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SURVEY REPORT
and
EDUCATIONAL-USE PLAN

RURAL LIFE CENTER

Bluffton College
Bluffton, Ohio



NATIONAL AUDUBON SOCIETY
Nature Centers Division
1130 Fifth Avenue, New York, N. Y. 10028



Aerial Photo--Bluffton College and Related Properties

Preface

This survey report and educational-use plan for a Rural Life Center is a proposal to suggest the manner in which Bluffton College and the neighboring four counties can work together creatively to preserve open space, and at the same time to demonstrate that the college can strengthen its own curriculum in the natural sciences and professional education, and service the outdoor education programs of elementary and secondary schools.

The presentation is in five sections with Part I containing background information and objectives of an outdoor interpretive program. Part II is a report on the site survey of the College Farm and certain nearby properties, and an appraisal of the various resources studied. Part III presents program suggestions and an overall plan for the development of the Rural Life Center along with cost estimates and other data. Part IV contains a summary of major recommendations, and Part V consists of appendices which support the text of the report.

Location 11

Accessibility. 13

Size and Shape 13

Terrain and General Characteristics 13

of the Land. 13

Geology and Soil 14

Water Resources. 17

Forest and Other Plant Cover Resources 18

College Farm Woodlot 18

Woodlot Crossed by Power Lines 18

Old Orchard 18

Black Walnut Grove 18

January 4, 1967

TABLE OF CONTENTS

	<u>Page</u>
PART I BACKGROUND INFORMATION	1
Perspective.	1
Special Significance of a Coordinated Nature Center Program.	3
Objectives of a Nature Education Program	4
Problems of Teaching Conservation.	7
Rural Life Center--A Special Form of Nature Center.	9
PART II SITE SURVEY AND APPRAISAL.	11
Location	11
Accessibility.	13
Size and Shape	13
Terrain and General Characteristics of the Land.	13
Geology and Soil Resources	14
Water Resources.	17
Forest and Other Plant Cover Resources	18
College Farm Woodlot	
Woodlot Crossed by Power Lines	
Old Orchard	
Black Walnut Grove	

Kreider Woods
 Diller Woods
 Bottomland Hardwoods
 Cabin Area

PART II	Wildlife Resources	26
	Human Factors.	27
	Rural Life Center Recommended.	28
PART III	DEVELOPMENT AND USE PLAN, RURAL LIFE CENTER.	29
	Initial One-Year Program	30
	Director Caretaker-Farmer	
	Full-Scale Rural Life Center	36
	Suggested Improvements Program Offering Maintenance Administrative Guidelines	
PART IV	SUMMARY OF MAJOR RECOMMENDATIONS	56
PART V	APPENDICES	57

PART I

BACKGROUND INFORMATION

PERSPECTIVE

The idea of using land to teach nature appreciation and conservation of natural resources is a growing concept in America. Increasingly more emphasis is being placed on conservation education and interpretive programs through the use of parks, school lands and other natural areas as outdoor laboratories, particularly in and around our cities and suburbs where the need is greatest. More and more the idea of community nature centers as gateways to the natural world is gaining favor.

Today, as outdoor recreational demands grow, many people who take to the outdoors are seeking something more than ball fields, benches, fireplaces and picnic tables. A great many are seeking solitude and natural beauty. They are seeking greater personal satisfactions in leisure. Thoreau recognized man's need for nature when he wrote in Walden:

We need the tonic of wildness--to wade sometimes in marshes where the bittern and the meadow hen lurk, and hear the booming of the snipe, to smell the whispering sedge where only some wilder and

more solitary fowl builds her nest, and the mink crawls on its belly close to the ground....We can never have enough of nature.

This suggests, then, that those who are interested in community development should plan for the use of land to provide education and esthetic enjoyment; moreover, programs and facilities should be promulgated which will help people to enjoy fuller and richer lives.

The modern age has brought urban America to an era of mass leisure. Accelerated advances in science and technology have given us new dimensions in power, including power to move and modify vast areas of our natural environment. In addition, automation, improved transportation and communications, and higher wages are creating a socio-economic revolution the like of which our nation has never known before.

People in America are changing their total environment--the place and the way they live. As we sacrifice country life for city life, we are faced with serious problems: a lack of appreciation by people, generally, for land and the natural environment; the pollution of water and air; the loss of open space; blemished landscapes; and squalid surroundings. In growth and development we must recognize the importance of a life-supporting

environment, or watch our urbanization go down the road to shapeless sprawl, decaying and unhealthy neighborhoods, exploited resources, noise and general ugliness. These are dilemmas which all community leaders, including educators, planners, engineers, developers, economists and ministers, must ponder.

SPECIAL SIGNIFICANCE OF A COORDINATED NATURE CENTER PROGRAM

A nature center, in simple terms, is a gateway to the great world of nature. It is a special outdoor area where the people of a community can see and enjoy nature readily and easily. At such a center everyone can learn something about the interrelationships of plants and animals as well as non-living features, and develop insights on how man can maintain a life-sustaining environment. A dynamic nature center provides innumerable recreational, educational, scientific and cultural values to the people of an urbanized community.

The nature center program is designed to bring land and people together. All who participate in the program will have a better opportunity to interpret the natural world about them and to develop the kind of perception they need in order to live as better citizens.

People will not safeguard that which they do not understand. They will not protect and treat kindly that which they do not appreciate. A nature center program is designed to help everyone become better stewards of open space, of undeveloped land, and of natural resources in general. Mr. Walter A. Tucker, director-secretary, Columbus Metropolitan Park System, Columbus, Ohio, has commented on the values of nature education in parks as follows:

The success of the nature interpretive program in our parks is reflected by increased public participation. The benefits are evident in the improved public behavior as shown by the orderliness of visitors, the absence of litter, and freedom from willful destruction of property.

We believe that natural history programs more than justify the expense involved. We are convinced that our park nature program more than pays its way on a dollars and cents basis.

OBJECTIVES OF A NATURE EDUCATION PROGRAM

The nature center program provides firsthand, direct experiences in the outdoors to groups and individuals. It is particularly suited to the pursuit of nature recreation and to studies and research in social science and natural science as well as the conservation of natural resources.

The primary educational objectives which seem important here are:

- To develop an awareness of the importance of conserving our natural resources, especially those which provide food, clothing, recreation and shelter, by emphasizing the broad concepts of conservation
- To develop the ability to read the record of past and present resource use from the landscape
- To grasp scientific understanding by seeing applications of natural principles and laws in their outdoor settings instead of just reading textbook descriptions
- To develop an awareness that all things in nature change constantly
- To promote an understanding of the interdependence of the various facets of nature, with particular emphasis on ecological relationships
- To give students an opportunity to share knowledge and experiences with classmates
- To practice decision-making through democratic action
- To develop self-reliance as well as a cooperative attitude

- To help students think creatively

For the visitors to parks, school grounds and other areas of open space, the following general objectives seem worthwhile:

- To teach proper outdoor manners and good conduct, and thus help curb vandalism
- To promote better citizenship by stressing the need for responsible individual action, since the maintenance of a healthful environment in a community is the cumulative result of many decisions made by residents, financiers, developers, school personnel, park employees and other government workers
- To make leisure time more productive and satisfying
- To provide a place for creative types of outdoor pursuits (nature study, hikes, painting, sketching, photography, writing)
- To help increase knowledge and understanding of the natural world and man's place in it
- To develop sensitivity, awareness and appreciation toward land and natural resources

- To help develop a desire and thus a will to protect the living and non-living resources in all parks and other open lands

PROBLEM OF TEACHING CONSERVATION

A persistent problem in teaching conservation in American schools and colleges is one of how to reach young people so as to influence the way they treat natural resources and the environment in which they live. What students do today and how they live are patterns that will be seen in resource use and environmental control in the future.

To create conservation-mindedness in the individual it is necessary to stress personal experiences and to develop perception through use of the senses so that the outdoor world will have full meaning. The essential element, life, is absent from a tray of mounted butterflies. Even a fish in an aquarium or a bird in a cage is no teaching substitute for a wild fish in a pond or a thrush in a native wood lot.

Where can the urban resident (child or adult) go to study nature? Where can the teacher take a class to study interrelationships in the outdoors? What methods should a teacher use to make outdoor experiences meaningful?

Nature center lands are currently available for outdoor

learning experiences in many parks and school grounds. The principal problems seem to be those of holding on to what is available, adding land, and of developing additional programs.

A corollary to providing and retaining "lands for learning" is the training of teachers and youth leaders who can teach comfortably and competently in the outdoors. Perhaps a basic change is needed in viewpoint, especially on how to approach the outdoors where children are concerned. The late Rachel Carson, in a recent magazine article (in Woman's Home Companion) entitled "Help Your Child to Wonder," had some advice for parents which teachers and youth leaders may want to ponder. She wrote:

"How can I possibly teach my child about nature-- why I don't even know one bird from another." I hear parents say.

I sincerely believe that for the child, and for the parent seeking to guide him, it is not half so important to know as to feel. Once the emotions have been aroused--a sense of the beautiful, the excitement of the new and the unknown, a feeling of sympathy, pity, admiration, or love--then we wish for knowledge. It is more important to pave the way for the child to want to know than to put him on a diet of facts he is not ready to assimilate.

activities.

Offer experiences that emphasize the care and observation of farm animals, milk production, poultry raising, and the care and handling of pets.

RURAL LIFE CENTER--A SPECIAL FORM OF NATURE CENTER

A rural life center involves an operating farm--its land, crops, farm animals, wildlife, woodlot--and portrays farming as a way of life. The varied resources of a farm become the foundation for firsthand outdoor experiences for school children, college students, and adults of the community. The rural life center combines the educational potentials of such features as crops produced through the best known conservation practices, animal husbandry, gardens, farm ponds, fruit and nut orchards, woodlots and native wildlife. Many of the educational program activities of such a rural life center seem obvious; however, the following list is meant to suggest a few of the ways in which such a center can fulfill its role as an educational institution in the community:

- Be a focal point for all types of nature and outdoor activities for all age groups, which would include plants, wildlife and other living creatures indigenous to the farms of the area.
- Feature conservation projects involving land and water use, wildlife management, woodlot management and bee-keeping.
- Demonstrate appropriate types of gardening and orchard activities.
- Offer experiences that emphasize the care and observation of farm animals, milk production, poultry raising, and the care and handling of pets.

- Provide a place to study the processing, marketing and consumption of farm products, and which stresses home management activities, landscaping, and general improvement of the community through wise use of its resources.
- Offer farm experiences through such activities as weaving, making apple butter and dairy products, corn roasts, corn husking, hayrides.
- Demonstrate the use and care of farm machinery.
- Be a center for community service activities. This would include meetings of farm and church organizations, conservation clubs, and groups interested in city-rural relationships.

LOCATION

The College Farm is located just off Bluffton College campus and about 1 mile northwest of the village of Bluffton. The site, as shown on Map #1 on the next page, is situated very close to the center of the four counties of Allen, Hancock, Hardin and Putnam. The location of the proposed Rural Life Center on the College Farm is very favorable from the standpoint of being within easy reach of all schools in the four-county area.

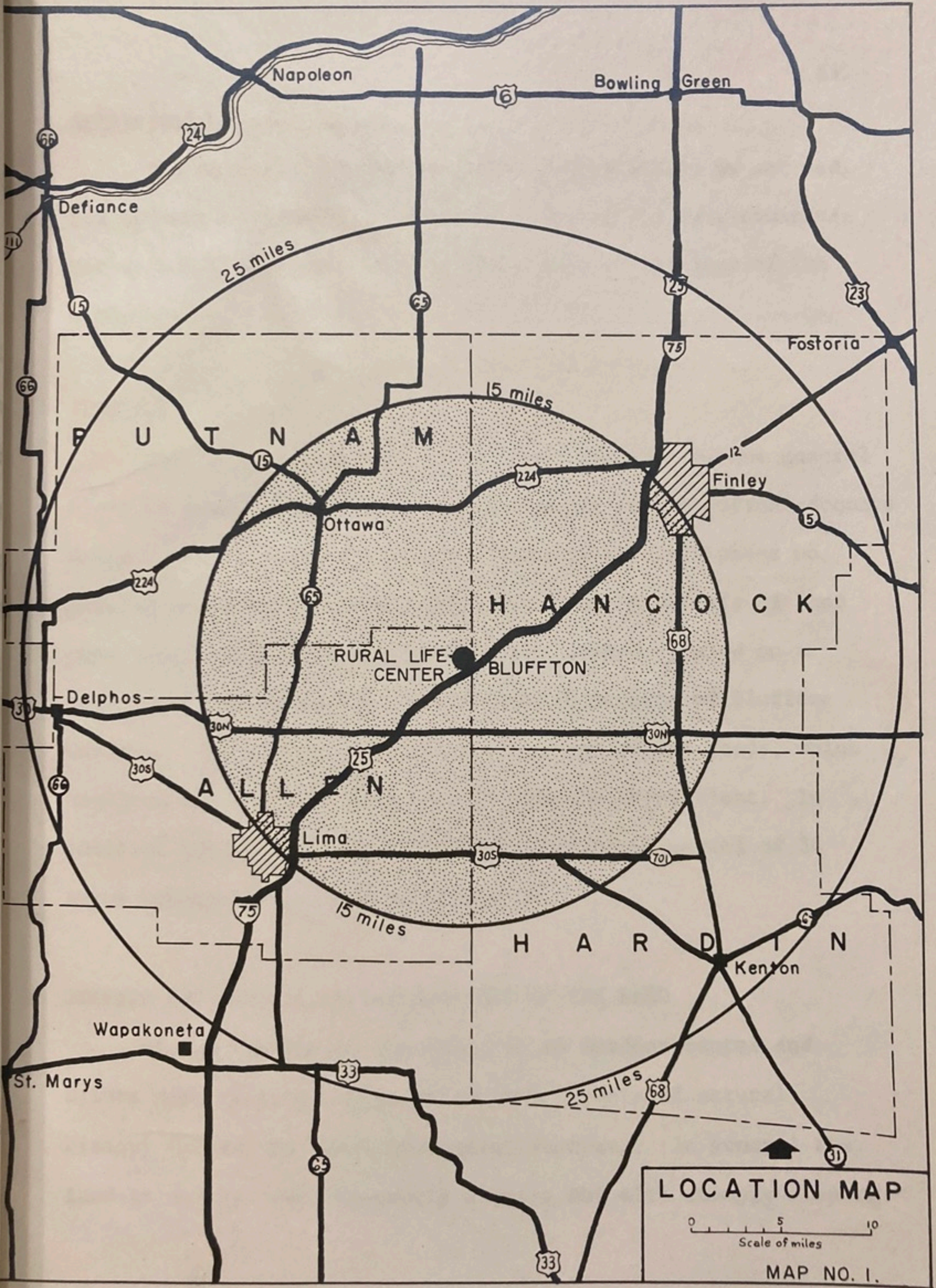
PART II

SITE SURVEY AND APPRAISAL

This part of the report contains information and data relative to the farm of Bluffton College and certain adjacent properties. Pertinent information will be given on the location of the land, accessibility, size and shape, terrain and general characteristics, a review of the natural and other resources of the area, and important local human factors. Where appropriate, brief recommendations will conclude each section.

