicalsAmerican Biology Teacher

National Association of Biology Teachers
1420 N Street N. W.
Washington, D. C. 20005

Monthly from September to May. \$10.00 per year. The journal of the National Association of Biology Teachers. Contains articles of an environmental nature frequently.

Geotimes

American Geological Institute
2201 M Street N. W.
Washington, D. C. 20037

\$10.00 a year includes membership. \$2.00 per year for non-members. This publication is designed for teachers of the earth sciences.

Journal of Chemical Education

American Chemical Society
Division of Chemical Education
441 Lexington Avenue
New York, New York 10017

Monthly publication. \$4.00 per year. This periodical serves a large segment of the nation's chemistry teachers.

Physics Teacher

American Association of Physics Teachers
Department of Physics
State University of New York
Stony Brook, New York 11790

Nine issues per year. \$5.00.

Science and Children

National Science Teachers' Association
1201 16th Street N. W.
Washington, D. C. 20036

\$5.00 per year includes membership (elementary) in NSTA.

The Science Teacher

National Science Teachers' Association
1201 16th Street, N. W.
Washington, D. C. 20036

\$10.00 per year includes membership in NSTA. The professional journal for all teachers of science.

THE FOLLOWING SPACE IS AVAILABLE FOR ADDITIONAL BIBLIOGRAPHICAL ENTRIES:

Additional Learning Aids

Bibliographical Sources:

Committee on Public Education, COPE
The American Institute of Architects
The Octagon
1735 New York Avenue, N. W.
Washington, D. C. 20006

The objectives of the Institute are "to advance the science and art of planning and building by advancing the standards of architectural education, training, and practice, to coordinate the building industry and the profession of architecture to insure the advancement of the living standards of our people through their improved environment; and to make the profession of over-increasing service to society." The American Institute of Architects, Committee on Public Education has produced: "Environmental Education, 1970." This publication attempts to channel information on the environment. It is a collection of sources, designed to be a working reference tool to aid the teacher in becoming familiar with some of the current environmental programs. The body of information was contributed by various sources, but the publication is heavily endowed with architectural and aesthetic projects.

Carteret County Marine Science Center
Director
Courthouse Annex
Beaufort, North Carolina 28516

This is an ESEA Title III Project which has done a great deal of work in marine science education. The program has produced a large number of publications and this material is available free or at the cost of printing. The Project is concerned with both teacher education and supplementary education for students in the regular school programs in and around Carteret County.

"Conservation Packet for Teachers"

These packets are often supplied free from several public and private agencies. These packets generally include information on specific resources, teaching guides, charts, and maps, and lists of audio-visual aids. Packets may be requested from the following sources:

- a) American Forest Products Industries
1816 N Street N. W.
Washington, D. C.

Includes bulletins, charts and maps, and bad land use.

- b) Soil Conservation Service
U. S. Department of Agriculture
Washington, D. C.

Packet of material on soil and water conservation.

- c) Department of Health, Education and Welfare
U. S. Public Health Service
Washington, D. C.

A teacher's packet contains information on clean water and pollution control.

- d) U. S. Forest Service
Department of Agriculture (Regional Office)
Atlanta, Georgia

Separate teacher packet for elementary and for high school.

ERIC - Educational Research Information Center
ERIC Document Reproduction Service
Bell & Howell Company
1700 Shaw Avenue
Cleveland, Ohio 44112

This is a network of centers which compile information on research in specific fields of education. Coordinated with the offices of education, the various centers abstract, index, store, and disseminate nationally significant research documents.

Regional Science Experience Center
156 Adams Lane
Oak Ridge, Tennessee 37830

This center, established under an ESEA III grant serves Eastern Tennessee. It has long been active in providing innovative assistance to science educators in eastern Tennessee, and now it is beginning to formulate a plan to encourage and facilitate the sharing of ideas on environmental education by the teachers in the schools it serves.

SIPI - Scientists' Institute for Public Information
 Executive Director
 30 East 68th Street
 New York, New York 10021

SIPI is a national organization of the various disciplines in science which are concerned with today's environmental problem. Pollution, population, waste management, land use, and education are but a few of the areas studied from the scientific aspect by local groups.

Superintendent of Documents
 U. S. Government Printing Office
 Washington, D. C. 20402

- 1) The government is an available and invaluable source of information. To obtain a more complete and current list, write to the Superintendent of Documents and ask to be placed on the mailing list for "Selected U. S. Government Publications" (issued bi-weekly).
- 2) "List of Publications on Conservation and Related Department of the Interior Subjects" (#PL 87).

In addition, the local library should have monthly and annual issues of the following:

- 1) "Catalog of U. S. Government Publications-- Biological and Agricultural Index".
- 2) "Checklist of State Publications".
- 3) "Public Affairs Information Index".

Especially interesting recent publications from the U. S. Printing Office include:

- 1) "No Laughing Matter," a book of syndicated cartoons on air and water pollution. 70¢.
- 2) "Primer on Waste Water Treatment." Current and possible future methods for treating sewage and industrial wastes. 55¢.
- 3) "Showdown." Picture pamphlet discussing "showdown" for water quality. 65¢.

- 4) IT'S YOUR WORLD-- THE GRASSROOTS CONSERVATION STORY and other yearbooks of the U. S. Department of the Interior. Series includes: QUEST FOR QUALITY (1965, \$1.00), THE POPULATION CHALLENGE (1966, \$1.25), THE THIRD WAVE (1967, \$2.00), and MAN-- AN ENDANGERED SPECIES? (1968, \$1.50).
- 5) SCIENCE FOR BETTER LIVING and other yearbooks of the U. S. Department of Agriculture, 1968. \$3.00. The yearbook series includes: MARKETING (1967, \$1.75), and PROTECTING OUR FOOD (1966, \$2.50).
- 6) SOIL, WATER, AND SUBURBIA. U. S. Department of Agriculture and U. S. Department of Housing and Urban Development, 1968. \$1.25. Contains addresses presented at the National Conference on Soil, Water, and Suburbia. Urban development and regional planning.

Kits and Games:

"Basic Camera Kit"

The Workshop for Learning Things
55 Chapel Street
Newton, Massachusetts 02160

A camera and materials for ten children can provide an opportunity for exploration and documentation of important environmental factors influencing the local community. All ages.

"Basic Cardboard Carpentry Tool Kit"

The Workshop for Learning Things
55 Chapel Street
Newton, Massachusetts 02160

The use of this inexpensive building material can provide a wealth of opportunities for children to construct more exciting areas of learning. The material provides a good display center for children's work.

MATCH - Materials and Activities for Teachers and Children

American Science and Engineering
20 Overland Street
Boston, Massachusetts 02215

This program has produced a series of kits designed for use from grades K-6. Can be used with a classroom for about two to four weeks.

"Waterplay Kit"

Material involves the water table. (K-3)

"The City Kit"

Children create a city by using films, photos, and model building. (3-5)

"Housing Kit"

Different forms of housing around the world are explored. (1-3)

"Netsilk Eskimos Kit"

Hunting, tools, clothing, and other activities of the Netsilk Eskimos are explored. (3-4)

"The Algonquins Kit"

The Northeast Woodland Indian life becomes real through the use of related objects and activities of the Algonquin Indians. (3-4)

"Paddle-to-the-Sea Kit"

The story of the settling of the Great Lakes comes alive through fur bartering, buoy rigging, and boat launching. (4-6)

"Imagination Unlimited Kit"

A child's perceptions and awareness are given free reign in an attempt to give expression to the development of their imaginations. (4-6)

"Japanese Family Kit"

Role-playing is important in developing the style of middle class family life in Japan. (5-6)

"A House of Ancient Greece Kit"

"Archaeological discoveries" lead to the class making deductions concerning how early Greeks lived.

"Match Press Kit"

A class publishing company is created and types, inks, prints, and lends its own book.

"Neighborhood"

C. Abbot Associates, Inc.
55 Wheeler Street
Cambridge, Massachusetts 02138

This is a simulation game which is designed to teach how an urban area is developed. (4-6)

Manuals and Bulletins:

ACT IN TIME. Indiana State Department of Public Instruction, Division of Curriculum, Room 108, State Office Building, Indianapolis, Indiana 46204, 1969. Free. Art and environmental education curriculum guide, K-12.

"Available Curriculum Materials." Golden Valley Environmental Science Center, 5400 Glenwood Avenue, Minneapolis, Minnesota 55422. A list.

"Biology Experiments for High School Students." American Cancer Society, obtain from local branches, 1965. Free.

"Catalog of Free Films on Air Pollution on Loan for Group Showing." U. S. Government Printing Office, 1967. 10¢.

"A Critical Index of Films and Filmstrips in Conservation." Conservation Foundation, 30 East 40th Street, New York, New York 10016. Free.

"Discovering Your Environment." M. Chase. NASCO Nature Study Aids, 1970. 65¢. Booklet introducing student discovery programs at local level. All levels.

ENVIRONMENTAL CRISIS. Intermediate Science Curriculum Study. The Florida State University Department of Education, 507 S. Woodward Avenue, Tallahassee, Florida 32304. April, 1970. Trial edition. Ecological problems associated with man's influence on his environment. Grade 9. One of eight units.

ENVIRONMENTAL EDUCATION-- OBJECTIVES AND FIELD ACTIVITIES. Major, Cissell et al. Paducah Public Schools, Environmental Education, 10th and Clark Streets, P. O. Box 1137, Paducah, Kentucky 42001. 1969. Single copies free (supply limited). Outdoor education, curriculum guide, activities and experiments, interdisciplinary. Grades K-12.

EVALUATION FOR ENVIRONMENTAL EDUCATION (A SYSTEMS ANALYSIS APPROACH). New Jersey State Council for Environmental Education, 1969. Single copies free. Grades K-12. Activities and experiments.

"Filmstrips on Conservation." Adams and Michaud. Interstate Printers and Publishers, 1969. 50¢.

GUIDELINES TO CONSERVATION EDUCATION ACTION. Izaak Walton League of America, 1969. \$2.50. Suggestions, recommendations, and information on how to transform local needs into conservation education action at national and local levels. Directed at club groups as well as teachers.

"Guidelines for Environmental Sensitivity." Eleanor Bennett et al. Pennsylvania Department of Education, 1969. Free. Grades K-6.

LAND USE AND ECOLOGICAL CONSCIENCE. Olive H. Lockard. Shoreline Public Schools, 1968. \$1.00. Interdisciplinary outdoor education.

LIVING, LEARNING, LOVING WEST VIRGINIA. West Virginia Department of Education, 1969. Free. Curriculum guide in conservation. Grades 1-12.

