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An environmental education center in Scott County, Tennessee a proposal

Charlotte Ann Shea

To the Graduate Council:

I am submitting herewith a thesis written by Charlotte Ann Shea entitled "An environmental education center in Scott County, Tennessee a proposal." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Ecology and Evolutionary Biology.

Frank W. Woods, Major Professor

We have read this thesis and recommend its acceptance:

Kerry F. Schell, Thomas H. Ripley

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To the Graduate Council:

I am submitting herewith a thesis written by Charlotte Ann Shea entitled "An Environmental Education Center in Scott County, Tennessee: A Proposal." I recommend that it be accepted for nine quarter hours of credit in partial fulfillment of the requirements for the degree of Master of Science, with a major in Ecology.

Frank W. Woods
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We have read this thesis and recommend its acceptance:

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AN ENVIRONMENTAL EDUCATION CENTER IN SCOTT COUNTY, TENNESSEE: A PROPOSAL

A Thesis

Presented to

the Graduate Council of

The University of Tennessee

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

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by

Charlotte Ann Shea

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ABSTRACT

The purpose of this investigation was to determine the feasibility of using the Cowan Creek drainage in Scott County, Tennessee, as the site for an environmental education center, and to propose specific facilities and program outlines to be implemented should the site prove acceptable. The site analysis was used in the development of center purposes, in the format of the teaching program, and in the design of the facilities.

An examination of the Cowan Creek location was conducted using United States Geologic Survey Maps, by constructing and analyzing three-dimensional contour maps, and by exploring the area on foot. Using National Audubon Society criteria as a guide, it was determined that the site was suitable for the purpose of environmental education. Subsequent trips were made to the area to compile species lists, to define instructional areas, to analyze construction locations, and to obtain the history of the drainage area via personal interviews.

Following site analysis, sample program outlines were devised and designed specifically for a Cowan Creek environmental center. Each major subject was organized according to student age divisions. Example lesson plans were developed for grades 1-3, 4-6, and junior-senior high school students.

Facilities for center living were designed, including dormitories, a teaching and administration building, and a maintenance building. Also considered were special educational features, roads, and utilities. Estimated costs for construction and outfitting, operational expenses, and costs for an individual site user were compiled.

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INTRODUCTION

In the past few years, environmental education has come to occupy new and prestigious positions in the realm of American educational thought. With ever-increasing emphases from the news media, popular reading materials, and everyday living, the condition of the world's environment is constantly presented and analyzed for the citizenry.

Much concern and interest have been focused on the subject of living standards and environmental conditions; at the same time, much confusion exists over the extent to which environmental phenomena influence man's level of existence. By and large, the American public is ill-prepared to assimilate and judge the various and conflicting reports on the state of the spaceship Earth.

The task of environmental education has been to acquaint the layman with the principles and interrelationships of life as we know them. This has involved education in the natural and physical sciences, the social sciences, language arts, and all other subjects to which man has lent his mind. It has striven to guide the thinking of the American public by presenting in simple, clear, and emphatic terms the nature of the world in all its facets.

Nevertheless, though the environmental movement has recently gained popularity and momentum, much remains to be accomplished. While certain areas of the nation have been operating environmental centers for twenty-five years, other areas are in an early stage of the development of such programs. Large portions of the nation are without access to centers where such environmental information may be disseminated, digested, and employed.

It is felt that an environmental education center would serve such a purpose in the area of Scott County, Tennessee. In this portion of the State, other centers with similar purposes are removed to the extent that travel to and from the sites is not feasible. Considering the specific locality, the benefits of an environmental education center to the Scott County area, and the availability of the land, this thesis seeks to define and outline such a facility and program unique to that site.

CHAPTER I

A BRIEF HISTORY OF ENVIRONMENTAL EDUCATION

Since the founding of the British colonies in America, a succession of resource-use concepts and management practices has been manifested by the American public. One of the most recent conceptual developments in this area is the theory of environmental education. The progressive assemblage of ideas presently associated with environmental education had its foundation in the resource attitudes of the early colonists.

At the time of the colonization of the New World, the mineral, plant, animal, and soil resources were viewed either as barriers to the establishment of communities or as limitless, exploitable commodities to sustain and enhance life. The highest quality of timber was used for houses; the best soils were farmed, often carelessly; the largest and finest game animals were shot; and the richest mineral lodes were mined. In general, only the choice resources were tapped, much as is done today.

However, in those times, when resource quality declined, it was possible to abandon a site and move on toward, literally, greener pastures. Therefore, resources such as forested lands or swamps were destroyed in attempts to found new communities, while others, particularly farmlands, were utilized to the extent that they were of no value to the community.

As this country grew and progressed, these colonial attitudes prevailed and were carried westward into the grasslands, eventually to

the Pacific coast. Natural resources were exploited and abandoned, or reduced and destroyed. Human resources, too, were often overrun, subdued, and misused. Cultures impeding progress were eliminated, and life styles adapted to a close dependence on natural surroundings were ravaged. Minds realizing the importance of thoughtful resource-use and the necessity of heeding the natural relationships of the environment were tolerated but largely ignored.

As the American economy grew and scientific knowledge attained new heights of significance, the American conscience was stimulated to review and revise the principles of resource-use, natural and human alike. This social awakening led to the conservation and use of certain resources as scenic areas, historic records, geologic features, parks, forests and wildlife refuges. Yet for a time, this was the extent of the resource ethic: the preservation of particular features of the land. It was at this point that Aldo Leopold summarized the state of the public conscience with his noted remarks on the need for a new "land ethic" that restates man's relation to the earth from which he comes.[1]

There seemed to be a general public tolerance of Leopold's statement, but no imposing urgency of purpose was evident. Until the public became aware of the state of misuse of the environment, little beyond the teaching of conservation courses in schools was done to formulate this land ethic. These classes varied in subject matter, scope, and basic philosophy. Some would more properly be termed "preservation

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[1]Aldo Leopold, A Sand County Almanac (New York: Oxford University Press, 1949).

instruction," stressing the complete protection of forests, wildlife, soils, and waters. On the other end of the continuum were the classes emphasizing the wise use of resources. These courses accentuated the characteristics of renewability or nonrenewability of certain resources and the concepts of management for the fullest current resource-use and continued utilization for future use. For several years the sole directive toward the creation of the "land ethic" was conservation education.

At this point, a new movement came to the fore--outdoor education. Many teachers began moving their classes into the out-of-doors to teach natural principles. They often found demonstration and observation of natural phenomena to be more conducive to learning than lecturing or classroom investigation. Short trips around the school yards lengthened into field trips away from school grounds until eventually educational systems began acquiring lands for longer excursions. Overnight outings, weekend forays, and week trips became possible. The school camp came into being. As early as 1937 San Diego schools had a year-round camp available for outdoor conservation education.[2]

The emphasis in outdoor education and school camping has continued to grow, and more school systems are obtaining sites for school camps. The objectives of outdoor education have broadened, however. With the beginning of the public to notice scars over the countryside from indiscriminant land use, the decrease in atmospheric visibility from particulates in the air, intensified population pressures resulting from increased ratios of individuals to units of available resources and space,

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[2]Wilbur Schamm, Classroom Out-of-doors (Kalamazoo, Mich.: Sequoia Press, 1969).

the decline in common plant and animal species and the growing numbers of "pest" species, the multiplying health hazards from chemicals in foods and the atmosphere, and the general decline in the quality of the world environment, an unprecedented readiness and desire for environmental education on the part of the American public has presented countless opportunities for teaching environmental subjects.

Program goals are now being expanded beyond those of the classic science-field-trip, so that what was once termed outdoor education might now more properly be labeled "environmental education". Outdoor education is often, though not universally, a conservation education program, while environmental education is that and more. The most basic philosophical difference between outdoor education and environmental education is that the former does not necessarily imply education via the entire environment. H. H. Visher defined conservation education as:

> . . . the sum of all learning experiences which result in a better understanding of and an appreciation for the nature and complexity of the natural environment; increased recognition of the dependency of human welfare upon a wise adjustment to the earth; a sensitivity to resource misuse; a desirable combination of favorable attitudes toward the wise use of the earth; and a feeling of individual responsibility for its continued productiveness and well-being.[3]

Environmental education has its basis in this definition, for conservation education is a vital part of an environmental design.

Yet an additional idea enters into environmental education philosophies . This concept is one of total environmental learning. Just as all our knowledge today has come from interpretation of the environment,

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[3]H. H. Visher, "Conservation Education through Social Studies," Journal of Geography, LI (March, 1952), 89-96.

diagnoses of resources, social structures, mental perception, space and time, so environmental education seeks to introduce the procedures of interpretation and consolidation of knowledge available to each individual in his unique environment. Thus sciences are pursued through an interpretation via the senses, emphasizing those sensors which are often neglected in information-gathering. Sight, taste, touch, smell, hearing, and tension sensing often reveal new depths of understanding and appreciation which can be enhanced by an individual's formal expression of his observation. Once a student grasps the fundamentals of a particular science through sensory perception and communication with other individuals, the potentiality and practicality of that science may then be considered and explored.

The social studies are considered by observing and participating in a functioning group. Social structures and their evolution are studied by the actual construction of a social framework. Language arts become tools through which the student records his observations and learnings and communicates his knowledge and experiences to his fellow students. Art and music take on new meanings by noting the rhythms, sounds, and patterns in one's environment. Mechanical and technical knowledge is gained by experience with tools of the organizational operation--the water works, electrical power sources and their distribution, construction of buildings and educational materials, trail construction and layout. In short, environmental education is that teaching and learning which an individual gives and receives through and from his environment. This encompasses all phases of formal and informal education, sciences,

social studies, language arts, fine arts, mechanics, shop, physical education and recreation, technical skills, and social interactions.

Whatever the teaching methods employed, there are certain basic goals of environmental education programs. First, each program seeks to sensitize participants to the environment to "make them increasingly aware of the ways in which the environment shapes man and the way man shapes the environment."[4] This might be considered the foremost goal of environmental programs. That man is dependent on and influential in his world is an essential principle in each unit taught and in every activity. Whether the subject be physical education, geography, government, or creative writing, the purpose of an environmental education program is to teach man's reliance on natural phenomena.

A second integral part of every program is a conservation and resource-use emphasis designed to acquaint the student with the flexibility or inflexibility of various resources and to prepare segments of the American citizenry for responsible decision-making regarding our resources. J. J. Shomon comments on this goal:

> . . . There is interest among people or groups to safeguard our natural environment. The problem ahead, however, lies in transferring what is needed into what is really wanted by the body politic. . . . There exists in America a distinct need for a geographical-ecological awareness among men. . . a feeling of responsible stewardship toward all that nature is, toward all our land is and represents.[5]

He speaks of a geo-biotic ethic which does not exist and must be created,

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[4]James M. Major and Charles A. Cissell, Environmental Education Objectives and Field Activities (Paducah: Paducah Public Schools, 1970), 2.

[5]J. J. Shomon, Manual of Outdoor Conservation Education (New York: National Audubon Society, 1964).

in his opinion. Thus a third characteristic of any environmental study is the creation or enhancement of a feeling of responsible concern toward man's environment.

Fourthly, an environmental education program attempts to provide an integrated view of man's situation, considering physical and biological aspects of man's cultural, social, economic, and aesthetic nature.[6] Man is presented in his incompletely-known entirety. The biological man is not emphasized to the exclusion of the cultural and the economic man or any other facet of humanity. All are considered as one, interacting with the world environment.

A final characteristic and goal of environmental education design is to create an awareness of environmental problems and to develop a populace with the ability to objectively analyze environmental changes and interpret their effects. This goal, of course, is of continuing proficiency, one which develops and improves with use and experience. Creating the interest and concern for the environment and the many influences acting within it on the part of students may well be the first encounters with environmental analysis and responsible action on an individual basis.

Though goals and characteristics of environmental programs are strikingly similar across the country, the teaching designs for accomplishing these aims are varied. Classes are conducted in and out of the classrooms, in urban and wilderness areas, by the regular class teacher and by resource teachers. An advantage to environmental teaching is

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[6]Clay Schoenfield, "What's New About Environmental Education?," Environmental Education, I(1) (Fall, 1969), 1-4.

that it can be conducted at any time and in any place. Applying this to our public schools systems, this means that it may be taught within or without the schoolroom, on or off the school grounds.

Of course, there are certain phases of environmental investigation which are best conducted within an enclosed setting such as a laboratory or library. Water samples often require chemical analysis that can only be performed with laboratory procedures and equipment. The natural history of an area may be more fully investigated through reading accounts contained in the library. Certain art techniques require the protection of a building and the availability of water that an arts and crafts room affords. Weather may not permit a discussion of an author's description of natural phenomena to be conducted in the out-of-doors.

On the other hand, many subjects are best investigated outside classroom walls. Cloud formations require firsthand experience to acquire deeper significance. Leaf collections may be begun. Habitats of animals are better understood when they can be walked through or sampled or simply observed. Tombstones in old cemeteries often bestow more insight into the effects of the environment on social characteristics than will hours of classroom lecturing. Physical education and recreation expand in their possibilities for activity in the out-of-doors, and forestry management practices become real conceptual tools when they can be investigated where they occur.

In addition, there are those subjects which are best presented through a combination of methods. Soil studies are more meaningful when a student collects his own samples, observes water and plant relationships

with the soil, and then continues his analysis in the laboratory where variables may be controlled, minimized, or maximized for optimum data return. Certain types of weather information can only be collected outside, but the analysis of the data might best occur inside. The exploration of a homesite is conducted to the greatest benefit to the student on the actual site, rather than via pictures or books. Nevertheless, the construction of a model homesite patterned after the original would be most easy to complete in the protection of a building.

Each school system, each school within that system, and each school camp has its own peculiar methods of teaching, whether it be strictly outdoor instruction or a combination of methods. Nonetheless, aims and goals are identical.

The most glaring difference among environmental programs is philosophical. Should environmental education be taught as a separate course or as a fundamental principle encompassing all fields of interest? One school of thought holds to the tenet that it is best presented by way of a separate course which deals with such subjects as soil, water, wildlife, resource management, language arts, and math. This is a course offered in addition to the students' other courses. Some systems conduct their environmental education in this manner. However, considerable criticism of this method has been offered. The most noted objection is that the separate course does not serve to unite all subjects to the extent that the following method does.

This second theory is that of recognizing fundamental principles that underlie and encompass all fields of interest so that environmental

principles are taught when functional in other disciplines. In this manner the environment may be perceived as being fundamental and functional in any subject or situation. It is this second theory of environmental education that is incorporated in the following design of a center for Scott County, Tennessee.

