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ABSTRACT

Included is comprehensive information on how to establish an Environmental Study Area (ESA) similar to those organized by the National Park System. Following the introductory sections on educational philosophy and objectives are suggestions relating to these aspects of an ESA project: how to select an ESA site; contacting the key people; educational feasibility study; presenting the ESA program to the local educational community; teacher education programs; and others. The book also includes suggestions for lessons and activities in the ESA relating to art, communications, mathematics, science, and social studies. The lessons follow the conceptual or "strand" approach to the environment with the format: Variety and Similarities; Patterns; Interaction and Interdependence; Continuity and Change; and Evolution and Adaptation. Appendices include examples of the strand development listed above and a glossary of ESA terms. This guidebook can be used by teachers having little or no ecological training. (PR)

National Environmental Study Area

n Guide

We had expected to have this guidebook ready, in absolutely letter perfect form, and in mint condition for saving our world.

Actually . . .

The content is undergoing a final professional scrutiny by the National Education Association (NEA), the result of which will be slight corrections in some of the lessons, plus expanded discourse with the teachers. The latter will include instructional suggestions and helpful interpretive hints — all aimed at making you more comfortable in your role of instruction guide.

So . . .

In the interests of "getting on with it" this summer, we have resorted to this preliminary production, at minimum cost, and still containing some confusing references, which will be smoothed out and taken care of professionally in the final editions — slated for fall printing.

Such as . . .

The Secretary of the Interior's introduction refers to NESAs — National Environmental Study Areas — while the book proper speaks only on ESAs — Environmental Study Areas.

A word of explanation . . .

The concept of environmental study areas remains the same as its explication in the body of this guidebook. The "National" designation has been added in order to give all such areas using these basic concepts and materials a national unity. The Office of Education, in the Department of Health, Education and Welfare, is now maintaining a catalog of NESAs — environmental study areas using these materials as part of an on-going program of environmental education within a certain area — whether school-connected or community-based.

The further designation of NEEL — National Environmental Education Landmarks — refers to a registry which will be kept by the National Park Service, Department of the Interior, composed of outstanding, exemplary environmental study areas, all of which will also qualify as NESAs. A NEEL will be to a NESA as a National Park is to a park.

There will be other changes of a similar nature between this interim edition and the revised printing which will be available this fall.

We felt, however . . .

The condition of our environment, the missions of the National Park Service and the Office of Education where the two overlap, and the almost-ready state of our program materials would make any delay unwise, even irresponsible.

So here it is . . .

As it is . . .

It will give you a good head start.

As the Federal agency with the widest land management responsibilities, the Department of the Interior has taken the lead in making available its lands and facilities for establishment of areas dedicated to the study and understanding of our environment.

Not only the National Park System, which gave birth to the National Environmental Study Area (NESA) idea, but all Interior-managed lands now are dedicated to ecological awareness and education, wherever opportunity and citizen interest coincide. We hope and anticipate that the program eventually will spread far beyond Interior, taking on the complexion of the cultural and natural environment in which it takes hold.

The NESA program is an exciting endeavor, combining the Department's individual-oriented environmental materials with the resources of local educational communities.

This blend of efforts in interpreting the values and relationships between man and his cultural and natural worlds has worked splendidly within the National Park System. Now we are sharing it. We think it will stand on its own, wherever there is a piece of land, a teacher, and a child.

We fully expect that by offering this program to others, we will see the NESA concept take on added value and new dimensions.

Follow the environmental strands, and the sense of wonder shortly grows into a feeling of "belonging" — of being at home in the world, whatever part that may be.

As a teacher or resource person, the world you open up through these pages will be as big and meaningful and beckoning as your own daring, imagination and enthusiasm lets it be.

Students will find the NESA to be a jumping off point, not a destination.

Students and teachers together will discover a beautifully complicated, much more wonderful world.

Walter J. Hickel
Secretary of the Interior

OF MEN AND DRUMS

We are desperately in need today of help in relating ourselves to a world that seems increasingly shoddy – even downright dangerous to human life.

If man is a natural creature, why do we need this help? Possibly because we have lost track of our natural beginnings. Modern man is more a creature of his own civilization than of the natural biotic environment that, quite literally, grew him. We shaped a civilization and then, in turn, the culture of our own creation began to shape us. Most of our environmental woes today spring from "loss of touch" with the natural balances that still govern us, whether we realize it or not. Even man, with all his technology, cannot unbalance nature. If we put too heavy an entry into the pollution column, nature simply subtracts from the columns labeled "beauty" and "comfort" and eventually even "safety." The adjusted balance results in an unpleasant squeeze for most life forms that we humans consider desirable.

Our lives are inextricably interwoven into the thin blanket of life that covers our tiny planet. Let one thread rot or ravel, and the whole fabric is in danger of falling into disrepair or complete disintegration. Should such a tragedy occur, nature would eventually reach new balances. They might be of such a nature that man would no longer be a factor.

The National Park Service has established a network of Environmental Study Areas (ESAs) where the superb natural and cultural values of the National Park System are interpreted through on-going environmental education programs in nearby schools and for interested individuals or groups. ESAs are for exploring, for discovering, for awareness and for growth. In them, people can examine the natural pulses and rhythms of the Earth and its delicate, quivering balances. They can examine too the "different drummer" to which their own civilization marches.

Man is cunning, acquisitive, comfort-seeking, and infinitely inventive. If he can be jarred out of his preoccupation with his own uniquely human desires and his terrifying abilities to fulfill them, he may yet create a harmonious counterpoint of human and natural drums.

George B. Hartzog, Jr., Director
NATIONAL PARK SERVICE

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TO THE TEACHER:

Relevancy in education? What could be more relevant and practical than to use your surroundings as your classroom? Such an approach need not involve another bout with wildlife charts and the naming of trees and rocks, although to some, that's all environmental education amounts to. But relevant environmental education is more—it includes all the people, all the things, and all the places that surround you. The entire universe, in other words, is the textbook, and what you read in it is going to relate to everything that happens in the classroom.

The question is, how do you get environmental? How and when can you begin to read this "universal textbook"? The ESA book addresses itself to these questions and clarifies the use of Environmental Study Areas. It explains how you can use the environment to teach your students with the skill of a naturalist. There is no great secret which makes only those trained in ecology masters of the outdoor educational arena. The same subjects you have been teaching in your classroom—mathematics, language skills, social studies, science, and the arts—are illustrated in real life and living color just outside the door. These are the contents of your universal textbook.

Such an outdoor safari can be a learning experience for you as well as for your students. Much will be discovered by using unifying, conceptual approaches coupled with problem-solving, open-ended challenges. All the equipment you need is you, your students, and some of the ideas from this book.

ESA: A Definition

National Park lands are incredibly rich educational resources ideal for interpreting the environment through school program Areas that best exemplify both biological and physical relationships can be identified as Environmental Study Areas. These areas may include natural, historical, cultural, or technological features which can supplement school studies for the purpos of understanding man's relationships to his total environment.

An ESA program: should introduce the student to his cultural and natural environment, past and present, and help him realize that he is a part of it;

will promote an understanding of how man is using and misusing his resources;

will equip the student to be a responsible member of the world which he is shaping and which is shaping him.

ESA Objectives

What is most important, an ESA should provide an opportunity for a student to work with environmental-solution strategie

An Environmental Study Area can be an historic tour, can be a nature walk, can be a social studies lesson . . . but the most rewarding ESA experience is something of each of these, which places the individual and his own culture into an environme perspective. The ESA focus on environmental awareness should synthesize fragments into an environmental whole.

THE GOAL OF THE NATIONAL PARK SERVICE ENVIRONMENTAL STUDY AREA PROGRAM IS TO CREATE AN ENVIRONMENTAL AWARENESS THAT WILL LEAD THE INDIVIDUAL TO A PERSONAL SENSE OF INVOLVEMENT AND TO THE SHAPING OF AN ETHIC TO GUIDE HIS ENVIRONMENTAL BEHAVIOR.

BACKGROUND

Day trips to parks and nature areas, industrial and historic sites, have long been recognized by educators as an important part of the school experience. The National Park Service seeks to expand that school experience by offering Environmental Study Areas on Service-administered properties for use by student groups. These areas will provide study opportunities for organized educational programs.

Environmental Study Areas (ESAs) are intended to support conservation education, which is a study of the wise use of our natural resources, and to supplement outdoor education, which uses the outdoors as a classroom for teaching about nature. ESAs are to be used to teach students about man's relationships with nature. Over and above this, however, the ESA programs should teach students about man's historic relationships with nature: his interaction and interdependence with his surroundings examined through all disciplines in the school programs. The concepts in the ESA program will carry over and give the student new ways to perceive, appreciate, and evaluate his *own* environment, whatever it may be, however it may change.

A network of ESAs has been set up in National Park areas throughout the country. Park personnel create the sites, help to initiate programs among local schools for their use, and provide guidance to the teachers in the form of orientations and seminars. But it is the teachers themselves who conduct the tours and on-site classes, using ESA lessons that the Park Service can furnish, or by adapting their own lessons to the ESA.

The ESAs will serve as testing grounds to establish standards, guidelines, and models to stimulate the establishment of similar environmental study areas on non-NPS lands. It is hoped that this new educational direction will also stimulate school curriculum changes toward using relevant environmental education.

This publication was designed by Dr. Mario M. Menesini, Director of Educational Consulting Service and revised by ECS writers to meet the specifications of National Park Service Advisory groups.

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WHAT IS ENVIRONMENTAL EDUCATION?

In order to best answer this question, we should first consider how environmental education relates to conservation instruction and outdoor programs in general. Conservation education is described as instruction in the wise use of natural resources and has utilized symbols and slogans appealing to a great variety of interest levels. Smokey the Bear, for example, has crusaded for caution and care in the use of our forests, and Johnny Horizon is the symbol utilized in anti-litter campaigns. Both outdoor education and conservation education have been associated with particular interests and subject-matter areas. For example, those who are most interested in providing more beautiful waterscapes and a purer quality of air have supported certain facets of conservation education. Science and physical education are the school subjects generally used in such programs. Environmental education, however, may include all of the above as significant and relevant to the relationships of our citizens with their immediate surroundings.

Subject-matter headings such as mathematics, literature, biology, or geography, categorize man-made, logical studies by which the universe is examined. The total school curricula including every subject taught at a given grade level is, indeed, a way for students to explain and measure their surroundings. No one subject-matter area will do a complete job of describing the environment. Therefore, environmental education is a total look at where you live, how you live, and finally, why you live. Environmental education is interdisciplinary, a synthesis of all educational understandings and skills, for the ultimate purpose of environmental education is to provide the most vital awareness possible about our living and non-living surroundings.

Because man is the dominant organism on the earth (not numerically, though he is approaching this type of dominance, too) and can, through his technological manipulations of the environment, control much of its effect and affect, man is the central figure in environmental education. Whether he is cloistered in a subterranean bunker of experimental laboratories in the South Pole, comfortably nested in a penthouse in the midst of an urban setting, or thousands of miles out in space, the environment is a crucial and significant factor in determining the quality of life.

The major objectives of environmental education are to help individuals acquire:

1. a clear understanding that man is an inseparable part of a system consisting of man, culture, and the bio-physical* environment, and that man has the ability to alter the interrelationships of this system;
2. a broad understanding of the bio-physical environment, both natural and man-made;
3. a fundamental understanding of the bio-physical environmental problems confronting man, how these problems can be solved, and the need for individual citizens and government agencies to work toward their solution;
4. attitudes of concern for the quality of the bio-physical environment which will motivate citizens to participate in bio-physical environmental problem solving.

* bio-physical is defined as the living (BIO) and non-living (PHYSICAL) world.

THE CLASSIFICATION OF ENVIRONMENTAL STUDY AREA SITES

Introduction

The kind of educational experiences possible at Environmental Study Areas will depend ultimately on the characteristics of the site. The classification system is designed to identify ESAs so that educational programs can be developed to fit the site characteristics.

The classification system should never be confused with a hierarchy of value, and therefore even such minor points as assigning sequential, numerical or letter designations (1 2 3...or A B C...) should be avoided. The classification scheme is provided only for the purpose of developing logical and realistic ideas about the educational possibilities of ESA sites. The purpose and use of the system should be clearly understood by ESA developers, educational program designers, and the people using the sites.