LOCATION

The College Farm is located just off Bluffton College campus and about $\frac{1}{4}$ mile northwest of the village of Bluffton. The site, as shown on Map #1 on the next page, is situated very close to the center of the four counties of Allen, Hancock, Hardin and Putnam. The location of the proposed Rural Life Center on the College Farm is very favorable from the standpoint of being within easy reach of all schools in the four-county area.



ACCESSIBILITY

The College Farm has excellent accessibility by car and bus on many good highways from all parts of the four counties. Interstate Highway 75 passes about a mile to the east of the site.

SIZE AND SHAPE

The College Farm covers 104 acres and assumes the general shape of a rectangle. The present acreage is considered adequate for a rural life center, and the shape of the land poses no serious problems of control and use. Certain parcels of land near the College Farm might be rented, leased or used on a contractual agreement in the educational program of Bluffton College. These areas are Kreider Farm and Diller Woods, which combined could add as much as 130 acres to the project. In addition Bluffton College has a newly acquired parcel of 34 acres between the campus and the farm.

TERRAIN AND GENERAL CHARACTERISTICS OF THE LAND

Varied terrain is important to an outdoor center and offers opportunities to teach several aspects of natural history related to local geological features. In general the land is nearly level to gently sloping but with steeply sloping

areas and escarpments along the main streams. The range of elevation is from 800 to 835 feet above sea level, making a difference of only 35 feet between the lowest land along Riley Creek and the highest point in the vicinity of the campus. Bluffton is near the southern edge of an old lake bottom (Lake Maumee) which accounts for the gradual rise in elevation.

GEOLOGIC AND SOIL RESOURCES

Bluffton is located in the Central Lowlands of Ohio astride the Lake Plain and Till Plain areas. Several glaciers covered this region, but the Late Wisconsin drift covered all the material left by former glaciers. A mantle of glacial drift ranging from a few feet to several hundred feet in thickness overlies limestone bedrock of the Monroe formation. One prominent limestone outcrop is at Bluffton. It is believed that the last glacier retreated from the area about 15,000 years ago.

Two general groups of soils are represented in the Bluffton area: gray-brown podzolic soils and humic gley soils. The gray-brown podzolic soils developed under deciduous forests in a humid, temperate climate. The humic gley soils are poorly drained or very poorly drained and occur in nearly level areas or depressions. They have a periodically high water table,

and the original natural vegetation was predominantly swamp forest.

Several specific soil types are found on the College Farm and adjacent areas and are shown on Map #2 on the next page.

Description of the more important soil types follow:

Shoals silt loam. A brownish-gray, imperfectly drained, nearly level bottom soil found adjacent to streams. Two problems exist--flooding and internal drainage. This is a highly productive soil if flooding can be controlled.

Sloan silty clay loam. A dark colored, very poorly drained bottom soil. Responds well to artificial drainage. A very productive soil for row crops if good drainage is provided.

Mill creek silt loam. A very dark gray to very dark brown, well drained silt loam soil occurring on nearly level to gently sloping areas of the terraces or other outwash areas. Erosion is a hazard on sloping areas.

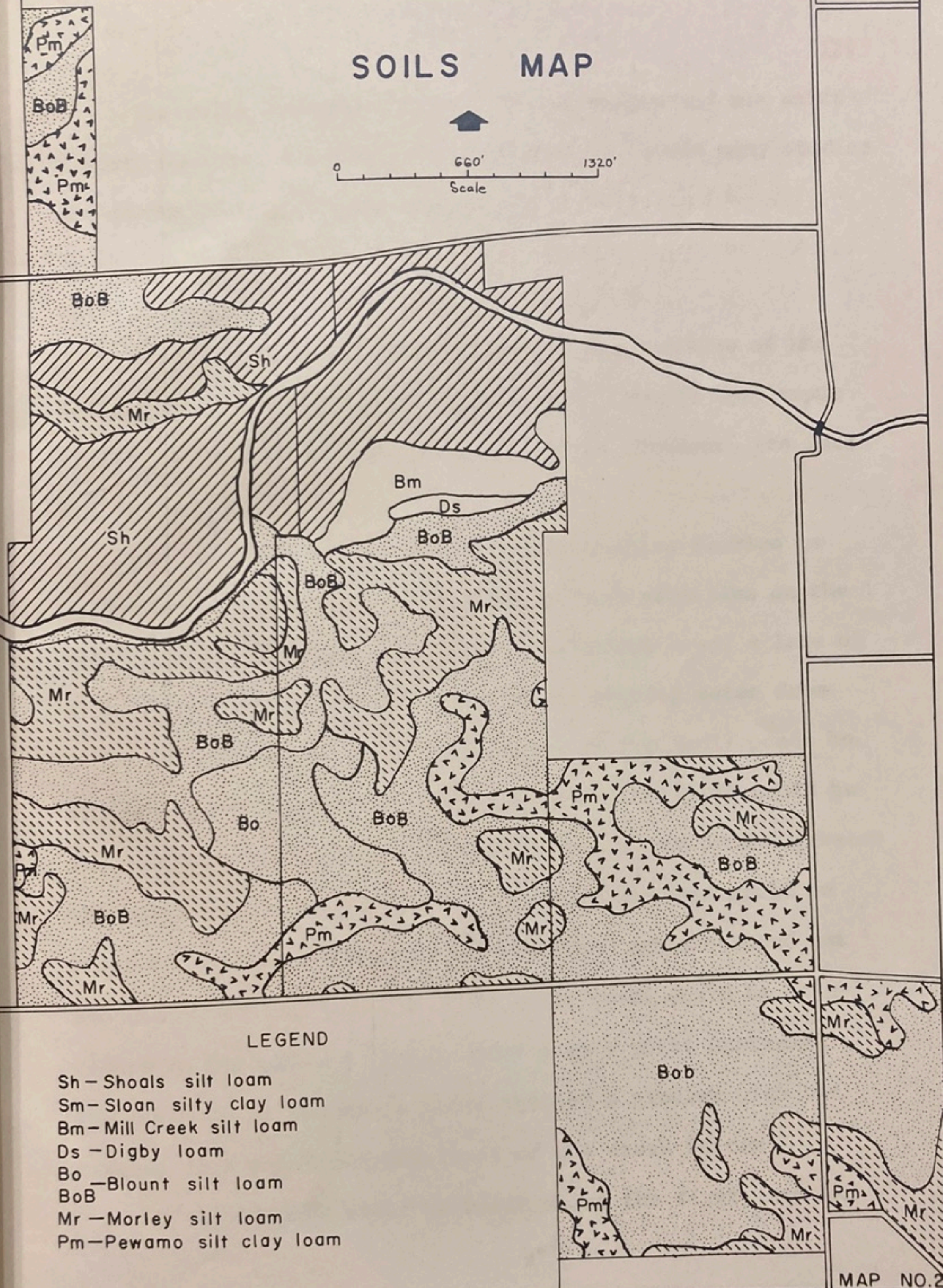
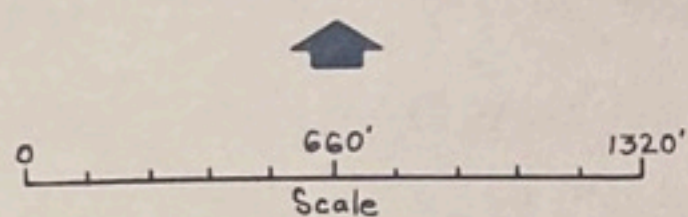
Digby loam. A dark grayish brown, imperfectly drained loam soil occurring on level to gently sloping terrace areas bordering the bottom areas of major streams. This soil has a very high producing capacity if properly managed.

Blount silt loam. A dark grayish-brown soil found on nearly level to moderately sloping areas of the uplands. The tight subsoil creates an erosion hazard on sloping areas. The soil is slow to dry out.

Morley silt loam. A dark grayish to yellowish-brown surface color, silt loam surface texture moderately well drained, occurs on the steeper sloping areas of the glacial uplands. The soil has a dense, compact, and fine subsoil which restricts internal water movement and root penetration. The soil responds well to fertilization, lime, and good management.

Pewamo silty clay loam. A dark gray to black, very poorly drained soil, occurs on level places and in depressions near wet seasonal drainways. Internal and surface drainage is needed.

SOILS MAP



The soils are generally of glacial origin and are sufficiently numerous and varied in character to permit many studies and demonstrations.

WATER RESOURCES

Riley Creek flows through the northern portion of the College Farm and Little Riley Creek winds through the campus to its confluence with Riley Creek. Ponds, however, are lacking on college property.

At the present time the Soil Conservation Service is studying the feasibility of a three to four-acre lake on the College Farm. Because of a limited watershed area, a lake of this size can probably be maintained by pumping water from wells or the creek. It is suggested that two small ponds be constructed in place of one larger pond. The first could be located near Riley Creek with the bottom of the pond dug below the water table created by the creek; or the pond could be built a short distance from the creek but again scooped out and with a low earthen dam. The water level could be maintained in the pond by piping water from a point upstream. The presence of limestone would present a problem with the digging of a pit below the level of the creek bottom.

A second pond could be built above the first, and in

periods of dry weather a windmill could lift water from the first pond into the second, or this could be done more directly by electric pumps. A marshy area could be created around one of the ponds to make a new wildlife habitat. See Map #3 on page 37 in Part III for suggested pond locations.

FOREST AND OTHER PLANT COVER RESOURCES

The hardwood forests of the Bluffton area lie within the Central Hardwoods region and include most of the Midland Hardwood Forest, a major subdivision of the Eastern Deciduous Forest.

At the time this area was settled, the dominant woodland was a mixed hardwood forest consisting of elms, ashes and maples of the swamp forest community in combination with many other species which made up the beech-maple and oak-hickory forests. In general, the hardwood vegetation can be divided into three major forest types, namely, (1) oak-hickory, (2) mixed mesophytic, and (3) elm-ash-maple. Each is described as follows:

1. The oak-hickory forest is comprised predominantly of white, black, and red oaks and hickories. Associate species are elms, ash, basswood and many other hardwoods.
2. The principal species of the mixed mesophytic type are sugar maple, American beech and American elm. The most common associates are basswood, ash, oaks and black walnut.
3. The elm-ash-maple vegetation, commonly known as

"bottomland hardwoods," includes American elm, black ash, red maple, cottonwood, sycamore, swamp white oak, hackberry, box elder and willows.

The present pattern of forest and plant cover has been produced by past land-use practices. As a result, the forest resources vary considerably in composition, age, size and plant distribution. The more prominent woodland areas are shown on Map #3 on page 37.

College Farm Woodlot

The dominant forest species are sugar maple, American elm and hickory. Most of the trees range from seedlings to widely-scattered trees 20 inches in diameter. Many of the elms are dying from the elm blight and should be removed. As was a common practice in past years, cattle were permitted to graze in the woodland, destroying most of the young trees. With the elimination of grazing, young hardwood trees are becoming established. See Photo #1 on the next page.

This woodlot could be divided into two equal sections. A series of demonstration plots of about $\frac{1}{2}$ acre each could be established to demonstrate sound forest management practices, such as selective logging, sanitation cutting, pruning and improvement cutting. One section could be devoted to demonstration plots while the other section would serve as the control and would also illustrate natural succession. ✱



Photo No. 1--View of college farm woodlot.