CHAPTER II

PURPOSES OF THE ENVIRONMENTAL EDUCATION CENTER

A set of specific goals for the Cowan Creek facility will endeavor to integrate the theory of incorporating fundamental environmental principles into all subjects when these guidelines are functional. These aims are:

1. To provide a setting for school classes to visit and to live in the out-of-doors during the school year; while there to study all subjects regularly covered in a classroom setting, using the outdoors as an experience base for concepts which are developed as abstractions in the classroom; to use the total environment around the student as a laboratory for teaching;

2. To provide an opportunity for the student to develop an appreciation for and an understanding of his environment, its resources, interactions, and its need to be wisely managed; to develop in each student an awareness of his reliance on nature and natural phenomena, and his responsibility to enhance these processes;

3. To reinforce classroom learning; to provide motivation for classroom learning; to enrich classroom curricula and to present the curricula in a varied and interesting method;

4. To provide each student an opportunity to develop an appreciation and affection for the outdoors, derived from a natural setting;

5. To be used not only as an extension of the school system, but also to be available for community, area, regional, and State use as a

site for meetings, conferences, summer camp conservation programs, retreats, etc.; to be used to educate all those in contact with the program according to the above goals.

These purposes are similar to others adhered to in many environmental education centers; at the same time, they are peculiar to the Scott County center in that the populace to benefit from this facility differs from those persons having recourse to any other center.

Certain implications are noted when populations exhibit distinctive regional features. One is that teaching examples and methods must be modified for maximum effect. Sand dunes and spruce-fir forests are contrasting habitats. Yet while both are acceptable illustrations of the effects of habitat management, Gulf Coast Texans would respond more favorably in understanding to the sand dune examples than to those of the spruce-fir forests.

In order to determine which methods and activities are most suitable to a specific area, it is necessary to consider the population concerned, their peculiarities, attitudes, and distinctive qualities, and the features of the land. The sample programs contained in this thesis have been designed for both the populace and the land in and around Scott County, Tennessee. The above center purposes are applicable to any environmental facility; yet, with specific teaching tools and methods of accomplishing these goals, the aims become peculiar to the Scott County center.

CHAPTER III

SITE DESCRIPTION, HISTORY, AND POPULATION DESCRIPTION

Scott County has been chosen as the site for an environmental education center because of the local need and because of certain features of the surrounding area and its inhabitants which, it is assumed, would enhance such a project. The rationale for such a facility centers around two unique site characteristics--the physical properties of the site and the history of the area.

According to the National Audubon Socity, there are three fundamental requirements for a site to be considered as a potential environmental education center: (1) that the site be suited for the purpose of environmental education and not merely leftover land; (2) that the size of the area be adequate--the larger the site the better adapted it is for educational purposes; and (3) that the area include a variety of landscapes, soils, habitats, and vegetational types.[7] It is felt that the Cowan Creek watershed meets the above requirements in addition to possessing special site characteristics for environmental learning. It has, therefore, been chosen as the site for the proposed environmental education center. The natural resources of the site lend themselves readily to investigation and study; site features are exceptionally appropriate for social studies and exploration; and,

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[7]J. J. Shomon, Manual of Outdoor Interpretation (New York: National Audubon Society, 1968).

lastly, the site is available for environmental education purposes and is easily obtainable.

I. SITE DESCRIPTION

Ownership

The entirety of the Cowan Creek drainage, approximately 1,300 acres, with the exception of the extreme mouth of the creek, is currently owned and managed by the University of Tennessee, and the land-use practices on this area are dictated by the University College of Agriculture, Department of Forestry, at Knoxville, Tennessee. The entire tract of land owned by the University in Scott and Morgan Counties is being analyzed and examined for maximum land-use practices, and the Cowan Creek drainage, with its special potentialities for instruction, is peculiarly appropriate for environmental education.

Geography and Soils

Cowan Creek is located in the east-central area of Tennessee, between Wartburg and the Tennessee-Kentucky line, at 36° 30' latitude and 84° 33' 75" longitude. It is topographically classified in the Cumberland Plateau, a division separating the Valley and Ridge formation from the Highland Rim Section. The creek drains a long, narrow watershed, flowing due north from Griffith Mountain and joining Mill Creek to form the Black Wolf Creek, a tributary of the Clear Fork River. This river eventually enters Lake Cumberland in Kentucky via the South Fork.

Soils in the drainage are derived from Pennsylvanian parent material. These parent materials fall into five formations: The Vowell Mountain, Grave Gap, Redoak Mountain, Indian Bluff, and Slatestone Formations, and the Crooked Fork Group. The Vowell Mountain formation is found along the tops of the higher ridges surrounding Cowan Creek. It consists of shale, sandstone, siltstone, and coal and ranges in thickness from 230 feet to 375 feet. Immediately below the Vowell Mountain formation is the Redoak Mountain division. This formation and the adjacent Grave Gap formation have a similar composition to the Vowell Mountain association. The coal beds are largely of Windrock and Pewee coals. The Indian Bluff formation contains thin beds of Jellico coal in addition to the shale, sandstone, and siltstone of the other formations. Separating the Indian Bluff formation from the bottomland groups is the Slatestone formation. This is by far the thickest formation in the drainage, extending from 500 feet to 720 feet in thickness. Here the Jellico coal is joined by the Poplar Creek coal. Finally, the bottomland soils are derived from the Crooked Fork Group, an association of shale, sandstone, conglomerate, siltstone, and coal. Glenmary Shale, a dark-gray to light-brown shale with minor siltstone and sandstone deposits with a thin coal near its base, is a common component of this group. In addition to the shale is the Wartburg Sandstone, a gray to brown sandstone which is fine- to medium-grained.

Vegetation

The vegetation of Cowan Creek is representative of that found in East Tennessee. Forest stands of oak-hickory and tulip poplar are

interspersed with pine plantings and naturally occurring pine stands. Laurel thickets and young locust stands are found close to cane associations along the creek. Hemlock pockets are common along the creek's tributaries. Old fields are in early seral stages. On certain exposed creek banks, primary succession occurs. There are many species of shrubs, grasses, wildflowers, mosses, fungi, and lichens, a partial list of the most abundant of which occurs in Appendix A. This listing was compiled on the several visits to the site. Species which are included are those which were encountered on walks over the land.

The drainage forests are the results of farming, logging, and fires. Saplings and shrubby undergrowth are dense, and there are few trees of commercial value. Black gum, chestnut oak, and black oak comprise the dominant species on the upper slopes, while immediately below the strip and auger coal mines at the head of the valley are the tulip poplar-black cherry-black locust-red maple associations. These are largely experimental plantings, though the black locust occurs throughout the drainage on all slopes and exposures. Hickories, dogwood, white pine, witch hazel, and beech appear on the lower slopes, while Virginia pine is prevalent on the lower slope old field sites. At the northern end of the drainage the locust and cane become the most abundant species along the creek. On the lower slopes here, pines predominate as old fields become more numerous. On both the northwest and southeast facing slopes at extreme lower elevations, wild flowers are abundant, affording excellent opportunities for the development of wild flower gardens and nature trails along the southern end of the drainage.

Wildlife

The wildlife species found on Cowan Creek are representative of those found in East Tennessee. (See Appendix B.) Aquatic communities, open field associations, forest habitats, and soil communities all boast their various species.

Most of these animal populations can be maintained with good management practices coupled with multiple-use planning of the site. This includes the construction of necessary buildings and roads in areas removed from a population's habitat requirements, the setting aside of sites specifically for wildlife management areas, a minimum of habitat destruction, and a rotation of instructional sites to afford regular respites to particular wildlife domains. With the construction of the camp facilities, the increased forest openings may also enable other species to become established on the site.

Social Studies Features

In addition to the natural features of Cowan Creek which can be employed in environmental teaching, several regions of the drainage are exceptionally suitable for teaching social studies and investigating economic aspects of land use. The numerous abandoned homesites, school buildings, community and family cemeteries, and the deserted coal mines above the valley provide many lessons of man's dependence on the land and resources in his activity.

There are five homesites either in or in close proximity to Cowan Creek. Three of these are in favorable condition, with the dwelling

places standing or with the foundations still visible. One old farm homesite retains a barn, corn cribs, a smokehouse, and a root cellar, in addition to the ruins of a still. A second site affords the remains of the home, bee-stands, a cellar house, barn, and two roads which have fallen into disuse. In close proximity to this homesite are an old family cemetery and a specially fascinating cave whose legends date back to pre-Civil War years. The third site boasts two dwellings. One is a log cabin in exceptional state with the roof and ladders to the attic still in evidence. The second is a stone house; in this case, the foundation and chimney are the most outstanding features. In addition, this third homesite has a stone creek-wall to retain the creek tributary in times of heavy rainfall.

Stone fences are evident throughout the watershed, and in many cases, it is possible to define other sites of construction, though any analysis of the sites is difficult due to their states of disrepair. It is suspected that one or two sites are the remains of small sawmills that were common in the valley. Others are various structures of farm life and an old schoolhouse.

The coal mines above the creek are also available for instructional purposes. There are three types of mines on Griffith and Young Mountains--auger, shaft, and strip. The strip mines are in particularly appropriate condition for teaching as are the auger holes; yet the shaft mine requires the construction of safety devices before any teaching may take place.

Other Site Features

Other general attributes of Cowan Creek which make it acceptable and desirable as an environmental education center are its location for privacy and solitude, its minimum of natural and man-made hazards, its proximity to adequate medical services, its year-round accessibility by road (although the construction of a service road to the valley proper will be necessary for camp traffic), the constant water supply, and its propinquity to a sizeable population in the southeast and mideast. In addition to the above, the history of Cowan Creek watershed is a singularity conducive to environmental learning and teaching.

II. SITE HISTORY

The Cowan Creek watershed was originally a part of the Sol Young land grant and, as is much of the land in east-central Tennessee, it has been homesteaded, farmed, lumbered, burned, and mined. Young, a landowner in Morgan County over one hundred years ago, desired to hold property in Scott County rather than in Morgan County. Consequently, the local governments agreed to a county line change which resulted in the Sol Young grant being in Scott County.

About the time of the Civil War, Young sold a 1,000-acre tract of land adjoining Cowan Creek to the Bryn-Mawr Land Company which held the property for a time before selling out to Knoxville Table and Chair Company. The land was lumbered until the early 1920's when Harrison Land Company, now the Cumberland Plateau Real Estate Company, bought the

tract. The property is currently held by this company and adjoins the University property.

After Young died, the Young heirs managed the grant, a part of which was sold to Aaron Armes who homesteaded the Service Flats region above the head of Cowan Creek on Griffith Mountain. Eventually Armes and another man, Mr. Haun, sold their portions of the Sol Young grant to the University of Tennessee, the current owner. Armes' heirs, however, are still in possession of a tract of fifteen acres adjacent to the University property on Service Flats. This land has been farmed, logged, and is now being mined for two four-foot seams of coal.

While the transactions were continuing between Young, his heirs, and the various land companies, Cowan Creek was being homesteaded and farmed by two families related to Young. Henry Young settled along the creek about one hundred years ago. He had been raised on the grant, attending a school on the top of Griffith Mountain, living his life in the vicinity of Cowan Creek. His son Wesley Young eventually built his own home down-creek from his father and farmed the land. Another family, that of Tilman Sexton, settled in a branch of the creek from Wesley Young. The homes were occupied until the 1930's. In addition to the homesites, the W. M. Ritter Lumber Company operated a logging venture one-half mile upstream from Henry Young's house. The logging camp consisted of bunk-houses and barns and concentrated on logging the virgin timber at the head of the creek. At the foot of the mountain an incline to Service Flats was constructed to facilitate the logging operations. The lumber company ceased operations on Cowan Creek in the 1940's when the area

suffered a serious fire. The log slides from the logging operations are still evident.[8]

Since the University of Tennessee acquired the land, numerous plantings and experiments have been conducted in the creek valley. Tulip poplar plantations and pine stands are objects of research over a sizeable portion of the valley, and until recently the only activity in the valley has been the periodic testing, censusing, and sampling of the research plots.

This history and the physical features of the Cowan Creek watershed have lead to the development of specific sample programs. These programs are represented in the following chapter.

III. DESCRIPTION OF POPULATION TO BE SERVED

Scott and Morgan Counties are the homes of over 16,000 people. Seventy-five percent of the households in both counties receive an income of $5,000 or less per year. Approximately two-thirds of the work force is engaged in nonmanufacturing and agricultural pursuits. These jobs and the manufacturing positions account for a yearly per capita income of $1,100 in Scott County and of $1,067 in Morgan County. This may be compared with per capita earnings in the following areas of the State: Knoxville--$2,671; Memphis--$2,737; Chattanooga--$2,798; and Nashville--$2,984.[9]

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[8]Personal communications with Mr. English Armes, Deer Lodge, Tennessee, and Mr. and Mrs. Arthur Young, Mill Creek Community, Tennessee.

[9]State Planning Division, Income and Employment in Tennessee (Nashville: Tennessee State Planning Commission, 1970).

Of these 16,000 persons, 8,000 are school age youngsters.[10] It is this segment of the population which will benefit most from an environmental center on Cowan Creek. If the camp services 120 persons as a maximum, it would be possible for over half the currently enrolled school children to make use of the facility in one year, assuming 36 weeks of operation. If the camp were run for school classes in the summer, an additional 1,500 children would be reached. Yet, even operating solely during the school year, every child in Scott and Morgan County school systems would average one extended visit to the facilities every two years, totaling six weeks of study on the site by the time a student graduates from high school. This is a fairly intense exposure per child.

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[10]E. C. Stimbert, Commissioner, Annual Statistical Report of the State Department of Education 70/71 (Nashville: State Department of Education, 1971).

CHAPTER IV

SAMPLE PROGRAMS

I. SOILS

Grades 1-3

Objectives: To learn what soil is; to learn how soil is formed; to learn how soil is used

Basic Vocabulary: sand, dirt, rock, organic matter, water, air, organism

What is soil? Have the students look at the soil. Ask: What colors can you see? Can you find any animals in the soil? If an animal lives in the soil, the soil is called its habitat. What kinds of animals can you find? Do you see any plants in the soil? Have the class get a small handful of soil. Does the soil feel wet? Does the soil form a ball when it is squeezed? Does it stick together at all? How does the soil feel? Is it hot or cold or neither or both? Rub some soil between your fingers. How does the soil feel? Is it gritty, sandy, muddy, or dry? Can you hear sounds when you rub the soil near your ear? Smell your handful of soil. Does it have a smell? Describe the smell.

What is soil used for?