A classification system of ESAs can be developed according to the educational opportunities or use of the site, the people who would be using the site, the ecological specializations, or the location's geography paired with its environmental character. Consider, for example, what would be involved if the Statue of Liberty were used as an ESA. Its magnificent harbor location highlights the many educationally valuable aspects of the spot. From the Statue, a splendid panorama gives one a bird's eye view of the total urban environment and the many complex interrelations of its technical and natural elements. The harbor, with its network of warehouse facilities, illustrates the commercial use of a geographical asset. In the distance, the famous New York skyline shows man's high-rise use of a limited land area.

Geographic classifications are best used for ESA sites because they are readily identifiable, generally understood, and easily paired with unique learning activities. The classification system will utilize a 'short cut' terminology and be known as The Geo-Environmental Site Classification System.

The Geo-Environmental Site Classification System

Geography can be used to classify areas in the following way:

Urban Areas (U)
- Parks and Open Space (P)
- Public Buildings and Grounds (B)
  (of historic or other specific interest)
- Waterfronts (W)
- Industrial Complex (I)

Metropolitan Areas (M)
- Parks and Open Space (P)
- Public Buildings and Grounds (B)

Rural Areas (R)
- Farms and Ranches (F)
- Water and Waterways (W)
- Industrial (I)

Natural Areas (N)
- (National Parks, Forests, and Wilderness)

Educational classification of the areas will be defined more specifically as ESA programs are developed. Classification requirements of each area will be evident as returns from educational survey instruments are studied and applied to ESAs. Classification will indicate educational use. (For example, historic and archeological sites can be identified for presently designated ESAs.) Following are classifications using some random samples:

Independence Square, Philadelphia, Pennsylvania
Urban, Public Buildings and Grounds, Historic (UBH)

City Dump, Washington, D.C.
Urban, Industrial, Dumping (UID)

Regional Parks, Bay Area, California
Metropolitan, Parks and Open Space, Multiple (MPM)

The educational use designation following the first two "Geo-Environmental" characteristics will serve to indicate lessons or sites for which lessons should be prepared. A numerical designation after the letter classifications can indicate grade level of the lesson. So, UBH5 would identify a lesson for an Urban Building Site, using history as subject matter, and for use by 5th grade students.

HOW TO SURVEY AND SELECT THE ESA SITE

Before entering into conversations with local school people, the National Park Service staff should examine their facilities for possible use as study areas. The most obvious considerations are accessibility for children and other pragmatic considerations such as drinking fountains, restrooms, and parking areas. The site should have some elements which could illustrate effects of human activity. The accommodations for usage by students should also take into consideration the effect that repeated numbers of school children will have on the site. The Park Service staff can look into various aspects of school subject-matter relationships to the site, but should not consider themselves educational specialists in their initial consideration of the ESA site.

Whoever examines the area will see certain obvious educational possibilities in some aspects of the site.

> There may be, for example, an outstanding mathematical problem that could be associated with an important statistic about the total facility, or perhaps just involve a population survey of the area.
>
> On the other hand, there may be a story associated with the site that would relate students to some study of sociology, history, or geography.
>
> Advanced high school students might be interested in the application of their skills derived from chemistry, physics, or biology.
>
> One consideration is probably inherent in every ESA selection, that is, a particular esthetic view or impact area which could lead to a sensitive or artistic relationship to the site.
>
> The area might be specifically helpful for motivating students to consider different forms of literature, or a writing activity of some kind.

Whatever the National Park Service staff member considers as educationally pertinent should be set down in a general manner as one of the characteristics likely to attract teachers and students to that particular area. In essence, the National Park Service is providing school instructional people the opportunity of using an educationally relevant area. The preliminary survey described above will serve as a basis for discussion with the educators who are called in for their assistance in further defining the area as to its educational possibilities. The decisions on how to relate subject-matter areas to the site will most likely be determined later by educational specialists and the teachers using the site.

It is of utmost importance to predetermine both to what extent NPS staff can be involved in instructional activities and the amount of latitude the NPS staff members at the facility wish to give the educational community. It would be impossible for the National Park Service personnel to provide all of the instructional materials and all of the instructional tasks which would be related to the ESA program. The NPS staff should therefore consider themselves consultant advisors and providers of a site, rather than teachers who would engage in a day-to-day relationship with students.

An outline of how to present the ESA program to the local educational community follows. However, before establishing a presentation for the ESA program, the NPS staff should meet with some local educators and review their findings and expectations for the site.

CONTACTING KEY PEOPLE

Once the ESA has been selected and evaluated with the assistance of educator consultants, the next step is to develop broad school and community contacts. The following suggestions will assist you in identifying what schools and groups will use the site:

—the Curriculum Coordinator (or Assistant Superintendent in charge of curriculum)

A man in this position can usually make decisions or is close to the administrative decision-making authority.

—Curriculum Consultants
and/or
—Supervisor of Primary or Secondary Instruction (sometimes listed under coordinators of various subject-matter areas)

School personnel in this role (sometimes called directors or coordinators) are usually subject-matter specialists. Perhaps more than any other group, they can help you to develop educationally significant experiences for students, or assist teachers in preparing lessons for students. You may have a coordinator of outdoor education in one of the school districts whom you intend to invite as an ESA participant. Next in order of highest interest may be the science or social-studies coordinators.

—prominent, interested teachers in specific fields

There are many dedicated classroom teachers who are anxious to be involved in projects such as your ESA development. More often than not, administrators will assign a qualified instructor to assist in the developmental aspects of ESA planning. It is of the utmost importance that teachers using the ESA be involved in planning.

—local professors of education, who are known to be interested in environmental education

Many education professors will offer their assistance. They may serve as planning consultants and may often find the activity important to their academic involvements. Some professors might assign graduate students to the ESA project as a part of their training. Environmental-education or conservation-education programs have been getting more attention recently as a significant area for attention in teacher training.

—specialists in various higher-educational institutions
and/or
—lecturers in ecology or conservation from various organizations

Professors conducting research programs related to the environment can play a prominent role in helping to formulate activities for ESA programs. Ecology researchers, for example, may offer up-to-date findings or unique ideas which might otherwise be overlooked. The planners should not overlook the value of having a prestigious academic individual as a member of the planning ESA task groups.

—local officials in other federal or state agencies

Many federal and state agencies have been in the business of conservation education for many years. Though there has been a rivalry between certain agencies in certain aspects of operation, there should be little trouble in finding a cooperative attitude in a project as worthy as the ESAs. Materials, pamphlets, guides, and audio-visual aids are readily available from such sources as the Fish & Game Agencies, Water Resource Departments, Forestry, Agriculture, and many other national, state, and local agencies.

—local welfare staffs concerned with the development of programs for disadvantaged populations

Federal programs for the poor and ethnic minorities have proliferated in recent years so that a comprehensive list would be rather unwieldly. Some examples are O.E.O. programs, Head-Start, and educational-research centers. School officials are most likely to have knowledge of such groups and can assist you in contacting them. A great plus factor can be achieved by involving minority groups in the plans for an ESA program. There is probably more need for environmental education in the minority groups and probably no greater satisfaction than providing ESA experiences for disadvantaged youth.

EDUCATIONAL FEASIBILITY STUDY

One of your contacts, or a committee of such interested individuals, can help you identify more specifically the educational potentials of your area. Conducting a survey of the site after you have made a preliminary evaluation with specialists from subject-matter areas, or curriculum consultants, will provide the necessary educational input to guarantee a valuable working relationship with the academic community.

Before formally presenting the ESA program to educators, investigate what kinds of programs, if any, are already being conducted in the area. School personnel who have interest in an operating outdoor program must be approached with understanding. Many school districts are presently involved in successful programs. An interpreter advising the use of a new or alternate program should represent an ESA program as a supplement to on-going school-district programs.

If the above applies, at the time of the presentation the following thoughts might be offered:

- *ESAs are designed to supplement your established curriculum.*
- *They are geared to your needs, your programs, your teachers.*
- *The ESA program will enrich your students' understanding of their environment.*

A fact sheet, packet, or guide on the ESA program and area will be useful at all stages of development, particularly at the stage outlined above. Such a guide can be organized by collecting information from a variety of sources. (See Appendix, "Proposed Outline of Basic ESA Information Packet.")

PRESENTING THE ESA PROGRAM TO THE LOCAL EDUCATIONAL COMMUNITY

A complete and concise presentation is essential. Your research, compilation of facts, and organization are important to the success of the presentation. The environmental education conferences can be co-sponsored by local conservation organizations or involved school personnel. It is suggested that you limit these conferences to educators and conservation leaders.

Among the important subjects to be included in your presentation are:

An overview of the ESA program including objectives and values:

1. *Environmental Study Areas are designed to provide an opportunity for dissemination of current understandings about man and his environment.*
2. *The Environmental Study Areas provide a great variety of approaches to the environment.*
3. *ESA materials are provided which, by their nature, encourage awareness of environmental relationships.* *
4. *The ESA program is designed to encourage intellectual stimulation.*
5. *Environmental Study Areas serve as demonstration and information centers. Each center provides information for other areas that may wish to establish similar educational resources.*

Additional subjects which can be covered in the presentation:

- *the human history of the study area*
- *the natural history of the study area*
- *the National Park Service's interest in environmental education*
- *the use of the study area in elementary- and secondary-school curricula*
- *the use of the study area for the total community*
- *a slide presentation of the area's facilities.*

Allow ample time for questions, discussions, and informal participation.

The presentations should be coordinated with a public-relations campaign. The underlying theme of this campaign is that NPS is prepared to contribute an Environmental Study Area for the use and educational benefit of the community.

* *The materials will include a pre-site, on-site, and post-site environmental lesson. In addition to the presentation of broad concepts and particular disciplines, these lessons will include suggestions for sensitivity retreats and individualized activities.*

ON-SITE ORIENTATION

After the initial presentation, an on-site orientation at the Environmental Study Area is conducted. This will give you the opportunity of introducing the site to the teacher and together exploring its educational possibilities. This orientation will afford you an important opportunity to gain educators' opinions to support or expand upon your evaluation of the site. Their firsthand observations will be invaluable in deciding how to use the resources to the best possible advantage.

The on-site orientation also gives you the opportunity of introducing the coordinators or teachers to the logistics of the program and the utilitarian aspects of the site check list.

1. Survey the site with the district coordinators and/or teacher(s).
2. Discuss with the educators how the discipline(s) may be implemented on site.
3. Provide your insights into additional educational opportunities of the site.
4. Schedule visits for student groups to the ESA.
    a. Arrange date, follow-up notification, meal plans (if necessary), and site reservations.
    b. Select/order materials for pre-site, on-site, and post-site use.
    c. Suggest available audio or visual aids for class use.

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TEACHER EDUCATION PROGRAM

BRINGING THE TEACHER INTO THE ENVIRONMENTAL PICTURE is not always a job for the specialist in teacher in-service education. The Park Facility staff member, interested in helping teachers to better understand what is available, is as logical a person as anyone to conduct such a workshop. Of course it all depends on the purpose of the in-service program – how you wish to relate this program to your ESA.

It is always best to discuss the teacher training with local school educators and, if available, with some of the college teacher who have had experience in setting up teacher workshops. You may find that a teacher in a local school has had environmer training and can serve as a consultant or participant in organizing and implementing your teacher training program.