Office closed in 1985

- MAN IN HIS ENVIRONMENT. San Diego City Schools, Curriculum Productions, 4100 Normal Street, San Diego, California 92103. 75¢. Curriculum guide. Grade 6.
- NABT MATERIALS FOR TEACHING CONSERVATION AND RESOURCE USE. National Association of Biology Teachers. Danville, Illinois: Interstate Press. 50¢.
- OUR MAN-MADE ENVIRONMENT - BOOK SEVEN. Alan Levy et al. Group for Environmental Education, Philadelphia, Pennsylvania, 1969. Workbook approach; mainly architecture, a major part of the human environment.
- PATTERNS FOR PRESERVATION and CONSERVATION WORKBOOK. David Tillotson. Great Northern Publishing Corp., 400 E. Silver Springs Drive, Milwaukee, Wisconsin 53217, 1969. \$12.00 and \$2.95 respectively, less 20% educational discount. A conservation text for grades 7-12. Exercises are contained in the accompanying workbook.
- "Proceedings to Governor's Conference on Environmental Education." Idaho Department of Education, 1969. Single copies free.
- REPORT TO THE PRESIDENT AND THE PRESIDENT'S COUNCIL ON ENVIRONMENTAL QUALITY. Citizen's Advisory Committee on Environmental Quality, 1700 Pennsylvania Avenue N. W., Washington, D. C. 20006, 1969. Free.
- RESIDENT ENVIRONMENTAL EDUCATION HANDBOOK. Conservation and Environmental Science Center, 1969. \$2.00. Grade 6 resident outdoor education.
- SCIENCE-- GRADES K-6. This is a bulletin produced by the North Carolina Department of Public Instruction, Science Education Section for distribution to North Carolina's elementary school teachers. The bulletin contains a number of teaching concepts coordinated with science activities in the areas of (1) Introduction to Science, (2) Living Things, (3) Matter and Energy, and (4) Earth and Space. The purpose of this curriculum bulletin is to assist each school in developing a coordinated program in elementary science which is suitable to its own needs and resources. Write: N. C. Department of Public Instruction, Science Education Section, Raleigh, N. C. (Publication #410).
- SCIENCE-- GRADES 7-9. This is a bulletin produced by the N. C. Department of Public Instruction, Science Education Section for distribution to North Carolina's junior high school teachers. The bulletin contains a number of concepts coordinated with science activities for life science, earth science, and physical science. The purpose of the bulletin is to bring to the attention of the science teacher the importance of some of the factors inherent in a good science program.

SCIENCE AND SOCIETY. Madison Public Schools, 1969. \$1.00. Curriculum development. Junior high.

SCIENCE IN CITY AND SUBURBS. American Education Publications, 1969. 35¢. Outdoor and urban education, activities and experiments. Grades 7-9.

SOME HIGHLIGHTS OF 1969. Resources for the Future, Inc., January, 1970. Free. Articles include: "Fly Now--Pay Forever?", "Fuming Highways", "Fish in Troubled Waters", "Room for How Many More?", "Oil on the Alaskan North Slope."

TEACHER'S GUIDE TO RESIDENT OUTDOOR EDUCATION. Norm Hansen, Neil Berger, and Dave Johnson. Shoreline Public Schools, 1969. 50¢. Interdisciplinary.

TEACHER'S WORKSHOP HANDBOOK. Conservation and Environmental Science Center, 1969. \$1.50. For teacher training, resident and environmental education.

TO KEEP LIFE ON THE MOVE. Fred Smith. American Conservation Association, Harry Rand, Room 5600, 30 Rockefeller Plaza, New York, New York 10020, 1969. Free. Discusses the necessity of reconstructing our fragmented society and preserving an environment fit for human habitation.

Educational Programs:

CEMREL: CENTRAL MIDWESTERN REGIONAL EDUCATIONAL LABORATORY

This is a plan to develop a "computerized indexing and retrieval system for the knowledge, findings, and tests that relate to the arts. This system will provide a tool for curriculum development and research." Founded upon the premise that "the sensibilities and capacities for judgements and effective action can be trained within the school," the Program materials should be valuable to anyone in the field of environmental science.

The program's materials include: a handbook, a thesaurus of activities which can be a part of aesthetic education, a curriculum developer's handbook, concept cards, and activity cards. In addition, the Laboratory publishes a CEMREL Newsletter.

Field testing is now underway in Missouri schools. Marketable materials may be limited until some future date. For more information write:

Public Information Officer
CEMREL
10646 St. Charles Road
St. Ann, Missouri 63074

ENVIRONMENTAL STUDY AREA PROGRAM (ESA)

A nationwide cooperative environmental education endeavor of the National Park Service and local communities, utilizing parks as study guides, for example, in the Washington, D. C. area and the Theodore Roosevelt Island Environmental Study Area. Write:

U. S. Department of the Interior
National Park Service
Washington, D. C. 20240

GROUP FOR ENVIRONMENTAL EDUCATION, INC. (K-12)

This program is directed toward an understanding of the "man-made environment" as a response to the needs of man. It attempts to investigate the purpose, form and dimension of the constructed environment. Building upon an awareness, the program develops confidence in judgement decisions determining man's wants and needs. The introduction of complex choice-making is introduced in an atmosphere of expanding alternatives. It is a program developed for the educational range of K-12. The goal of the program is to enhance the flexibility and increase the support of a teacher as he chooses his own direction.

Materials for the program are in all stages of development. They include student workbooks, teacher guides, bibliographies, collections of teacher experiences and suggested classroom activities. In addition, a workbook for determining needs, working with limitations and resources, a series of pamphlets and more teacher supportive materials are currently being developed.

Primarily, social studies, art, and to some degree, English teachers have been involved in most of the program's experimental development. Math and science classes have been involved in some areas.

Limited copies of published materials are available on a complimentary basis to educational institutions or similarly interested groups. Write:

The Group for Environmental Education
1214 Arch Street
Philadelphia, Pennsylvania 19107

HIGH SCHOOL GEOGRAPHY PROJECT (9-12)

A one-year high school geography course has been developed and organized on a settlement theme. Funded by the Ford Foundation, the National Science Foundation, and sponsored by the American

Association of Geographers, the course centers around the "varied institutions and technologies of societies around the earth." A series of teams in consultation with educational psychologists, developed a series of six units which may also be used in economics, government and history courses. Some of the units include: "Geography of Cities," a study of the factors influencing location, structure, and growth of cities, culminating with the construction of a model city; "Manufacturing and Agriculture," role-play activities operate in site location of a factory and form operation; "Cultural Geography," exploration of attitudes toward cattle in different areas of the world with multi-media presentations used to show cultural relativity; and "Political Geography," role-play operates in solving an international boundary dispute, state redistricting and other political problems.

Each of the six units contains a complete package of slides, tapes, readings, maps, and other materials. Supplementary reference volumes, local geography material, and aerial map photography information is available. The project publishes a newsletter available from the project office.

The program has had exclusive classroom development and has been used successfully by teachers with and without geographic backgrounds from inner-city, suburban and rural areas. Write:

High School Geography Project
P. O. Box 1095
Boulder, Colorado 80302

or:

The Macmillan Company
School Department
866 Third Avenue
New York, New York 10022

MAN: A COURSE OF STUDY

Man is the content of this course and it has nature as a species, the force that shaped and continues to shape his humanity that forms the central emphasis of the program. Exercises and materials are selected which show that man is distinctive in his adaptation to the world, and there is a discernible continuity between man and his animal forebears. The fundamental questions about the nature of man are introduced by way of familiar animal contrasts. Subsistence activities, child-rearing practices, the family structure, member behavior, cooperative activities of a society, and values and beliefs are studied in an attempt to understand the cohesiveness of culture and its universal aspects.

The aims of the course are:

- . To give pupils confidence in the powers of their own minds.
- . To give them respect for the powers of thought concerning the human condition, man's plight and man's potential.
- . To provide them with a set of workable models for analyzing the nature of the social world in which they live.
- . To impart an understanding of the capacities of man as a species in contrast to others.
- . To instill concern for the human condition in all its forms, whatever race or culture.

Materials for the program include a range of media, styles, and complexity and they are broad enough to involve children of varying aptitudes and interests in the ideas and problems of the course. Films, booklets, and other materials along with a teacher's guide create an opportunity for students to gather and organize data in ways similar to those of a social scientist, but this emphasis does not obscure the affective domain-- the emotional, artistic, and spiritual life of the child. For more information contact:

Man: A Course of Study
 Educational Division Center
 15 Mifflin Place
 Cambridge, Massachusetts 02138

NEED - NATIONAL ENVIRONMENTAL EDUCATION DEVELOPMENT (3-4, 5-6, 7-8, 11-12)

The aim of the NEED Program is to "foster an appreciative and critical awareness of the environment, particularly an awareness of the intersections of natural and social processes as illustrated in National N. C. Service areas and to increase in children the will and capacity to improve the environment."

This program is integrated with stimulating interdisciplinary materials which are drawn from the areas of social studies, the arts, mathematics, and science. The program concentrates on an experience in a natural setting with a pre-site (preparation) and post-site (follow-up) section.

Still in the experimental stage, materials developed so far include a teacher's guide, a student notebook of classroom materials and a student "Environmental School Log Book." The program, as now planned, encompasses grades: 3-4, Appreciation; 5-6, Aesthetic and Physical Relationship; 7-8, Conservation and the Effect Man Has Had on Land, Air, and Water; 11-12, The Necessity and Effects of Environmental Management. For further information, write:

NEED
 National Park Service
 U. S. Department of the Interior
 Washington, D. C. 20240

URBAN ACTION: PLANNING FOR CHANGE (4-5; 7-8)

This is a very detailed social studies curriculum written with the assumption that citizens can learn about, understand, and change their environment. It uses history, politics, government, art, literature, and planning to support the program in imaginative ways.

Present materials include a "multi-media kit" of color filmstrips, records, planning information cards for city development, teacher manual, course planning guide, community planning handbook, and a student workbook with diagrams, games, maps and exercises.

The program has been used in Harlem Schools in New York City. The program was developed by C. Richard Hatch Associates of New York. It is beyond the development stage and is now commercially published. For more information contact:

Ginn and Company
Boston, Massachusetts 02117

THE FOLLOWING SPACE IS AVAILABLE FOR ADDITIONAL BIBLIOGRAPHICAL ENTRIES:

CHAPTER VI

RESOURCES AVAILABLE FROM GOVERNMENT AND PRIVATE AGENCIES

RESOURCES AVAILABLE FROM GOVERNMENT AND PRIVATE AGENCIES

There are many agencies of both the State and Federal Governments that actively participate in the development of materials of an environmental nature. A review of the environmental education material produced by these agencies was undertaken by the Task Force on Environment and Natural Resources in an effort to evaluate the potential effectiveness of the material. It also provided a central listing of the sources presently available to the teacher for the development of a comprehensive environmental science program.

A number of agency programs offer opportunities for specialized training for public school teachers of environmental science. Others have a great deal of available materials which could easily be used to supplement a public school curriculum in environmental awareness. The agencies are grouped according to Federal, State, and private sources. In addition, a comprehensive listing of potential sites for field activities of an environmental nature is included. The listing, restricted to the state of North Carolina, is regionalized for the convenience of teacher planning, travel time, and money.

The Teacher's Guide to Environmental Education also recognizes the services contributed to education by many citizen membership and non-membership organizations. Such organizations often are active leadership roles in the present environmental crisis. The organizations offer a base upon which personal participation in group activities can take place. By providing numerous publications for use in the public schools, citizen membership and non-membership organizations must be recognized as a

valuable educational source. A listing and description of such organizations is included.