1. Soils are used to grow food. In this activity, have the class either plant seeds or seedlings or harvest a crop. Why do we cover the seeds? Does the soil protect

the seeds? Why do plants grow in soil? Can people eat soil for food? What do we use instead? How do we use soil for getting good? How many people could we feed with our garden? One or two? One dormitory? The whole camp? How could we feed more people? Can we grow food everywhere there is soil? If possible, visit nonagricultural areas.

2. Soil is used to grow trees. Visit one of the pine plantations with the class. Why do trees need soil? Why does soil need trees and other plants? Take cans of soil in which one soil sample has no vegetational covering and one is covered with grass. Pour water over the soil and measure the amount of water that comes out the holes in the can bottoms. How do people use trees?

3. Soil is used for building on, walking on, etc.

4. Soil is used as a home for some animals.

How is soil formed? Give each child two pieces of rather soft rock. How could you make soil from these rocks? Make some soil with your rocks. How do you suppose rocks become soil without someone to pound them together? Walk along to find areas of primary succession. Can land plants grow without soil? How do you suppose the mosses and ferns grow on these rocks? Explain how roots speed the disintegration of rocks. Walk by the creek or cliff areas. What do you see in the rocks here? Have you ever seen cracks in asphalt or sidewalks or pavement? Explain freeze and thaw actions. Observe litter and humus on the ground. Look for decaying organisms.

Increased Vocabulary: texture, soil, habitat, litter, humus, minerals

Grades 4-6

Objectives: To learn the three components of soil; to distinguish organic from inorganic matter; to learn the differences among soils of different environments

Basic Vocabulary: humus, texture, litter, inorganic matter, organism, organic matter

Physical Properties: In each of four environments (old field, forest edge, interior of the forest, water's edge) have the students investigate the soil. On a square foot area: (1) take the temperature of the air (three feet above the ground) and of the soil (at ground level and six inches below the soil surface) and record; (2) remove and save the litter. Can you recognize what the litter is made of? (3) Investigate the humus. Can you find individual organisms? Is the humus "flaky" or "in pieces" or "in layers"? Carefully remove the humus and save it. (4) What color is the soil beneath the humus? This is the topsoil. (5) What is the texture of the topsoil? Rub some soil between your fingers. Can you feel particles? Are they gritty (sand)? Are they finer than sand (silt)? Do they stick together like clay (clay soil)? (6) Soil also has a moisture content. Will your soil form a ball or does it crumble when you squeeze it in your hand? What does this tell you about how much water is in the soil? (7) Now

dig a hole one foot deep. Can you see a change in soil color in this hole? How deep is the topsoil here? (How deep does the topsoil color continue?) Below the topsoil is the subsoil. (8) Now in an area one square foot dig down four inches. Put the soil you dig into your soil sieves. Put the soil into the sieve with the largest holes first, and shake the soil through into the sieve with the second largest holes. What is left in the first sieve? Can you separate the organic matter from the inorganic matter? Put the plant materials (roots, leaves, seeds, acorns, etc.) in one pile; record the animal life you find. What is it? How many do you find? Place the mineral particles in one pile. Now sift the soil through the second sieve into the third. Can you separate the organic from the inorganic matter now? Place the plant, animal, and mineral parts in separate piles. Are these piles as big as the ones you made from the first sieve? Why? What is happening? (9) Now carefully replace the soil and recover it with the humus and litter.

Increased Vocabulary: topsoil, sandy soil, silty soil, clay soil, subsoil, moisture content

Junior-Senior High School

Objectives: To discover some chemical and physical properties of soil; to discover some plant-soil relationships

Basic Vocabulary: organic matter, mineral content, clay acidity, moisture content, alkalinity, sand, silt

Chemical and physical properties: Activities will be conducted in four sites--the forest, the forest edge, a field, and the water's edge. (1) Take the air and soil temperatures, recording the readings for one foot above the ground, six inches above ground, at ground level, and six inches below the soil surface. (2) Dig a hole one foot deep, noting soil color and depth of the color. Record this. (3) How does the soil feel when rubbed between your fingers--gritty, sandy, clayey, muddy, fine, coarse? (4) Will the soil compact into a ball? Why or why not? (5) With two tin cans full of soil from each habitat, determine the moisture content of the soil in one can (weigh, dry, reweigh, and record); then burn the soil until all organic matter is destroyed and weigh. Determine the percentage of organic matter and the percentage of mineral content for each sample. With the second can of soil place the soil in a glass container; pour water over this soil and shake. Let the mixture settle and dry. Record the characteristics of the layers you see (color, particle size, texture, etc.) In each of the four habitats follow the instructions in the soil testing kits and determine the acidity or alkalinity of the samples of soil taken at ground level, six inches below the soil surface, and one foot below ground level.

Plant-soil relationships: What life-form of plants do you see in each area? Record these life-forms. What are the names of the

plants? Record these. Review the characteristics of the soils of each area. Compare these with life-forms found.

Increased Vocabulary: pH, ecotone, life-form, texture

Suggested Activities For Soil Studies

1. Construct check dams on the camp land where they are needed.
2. Plant vegetation on erosion surfaces (trees, grass, shrubs).
3. Calculate the tonnage of organic matter as litter and humus at Cowan Creek camp.
4. Show the effect of soil characteristics on the temperature of the soil.
5. Make some soil.
6. Make soil core samples and display the different soils on camp land.
7. Make a worm farm.
8. Care for a section of the garden every day. Record how you cared for it.
9. Make a poster of soil animals.
10. Make a poster showing how soil is used by man.
11. Make an exhibit of how soil forms.
12. Draw and lay out a trail on the camp land to be used for a hike to investigate camp soils.
13. Write a history of the Cowan Creek soils.
14. Analyze chemically the soils in the drainage and write a report of your findings.
15. Plant vegetation which will enrich the soils on appropriate areas of the camp. Report on your project to your class.

II. WATER

Grades 1-3

Objectives: To discover that water is necessary for life; to discover that water is a home for many organisms; to discover that water moves in a cycle

Basic Vocabulary: liquid, rain, ground water, stream, organism, thirsty, use

Water is necessary for life: Take the class to the stream and let them observe the stream environs. What animals and plants do you see here? Why do you think these organisms live in this particular place? What would happen if the stream dried up? What happens when a goldfish is taken out of its bowl or when you forget to water a plant in your house? What would happen if you forgot to give your pets water for a day or so? What happens when you eat something salty or when you run and play hard? If you and I could drink no water for three days, we might die. Explain that certain foods contain water and can be substituted in emergencies when water is unavailable. How many things can you name for which water is used? Name some things that would happen if all our water was gone or if it was all polluted.

Water is a home for many organisms: After the class has discussed the necessity of water for life, divide them into three groups, sending one group to a "rapids" area, one to the "riffles" area, and one to a "pool" area. Let them collect animal

life they find (polliwogs, salamanders, water pennies, small fish, aquatic insects, etc.). Have them draw the plants they find. Collect a bottle of water from each area to be taken back to the microscopes and observed to see what is in each. Record animal tracks, homes, and other animal signs near the water's edge.

Water moves in a cycle: Question the class on the presence and travels of water in Cowan Creek. Where does the stream water come from? Where is the water in the stream going and what happens to it on its way? How does the water in the ocean get into the air to form rain? What happens to rain or snow when it hits the ground?

Increased Vocabulary: riffles, rapids, evaporation, cycle, spring, algae

Grades 4-6

Objectives: To discover the nature of water; to discover that soil and water are related

Basic Vocabulary: life-forms, water cycle, texture

Water occurs in three states: In the laboratory have the students melt ice cubes until they become liquid. Remove the water from the heat and observe. What is the color of the water? What shape does the water take? What is the texture and temperature of the water? Replace the container over the heat and bring it to a boil. Put your hand over the container for a few seconds. How does your hand feel? When you remove your hand what do you observe? Connect the water's

container with another glass bottle by way of rubber stoppers and glass tubing. When the bottle of water is replaced over the heat what happens to the water? Where does it go? From your observations, make a table of the three states of water, their shapes, relative temperatures, and textures. How do we use water in all three of its states?

Water is necessary for life: Take the class to the creek. How many life-forms are seen here? What are these? What would happen if the stream should dry or become badly polluted? What happens to plants when they do not receive any water for a period of time? To pets when you forget to give them water? How do you feel on a hot day or when you have eaten something salty or played hard? Think of a plant that has not been watered for several days. Does it look the same as the plants we see around this creek? How does it look different? What do you use water for? How many things would you not be able to do if there was no water?

Water contains solid particles: Take a glass of water from the stream before a rain. Take one after the rain. Observe and compare the two glasses. Take water samples from various areas of the stream--the riffles, rapids, and pools--and some from the pond. Let the samples settle overnight. Observe and record your findings. Observe a drop of stream water and a drop of pond water under a microscope. Draw

what you see. Do you find any plants or animals? With a Secchi-disc measure the visibility of water. Why can you not see straight to the bottom of all bodies of water? Does the Secchi-disc reading vary among the various parts of the stream?

Water is a source of power. Construct a water wheel and use it to perform some type of work.

Water can be reused. Purify samples of stream or pond water in the laboratory.

Soil and water are interrelated. Divide the class into three groups. Send one group into the forest interior, one into a field, and one to a cultivated area. Give each group two tin cans, one with its ends removed and one with a bottom. Have the class push the can with no ends into the soil two inches. Then fill the second can with water and pour it into the first can. When the water has completely disappeared into the soil, refill the can. Measure how many cans of water are taken into the soil in ten minutes and compare results with other groups. Compare the number of cans of water used and figure the rate of water intake for each area. Analyze the soils for each area for the amount of organic matter they contain. How much organic matter is there in each square foot of soil to a depth of six inches? Now have the class look through their soil samples. What color is the soil? What is its texture? How many kinds of

animals do you find? Place a sample of earth from each area in a tin can with holes in the bottom. Pour 500 ml. of water over the soil. In a container placed below the cans, catch all the water that filters through the soil (percolates). Measure how much water percolates through. Record which area the soil comes from, its color, texture, etc. Determine which soil takes up the most water and which the least amount. Which soil has the highest content of organic matter and which the least? What can be said about how organic matter affects the water-holding capacity of the soil? Through which soil does the water pass fastest The slowest? When water percolates through the soil, what might it pick up? What uses water in the soil? When hard rains fall on the earth, would they do more damage to forested soils, to soils on grassy areas, or to soils where crops are planted? Can you think of a reason for this?

Increased Vocabulary: purification, gaseous, percolate, liquid, plankton, water-holding capacity, solid, physical state, visibility

Junior-Senior High School

Objectives: To discover the general water cycle of Cowan Creek; to analyze Cowan Creek water

Basic Vocabulary: tributary, surface water, spring, contours, ground water, percolation

The water cycle of Cowan Creek: Take the class on a hike to the creek, the pond, the well, and water tower, discussing the following

questions: Where does the water on this land originate? What happens to the precipitation which falls to the ground? Dig a shallow trench on a slope to collect water. Sprinkle one liter of water on a 20 cm. x 20 cm. area. Collect the runoff in the trench. Filter the water and measure it. After five minutes repeat the process to find the influence of increased soil moisture. Is all the water accounted for? What has happened to the rest? Lay a 20 cm. diameter circle with aluminum siding. Fill the area with water and calculate the time required for the water to penetrate. Do this on several areas. Now dig a 15 cm. hole and pour water containing a tracer over the area adjacent to the hole. With filter paper and a timer, determine how long it takes for the water to percolate to a certain depth. Does all the water that percolates or runs off reach a water body? Enclose branches of trees and bushes with plastic bags at the beginning of this exercise. Collect the bags and observe their contents and measure the water in them. Where does this water originate and where does it go? Clear the vegetation from a twelve-inch square area and take a soil sample to determine the moisture content. The next day repeat. Compare the differences in water contents. Why is this? Place a plastic sheet on the ground for thirty minutes. Collect and measure the water forming on the sheet. Where does this water come from? Where does the stream water come

from? Where will the water eventually end up? Are there any losses of this stream water? Lead a discussion of ocean evaporation, winds, formation of water vapor, and precipitation initiation.

Analysis of Cowan Creek water: Have each group collect several bottles of creek water. Record the water temperature, time, and place collected. Analyze the water for oxygen concentration by the Rideal-Stewart modified Winkler method. Analyze for free carbon dioxide concentration with phenolthalein and NaOH. Determine alkalinity conditions. With the soap method, determine water hardness. Analyze the amount of suspended sediment by letting graduated bottles sit for twenty-four hours and measure the amount of suspended particles which have settled out. Test for silica, iron and aluminum oxides, calcium, magnesium, sulfates, sodium, and potassium. Determine the visibility of the water and the water velocity (cu. ft./sec. = length x width x depth/time). What is the color of the water?

Increased Vocabulary: watershed, water budget, water cycle, water table, water hardness, velocity, riffles, rapids, pools, light penetration, turbidity

Suggested Activities For Water Studies

1. Make a poster of water animals.
2. Make a poster of water plants.
3. Make a poster showing the water cycle.

4. Compare the amount of sediment carried by riffles, rapids, and pools.
5. Make a poster of water uses.
6. Calculate how much water is used in one day at camp; in a week; in a year.
7. Construct water-powered machines and toys. Demonstrate how they run.
8. Devise a demonstration of the water cycle. Show precipitation, evaporation, condensation, etc.
9. Measure light penetration in the stream and pond, and determine the effects of turbidity, suspended matter, temperature, light intensity, and other site characteristics influencing the degree of light penetration.
10. Demonstrate various soils' water-holding capacities.
11. Devise and construct a water-treatment process. Demonstrate.
12. Analyze rainwater, creek water, and pond water for various life-forms, nutrients, minerals, hardness, pH, temperature, and color. Report your findings.

III. WEATHER

Grades 1-3

Objectives: To learn about wind; to learn that temperatures change; to learn about clouds

Basic Vocabulary; thermometer, cloud, temperature, wind

To learn about wind: (1) Wind is air that is moving. Make pinwheels and watch them work, or blow milkweeds. What makes the pinwheels turn and the milkweeds fly? Inside a building, would the pinwheel work if you held it and did not puff on

it? What would you have to do to make it work? Watch the trees and flowers and grass wave in a breeze. Observe the pond surface for ripples. What makes the trees sway and the flowers nod and the water wavy? Sit in a breeze or runway. Can you feel the wind? Can you feel it move over you? Can you feel it in your face and in your hair? (2) Wind can work. Do you know any machines that run by air? Do any animals use the wind? Do any plants use the wind to work for them? (3) Wind can be cool or warm. Sit near the creek. Can you feel a breeze? Is it hot? Is it warm? Is it cool? Sit in the grassy field in a sunny place. How does the breeze feel here? Is it warm or cool? Does this breeze feel as cool or as warm as the breeze at the creek? (4) How can we learn about the wind? Can you see the wind? What can you see that tells you where the wind is blowing? Can you taste the wind? Can you feel the wind? How do you do this? Can you hear the wind? Listen for a few minutes. What do you hear that tells you the wind is blowing? Can you smell the wind? What are some smells that winds carry? Make weather vanes from wet fingers or balloons. What direction is the wind blowing? How can you tell which direction?