There are several considerations to be aware of in setting up the workshop:

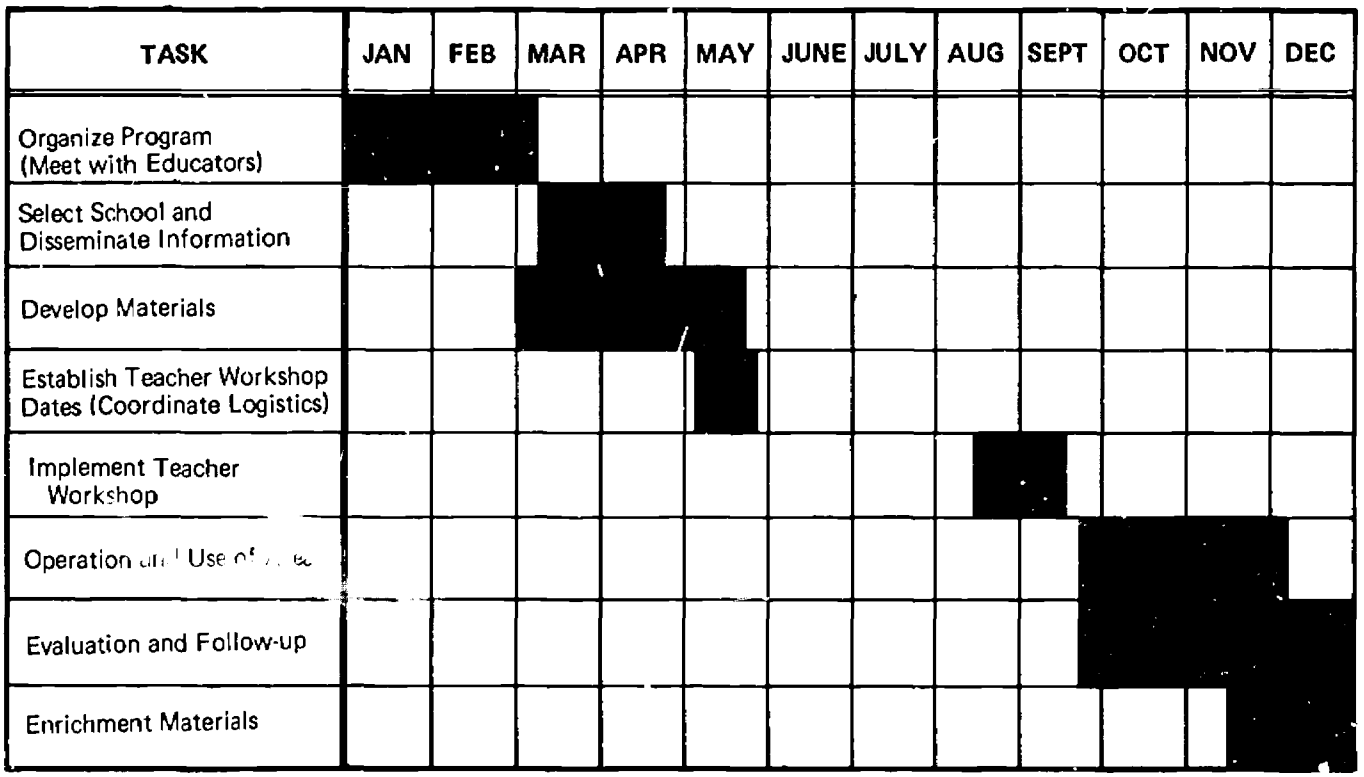
1. What does the in-service education program wish to accomplish?
2. Who should be involved with the teaching of the program?
3. What is the background of participating teachers?
   a. their past training in ecology
   b. past experiences with the environment
   c. the grade levels they teach
   d. how many teachers will be involved
4. Where is the program to be held (school or on site)?
5. When should the program be held relative to the on-site experiences?

A common fault experienced in natural history in-service programs is the heavy emphasis on facts and the overuse of flora ar fauna nomenclature. Taxonomy has its place, and stories of high-motivational interest about the life histories of certain popu lations are certainly worth attention. However, the most successful presentation would concentrate on the overall ecology o site rather than the specifics of detailed information. Remember at all times that you are not going to–nor do you wish to– trained ecologists out of teachers who are able to spend only a limited amount of time with your program. You can not tell teachers **ALL** that you would consider interesting and important about your site. Careful selection is essential and should be guided by the following considerations:

1. How will the information apply to the teachers' classroom situation?
2. Can what is presented support a conceptual understanding of the environment (i.e., use of the STRANDS)?
3. Can on-site information be related to the students' own home environment as well as the ESA?
4. What choice of subject matter will best show the constructive and destructive relationships of man to the environment?
5. Is there something from the site that will make the environmental in-service workshop a motivating as well as an instructional experience?

ESTABLISHING A LOCAL ESA PROGRAM

TIME SCHEDULE



STEPS FOR SETTING UP AN ENVIRONMENTAL STUDY AREA

Check list for Interpreter

1. Assign NPS staff responsible for ESA development.
2. Survey facility to find prospective ESA areas. Determine conditions and limitations for use of the site for educational purposes.
3. Contact the possible users of the site (administrative personnel) and explain your interest in providing a site for environmental studies and solicit aid in developing ESA program.
4. Schedule conference for representatives of interested school districts and community representatives for explanation of ESA program. (The STRANDS APPROACH should be explained at this time.)
5. Form ESA advisory committee (educators and other consultants) who can help select the most educationally suitable site from those sites which you consider feasible for school use.
6. Act as consultant to the advisory committee for the preparation of ESA lessons using the pre-site, on-site, and post-site format.
7. Using advisory committee input, prepare a guidebook for the area based on the conceptual approach.
8. Secure from school-district administration the name of one school-district staff member through whom all arrangements and school contacts will be made.
9. Meet the assigned ESA school contact (school-district coordinator) to explain the development and use of the ESA site and lessons.
10. Through the coordinator select several pilot-test classes to try out the ESA lessons.
11. Evaluate the results and correct the ESA program accordingly as follows:
    Are the logistical plans satisfactory?
    Were conditions for use adhered to by users?
    Was the guidebook adequate?
    How did the students respond to the experience?
    What did teachers think about the experience?
    Was it necessary to involve NPS staff beyond expectations?

STEPS FOR SETTING UP AN ENVIRONMENTAL STUDY AREA

Check list for Coordinator of ESA Program

1. Contact is made by NPS with schools.
2. Designate school personnel as members of ESA advisory committee and coordinators of ESA activities.
3. Attend NPS conference to explain ESA to school personnel.
4. Meet with participating teachers to explain ESA program.
5. Disseminate ESA lesson materials prepared by ESA advisory committee.

Check list for Teacher of ESA Materials

1. Pre-site instruction to students (new lessons may be developed to fit current educational program).
2. Conduct on-site instruction geared to informational guide prepared by NPS.
3. Conduct post-site lessons and return evaluative data to NPS staff.

HOW THE SITE RELATES TO ESA LESSONS

The ESA lessons are student-centered and are oriented to high motivational learning. Briefly, the student is expected to *observe accurately* present site conditions, reconstruct in his mind how the site might have looked before man, and how various civilizations have affected the site. In the lower grades, the lessons will go on to emphasize environmental appreciation. In the junior and high school lessons, however, the student will then *assess the constructive/destructive signs of man* in terms of a logical evaluation of the effects of human technology on the environment. The lessons utilize the *school disciplines as tools for problem solving.* For example, the students can use elements of math or science to find their way to a particular spot by transit, compass, or trail maps.

The pre-site, on-site, and post-site lessons can pose a number of environmentally related problems to the students. In the lower grades, these can be problems related to the way one can learn about and appreciate his surroundings. For junior and high school students, these problems may relate to soil erosion and control, water pollution, land use, human behavior, values, effects of populations on environments. The lessons introduce the general problem, suggest methods of possible attack (using the school disciplines), and explore possible solutions. Emphasis is placed on *creative thinking and productive activity.* One group might be concerned with the artistic/esthetic aspects of water, soil, and rock interaction in a stream bed, while another creates a topographic map of the area for later use in selecting a campsite for the class. A third group might reconstruct the history of man on the site by geological observation of the area with help from on-site personnel. A fourth group might discover nature's manner of communicating with us through an intriguing session in sensory awareness.

Students would be encouraged by their on-site experiences to continue their investigations in the classroom. Using a post-site lesson and projects based on student interest, each student can develop a richer sense of his relationship to the environment. ESA lessons will be available in all disciplines from the National Park Service.

THE CONCEPTUAL APPROACH TO THE ENVIRONMENT

Many educators, naturalists, and writers have suggested valuable ways in which to observe natural history and to make use of the out-of-doors as an educational vehicle.

One approach is strictly taxonomical: everything has a name and a specific way of interacting with the universe. Scientists describing unique objects find this specificity a principal operational procedure within their scope of investigation. This method, however, has a drawback to the non-scientific teacher who does not know the multitude of specific names and conditions that would scientifically describe the environment.

Another way of approaching environmental study is to provide an investigative, completely open-ended method. Here the teacher acts as a guide, while the student is left to discover what is present in his surroundings and to place his discoveries into some kind of perspective. This method has several advantages, for it provides the kind of study that activates sensory awareness and causes the student to develop creative, problem-solving techniques. The difficulty, however, rests with the development of research skills. Research skills are another tool of the scientific researcher, and, although they would provide a good background in problem solving for the student, it takes time to develop them.

To deny the student either the specific or the investigative approach, or to accept completely one or the other, would be folly. To incorporate both into a third approach is one solution with which both student and teacher can feel more comfortable. This alternate method is here referred to as THE STRAND APPROACH.

THE STRAND APPROACH: Probably no adjustment is more difficult at first than to reorganize one's thinking into patterns which are unfamiliar and to replace long, arduous periods of training with a more simplified approach. The valuable, unifying characteristic of the strand approach, however, makes whatever initial effort may be necessary unquestionably worthwhile. The CONCEPTUAL APPROACH, or STRAND APPROACH, considers five large, universal ideas as a way of drawing the environment under a total, integrated "umbrella."

These STRANDS are:

I Variety and Similarities
II Patterns
III Interaction and Interdependence
IV Continuity and Change
V Evolution and Adaptation

ENVIRONMENTAL STRANDS

I VARIETY & SIMILARITIES:
Many likenesses and differences occur among living and non-living things. A variety of functions, sizes, and structures exist in plants and stars, rocks and animals, processes and people. However, there are sufficient similarities to permit you to classify them into orderly patterns. These classifications increase your understanding of your world.

II PATTERNS:
Organizational patterns are kinds of structures which may be found in such things as rock formations as well as in social groups of people and animals. Functional patterns include traffic movements and classroom schedules. Spacial arrangements are patterns that often please us. We find such patterns both in nature and in artistic design.

III INTERACTION & INTERDEPENDENCE:
Nothing exists in isolation. You are constantly interacting with living and non-living things: your family, your books, your friends, your world. These people and things also depend on you in order to function properly. The process is continuous (as part of the life cycle) even after death, for dead life-forms nourish the living.

IV CONTINUITY & CHANGE:
Both living and non-living things are constantly changing—whether among galaxies and planets or your body cells and body systems. Some things remain the same in spite of change. Matter and energy may change in form, but they can never be created or destroyed.

V EVOLUTION & ADAPTATION:
Over centuries upon centuries of time, living and non-living things alter and develop in the process we call evolution. Probably the greatest number of changes over the longest periods of time are brought about in order to "fit" the environment. Hereditary factors then preserve the elements that are continuing. The characteristics that enable us to fit (adapt) best (for example, the best food-finder) are apt to be the traits passed on from generation to generation and insure survival of the species.

THE STRANDS: *An Overview*

VARIETY & SIMILARITIES is merely the recognition of each organic or non-organic thing. A classification is derived by noting similar characteristics in distinct objects. Once a classification is made, an object's

PATTERNS can be identified. What is the pattern of its design?
of its function (what does it do)?
of its organization?

The functional pattern leads directly to

INTERACTION & INTERDEPENDENCE: How does that specific variety interact with
AIR WATER EARTH (OTHER) POPULATIONS?
As that variety interacts, it is subject to

CONTINUITY & CHANGE: Anything that exists goes on,
subject to the constant change that every organic and inorganic substance – no matter how minute or how great – is undergoing as a result of interacting with the
AIR WATER EARTH (OTHER) POPULATIONS.
As it continues to change, it is constantly undergoing

EVOLUTION & ADAPTATION, according to how it fits into the pattern of existence. If a substance does not adapt, it evolves, through Continuity & Change, into a new Variety, with a new Pattern of existence.

Using these large concepts, or STRANDS, teachers who have had no particular scientific or ecological training can instruct or guide students toward open-ended, purposeful activities. The scope of the STRANDS can be focused on the specific at almost any level of detail or sophistication. Within the STRANDS there is a synthesis of environmental relationships. This synthesis makes the STRANDS applicable to the wide range of disciplines within the school program, and yet the STRANDS provide a vehicle for study which can be specifically related to the most unique ecological situations. For example, PATTERNS can be applied to the arrangements of beach fauna (biology), mountain ecology (natural history), or to the patterns of people living in an urban area (social sciences).