The aforementioned resources are presented below in the following order:

U. S. Government Agencies
North Carolina Government Agencies
Membership and Non-Membership Organizations
Field Trips

U. S. GOVERNMENT AGENCIES

U. S. Department of Agriculture

Forest Service

The Forest Service is charged with the responsibility for promoting the conservation of the nation's forest lands, amounting to approximately one-third of the total land area of the United States. The National Forests are managed under the twin conservation policies of multiple use and sustained yield.

A catalog listing a series of materials to help teach Forest Conservation is available. The Service also provides a listing of Forest Service films available on loan for educational purposes to schools, civic groups, churches and television. For further information contact:

U. S. Department of Agriculture
Forest Service
National Forests in North Carolina
P. O. Box 2750
Asheville, North Carolina 28802

Soil Conservation Service

The Soil Conservation Service has the responsibility for developing and carrying out a national soil and water conservation program for soil erosion control, flood prevention, sediment reduction, land-use planning, recreation, beautification, and water development for agriculture, recreation and wildlife.

The soil and water conservation program is carried out through technical help to locally organized and operated soil conservation districts. More than 3,000 soil conservation districts cover almost two billion acres in the nation. Assistance to districts includes:

- (1) giving cooperators a soil and land capability map of his land;
- (2) providing information about practical alternatives for land use;
- (3) helping to develop an orderly plan and installation of the suggestions needed; and
- (4) helping with skills and knowledge in the plan's development.

More information may be received by contacting the local soil conservation district headquarters.

Agricultural Stabilization and Conservation Service

In addition to providing local farmers with (1) price support, (2) production adjustment, and (3) disaster relief, the ASCS provides (4) conservation and land-use adjustment assistance, carried out through sharing with individual farmers the cost of installing needed soil, water, woodland, and wildlife conserving practices.

Local ASCS offices in each county can provide more information.

National Agricultural Library

The National Agricultural Library provides services to agricultural colleges, research institutions, government agencies, industry, farmers, and the general public. With resources of 1,300,000 volumes, next to the Library of Congress, it is the largest U. S. Government library. Information in the Library's collection is disseminated through loans, photocopies, reference services, and bibliographies, (including the Bibliography of Agriculture). It also publishes the Pesticides Documentation Bulletin, a bi-weekly computer produced index of worldwide published literature on pesticides-related research. These services and information from the collection are available to anyone in the United States and abroad.

For further information concerning the Department of Agriculture contact:

The Information Office
 Fourteenth Street & Independence Avenue, S. W.
 Washington, D. C. 20250

U. S. Department of Commerce

Environmental Science Services Administration

The Environmental Science Services Administration consists of five major components: (1) Environmental Data Service, (2) The Weather Bureau, (3) The Research Laboratories, (4) The Coast and Geodetic Survey, and (5) The National Environmental Satellite Center. This Division of the Department of Commerce conducts comprehensive programs with respect to meteorology, climatology, hydrology, surveying and space investigations, electromagnetic wave propagation properties of the atmosphere, telecommunications and other activities related to the special competencies of the Environmental Science Services Administration.

This agency serves the public in efforts to protect the woodlands, ranges, waterways and coastal areas against fire, flood and storm. Its air pollution service is developing methods to forecast conditions which favor hazardous pollution concentrations in the atmosphere. It is also conducting studies of natural transport, dilution and removal of such air pollutants. For more information write:

Office of Public Information
Environmental Science Services Administration
6010 Executive Building
Rockville, Maryland 20852

U. S. Department of Health, Education and Welfare

Public Health Service

Environmental concerns of the Public Health Service include expanded programs for air pollution control and solid waste disposal.

The Public Health Service is the federal agency specifically charged with promoting and assuring the highest level of health attainable for every person, in an environment which contributes positively to healthful individual and family living.

The major environmental functions include: (1) to identify health hazards in man's environment and in the products and services which enter his life, to develop and promulgate, and assure compliance with standards for the control of such hazards; (2) to support the development of, and improvement of, the delivery of comprehensive physical and mental health services to all Americans; (3) to conduct and support research in medical and related sciences furthering the development of health education to insure an adequate supply of qualified health manpower.

Food and Drug Administration

The mission of the Food and Drug Administration is to protect the public health of the nation as it may be impaired by foods, drugs, cosmetics, therapeutic devices, hazardous household substances, poisons, pesticides, food additives, flammable fabrics, and various other types of consumer products. For more information write:

Food and Drug Administration
Consumer Protection and Environmental Health
Service
200 C Street, N. W.
Washington, D. C. 20204

Environmental Control Administration

The Environmental Control Administration's mission is to preserve and improve the physical environment in order to promote the health and welfare of man through programs designed to reduce the levels of exposure of people to the hazards of improper housing, noise, rodents, insects, occupational and community accidents, waterborne diseases, radiation, and waste accumulation. For more information write:

Environmental Control Administration
Consumer Protection and Environmental Health
Service
200 C Street, N. W.
Washington, D. C. 20204

National Air Pollution Control Administration

The National Air Pollution Control Administration's duties are to conduct a National program for the prevention and control of air pollution. It encompasses programs for regulatory controls, research and development activities, technical and financial assistance, and the development of air pollution-manpower resources. For more information write:

National Air Pollution Control Administration
Consumer Protection and Environmental Health
Service
200 C Street, N. W.
Washington, D. C. 20204

For further information concerning the Department of Health, Education and Welfare, contact:

Information Center
330 Independence Avenue, S. W.
Washington, D. C. 20201

Institute for Air Pollution Training

The office of Manpower Development, Institute for Air Pollution Training offers a variety of courses for scientists, engineers, and other professional people in the field of air pollution control and related activities. No tuition or registration fee is charged but early application is advised since course rosters are limited. For more information ask for the Bulletin of Courses.

Institute for Air Pollution Training
P. O. Box 12055
Research Triangle Park, North Carolina 27709

The Office of Education

This office of the Department administers several programs which support and improve primary, secondary, vocational, adult and higher education across the country. Its work in conservation education includes curriculum development, assistance to conservation education organizations, and support of research. For more information about specific programs available in your area contact:

Office of Education
400 Maryland Avenue, S. W.
Washington, D. C. 20202

The Office of Surplus Property Utilization

This office makes surplus property available for development and use as nature study areas, arboretums, forestry and agricultural study projects, and other projects that are a part of school, college or university curriculums. For more information write:

Director
Office of Surplus Property Utilization
330 Independence Avenue, S. W.
Washington, D. C. 20201

U. S. Department of the Interior

The Department of the Interior is the nation's principal conservation agency. The Department has the basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. The Department works to assure the wisest choice in managing all the nation's resources so each will make its full contribution to the United States--today and tomorrow.

Bureau of Sport Fisheries and Wildlife

Hunting and fishing license sales statistics; federal aid to fish and wildlife restoration; fish and wildlife research; duck stamp data; migratory bird hunting regulations; recreational use of National Wildlife Refuges and National Fish Hatcheries; river-basin studies; pesticide research related to fish and wildlife; rare and endangered wildlife; and photographs are the responsibilities of the Bureau of Sport Fisheries and Wildlife. For more information contact:

Office of Conservation Education
Bureau of Sport Fisheries and Wildlife
Room 3242, Interior Building
Washington, D. C. 20240

Bureau of Commercial Fisheries

Biological and technical research; market promotion programs; statistical facts on commercial fisheries; economic studies; administration of fisheries Loan Fund and Commercial Fisheries Research and Development Act; manages the fur-seal resources of the Pribilof Islands, Alaska. For further information contact:

Information Officer
Bureau of Commercial Fisheries
Room 3042, Interior Building
Washington, D. C. 20240

National Park Service

Information on 259 National Park Administered areas, including 32 National Parks, National Recreation Areas, National Seashores, and dozens of National Monuments and Historic Sites. Contact:

Information Officer
National Park Service
Room 2325, Interior Building
Washington, D. C. 20240

Bureau of Land Management

Information on wildlife management on 467 million acres of public lands; camping, hunting, fishing, hiking, pack trips on public land, mostly in the West and Alaska; wildlife use of lands; forests and water-shed practices aiding wildlife and recreation; outdoor pursuits on public-land areas; obtaining public lands for state and community parks; photographs are all the responsibility of the Bureau of Land Management. For more information contact:

Information Officer
Bureau of Land Management
Room 5643, Interior Building
Washington, D. C. 20240

Bureau of Indian Affairs

Information on Indians and their relationship to the Federal Government, tribes when the tribe is specified, location of specific reservations as well as ceremonials and celebrations of interest. Contact:

Information Officer
Bureau of Indian Affairs
Room 222
1951 Constitution Avenue
Washington, D. C. 20242

Bureau of Outdoor Recreation

Information on national recreation needs and plans; state, government, and private programs for recreational development; statistics on needed areas, travel, outdoor pursuits; coordination of various federal recreation programs; forecasts of future needs are the responsibilities of the Bureau of Outdoor Recreation. Contact:

Information Officer
Bureau of Outdoor Recreation
Room 4125, Interior Building
Washington, D. C. 20240

Bureau of Mines

Maintains a free-loan library of 16 mm motion pictures in sound and color, several of which picture the mineral and other natural resources such as parks, scenic and tourist attractions of various states. Also, publishes technical literature useful to amateur and professional prospectors and gem-stone collectors; photographs. Contact:

Chief, Office of Mineral Information
 Bureau of Mines
 Room 2611, Interior Building
 Washington, D. C. 20240

Office of Saline Water

Information and pamphlets on the Department's program to develop low-cost processes for desalting sea or brackish water through operation of demonstration plants; plant visits welcome; Saline Water Conversion Research and Development Test Station, Wrightsville Beach, N. C., and demonstration plants at Freeport, Texas; Roswell, New Mexico; and Webster, South Dakota. Contact:

Information Officer
 Office of Saline Water
 Room 5024, Interior Building
 Washington, D. C. 20240

Federal Water Pollution Control Administration

Popular booklets and leaflets on the importance of clean water; material on citizen action for cleaning up rivers, lakes, streams, estuaries; 16 mm color films on water quality and pollution control; photographs of pollution problems and water uses.

To obtain clean water the agency:

- . Administers grants to communities for construction of municipal sewage treatment plants.
- . Administers enforcement provisions of the Federal Water Pollution Control Act.
- . Encourages and supports states in the establishment of water quality standards.
- . Provides technical assistance to states on water pollution problems.
- . Develops long-range water pollution control programs in major river basins and estuaries.
- . Operates monitoring stations on the nation's waterways.
- . Studies and prepares reports on special problems such as oil pollution, watercraft wastes and thermal pollution.