To learn that temperatures change: Show the class a thermometer and make sure they all can read temperatures from it. What do we use thermometers for? When the weatherman says the temperature

is 78° F. in Sunbright, Tennessee, is that the temperature all over Tennessee? Know what the temperature is in Wartburg or Sunbright; then take the temperature at Cowan Creek. Why is the temperature different here than it is in Sunbright? Give each group a thermometer and send one group to the garden plots, one to the grassy field, one to a sunny part of the creek, one into a shady part of the creek, and one into the forest. Have them set the thermometers on the ground for three minutes and then read and record the temperatures. Repeat the experiment at six inches, one foot, and one-and-one-half feet above the ground, and at six inches below the soil surface. After taking all the readings, bring the groups together and compare data. Is the temperature at Cowan Creek the same as that in Sunbright? Are all the temperatures from the garden, creek, forest, and field the same? Are the garden temperatures the same as those from the creek? Are the temperatures from the shady area of the creek like those from the sunny creek area? Are the field temperatures the same as the forest temperatures? Where is the air warmest in each area? Where is the coolest air? What makes the temperature different in each area? This activity may be conducted in the morning and in late afternoon or just after supper. Discuss the differences in temperatures on the same area at different times of the day.

What are clouds? If possible, find a place for the children to lie on their backs and look at clouds for a short time. Have you

ever seen a cloud that looks like something else--a pig or a building or cotton candy? Can you find some clouds that remind you of something besides clouds today? Let them speculate awhile and show what they see in the clouds. Are all the clouds alike? Find different kinds of clouds and learn their names. Can you see through a cloud? How do we learn about clouds? Can you see them? Do they have color? Do they move? How many of you have ever been in a cloud? How does it feel? What do you suppose makes a cloud feel wet? Where does the water forming clouds come from? Recall the water cycle. What will become of these clouds that we see? Can clouds be tasted or heard or smelled? In the winter, people make little clouds with their warm breath in cold air. How many of you have ever made clouds this way? If possible, make some clouds now. This is the way big clouds are made, too. . . by warm air suddenly cooling and forming water droplets. The word we use for this is <u>condensation</u>. Fog is a kind of cloud. Can you see or feel or hear or taste or smell fog? Can you see through fog? What do you see?

Increased Vocabulary: water droplets, cirrus cloud, cumulus cloud, fog, stratus cloud, nimbus cloud, condensation

<u>Grades 4-6</u>

Objective: To learn to predict the weather

Basic Vocabulary: temperature, data, wind, cirrus cloud, cumulus cloud, nimbus cloud, stratus cloud

To learn to predict the weather: Take the class to the weather station and discuss the following: What is weather? Is it the same as climate? Do you know of any proverbs that deal with weather prediction? Do you know of any animals that are sometimes used as "weather prophets"--crickets, rain crows, wooly bears, man? Are there any ways to find out if any of the proverbs or weather prophets are reliable ways of predicting weather? Discuss the instruments in the weather station, their use, and how to read data from them. Explain relative humidity and atmospheric pressure. (1) Wind: with weather station instruments determine wind direction and speed in three habitats--forest, field, and forest edge. Record this data. Speed can be measured relatively or with a homemade anemometer. Are leaves moving? Are twigs moving? Are large branches moving? How fast are the clouds moving? (2) Cloud cover: record the kinds of clouds, their color, movement speed, and direction of movement. How much of the sky is covered by clouds? (3) Temperature: record from the hygrometer the wet and dry bulb temperatures. Use these to determine the relative humidity. (4) Atmospheric pressure: read and record the barometer reading. Speculate on the truth of the weather prophets after all groups have recorded their data. How might weather conditions be responsible for the

natural signals of weather conditions? This program may be continued throughout the camp stay, giving the class time each day to gather data. It can be continued in the school, so that when enough data has been gathered, it can be analyzed to show weather patterns and their development.

Increased Vocabulary: atmospheric pressure, relative humidity, velocity, barometer, anemometer, hygrometer, weather prophet, prediction, proverb

Junior-Senior High School

Objective: To analyze micro-weather conditions and their effect on vegetation

Basic Vocabulary and Skills: relative humidity, atmospheric pressure, life-form, familiarity with weather-recording instruments

Micro-weather conditions exist: Divide the class into six groups and assign each group to one of the following areas: forest, grassy field, shady and sunny areas of the creek, the forest edge, garden plots. Have each group perform the following activities: (1) Temperature--measure and record temperatures at various heights within and above the earth's surface (six inches below, ground level, six inches above, one foot, two feet, four feet, and five feet). Plot these temperatures on a graph. (2) Relative humidity--with a sling psychrometer, determine the wet and dry bulb readings. Record the readings. (3) Wind--determine wind direction with a compass and weather vane. Determine the velocity

with a wind-meter or anemometer. Record. (4) Cloud cover--estimate the percentage of cloud cover. Record the type of clouds present and their approximate importance in cloud coverage. Determine the speed, horizontal direction, and vertical movement of clouds. (5) Atmospheric pressure--record barometer readings. (6) Estimate the percentage of area receiving direct sunlight and that in shade. (7) Record vegetational life-forms, being as specific as possible. Does the vegetation show any special adaptations for the atmospheric conditions in its habitat? Consider leaves, height, density, abundance, place in the habitat. (8) Repeat steps (1) and (2). Have the groups reconvene. Have each prepare a temperature gradient graph for their area, determine the relative humidity, discuss the vegetational adaptations, and appoint a spokesman. Have the group spokesman present the data for each area. How do the temperature gradients resemble one another? How do they vary among the areas? Which are dissimilar and why? Record answers given. What does relative humidity measure? Which areas have approximately the same relative humidities? Why? What other characteristics do these areas have in common? How are they different? Do vegetational types vary on each area? Can you correlate changes in temperature, relative humidity, the percentage of direct sunlight, wind, atmospheric pressure, etc., with vegetational changes? Why?

Increased Vocabulary: gradient, continuum

Suggested Activities for Weather Studies

1. Make an anemometer.
2. Make a hygrometer.
3. Make a weather vane.
4. Make a poster of the different types of clouds.
5. Show how water condenses and devise models to demonstrate the process.
6. Predict the weather for three days. Record weather data, your prediction, and the actual weather.
7. Make up your own weather proverbs and explain why they are reliable.
8. Keep weather data on one area for four days. Record and analyze the data. Predict atmospheric phenomena.
9. Relate weather data collected by all groups in your class. Compare different areas. Report your findings.
10. Make a nephoscope and use it to record cloud data for three days.
11. Keep a weather log of your stay at Cowan Creek.
12. Learn how to read weather maps and teach your class.
13. Make a precipitation gauge and record the precipitation during your stay at camp. Calculate how much precipitation might fall in a year at camp.
14. Make a barometer. Record its readings during your stay and the weather. Is there a relationship between the barometer reading and the weather?

IV. PLANTS

Grades 1-3

Objectives: To discover that plants have different parts; to discover

that not all plants are alike; to discover what plants need to grow.

Basic Vocabulary: soil, water, sunlight, organism

Plants have different parts: (1) Plants have leaves. Have the class examine several kinds of leaves. What colors are the leaves? How do the leaves feel? Are they smooth? Rough? Slippery? Fuzzy? Hard? Soft? Do they break or bend? What shapes of leaves do you see? Can you make sounds with leaves? Crush some of the leaves. Do some of the leaves have an odor? What does this smell remind you of? Does anything come out of the leaves when they are crushed? What is this? Taste some of the leaves. Do they have a taste? Leaves are the plant's "kitchen". Leaves make food for the plants to use. They use water (did you find water in your leaves?), sunlight, and air to make food. Do you know of any other organism that can make food? (2) Plants have flowers. Take the class to the nursery greenhouse if any plants are in bloom, or take them on a wild-flower walk. How many of you have been to a florist's shop? What do florists sell? Where do flowers come from? Can you name some flowers? What colors are the flowers you see? Can you name a flower that is red or yellow or white? Examine the flowers. How big are they? Are they all the same size? Do the flowers smell? Do they all smell alike? Do they smell good? What does one flower smell that you like remind

you of? What words would you use to tell a friend about a flower? Touch gently different flowers. Are they smooth, prickly, soft, hard? Do you know why plants have flowers? The flowers are like a plant's "nursery". Here the plant seeds form and develop. Later the seeds will grow into new plants. (3) Plants have roots. Examine the exposed roots along an erosion bank or the creek. What do plant roots look like? Are all the roots the same size? Are they the same size on one plant? Examine roots with a hand lens or carry some back to the microscopes. What color are roots? Are they hard to see in the soil? Gently wash off the earth. Does the color change? Feel the plant roots gently. What do plant roots feel like? What is their texture? What is the job of a plant root? Discuss answers. Roots are the plant's "mouth" and "hands". A plant's roots take water and minerals out of the soil for the leaves to use to make food. The roots also hold a plant in the ground. This is important when rains or snow or winds strike the plant. If not for the roots, a plant would easily be pulled up and would have no way to get water to make food and would die. (4) Plants have stems. A stem supports or holds up a plant. It also carries or transports water from the roots to the leaves and food to the rest of the plant. What shape is a stem? What do we call a tree's stem? Smell and taste several twigs. Do any twigs or stems have a smell? What do they smell like?

Do any twigs or stems have a taste? What do they taste like? How do stems feel? Do they all feel alike? Name some stems that feel different.

Not all plants are alike. (1) Leaves are different. Examine leaves in the forest. Are all the leaves shaped alike? What shapes do leaves come in? Place the leaves which are shaped alike in piles. Are all leaves the same size? Separate the big leaves from the little leaves. Do all leaves have the same color? Make groups of the different colors of leaves. Do the leaves feel similar? Place the smooth leaves in one pile and the rough leaves in one pile and the fuzzy leaves in another pile. Do all the leaves smell alike? Do they taste alike? (2) Flowers are different. Examine several plant flowers. Are the flowers all shaped alike? What are some of the flower shapes? Are the flowers all the same size? How many colors of flowers do you see? Do the flowers feel alike? Do they smell the same? Can you recognize flowers by just smelling them? (3) Stems are different. Find a plant with a tiny, smooth, fragile stem. Find a plant with a rough, strong stem. Taste several stems and twigs. Do they taste alike? How many colors of stems and trunks can you find? (4) Roots are different. Explore the exposed earth area and find some roots. How many sizes of roots can you find? Are some roots fragile? Are some strong? Try to pull up a medium-sized tree or bush. Can

you do it? Try to pull up a weed. Is this easier? Why? Do you know any roots that we use for food or a drink?

What plants need to live: Take the students to the crop plots. Have them clear a patch of ground to plant either seeds or young plants. Discuss the plant needs while digging soil, putting plants in an area where they will get the right amount of sun, watering, and fertilizing, if need be.

Increased Vocabulary: leaf, stem, trunk, root, flower, shape, texture, odor, florist, size, rootlet, support, transport, fragile

Grades 4-6

Objectives: To learn that a plant community changes; to learn that plants are different.

Basic Vocabulary: community, population, vegetation

A plant community changes: This program is conducted on a hike to various areas of the Cowan Creek camp: first, to the successional plots; second, to the forestry pine plantations; third, to a twenty-five-year-old timber stand; last, to an over-thirty-year-old stand of trees. In each of the plots discuss successional changes and the following questions: What animal life can be found on this plot? What animal signs are present? What plant life-forms are found here? Lichens? Ferns? Grass? Blackberry bushes? Shrubs? Saplings? Trees? How much of the ground on this plot is covered with vegetation? What kind of vegetation is here? Are there more grasses, shrubs, bushes, young trees, or mature trees?

Is the important life-form (the most abundant) in this plot the same as the most abundant life-form on the plot looked at immediately before? How do these plants reproduce themselves? Do they have heavy seeds or light seeds? How far do these seeds travel? How do they travel? Do you find any new plants in this area that were not in the last plot? Where have these new plants come from? How close are the younger plants to their parent plants? What color is the soil? Can you see any evidence of soil improvement due to vegetation or animal life? What is this evidence? Discuss with the class the statement: If a bare plot of earth in the eastern United States is undisturbed by man, it will eventually become a forest. What does man do to keep land from becoming forested? What are some natural happenings (phenomena) which keep a piece of land from becoming forested?

All plants are not alike: This phase of the program can be conducted on the hike back to camp. Begin in the climax successional stage to count the number of different plants in each plot. Continue to make counts for the young stands of timber, the fields, and earlier successional stages. How can we tell that plants are different? How many different life-forms do we see? Does the variety of plants and of life-forms remain the same for each successional stage? Are all plants the same age? What are the ages of most of the plants in

each area? Which stage has the most kind of plants? Which has the fewest? Which stage(s) has (have) more trees than shrubs? More trees than grasses? More grasses than bushes? More shrubs that grasses? More lichens and mosses or algae than anything else? More blackberry bushes than trees?

Increased Vocabulary: succession, life-form, age-stands, climax vegetation, successional stage, variety

Junior-Senior High School

Objective: To learn to survey plant communities

Basic Vocabulary: transect, plot, quadrant, community, population

Surveying plant communities: Take the class into a forest community or a grass community and divide the students into three groups. Place each group in a different plant association. Have them survey these areas in the following manner: (1) Herbs--mark off a one-yard square plot. List all the species of herbs in the plot. Estimate the percentage coverage of each species and record. (2) Shrubs and seedlings--mark off a circular sample plot with a twelve-foot radius (1/100 acre). Have one student serve as the hub of the circle, holding one end of the twelve-foot tape. Another student holds the other end of the tape and moves around the hub until he has completed the circle. The rest of the students follow the tape-radius and count the shrubs in a specified area. Also have one student record species and tally numbers. List all

species and tally their numbers. (3) Saplings (1"-5" diameters)--conduct this survey in the same manner as shrubs and seedlings were sampled, with the exception that the circle has a six-foot radius (1/1000 acre). (4) Trees--if available use the prism-wedge method of sampling. If this is not feasible, use the Bitterlich method. Record species and the numbers of individuals. As a second sampling technique, use the quarter-method. Walk a grid line, determining every sample point to be a certain distance from the last point and designating the distance so that no plot sample will include trees from any other plot. At each stopping point divide the area into quadrants; face the nearest tree in each quadrant (each nearest tree greater than five inches in diameter). Record the plot number, the species of tree and its diameter at breast height (d.b.h.). Also record the distance from the plot center to each tree recorded. Continue to the next plot and repeat the sampling method. Sample ten plots. A third technique is the random-pairs method. Determine plots as in the quarter methods. Face the nearest tree to the plot center and record its species and d.b.h. Raise your arms out to your sides, dividing the area into halves. Record the nearest tree to the plot center in the second half. Measure and record the distance between the two trees. Sample ten plots in this manner.