Kreider Woods

Kreider Woods is made up of two distinct stages of forest growth. One stage consists of the older trees up to 20 inches in diameter with large, wide, spreading crowns, and the other stage has shrubs, young tree and pine plantings. The larger trees, as well as much of the young hardwood growth, are in a beech-hickory-sugar maple association. The large variety of hardwood shrubs includes several species of thornapple. Several hundred red pine seedlings have been planted in the past few years. A small red pine plantation up to 20 feet in height is located at the southern edge of this area.

It is suggested that no overnight camping be permitted in this area but that it should be reserved for day camp use. *
Three well-separated locations should be selected for these day camps, and a fireplace with a council ring should be built at each site. A portable chemical toilet should also be provided.

Diller Woods

A most unique and certainly a most exciting woodland community is Diller Woods. This forest remnant is estimated to be nearly 400 years old and typical of the once vast wilderness of the Bluffton area. Diller Woods is a priceless

heritage of the past, worth far more for its historic, primitive and scientific values than for anything that could be realized by resource exploitation.

As one enters this tract from the south and walks in a northward direction, he travels backward in time from the younger, more recent stands of mixed hardwoods to the massive 26"- to 44"-inch trees of past years. The stand composition is representative of the oak-hickory climax. The principal species are red oak, bur oak, white oak, shagbark hickory, bitternut hickory, basswood, sugar maple and beech.

Possibly due to age and disease, a number of the large trees are already dead, and more are dying. Because of the dense ground cover of sugar maple, the stand will gradually change to that of the sugar maple climax.

Diller Woods should be set aside for research and study * purposes. A trail could be provided to eliminate indiscriminate wandering. Tent camping should no longer be permitted due to the fire danger. A new and much larger group camping area should be located through the "Greenspan" program of the Bluffton area.

Woodlot Crossed by Power Lines

This woodlot was heavily grazed by cattle in past years.

Some large, widely-scattered trees of sugar maple, hickory, elm and oak predominate the scene. Weed and grass growth is giving way to dense stands of ash trees up to 15 feet high. Ash usually reseeds prolifically and dominates an area in early life but eventually will give way to a mixed oak stand.

The woodlot is ideal for the purpose of demonstrating the methods of converting poor, worthless forest growth to the more valuable pines, walnuts and oaks. Demonstration plots can illustrate site preparation techniques through bulldozing, disking, slashing, and use of chemicals to eliminate unwanted hardwood trees. The most suitable species for planting on the soils in this area are Norway spruce, Austrian pine, white pine, arborvitae, hybrid black walnut, red oak and white oak. The northwestern side of the power line right-of-way would be an ideal location for a series of wildlife food and shrub plantings.

Old Orchard

The orchard consists of about a dozen old apple trees, half of which are in bad condition. The trees can be restored by pruning and thus provide more food for wildlife. Trails of several kinds of animals were noted. Additional fruit trees could be planted to include apples, pears, cherries and plums.

Black Walnut Groves

Two areas of large black walnut trees were checked (see Map #2). The trees measured up to 28 inches DBH (diameter breast height) with large, wide-spreading crowns supporting an abundance of walnuts. This nut crop could be gathered each year and sold as a source of revenue for the farm. In area 6, a grove of hybrid black walnuts and other commercial nut-producing trees could be established for demonstration purposes and provide a source of future income.

Bottomland Hardwoods

These stands are located in the flood plain along Riley Creek. Stands of huge black walnut and honeylocust trees with large crowns dominate the stand. Shrubs and other plant growth are interspersed throughout. In most cases this stand occupies stream banks, low wet areas, and odd corners not suited for cropping. Elm, ash, maple, Osage orange, box elder and black cherry are the important species.

Cabin Area

Located in the northern part of College Farm between Riley Creek and Bixel Road, the cabin area supports stands of mixed hardwoods. Of prime importance is their function of holding the steep creek bank in place.

Table #1 is a partial list of trees, shrubs and wildflowers, observed by the survey team during the field study. This list helps to document the great variety of plants found in the area.

Table 1

Trees, Shrubs, Brambles, Vines and Wildflowers

Trees

American elm	shagbark hickory	white oak
slippery elm	pignut hickory	red oak
pussy willow	shellbark hickory	black oak
black ash	bitternut hickory	swamp white oak
white ash	black walnut	sugar maple
box elder	basswood	red maple
black locust	catalpa	silver maple
paw paw	Norway spruce	Ohio buckeye
honeylocust	American beech	sycamore
domestic pear	red cedar	tree-of-heaven
domestic apple	black willow	hophornbeam
cottonwood	ironwood	Osage orange
black cherry	hackberry	bur oak
white mulberry		

Shrubs

chokecherry	blackberried elder	red-osier dogwood
bush honeysuckle	smooth sumac	maple-leaf viburnum
spicebush	thornapple	shadbush
bristley currant	nannyberry	poison sumac

(Table 1 continued on next page)

Brambles and Vines

deadly nightshade	woodbine	blackberry
ground ivy	poison ivy	multi-flora rose
Japanese honeysuckle	wisteria	black raspberry
common greenbrier	grape	

Wildflowers

purple aster	pokeberry	smartweed
Queen Anne's lace	chickweed	brown-eyed susans
fall dandelion	sarsaparilla	butter-fly weed
common goldenrod	common plantain	hepatica
common dock	New England aster	bedstraw
jack-in-the-pulpit	Canadian thistle	teasle
stick-tight	ground cherry	milkweed
lanceleaf goldenrod	Spanish bayonet	ragweed
jimsen weed	wild asparagus	yarrow
yellow-flowered aster	great mullein	mint
sourgrass	pigweed	St. John's-wort
selfheal	dogbane	nettle
bindweed		

WILDLIFE RESOURCES

The College Farm appears to support an average number of native mammals, birds and other forms of wildlife. More adequate cover and food could be provided for wildlife by planting additional shrubs and coniferous trees in odd areas, around the ponds to be built, along ditches and in the forested area. Cropland could be managed so as to provide better food and cover for wildlife.

The following are some practices that would probably in-

crease the number and variety of wildlife on college lands:

1. Construction of farm ponds to provide more surface water
2. Use of crop rotation
3. Improvement of the vegetative cover by planting shrubs and other kinds of vegetation in areas where adequate food and cover are lacking
4. Protection of woodlands from fire and grazing
5. Planting odd areas to wildlife foods and establishing hedgerows where possible
6. Seeding stream and ditch banks
7. Stocking ponds with fish
8. Controlling erosion by planting problem areas to trees and shrubs.

WILDLIFE HABITAT IMPROVEMENT (Bulletin #5), which is published by the National Audubon Society, could serve as a guide for improving wildlife conditions on College Farm.

HUMAN FACTORS

More than 215,000 people are currently living in the four-county area. Of this number about 25%, or 53,000, attended school last year. Statistical information on population and school enrollment for each county is given in Table 2. It seems quite clear that there is sufficient population in the four-county area to keep a modest rural life center very busy.

Table 2Human Factors, Four-County Area

Population (1960 Census):	Allen County	103,691
	Hancock County	53,686
	Hardin County	29,633
	Putnam County	<u>28,331</u>

Total 215,341

Public School Enrollment K-12 (1965-1966):	Allen County	25,382
	Hancock County	12,770
	Hardin County	7,805
	Putnam County	<u>7,301</u>

Total. . . . 53,258

Colleges: Bluffton College, Bluffton
Findlay College, Findlay
Ohio Northern University, Ada
Ohio State University Branch, Lima

RURAL LIFE CENTER RECOMMENDED

The Nature Centers Division of the National Audubon Society recommends that the College Farm be dedicated for all times to the purposes of esthetic and educational activities. A rural life center is recommended and is envisaged to include three fundamental elements. When in complete operation, the center would include the land, a fulltime program, and certain facilities needed to make the program efficient and successful.

PART III

DEVELOPMENT AND USE PLAN

RURAL LIFE CENTER

No area of land can be everything to everybody. The

Society's Nature Centers Division has found that certain uses are compatible to a rural life center; others are not. If the area studied is to become a rural life center, then the following compatible and non-compatible uses should be noted:

Compatible Uses

Land and water conservation practices
 Farm animal observation and study
 Nature and ecological studies
 Organized, naturalist-led walks
 Self-guided walks
 Bird studies
 Organized (group) outdoor education tours
 Studies of farm folklore
 Indoor and outdoor lectures
 Nature painting, photography, sketching, writing
 Conservation meetings, forums, workshops, programs,
 exhibits in interpretive building
 Educational day-long sessions for school, college and
 youth groups, especially in the summer
 Weekend meetings for church and farm organizations.

Non-Compatible Uses

Picknicking
Collecting of specimens and materials
Trailer camping, overnight tent camping
Hunting and fishing
Field sports-ball sports
Rifle marksmanship
Motor scooter use
Animal zoo (caged native mammals and birds)
Indiscriminate lounging and romping through the area
(walking permitted only on established trails)
Bicycling on hiking trails

INITIAL ONE-YEAR PROGRAM

Proper educational programming requires advance planning so that when the center is open, all visiting groups will be properly handled. Also, each person who comes to the center should feel that the visit is both pleasant and rewarding. Inasmuch as a great portion of the director's time in the initial stages will be spent on program planning and on center development, it would be a mistake to start a major educational program at this time.

A center is like a school or any other development. It must be reasonably ready and organized before being put to use. Nothing is more disconcerting and discouraging than to visit a half-completed facility where adequate provisions do not exist to accommodate visitors and constant apologies must be made

for unsatisfactory conditions. It is recommended, therefore, that the formal opening of the Bluffton College Rural Life Center be delayed until the physical area is ready for the public. This does not mean that an initial educational program, such as is herein suggested, cannot be undertaken immediately.

If such action is desired, then a director should be employed as soon as funds are available. The director would begin working with college and school (K-12) teachers to acquaint them with the rural life center program. As a result of working with teachers and others interested in natural resources, a limited number of scheduled groups would be given interpretive tours of the farm to demonstrate values of the center to the community. *

The director should be provided with a small van-type vehicle to visit schools and for transportation of educational materials and small groups. Under this arrangement the director would spend about half of his time teaching and the other half planning center programs and facility development.

A fulltime caretaker-farmer should be employed at this time, too. His services would be required to keep the property and new developments under surveillance. He will be needed also for general maintenance, development of trails as well *

as care of crops, orchards, garden and farm animals.

A few comments on the two positions follow:

Director

This is the key position at the center. Much of the success or failure of the project will rest with this man. The minimum qualifications should call for a person of college background with a major in biology, zoology or natural resources conservation, and with at least two years of professional, practical experience in outdoor interpretation, land management and natural history education. A person with an aptitude for meeting people and with competence in administration, outdoor teaching, public speaking, guiding, and sound land management should be sought.

Caretaker-Farmer

A fulltime paid caretaker-farmer is essential to a rural life center project. This is a non-technical job calling for the services of a responsible guard and grounds man who knows and likes to work with crops and farm animals. Maintenance and development work would be involved in the position.

Even though money for some development will be included in the first-year budget, information on all suggested developments will be given in the next section.

Such an initial one-year program could probably be carried out on a capital budget of \$34,500 and on an operating budget of \$18,900. A breakdown of the capital improvement and annual operating budgets follow:

Table 3

First-Year Capital Improvement Costs

Demolition of a number of existing farm buildings and major repairs to the buildings retained for the program.	\$15,000
Vehicle (new panel van).	3,000
Fencing.	3,000*
Entrance road and parking lot.	4,000
Farm animals	1,500
Visual aids equipment and supplies	1,000
Machinery and tools.	<u>7,000</u>
Total.	\$34,500

*adjacent property owners should contribute at least \$1,000 to add to this figure

(Photo #3 on next page)

(Table 4 on next page)

Table 4First-Year Annual Operating Costs

Director	\$8,000
Caretaker-farmer	.4,000*
Personnel benefits	.1,000
Office supplies and postage.	600
Educational supplies	500
Insurance.	300
Feed for animals	.1,000
Vehicle operation.	500
Utilities (telephone, water, fuel, electricity)	.1,000
Miscellaneous.	<u>.2,000</u>
Total.	.\$18,900

*plus house and utilities

(Photo #2 on next page)



Photo No. 2--View of college farmstead.

FULL-SCALE RURAL LIFE CENTER

The next step in establishing the full-scale program at the Bluffton College Rural Life Center involves the provision of additional improvements and implementation of a complete nature and conservation education program at the College Farm.