For further information contact:

Information Center
 Federal Water Pollution Control Administration
 Washington, D. C. 20242

Geological Survey

General and detailed geologic and topographic maps; geologic reports on mining districts, mineral occurrences, laboratory investigations and many areas of general interest; water resource studies; information from 18,000 stations on stream flow quality, sediment, and ground water levels; aerial photographs at 1:60,000 scale of entire country and at other scales of many local areas; photographs of activities. Contact:

Information Officer
Geological Survey
Department of the Interior
5232 GSA Building
Washington, D. C. 20240

Bureau of Reclamation

Information on widespread recreational use of more than 100 reservoirs; fishing, water sports, boating, swimming, scenic tours and camping areas; sight-seeing attractions at dams and related works; recreational development plans on basin-wide pattern; photographs. Contact:

Information Officer
Bureau of Reclamation
Department of the Interior
Room 7642, Interior Building
Washington, D. C. 20240

For any additional information about the Department of the Interior, contact:

Director of Information
Department of the Interior
Washington, D. C. 20240

NORTH CAROLINA GOVERNMENT AGENCIES

North Carolina Department of Administration

The Department of Administration represents the consolidation of all state fiscal and management agencies in one department. Two of the Department's divisions are directly involved in the conservation and development of the state's natural resources.

The Property Control Division

The Property Control Division is responsible for all state-owned land. The sale, purchase, lease, or transfer of state property is handled by this agency of state government.

The State Planning Division

The State Planning Division's objectives are the development of the total resources of North Carolina. Its operations are divided according to the three basic areas of the state--the Appalachian region, the Piedmont region, and the Coastal Plain region. This Department functions to coordinate federal-state programs of resource use. Joint federal-state programs include:

(1) With the Appalachian Regional Commission

- . The Division of Water Resources in Appalachia - a comprehensive study participated in by virtually all of the federal agencies with water-related interests. A final report is available.
- . A Stayed-Development Program of Water Resources for the Appalachian Corridors - in cooperation with other state agencies. A final report is available.
- . Soil Stabilization and Conservation - with the Soil Conservation Service and Agricultural Stabilization and Conservation Service as well as other state agencies, this program provides funds to farmers in Appalachia for soil conservation purposes.
- . Parks and Recreation - Funds are available for parks and recreation areas.

(2) With the Coastal Plains Regional Division Commission

- . Sanitary River Basin Study - with the Soil Conservation Service, the Planning Division is coordinating studies of these regions.

- Upper Cape Fear River Basin Study - with the Soil Conservation Service, the Planning Division is coordinating studies of these regions.
- Wild, Scenic, and Recreational Rivers - with the Bureau of Outdoor Recreation, this Division is coordinating state efforts to designate such areas.

Education Programs

The State Planning Division sponsors seminars and public meetings demonstrating the importance of planning to conservation. It publishes numerous reports and periodicals that deal with conservation. The Division has produced a movie relevant to the conservation needs of the Piedmont. It is available on loan from the Institute of Government, Chapel Hill, or the Department of Public Instruction, Raleigh.

For further information write:

Department of Administration
Administration Building
Raleigh, North Carolina 27602

North Carolina Department of Agriculture

The Department of Agriculture is the agency that serves the state's farm population. In addition, the Department carries out services and activities designed to protect the consumer. The Department is responsible for administering many laws governing materials affecting the total environment. The regulatory responsibilities are accompanied by educational programs, news releases, speeches, special articles, and the Department's own paper, Agricultural Review.

For additional information on the seventeen divisions of the Department of Agriculture contact:

Commissioner
North Carolina Department of Agriculture
1 West Edenton Street
Raleigh, North Carolina 27611

North Carolina Museum of Natural History

Of special interest to educators is the Department's Division controlling the State Museum of Natural History. The Division is responsible for the exhibit halls in Raleigh and administering the Hampton Marine Museum, Morehead City.

The North Carolina Natural History Museum offers a variety of services in its Educational Program.

- (1) Information Circulars pertaining to natural history subjects of common interest. Examples include: bird checklists, poisonous plants of North Carolina, North Carolina gem stones, etc. These circulars are free and mailed upon request or given to teachers in packet form when they visit the Museum.
- (2) Slides and Filmstrips for loan to schools is another service of the Museum. These filmstrips are primarily the type of visual aid often missing from the average classroom. The 35 mm color slide collection of the Museum is extensive and is circulated in sets such as North Carolina Reptiles, North Carolina Mammals, Birds of North Carolina, etc.
- (3) Group Interpretation of the Natural History displays in the Museum is offered to school classes. The groups can be accommodated both within the Museum and outside as time and personnel will permit.
- (4) Traveling Exhibits of individual birds or mammals mounted in a case suitable for viewing and for shipping are provided by the Museum. They can be shipped inexpensively to any point in the state.
- (5) Consultation and Counseling is provided as personnel permits, so the teacher can make the best possible use of the Museum facilities in his instructional program.

The Museum is anxious to serve the schools of North Carolina. For more information and a catalog of the other services contact:

Director, State Museum of Natural History
P. O. Box 2281
Raleigh, North Carolina 27611

North Carolina State Board of Health

The State Board of Health is charged with the protection of the public health interests of the state, especially in connection with communicable and infectious diseases, water supplies, sewage disposal, and registration of births and deaths. There are seven divisions of the State Board of Health. Following is a brief description of each program which produces information of environmental concern:

The Dental Health Division

The Dental Health Division is charged with conducting programs in education, prevention, research, and dental care. The Division conducts educational and preventive programs involving the use of fluorides. The Division prepares and distributes materials at all

levels relating to fluorides and would be glad to participate in developing curriculum programs in dental health. For more information contact:

North Carolina State Board of Health
Dental Health Division
P. O. Box 2091
Raleigh, North Carolina 27602

The Radiological Health Section

The Radiological Health Section is charged with providing for the radiation safety of the North Carolina public and users of radiation in North Carolina through the operation of the North Carolina Radiation Protection Programs. The Radiological Health Section makes its staff available for the presentation of lectures and discussions to any group including: (1) public school classes; (2) professional groups, (3) medical groups, (4) college and university classes; (5) federal and civil defense training courses.

A limited quantity of printed material is also available from the Radiological Health Section upon request. For further information write:

North Carolina State Board of Health
Radiological Health Section
P. O. Box 2091
Raleigh, North Carolina 27602

The Community Health Division, Nursing Section

The Community Health Division, Nursing Section's principal programs include: (1) in-service education for nurses employed in ESEA programs, and (2) workshops and seminars for ESEA nurses. The Section's education program encourages school nurses to participate in in-service programs covered by local public health nurses. Subjects could include: school health, administration and service, mental health, child growth and development, nutrition, health counseling, case finding and follow-up records, etc.

Several Public Health Service short training grants are available to allow school nurses to improve their background and experience both at the local and nursing school level. For more information write:

North Carolina State Board of Health
Community Health Division, Nursing Section
P. O. Box 2091
Raleigh, North Carolina 27602

The Division of Epidemiology, Veterinary Public Health Section

The Section operates a Pesticides Program under contract with the Food and Drug Administration of the U. S. Public Health Service. The Section operates periodically in-service training programs emphasizing potential health hazards. For more information write:

North Carolina State Board of Health
 Division of Epidemiology
 Veterinary Public Health Section
 Pesticides Program
 P. O. Box 2091
 Raleigh, North Carolina 27602

The Community Health Division, Health Education Section

The Section provides consultation and technical assistance in the planning and implementation of the educational component of health and health-related programs. Specific competencies are in the areas of community organization, identification of target groups, educational methods, selection and preparation of materials, training programs and evaluation. A quarterly bulletin on suggested bulletin boards and educational materials is sent to local health departments. Services are available to state and community agencies and organizations concerned with health problems. For more information write:

North Carolina State Board of Health
 Community Health Division
 Health Education Section
 P. O. Box 2091
 Raleigh, North Carolina 27602

The Sanitary Engineering Division, Engineering Section

The Section is responsible for the surveillance of all public water supplies in North Carolina. The Engineering Section keeps in touch with water works officials, water treatment facility operators, city officials, and others in an effort to assure that all public water supplies in the state furnish at all times, water safe for human consumption. The Section has available color pamphlets which explain water treatment and water supply protection to school age children. Also, technical publications on protection of water supplies and waste water disposal are available. The personnel of the Section attend and participate in regional and state water works meetings, and frequently conduct educational or training programs. For more information contact:

North Carolina State Board of Health
 Sanitary Engineering Division, Engineering Section
 P. O. Box 2091
 Raleigh, North Carolina 27602

Film Library, Central Administration

The State Board of Health also operates a Film Library on a free-lending basis to the public and private schools, colleges, universities, civic groups, and many others on a state-wide basis. The Library has approximately 3,650 films with about 1,000 individual titles. These films are in the field of health and health-related areas. For more information write:

Supervisor, Film Records and Equipment
North Carolina State Board of Health
P. O. Box 2091
Raleigh, North Carolina 27602

Department of Conservation and Development

There are eight departmental divisions which cover the varied functions of the Department:

The Division of Commerce and Industry

The Division promotes industrial development for the entire state. The Division's technical services provide market surveys and supporting studies in an effort to locate industrial concerns. It produces graphic work and publishes a newsletter as well as transportation and airport directories and special brochures. For more information contact:

Department of Conservation and Development
Division of Commerce and Industry
Room 300
Administration Building
Raleigh, North Carolina 27611

The Division of Commercial and Sport Fisheries

The Division has jurisdiction over all activities connected with the conservation and regulation of marine and estuarine resources. The Division's program consists of the following activities: (1) research to develop information upon which to base management and regulatory action; (2) management to enhance the value of marine and estuarine resources; (3) regulation of activities which may endanger marine and estuarine resources; and (4) education of the public in order to provide more general understanding of the value of these resources and the factors which affect them. A monthly newsletter is available for dissemination to all interested persons. For the newsletter and further information write:

Department of Conservation and Development
Division of Commercial and Sport Fisheries
P. O. Box 27687
Raleigh, North Carolina 27602

The Division of State Parks

The Division develops, maintains, and administers North Carolina's 16 state parks. It is the aim of the State Park System to: (1) preserve and protect the natural areas of unique or exceptional scenic value for the citizens of today and for the generations to come; (2) operate the state parks to provide recreational use of natural resources; and (3) to portray and interpret plant and animal life, geology and all other natural features and processes included in the various state parks.

The Division's education program provides: (1) Museums and public displays; (2) Park Naturalist Slide Lectures; (3) Cooperation with universities in implementing research on park land; (4) Publications including State Park Brochures, travel maps, information sheets, and bulletins; (5) Cooperation with secondary schools involving outdoor education and school camping; and (6) Special lectures for civic and cultural groups. For further information write:

Department of Conservation and Development
 Division of State Parks
 P. O. Box 27687
 Raleigh, North Carolina 27611

The Division of Geodetic Survey

The Division locates and erects boundary marks on monuments. It is responsible for the compilation and evaluation of accurate geodetic data, the publishing of geodetic maps, and provides technical help of value to land owners, developers and construction projects. The Division furnishes published data to City Engineers and Registers of Deeds, distributes newsletters to engineers and land surveyors, and conducts talks to civic groups. For further information write:

N. C. Department of Conservation and Development
 Division of Geodetic Survey
 P. O. Box 2719
 Raleigh, North Carolina 27611

The Division of Forestry

The Division is the largest of the eight divisions. It is in charge of protecting more than 18,000,000 acres of state woodland from fire, insects, and disease. The Division also promotes and carries out reforestation across the state. It is charged with the enforcement of laws governing forests and works to promote better forestry practices and management.