Analysis: (1) Herbs--estimate species importance by the percentage of area covered. (2) Shrubs and seedlings--estimate the percentage of coverage for each species and calculate the coverage per acre for each species. (3) Saplings--calculate the coverage per acre for each species. (4) Trees--with the data from the prism-wedge method, multiply the number of species individuals by the basal area factor for the specific prism used to determine the basal area per plot. Determine the basal area per acre. Calculate species abundances. With the Bitterlich method, determine the basal area for each species, the abundance of each species, species density, and frequency. For the quarter-method, determine abundance and frequency for each species and density per acre. Calculate the average distance from trees to the plot center and divide by 43,560 $ft.^2$. Then divide the number of trees per acre by the species abundance. For the random-pairs method determine the average d.b.h., the density of each species, abundance, and the number of trees per acre. The latter calculation is accomplished by multiplying the average distance between trees by 0.08 and dividing by 43,560 $ft.^2$. After all computations are completed, compare the different sampling techniques according to the forest profiles yielded.

Increased Vocabulary: abundance, density, basal area, d.b.h., plotless sample, frequency

Suggested Activities For Plant Studies

1. Plant trees, shrubs, and flowers.
2. Develop a tree trail, a wild flower trail, or a plant community trail.
3. Make a leaf print collection.
4. Plant a crop in the garden.
5. Make a poster of how seeds travel.
6. Make jewelry, utensils, tools, or pictures from plants.
7. Sketch ten different trees (or flowers, shrubs, grasses). Include the shape of the plant, leaf shapes, bark, flowers, and fruits.
8. Make a tree game, a flower game, and a shrub game.
9. Make pictures from plant parts.
10. Devise a plant "key" for one life-form.
11. Draw a poster of plant parts.
12. Write up your plant communities survey. Include the methods used, methods of analysis and findings.
13. Make a poster of soils and plant communities.
14. Make a poster of the plant communities found at camp.
15. Write the story of the life of a tree.
16. Write a collection of poems on plants.

V. ANIMALS

Grades 1-3

Objectives: To discover and observe some animals; to learn that wildlife leave signs that tell about them; to discover what animals need to live.

Basic Vocabulary: animal track, animal hole, wildlife

To observe some wildlife species: Throughout their stay in camp, take the class to visit the bird feeders in the early morning, to visit animal blinds at night, dusk, or dawn, help them study the insects collected, to visit the baby animal farm, and to visit the birdhouses and beehives. Ask: What are the names of the animals you can see? How many different kinds of animals can you see? What are the animals doing? Do the animals look alike? How are the animals different from one another? Do the animals you can touch feel the same? Do the animals make different noises? How many animal noises can you hear? Can you smell any of the animals? Do these animals help us? How can we help them? Have you ever eaten these animals? How do they taste?

Wildlife signs: Take the class to a muddy area in late afternoon and have them set out bits of food to attract wildlife. The next day take a hike along one of the camp trails to observe animal signs and end up at the food plot you made. Look for signs made by animals that tell, "An animal lives here", "An animal eats this food", "An animal has come this way". Look for signs that tell there are new animals being born or hatched. Do all animals leave messages? How can people use these messages? How many kinds of signs do animals have?

What do animals need to live? Observe mother animals feeding their young. Observe and/or help care for small animals at camp. Observe

birds and fish feeding. How did all the animals get here? Do baby animals spend all their lives as babies? What do they do to grow? Does an animal spend all its time eating food? When an animal sleeps, where does he pick to go to sleep? What happens when streams and ponds go dry? Do animals need water?

Increased Vocabulary: burrow, tunnel, den, scat, droppings, signs, shelter, nourishment

Grades 4-6

Objectives: To learn that not all animals live in the same place; to learn to identify some animal tracks; to learn different kinds of animals

Basic Vocabulary: habitats, tunnels, wildlife, burrows, animal signs, scat

Animals live in different places: Take the class into an area where there is a creek area, a field, an ecotonal field-forest area, and a forest. Divide the class into three or four groups, and give each group a form on which to record the habitat, animal signs seen, animal foods present, animal homes, and animals seen. Beginning at the creek, fill in the form as groups walk thirty paces toward the woods; stop and record the data they collect there. Continue until the woods are reached and two plots have been sampled in the forest.

Identification of animal tracks: Set out food as an attractant in a muddy site where animals might come. The next day return and

identify the tracks. If the tracks are plentiful and clear, show the class how to make Plaster of Paris track casts.

Different animal names: Observe the birds at the feeders and in the blinds, learning their names. Take a night hike to places where food has been used to attract animals and observe the wildlife there. Spend some time at the creek finding fish, salamanders, crawdads, insects, and other aquatic animals.

Increased Vocabulary: crepuscular, nocturnal, diurnal, activity, food habits, animal behavior

Junior-Senior High School

Objectives: To analyze different animal habitats; to discover some food chains.

Basic Vocabulary: habitat, animal food, food chain, population interrelationships, proximity, "web of life"

Analysis of different animal habitats: Divide the class into six or more groups. Send a group to each of the following habitats: creek boggy area, old field, forest-field ecotone, piney woods, and deciduous woods. Instruct the class to choose a site which seems typical of the habitat they are investigating. Establish how much of the habitat they wish to sample, and answer the following questions: (1) Wildlife--what animals are present which can be seen? What animals are present, but their presence is only known by reading animal signs? What animal signs are in this habitat? Extra credit: estimate how many animals use this habitat.

(2) Plants--which plants serve as food for the animals of this habitat? List these. How do you know these are food plants? How abundant are these plants? How close are these plant foods to shelter and water? Which plants serve as shelter for animals? Can you tell which animals live in the shelters? Are any plants both food and shelter providers? What is the proximity of shelter to food and water? (3) What are the sources of water in this habitat? How far must animals travel to reach a permanent water supply they can utilize? Would water availability ever limit the number of animals which could live in this area? (4) Which animals interact with one another? What is this relationship--parasitism, predation, commensalism, mutualism, amensalism, competition, neutralism? From the above information, devise a possible food chain for your area. Determine which factors in the habitat (food, water, cover, other animals) might possibly limit the populations of animals which would use the habitat. How might these factors' influences be enhanced or minimized?

Increased Vocabulary: parasitism, predation, commensalism, mutualism, amensalism, competition, neutralism, limiting factor

Suggested Activities For Animal Studies

1. Plant food crops.
2. Set out salt blocks.
3. Make casts of animal tracks and display them.
4. Mount study skins of animals.

5. Construct birdhouses and/or feeders.
6. Make holding cages for injured animals.
7. Make a poster showing different animal homes.
8. Make an ant or worm farm.
9. Make a wildlife check-list for Cowan Creek.
10. Make a display of scats. Identify them and show what the animals ate.
11. Help care for injured or orphaned animals.
12. Check mist-nets and write a report on the birds banded while you were checking the nets.
13. Choose a North American animal and write its life history, or propose a management plan for the species.
14. Make a collection of spider web prints.
15. Dissect a rotting log. Record all animals, signs, and suggest why they are in the log.
16. Construct bird blinds.
17. Make a collection of your own sketches and paintings of animals at camp.
18. Make an insect collection.
19. Make a brush pile.
20. Construct a key for four-legged animals.
21. Construct a key for birds at camp.
22. Construct a key for insects at camp.
23. Make up a game which will help you identify animals.
24. Make a "family tree" for animal families.
25. Map animal homes found at Cowan Creek.
26. Make a poster showing how animals move or care for their young.

VI. SOCIAL STUDIES

Grades 1-6

Objective: To learn about people from cemeteries

Basic Vocabulary: cemetery, tombstone

To learn about people from cemeteries: Take the class to visit an old cemetery. Have each child equipped with pencil, paper, and a hard surface on which to write or draw. What is a cemetery? Why do we have cemeteries? What can we learn about people from cemeteries? Who is buried here? How old was this person? Were they male or female? Are any families buried here? Were there any catastrophes occurring in this area? What was the occupation of this person (if the information is available)? Were the people here wealthy? What religions are represented in this cemetery? Do you find any clues about how this person might have died? What historical events occurred while these people were living? Could their lives have been affected by these events? What ancestries are represented in this cemetery? Make tombstone prints with your pencil and paper. Make a print of a tombstone which interests you. Devise a story about one person or family from what you learned about the people buried in this cemetery.

Increased Vocabulary: epitaph, ancestry, occupation, historical period, catastrophe, wealth

Junior-Senior High School

Objective: To learn about early life in Tennessee

Basic Vocabulary: topography, foundation, homesite

Early life in Tennessee: Analyze an old homesite. Find all the building sites by locating foundations, cornerstone piles, excavations, and log piles. Decide what purpose the buildings served. Postulate why a building was placed on this particular site and what the areas around the building were used for. What are some of the reasons that the homesite was located in this place? What building materials were used? How did the people dwelling here make their living? Are there any evidences of the age of the homesite? Determine the location of the homesite on a map. Are there other homes nearby? What other structures are present--fences, springhouses? How was communication with others accomplished? How was the cooking done? Were there any plumbing facilities? What substitutes were there? What did the people do with their trash? Are there any evidences of the name of the people living here?

Increased Vocabulary: heritage, epitaph, cornerstone

VII. GEOGRAPHY

Grades 1-3

Objectives: To learn that maps are useful; to learn to read simple maps

Basic Vocabulary: direction, symbols, landmark, map

Maps are useful: Have each class member make a map to his or her "special spot" at camp. For younger children, have them give directions to the spot by paces. ("My spot is thirty paces toward the boys' dorm from the flagpole. Then take twenty-five paces toward the old dead tree. Next, turn right and take fifteen paces to a big blackberry bush.") Have the older children use a compass to give directions on their maps. Include all trees, bushes, large rocks, fallen logs, and other landmarks which will help find the spot. Have each child make up a legend for his map and use symbols for landmarks. On the following day, give half the class the maps to the other children's spots during Quiet Hour. Have them read and follow the maps to find the rest of the class. On the next day, reverse roles. The class can also map a short trail, using compass, scale, and symbols. Hand out maps of the camp. Have the children take turns leading the class to areas where they have never visited. Have each class member measure his pace.

Increased Vocabulary: pace, legend, compass direction, azimuth

Grades 4-6 and Junior-Senior High School

Objectives: To learn how land influences man's use of it; to learn to construct a map

Basic Vocabulary: map, compass, resource, land-use

How land influences man's use of it: (1) Take the class on a hike up to the old coal mines, past the Armes homesite. Discuss the

coal resources in the Cumberland Mountains, the uses of coal resources--coal products, jobs, a community income. Ask: If coal resources provide products and jobs, what might the people who live near the coal deposits do? Extend the concept of using nearby resources to other materials--water, forests, wildlife, good farmland. Discuss the methods of coal extraction (above-ground and underground mining). Expound on the effects of mining upon community development, the land itself, and the economy of the people in the community. (2) At the Armes homesite, use grid lines, compass, chain or string to define the home and its surrounding area. Produce a scale map of the site. Discuss what various structures were and what they were used for. Why was this site chosed for farming? (3) Determine the area of the homesite and its structures.

Increased Vocabulary: azimuth, interval, economy, land-use, livelihood, resource, grid, affect, effect, strip mine, underground mine, coal vein, auger

Suggested Activities For Geographical Studies

1. Devise a compass walk.
2. Make a map of the camp lands.
3. Make up a treasure hunt using compass directions.
4. Determine the paces of your class.
5. Make a contour map of an area of the camp.
6. Make a map (directional or contour) of the creek for one hundred yards.

7. Make a model compass.
8. Make a display of the different kinds of maps.
9. Show your class how to read one kind of map that you have not used with your instructor.
10. On a map of the camp lands, locate and mark on the map all the springs, tributaries, and the direction of creek flow of Cowan Creek.
11. On a map of the camp lands, orient by compass all the buildings.

VIII. MATHEMATICS

Grades 1-3

Objectives: To identify shapes; to learn to measure

Basic Vocabulary: shape, size

To identify shapes: Demonstrate to the class different shapes--cone, triangle, rectangle, circle, square, pyramid, cylinder, sphere. Take a "shape" hike. Have the children look for and identify shapes in nature. For example: triangle--pine tree, a leaf; rectangle--part of the trail, a piece of bark; circle--the sun, a rock; cone--an acorn, a bird's bill; square--crack in a rock; pyramid--a mountain or hill; cylinder--a log, stems; sphere--fruits, berries, rocks, scat.

To learn to measure: (1) Counting--have the class count all the items in a group (the birds at the feeder, the leaves on a plant, flowers in a garden). Have them decide which of two groups is larger (boys or girls in the class, flowers or trees in front of a building, cardinals or starlings). (2) Length

and width--have the class make rulers and use them to measure the length of a log, the length of a shadow. Use the rulers to measure the width of a log or of the creek. Which is greater--length or width? Have the class not use rulers to measure. Have them use fingers, armspreads, or footsteps to measure a distance. (3) Time--make a sundial and learn to read it. Measure the shadow on the sundial at different times of the day. (4) Weight--compare weights of rocks, sticks, fruits, and other objects. Which is heavier? Make a weight scale. Use it to weigh items. (5) Direction--teach the class to use a compass.

Increased Vocabulary: triangle, square, rectangle, measure, direction, circle, cylinder, pyramid, sphere, cone, cube, length, width, weight

Grades 4-6

Objectives: To learn to estimate measurements; to learn to make graphs and plot data.

Basic Vocabulary: estimate

To learn to estimate: Supply the class with diameter tapes, measuring tapes, rulers to check estimates, a scale, and a compass. Have them practice guessing the widths of the creek, tree diameters, the area of garden plots, the number of birds at the feeders, the height of grasses, shrubs, and trees. Try to determine without a compass the directions North, South,

East, and West. Have the children take turns guessing the measurements. Then have them measure with the instruments.

To learn to make graphs: Take data from other programs (the number of cans of water taken into the soil in ten minutes, air temperatures at different levels, the number of trees in different habitats, estimates made in the first exercise). Explain the abscissa and ordinate axes and the value of a graph in interpreting data. Have the class plot the various sets of data of a graph.