Suggested Improvements

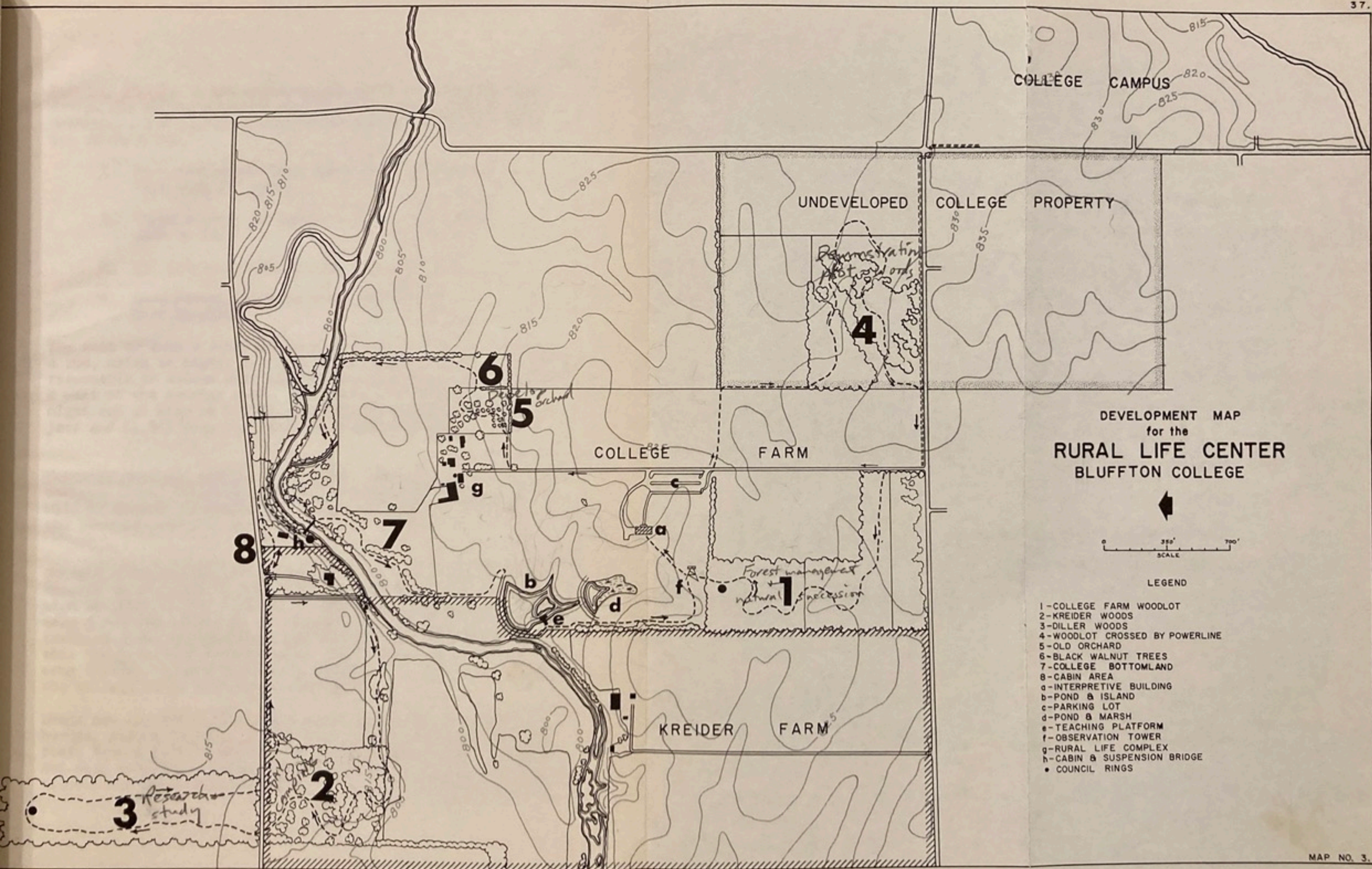
Certain land and water improvements and features, including educational facilities, are basic to a successful rural life center. However, only the more important of these are recommended in this report. A number of such features are shown on Map #3 on the next page. Each is described briefly and accompanied by a priority rating to effect a suggested order of development. Priorities are symbolized as follows:

First priority: PR-1 (immediate development)

Second priority: PR-2 (secondary stage development)

Third priority: PR-3 (long-term development)

Renovation of existing farmhouse, barn, garage, one chicken coop and wooden corncrib (PR-1). All other buildings should be demolished. The barn at the Aullwood Children's Farm, Dayton, Ohio, has an excellent arrangement of interior animal stalls and outdoor corrals. A layout similar to Aullwood's is recommended for the center. See Appendix D for information on Aullwood Audubon Center for conservation education. *



DEVELOPMENT MAP
for the
RURAL LIFE CENTER
BLUFFTON COLLEGE



LEGEND

- 1-COLLEGE FARM WOODLOT
- 2-KREIDER WOODS
- 3-DILLER WOODS
- 4-WOODLOT CROSSED BY POWERLINE
- 5-OLD ORCHARD
- 6-BLACK WALNUT TREES
- 7-COLLEGE BOTTOMLAND
- 8-CABIN AREA
- a-INTERPRETIVE BUILDING
- b-POND & ISLAND
- c-PARKING LOT
- d-POND & MARSH
- e-TEACHING PLATFORM
- f-OBSERVATION TOWER
- g-RURAL LIFE COMPLEX
- h-CABIN & SUSPENSION BRIDGE
- COUNCIL RINGS

Fencing (PR-1). A new cattle-tight fence will be necessary around the entire property with a good, strong gate at the entrance. The following specifications for a 30-year fence are recommended:

1. Four-foot woven farm fence of #9 galvanized wire with 12" stays
2. Three strands of heaviest galvanized barbed wire on top
3. 6½' galvanized metal posts every 14'
4. Re-enforced concrete posts and braces cast in place.

The cost of such a fence on level land is estimated at \$7.50 a rod, which is higher in woods or on rough terrain. It seems reasonable to assume that adjacent property owners will share a part of the fencing cost. The total cost of the fence might run as high as \$4,000, with \$3,000 coming from the project and \$1,000 from the adjacent property owners.

Entrance road and parking lot (PR-1). A widened and improved entrance road, following the route of the present farm lane, will be needed. A graded lot for 25 cars will be required at the location shown on Map #3.

General conservation trail (PR-1). This trail starts at and returns to the parking lot, and tells the story of conservation of soil, water, forests, wildlife and minerals in one, easy 90-minute walk. It is equipped with simple trailside teaching signs and displays and resource stations. On Map #3 this trail extends through areas 1 and 4 as well as across crop fields. Longer trails are suggested to reach the campus, the college cabin area and Diller Woods.

Where new heavy-use trails are put through dense growth or bushes, shrubs or young trees, it is desirable to clear the trail from 8 feet to as much as 15 feet wide. Such clearing not only encourages ferns, clovers, grasses and some flowering plants, but makes trail maintenance easier. Clearing should

be to 10 feet above the trail in order to allow for branches that hang down when wet from rain or laden with snow. Cut large trees only where it is impracticable to build around them. Brush and logs from the clearing process can be stacked into large piles at some distance from the trail to serve as wildlife shelters. All cutting should be done very close to the ground and all stumps and rocks should be cleared from the tread area. This includes small stones, snags and roots.

Shrubs and many trees may send up dense clusters of sprouts after the main stem has been cut. In such cases it seems wise to use chemical controls instead of allowing these sprouts to become dense clumps which get in the way and require further hand cutting. The fresh-cut stumps can be sprayed or brushed with a mixture of 2-4-5T ester, using one-half cupful of the ester in one gallon of kerosene or fuel oil.

The main conservation trail for the Rural Life Center should be developed to include the following sections or loops:

Soil. Illustrates the various phenomena in the formation of soil. It also shows the effects of weathering on soil, and how lichens, mosses and ferns, grasses, shrubs and trees and animals affect the soil and are related to it.

Water resources. Leads to trailside features which tell the story and importance of water and explain the hydrological cycle.

Forest resources. Leads through a wooded area and stations and provides stops where forest community principles can be explained.

Wildlife. Includes a demonstration of wildlife habitat improvement and leads to a number of animal homes.

Geology. Points out the importance of rocks and minerals, shows effect of glaciation and more recent erosion.

Emergency fire tool box (PR-1). This is a metal display box containing forest fire fighting tools set on four treated posts and placed along the forest resources trail segment or near the parking lot where the story of forest fire prevention and control can be stressed. The tools can also be used for

emergency purposes, and should include an Indian back-pack pump, 4 council fire rakes, long-handled shovel, regular rake, rattan broom, swatter and Swedish bow saw.

The following items are not budgeted in Tables 3 and 4 and therefore will have to be funded at a later date.

Interpretive-education building (PR-2). This structure would serve as a communications focal point for the center. It would function as a visitors' gathering and recording point where information and orientation services would be available and where indoor exhibits and seasonal displays would be arranged. It would contain, among other things, rooms for school and other groups during orientation or inclement weather, and for special meetings and conferences.

The building would also serve as the official headquarters for the project with space for an office, a library corner and workshop. An attractive walkway and service road are essential. The entire area around the building should be landscaped with native plants and reflect natural beauty.

A sketch and floor plan for an interpretive-education building is suggested which would provide 2100 square feet of floor space (Sketch #1). (All sketches are presented at the end of this section on improvements.) This design would fit nicely into the building site selected and would allow for future expansion. See suggested location on Map #3.

Certain economies can be effected by using a redwood or western red cedar pre-cut building. At least two reliable companies are in the pre-cut lumber business and produce buildings for centers. The two companies are:

Heritage Timber Building, Inc.
56 Dee Road
Park Ridge, Illinois (plant at Dowagiac, Mich.)

Timber-Lodge Division
Pritchard Products Corp.
4625 Roanoke Parkway
Kansas City, Missouri 64112

Sketch #2 illustrates an expandable building of 1680 square feet of floor space modified from Sketch #1 to conform to the 24-foot width of most pre-cut buildings. The basic cost for this building, less equipment, is estimated at \$30,000. The cost of utility development which would include water, electricity and sewerage could amount to \$5,000. Furniture and equipment for this building could run as high as \$7,500. Landscaping of the area around the parking lot and building with native vegetation should not be overlooked.

Trail for the blind (PR-2). This can be a short version of the general trail, equipped with feeling, touching, smelling and hearing devices geared to teach conservation and natural history to the visually handicapped.

Trail for wheelchair patients (PR-2). This could be another separate, short, paved trail with special features adapted for non-ambulatory visitors and would begin and end at the parking lot of the center.

Super bird feeder (PR-2). A large bird-feeding station with a bird bath and dripping water should be located near the interpretive building, screened with shrubs in semi-circular fashion, yet visible from a window of the building and a nearby observation blind.

Council ring (PR-2). A council ring is a trailside facility for orientation before a group begins a tour, or a place to hold critiques at mid-point or after a field trip has been completed. Several possible designs can be used: one (Sketch #3) is a small, modest ring seating 50 people; the other (Sketch #4) is a larger, semi-circular version holding up to 100 people. The council ring is an excellent place to hold evening fellowship programs. Three locations are suggested on Map #3.

Weather station (PR-2). A small but officially approved U.S. Weather Bureau field station is recommended. Equipment would include a rain gauge, psychrometer, thermometer, aerometer and directional wind vane, and location should be near the inter-

pretive building. Records of daily readings are kept and periodically sent to the U.S. Weather Bureau, Department of Commerce, Washington, D.C.

Soil profile (PR-2). A pit dug along the soil section of the trail shows a typical soil profile in the area. The pit should be kept covered with a sheet of marine plywood or tempered masonite.

Herb garden (PR-2). This is a plot of mints and seasoning herbs common in the locality. A garden club may be willing to provide and maintain such a project.

Bee tree (PR-2). A bee tree is a fascinating trailside feature. If a wild bee tree cannot be found in a convenient location, a swarm of bees can be placed in a crevice of a hollow tree. The director should secure the technical assistance of a professional beekeeper for this feature and for establishing a live beehive in the interpretive building.

Photographic and observation blind (PR-3). One or more blinds can be constructed of plant materials or woven redwood panels and located in different habitats for wildlife study and photography. Locations should be selected by the director.