The education program of the North Carolina Forest Service is carried out by the county personnel and district personnel at the local level. Literature concerning all programs is distributed to schools. Programs for schools, civic clubs, and other interested groups are a regular part of the information program. For more information write:

N. C. Department of Conservation and Development
 North Carolina Forest Service
 P. O. Box 2719
 Room 318, Administration Building
 Raleigh, North Carolina 27611

The Division of Community Planning

The Division has the responsibility for community planning studies and assists counties, cities, and towns in mapping long-range plans for future growth.

The Division of Mineral Resources

The Division encourages and conducts research on the state's mineral resources, publishes reports and geological maps and assists the private sector in promoting development of the state's mineral resources. The Division prepares and distributes an Educational Series of publications, describing the geology and mineral resources of North Carolina. A special effort is made to place this material in the hands of teachers and earth science students. Staff geologists are available to a limited degree to give talks to civic and school groups. For further information contact:

N. C. Department of Conservation and Development
 Division of Mineral Resources
 P. O. Box 2719
 Raleigh, North Carolina 27611

The Division of Travel and Promotion

The Division is in charge of North Carolina's industrial and tourist development. It manages advertising programs and conducts a general campaign for tourist promotion. For more information write:

N. C. Department of Conservation and Development
 Division of Travel and Promotion
 Raleigh, North Carolina 27602

The Consolidated University of North Carolina

For the past several years various aspects of research and study in the environmental sciences has been underway at the Consolidated University. Much of the emphasis is upon graduate education but there are some programs which can provide information to the state's public schools. The Institute for Environmental Health Studies has operated for a number of years. In cooperation with Duke University the campuses at Raleigh and Chapel Hill have created the Triangle Universities' Consortium on Air Pollution. Originating in 1970, the Consortium will attempt to offer a series of courses on Air Pollution. The Water Resources Institute is also engaged in studies of the water resources around the state.

The Carolina Population Center at Chapel Hill engages in a supports and comprehensive program of research in population dynamics and family planning. The Center has an education service and can supply up-to-date statistics on the world population crisis.

At Morehead City, the Consolidated University operates the Institute of Marine Sciences. It cooperates with the Duke University Marine Laboratory and the Radiological Laboratory of Beaufort in conducting estuarine and oceanographic research. The State Division of Commercial and Sports Fisheries is adjacent to the Institute and participates in a number of marine investigations.

Governor's Beautification Committee

The Committee sponsors many community and state-wide beautification awards programs involving both adults and children. Three specific items, legislation to improve the state's anti-litter law, legislation to stiffen regulations concerning junked cars and planning for a statewide cleanup program, occupy the priorities of the Committee. In addition, the Committee supplies information to teachers, home extension workers, area development coordinators and many other organized groups in the state. The Committee operates a statewide beautification contest in the public schools of the state. To broaden its influence, it encourages requests for films, brochures and other information on youth projects. For further information contact:

Mrs. Roy E. Wilder, Jr.
Executive Director
Governor's Beautification Committee
Raleigh, North Carolina 27601

North Carolina Department of Local Affairs

The Department of Local Affairs is an advisory agency serving public and private agencies and organizations. Much of its responsibilities directly relate to education of the public. Of particular concern

is environment and natural resource education. As presently constituted, the Department can serve environmental education through the following Divisions:

- . The Division of Community Planning - helps in the planning and zoning of cities, towns, and counties.
- . The Division of Governmental Relations - offers technical services, housing, model cities, and Operation Breakthrough.
- . The Human Resources Division - serves the "people related programs" of Head Start, OEO, CAP, and pilot project programs.
- . The Recreation Division - is involved in an advisory capacity to North Carolina's environment and natural resources services. It is the headquarters for the North Carolina Recreation and Park Society, Inc. The society's publication, Recreation and Park Review, published every other month, is a medium through which North Carolina's schools can be kept informed on articles and information relating to environment and natural resources.

The Department has a public information officer responsible for publishing the Department's newsletter. This release contains service information which can be utilized by the public schools of North Carolina. For further information write:

North Carolina Department of Local Affairs
P. O. Box 1991
Raleigh, North Carolina 27602

North Carolina Department of Water and Air Resources

The Department of Water and Air Resources is responsible for the protection, wise management, regulation, and use of the water and air resources of the state. Some of the principal programs of the Department include:

- (1) Water Pollution Control - a program based on a stream classification system whereby the best use of a body of water is determined and a suitable classification and water quality standard is established.
- (2) Air Pollution Control - a program based on the development and adoption of ambient air quality standards adequate to protect public health, plant and animal life, property, and the development, adoption and implementation of emission control standards adequate to achieve the ambient air quality standards.
- (3) Water and Air Information Program - this program includes all measures reasonably necessary to assure that those affected by water and air management decisions and plans have had an adequate opportunity to be heard. The program publicizes the activities of the Department to assure the fullest possible understanding of actions, to protect and support beneficial water and air resource use, to assure that the public understands the need for and content of long range plans and other activities to keep the public informed.

A supply of the Department's material and information is available to special interest groups, schools, and students in higher institutions. Staff personnel participate in meetings and seminars and deliver talks to civic clubs and professional organizations. For more information contact:

North Carolina Department of Water and Air Resources
P. O. Box 27048
Raleigh, North Carolina 27611

North Carolina Wildlife Resources Commission

The Wildlife Commission has the duty of protecting, restoring, and producing a harvestable supply of wildlife species for the enjoyment of the general public. It is basically a regulatory commission with the authority to establish regulations for wildlife control. A considerable amount of attention is given to research to develop a more efficient program of wildlife conservation.

The Commission's education program includes a monthly magazine, Wildlife in North Carolina; the issuance of books, bulletins, brochures, and releases on various subjects relating to game and fish and their relation to the other renewable natural resources; the production of 16 mm films for distribution; the production of weekly television and radio programs on conservation; and personal contacts with schools and teachers across the state. For more information write:

Executive Director
North Carolina Wildlife Resources Commission
P. O. Box 2919
Raleigh, North Carolina 27602

MEMBERSHIP AND NON-MEMBERSHIP ORGANIZATIONS

Air Pollution Control Association

Membership represents industry, government, education, and health organizations. Emphasizes education, cooperation, and exchange of technical information on atmospheric pollution control and improved air sanitation. Publishes monthly journal and abstracts.

Air Pollution Control Association
4400 Fifth Avenue
Pittsburgh, Pennsylvania 15213

American Association for Conservation Information

Promotes understanding of conservation principles by assisting State efforts in conservation information and education.

American Association for Conservation Information
1416 Ninth Street
Sacramento, California 95814

American Conservation Association

Privately supported non-membership educational and scientific organization dedicated to the advancement of knowledge in conservation and the preservation and development of natural resources for public use.

American Conservation Association
30 Rockefeller Plaza
New York, New York 10020

American Forest Products Industries

Encourages management of forest lands on the multiple use principle. It encourages a regard for natural beauty, provides free materials, booklets, charts, and packets for organization programs and films.

American Forest Products Industries
1835 K Street, N. W.
Washington, D. C. 20006

American Forestry Association

Membership organization supported by private citizens and businesses to promote conservation education and conservation of forests and related resources of water, soil, and wildlife. Sponsors annual conferences on resource topics and wilderness trips. Publishes their monthly magazine, American Forests.

American Forestry Association
919 17th Street, N. W.
Washington, D. C. 20006

National Audubon Society

The National Audubon Society is a membership organization created in 1905 by conservationist, George Bird Grinnell. The Society cares not only about birds but all wildlife, especially nearly 1,000 endangered species. The organization promotes conservation efforts which serve

to preserve the balance of nature in a world in which that condition is highly threatened. The organization works to educate the public to conservation needs. It maintains a staff of lecturers, sends out special mailings and pleads for public awareness of the natural wildlife needs of the nation, through its bi-monthly publication, Audubon. It has battled against the use of DDT, and for the preservation of endangered species and wilderness areas such as North Carolina's Baldhead Island.

To support sea-birds, the Society owns or leases islands for the protected breeding of ducks and sea-birds. With a membership of around 80,000, the organization is affiliated with an additional 250 environmental groups.

The membership also supports wildlife films, camps, Audubon Centers, aids in natural science, and wildlife research.

For additional information write:

National Audubon Society
1130 Fifth Avenue
New York, New York 10028

or
Roger Jones, North Carolina Director
National Audubon Society
Trailing Cedar Farm
Route 2
Summerfield, North Carolina 27358

Belle W. Baruch Foundation

The Belle W. Baruch Foundation is dedicated to teaching and research in forestry, marine biology, and the care and propagation of wildlife, flora, and fauna. The Foundation centers many of its activities in South Carolina. It was responsible for supporting the development of the South Carolina Conservation and Curriculum Improvement Project's Teacher Guide Series, People and Their Environment. Write:

Belle W. Baruch Foundation
274 Madison Avenue
New York, New York 10016

Boy Scouts of America

A membership organization for boys. The Scouts offer an extensive program in outdoor education in nearly every community in the state. It supports, through subscription, the publication of a number of conservation-oriented publications.

Boy Scouts of America
New Brunswick, New Jersey 08903

Campfire Girls, Inc.

A membership organization for girls that emphasizes outdoor education. The organization is active in some areas of the country.

Campfire Girls, Inc.
65 Worth Street
New York, New York 10013

Citizens for Clean Air

An example of a citizen group working for public education on health, aesthetic, and economic effects of air pollution. Pioneered an all-media educational advertising campaign which has resulted in citizen support for enactment of a local air pollution control ordinance.

Citizens for Clean Air
40 West 57th Street
New York, New York 10019

Conservation Education Association

Encourages conservation educational programs in public schools and teacher training. Sponsors annual conferences; publishes a newsletter, bibliography, reports and other educational materials.

Conservation Education Association
c/o Dr. W. F. Clark
Eastern Montana College
Billings, Montana 59101

The Conservation Foundation

A privately supported organization for research, education, and information to protect and enhance the quality of the environment. It seeks to encourage the recognition of ecological principles and natural resources values in planning and decision-making, and to increase effectiveness of a social action for accomplishing conservation goals. Publishes a periodic newsletter, a quarterly educational bulletin, and booklet.

The Conservation Foundation
1250 Connecticut Avenue, N. W.
Washington, D. C. 20036

Conservation Council of North Carolina

The purpose of the Conservation Council of North Carolina is to participate in and coordinate local, state and regional programs of conservation and conservation education. To this end, the Conservation Council of North Carolina will publicize and bring before the people of North Carolina for their support and cooperative action, all matters, both public and private, that affect the health and well being of our citizens through past, present and proposed changes in the natural environment of our State and region.

Conservation Council of North Carolina
208 East Green Drive
High Point, North Carolina 27260

Ford Foundation

A privately founded institution to serve the public welfare by supporting research training, and demonstration projects relevant to the quality of man's environment. Its concerns include strengthening applied ecology, improving the training of resource administrators, preserving open space, assisting the elimination of pollution, and the promotion of a sound policy of resource use.

Through the Resources and Environment Program of the National Affairs Division, the Foundation assists in the search for the underlying causes of the present environmental crisis. The Foundation encourages a focus upon the causes rather than the symptoms of the neglect.