Increased Vocabulary: graph, plot, abscissa, ordinate, x-axis, y-axis, data

Junior-Senior High School

Objective: To learn to analyze data

Basic Vocabulary: graph, data

To analyze data: (1) Junior high--take data collected from other programs (soil, water, plants, animals, weather) and have the students plot the data in several ways (bar graphs, circle graphs, line graphs, tables), explaining and discussing the advantages and disadvantages of each method. Are there relationships evident in your data representations? Are the relationships linear or colinear? Why do you or do you not see a relationship between factors? Do some forms of data presentation show relationships between factors while others do not? Would having more data to analyze make your analysis more significant? Why or why not? (2) Senior high--geometry.

Find natural geometric shapes. Record the number of each and plot the data by frequency of occurrence, place of occurrence, and physical properties. For example, record the number of wooden shapes, the number of mineral shapes, or the number of animate shapes. Are any relationships present? What is the most frequent shape? Where does it occur? Can you make any statements about your findings? Do you find any natural influences at work? What would be the effect of having more data? Use geometric theorems to measure tree height, building height, angles of slope and so on. Plot the data you accumulate. Algebra--From the graphs produced by data collection, answer the following questions: What types of relationships are present? Is there a formula for the relationship seen? Devise one if possible. Statistics--Use the sorted data to introduce principles of statistics, probabability, and significance levels.

Increased Vocabulary: probability, graphs, significance, frequency, statistical significance, tables, linear and colinear relationships

Suggested Activities For Mathematical Studies

1. Make a Secchi-disc and measure light penetration in water bodies.
2. Record data collected for one subject.
3. Make graphs of data collected.
4. Calculate tree heights, or other heights, using geometric theorems.

5. Statistically analyze a plant community.
6. Make a sundial.
7. Count tree-rings to determine the ages of trees. Make a poster showing your findings.
8. Measure your dormitory room. Make a map of the room with all the furniture represented.
9. Take a compass hike.
10. Make a poster showing the geometric shapes you found in nature.
11. Choose a particular subject's data and analyze or graph it.
12. Make a ruler and use it to measure different items.
13. Estimate several different measurements (tree diameters, tree height, log length, number of bushes, direction, time) and by using instruments, decide the true measurements. Write a report telling how close your estimate came to the true measurements.
14. Determine the average pace of your class.

IX. LANGUAGE ARTS

Objective: To increase language skills

Partial listing of suggested activities:

Grades 1-3

1. Close your eyes and listen to sounds for five minutes. Describe the sounds to your class.
2. Close your eyes and smell and sniff for five minutes. Describe the smells to your class.

3. Close your eyes and feel the grass where you are sitting. Describe what you feel.
4. Pretend you are an animal. Tell the class about yourself. How do you sound? What do you look like? How do you feel? How do you smell? Do you have a taste?
5. Act out a storm or the wind or sunshine.
6. Write haiku poetry. Read your poems to the class.
7. Write a story about what you did today at camp.
8. Write the new words you learned today in the mud or in dust or sand.
9. Make labels for trails at camp.
10. Play "As _____as a _____" (As sharp as a blade of grass; as rough as bark.)

Grades 4-6

1. Write haiku poetry.
2. Keep a daily log or diary.
3. Think of a descriptive word and name natural objects that this word can describe.
4. Make up a story to fit an interesting tombstone.
5. Make up new words for common ones. Use these new words in sentences until your class can guess what the new words mean.
6. Write the words to a song.
7. Write letters to your friends describing a day at camp.
8. Introduce to your class a topic which you want to discuss.
9. Read haiku poetry aloud.

10. Blindfold a child and hand him an object to describe to the class (carrot strips, a flower, an animal, a rock).
11. Have an ABC scavenger hunt.
12. Play nose-bag dramatics.
13. Have the class tell a continuous story, with one child relating a small part of the story and moving on for another child to continue the story.

Junior-Senior High School

1. Keep daily records of camp happenings.
2. Write haiku poetry.
3. Compose short stories about camp events.
4. Write a description of an owl hooting at night, a cloud formation, a dawn sky, a skunk scent, the feel of creek water on your face in the morning, or another camp experience.
5. Discuss the day's programs: their strong and weak points, make suggestions for improvement, define important concepts and findings.
6. Introduce speakers giving reports.
7. Present your group's report of activities conducted.
8. Make up games with new words learned.
9. Make a collection of your writings.
10. Discuss a natural history author and his writings.
11. Select and read to your class the nature writings of an author you appreciate.
12. Discuss the communications that might have occurred on the site four hundred years ago.

13. Debate controversial topics such as clear-cutting, population control, or year-round school.
14. Present a choral reading with some friends.

X. ART

Objective: To stimulate construction with natural materials

Partial list of activities for all grades:

1. Use natural materials to make pictures (leaves, nuts, seeds, etc.)
2. Make a collage of leaves or mushroom spore prints or algae.
3. Paint, sketch, or draw a scene you like at camp.
4. Make a poster showing your activities at camp.
5. Make rock sculptures.
6. Make articles from clay, sticks, leaves, and other materials.
7. Make drawing paper from birch bark.
8. Make small canoes and boats from birch bark.
9. Make jewelry from nuts, berries, seeds, dried flowers, and other materials.
10. Make note paper with your own printed design.
11. Make a collection of spider web prints.
12. Try to build a bird nest by using the materials a particular bird uses and weaving or "mudding" the material together.
13. Weave with natural materials.
14. Make animal track casts.
15. How many colors can you see? Try to make some of these colors.
16. Dye materials with natural dyes.

17. Find designs in nature--circles, straight lines, zigzags, wavy lines.
18. Draw a sound.
19. Make a charcoal drawing implement and sketch with it.
20. Carve an object.
21. Make toys with natural materials.
22. Make nature prints (spider webs, tree-rings, spores, leaves).
23. Make a stitchery.
24. Macramé.

XI. MUSIC

Objectives: To become aware of natural music; to compose music

Partial list of activities for all grades:

1. Make musical instruments from natural materials (whistle, drum).
2. Write words to an already-composed tune.
3. Compose a song or musical piece using natural sounds you hear.
4. Imitate animal sounds. Use them to compose an "animal symphony."
5. Where do you see or hear rhythm in nature? Imitate this rhythm with your voice or body.
6. Compose a dance using natural rhythms (swaying trees, rippling water, soaring birds, rustling leaves, insect flights). Name the dance and perform it for your class.
7. Sing a song about the out-of-doors.
8. Make up your own songs about nature.
9. Learn folk dances or Indian dances.
10. Learn folk songs from Scott County.

11. Write a choral composition for your class.
12. Compose a choral reading from your favorite natural writings.
13. Write a musical piece for the musical instruments your class has made. Conduct the "orchestra" or "band" for a performance.
14. Record animals' sounds, or sounds of a storm, the wind, or rustling grass.

XII. SPECIAL PROGRAMS

Survival Trip (for summer campers)

After learning fire-building, wild foods, shelter making, basic first aid, and outdoor cooking, take a small group out into the forest with matches, a pot and a pan, a poncho, some string and a safety pin, and extra socks and help the group learn to rely on their own resources and nature skills in the out-of-doors. Take the groups out for two days and one night or two nights and one day and have them "live off the land". Have them make their own shelter, find their own food and cook it, and relax in the outdoors.

Astronomy

This makes an exceptional campfire program. Begin by learning several constellations and key stars. Then explain how to find your direction or tell the season by the heavens. Finally, close with a period for aesthetic appreciation of the night.

Outdoor Cooking

This program can be extended over the entire camp stay. Teach the students how to build a simple fire and prepare their own food. Make

buddy-burners and use these for simple meals on camping trips. Show the class how to devise well-balanced meals for an overnight trip or a cook-out. Finally, have a nature supper, using foods the campers have collected.

Camping

There are many suggestions for class camping. Take them on an overnight camping trip, having them to plan the trip and meals. Teach the class how to build four kinds of fires, sharpen knives and axes, and several ways to build shelters. When they are proficient, plan a survival trip or extended camping trip to utilize the skills. Take an overnight hike. Show the students how to walk in the forest, how to pack for a hike, and the kinds of foods to carry on a long hike.

Campfires

Outdoor experiences seem to draw much of their appeal through well-planned campfire programs. Suggestions for such programs include a welcome campfire, an astronomy fire, singing campfire, drama program, an inspirational fire, a last-night campfire, cooking night, a Camper's Own campfire, a skit and game program, and an awards night.

Gardening

With the facilities for crop and garden planting, many campers will try their hand at gardening. They may decide to plant animal foods, crops for camp consumption, flower gardens, trees, rock gardens, bog gardens, or crops which enrich the soil.

Social Evolution

The objective for such a program is to learn how social relationships develop. Have the class decide on a site which will become the "headquarters" for an experiment in social evolution. Five people will form a family composed of parents, two children, and a grandparent. They will decide where their own "homesite" will be and why, and will delegate family duties to each member. For example, the father's duty may be to tend the farm, the mother and daughter will gather foods and tend the house, the son may help his father and gather wood and water, while the grandparent might make clothes or watch younger children. After the family groups have formed, they will decide among themselves how to provide the family with the essentials of life, considering (1) food--where and how to get it, how to prepare it, (2) water--where to get it, how to carry it to the homesite, if it is drinkable, what to do if it is not, (3) shelter--where the house will be and what it will be built of, how it will be furnished, and (4) protection--from what they will need to protect themselves, how they will be protected, what materials will protect them, and at what time protection is needed.

After these family matters have been decided, the entire group will come together as a community to decide on topics important to community survival, considering (1) neighbors--how will they help one another, how will one family be protected from another group, and how the community resources will be shared, and (2) town--how disputes will be solved, how work will be done for the community good, who will perform community services, what medium will be used for currency and its value, and social

services for the enrichment of community life (communication and social functions).

This experiment should be conducted for varying periods of time--all day, for half a day, or two days. At the conclusion of this exercise, each participant should have a deeper appreciation for the terms family, town, local government, currency, shelter, protection, and community.

CHAPTER IV

FACILITIES

In keeping with the objectives of an environmental education center, the facilities of the Cowan Creek center have been designed to enhance learning opportunities, to provide comfortable living quarters, and to be used as multiple-purpose structures. This last center characteristic is important in order to conduct as many educational programs, such as those outlined in Chapter III, as are feasible.

Four main buildings comprise the physical facilities of the Cowan Creek camp. . . two dormitories, a main lodge and administration building, and a maintenance area. These structures will provide the basic necessities of food and shelter during a student's visit to the center and have been planned to create an atmosphere of comfort and utility with the least disturbance to the natural state of the valley. In addition, allowance is made for camp growth and future expansion of these facilities with minimum inconvenience to camp programs already initiated.

Dormitories

Each of the two dormitories is designed to accommodate sixty campers and four or more teachers and regular staff members. Ten bedrooms with a capacity of six campers each provide lodging for the students. Each room has three bunk beds, three bureaus, two chairs, overhead lighting, waste cans, and heating. The staff and teacher accommodations include beds, bureaus, working desks and chairs, heating, overhead lighting, and desk

lights. The dormitories are also equipped with showers, toilets, and sinks, a lounge for introductory meetings and informal gatherings, a fireplace, and a kitchen. The kitchen, however, is not designed for the feeding of the dormitory residents, but rather as a convenience to small groups using the center and as a storage area for dormitory snacks, refrigeration, and cleaning.

Main Lodge and Administration Building

The main lodge and administration building will be used by the resident campers, their staff, the day-use groups, community gatherings, and camp administration, and is, therefore, a multi-use facility. Classrooms are available for teaching purposes, lectures, workrooms, and informal meeting areas. An equipped laboratory is near these classrooms, affording easy access to instruments and scientific data. Also in close proximity is the center library, open to teachers, camp staff, students, and the community. A large lecture hall provides an area for large meetings, film and slide showings, and other camp activities which call for greater space, such as rainy day games and investigations. An arts and crafts room doubles as a workshop for students interested in creating and constructing with natural materials. This is next door to the center storeroom, making storage of tools and materials a simple matter.

The remainder of the main lodge is devoted to public relations, administration, and food services. Upon entering the lodge, the visitor is confronted with the exhibition hall and lobby, boasting features of center activities, experiments, and general information about the Cowan Creek valley. An information desk is available to all center users, and

the other side of the exhibition hall is an access route to the nature trails over the drainage. To the left of the entrance is the camp director's office and the control area of center use.

The kitchen and dining hall occupy the better part of this area of the main lodge. The area is designed for serving frozen meals or home-style cooking, with campers filing through cafeteria-style to facilitate rapid service and maximum use with minimum delay to the students. The dining area may also see use as an area for evening activities. A staff room, first aid room, an area for community meetings, and rest rooms com-comprise the remainder of the building.

Maintenance Building

The maintenance building is for the exclusive use of the maintenance personnel and is, therefore, placed at a distance from the visitor's use areas. Provision is made for maintenance vehicle parking and repairs, a large storage area serves for larger equipment, and a workshop and office provide the supervisor with equipment and space for maintenance coordination, records, and planning.

Floor Plans

These four buildings comprise the initial construction on the Cowan Creek land. There are other smaller structures on the area such as the water tower, camping shelters, and the man-made pond, but a description of these facilities is omitted here. Floor plans have been drawn for construction purposes and are incorporated later in this treatise (see Appendix C). They represent the construction of buildings covering 17,325 square feet and servicing approximately 150 persons every camp session.

Utilities

The year-round availability of water from Cowan Creek is a definite asset to the camp program and plan. With this constant water resource, the problem of supplying the environmental center with water is simplified. During the construction of the camp, the sinking of a well, the installation of a proper pump and chlorinator, and the construction of a water storage tank will provide a reliable source of water for camp operations such as food preparation, laboratory use, bathing, drinking, and sewage disposal.

Sewage will be disposed of via septic tanks and drainage fields. It is estimated that four 1,500-gallon tanks are capable of servicing the camp visitors at any one time. Solid waste disposal will be handled by compost piling food wastes, incinerating burnables, and recycling cans, bottles, and appropriate paper wastes.

It will be necessary to have telephone and electric lines run into into the camp, as there are no such facilities on the site. In addition, an all-weather road must be built from the old logging-mining road which now provides access to the Cowan Creek valley. It is estimated that a one-mile, two-way road will be sufficient to handle camp traffic. Other service roads will also be necessary on the grounds; however, these will be neither asphalted nor two-way structures.

Special Educational Features

In addition to the camp buildings, utilities, and access roads, there are special educational features to be developed on the site. A

small water impoundment and pond are planned so that students will have opportunity to observe aquatic communities in addition to that of the free-flowing creek. Provision will be made for censusing activities, collecting of animal and plant life-forms, water quality sampling and analyzing, community comparisons, and successional studies. The impoundment will be created by a small dam on Cowan Creek, while the pond will have to be constructed and stocked.