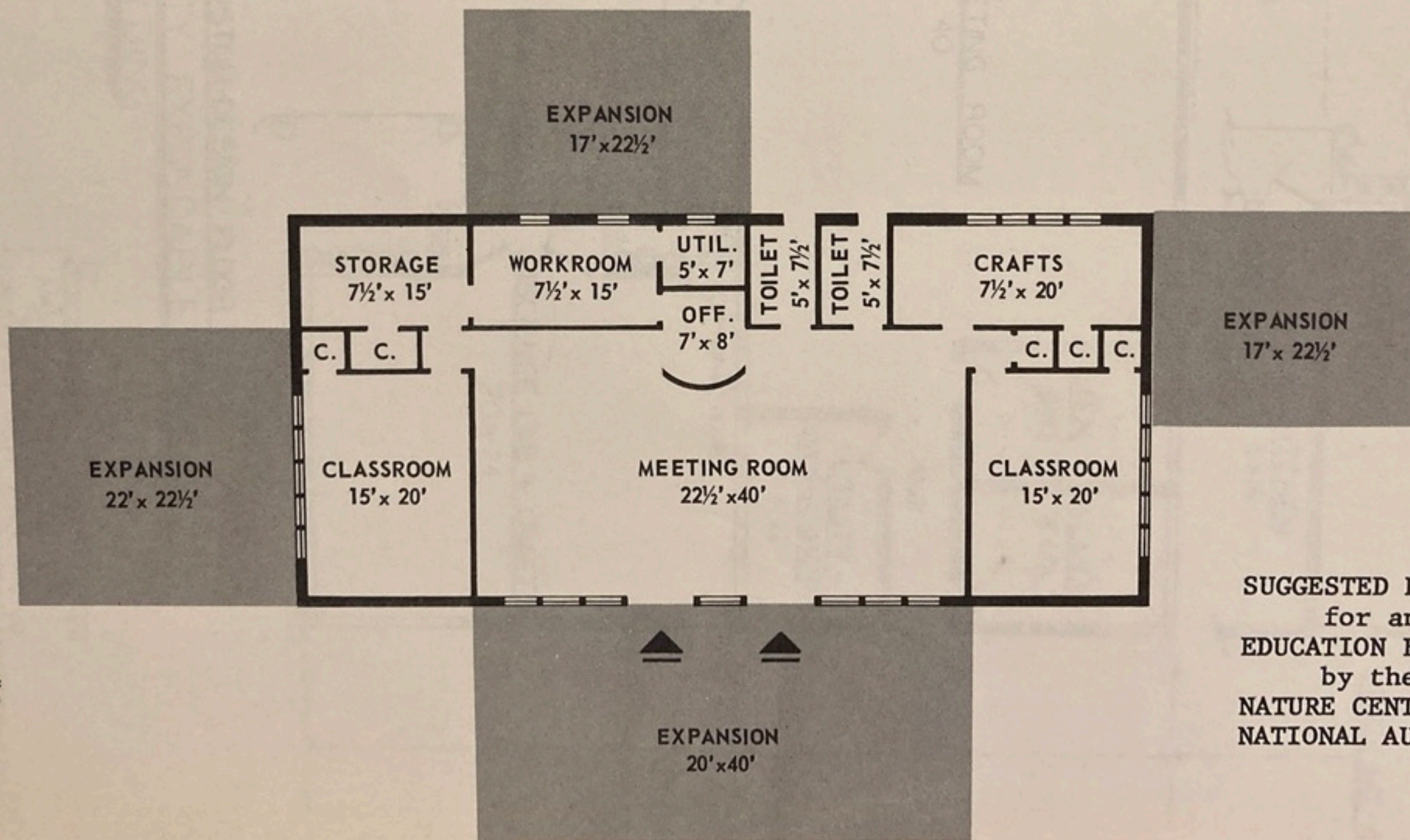
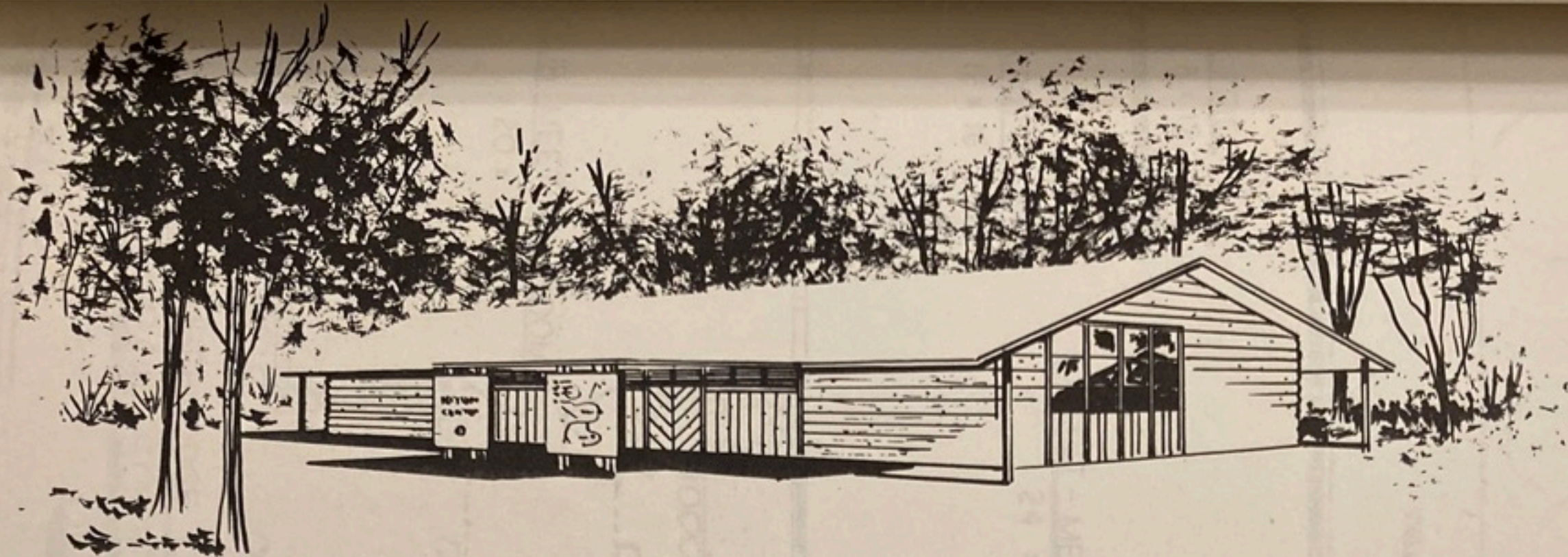
Tree stump and log display (PR-3). Where convenient a tree stump with a sloping cut can be made into a smoothed and water-proofed display. The annual growth rings can be matched with local events which occurred during the life of the tree. A log can be split or cut at several angles, sanded and varnished to show rays, grain and wood texture.

Geology and fossil wall (PR-3). This is a short, low, stone wall exhibiting on top in cemented fashion a number (10 or 12) of the more important rocks, fossils and minerals of the area. It should be accompanied by a panel showing the origin, location and name of each specimen imbedded on the wall.

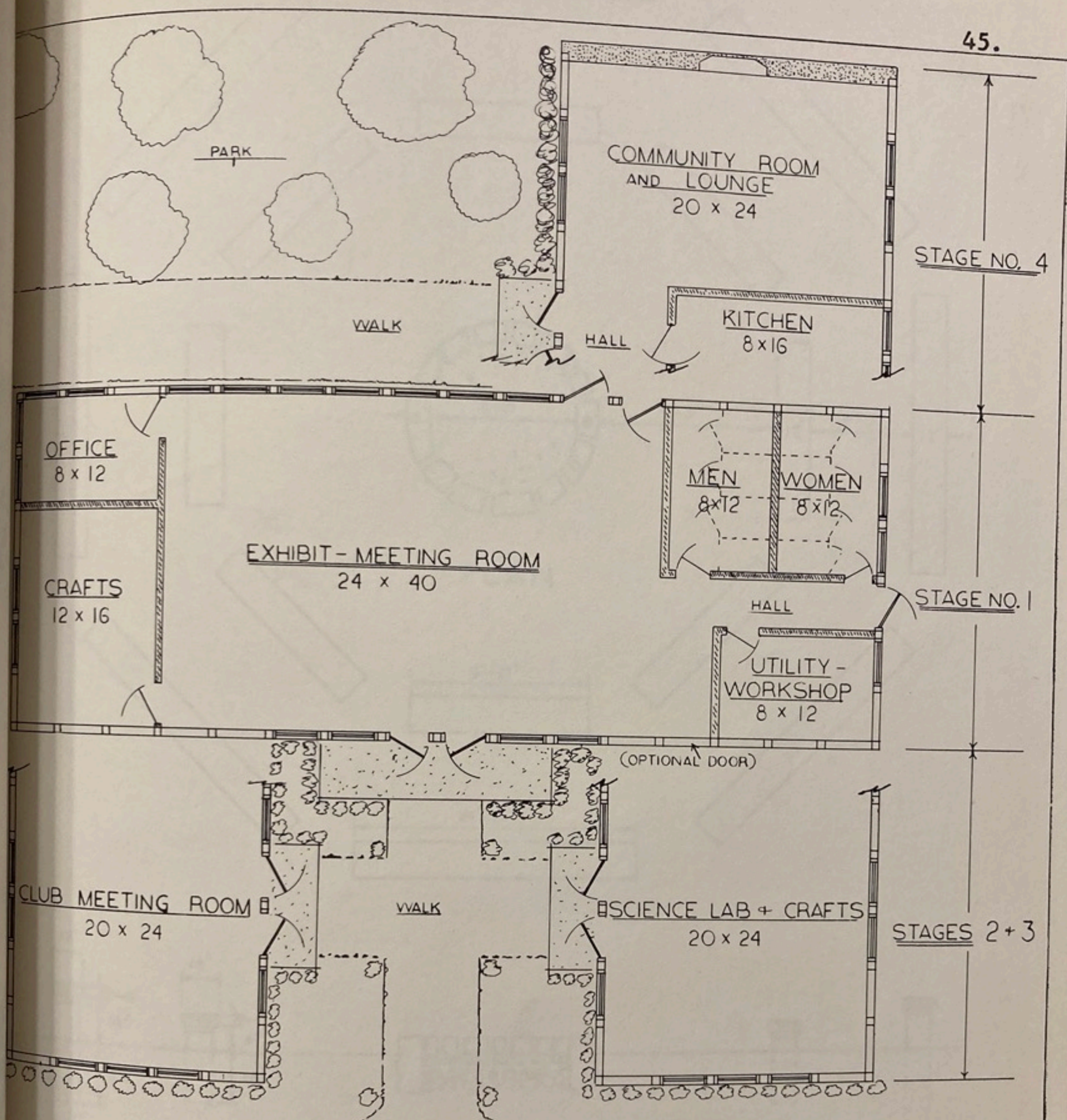
Concentrated plant plots (PR-3). These are small (4'x10'), carefully planted and tended plots near the interpretive building which enable visitors to identify wild plants by means of labels. The design should utilize rocks or other natural features associated with plants. It has been found educationally worthwhile to transplant and concentrate in small areas the following common native plant groups: (1) lichens, fungi and algae; (2) mosses, club mosses and horse-tails; (3) ferns; and (4) wildflowers.

Observation tower (PR-3). A functional observation tower at the location shown on Map #3 on page 37, would provide a wonderful panoramic view of the countryside. It can be an elevated wooden or steel structure. See Sketch #5 for a suggested design. A modest tower might cost \$5,000, while a super tower could amount to as much as \$25,000.

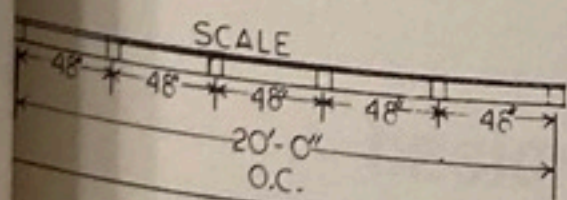
(Sketches 1 - 5 on the
following pages)



SUGGESTED DESIGN
for an
EDUCATION BUILDING
by the
NATURE CENTERS DIVISION
NATIONAL AUDUBON SOCIETY

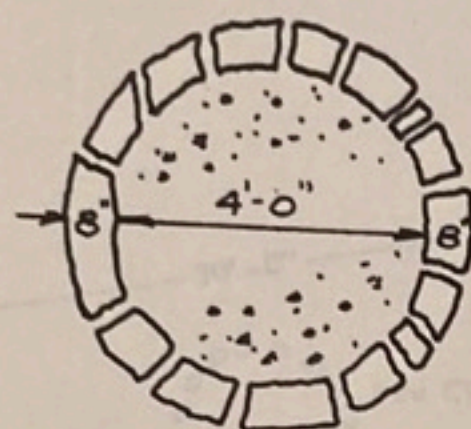


TIMBER-LODGE CUSTOM-DESIGN FLOOR PLAN
NATIONAL AUDUBON SOCIETY EXPANDABLE EDUCATION
BUILDING

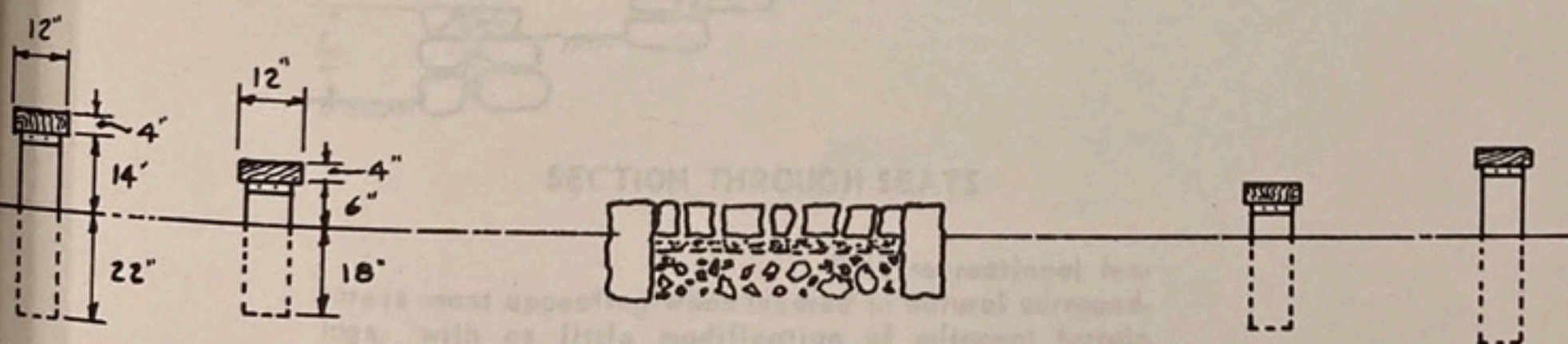
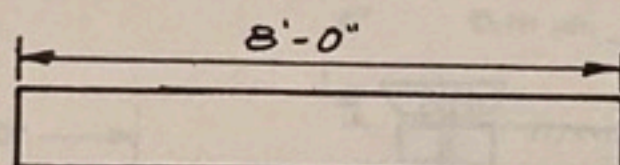
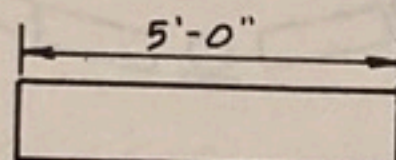