Ford Foundation
477 Madison Avenue
New York, New York 10022

4-H and Youth Development

4-H clubs operate in a number of rural areas in North Carolina.

4-H and Youth Development
Federal Extension Service
U. S. Department of Agriculture
Washington, D. C. 20250

Garden Club of America

Organization of local member clubs which promotes knowledge and appreciation of horticulture, landscape design, and natural resource conservation. Distributes packets on conservation practices to teachers and children.

Garden Club of America
598 Madison Avenue
New York, New York 10022

Girl Scouts of the USA

A membership organization for girls emphasizing outdoor education.

Girl Scouts of the USA
830 Third Avenue
New York, New York 10022

Izaak Walton League of America

Membership organization with local chapters and state divisions. Promotes conservation of natural resources, and development, protection and enjoyment of high quality outdoor recreation and natural beauty resources and public education in these concerns. Publishes a monthly magazine and co-sponsors books and other educational materials.

Izaak Walton League of America
1326 Waukegan Road
Glenview, Illinois 60025

Keep America Beautiful, Inc.

Keep America Beautiful, Inc. is the national public service organization for the prevention of litter and aims to preserve and improve America's scenic beauty through a continuing program of public education awareness to stimulate individual responsibility. It is supported by industry, business, labor and trade associations representing nearly every industrial category in the U. S. Keep America Beautiful attempts to provide literature guides and other information to education and the general public. Several teacher's guides with suggestions for litter prevention activities, and youth group projects are available at low cost upon request.

Keep America Beautiful, Inc.
99 Park Avenue
New York, New York 10016

National Geographic Society

The National Geographic Society is a non-profit scientific and educational organization for increasing and diffusing geographic knowledge and promoting research and exploration.

The Society publishes a variety of materials of interest to educators. In addition to its journal, National Geographic, the Society also publishes maps, books, and special publications. The School Service Section produces a National Geographic School Bulletin and various educational filmstrips. The Society periodically produces a television program related to environmental education.

National Geographic Society
1146 Sixteenth Street, N. W.
Washington, D. C. 20036

National Parks Association

Encourages public support for the protection of the national park system and of the natural environment generally. Publishes monthly National Parks Magazine, conservation leaflets for use in schools and studies on conservation issues.

National Parks Association
1300 New Hampshire Avenue, N. W.
Washington, D. C. 20036

National Recreation and Park Association

Dedicated to advancement of recreation and park activities and the conservation of natural and human resources. Publishes monthly parks and recreation magazine and newsletters on specialized subjects.

National Recreation and Park Association
1700 Pennsylvania Avenue, N. W.
Washington, D. C. 20006

Nature Museums

Nature museums are numerous in the state of North Carolina. The museums are designed to appeal especially to school age children and their parents and accordingly, they encourage local school interest in their activities. Each museum has a somewhat different program so the reader may wish to contact the nearest museum center and request additional information. Most of the state's museums

interpret exhibits based on ecology and relate the delicate balance of nature to the role man is playing in maintaining that balance.

The Winston-Salem Nature Science Center

The Nature Science Center provides numerous programs which have been well-received by local schools. Adults use the center for various nature-oriented club meetings. Volunteers give guided tours, teach classes and develop exhibits for the center.

The Winston-Salem Nature Science Center
Myron Vourax, Director
Reynolda Village
Winston-Salem, North Carolina 27106

The Schiele Museum of Natural History

School classes from kindergarten to college can make extensive use of the planned exhibits, illustrated nature talks, and planetarium programs. The Natural History and Planetarium programs are planned to closely correlate with the related subject matter currently presented in the public schools.

The Schiele Museum of Natural History
P. O. Box 953
1300 Kendrich Drive
Gastonia, North Carolina 28053

Charlotte Nature Museum

The museum is a supplemental education center for the students and teachers of the Charlotte-Mecklenburg School system, and for the surrounding areas. The museum has a spectacle of changing exhibits and programs on Natural History and the physical sciences. In addition, the museum has planetarium programs, health theater programs, lecture-demonstrations, and field trips.

The Charlotte Nature Museum
Freedom Park
1658 Sterling Road
Charlotte, North Carolina 28209

The Children's Museum Association, Inc.

The Children's Museum offers a regular series of classes on science and nature from the study of ancient fossils to modern space exploration. Field trips by school classes and other groups are encouraged. The museum operates a zoo for its live animal exhibits.

The Children's Museum Association, Inc.
433 Murray Avenue
P. O. Box 1624
Durham, North Carolina 27702

The Nature Science Center

The Center offers outdoor learning and enjoyment by stimulating an appreciation of the state's natural resources. Special programs with staff naturalists as instructors can be arranged by appointment for schools and youth groups from kindergarten to college.

The Nature Science Center
4301 Lawndale Drive
Greensboro, North Carolina 27408

North Carolina Museum of Natural History

(See North Carolina Department of Agriculture.)

The North Carolina Outward Bound School

Outward Bound is an educational concept originating in England over twenty-five years ago by Kurt Hahn. It is a program of outdoor education in the North Carolina mountains. The activities are intense and rigorous and include preparatory training, rock climbing, conditioning and initiative development, rescue and fire training, expeditions, solo experience, and value formation. The students include university and prep-school students, secondary school students, and young job holders. For further information about the school and its program, contact:

North Carolina Outward Bound School
P. O. Box 817
Morganton, North Carolina 28655

North Carolina Wildlife Federation, Inc.

The North Carolina Wildlife Federation is a statewide, non-profit, non-political organization interested in the present and future well-being of the state. It supports conservation, good farming practices, wildlife and forest management, and wholesome outdoor recreation. Its purpose is to coordinate the efforts of conservationists to correct the abuses to the soil, water, forests and wildlife and to serve as a spokesman for people in conservation issues. The Federation assists in many conservation education projects with interested youth and adult groups. One of its immediate objectives is to aid in the inclusion of conservation courses in public schools. The Federation works with schools, newspapers, radio, television and through its affiliated clubs to inform the public of the needs for the solution of the state's overall conservation and pollution problems.

The North Carolina Wildlife Federation, Inc.
P. O. Box 948
Rocky Mount, North Carolina

Resources for the Future

This organization conducts programs of research and education in the development of conservation and resource use.

Resources for the Future
1755 Massachusetts Avenue, N. W.
Washington, D. C. 20036

Sierra Club

Membership organization devoted to exploring, enjoying, and protecting natural scenic resources. Active in conservation administration, litigation, and legislation. Publishes books on wilderness and other scenic resources, guide books, and a monthly bulletin and other conservation educational materials.

Sierra Club
1050 Mills Tower
220 Bush Street
San Francisco, California 94104

Society of American Foresters

Membership of professional foresters to represent, advance and protect the interests and standards of the profession. Publishes a monthly magazine.

Society of American Foresters
1010 Sixteenth Street, N. W.
Washington, D. C. 20036

The Wilderness Society

Membership organization to increase knowledge and appreciation of wilderness and to see established policies and programs for its protection and use. Publishes a quarterly magazine, The Living Wilderness.

The Wilderness Society
729 Fifteenth Street, N. W.
Washington, D. C. 20005

THE FOLLOWING SPACE MAY BE USED FOR LISTING RESOURCES AVAILABLE FROM
ADDITIONAL AGENCIES:

FIELD TRIPS

Environment, by definition, means that which surrounds the individual. An effective environmental science program cannot be operated unless students, in some way, become engaged in the study of relationships existing in the real world. The field trips thus become a valuable teaching-learning experience for both teacher and pupil. A few suggestions often help in developing and carrying out an effective field trip.

1. Carefully define the purpose of the trip. Make certain everyone understands the major objectives of the trip.
2. Make a preliminary trip to the site to become personally acquainted with the necessary details to insure the trip's objectives can be met.
3. Plan ahead for such details as parental permission, transportation, scheduling, school permission, site guides, safety provisions, equipment, materials, money and any other necessity dictated by the trip.
4. The extent of the trip should be governed by the time allotted and the size of the group. Avoid attempting to do too much within a limited time period. Often it is desirable to sub-divide the group for greater effectiveness.
5. The trip experience should be followed up with appropriate experiences to evaluate the effectiveness of the trip.
6. Environmental education is related to many specific disciplines. Be sure to relate the field trip to other phases of the school's instructional program.

It is important to develop in young people attitudes, appreciations, and habits that will lead to sound thinking and positive action concerning our environment. With sufficient planning, proper site selection, and student-teacher cooperation, the environmental field trip will be an effective learning experience for both teacher and pupil.

It is unfortunate, but often true, that the obvious is the most overlooked and neglected experience. It is the responsibility of the teacher to insure that the obvious is not ignored. It is through an understanding of and interest in events close at hand that children will develop an interest in and attitude toward appreciating those events. The children can soon see for themselves the harm that often comes from neglect, carelessness and misuse.

Thus, a good place to start in selecting field locations is right in the school itself. The building material of the school (i.e. marble, granite, limestone, brick) offers an opportunity to discuss the physical conditions under which such material was created. The answer to why that material was selected and what economic and structural reasons dictated its use gives rise to other fields of inquiry.

The schoolyard offers another starting place. Its topography, location, plant life, pavement, etc. give numerous examples of man's reshuffling of a natural system. Even the selection of the particular site gives rise to questions concerning government, city planning, land costs, convenience, demography, etc.

From here, trips move farther afield, and a more diverse environment is encountered. Vacant lots, excavations, road cuts, and woods are all common sites near any school location. Never pass up the opportunity to exploit such

environmental resources in planning field trips. Often nearby woods and fields can provide the opportunity for class or school to develop nature trails and preservation areas. Not only can enjoyment and beauty be experienced, but also genuine experimentation and research in the ecosystem involved can be undertaken by interested teachers and students. From nearby locations, trips move farther and farther afield.

Following is a regional listing of some of the more important field trip sites of natural and man-made environmental locations in North Carolina:

COASTAL PLAIN

Cape Hatteras National Seashore

Covers 28,000 acres of land. This outer banks reserve will always provide an opportunity to study estuarine and marine life as well as plant succession, zonation due to tides, and any number of sand dune environments. Bodie Island Visitor's Center near Bodie Island Lighthouse, the Museum of the Sea, near Cape Hatteras Lighthouse and Visitor's Center at Silver Lake Marina in Ocracoke, Pea Island National Wildlife Refuge are within the park and include 5,880 acres between Pamlico Sound and the Atlantic Ocean.

North Carolina State Parks

Cliffs of the Neuse

434 acres in Wayne County. Fishing, swimming, picnicking, hiking, nature study and museum. Route # 2, Seven Springs, North Carolina.

Fort Macon

390 acres in Currituck County. Historic fort, museum, bathing, hiking, and nature study. Atlantic Beach, North Carolina.

Hammocks Beach

890 acres in Onslow County. Reached by ferry (no vehicles) June 1 to Labor Day. Bathing, fishing, picnicking, hiking, and nature study.

Jones Lake

1,893 acres in Bladen County. Picnicking, swimming, boating, camping, hiking and nature study. Route # 2, Elizabethtown, North Carolina.

Pettigrew

Comprises 17,368 acres (including Lake Phillips) in Washington and Tyrell Counties. Boating, fishing, hiking, historic structures and nature study are available. Route # 1, Creswell, North Carolina.