[illegible]

THE ENVIRONMENTAL CLASSROOM

Use of the environment as a teaching vehicle is not a new idea. It's been around for a long time, and many teachers have used outdoor classrooms as a significant resource in teaching specialized subjects such as natural science, physical education, and health.

> Environmental education uses the bio-physical environment to teach man about himself, how man is the *producer of* and the *product of* his environment. This study should not be limited to any one discipline, but can be taught in ALL subject-matter areas.
>
> The following pages provide you with leading questions and concepts that can be considered as take-off discussion points, and also specific lesso' suggestions for each strand and discipline. Since the many different environments can not be individually covered in this book, these pages have been evolved to assist you in determining the most cogent points to be discussed with the students. Space is left for the insertion of particular items that apply to your particular site.
>
> The Environmental Strand Implementation chart on the next page presents a brief, overall view of the interdisciplinary unity achieved by the strand approach. Each discipline is then discussed individually (art, communications, science, and social studies). Following these discussions are specific examples of how strands and discipline work together, including the specific lesson suggestions. Once the basic strand understandings are established with the students, they will continue to seek new examples in new environments, leading to a major awareness of man's interactions with his world.

NOTE: Teachers should be encouraged to be catalysts – to permit the students to develop the answers themselves whenever possible, which will result in a greater retention of the basic understandings that are sought.

ENVIRONMENTAL STRAND

IMPLEMENTATION

Subject Matter	Variety & Similarities	Patterns	Interaction & Interdependence	Continuity & Change	Evolution & Adaptation
ARTS	Variety of art forms and variety of environmental factors entering art forms	Interpretive art forms describe patterns	Artist interacts with environment to reflect a positive or negative image	The student art critic interprets the dynamics of environment in changing art forms	Adaptation described through artistic assessment of environmental relationships
COMMUNI-CATIONS	Communications systems—varieties of communication and interpretation. Environmental varieties contribute to differences in communications	Networks of communications are related to environmental patterns	Interaction with environment necessitates communication	Mass media can effect a change in the environment	Communications explains and describes the continuing necessity to adapt
MATH	Recognizing the why as well as the how in counting, using different kinds of environmental objects	Statistical assessment of the sorting of patterns counted	Ratio relationships/ environmental ratios	Relationships in environmental ratios are affected by environmental changes	Probability studies can predict
SCIENCE	Comparison of specific objects related to biological or physical sciences	Physical environmental patterns. Effects on life patterns (classification systems)	Interaction of technological innovation and natural phenomena	Natural and man-made changes — the cyclic order of nature (energy)	Continuing long-range changes in physical and biological objects
SOCIAL STUDIES	Differences in geographic features	Environmental sociology (people patterns)	Population inter-actions/attitude relations (political science)	Economics relates the environment to use — changes	The future of the environment as related to technology/ economy/ecology

A R T

Man interprets his environment through. . . song.
dance.
poetry.
painting.
sculpture.
architecture.
photography.

ART is a feeling experience.

ART can be how you see beauty where you live.

YOUR ESA & ART:

The out-of-doors can be a source of inspiration for painting, poetry, or song, or...?

Here is the place to find such inspiration–away from school, in the real world...be it pristine or man-made, here is an environmental source.

Art often focuses upon the environment. What on-site discoveries can students make of subjects that would lend themselves to painting,

song,

dance,

other interpretations?

What might the student reveal about the area with a variety of on-site photographs made into a collage?

What similar elements of this site would recur in a variety of artistic representations of it?

LESSON SUGGESTION

Art/ Varieties and Similarities

At the site a student can see the environment in new ways through the focus of different art forms. Asked to interpret what he sees in a creative way and according to his choice of art media, the student will come up with his own insights and feelings about the site. These may never have been brought out through a scientific or mathematical analysis of the environment.

Students participating in such a lesson can observe the great variety of ways their classmates interpret the same environment. Perhaps in pre- and post-site lessons students can study what some great artists have done to similar environments in various art media.

Patterns in the environment are also the patterns of art: circles, ovals, squares, triangles, stars, spirals, crescents. How many of these can be identified on site?

Patterns of leaves, flowers, and plants can be arranged to indicate certain seasons of the year. The use of musical patterns as background to an on-site experience could produce an esthetic experience beyond capability of the classroom.

What similar environmental patterns both on site and in the student's home or school surroundings have been rendered in art?

LESSON SUGGESTION

Art/ Patterns

On site the student can see natural patterns in functional operation and can realize more fully how they influence the patterns of art.

The pre-site lesson can examine patterns in art works whose subject matter is the environment, and the post-site lesson how patterns of design can be utilized in tomorrow's environment. The student thereby not only learns to better appreciate the natural world, he learns design principles basic to all of man's creations.

Man uses his environment in the creation of art—as subject matter and material. He uses the sun as a character in stories and songs and as a reflector for sculpture and fountains; flowers provide the subjects of myths and the material for artistic arrangements; man sings of trees and uses wood instruments to play the music.

What on this site could an artist use for inspiration?

What materials on this site could be used to produce art objects?

LESSON SUGGESTION

Art/ Interaction and Interdependence

On site the student should have a creative arts lesson which encourages him to wander at will, observe on impulse, and contemplate at length.

This type of lesson can illustrate the principle of interaction between inspiration from the environment and an artist's production of a work of art about his surroundings. An examination of how artists depend upon their environment for materials and how the environment depends upon artistic and creative ideas for improvement will give the student a deeper awareness of and appreciation for his surroundings.

How does man's art change as his environment changes?

What materials from the environment has man changed to produce art?

Do ideas about art change as environmental values change?

Do natural resources ever become landmarks? Why do they get this attention?

Dance, music, poetry, painting—all these art forms can express the movement and change of the environment. Which art form would best express the flow of this site?

How can music played on site change students' moods?

LESSON SUGGESTION

Art/ Continuity and Change

One lesson should illustrate for the student how—though artistic styles have changed through the years—the environment remains a constant theme.

An on-site lesson can direct the student to observe the everyday changes occuring within the framework of constant environmental processes while it examines what a painter, dancer, composer or other artist must do to capture those changes.

Post-site study can examine how both the environment and artistic representations of it have constantly influenced the inner man—moving, shifting, ever in transition, but always mirroring, deepening, and changing man's feelings of beauty, pathos, and harmony.

How has man's decoration of his body and his home evolved from the past to the present as an art form?

What different art forms have evolved with man's technology? What evidence of either those art forms or that technology can be seen on site?

How is architecture an adaptation of art found in the environment?

How have architecture and creative planning adapted this site to satisfy your needs and desires?

LESSON SUGGESTION

Art/ Evolution and Adaptation

Art lessons in Evolution and Adaptation can clarify for students how man has adapted his creative ideas to his surroundings and evolved art works that reflect and fit his environment--modern architecture and outdoor sculpture are just two examples.

An on-site lesson might examine any number of ways the environment could evolve through artistic adaptations. Charlie Russell, the famous cowboy artist from Montana, depicted the Old West as it evolved from his day of the stagecoach to the days of the railroads and airplane. Many artists have revealed their feelings as they lived through the evolution of the landscape and adapted with the environment. These testaments and works of these artists can be the basis for a number of lesson plans.

COMMUNICATIONS

Sights. . .sounds. . .smells. . .they are all part of the vast communications network constantly broadcasting in the environment. Reading environmental signals requires only six senses: the ability to see, smell, hear, feel, and taste–and a sense of concern.

Observing–empathizing with the environment–is as rewarding a form of communications as using language.

One can consider environmental communications in either of two ways:

1. *What the environment communicates to you.*
2. *What you communicate about the environment.*

YOUR ESA & COMMUNICATIONS:

Every environment is constantly communicating with anyone who wants to "read" the signals. Educating a student's perceptions, making him aware of the messages emanating from his environment, whether it be pristine or polluted, is a giant step toward establishing his environmental ethics.

How many ways can one pick up environmental communications?

SEEING

HEARING

TOUCHING

SMELLING

TASTING

How many different feelings do the physical perceptions of the environment convey to the aware observer?

PLEASURE

JOY

THOUGHTFULNESS

FEAR

HOPE

How many different sounds can be heard on site?

HOW ARE THEY ALIKE?

HOW ARE THEY DIFFERENT?

HOW CAN THEY BE IDENTIFIED?

WHAT EMOTIONS DO THEY SUGGEST?

What danger signals can you read from the environment that tell you that the land has been misused?

LESSON SUGGESTION

Communications/Varieties and Similarities

The pre-site lesson can be centered on the many different kinds of communication: animal and human non-verbal communications; human languages, oral and written; and the great variety of invented languages (deaf-and-dumb sign languages, espionage codes, etc.)

But how are these varieties of communications similar? Why do we need to communicate? How does our environment communicate with us?

The on-site lesson can be a look-and-listen research project, directing the students' attention to the many kinds of communication that are transpiring at the site. These should be non-verbal as well as verbal, animal as well as human. The follow-up back in the classroom can explore the many factors which hinder good communication. Why are we not "reading" or listening to our environment better?

From the land formation, evidence of habitation, cloud patterns, and use of the land, what does the site "communicate" about its past, present, and future?

How have environmental factors influences or even dictated certain patterns of communication?

Man's modern existence necessitated a pattern of complex communications How did patterns of communication figure in the on-site trip?

What animal communications patterns are recognizable on site?

LESSON SUGGESTION

Communications/ Patterns

What makes languages intelligible?—the many intricate patterns that are built into them. Patterns render a sense of order and comprehensibility to our world. What are these language patterns? Grammatical patterns can be discussed at this point, of course, but other patterns, such as the diaphonal nature of dialogues or the battery of rhetorical devices, should be mentioned at this juncture too.

At the site, the students should analyze the patterns they can observe in animal and human communications. For instance, can they see differences in the patterns of animal communications (bird calls, the antennae-touching of ants, the dances of bees, etc.)? Are there patterns in the kinds of human communications (lectures, friendly exchanges, commands, etc.)?

Back in the classroom, the teacher can show how patterns in the environment can affect patterns of communication. For example, try out various seating arrangements—even very unusual ones, such as a wide circle with everyone's back to the center—and observe how this pattern changes the content and feelings of the communications exchanged. Put a student "in Coventry" (all refuse to talk to him) and observe how the patterns of communication change.

The student should be given an exercise that clarifies how language and perception are allied. This can be done by interpreting situations on site, translating "signals" from the animate and inanimate objects into verbal or written communications.

What conditions on site can be "read" about the interactions of the air, the earth, the water, and plant and animal populations?

Are there examples of water pollution on site, of overuse of land or resources, that can be translated by the student into the need for action?

LESSON SUGGESTION

Communications/ Interaction and Interdependence

The first lesson can show how nature acquires a voice and a mind that can think about itself with the advent of human beings on this earth. But we must be sensitive and careful in our interactions with nature so that our interpretations are accurate.

For example, how accurately can they interpret their pets' wishes? Do they have a "green thumb" in relation to plants (a fine ability to sense what botanical life needs and wants)? Are some people more "in tune" with the environment than others? Why?

The on-site experience can provide countless exercises in trying to put into words what the many things in their surroundings are trying to "say". Even inanimate nature may, in this sense, be delivering a message. Don't we often speak of a "proud" cliff or an "angry" cloud?

The final lesson can be an exploration of the many messages an endangered environment might be sending to us.

What human communications would you have heard 300 years ago on this site?

What communications can you now hear that you could not have heard 300 years ago?

What does the presence or absence of people, animals, and plants, tell you about how this site has changed?

Can you "read" from the conditions in a given locality at a given time what season it is?

What feelings are communicated by a change in the season?

LESSON SUGGESTION

Communications/Continuity and Change

The pre-site lesson can explore how man, on receiving messages from an endangered environment, makes changes to bring ecological imbalances back into normal order and continuity. What kinds of messages must we receive in order to make our changes the most intelligent? Surely, we will want to read as much as we can and consult with as many experts as possible. Are your students aware of the many sources of information that would be available to them?

The on-site experience can examine environmental needs specific to the ESA and discussions can be built around what appropriate sources of information can adequately guide and inform those who would institute the necessary changes.

The post-site lesson can be a class activity in which the students, functioning as a committee, prepare a report to a fictional mayor of the city, detailing the environmental needs of the community, the informational resources available, and suggestions for change and continuity.

What kinds of communications are best adapted to presenting environmental conditions to the public?