BCW

Sketch #2



PLAN



SECTION

COUNCIL RING

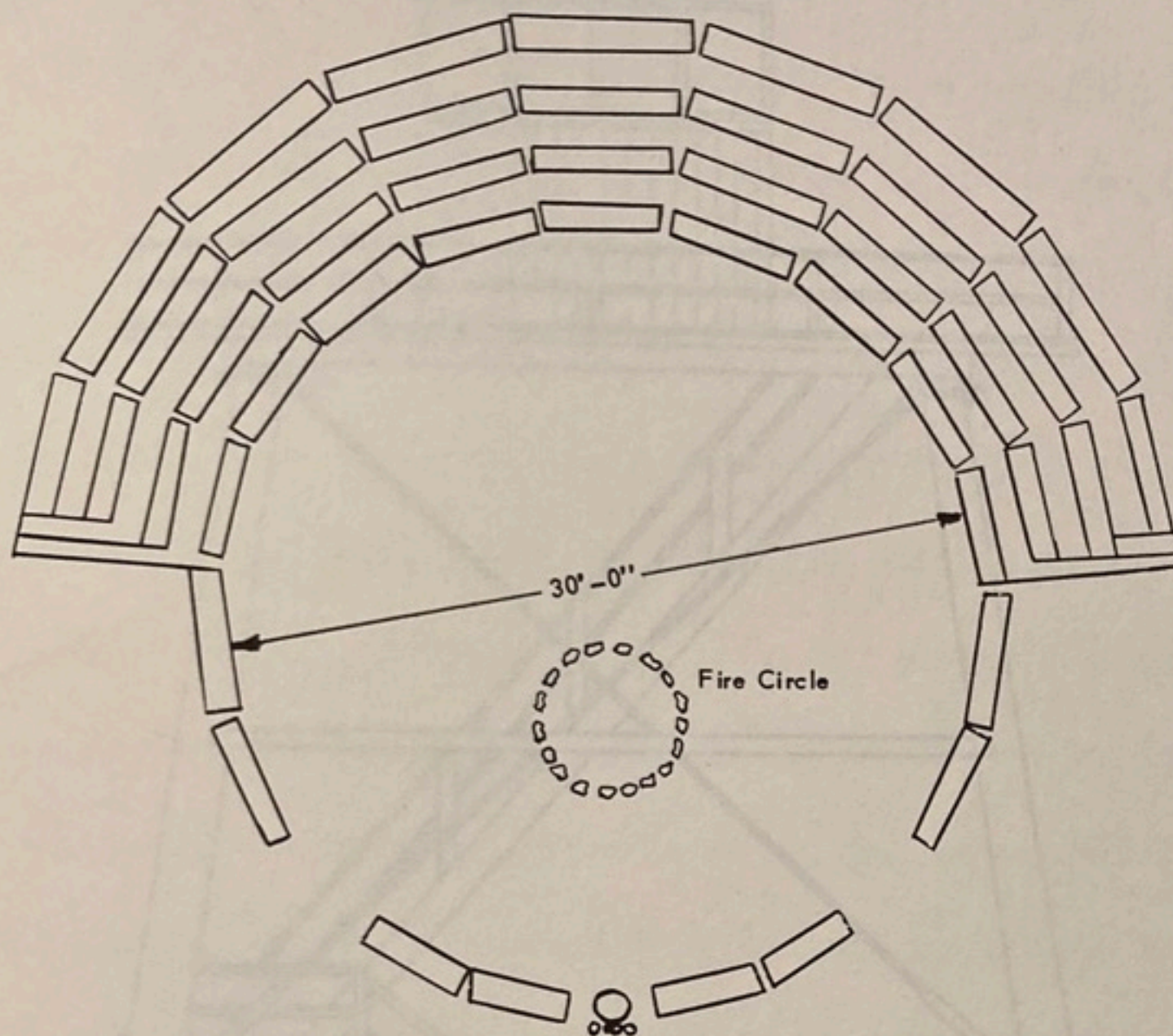
DESIGNED BY: U.S. FOREST SERVICE
 DISTRIBUTED BY: NATURE CENTERS DIVISION
 NATIONAL AUDUBON SOCIETY

SCALE 1/4" = 1 FT.

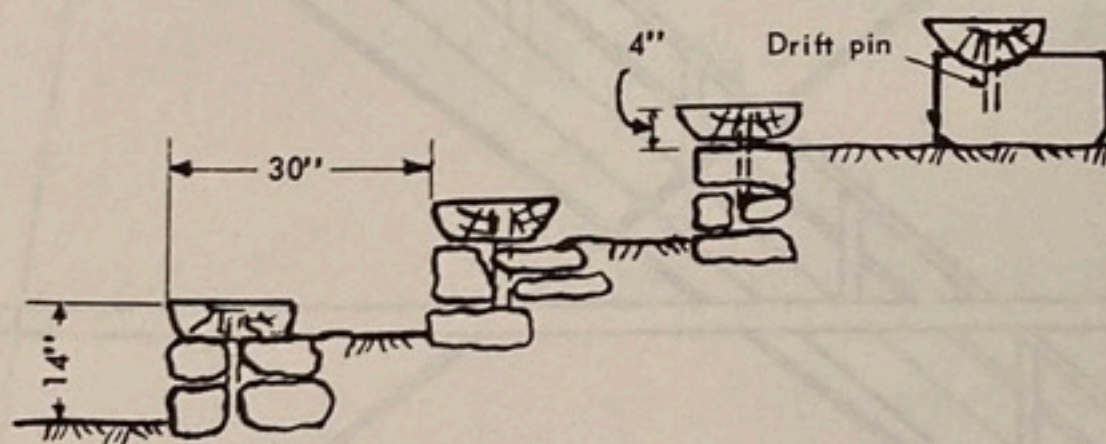
Sketch #3

LARGE COUNCIL RING

47.



PLAN



SECTION THROUGH SEATS

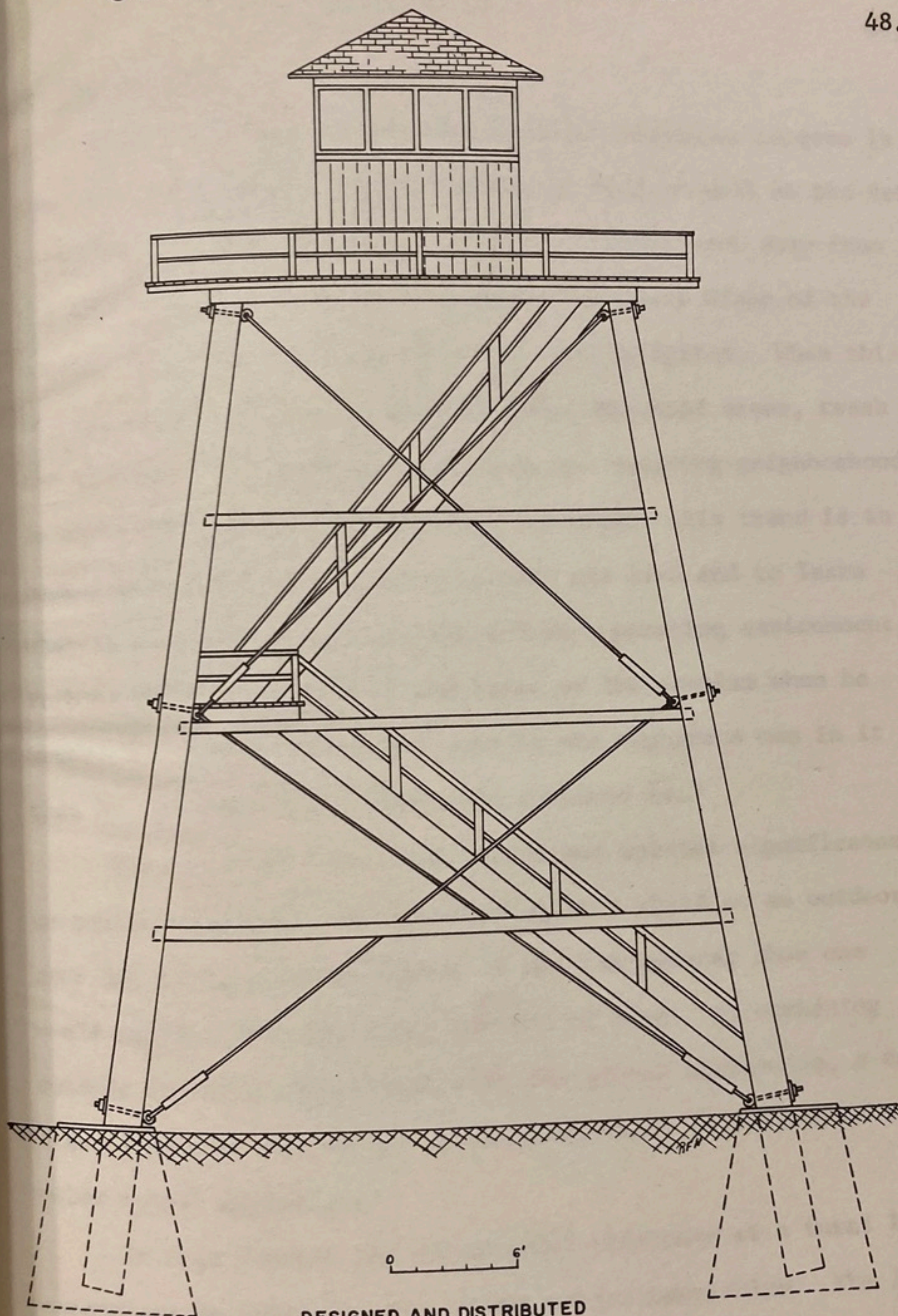
This recreational feature is most appealing when located in natural surroundings, with as little modification of adjacent terrain features as possible. Plant screening often lends additional effect.

Simplicity is the keynote in this design; seating arrangement in successively elevated tiers. The natural earth floor of the ring should be well drained, even to the extent of using catchments and subterranean drains when necessary.

Sketch #4

OBSERVATION-FIRE TOWER

48.



DESIGNED AND DISTRIBUTED
BY THE
NATURE CENTERS DIVISION
NATIONAL AUDUBON SOCIETY

Sketch #5

Program Offering

The crux of an outdoor conservation education program is the laboratory use of specific areas of land as well as the total environment in the community. As our citizens move away from the land and into urban developments, they lose sight of the concept that they are part of a vast living system. When this happens we get air and water pollution, blighted areas, trash on the sidewalks and highways, ugliness and decaying neighborhoods in the urban sprawl. One approach to combat this trend is to have people renew their contacts with the land and to learn what is involved in maintaining a life-supporting environment. Perhaps Thoreau pointed to the heart of the problem when he wrote, "A town is saved, not more by the righteous men in it than by the woods and swamps that surround it."

The use of a rural life center has special significance to school children. The experiences of a child at an outdoor area has an educational impact on him far greater than one would expect from such short periods of time. By combining outdoor learning experiences with the school curriculum, a degree of program continuity is attained which is matched in few other school situations.

In this context the educational offerings at a rural life center are an integral part of the school curriculum. The land

becomes a laboratory where children may experiment and work with real objects, situations, demonstrations and ideas suited to them. It naturally follows, therefore, that a rural life center program should operate under the overall aim of correlating the outdoor activities with indoor classroom curriculums.

The setting that a rural life center offers for learning represents the unity of the environment of which man is an integral part. A rural life center provides a laboratory situation for many of the traditional school subjects. The very essence of this setting, however, makes it particularly suited to explorations and learnings in social science (democratic living and local history), natural science as well as the conservation of natural resources.

The following is a partial list of activities which grade school classes can enjoy in the outdoors and which will enrich and extend curriculums in the schools.

Science

1. Astronomy--observation through telescope correlated with use of sky charts
2. Geology
3. Plant study
4. Animal study
5. Ecology--soil-water-plant-animal interdependence

6. Weather--factors, cloud formation, forecasts
7. Soil as the living mantle of the earth
8. Natural succession
9. Life history studies

Conservation

1. Wise use of natural resources--water, forests, soil, air, natural beauty, wildlife
2. Animal habitats
3. Use of bird and other wildlife studies for recreation
4. Erosion problems--control projects on the farm and in the community
5. Water supply and sewage disposal
6. Food production and care on the farm

Mathematics

1. Forest--finding height of tree, figuring board feet in a tree, volume of a cord of wood
2. Land--length of rod, size of acre
3. Compass orientation and map making

Language Arts

1. Creative writing--poems, stories, skits
2. Dramatics--plays, public speaking, master of ceremonies
3. Tape recordings of dramatics, discussions, programs

Social Studies

1. Organizing and cooperating in groups--democracy in action
2. History of four-county area
3. Past and present uses of four-county area's resources
4. Study of farm folklore
5. Farming as a way of life

Art

1. Sketching and drawing--pencil and charcoal
2. Painting
3. Ceramics
4. Woodcrafts--small wood carvings, wood burning
5. Photography
6. Creative expression through design and model

Music

1. Creative music
2. Music in nature--songs of birds and other forms of wild-life, the sounds and rhythm of wind-rain-thunder.

Appendix A, "Teaching in the Outdoors," gives a variety of ideas on what can be taught in the outdoors.

It can be said that attitudes stem from knowledge, and that knowledge begets understanding, which in turn generates interest. When knowledge, understanding and interest develop,

then sound conservation attitudes follow. When such attitudes develop in people, there emerges a sense of responsibility toward resources, including an appreciation of property, natural beauty, and the landscape in general.