Singletary Lake

1,221 acres in Bladen County. Boating, fishing, hiking and an organized camp are available. Elizabethtown, North Carolina.

Weymouth Woods

Sandhills Nature Preserve. 403 acres (all undeveloped). Southern Pines, North Carolina.

Cartaret County Marine Science Project

ESEA III. This project offers a program of curriculum development, including teaching units and field trip guides for grades 4-10. The Center, at Beaufort, serves as an interpretive center, demonstration area, field trip nucleus, laboratory, reference library and information center.

International Nickle Company

Wrightsville Beach, North Carolina.

Marine Museum

Title III program with Field Areas. Morehead City, North Carolina.

Phosphate Mines

Aurora, North Carolina.

Robeson County Educational Resource Center

A small, newly organized Resource Center housing a planetarium, library, audio-visual center, and instructional materials display area. Lumberton, North Carolina 28358.

Saline Water Research Station

The Office of Saline Water Conversion of the Department of the Interior operates this facility at Wrightsville Beach. It is primarily used in pilot project testing of larger facilities. An excellent place to observe what may be one source of the nation's drinking water in the future.

National Forests in North Carolina

Croatan National Forest

Between the Neuse and White Oaks Rivers south of New Bern, this Forest contains 152,351 acres extending south along the New Port River. Recreation points at Cedar Point at Swannsboro and Neuse River Recreation Area at Croatan are available.

State Forests

Bladen Lake State Forest

36,000 acres near Elizabethtown in Bladen County are owned and operated by the State of North Carolina. Jones and Singletary Lakes are within the Forest. An excellent example of science forest management, this Forest shows examples of cutting, reforestation and utilization.

Lakes and Rivers

Roanoke Rapids Lake] on the Roanoke River in Warren, Halifax and Northampton Counties
Lake Gaston	

White Lake	Bladen County
Lake Waccamaw	Columbus County
Lake Phelps	Washington County
Mattamuskeet Lake	Hyde County

Intracoastal Waterway

There are 265 miles of U. S. Intracoastal Waterway between Virginia and South Carolina with towns along the Waterway rich in historical interest. The Waterway is of historical importance to the development of North Carolina.

PIEDMONT

North Carolina State ParksHanging Rock

4,030 acres in Stokes County. Picnicking, bathing, hiking and nature study available. Danbury, North Carolina.

Morrow Mountain

4,135 acres in Stanley County. Picnicking, swimming, camping, hiking, nature study and a museum. Route # 2, Albemarle, North Carolina.

Pilot Mountain

2,145 acres in Surry County. Picnicking, hiking, and nature study. Route # 1, Pinnacle, North Carolina 27043.

William B. Umstead

5,323 acres in Wake County. Picnicking, camping, organized camps, boating and nature study. Route # 8, Raleigh, North Carolina.

Lakes and Rivers

Lake Norman	Catawba, Iredell Counties
High Rock Lake	Davidson, Rowan Counties
Lake Tillery	Stanley, Montgomery Counties
Badin Lake	
Lake Rhodhiss	Burke County
Lake Hickory	Alexander, Catawba Counties

Cabarrus County Space and Earth Science Center

An ESEA Title III Project which supplements the science instruction in Cabarrus County. The Center has two earth science supplementary labs and a planetarium. The Center organizes field work at nearby ponds and streams in the area. Write:

Director, Cabarrus Co. Space and Earth Science Center
Box 338
Concord, North Carolina 28025

Morehead Planetarium

Public programs, graded school programs, exhibits, planet room.
Chapel Hill, North Carolina.

N. C. State Museum of Natural History

P. O. Box 2281, Raleigh, North Carolina 27602.

Rockingham County Diversified Outdoor Education Center

This is a Title III, ESEA Project which supplements the instructional program of the Rockingham County area schools by providing a summer camp and other outdoor educational activities. The project takes a field approach to environmental education. Wentworth, North Carolina 27375.

Salisbury City Supplementary Education Center

This ESEA Title III Supplementary Education Center provides the area schools with education specialists in space science and natural science. The program includes nature study through the field tour approach. Write:

Director, Salisbury City Supplementary Education
Center
314 N. Ellis Street
Salisbury, North Carolina 28144

MOUNTAINS

National Parks In North CarolinaGreat Smokey Mountains National Park

512,673 acres total with approximately one-half in North Carolina. It includes Clingman's Dome, 6,642 feet; second highest point in North Carolina. The Park contains 1,300 flowering plant varieties, 52 species of fur-bearing animals and 130 species of trees. Guided nature tours are available from spring to October. Provides camping, nature trails, hiking, fishing and other recreational activities. The Pioneer Museum and Farmstead at Oconaluftee Ranger Station on U. S. Highway 441 is open year round.

Blue Ridge Parkway

A mountain-top drive with average elevation over 3,000 feet. 245 miles of Parkway between Virginia and the Great Smokies. Interesting sites along the Parkway include:

- Cumberland Knob; 2,855 feet; includes 1,000 acres with picnicking, foot trails; galax, laurel and other mountain flora.
- Doughton Park; 3,508 feet; 6,000 acres with picnicking, camping, and 20 miles of trails with laurel, azalea, and rhododendron profusely growing among other flora.
- E. B. Jeffress Park; 3,550 feet; with comfort station and a nature trail following a mountain stream to a waterfall of several hundred feet.
- Moses H. Cone Memorial Park; 3,579 feet; 3,600 acre former private estate; has 25 miles of riding and carriage trails; and fishing lakes.
- Julian Price Memorial Park; 3,400 feet; 4,200 acres with picnicking, camping, trout fishing, and hiking.
- Linville Falls; 3,200 feet; 500 acres with picnicking; self-guiding nature trail with spectacular views of the waterfall and Linville Gorge, a wild area of Pisgah National Forest.
- Crabtree Meadows; 3,735 feet; 250 acres of hiking trails, picnicking and camping.
- Craggy Gardens; 5,892 feet; 700 acres with self-guiding trails; visitor's center; and abounds in the crimson (catawba) rhododendron.
- Mount Pisgah; 5,000 feet; 690 acres with picnicking and camping.
- Balsam Mountain; 5,340 feet; with limited recreational facilities.
- The Museum of North Carolina Minerals at Gillespie Gap near Spruce Pine exhibits most of the 300 kinds of minerals and gem stones found in North Carolina.

North Carolina State ParksMount Jefferson

540 acres in Ashe County with picnicking, hiking, and nature study. Jefferson, North Carolina.

Mount Mitchell

1,275 acres in Yancey County with picnicking, museum, hiking, camping, nature study, and observation tower. Route # 5, Burnsville, North Carolina.

National Forests in North CarolinaPisgah National Forest

479,232 acres encompassing 600 miles of trails, including 80 miles of the Appalachian Trail. Many other scenic locations offering camping, fishing, swimming, nature study and other recreational activities.

Nantahala National Forest

This 449,869 acre forest west of Asheville is located in waterfall country. There are 320 miles of hiking trails with 75 miles of the Appalachian Trail. Accommodations within the Forest have the usual recreational facilities.

Lakes and Rivers

The TVA operates Chatuge Lake near Hayesville and Fontana Lake, highest in the TVA system, at Fontana Village, and Hiwassee Lake, largest overflow dam of TVA near Murphy, for power and flood control. These lakes abound with fish and serve as recreational centers for visitors.

W. Kerr Scott Dam and Reservoir in Wilkes County, Lake James in Burke County, and Lake Lure in Rutherford County, offer recreational facilities and nature study areas as well.

Corundum Hill

Gem mines, minerals.

Corundum Hill Enterprises, Inc.
Franklin, North Carolina

Coweeta Hydrologic Laboratory

Coweeta Hydrologic Laboratory
P. O. Box 601
Franklin, North Carolina

Highlands Biological Station

Highlands, North Carolina.

Mica Mines

Spruce Pine, North Carolina.

THE FOLLOWING SPACE MAY BE USED FOR LISTING ADDITIONAL FIELD TRIP LOCATIONS:

APPENDIX

SUGGESTED PROCEDURES FOR ACQUISITION OF MATERIALS

Listed in this appendix are the names and addresses of the publishing companies and motion picture distributors included in the bibliographical entries of the Teacher's Guide for Environmental Education. It is hoped that such a listing will facilitate the acquisition of requested materials. Where appropriate, the company address responsible for purchase and distribution is listed rather than the central offices cited in the formal bibliographical entry. It should reduce much of the delay commonly encountered by classroom teachers and curriculum specialists in securing desired titles.

In addition, the authors have provided sample letters to facilitate some of the secretarial tasks encountered by the classroom teacher. It is recommended that, when possible, teachers or their teacher aides process requests for information. The use of school or system stationery will enhance the nature of the request.

Often, a simple postcard will be sufficient to request material. Such cards can be printed in advance with the appropriate spaces left blank. It becomes easy for clerical aides or students to fill in particular information and secure the material for your program.

Ridgemont Junior High School

RIDGEMONT, NORTH CAROLINA
27601

Creative Educational Materials
1 Creative Plaza
Creative, North Carolina 27802

Gentlemen:

Please forward to me as soon as possible a copy of your free publication, "Catalog of Creative Educational Materials" listed in the 1970 edition of Teacher's Guide for Environmental Education.

I am currently involved in developing an environmental education program at Ridgemont Junior High School and I feel your material would add to the total program.

Thank you.

Sincerely,



Eliot Henderson
Director, Environmental Education

SAMPLE LETTER

Gentlemen:

Please forward to me as soon as possible a copy of your free brochure, Understanding the Ecosystem, for use in my environmental education program.

Thank you.