Another feature of the site is to be the trail system over the drainage, providing easy access to a variety of habitats. Each trail will be a multi-use asset, providing demonstration materials for more than one aspect of the environment, so that vegetation, wildlife, soils, and water studies may be conducted on any of the walks. Special trails are also planned for the handicapped--those in wheelchairs, the blind, and those with other physical disabilities which discourage use of other walks. These trails will also furnish lesson materials for all subjects and will be available to all campers.

Homesite improvements will be necessary in some instances to maximize educational values; however, these will be generally restricted to safety measures. Low, tangled vegetation around structures should be removed; shorings of floors, porches, and roofs will need to be reinforced; old wood piles will be cleared away to reduce the possibility of snakebite. The old mines also present safety problems and will necessitate certain precautionary measures such as cleaning, shoring, and the possible closing of particular shafts and drillings.

Still another feature of the center will be the crop plots where students may participate in the planting, care, and harvest of a part of the camp diet, such as tomatoes, corn, potatoes, beans and other vegetables. These crop plots will be available for studies of soil-plant relationships, for the growing of food for camp animals, for exposures to farming techniques and problems, and for other horticultural endeavors such as plant propagation, the growing of landscaping materials, and investigation of various methods of plant handling.

Special demonstration areas are to be developed on the site. Among these will be a forest management area, successional plots, a stream stabilization section, an erosion control demonstration, wildlife food plots and management areas, a natural foods and dyeing exhibit, soils and geologic demonstrations, and seasonal farm operations. These special areas will be available as teaching tools, and many, such as the natural foods and dyeing exhibits and the wildlife food plots, will be participatory activities.

Finally, primitive camping areas will be made available to campers. Since these sites will be in use only during mild weather, they will consist only of garbage pits, privies, and improvements which the campers themselves devise, such as lashed tables and shelters, cleared areas for sleeping and campfires, and woodpile storage areas.

It is further hoped that other educational features will be added at later dates to complement and supplement the above-mentioned facilities. These developments might include an arboretum, a planetarium, a plant nursery, an animal complex of farm animals, an apiary, baby animals, and

provisions for the care of orphaned wild animals, an observation tower, a museum of artifacts, various gardens and plantations, and an amphitheater.

CHAPTER VI

COSTS

The funding of environmental centers has traditionally fallen into one of several categories. It is either accomplished by a school system (or by the cooperation of neighboring systems), by government funding, by State funds, by private grants and donations, or by a combination of these methods.

The federal government sponsors numerous programs which make funds available to environmental centers. Perhaps the best-known of these programs is the N.E.E.D. project (National Environmental Education Development) which is under the jurisdiction of the National Park Service. This program finances centers which are conducted on Park Service lands. N.E.S.A. (National Environmental Study Areas) is another government-sponsored project, also developed on National Park lands but not limited to those areas. This program combines the efforts of the National Education Association, the U. S. Department of Health, Education, and Welfare, the U. S. Department of the Interior, and local education systems. A third government program is N.E.E.L. (National Environmental Education Landmarks) which provides assistance to individuals and groups interested in developing environmental programs. However, this program is primarily to provide technical assistance rather than financial aid.[11]

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[11] NEED, U. S. Department of the Interior, National Park Service (Washington, D. C., 1971), p. 5.

It is conceivable that the Cowan Creek center might receive assistance from such government programs; however, considering its own peculiarities and specialties, another possibility is that the University of Tennessee will maintain the site while another agency funds the building and equipping of the facilities. Still another likelihood is that the school systems in and around Scott and Morgan Counties would cooperate to maintain the site and supply funds for operation, above those received from camper fees. Possibilities for cooperation among agencies, private individuals, and school systems for the funding of the Cowan Creek center are numerous.

As can be seen (Appendix D), an estimated $460,000 should suffice for the initial construction and equipping of the facility. This figure accounts for building construction, roads and access, the cost of utility installations, the securing of the water supply, landscaping, the cost of operational and maintenance equipment, and the construction of special educational features.

Operational costs, amounting to $211,000, have been estimated using a figure of 130 campers to be serviced at any one time. This estimate accounts for insurance payments, utility costs, the salaries of the permanent camp staff (director, secretary, resource staff member, cooks, nurse, and caretaker), maintenance costs for the facility, the replacement of educational and operational equipment, and food services.

Assuming 7,000 center-users in a year's time, and allowing for a camper's fee of $20 per person, an income of $140,000 can be supposed. This leaves $71,000 to be secured from sources mentioned earlier--school systems, federal and State funds, or private agencies.

The camper's fee was derived chiefly from food and lodging costs, and considering insurance rates and utility use. It was calculated that one child could be fed, housed, and exposed to the educational materials at a rate of $4 per day.

In conclusion, it seems feasible to require $700,000 for the construction and outfitting of the center to prepare for the first year's use. Such an estimate is not overly presumptuous when the benefits to the community, region, and State are considered.

CHAPTER VII

SUMMARY

With the advent of environmental concepts in the realm of American educational thought, school camps and environmental centers have been springing up across the nation in order to provide school classes a means of studying environmental principles firsthand. It was the purpose of this thesis to analyze the Cowan Creek drainage in Scott County, Tennessee, to determine whether or not this site would be suitable for the construction and operation of such a center for the population in and around Scott and Morgan Counties.

It was first necessary to define the term environmental education and to note its entrance into educational vocabularies. The concept was initially a reaction to the havoc wreaked on the nation by colonial resource-use attitudes. Conservation and outdoor education then became viable tools in the early years of widespread environmental awareness. Having its origins in these ideas of wise resource-use, environmental education extended these principles to create in the individual an awareness of the wise use of the total environment.

Methods of environmental education were reviewed, with the basic theories being that of separate environmental education courses and that of teaching fundamental principles underlying all fields of interest. The latter theory of teaching appears to be more capable of unifying all subjects and was, therefore, chosen as the principle to be employed in Cowan Creek programs.

Once the term environmental education was defined, it was possible to outline specific goals for a center. The goals, in conjunction with National Audubon Society site guidelines, then enabled analysis of the Cowan Creek site to begin.

The site was described according to ownership, geography and soils, vegetation, wildlife, social studies features, and safety factors. In addition, the history of the drainage was investigated, as were characteristics of surrounding communities. It was found that the Cowan Creek area is indeed suitable for environmental teaching, due to its peculiar site characteristics, its potential benefit to the east-central area of the State, and its availability as a site.

Using the site descriptions and peculiarities, specific sample programs were proposed for the Cowan Creek center. These programs included soil studies, vegetational subjects, wildlife investigations, water studies, weather lesson plans, social studies, geography, art, music, mathematics, language arts, and suggestions for special activities, such as a survival trip, astronomy, camping, cooking, gardening, campfires, and an experiment in social evolution.

With programs so defined, facilities were designed to accommodate site users. Floor plans of two dormitories, a teaching and administration building, and a maintenance area were developed; special educational features were suggested, such as a trails system, a pond, and a dammed area of the creek; and the problem of utilities was considered.

Finally, the cost of constructing such a center was estimated. It seems the cost will approach $700,000 for the construction and

operation of such a facility for one year. Part of this cost will be defrayed by a nominal camper's fee; however, the purpose of this fee is not to meet camp expenses. Thus a broader funding base will be necessary. Possible means of funding were discussed and include the NEED, NEEL, and NESA programs of the National Park Service, contributions from grants and private individuals, cooperation among area agencies such as the Tennessee Valley Authority and the University of Tennessee, and cooperation among school systems to be benefitted by such a program.

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APPENDICES

APPENDIX A

PARTIAL VEGETATIONAL SPECIES LIST

TREES AND SHRUBS

Acer saccharum
(sugar maple)
Aesculus pavia
(dwarf chestnut)
Amelanchier sp.
(serviceberry)
Carya ovata
(shagbark hickory)
Carya glabra
(pignut hickory)
Celtis occidentalis
(redbud)
Cornus florida
(flowering dogwood)
Fagus grandifolia
(American beech)
Fraxinus americana
(white ash)
Hamamelis virginiana
(witch hazel)
Juglans nigra
(black walnut)
Kalmia latifolia
(mountain laurel)
Liriodendron tulipifera
(tulip poplar)
Liquidambar syraciflua
(sweet gum)
Morus rubra
(red mulberry)
Nyssa sylvatica
(black gum)
Oxydendron arboreum
(sourwood)
Pinus echinata
(short-leaf pine)
Pinus strobus
(white pine)
Pinus virginiana
(Virginia pine)
Prunus serotina
(black cherry)
Quercus alba
(white oak)
Quercus marilandica
(blackjack oak)
Quercus prinus
(chestnut oak)
Quescus rubra
(Northern red oak)
Quercus velutina
(black oak)
Robinia pseudoacacia
(black locust)
Rhus alata
(winged sumac)
Rhus glabra
(smooth sumac)
Sassafras albidum
(sassafras)
Tsuga canadensis
(hemlock)
Vaccinium arborea
(sparkleberry)
Vaccinium sp.
(blueberry)
Viburnum acerifolium
(dockmackie)
Viburnum prunifolium
(stagbush)

HERBACEOUS PLANTS

Anemonella sp.
(anemone)
Asarum canadense
(wild ginger)
Chimaphila maculata
(pipsissewa)
Conopholis americana
(squawroot)

Fragaria sp.
(wild strawberry)
Galax sp.
(wandflower)
Galium sp.
(bedstraw)
Geranium maculatum
(wild geranium)
Goodyera sp.
(rattlesnake plantain)
Impatiens sp.
(touch-me-not)
Melilotus officinalis
(clover)
Monotropa uniflora
(Indian pipe)
Podophyllum peltatus
(mayapple)
Polygonatum biflorum
(Solomon's seal)
Sanguinaria canadensis
(bloodroot)
Scutellaria elliptica
(skullcap)
Silene virginica
(fire-pink)
Smilacina racemosa
(false Solomon's seal)
Smilax rotundiflora
(greenbriar)
Tiarella cordifolia
(foamflower)
Tradescantia virginica
(spiderwort)
Trillium sessile
(toad trillium)
Vicia sp.
(vetch)
Vinca minor
(periwinkle)
Viola papilionacea
(butterfly violet)
Viola pedata
(bird's-foot violet)
Viola sp.
(violet)
Vitus sp.
(grape)

LOWER PLANTS

Adiantum pedatum
(maidenhair fern)
Cladonia cristatella
(British soldiers)
Cladonia rangiferina
(reindeer lichen)
Cladonia verticillata
(ladder lichen)
Clavaria cinerea
(ashy coral fungus)
Geaster sp.
(earth star)
Hygrophorus sp.
(mushroom)
Parmelia sp.
(boulder lichen)
Polystichum sp.
(Christmas fern)
Polystichus sp.
(shelf fungus)
Russula emetica
(emetic russula)
Russula virescens
(green russula)
Umbilicaria sp.
(toad skin lichen)
Umbilicaria sp.
(rock tripe)
Verrucaria sp.
(pitted lichen)

APPENDIX B

PARTIAL WILDLIFE LIST

INSECTS

Apis mellifera
(honeybee)
Conocephalus sp.
(grasshopper)
Edeira diadema
(orb spider)
Lucanus cervus
(stag beetle)
Lympyrus noctiluca
(firefly)
Papilio sp.
(swallowtail butterfly)
Phryganea grandis
(caddis-fly)
Polyphemus sp.
(Polyphemus moth)
Termes sp.
(termite)

FISH

Alosa sp.
(shad)
Hybopsis sp.
(chub)
Lepomis sp.
(sunfish)
Notropis sp.
(shiner)

AMPHIBIANS

Ambystoma maculatum
(salamander)
Bufo terrestris
(common toad)
Cryptobranchus sp.
(hell-bender)
Desmognathus sp.
(dusky salamander)
Diemictylus sp.
(newt)
Hyla sp.
(treefrog)
Rana pipiens
(leopard frog)

REPTILES

Agkistrodon contortrix
(copperhead)
Crotalus horribilis
(timber rattler)
Eumeces inexpectatus
(skink)
Natrix sp.
(water snake)
Sceloporus undulatus
(fence lizard)
Terrapene carolina
(box turtle)

BIRDS

Accipiter striatus
(sharp-shinned hawk)
Caprimulgus vociferus
(whippoorwill)
Cathartes aura
(vulture)
Colaptes auratus
(yellow-shafted flicker)
Contopus virens
(wood pewee)
Cyanocitta cristata
(blue jay)
Dryocopus pileatus
(pileated woodpecker)

Empidonax sp.
(flycatcher)
Geothlypis trichas
(yellowthroat)
Hirundo rustica
(barn swallow)
Hylocichla mustelina
(wood thrush)
Mimus polyglottus
(mockingbird)
Otus asio
(screech owl)
Parus carolinensis
(Carolina chickadee)
Pipilo erythrophthalmus
(towhee)
Polioptila caerulea
(gnatcatcher)
Spinus tristis
(goldfinch)
Thryothorus ludovicianus
(Carolina wren)
Tyrannus tyrannus
(kingbird)
Vireo sp.
(vireo)
Zenaidura macroura
(mourning dove)

MAMMALS

Didelphis marsupialis
(opossum)
Marmota monax
(groundhog)
Peromyscus sp.
(mouse)
Scalopus aquaticus
(eastern mole)
Sciurus carolinensis
(gray squirrel)
Sorex sp.
(shrew)
Sus scrofa
(wild hog)
Sylvilagus floridanus
(Eastern cottontail)
Tamias striatus
(chipmunk)
Urocyon cinereoargenteus
(gray fox

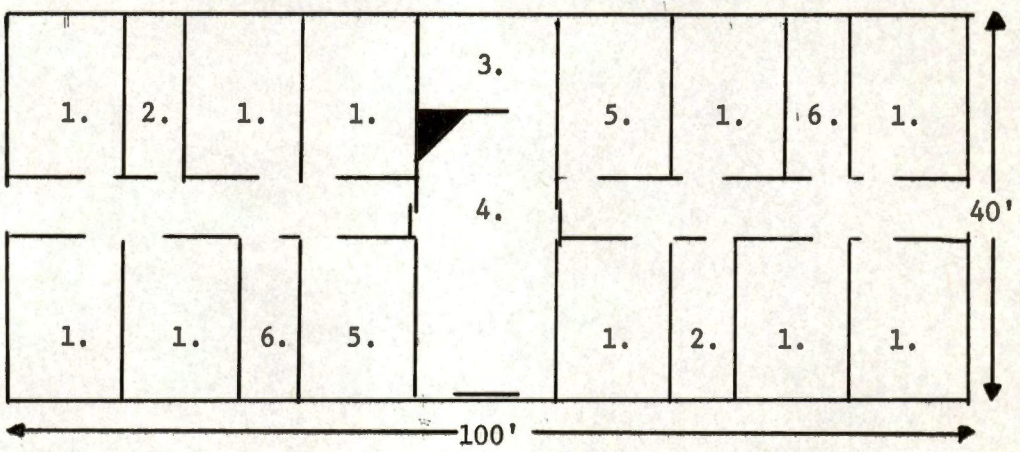
APPENDIX C

FLOOR PLANS

Dormitory

Accommodates 60 campers
4 teachers and staff

Area: 4,000 sq. ft.
Scale: 1" = 20'