What do you "read" here about adaptation of the site for its present use? Its future use?

How can you evolve a better understanding of this site in order to communicate your feelings about it?

How will this spot evolve? How can the students' ability to communicate effect changes on this spot (pristine or man-made) for future generations?

What new kinds of communications systems can be evolved to signal man when the environment is in danger?

44/45/46/47

How many different things can be counted in one area?

How many are there in each set?

How many sets intersect (have similar parts)?

How many equivalent sets are there?

How many equal sets are there?

How many disjoint sets?

Can methods of counting environmental objects change the count?

Why is it critical to count things in the environment?

How can you make population counts?

LESSON SUGGESTION

Mathematics/ Patterns

Statistics can be described as numbers arranged in patterns. Lessons in number arrangements can effectively describe the student's world as averages, medians, and stanines. Such lessons can clarify for the student how to group objects into certain number relationships that show trends (where his environment is going, for example) or reveal what objects should or should not be present in his surroundings and in what quantities.

A lesson can be written on the environment from statistical reports in newspapers, or they can be written from data and counts of student characteristics made right in the classroom. Either way the student can get firsthand understandings about his own surroundings by treating numbers of things in patterns as they relate to the total environment.

How many animals and what kind of animals can interact with an environment for a given time without decimating that environment?

What considerations do planners give to ratios of people, air, water, earth, in establishing new urban areas?

What percentage of air must be composed of foreign materials before it is considered polluted?

What percentage of water must have foreign elements in it before it is considered polluted?

How can you measure environmental interactions?

52/53/54

LESSON SUGGESTION

Mathematics/ Continuity and Change

It is difficult sometimes to see spectacular changes on site which may sometimes lead students to wonder if things just exist from day to day, continuing to be just as they are. Graphing, even by very young students, is a lesson technique that can show change relationships. There are growth curves (measuring and plotting, for example, the height of plants against time).

Other graphing lessons can get into the urban growth and the relationships of populations to housing. Many people environments, such as the classroom itself, can show a change as one plots and graphs the various characteristics of the changing student population.

In higher mathematics, the use of proportions can show how changing one element of the environment changes the numerical relationships of other environmental factors as well. Such lessons indicated as possibilities here can start with on-site measures and counts, which will make students more interested in how their calculations turn out.

What percentage of your city has been adapted for use by the automobile?

Has automation changed the on-site environment?

Has the invention of new technologies played a role in the evolution of the environment? For example:

How many ways has the wheel changed man's environment?

Could you adapt to a world without numbers?

What role does statistics, the mathematics of chance and probability, play in understanding biological evolution?

54/55/56/57/58/59

VARIETY and SIMILARITIES

How many varieties of objects can be identified on site?

How are they similar to each other?

How are they different from each other?

What scientific laws can be readily illustrated?

How many different kinds of populations are there here?

How are they alike?

How are they different?

How many of the things can the students observe here which can also be seen in their home environment?

LESSON SUGGESTION

Science/ Varieties and Similarities

The pre-site lesson can consider the diversity of objects found in the environment, including matter as seemingly disparate as the human animal and a tiny marble.

In the on-site lesson, the student can focus upon the infinite variety found in nature and, at the same time, upon the similarities that allow certain objects sharing characteristics to be categorized as either animal, vegetable, or mineral. That tiny marble which you may refer to in the classroom might be seen on site as an enormous slab in a rock formation, illustrating how substances with similar scientific properties may appear in a variety of forms.

The post-site lesson can deal with the many factors that influence the objects in a given environment, such as weather and other natural phenomena, as well as with the basic scientific laws that govern all of these functions.

The object hunt (something like a treasure hunt) is a good introduction to the on-site program.

What are the patterns that help to classify objects on site?

What is the design of each object?

What is the function of each object?

What are the topographical patterns of the area?

How does the pattern of the food-chain cycle work at this site?

How does it compare with man's food-chain store?

LESSON SUGGESTION

Science/ Patterns

On site, the student can be asked to concentrate on the patterns he sees (or otherwise senses) in and among the objects around him. Are the patterns spatial (an interesting crystal formation), organizational (a colony of bees), or functional (a team of National Park Service personnel fighting a brush fire or building a campsite)?

The student can try to identify the ways in which the patterns he sees may be determined by certain environmental factors, i.e. a cluster of trees whose trunks all bend the same way because of constant exposure to wind from a given direction.

How has man interacted with water to change his environment?

How has man used the air to change his environment?

How does the moon affect the earth's environment?

How does the sun affect the earth's environment?

What physical forces are interacting on site right now?

How does each object on site interact within its environment?

What are things that man has made out of raw materials on site?

What natural laws govern interactions between the air, water, earth, and other populations on this site?

What scientific inventions have had detrimental or beneficial effects on this site?

Could man improve this site? How?

LESSON SUGGESTION

Science/ Interaction and Interdependence

In the on-site lesson, the student can observe the difference between interaction and interdependence. When a bird alights in a tree, it is an instance of interaction. When the bird eats the tiny insects that subsist off the leaves of the tree, it is an instance of interdependence. The tree harbors certain organisms which the bird can eat, and thereby survive. By devouring these organisms, the bird in turn helps to protect the tree.

The student can focus as well on broader interactions and interdependencies, such as those that are triggered by seasonal changes (a river-bed depending on the spring thaw to melt the snow so that the river may flow and, in turn, irrigate the land). Such observations can illustrate the ways in which nature's cyclic processes operate independently.

Lessons on interaction may be as simple as the observation of leaves turning toward the sun or as complicated as a study of plant auxins biochemically regulating plant growth.

How does water change?

How does the air change?

How does the earth change?

How does a change of season affect this area?

Have scientific discoveries changed this site in any way? How?

Has man made any changes on this site? How?

Have there been changes for the good on this site?

Have some changes had a negative effect?

What conditions have continued?

LESSON SUGGESTION

Science/ Continuity and Change

In the first lesson, the student can consider objects in the classroom as they have changed over time. What materials constitute the desk at which he now sits? How have they been changed to create the finished product? One-hundred years ago, how were desks different?

On site, the student can then identify certain raw materials used to produce the objects with which he is familiar in daily life. The wood of a tree for lumber, minerals from rocks or mines for nails and bolts, and so forth. An object can undergo many changes and still retain its primary qualities. A tree may be bare in winter, budding in spring, blooming in summer, and losing its foliage in fall, but there is a basic continuity to these processes which permits the tree to continue living and undergoing changes.

In the post-site lesson, the student can furthur explore the links between the objects around him and those found in nature. When his desk is no longer functional, perhaps it will be chopped up and used for firewood, its ashes becoming part of the soil from which they trees will continue to grow. All cycles—water, nitrogen, sugar, metabolism—are illustrations of such change and continuity.

How has this site evolved into its present state?

How has it changed in appearance since prehistoric times?

What kind of prehistoric animals do you think lived here?

Why did some animals become extinct from this area?

How do animals adapt to seasonal changes in this site?

How have organisms here adapted to this site?

Which will continue to adapt?

Are there some objects that will not evolve—that are in danger of becoming extinct? Why?

What are some of the successes man has enjoyed in trying to control his environment? What are some of the failures?

LESSON SUGGESTION

Science/ Evolution and Adaptation

On site, the student can observe the ways in which the objects he sees have adapted themselves to their environment. Through the process of evolution, many animals have adapted to cold climates by developing heavy fur coats which cover layers of stored fats that will sustain them during the long winter months when food is scarce. The student can recognize that he, himself, has probably taken steps to adapt to this environment by using his intelligence and technology. Perhaps he has put on a warm coat or hiking shoes. Without these efforts at accommodation, he might not feel at all comfortable at the site.

So it has been through the ages; organisms that have not evolved the means to adapt to their surroundings have not fared well. Most have died out. The student can regard the majority of objects he sees on site as successful examples of adaptation to a given setting. He can consider, however, what kinds of adaptation will be necessary in the future so that these objects can exist in environments being changed by man, as in the case of a highway being built through a forest. Can the slow process of evolution permit the necessary adaptations to take place in time for the organisms present to survive?

More advanced classes may discuss the theories of evolution and the ways in which molecules direct hereditary continuity and change.

SOCIAL STUDIES

ECONOMICS..... how people produce, distribute, and consume goods and services
GEOGRAPHY..... land, sea, and air, including man's industries
POLITICAL SCIENCE..... the governments and institutions of the people
SOCIOLOGY..... behavior of the people--groups, processes, societies

YOUR ESA & SOCIAL STUDIES:

Plant populations and animal populations live together in a relationship parallel to that of any human society. Of growing concern is the effect of technology upon this society--and upon the society of the natural environment.

70/71

VARIETY and SIMILARITIES

Every area has a geographical history. What is the geographical history of this area?

Was this area habitable by people?

What other kinds of populations were here?

Are they still here?

Are there new populations? Changed populations?

How many things on this site are valuable to man?

LESSON SUGGESTION

Social Studies/ Varieties and Similarities

The pre-site lesson can introduce the student to the study of a variety of populations, human and animal. Analysis can point to the ways these groups are similar in their functioning, i.e., mutual protection, food-gathering, child-rearing, etc.

The on-site experience can direct the student's attention to living populations present at the site. These should include insect, bird, and mammal groups.

The post-site lesson can scan the various social groups that have an interest or have played a part in the setting up of the ESA itself. All of these social and political groups, of course, share a common goal in relation to the site.

How does the environmental pattern affect the way people live?

What are the major industries in the immediate area?

How do those industries affect the water?

the air?

the land?

What resources do they depend on?

What natural resources are used for recreation?

Is the population pattern affected by the environmental pattern?

For what purpose do people migrate to this area?

For what purpose do people emigrate from this area?

How do the population patterns affect the environmental pattern?

How does this area fit into the overall pattern of the nation?

LESSON SUGGESTION

Social Studies/ Patterns

What patterns can be observed in the groups to which we belong? Some groups, such as the family, have several important functions. Others are more specialized and specific, such as fellow church-goers and political party members.

What are the patterns of the groups observed on site? A column of ants can illustrate work groups and nesting birds can show the patterns of familial groupings.

The post-site lesson can probe other aspects of populations beyond function, such as groups determined by age or sex or formal vs. informal organizational structure.

How has man tried to assert his dominance over his environment?

What natural resources are involved in agricultural developments? Economic developments? Political? Technological?

How does man use mountains as a natural resource? Deserts? Water? Earth? Air?

How does a search for gold, riches, and adventure, work for or against conservation of natural resources?

What are some historical examples?

How did populations use this site previously?

Where did the water come from?

How did they get their food?

What kinds of homes did they make?

Has population growth had any impact on this area? What? With what effect?

What government agency is responsible for regulating the use of this area?

LESSON SUGGESTION

Social Studies/ Interaction and Interdependence

The first lesson can explore how individuals stand in relation to groups; how, in small groups, the individual can exercise a greater number of roles; how, in larger groups, the individual is subsumed to a more generalized function, such as a voting voice.

On site, the student can note how the various animal populations are interrelated and interdependent on the food chain or how individual members of groups assume specialized functions for the protection and efficiency of the group (worker vs. drone bees, male bird food-gathering while mate is nesting, etc.).

The third lesson shows how new groups are formed in our society to bring about social change and reform. This lesson can present to the student the many different kinds of groups that have been formed to solve ecological problems from the small neighborhood anti-litter groups to environmental study groups set up in Washington, D.C.,by Presidential initiative.

What life cycles are evident on this site?

Have the communities of plants, animals, and people changed?

Has the entire area changed?

Has the territory belonging to animals changed?

Has the territory belonging to people changed?

Has the value of the area changed? Why?

Has agriculture or industry changed this area? How?

What changes in the environment, brought about by people, are beneficial to the environment?

What changes in the environment, brought about by people, are detrimental to the environment?

What changes in this environment, brought about by people, are beneficial to other people?

What changes in this environment, brought about by people, are detrimental to other people?

LESSON SUGGESTION

Social Studies/ Continuity and Change

The pre-site lesson can focus on differences between our social environment today and some other at a fixed time in the past. A good contrast can be drawn between social attitudes towards conservation and pollution as prevailed in this country at the turn of the century, when only a handful of dedicated men, such as John Muir and Theodore Roosevelt, fought against a ruthless and reckless exploitation of the national heritage. Today, of course, our environmental problems are more drastic, but the social groups coping with these problems are greater in number too. The point here should be: social attitudes do change.