Sincerely,



Herbert Henderson
Environmental Science Teacher
Ridgemont Junior High School
Ridgemont, N. C. 27601

SAMPLE POSTCARD

PUBLISHERS' ADDRESSES

Abingdon Press
Nashville
Tennessee 37202

Academic Press
111 Fifth Avenue
New York, New York 10003

Addison-Wesley Publishing Co., Inc.
Reading, Massachusetts 01867

Air Pollution Control Association
4400 Fifth Avenue
Pittsburgh 13, Pennsylvania

Allyn & Bacon, Inc.
Rockleigh, New Jersey 07647

American Association for the
Advancement of Science
1515 Massachusetts Avenue, N. W.
Washington, D. C. 20005

American Association of School
Administrators
National Education Association of
the United States
Publication Sales Section
1201 Sixteenth Street, N. W.
Washington, D. C. 20036

American Chemical Society
1155 Sixteenth Street, N. W.
Washington, D. C. 20036

American Education Publication
Xerox Education Division
55 High Street
Middletown, Connecticut 06457

American Library Association
Order Department
50 East Huron Street
Chicago, Illinois 60611

Anchor Enterprises
P. O. Box 27893
Los Angeles, California 90027

Arizona Press
Tucson, Arizona

Association Press
291 Broadway
New York, New York 10007

Atheneum Publishers
122 East 42nd Street
New York, New York 10017

Ballantine Books, Inc.
101 Fifth Avenue
New York, New York 10003

Bantam Books, Inc.
271 Madison Avenue
New York, New York 10016

Basic Books, Inc.
404 Park Avenue South
New York, New York 10016

Benefic Press
10300 W. Roosevelt Road
Westchester, Illinois 60153

Boxwood Press
Box 7171
Pittsburgh, Pennsylvania 15213

Burgess Publishing Co.
426 South 6th Street
Minneapolis, Minnesota 55415

Children's Press, Inc.
1224 W. Van Buren Street
Chicago, Illinois 60607

Comstock Publishing Associates
Division of Cornell University Press
124 Roberts Place
Ithaca, New York 14850

Coward-McCann, Inc.
200 Madison Avenue
New York, New York 10016

Creative Educational Society
515 N. Front Street
Mankato, Minnesota 56001

Crest Publishing Co.
210 Fifth Avenue
New York, New York 10010

Crowell, Collier & MacMillan, Inc.
866 Third Avenue
New York, New York 10022

Crown Publishers, Inc.
419 Park Avenue South
New York, New York 10016

Dell Publishing Co.
750 Third Avenue
New York, New York 10017

The Devin-Adair Co.
23 East 26th Street
New York, New York 10010

Dial Press, Inc.
750 Third Avenue
New York, New York 10017

Dodd, Mead & Co.
79 Madison Avenue
New York, New York 10016

Doubleday and Co., Inc.
501 Franklin Avenue
Garden City, New York 11530

E. P. Dutton & Co., Inc.
201 Park Avenue South
New York, New York 10003

Fawcett World Library
Fawcett Publications, Inc.
Fawcett Place
Greenwich, Connecticut

J. G. Ferguson Publishing Co.
6 North Michigan Avenue
Chicago, Illinois 60606

Follett Publishing Co.
201 N. Wells Street
Chicago, Illinois 60606

W. H. Freeman & Co.
660 Market Street
San Francisco, California 94104

Funk & Wagnalls Co.
380 Madison Avenue
New York, New York 10017

Garrard Publishing Co.
1607 N. Market Street
Champaign, Illinois 61820

Golden Press, Inc.
Division of Western Publishing Co., Inc.
850 Third Avenue
New York, New York 10022

Stephen Greene Press
120 Main Street
Brattleboro, Vermont 05301

Grossett & Dunlap, Inc.
51 Madison Avenue
New York, New York 10010

Hafner Publishing Co., Inc.
31 East Tenth Street
New York, New York 10003

Harcourt, Brace & World, Inc.
757 Third Avenue
New York, New York 10017

Harper & Row Publishers, Inc.
49 East 33rd Street
New York, New York 10016

Hawthorn Books, Inc.
70 Fifth Avenue
New York, New York 10011

Holt, Rinehart & Winston, Inc.
383 Madison Avenue
New York, New York 10017

Houghton-Mifflin Co.
53 West 43rd Street
New York, New York 10036

Illinois University Press
Carbondale
Illinois

Indiana University Press
Tenth & Morton Streets
Bloomington, Indiana 47401

Interstate Printers & Publishers
19-27 N. Jackson Street
Danville, Illinois 61832

John Day Co.
62 West 45th Street
New York, New York 10036

Johns Hopkins Press
Baltimore
Maryland 21218

Alfred A. Knopf, Inc.
201 East 50th Street
New York, New York 10022

League of Women Voters of the
United States
1200 Seventeenth Street, N. W.
Washington, D. C. 20036

Little, Brown & Co.
34 Beacon Street
Boston, Massachusetts 02106

McGraw-Hill Book Co.
330 West 42nd Street
New York, New York 10036

David McKay Co., Inc.
750 Third Avenue
New York, New York 10017

The Macmillan Co.
866 Third Avenue
New York, New York 10022

Meredith Press
1716 Locust Street
Des Moines, Iowa 50303

Charles E. Merrill Publishing Co.
College Division
1300 Alum Creek Drive
Columbus, Ohio 43216

William Morrow & Co., Inc.
788 Bloomfield Avenue
Clifton, New Jersey 07012

NASCO Nature Study Aids
Red Wing, Minnesota

National Association of Counties
Research Foundation
1001 Connecticut Avenue, N. W.
Washington, D. C. 20036

National Audubon Society
Nature Centers Division
1130 Fifth Avenue
New York, New York 10028

National Wildlife Federation
1412 Sixteenth Street, N. W.
Washington, D. C. 20036

Natural History Press
Doubleday & Co.
501 Franklin Avenue
Garden City, New York 11530

New American Library, Inc.
1301 Avenue of the Americas
New York, New York 10019

W. W. Norton & Co., Inc.
55 Fifth Avenue
New York, New York 10003

Oxford University Press, Inc.
1600 Pollitt Drive
Fair Lawn, New Jersey 07410

Prentice-Hall, Inc.
Englewood Cliffs
New Jersey 07632

G. P. Putnam's Sons
200 Madison Avenue
New York, New York 10016

Pyramid Publications, Inc.
444 Madison Avenue
New York, New York 10022

Rand McNally & Co.
P. O. Box 7600
New York, New York 10022

Reinhold Publishing Co.
Van Nostrand-Reinhold Books
450 West 33rd Street
New York, New York 10001

Ronald Press Co.
79 Madison Avenue
New York, New York 10016

Rutgers University Press
New Brunswick, New Jersey 08903

W. B. Saunders Co.
West Washington Square
Philadelphia, Pennsylvania 19105

Scott Publications, Inc.
488 Madison Avenue
New York, New York 10022

Charles Scribner's Sons
Shipping and Service Center
Vreeland Avenue
Totowa, New Jersey 07512

L. W. Singer Co., Inc.
201 East 50th Street
New York, New York 10022

Spartan Books, Inc.
Division of Books, Inc.
432 Park Avenue South
New York, New York 10016

Springer-Verlag New York, Inc.
175 Fifth Avenue
New York, New York 10010

Sterling Publishing Co., Inc.
419 Park Avenue South
New York, New York 10016

Time, Inc.
Little, Brown & Co.
34 Beacon Street
Boston, Massachusetts 02106

U. S. Department of Agriculture
Graduate School
The Information Office
Fourteenth Street & Independence Ave., S.W.
Washington, D. C. 20250

University of Chicago Press
5750 Ellis Avenue
Chicago, Illinois 60637

University of Michigan Press
615 E. University
Ann Arbor, Michigan 48106

University of North Carolina Press
Box 510
Chapel Hill, North Carolina 27514

University of Wisconsin Press
Box 1379
Madison, Wisconsin 53701

Van Nostrand-Reinhold Books
450 West 33rd Street
New York, New York 10001

Viking Press, Inc.
625 Madison Avenue
New York, New York 10022

Wadsworth Publishing Co., Inc.
Belmont, California 94002

Franklin Watts, Inc.
575 Lexington Avenue
New York, New York 10022

Western Publishing Co.
Whitman Hobby Division
1220 Mound Avenue
Racine, Wisconsin 53404

John Wiley & Sons, Inc.
605 Third Avenue
New York, New York 10016

FILM SOURCES

- ACI Productions
16 West 46th Street
New York, New York 10036
- American Institute of Architects
1735 New York Avenue, N. W.
Washington, D. C. 20006
- American Institute of Biological Science
2000 P Street, N. W.
Washington, D. C. 20006
- American Petroleum Institute
Committee on Public Affairs
1271 Avenue of the Americas
New York, New York 10020
- American Telephone & Telegraph Co.
Information Department
195 Broadway
New York, New York 10007
- Astra Films, Inc.
19 Burton Avenue
Norwich, Connecticut
- Carousel Films, Inc.
1501 Broadway
New York, New York 10036
- Oil, Chemical & Atomic Workers
International Union
Citizenship Legislative Department
1126 Sixteenth Street, N. W.
Washington, D. C. 20036
- Conservation Foundation
1250 Connecticut Avenue, N. W.
Washington, D. C. 20036
- Contemporary Films
267 West 25th Street
New York, New York 10001
- Coronet Films
65 E. South Water Street
Chicago, Illinois 60601
- Curriculum Films, Inc.
1319 Vine Street
Philadelphia, Pennsylvania 19104
- Du Art Film Laboratories
245 West 55th Street
New York, New York 10019
- Eastman Chemical Products, Inc.
Kingsport, Tennessee 37662
- Encyclopedia Britannica Films
38 West 32nd Street
New York, New York 10001
- Environmental Control Administration
12720 Twinbrook Parkway
Rockville, Maryland 20852
Attention: Tom Edgar
- Extension Media Center
University of California
Berkeley, California 94720
- Film Associates
Division of Continuing Education
131 Coliseum
University Campus
Corvallis, California
- Film Associates of California
11014 Santa Maria Boulevard
Los Angeles, California 90046
- Stuart Finley Productions
3428 Mansfield Road
Falls Church, Virginia 22041
- Grey D. Haselton
7934 Santa Monica Boulevard
Los Angeles, California 90046
- Alfred Higgins Productions
9100 Sunset Boulevard
Los Angeles, California 90069

Imperial Film Company, Inc.
321 South Florida Avenue
Lakeland, Florida 33802

Indiana University Audio-Visual
Center
Field Service
Bloomington, Indiana 47401

Interlude Films
P. O. Box 651
La Crescenta, California 91014

International Film Bureau
332 South Michigan Avenue
Chicago, Illinois 60604

Jam Handy
2821 E. Grand Boulevard
Detroit, Michigan 48211

Journal Films
909 W. Diversey Parkway
Chicago, Illinois 60610

McGraw-Hill Text Films
330 West 42nd Street
New York, New York 10018

Martin Moyers Productions
900 Federal Avenue
Seattle, Washington 98102

Moody Institute of Science
1200 E. Washington Boulevard
Whittier, California 90606

National Academy of Science
2102 Constitution Avenue
Washington, D. C. 20037

National Fertilizer Association
1700 K Street, N. W.
Washington, D. C. 20006

National Film Board of Canada
680 Fifth Avenue
New York, New York 10019

National Fisheries Center &
Aquarium
Department of the Interior
C Street between 18th and 19th Streets
N. W.
Washington, D. C. 20240

New York State Conservation Department
Albany, New York

Northern Films
P. O. Box 98
Main Post Office Station
Seattle, Washington 98111

Pictura Films Corporation
29 East 10th Street
New York, New York 10003

Public Health Service
Audio-Visual Facility
Atlanta, Georgia 30333

Society for Visual Education
1345 Diversey Parkway
Chicago, Illinois 60614

Southern Bell Telephone & Telegraph Co.
195 Broadway
New York, New York 10007

Tennessee Valley Authority
Knowville, Tennessee 37902

Twentieth Century Fox Films
1417 N. Western
Los Angeles, California 90027

United States Department of Agriculture
Forest Service
South Building
12th Street & Independence Avenue, S. W.
Washington, D. C. 20250

United States Department of Agriculture
Motion Picture Service
Washington, D. C. 20025

United States Public Health Service
Welfare Building
5th Street & Independence Avenue, S. W.
Washington, D. C. 20201

United World Films, Inc.
221 Park Avenue South
New York, New York 10003

University of Miami
Box 8021
Coral Gables, Florida 33124

Walt Disney Productions
Educational Film Division
350 S. Buena Vista Avenue
Burbank, California 91503