Educational Programming. The following points on programming should be considered in operating the center:

- Organize displays and exhibits in an orderly fashion in the interpretive building, e.g., proceed from general conservation to soil resources, water resources, forest resources, wildlife, minerals, and interrelationships in a natural environment.
- School and other groups should visit the center by appointment. Naturalist-guided tours should be arranged well in advance. Each school group should be provided with some introductory material before the visit so that when the class arrives, it will be prepared for the outdoor experience.
- Provide each visiting teacher or group leader with a set of follow-up materials for subsequent study.
- Acquaint visitors with the rules of the center, and ask everyone to stay on established trails. Indiscriminate wandering over the center should not be permitted. All employees must help enforce this rule.
- Limit outdoor tours to not more than 90 minutes at a time for each group.
- Organize teenage work groups to help with simple maintenance and train capable teenagers to be guides. The center should be able to stimulate the interest of many young people in science, natural history and conservation.
- Concentrate on interesting, inexpensive displays rather than heavy, permanent dioramas. Change displays frequently.

.Have staff keep abreast of new and effective teaching techniques by occasionally visiting other centers and by attending conferences on outdoor interpretation. Colleges across the country are increasingly turning to the outdoors and making use of land areas as laboratories. Appendix B, "College-Level Utilization of the Outdoors in Education," gives values, desirable outcomes, and some subject areas that should benefit from the use of the center. Appendix C, "Scientific Uses of Land," gives suggestions for both high school and college research projects based on the outdoors.

Maintenance

A vital aspect of every rural life center is adequate maintenance. This applies both to facilities and grounds, and includes care of buildings, displays, signs, and the continuous clean-up and maintenance of grounds, trails and roads. The center must be kept clean, tidy and orderly at all times.

An important aspect of maintenance early in the development of the center is to clear out a fire break along the fence line and to open up sufficient fire lanes so that adequate equipment can be brought in to suppress a fire quickly. A single fire could destroy much of the value that an area has for educational purposes.

Administrative Guidelines

Any facility which seeks to serve the public interest

must operate efficiently and effectively; otherwise, complications will arise. The following guidelines should prove helpful:

- Inaugurate an efficient system of record keeping and cost accounting for the center; also, begin keeping a center history journal, and record minutes of all administrative and committee meetings.
- Exercise close supervision and control over public use of the area. Rules and regulations should be drawn up, approved, posted and then enforced.
- The director should keep an accurate check on attendance and program scheduling. He should also maintain a running inventory of the man-made and natural resources of the area.
- The naturalist should maintain close liaison with the local mass media, such as radio, TV and the newspapers. Local citizens, particularly school and youth groups, should be well informed as to what is going on at the center, what services are being offered, and how the center is serving the community.

PART IVSUMMARY OF MAJOR RECOMMENDATIONS

The Nature Centers Division of the National Audubon Society makes the following major recommendations regarding the development of the Bluffton College Rural Life Center as an outdoor laboratory for nearby colleges and schools and as a meeting place for churches and other community groups:

1. That Bluffton College dedicate its farm to esthetic and educational purposes for all times
2. That the Rural Life Center be developed through several stages as suggested in this report
3. That such a center should reflect community effort. Close cooperation should be sought with other colleges, the schools, churches, public agencies, service clubs and individuals in the counties of Allen, Hancock, Hardin and Putnam.

PART VAPPENDICES

- A. Teaching in the Outdoors
- B. College-Level Utilization of the Outdoors in Education
- C. Scientific Uses of the Outdoors
- D. Aullwood Audubon Center for Conservation Education

APPENDIX A

TEACHING IN THE OUTDOORS

HOW TO TEACH IN THE OUTDOORS

Capitalize on Natural Curiosity of Children

- Establish purpose
- Pre-plan
- Time each experience carefully
- Plan for proper pupil behavior
- Make observations
- Evaluate

Patterns of Pupil Experiences

Primary grades: Direct observation to find out what is happening at a particular moment in the outdoors and to maintain a sense of wonder — ?

Middle grades: Observation, with critical comparison and simple measurement

Upper grades: Comparative measurement, sustained experiments, calculation of results, and statistical evaluation

WHAT CAN BE TAUGHT OUTDOORS

Outdoor experiences should be part of many meaningful units of study. Such experiences can be used to initiate a unit of study, raise questions for research, or to test theories derived from reading. The outdoors can contribute to the curriculum in many other ways, e.g., for collecting data and specimens, observing natural phenomena, inspiring creative work, or helping to explain some concept introduced in the classroom. Each topic which follows is accompanied by a list of educational objectives:

Work Done by Solar Energy

- To measure solar energy received as heat and light
- To measure differences in solar energy absorbed by different colors
- To concentrate solar energy into a high temperature source
- To use solar energy to perform water distillation
- To use solar energy to produce electricity

The Nature of Seasonal Change

- To identify seasonal changes in trees, shrubs and flowers
- To distinguish between annual and perennial plants
- To distinguish between evergreens and deciduous trees

Deciduous Plants

- To identify deciduous trees and shrubs when leaves are present
- To identify deciduous trees and shrubs after leaves fall

Evergreen Plants

- To compare evergreen trees and deciduous trees
- To compare needles and cones of various coniferous trees
- To locate and identify evergreens in a community

Flowers and Their Work

- To identify the parts of a flower
- To learn the value of flowers
- To recognise similarities and differences between flowers
- To relate the shape of flower parts to the method of fertilization

Seed Dispersal

- To identify ways by which plants disperse their seeds
- To relate the pattern of seed dispersal with the places where seedlings sprout
- To find out why all seeds do not successfully produce plants

How Plants Multiply

- To find how plants multiply other than by seeds
- To describe how spreading plants are used to advantage in certain situations

Survival Needs of Invertebrates

- To relate activities of insects to their basic biological needs for food, protection and reproduction
- To identify some common insects and spiders
- To locate various insect homes

To describe how man manages the environment to encourage some insects and spiders and to discourage others

Birds

To recognize common birds of area
To describe differences in behavior of various birds
To provide winter feeding station
To identify birds that are residents and seasonal visitors
To improve habitat conditions for birds

Interrelationships Within Little Environments

To find changes in the environment caused by weather
To find changes caused by plants and animals
To discover how one form of life affects another

Soil Erosion and Deposition

To be able to point out evidence of soil erosion and deposition
To identify the factors that accelerate erosion and those that slow it down
To correct a soil erosion problem in the community

The Nature of the Physical Environment

To measure climatic factors of temperature, rainfall, wind, relative humidity and sunshine
To identify microclimates within a larger climate zone and be able to identify the factors that produce these microclimates
To recognize major cloud formations and relate them to weather, air movements and the influence of the sun

The Earth in the Solar System and the Universe

To locate apparent direction by sun's movement caused by rotation of the earth
To relate observed changes in the position of the sun and stars to the movements of the earth
To demonstrate size and distance relationship in the solar system
To be able to point out the North Star

- To recognize some star constellations
- To locate planet and first magnitude stars

CURRICULUM CONTENT BASED ON OUTDOORS

Energy of Sun is Necessary for All Life and Activity on Earth

- Sun's energy affects climate
- Plants use sun's energy
- Growth patterns of plants and animals
- Man's dependence on sun's energy

Movements of Earth in Space Produce Day and Night, and Seasonal Changes

- Day and night caused by rotation of earth on axis
- Seasonal changes result from movement of the earth around the sun and the $23\frac{1}{2}^{\circ}$ tilt of the earth's axis

Night Sky Shows Vastness of Universe

- Solar system
- Seasonal change in position of stars
- Constellations
- Direction and location determined from stars

Geological Structure of Earth's Crust Influences Topography and Determines the Distribution of Minerals

- Geological structure affects man
- Geological structure creates watershed
- Geological structure is found in stream beds and road cuts
- Geological structure provides parent material of soil

Natural Forces and Man Cause Changes In Earth's Surface

- Farming activities
- Stream action, wind erosion
- Decomposition
- Earthquakes
- Volcanoes
- Folding and faulting of earth's surface
- Rising and sinking of surface

Climatic Conditions are Affected by Interrelated Conditions

Latitude
Altitude
Sunlight
Location of mountain systems
Movement of air
Shape and distribution of land and water surfaces
Ocean currents
Humidity
Surface vegetation

Climatic Conditions Affect Plant and Animal Life

Vegetation at different altitudes
Seasonal influence on plant growth patterns and reproduction
Seasonal influence on animal habits
Plants, animals and man adapt to climatic conditions

Certain Natural Processes, Occurring as Cycles, Influence the Interrelations and Interdependencies of all Living Organisms and have Significant Effects on the Physical World

Photosynthesis and respiration
Water cycle
Nitrogen cycle
Food chain
Reproduction cycles

The World, When Undisturbed by Man, Tends to Maintain A State of Interdependence, but not a True Balance

All living organisms have a place and a function
Change and modification are a continual process
Specific habitats show a state of interdependence

Man is a Great Factor Responsible for Upsetting Interdependencies in the Living Environment

Radioactivity
Air pollution
Water pollution
Misuse of natural environment
Urbanization

SCIENCE INVOLVEMENT IN TEACHING OUTDOORS

Minerals of Economic Importance

Methods used to identify
Formation of certain minerals
Comparative amounts of various minerals
Uses by man and natural life
Amounts of deposits necessary for economical use
Rate of consumption
How various minerals are extracted
Types of topography where a certain mineral is most often found
The part these minerals have played in the history and geography of the area
What man does to conserve minerals
Esthetic values
Recreational values

Rocks and Soil

Identification of rocks
How certain rocks were formed
Minerals common to various rocks
Relation of rock type to topography
How to read the rocks to determine the geological history of the area
Natural forces that cause rocks to break and wear away
How the formation of soil depends on the decomposition of rocks
What happens to rock particles that are worn away, other than those which make soil
How the natural forces aid in making soil
The various forms of plant and animal life that contribute to soil building
How soil fertility and types depend on various climatic and environmental factors
Amount of time needed to make good topsoil
The dependence of all life on soil
The identification and characteristics of soil types
The identification and characteristics of soil layers
What man can do to conserve and build up the soil in the community
How to test soil for its properties
Factors, both natural and man-made, which contribute to the depletion and destruction of soil

Constructive and destructive effects of erosion
Rate of time to destroy good topsoil
Various types of erosion
Nature's way of retarding erosion
Methods used to retard soil erosion in the community
Esthetic values
Recreational values

Water

Forms of water
The water cycle
Cloud formations and their meaning
Various forms of precipitation
Comparative effects, both destructive and constructive,
of different types of precipitation
Water's contribution to soil building
The uses of water by plants and animals
The watershed, its importance and implications
Identification of the watershed in which school is located
The influence that precipitation has in determining the
types of plant and animal communities that inhabit the
area
How water contributes to erosion
The results of either an overabundance or deficiency of
precipitation during a year or a span of years
How precipitation affects climate
How man strives to conserve water and use it wisely
Water's effect on the locality
How a community can "save" water
Esthetic values
Recreational values

Plants

Differentiation and methods of identification
The various segments of the plant kingdom
The parts of plants and their purposes
Life cycles of the various types of plants in area
Explanation of pollination, its value and various methods
by which it is accomplished
How seeds are formed and methods of dispersal; the value
of seed dispersal
The basic necessities of all plant life are air, food,
water, and sun:

How green plants obtain necessities
How parasitic plants obtain necessities
How varying amounts and types of these necessities influence the character of the plant community
Adaptations of plants to fit in with their environment
How plants adapt themselves to secure necessities
The struggle for survival among plants
How plants depend on animals and animals on plants (food chain)
The dependence of plants on water
The role of plants in the water cycle
How plants contribute to the storage of water
How plants depend on soil and how various types of soil affect plants
How plants help in building soil
How different plant parts protect the soil
The dependence of plants on minerals
The nitrogen cycle
The oxygen cycle
The effect of fire on various plant communities
The natural defenses of certain plants against fire
The recovery of plant communities after fire
Man's utilization and dependence upon plants including new uses and discoveries
The conservation of plants by man
Plants' role in the history of the community
Reading the history of a community through a knowledge of plants

Animals

Methods of identification
The various segments of the animal kingdom
The parts of animals and their functions
The life cycles of various types of animals
The basic necessities of animals--air, food, water, shelter, space to live
The adaptations of various types of animals
How food chains contribute to interdependence
How animals depend on plants
The dependence of animals on soil
How animals contribute to soil building
The dependence of animals on minerals
Animals' role in the water cycle

The effect that climate has in determining the type of animal community

Animals' contribution to the nitrogen cycle

Struggle for survival among animals

Reading animals' characteristics by study of their tracks and droppings

The conservation of animals by man

How man has affected interdependence among wildlife

Animals' role in the history of a locality

The effect of fire on various animals

Esthetic value

Recreational value

Air and Weather

The components of air and their uses

Weather (high pressure, low pressure, precipitation, temperature, winds); their causes and effects

Various cloud formations; their origin and meaning

The water cycle

The understanding of humidity

The effects of dry and wet cycles

The oxygen cycle

The dependence of all living things on air

The effects of various types of weather on rock, minerals, soil

Air currents and their effect upon the local climate

The effects of various types of topography upon the weather and their resultant effects on climate

Man's use of the various properties of the air other than for breathing

The effect of weather on the history of the locality

Esthetic values

Recreational values

Physical Forces

The dependence of all life on the sun's energy

The effect of various types of weather on the earth's surface

The meaning and effect of weather cycles

The effect of glaciers on topography

The cause and effect of various types of geological
phenomena--volcanoes, faults, landslides, earthquakes

The importance of the stars, planets and the moon to our
earth

The composition of the earth

Esthetic values

Recreational values

APPENDIX B

COLLEGE-LEVEL UTILIZATION OF THE OUTDOORS IN EDUCATION

Many values accrue from education in the outdoors. For example, increased powers of observation, keener sense and appreciation of nature and the need for conservation, an expanded lifespace, a better understanding of group relations, and a more perceptive approach to discovery, exploration and research. Teachers and students alike have the opportunity to extend themselves--physically, sociologically and psychologically. All in all, the quality of education is upgraded in the outdoors. As Dr. Willar Zahn has said:

Outdoor education improves the quality of student interests, provides sources of motivation for developing new interests as well as for extending the old, and increases the availability of desirable interests in the total environment. Cause and effect relationships become more direct and obvious, emphasis on meaning is thereby enhanced, and the ensuing delight in learning is thus deepened and made more intimate and personal. The element that is important here is that the quality of experiencing is greatly improved.