The on-site experience can be an exploration of the evidence of society's attitudinal change toward the environment. What material changes made on the site since 1900 can show that change?

The post-site lesson should be directed to the question: what means are necessary to change social attitudes?

What evidence on site shows man's attempts to adapt the area to his needs?

How was this place used in the past?

How will it be used in the future?

If you were going to live here, how would you get your food, your clothing, your shelter, your water?

Do you think this area should be made into a housing development? Why? Why not?

How has the class adapted to the on-site experience?

What new attitudes have evolved because of ESA lessons?

LESSON SUGGESTION

Social Studies/ Evolution and Adaptation

We adapt to social groups by assuming certain roles within the group, but is it wise to adapt completely to any one group in society? Groups continually change in their composition, function, and purpose and require their members to continually adapt to these shifting conditions.

The pre-site lesson can explore how each individual in the class has adapted to the conditions of that social group and how he and his classmates are constantly adapting to changing conditions. For one, how is the class preparing for the on-site visit? What communal activities and what roles are necessary for this preparation?

On site, the student can study his own class and observe how the group changes now to fit the new surroundings. For example, have the class' seating arrangements been changed? How has the teacher's role changed?

After the site visit, the students can assess the evidence of change that has occurred in the group (in attitude, in purpose, etc.) and their own adaptations to that change.

Object	Variety & Similarities	Patterns	Interaction & Interdependence	Continuity & Change	Evolution & Adaptation
INTERPRETER	*Animal:* knowledgeable about natural science, the environment, people, animals, other populations. Interested in conservation of the environment.	*Design:* Man or woman wearing a NPS uniform with interpreter's badge. *Organization:* Employee of NPS and interpreter of the environment. *Function:* To make people aware of the environment and its effects on man, and man's effects on it.	He takes people on environmental seminars; he undertakes a program of educating teachers and leaders about the environment. He sets up ESAs for study purposes of student groups. He depends upon the NPS for sustenance and acceptance of his aims and ideals.	Every year he becomes more understanding of the web of life, and more knowledgeable about his work. He might change to other environments and continue to learn more about them. He gets older—he changes his area—but he continues his job.	He adapts to the schedule set by NPS because if he doesn't he will not evolve to the position of park superintendent.
TREE	*Vegetable:* it has branches, roots, leaves, trunk, chlorophyll. Different in many respects from all other trees but similar because it is one of many like trees and shares the characteristics of a tree with all other treas	*Design:* Roots grow in the ground, leaves grow on branches emanating from the trunk. *Organization:* groves, etc. *Function:* To provide beauty, shade, shelter for animals. To protect plants from the sun, to provide photosynthesis.	Animals furnish trees with carbon dioxide, and the trees transpose it into oxygen. Man also uses trees to build houses, bridges, furniture, as well as to make paper, and other items.	Trees change with the seasons, with man's use of them. As firewood, trees change into chemicals and energy. The leaves of trees decay into earth, and provide sustenance for plants.	Trees adapt to areas they are planted in according to the prevailing winds, soil, etc. Over long periods trees may evolve into other kinds of trees.
GOLD NUGGET	*Mineral:* it is similar to other rocks because it is hard, is part of the earth's solid surface, and is made of minerals. It is different because of its color, hardness, luster and has the elemental characteristics of gold (Au).	*Design:* it is a lump of stone with a vague yellow cast to it. *Function:* it is used for jewelry and in certain chemical reactions.	Chemicals in the earth interact with stone to make gold very rare. Man has a high regard for the beauty and rarity of gold, and has established it as a standard of value. In chemical activity gold interacts as a metal to produce new compounds.	After man discovered gold, he used it to decorate his person and his edifices, and put it into gold bars. Gold can change as it is heated or subjected to various pressures in the earth's crust. It will continue to be the element gold (Au).	Gold has become an international monetary standard, and has become adapted to all the financial systems of the world. Gold the element may change as it evolves over long periods of time from one form to another.

APPENDIXES

PROPOSED OUTLINE OF BASIC ESA INFORMATION PACKET

Your ESA informational booklet can be written as a simple fact sheet or as a comprehensive document. Many of the ideas and explanations presented in this "ESA Guide" may be used in the development of your informational packet to the schools. You should, however, prepare additional data that will help teachers to utilize the unique elements of your site in a productive and factually correct way.

The least complicated–and most easily prepared–ESA booklet would be a list of facts and figures about your study area You may already have some descriptive brochures that can either supplement or take the place of a specialized publication. However, far more rewarding and interesting to the users of your ESA site will be a publication that is functional and motivational through its conceptual STRAND APPROACH. You will need more input than lists of the flora and fauna or the outstanding physical feature of the facility. You will want to relate your study area to people, to vital social, political, or economic concerns of today.

Here is the way it might work: First take a close, analytical look around your site and decide which of its characteristics you consider most relevant to people. The John Muir Home, Martinez, California, can serve as a model. Here is an historical site located in a semi-agricultural, semi-industrial county seat. These aspects would fit the economic or social science curricula. The natural history of the John Muir Home site itself might be the focal characteristic, since the site is located near a beautiful creekside area which would be of interest to biology, ecology or even art classes. Surrounding environmental concerns include problems of pollution as well as those of diminishing natural beauty.

Whatever environmental problems relate directly to your site–misuse by visitors, threatened encroachment by developers, water or air pollution from nearby industry or townships–should be clearly spelled out in the guide. Such publicity is not meant as a condemnation or accusation of anyone or any group. It is rather the beginning of a solution. For the entire ESA program is built upon awareness–awareness of the environment, its glories and the dangers threatening it. Once initial awareness is engendered, the ESA program can begin to move toward the environmental solutions inherent in its interdisciplinary, strand approach. For all school subjects and skills can be used to observe, analyze, and attack environmental problems. The conceptual framework relates back and forth from the ESA environment to the student's own, thus giving immediacy to environmental problems of either or both. Not only will students talk to their teachers and parents--thus furthering environmental awareness and perhaps initiating action through votes–but they will soon be active, voting citizens themselves, educated to work in the ESA way to solve environmental problems.

What should be the plan of your booklet? First, it should have a title that would interest the users–perhaps "An Historical Oasis". Regardless of the type of site, a short historical review of the area and its historical importance would be interesting and informative.

There are going to be different populations of students using the area so the next consideration would be what to emphasize in the guide, and whom to address. Age levels and differences in school curricula should be considered. One can be fairly certain that the elementary students will not have in-depth abilities in any subject-matter area (there are exceptions). With this as a basic premise it follows that the focus for elementary grades should be on appreciation. Not merely appreciation of the beauty of the area, but also appreciation of knowledge about the site, of skills which can be developed by use of the area, and ultimately an ethical sensitivity.

In the "ESA Guide" are several questions that may be used to develop an examination of your specific ESA site. For the benefit of the teacher, you may want to answer in detail some of these questions relating to your site. At the same time, there is no point in asking students to discover things about the site and then giving them all the answers. Teachers will know how to use probing questions to stimulate their students to think about the visit.

At the higher levels there will be more stress on the technical approaches to environmental problem solving. For example, junior high school students have usually had enough science and math instruction to be able to answer quite interesting questions about the composition, quantities, and relationships of various objects.

High school students are probably most likely to be interested in the social sciences. These more mature students are close to becoming environmental decision makers–the voters of the future. Their concern for an ethic derived from environmental values should be encouraged by a booklet that probes the students' environmental conscience. Your publication should emphasize that high school students will have to be aware of environmental needs and problems in order to find solutions. What should be done at the John Muir Home area, for example, to curtail the air pollution caused by local oil refineries? Are the students willing to pay for possible higher oil costs should the refineries be forced to change production methods?

Subject-matter areas can present a problem. Most instruction at a "natural history type" site will tend toward the biological or general scientific areas. This is no problem and the study of ecological sciences should certainly not be discouraged. Yet there is so much more to do with environmental education that study should never be limited to any one subject-matter area. The STRAND guide questions are for this reason incorporated into subject-matter headings.

Another way to look at environmental education is to realize that in the environment no one subject stands alone and is sufficient unto itself. The traditional ways of education, that is, to fragment knowledge into subject-matter areas, are somewhat artificial. Certainly the arts should be studied through the environment, but concurrently, thoughts should range through the technological, the mathematical, and the historical realities of any given area. The John Muir Home again provides a case in point. While looking across the beautiful golden hills of California, one cannot avoid the oil refinery tanks that intrude upon the view; freeways and railroads cut into the land; power lines continue the linear disfigurement. Whatever a student in an English class wrote concerning this area would, perforce, consider these technological develop-

ments; whatever a student measured in a mathematics class would, of necessity, reveal the artistic and esthetic impact of the geometric patterns; whatever a student organized into statistics would have to underscore related trends in economics, politics, sociology, and certainly geography and history.

Besides the educational considerations already discussed, several very practical problems must be dealt with in your guide. First, you should include detailed instructions about logistics: where your site is, how to get there, what the surrounding area is like, the best times for travel. If possible, you may want to include a map showing how best to reach the site.

Detailed information about the site's characteristics will aid the teacher immeasurably in preparing to visit: what the site is comprised of, what can be expected at different times of the year, how best to take advantage of whatever special features your ESA offers, precisely what can be assumed in terms of facilities. Also, it will be tremendously useful for the teacher to know if there is a need for any special equipment or clothing. Some groups may be coming to the site for a day, others for a week; some merely to observe quickly, others to study minutely. If your site requires rain togs, boots for climbing, damp-proof sleeping bags, binoculars for bird watching–whatever–by all means include these facts. In this instance, it might again be helpful to work with someone from the educational field; such a person could tell you the kinds of activities students would most likely pursue at your site and you could then decide what special needs such activities might engender.

All such information will allow the teacher to make the most of certain lesson plans; it will also give her a sense of security knowing what to expect and feeling that her teaching needs have been considerately anticipated.

In addition to the specific information regarding special clothing or equipment possibly needed at your site, it will be helpful to teachers to include in your guide some of the following general instructions about preparing students to visit ESAs.

WHAT TO BRING TO THE SITE ? ? ?
really not too much ! ! !

There is a tendency to feel that being prepared for an environmental field trip should include taking along a great amount of equipment. Collecting on the site is done only by permit and is rarely (if ever) a wise experience. So bottles, nets, traps, or other paraphernalia of a cumbersome and sometimes dangerous nature should be held at a bare minimum.

Students saddled with the responsibility of comprehensive note taking or with a long check list of things to observe are often so busy recording and searching for specifics that they rarely get the BIG environmental picture.

Having in mind what is important to do at the type of site to be visited, and remembering the subject to be studied are the best indicators of what to take along. For example if the field trip to the site is to concentrate on mathematics, pre-arranged work sheets should serve as a guide for taking population census or for making measurements. Whatever the type of work sheet or data-collecting forms are used, simplicity of design should be the most important consideration. If the on-site experience is to include some identifications of objects, the pre-site studies should include enough information to prepare the students to know what to look for. If on the other hand the on-site experience is to allow the student the excitement of making discoveries, there should be enough guidance—in the form of pertinent questions—to direct the observations toward given goals. A research trip, which may be open-ended and allow students a great deal of freedom, should not be without objectives; the student should not wander about without purpose.

Identification keys are handy items, but not so essential that the expedition should be weighed down with volumes of reference materials. The on-site experience should be observational in so far as possible, leaving the reference and calculations and more academic studies for the return to the classroom situation. Work best accomplished in the classroom should not be attempted while at the ESA.

When the environment is to be used as a vehicle for discussion, as perhaps in a social studies field study, there should be a predetermined understanding of what environmental on-site observations will best motivate the students.

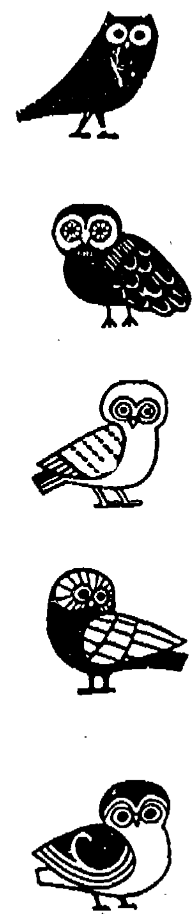
The ways of organizing an informational booklet for a given site seem limitless. The format is relatively unimportant, the structure somewhat beside the point, and the content important only as it serves to stimulate the user. Most important is the use of a unified conceptual approach, rather than small fragmented bits of information. Use this "ESA Guide" to develop your booklet. Head up the sections of your informational ESA publication with the STRANDS. They will bring to your ho the scope of universals and will highlight obvious relationships between the subject-matter areas.