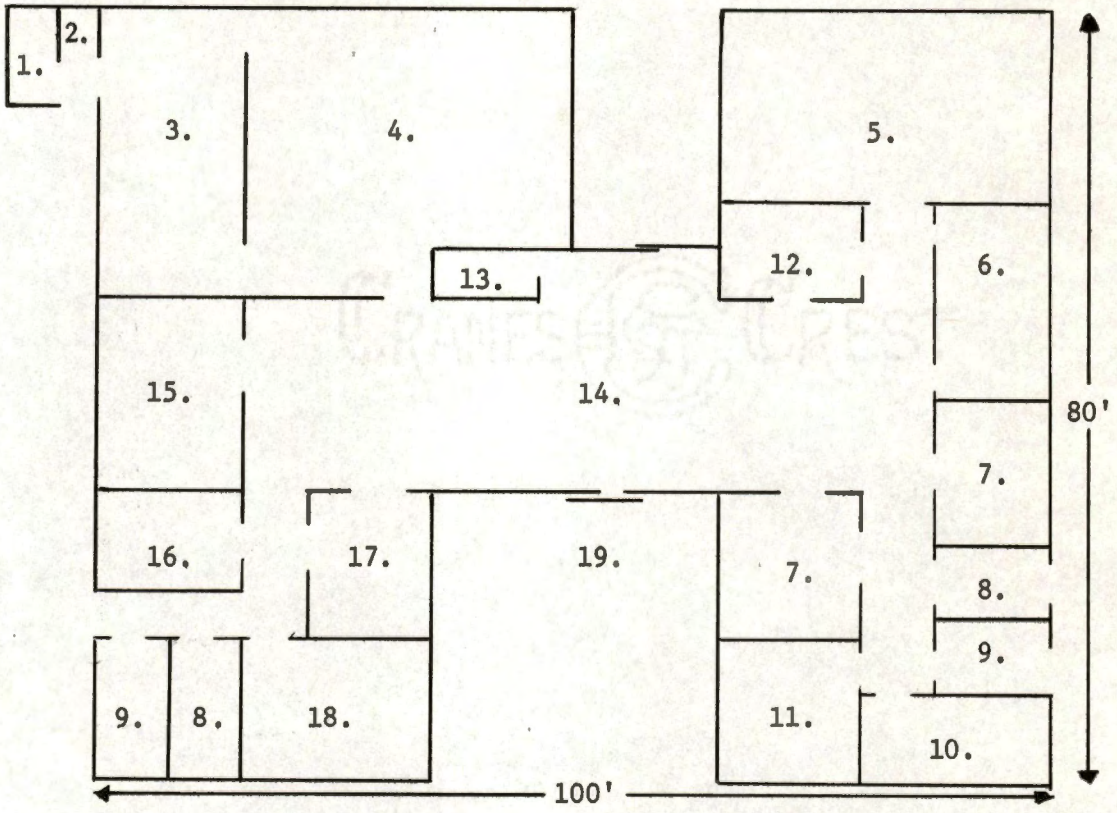
Legend:

1. Campers' Room
2. Showers and Sinks
3. Kitchen
4. Lounge
5. Teacher and Staff Room
6. Toilets and Sinks

Main Lodge and Administration Building

Area: 6,825 sq. ft.

Scale: 1" = 20'



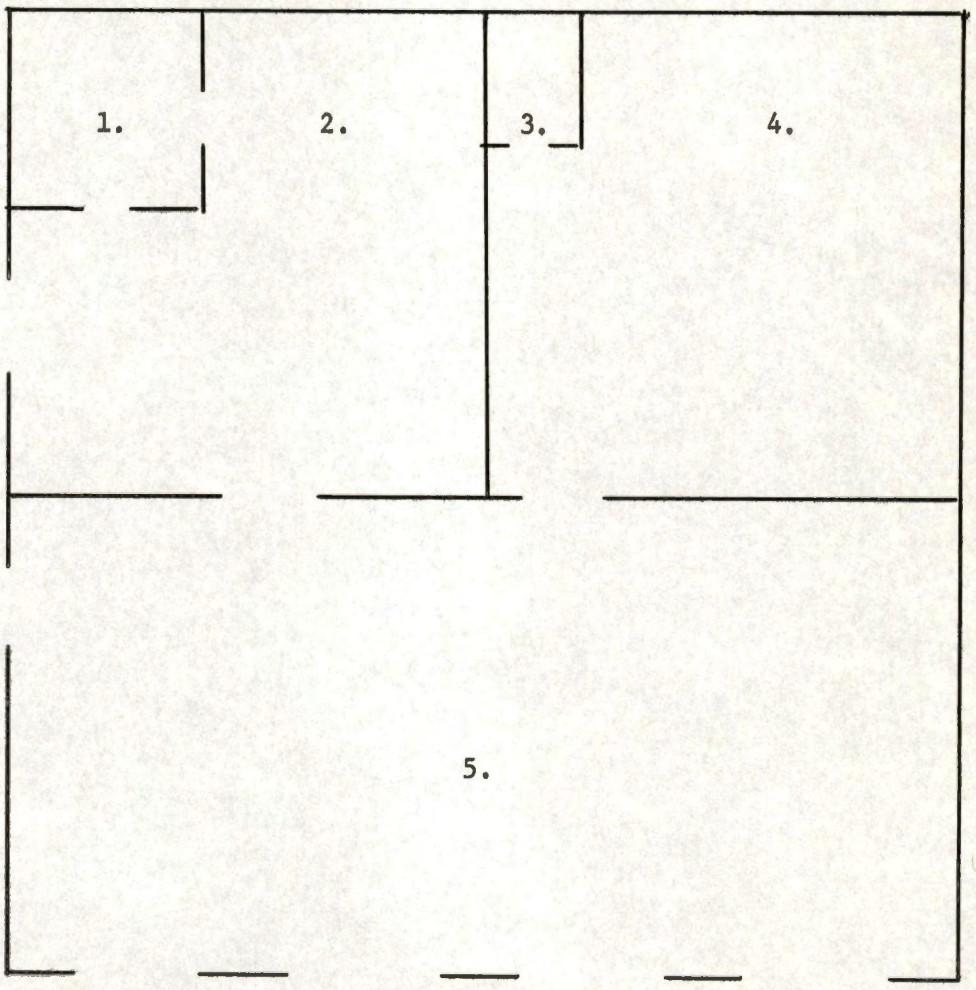
Legend:

1. Service Area
2. Lavatory
3. Kitchen
4. Dining Hall
5. Lecture Hall
6. Laboratory
7. Classroom
8. Girls' Rest Rooms
9. Boys' Rest Rooms
10. Storage Area
11. Arts and Crafts Room
12. Library
13. Information Area
14. Exhibition Hall and Lobby
15. Director's Office
16. Staff Room
17. First Aid Room
18. Community Room
19. Entrance

Maintenance Building

Area: 2,500 sq. ft.

Scale: 1" = 10'



Legend:

1. Supervisor's Office
2. Workshop
3. Lavatory
4. Storage Area
5. Parking for Maintenance Vehicles

APPENDIX D

COST ANALYSES

Initial Costs

Building Construction		$ 300,000
Road Construction:	all-weather road	50,000
	service roads	10,000
Laying of Utilities		12,000
Watersupply:	well	1,250
	pump and chlorinator	1,165
	1,000-gallon pressure tank	1,000
Landscaping		1,000
Educational Equipment		15,000
Maintenance and Operating Equipment		50,000
Special Features Construction[1]		17,000
Total		$ 458,415

[1]This cost figure allows for the construction of a small earthen dam, a one-acre pond, the center trail system, and primitive camp site improvements.

Operative Costs for one fiscal year

Salaries:	Director	$ 15,000
	Secretary	6,000
	Resource Staff Member	8,000
	Caretaker	6,000
	Nurse	9,000
	Cooks (2)	16,000
	General Aides (2)	10,000
Fringe Benefits		7,000
Utilities		30,000
Food		80,000
Educational Supplies		5,000
Insurance[2]		29,000
Total		$ 211,000

Camper's Costs for a five-day camp stay

Food	$ 12.50
Lodging, Insurance, Educational Supplies	7.50
Total[3]	$ 20.00

[2]The insurance rates are for camper and staff insurance, workmen's compensation, and liability.

[3]The camper's cost helps to defray expenses, but it is in no way sufficient to meet operational expenses.

APPENDIX E

MAPS

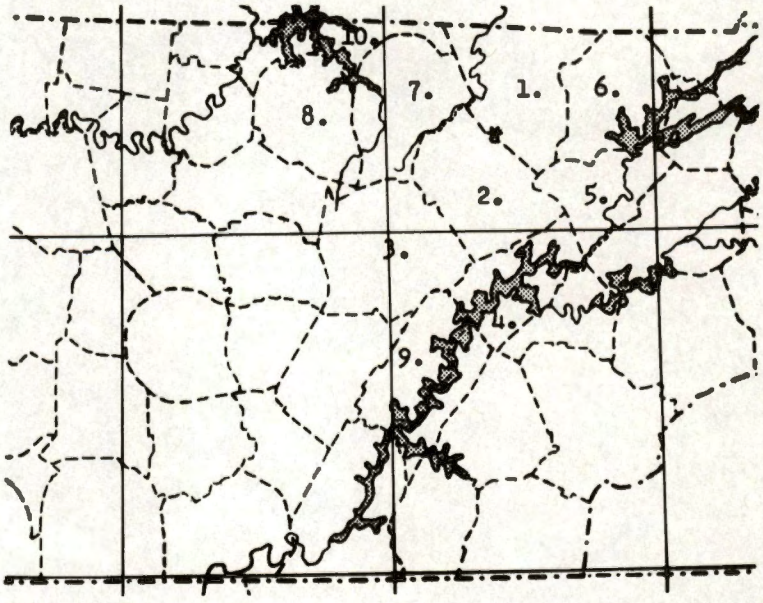
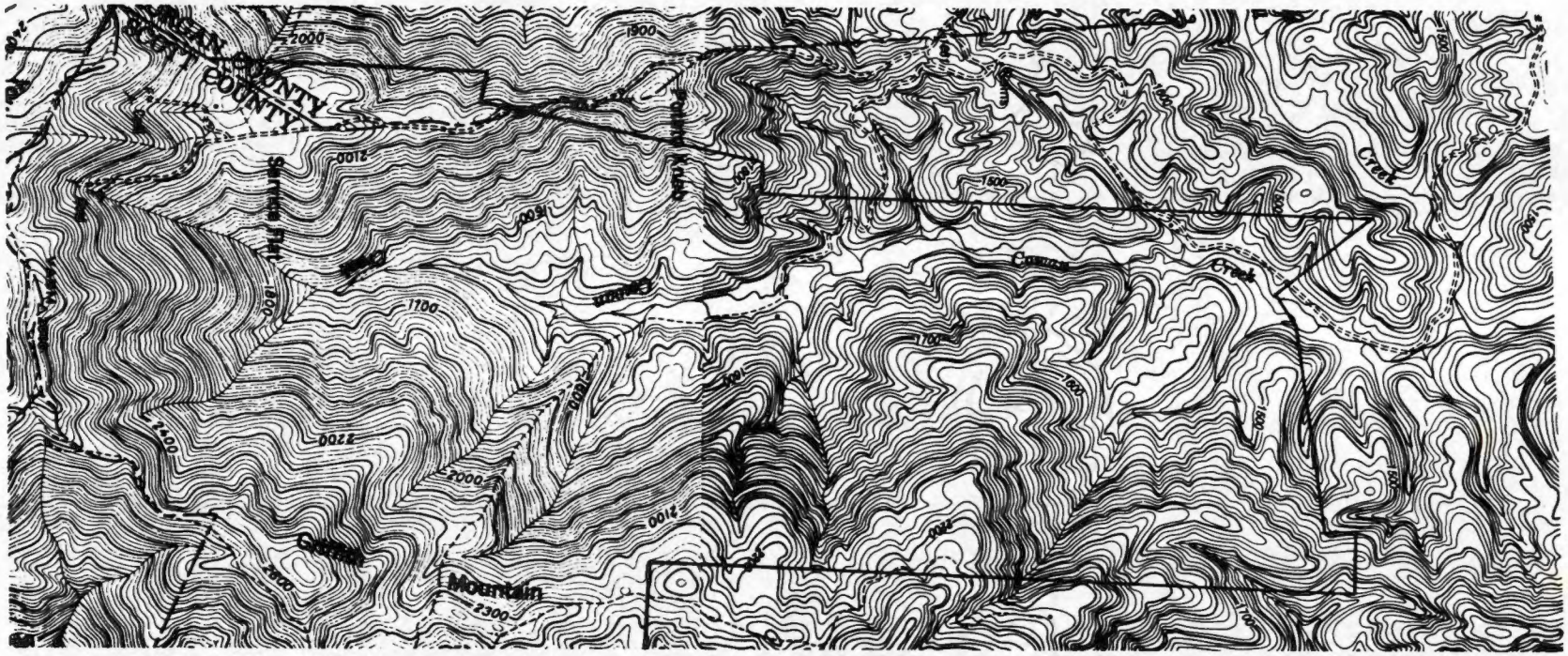


Figure 1. Map of Scott and surrounding counties.

*Site of the Cowan Creek Environmental Education Center.

Legend:

1. Scott County
2. Morgan County
3. Cumberland County
4. Roane County
5. Anderson County
6. Campbell County
7. Fentress County
8. Overton County
9. Rhea County
10. Pickett County



Scale: 1: 24,000

Figure 2. Contour map of the Cowan Creek Drainage

VITA

Charlotte Ann Shea was born in Knoxville, Tennessee, on June 26, 1948. She attended South Knoxville Elementary School in that city and was graduated from South High School in 1966. She then entered the University of Tennessee at Knoxville, and in June, 1970, she received the Bachelor of Science degree in biology.

In the fall of 1970, she accepted a National Science Foundation traineeship at the University of Tennessee and began study toward a Master's degree. In August, 1972, she received this degree in ecology. She is a member of Phi Beta Kappa and Xi Sigma Pi.