Dr. E. V. Pullias wrote:

In deep sincerity, I believe outdoor education is a ray of light, a crack in a thick, dark wall which could bring a desperately needed new dimension to man's attempt to educate himself.

DESIRABLE OUTCOMES

- The development of an awareness of the outdoor environment
- The participation in outdoor learning activities that will enrich classroom teaching
- The development of the ability to use a multi-sensory approach to teaching and learning
- The ability to use more exploratory learning in teaching
- The ability to understand and use teacher-pupil planning
- The recognition of the values derived from an informal group experience

The following is a partial list of subject areas that can benefit through using the outdoors:

SOCIAL SCIENCE

A study of the history of the local area; its land, its people, and its customs

An investigation of historical sites: Indian sites, old canals, mine and furnace sites

PHYSICAL AND NATURAL SCIENCE

A study of forests, forest life and reforestation

Field experiences in botany, zoology, geology, astronomy and meteorology

Investigation of conservation problems with respect to watersheds, rivers and lakes, fish and game, trees and forests

HEALTH, PHYSICAL EDUCATION AND RECREATION

Education in various outdoor skills: fishing, camping, swimming, boating

Investigation of health problems in connection with operating an outdoor school (camp)

Administration and organization of an activity program for an outdoor school

MATHEMATICS

Field problems in land measurement and map making

Estimation of distances and sizes: land areas, elevation, tree heights, lumber footage and tree ages

Keeping the accounts and financial records for an outdoor school operation

FINE ARTS

Developing a varied music and dramatics program for an outdoor school: informal sings, pageants, plays

An opportunity for creative drawing and sketching, pottery making and working with other native materials

INDUSTRIAL ARTS

Developing designs and plans for outdoor school buildings
Organizing an educationally sound arts and crafts program for an outdoor school

HOME ECONOMICS

Planning and preparing foods for regular menus and cook-outs
Investigating problems of an outdoor school food service operation

LANGUAGE ARTS

Opportunities for creative writing: plays, poems, and prose based upon outdoor experiences
An investigation of literature relating to the local area and local natural resources

PSYCHOLOGY AND TEACHER EDUCATION

Developing insights into child development, principles of learning and group dynamics
Investigation of the potentialities of the outdoors in curriculum development

APPENDIX C

SCIENTIFIC USES OF THE OUTDOORS

The foremost requirement in scientific study is accurate observation. In the outdoors, observation takes many forms. This involves more than just the use of the eyes since information comes to us through several senses. Observation alone is not science. Observation in a program of outdoor education should be directed toward answering questions or solving problems. The information gathered needs to be organized and examined, and when enough observations are made, conclusions are reached.

Many of the problems faced today in America with regard to proper management and wise use of our natural resources are related to identification, life histories, ecology, conservation practices and opportunities for research.

IDENTIFICATION

Wise resource use is based upon knowing and understanding the living things or materials involved. Identification of plants, animals, soils, rocks, minerals, weather elements and sources of water is best begun when one is young. The ideal place is in the outdoors where the items are found. A nature center or outdoor laboratory not only provides this setting but adds a most important ingredient--a carefully

planned and organized approach.

LIFE HISTORIES

Living things--and in a certain sense, rocks, soils and even water from different sources--all have patterns of development or individual life histories. Yet much of this life history information is lacking today because most individual species have not been observed and studied thoroughly and long enough.

If we knew more about the life histories of insects, for example, we could probably exercise more control over them through habitat control and the use of their natural enemies. Many aspects of the approaches to the control of harmful insects are difficult to study and require ingenious ways to get facts. Closely-supervised land such as is found at an interpretive center offers opportunities for such studies.

Life histories are a challenging field of study and this study requires unusual methods. Plant growth studies can be made with time-lapse photography or with the aid of carefully kept records. Illusive animals may be observed through one-way mirrors or with red light and with special infrared-light instruments. Soils can be tested for their physical, chemical and biological properties. Certain radioactive

salts can be added to water to trace its history as it percolates through the layers of the earth.

A person can be very practical about the studies of life histories at interpretive centers. All stages of the life histories of certain insects can be sought and studied rather than observing only the adults. The leaves, blossoms and fruiting bodies can be studied in place of just one of these vital parts. Soils can be traced through their component parts and especially to the bedrock or native base materials. It is not difficult to observe complete life histories of a number of amphibians and reptiles. Local rocks and minerals can be studied so as to relate their formation to the history of the earth's crust in the area where the center is located.

ECOLOGY

Ecology is the science concerned with the complex interrelationships between living organisms and their environment, and between the organisms themselves. No living thing exists without influencing or without being influenced by other living things and the surrounding environment. As a result such relationships as competition, parasitism, commensalism, mutualism, scavenging and predation develop in most habitats.

In any particular area relationships are established

between living things which form the foundations of natural communities. These are considered somewhat like sets of nested boxes. When one community has been defined it is almost always possible to find a smaller one inside the one just described. By this method, the earth itself is viewed as the largest community and a drop of pond water as one of the smallest.

Some of the interdependencies that can be studied first-hand are:

- The interdependence of plants and animals
- The relationships of plants to soil
- The relationships of animals to soil
- The relationships of plants of the same species to each other as well as to plants of different species
- The relationships of animals of the same species to each other as well as to animals of different species
- The effects of weather changes on plants and animals

Other fascinating interdependencies are revealed through a study of the great cycles in natural communities:

- Weather
- Energy (photosynthesis and release of energy by living bodies)
- Water (hydrologic)

- .Carbon
- .Oxygen
- .Nitrogen
- .Calcium

The plot or quadrant method is one answer to the problem of studying the relationships of organisms to each other and to their surroundings.

A standard size has not been established for sample plots. Many studies have shown that plot size should be adjusted to the vegetative type and plant layer being sampled. Foresters generally use a mil acre plot (6.6 x 6.6 feet) for measurement of lower vegetation and a 1/40-acre plot (33 x 33 feet) for the tree layers (overstory and understory). Ecologists in general use smaller plots, i.e., 4 x 4 inches for moss and lichen layers, 3 x 3 feet for grass and herb layers, and 12 x 12 feet for the shrub layer.

Plot shapes also vary. Circular plots are best adapted for studies in which the plots are resurveyed from time to time because they can be located permanently with one stake or marker at each of their centers. Square and rectangular plots require at least two stakes, although economy is achieved at some loss in accuracy by locating such plots at fixed intervals along a base line. In this case, the base

line is permanently marked and the plots are re-established by measurements along this base line.

Some suggested locations for the smaller plots are:

- Mowed grassy area
- Trail edge
- Lichen or moss-covered rock
- Clump of ferns
- Underneath deciduous tree
- Underneath coniferous tree
- Marsh
- Hedgerow
- Stream bank
- Pond edge
- Meadow
- Weedy field

Larger plots can be located as follows:

- Field that has gone to shrubs
- Field where shrubs are giving way to trees
- Sub-climax tree stand
- Climax forest

Suggested information to seek for each plot follows:

Slope. Is the terrain of the plot uniform or irregular?
Try to determine the % of slope.

Exposure. Note the location and extent of sunlit or shaded areas. How do these change during the daylight hours?

Temperature. Record the air temperature at eye level, at ground level and one inch under the ground surface. Always shade thermometer bulb from direct sunlight. When soil is packed make hole for bulb with pencil and repack soil around thermometer.

Soil pH. Determine soil pH with soil-testing kit.

Compactness of the Soil. Measure the distance a sharpened pencil can be pushed comfortably into the soil with the palm of the hand.

Porosity of the Soil. Press the edge of a large juice can, with both ends removed, about $\frac{1}{2}$ inch into the soil. Fill can to the brim with water and record time in minutes and seconds it takes for the water to soak into the ground.

Plants. Record the name and number of each kind of plant growing on the plot. Note the ones that are in bloom. Are any stunted or dried out? If so, why? It will be necessary to identify the plants where they are found or from notes, as any removal of specimens will make future checks on the plot of little or no value.

Animals. The size of the plot will have much to do with the possibilities as far as animals are concerned. In plots

up to and including the mil-acre size, study the plot for a ten-minute period each time an observation is made. How many different animals can be counted in this time? What is the smallest animal seen? largest animal? Are there any other signs of animals or animal activity--tracks, food remains, scats? Estimate the population of animals on the plot.

Interrelationships. Can you find evidence that animals are using plants or other animals as food, cover or nesting places? Can you find any plants that are using animals or other plants?

Map. Map the plot using graph paper. North should be at top of the sheet. A scale should be placed at bottom of the sheet. Major features, depending on plot size, should be accurately located and labeled.

Summary. How does soil affect the plants and animals of the plot? Do plants and animals affect the soil? Has the choice of plot size proved to be satisfactory? When should the plot be restudied? What values might be derived from continuing the study over a period of years? How has man's activities influenced the plot? What changes can be predicted for the plot in the years ahead?

CONSERVATION PRACTICES

Future conservation practices must take into account

man's relationship to his total environment. These methods are made more complex by the fact that the earth has several million species of plants and animals living together in a more or less balanced state and subsisting on a limited supply of mineral nutrients, soil, water and air. This limitation means that the basic life-giving elements are used and reused perpetually. Further, they cannot be managed wisely by a careless and uninformed people.

Man has made and continues to make mistakes in his use of soil, water, air and the earth's living forms. Correction of these mistakes and the establishment of better methods will depend on how well man knows and applies the facts of interdependencies, or, in other words, on how well he applies a good working knowledge of ecology. Such application is a large part of the demonstrations developed at a nature center or outdoor laboratory.

In brief, it appears that educators and leaders must turn to the outdoors in order to train a generation of people who will be aware of the environmental consequences of human acts and to give them a will to use resources wisely and to improve their environmental conditions. Educational programs must have the pursuit of resource knowledge and the application

of the conservation ethic as threads that run through all instruction at all levels.

OPPORTUNITIES FOR RESEARCH

A problem faced by college students who want to do research involving natural resources is that they cannot find land that will remain undeveloped for the duration of a proposed study. The nature center or outdoor laboratory offers an assurance against a change in the purpose and use of a piece of land. College students find outdoor laboratory lands ideal for studies dealing with land nutrients, land and water food chains, natural succession, composition of plant and animal communities, and succession as related to wild fire or some physiographic change such as erosion or piling up of sand at the edge of a lake.

High school students find opportunities for research at most, if not all outdoor laboratories. Most high school research is aimed at getting answers to specific questions about the landscape or providing background information so that local action can be initiated to solve community resource problems. Some areas for investigation by high school students are delineated as follows:

- (1) Study animal populations through visual census,

banding and drives, and provide suggestions for environmental improvements needed to make desired increases in the numbers of certain species. Animal and bird maps showing habitats are a part of the report.

- (2) Study a stream on or near the center property with a view to possible improvement through clean-up and by building structures to influence water current and direction. Any recommendations are supported by complete specifications on locating and building the structures. A watershed map is prepared for the stream showing the drainage areas, surface water and sources of ground water (springs).
- (3) Develop a forest-fire control system for an area. A fire-control map is made to show zones of greatest fire danger, location of fire breaks and fire lanes, water holes, lookout points or towers, and the location of fire-fighting equipment.
- (4) Study forest types present on an area. A forest map is drawn to illustrate the forest types found.
- (5) Census fish in a stream or pond by seining to determine the kinds and ages of fish present. Management suggestions, if needed, are listed.

- (6) Study the food chain in a pond or lake. Management, if desirable, is outlined.
- (7) Sound a lake or large pond for depths. Data obtained is used to prepare a contour map of the lake or pond bottom.
- (8) Locate and study shrubs, wildflowers, ferns, club-mosses, mosses and lichens. A plant map for each kind of plant is prepared.
- (9) Study soils of the area. The findings are placed on an appropriate soil map.
- (10) Study geology of area. A geologic map is made to locate geologic features, rocks and minerals.
- (11) Study past human uses of an area. A detailed historical map is made to show such items as old roads, old or abandoned farm and home sites, church sites, forts, springs, trails, and the like.
- (12) Investigate possible pollution sources of a stream, lake or pond. Plans are formulated for local action to correct a water pollution problem if one exists.

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