Appendix 2

EXAMPLE OF STRAND IMPLEMENTATION

The following pages show an interesting way to teach the five strands to young children.

Each strand is carefully defined in terms of a child's vocabulary and perceptual scope. A number of specific illustrations help to make these holistic concepts more concrete.



VARIETY & SIMILARITIES

The world is a continuous variety show.

A tree is not a tree is not a tree:

There are more than a thousand kinds,

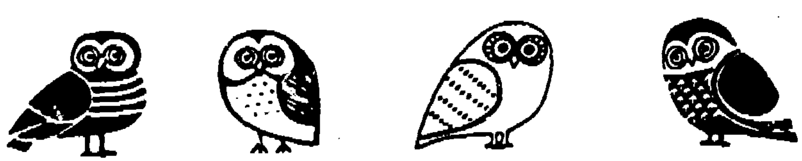
But each with similarities.

And so it goes with stars, rocks, clocks,

Animals, and people, too.

There's a variety of similarities . . .

Does that puzzle you?

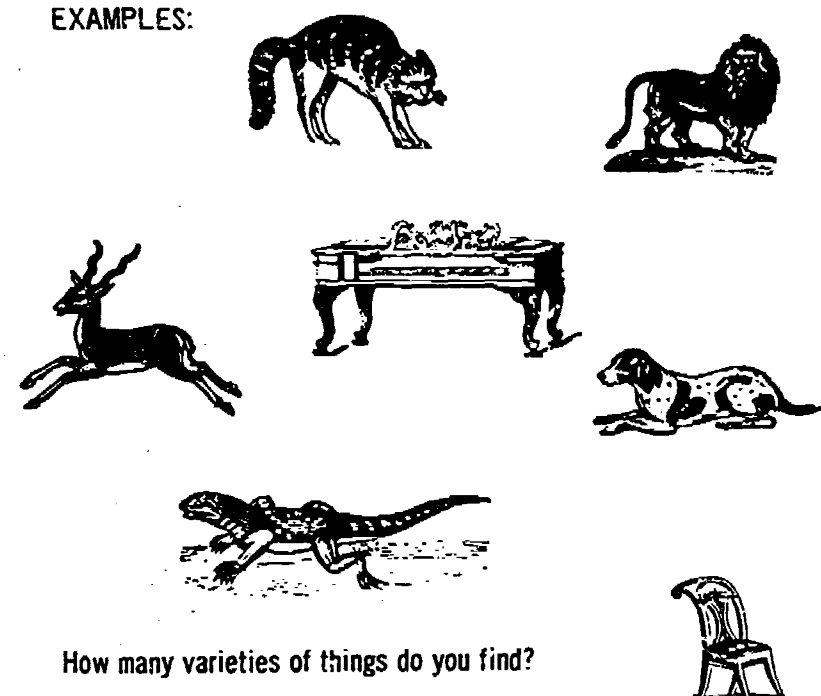


VARIETY can be found in the different KINDS of things in the same category, or class. The universe contains many different kinds of objects—some huge, like giant stars; some small, like microscopic bacteria.

Objects vary in many ways: color, shape, texture, and in the way they are used. And each unique VARIETY has a number of

SIMILARITIES by which you can recognize that it belongs to a certain group. A simple way to separate varieties of things into groups is to classify them as vegetable, animal, or mineral. Watch the characteristics for the distinguishing marks.

EXAMPLES:



How many varieties of things do you find?

What similarities are there?

ARIETY

the spice of life. Wouldn't it be strange if everyone looked exactly alike? You wouldn't be able to tell your friends from your family.

But though each of us LOOKS different, we all have similarities: eyes

noses

hair

arms

legs

and other similar features which put us into the group of: PEOPLE.

You can see variety in everything: outdoors and indoors there is such a constant variety that no matter where you go, you will find something new and different.

And you will find that everything you look at has

SIMILARITIES

to another grouping; it's like having look-alike relatives. In your mind you can always put any 'new' thing into its own family - or into the VARIETY of 'family' it belongs to.

Similarities make the difference. If all trees were identical, if all flowers looked and smelled the same way, things would be pretty dull.

REMEMBER:

YOU CAN ALWAYS RECOGNIZE A VARIETY

BY CHECKING ON THE SIMILARITIES

Team Game

DESCRIPTION		CLASSIFICATION		
Function	Appearance	Animal	Vegetable	Mineral
sit	4 legs	horse	wooden chair	iron bench

PATTERNS

You find patterns in the snowflakes,
Patterns in the sky.
It's the order of the universe
In whatever meets your eye.
Things fit together in patterns
As in puzzles and families too.
There's a pattern to our way of life
And there's even a pattern to you.

Patterns can be:

SPACIAL
(as in design)
FUNCTIONAL
(as in use)
ORGANIZATIONAL
(as in family)

What are Patterns?

The infinite order of things . . .
in the world, in your environment.
Patterns can be found in society, too,
and in the social patterns of people.

You can find patterns in stars and stripes:

Our flag
Starflower
Ivy leaf
The Pentagon

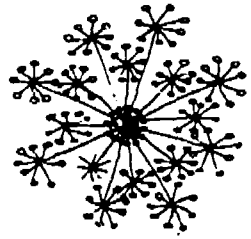
Zebra Stripes
Feather patterns
Leopard stripes
Striped shirts

When things fit together - belong together - you see

P A T T E R N S.

You can see organizational patterns in clubs, societies, and countries. You can see functional patterns in the way people, animals, and plants live together.

DO YOU READ PATTERNS?



Did you ever think of how strange it would be if we were all giants? We wouldn't be able to sit under trees because they would be like little bushes. And we would need a whole acre of corn to eat instead of just one ear. There wouldn't be enough food for everyone, and the whole pattern of life would be different.

There is a pattern to our existence and an order of things that fit together like a well-thought-out puzzle. Trees are of just the right structure for making shade. The pattern of leaves on branches makes the spacing right for catching the sun's light and just right for blossoms.

Rocks on the shore of a lake - in the ocean - or over the hills, come in patterns of pebbles, which a sand crab or spider can use for his home or habitat, to groups of boulders that are homes for cougars in our country, and tigers in Asia. The variety of patterns which produces homes, effects the variety of patterns of life inhabiting these homes.

Have you found patterns in the stars? Like the ancient Greeks, you can make your own designs from the stars in the sky, and make up your own tale. Try to find a pattern in the skies tonight for a story you can tell.

PUZZLE PAGE

Put a  Around spacial patterns.

Around functional patterns.

Around organizationa: patterns.

STARFISH

ZEBRA

PINE CONE

MILKY WAY

FREEWAY

BEE HIVE

APARTMENT BUILDING

FAMILY

BOY SCOUTS

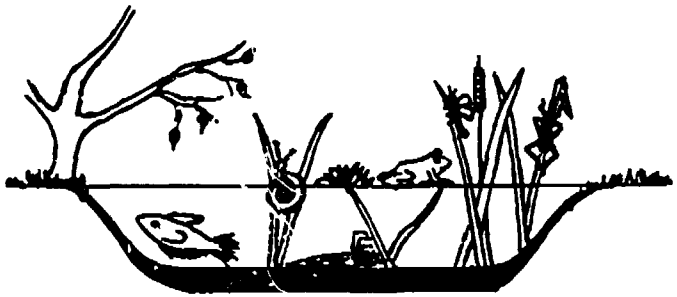
MARCHING BAND

LEAF PATTERNS

CITY COUNCIL

WOLF PACK

You are interacting now while
you're looking at this book.
INTERACTION is a thought, a kiss,
a hit, a bite, a look.
It makes no difference what you do,
you're always interacting –
And for every interaction,
there is something that's reacting.



INTERDEPENDENCE means just what it is –
you depend on some*one* or some *thing*
That also depends on you: it's mutual
between you two.
With animals, trees, with the birds and
the bees, you'll find this is true:
They are interdependent too.

INTERACTION AND INTERDEPENDENCE

are big fat words. Take them apart and you will find out what they mean.

INTERACTION means to act upon one another - the action has to be at both ends of the stick.

Can you think of how, in each of these situations, one acts upon the other?

It was a contest between the cobra and the mongoose, each struggling for its life.

The crocodile opened its maw for the plover, who methodically began cleaning the croc's jagged ivories.

The sunflower lifted its face to the rain, and drank gratefully.

The moss found root in the rock,and began the ageless process of grinding it into soil.

INTERDEPENDENCE means to depend upon one another. There is always interaction present, with the additional action of dependence each upon the other.

Some plants depend on bees to pollinate them,and bees depend upon plants for their nectar.

We depend on the water company to furnish water; the water company depends on us for payment.

Some fish depend on plankton for their food; plankton, in turn, depend on fish for carbon dioxide, its food.

The moon depends on the Earth to keep it in orbit; the Earth depends on the moon for tidal action.

IT STARTED ALREADY . . .

Your first example of interdependence this morning was when you depended upon the cook to prepare your food, and the cook depended upon you to eat it.

The interaction was obvious as the food began disappearing from your plate.

LOOK AND LISTEN

Today you will find many examples of interdependence and interaction between living things and non-living things. One animal eating another - such as a bird eating a worm - is interaction AND interdependence. Without the availability of food, the one organism eating lunch might well starve, and the other being eaten prevents its kind of organism from becoming too numerous.

Do trees interact with you? How are you interdependent with trees? Perhaps you never realized that the trees are transforming the carbon dioxide that you exhale into oxygen.

In nature and in everything we do, we find this strand of environment. Think of the town that you live in. The store owners depend upon your interaction with them, and you depend upon the store owners to furnish the food and goods you need. Proper interaction and interdependence keeps things in balance.

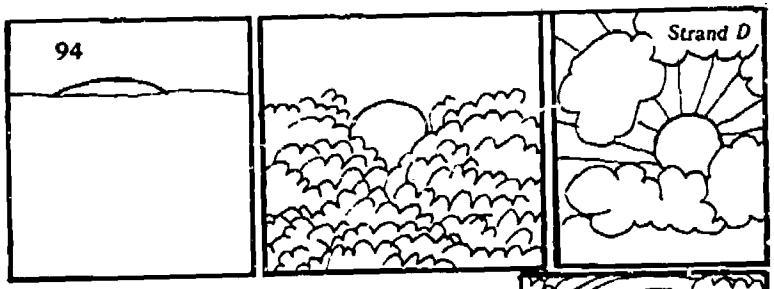
Not only in nature, but also in the rest of the world, when interaction and interdependence gets out of balance, chaos results.

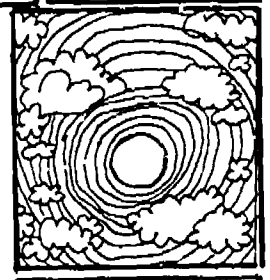
What are examples of such chaos?

List examples you saw today of the following.

Take 10 points for each correct example.

INTERACTIONS	INTERDEPENDENCE

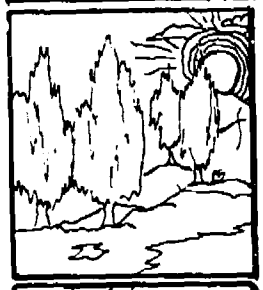


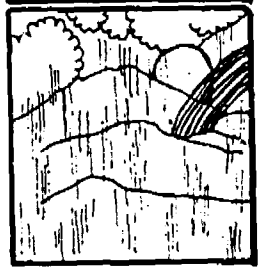


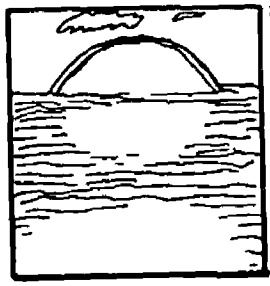
CONTINUITY AND CHANGE

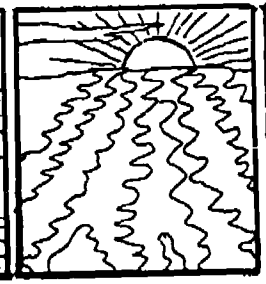
The sun comes up,
the sun goes down,
The earth keeps going
'round and 'round.
Things keep getting different -
They are never the same.

FOR EVERYTHING IN LIFE
CONTINUES TO CHANGE.









CHANGE

Animals are born, live a while, and die, and young animals take their place.

Flowers bloom, fade, and become part of the soil.

Water evaporates, forms clouds, snows, becomes water, and is used to irrigate the earth.

This is the very important

CONTINUITY

of life on earth. Things may change, but they always continue on in some form or fashion. Everything in the universe is part of a continuing cycle of change.

Oceans, lakes, and rivers change – WATER

The rocks change – EARTH

The weather changes – AIR

Animals and plants change – you change – POPULATIONS

Nothing really stands still:

Time changes hands every day.
And with each tick of the clock
important changes take place.

What changes will you see today?

HOW IS YOUR LIFE A CONTINUITY?

(and how is your life a series of changes?)

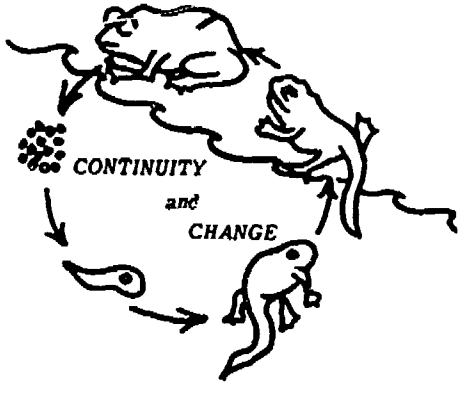
Do you get bored because your day-to-day experiences never change? You could call this daily schedule a CONTINUITY because everything continues evenly and undisturbed. But once in a while changes occur that break the daily stream of events

WAS YOUR TRIP HERE A CHANGE?

(and at the same time was there a continuity of events?)

Nature is much the same way. When you look up and see clouds streaming across the sky, you know those billowy fluffs will descend below the horizon and disappear, and the skies may again be clear. But these clouds will be back, fortunately, with their life-saving rain. So you can speak of the weather as a continuity over a period of time. Yet we speak rather casually about the CHANGE in the weather.

Look for changes and activity in nature in how nature is constantly on the move. What changes will there be in a day - a month - a year? In a special spot? In your home? In you?



PUZZLE PAGE

How does each of these items in the first column continue to change? Match each object to a change in the second column, then write a possible new change under continuity.

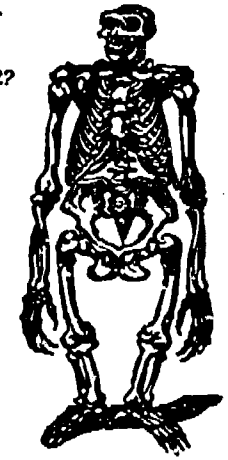
OBJECT	CHANGE	CONTINUITY
SUGAR	EARTH	
EGG	CEMENT	
GRASS	FISH	
ACORN	FROG	
SNOW	HAMBURGER	
COW	PENCIL	
TREE	CANDY	me
POLLIWOG	WATER	
WORM	TREE	
ROCKS	MILK	
LEAVES	CAKE	

Now try some of your own:

A 20th–Century Survival Scorecard

EVOLUTION AND ADAPTATION . . .

Who made it?



DINOSAURS didn't

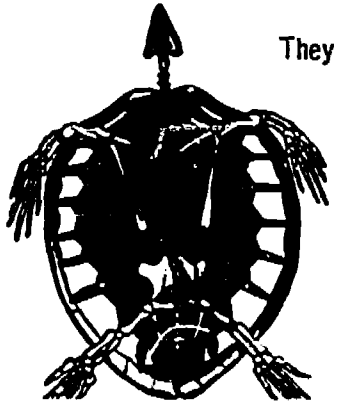
BEES did.

MAMMOTHS didn't -

WILDEBEESTS did.

Most COELACANTHS couldn't . . .

But OAK TREES and MANKIND did.

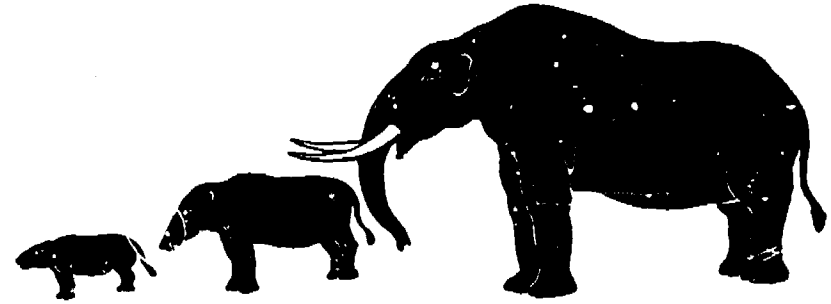


They adapted to evolve . . .

How about YOU?

EVOLUTION is a slow process by which organisms physically change. This change may take thousands or millions of years.

One familiar example: the horse, which evolved from an 11-inch, 4-toed creature into a 5-foot, 1-toed animal. The equine also evolved huge upper molars, which enable it to graze on prairie grass.



ADAPTATION is a fit or an adjustment to the environment. An animal or plant may evolve, but if it does not adapt or fit into an environment, it dies.

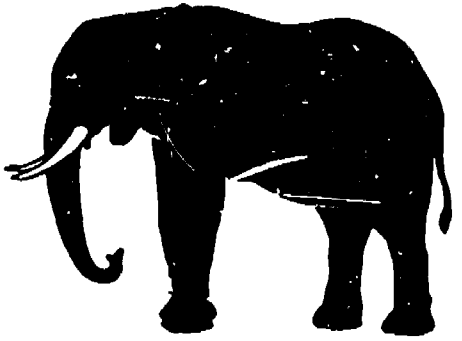
Adaptation is the successful interaction of an organism with its environment.

Man uses technology on the products of his environment to adapt to it.

You can pack a thermos or go to where a faucet is when you're thirsty. The camel and the cactus store water; most animals have to find it - at water holes, in the roots of plants, or in fruits and vegetables.

Does an animal have a special way of eating or of moving about that enables it to live more successfully in a particular place?

This is adaptation - or how well an organism (animals, plants, or yourself) fits into his environment. What special kinds of structures does a living thing have that make it fit into the surroundings?



The big question is:

HOW DO YOU FIT?

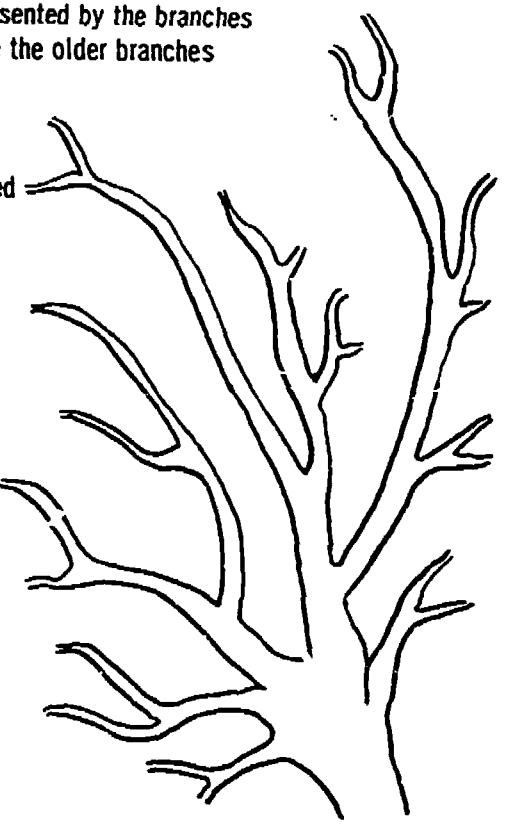
As a human being, how are you adapted to *your* environment?

There is a direct relationship between how you adapt to your environment and the pattern in which you live. The way that you have developed and how you fit into your surroundings is a very definite part of how successfully you can interact with your environment.

The development of your interdependence with your fellow creatures is a part of your adaptation to your environment.

ON YOUR FIELD TRIP TODAY, HOW MANY EXAMPLES OF ADAPTATION AND EVOLUTION CAN YOU FIND?

The time and order in which living things developed are usually represented by the branches of a tree because the older branches are at the bottom of the tree and the more recently developed are at the top.



Choose the branch where you think the following leaves should sprout on this tree of evolution.

worms	sharks	spiders
pigeons	ants	turtles
frogs	dogs	water dogs
snakes	clams	owls
fish	crabs	lions
lizards	cats	bats
flies	sparrows	elephants

Appendix 3

ESA GLOSSARY TERMS

CONSERVATION: The wise use of natural resources; conserving the environment for future use.

CONSTRUCTIVE TECHNOLOGY: The engineering and scientific endeavors which produce machinery or products that have a positive or building effect on the environment.

CURRICULUM: The courses offered by a school.

DESTRUCTIVE TECHNOLOGY: Those aspects of man's science and engineering which cause negative effects or the tearing down of the environment.

ECOLOGY: The totality or pattern of relationships between organisms and their environments.

EDUCATIONAL FEASIBILITY STUDY: Looking at a possible ESA in order to determine how it can be used by teachers and students for educational purposes.

ENVIRONMENT: The total surroundings of the individual. This includes immediate external surroundings, the internal world of his thoughts and feelings, and the far-reaching environment of space.

ENVIRONMENTAL EDUCATION: Those instructional processes which are concerned with the total surroundings of the individual. This may include people environments as well as natural and man-made technological environments.

ENVIRONMENTAL ETHIC: A value system based on a code of moral commitments to the environmental good.

ENVIRONMENTAL-SOLUTION STRATEGIES: Any conscious efforts to solve problems related to the environment: particularly efforts by students which utilize the traditional subjects taught in school. For example, an ESA has a population problem: too many rats. Students attempt to count the rats and figure how many rodent-eating owls might restore the population balance.

ENVIRONMENTAL STUDY AREAS: Environmental settings designated as study areas because of the ways in which they illustrate environmental relationships: biological, geographical, esthetic, technological, economic, political, cultural, etc. See Page 3.

ENVIRONMENTAL VALUES: A set of standards dictating the nature of man's relationships with his environment, in which the good of that environment is the foremost consideration.

FOOD CHAIN: A variety of living things depending upon one another for food; for instance, herons feed on fish, which feed on snails, etc.

ESA GLOSSARY TERMS continued

GEO-ENVIRONMENTAL SITE CLASSIFICATION SYSTEM: A means of classifying ESAs relative to their geographical and environmental features. See Page 6.

LESSON PLAN: The preparation a teacher makes for any particular class or lesson(s) to be taught.

NATURAL RESOURCES: Industrial materials and capacities (such as waterpower) supplied by nature.

POLLUTION: An unnatural additive to the natural environment which causes an adverse effect. Noise pollution, water pollution, air pollution, and land pollution are commonly discussed as environmental problems.

STRANDS: Universal concepts used in environmental education as a means of synthesizing relationships. See Page 17-19.

TECHNOLOGY: The use of science and mechanics to achieve a practical purpose; the totality of the means employed to provide objects necessary for human sustenance and comfort.

TOPOGRAPHY: The relief features and surface configurations of an area.

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AUDIO-VISUAL AIDS

Materials, pamphlets, and audio-visual aids are readily available from national, state, and local Fish and Game agencies, Water Resource Departments, Forestry, Agriculture, and Parks and Recreation Departments.

Audio-visual aids with local ecological relevance most likely exist; your county Office of Education should be contacted for information.

An ecology and related-subjects catalog of slides, films and other teaching aids for rental or purchase is available by request from the National Audubon Society, Photo-Film Department, 1130 Fifth Ave., New York, New York 10028. The Society offers special prices for schools.

A Critical Index of Films and Filmstrips: Dealing with Renewable Resources, Non-Renewable Resources, Resources and People, and Ecology is available from the Conservation Foundation, New York: 79 pages, $1.00.

TEACHING MATERIALS / LESSON PLANS

The National Park Service has developed packets of lesson plans applicable to any environment and all segments of the curriculum. Write to:

National Environmental Education Development, National Park Service, Washington, D.C.: *Attention:* Mr. Robert Nunn, for details.

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You can do something about it.

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